2019 Actuarial Valuation Report on the Firefighters' Retirement System

Actuarial Valuation as of
June 30, 2019
Issued January 2020

LOUISIANA LEGISLATIVE AUDITOR
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ON BEHALF OF THEACTUARY FOR THE LEGISLATIVE AUDITOR
LOWELL P. GOOD, ASA, EA, MAAA

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2019 ACTUARIAL VALUATION REPORT

FIREFIGHTERS' RETIREMENT SYSTEM

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LOUISIANA LEGISLATIVE AUDITOR
DARYL G. PURPERA, CPA, CFE

January 15, 2020

Mr. Steven S. Stockstill
Director and Legal Counsel
Firefighters' Retirement System of Louisiana
3100 Brent Drive
Baton Rouge, Louisiana 70809

Dear Mr. Stockstill:

This report provides the results of our actuarial valuation of the Firefighters' Retirement System of Louisiana as of June 30, 2019. The report contains our findings, conclusions, and recommendations.

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

Sincerely,

Daryl G. Purpera, CPA, CFE
Legislative Auditor

DGP:NE:ch

FRS 2019 VALUATION BY LLA

SUMMARY AND CONCLUSIONS

This actuarial valuation report was prepared by the Louisiana Legislative Auditor (LLA) and is hereby submitted to the Public Retirement Systems' Actuarial Committee (PRSAC) for its consideration

PUBLIC DOCUMENT

This valuation report is a public document. This report has been prepared for the following users:

Potential Users*	Definitions*	Identified Persons
Principal	A client or employer of the actuary.	The Legislative Auditor.
Intended Users	Any person who the actuary identifies as able to rely on the findings of the report.	The Louisiana Legislature and staff, PRSAC and FRS.
Other Users	Any recipient of the report who is not an intended user.	Other interested government entities or employees and the public.

* As defined by the Actuarial Standards of Practice (ASOP) No. 41.

SUMMARY OF CHANGES IN ASSUMPTIONS AND METHODS

This actuarial valuation implements a few significant changes as compared to the last PRSAC-accepted valuation for the Firefighters' Retirement System (FRS or System), which was dated November 5, 2018, and prepared by G. S. Curran & Company, Ltd.

- This valuation changes the mortality assumption for all members to the Society of Actuary's Pub-2010 Public Retirement Plans Mortality Tables, the most up-to-date mortality table published by the Society of Actuaries for public sector employees, but accepts all other demographic assumptions. Refer to Appendix A for more details.

- This valuation lowers the inflation assumption to 2.20% from the 2.70% assumption in the last PRSAC-accepted valuation, based on current consensus averages among reputable sources. Refer to Appendix B for more details.

- This valuation lowers the investment return assumption to 6.50% from the 7.30% assumption in the last PRSAC-accepted valuation, based on current consensus averages among 14 reputable sources and considering FRS' own asset allocation and cash flow expectations. Refer to Appendices C and D for more details.

- This valuation recognizes the reasonably expected costs of the System's future gain-sharing cost-of-living (COLA) benefits, while the last PRSAC-accepted valuation did not include the expected costs of the System's future gain-sharing COLA benefits. Refer to Appendix E for more details.

SUMMARY OF VALUATION RESULTS

Valuation Date		June 30, 2019	June 30, 2018
Census Summary:	Active Members	4,446	4,424
	Retired Members and Survivors	2,407	2,327
	DROP Participants	208	192
	Terminated Due a Deferred Benefit	84	76
	Terminated Due a Refund	671	656
Payroll (excluding DROP participants):		$ 240,413,972	$ 236,005,445
Benefits in Payment (excluding DROP accruals):		$ 97,547,088	$ 91,808,883
Present Value of Future Benefits:		$ 3,578,386,609	$ 2,866,047,701
Actuarial Accrued Liability (EAN):		$ 2,809,092,041	$ 2,279,256,967
Unfunded Actuarial Accrued Liability:		$ 988,051,137	$ 537,805,006
Actuarial Value of Assets (AVA):		$ 1,821,040,904	$ 1,741,451,961
Market Value of Assets (MVA):		$ 1,778,931,314	$ 1,704,049,168
Ratio of AVA to Actuarial Accrued Liability (EAN):		64.83%	76.40%
		Fiscal 2019	Fiscal 2018
Market Rate of Return:		4.4%	6.5%
Actuarial Rate of Return:		4.5%	5.6%
		Fiscal 2020	Fiscal 2019
Employers' Normal Cost (Mid-year):		$ 49,809,221	$ 34,904,077
Amortization Cost (Mid-Year):		$ 110,319,170	$ 58,710,108
Estimated Administrative Cost:		$ 1,937,980	$ 1,975,435
Expected Insurance Premium Taxes Due:		$ 28,017,672	$ 26,807,631
Net Direct Employer Actuarially Required Contributions:		$ 134,048,699	$ 68,781,989
Projected Payroll:		$ 246,180,693	$ 242,900,383
Statutory Employee Contribution Rate: *		10.00%	10.00%
Board Approved Net Direct Employer Contribution Rate: *		27.75% **	26.50% **
Actuarially Determined Net Direct Employer Contribution Rate: *		54.45%	28.32%
		Fiscal 2021	Fiscal 2020
Minimum Recommended Net Direct Employer Cont. Rate: *		57.00%	27.75%

Note: Please refer to the following pages for explanations of the reasons for the significant increase in contributions over what was developed by the System's actuary.

* The above rates are for members with earnings greater than the Department of HHS poverty guidelines. For members with earnings below the poverty guidelines, employer rates will be 2.0% higher and employee rates will be 2.0% lower.

** The Board elected to set the Net Direct Employer Contribution Rate higher than the 26.25% minimum recommended rate.

DISCUSSION OF CHANGES IN ASSUMPTIONS

In preparing this actuarial valuation, we accepted almost all the actuarial assumptions developed by FRS' actuary and adopted by its board of trustees, while we changed other actuarial assumptions. Following is a brief summary of the principles we applied in adopting different assumptions used in this actuarial valuation as compared to the System's 2019 valuation.

1. When demographic assumptions are developed based on a retirement system's own experience, they should be developed using current accepted actuarial models and tables.

2. The economic assumptions as to future inflation and future investment returns:
   a. Should be an unbiased expectation of the future from independent experts,
   b. Should not be unduly influenced by perceptions of what the contributing entity(ies) can afford in current annual budget negotiations,
   c. Should explicitly reflect a system's own asset allocation,
   d. Should explicitly reflect a system's own projected benefit cash flow, and
   e. Should lie within the mainstream of forward-looking forecasts from experts.

3. All material benefits that are reasonably expected to be paid in the future should be measured actuarially, including expected future cost-of-living (COLA) benefits, using actuarial methods that are:
   a. *Explicit:* Separately identify the cost of COLA benefits, and should not be implicitly buried or conflated within the return assumption, and
   b. *Transparent:* Clear and meaningful; should not be misleading or confusing to the public.

These changes in assumptions do not change the cost of the retirement program. They change the contribution timing or incidence, i.e., under these new assumptions, current and future generations of taxpayers are more equitably paying their respective fair shares (actuarially speaking).

The improvements in these three actuarial assumptions/methods (compared to the System's assumptions) enhance the benefit security of plan members by ensuring the contribution requirements have a stronger actuarial basis. Furthermore, these improvements enhance the integrity of the financial disclosures issued by all participating governmental entities by ensuring the balance sheet liabilities reflect all expected benefits, and are a more transparent and fair representation of the pension obligation.

The following sections provide a brief explanation of the new assumptions and methods and the rationale behind them.

Demographic Assumptions (Rates of Mortality)

This valuation revised the rates of mortality used in the 2018 valuation adopted by PRSAC. Refer to Appendix A for more information concerning the changes in future mortality rates.

Economic Assumptions (Inflation and Investment Return)

FRS' actuarial calculations and disclosures as of June 30, 2018, and as of June 30, 2019, were developed by its actuary using an investment return assumption of 7.3% and of 7.15%, respectively.

Based on its review of many independent national experts in the forecasting of inflation and investment returns, the LLA has determined that 6.50% is the *most appropriate* return assumption and is used for all purposes in this actuarial valuation. The LLA determined the *most appropriate* inflation assumption to be 2.20%.

Refer to the following Appendices for an understanding of how these revised economic assumptions were derived and why they constitute an improvement:

- Appendix B – Basis for Inflation Assumption
- Appendix C – Basis for Net Investment Return Assumption
- Appendix D – Horizon and Cash Flow Considerations for the Net Investment Return Assumption
- Appendix G – Press Clippings for Other Retirement Systems Lowering Their Return Assumptions (2015-2019).

Assumption for Gain-sharing COLA Benefits

This actuarial valuation employs an explicit method of recognizing the expected cost of future gain-sharing COLA benefits of the plan. The future gain-sharing COLA benefits are actuarially equivalent to an annual fixed COLA of approximately 0.60% for eligible retirees prior to age 65 and 0.90% thereafter. This was approximated using generally accepted stochastic (simulation) modeling techniques. The System's gain-sharing COLA program is complex but should be approximated within an actuarial valuation.

The System and its actuary do not recognize any future expected permanent benefit increase. It is the opinion of the LLA that not recognizing the future expected permanent benefit increases fails to measure the cost of the plan's COLA program properly, and understates the costs and liabilities. Future COLAs are reasonably likely to be allowed by the statutory template (as predictably as disabilities or turnover) and reasonably likely to be granted by the board of trustees. Therefore, they should be actuarially measured, just as other future benefits which are likely to be provided. It is the opinion, of the LLA, that when certain benefits are judged to be reasonably likely to be paid in the future and are actuarially measurable and material, it would be inappropriate to treat them as pay-as-you-go benefit, i.e., financing the payment of COLAs after the have been granted.

Users of this actuarial valuation report should refer to Appendix E for an understanding of *how* and *why* this change in method was derived and implemented and why it is an improvement.

The table on page 5 presents the effect of advance-recognizing gain-sharing COLA benefits (as well as other changes) on the unfunded accrued liability as of June 30, 2019, and on the minimum recommended net direct employer contribution rate for fiscal year (FYE) 2021.

BRIEF SUMMARY OF THE EFFECTS OF ASSUMPTION CHANGES

The following table presents (a) the unfunded accrued liability as of June 30, 2019, and (b) the associated minimum recommended net direct employer contribution rate for FYE 2021 for each of the new assumptions/methods described above. The entries below isolate the effect of each new assumption/method individually and cumulatively.

The Effects of Changes in Assumptions	Unfunded Accrued Liability as of 6/30/2019 ($ Millions)	Minimum Recommended Net Direct Employer Contribution Rate for FYE 2021 (as Pct of Projected Covered Pay)
(1) As Prepared by the System Actuary (after change in cost method) *(benchmark values)*	$584.1	32.2%
(2) Change in Method for Actuarial Valuation System *(effect of change in Actuarial Valuation System against benchmark)*	$592.3	32.8%
a. Effect of this Change: (2)-(1)	$8.2	0.6%
(3) Change in Demographic Assumptions *(combined effect of the change above and Mortality Assumption against benchmark)*	$619.3	34.5%
a. Effect of this Additional Change: (3)-(2)	$27.0	1.7%
(4) Change in Economic Assumptions *(combined effect of all changes above and Investment Return and Inflation Assumptions against benchmark)*	$787.8	44.8%
a. Effect of this Additional Change: (4)-(3)	$168.5	10.3%
(5) Change in Assumption for Gain-sharing COLA Benefits *(combined effect of all changes above and Method for Gain-sharing COLA against benchmark)*	$988.1	57.0%
a. Effect of this Additional Change: (5)-(4)	$200.3	12.2%
b. Combined Effect of All Changes: 2a+3a+4a+5a = (5)-(1)	$404.0	24.8%

Source: Developed by LLA's actuary.

(1) Benchmark values have been developed by the System actuary using assumptions adopted by the Board for the 6/30/2019 actuarial valuation.

(2) Change in method for actuarial valuation system.

(3) Change in mortality asumption.

(4) Change in inflation and net investment return assumption used in the 6/30/2019 actuarial valuation: for annual rate of inflation, from FRS' rate of 2.50% to LLA's rate of 2.20%; and for annual rate of net investment return, from FRS' rate of 7.15% to LLA's rate of 6.50% per annum.

(5) Change in method for gain-sharing COLA makes a revision from the current FRS' no COLA recognition to LLA's equivalent 0.62% COLA until age 65 and 0.90% COLA thereafter approximating all future COLA benefits.

QUALIFICATIONS, DISCLOSURES, AND CERTIFICATION

This valuation has been prepared as of June 30, 2019, based on plan provisions for FRS as documented in Title 11 of Louisiana Revised Statutes (R.S.), Sections 2251 through 2272.

This report was prepared at the request of the LLA and is intended for use by PRSAC and those designated or approved by the LLA and PRSAC. This report may be provided to parties other than PRSAC only in its entirety and only with the permission of the LLA. Neither the LLA nor GRS is responsible for unauthorized use of this report.

The purposes of the valuation are to measure the System's funding progress, to determine the unfunded actuarial liability as of June 30, 2019, and to calculate the actuarially determined contribution rate for the fiscal year ending June 30, 2021. This report should not be relied on for any purpose other than the purposes described herein. Determinations of financial results associated with the benefits described in this report for purposes other than those identified above may be significantly different.

The contribution rates shown on page 2 may be considered minimum contribution rates that comply with the statutes' funding policy. Users of this report should be aware that contributions made at these rates do not guarantee benefit security. Given the importance of benefit security to any retirement system, we suggest that contributions to FRS in excess of those presented in this report be considered.

The contribution rates in this report are determined using the actuarial assumptions and methods, policies, and plan provisions disclosed in Section II of this report. This report does not include a robust assessment of the risks of future experience not meeting the actuarial assumptions, as the assessment of these risks was outside the scope of this assignment. We encourage a review and assessment of investment and other risks that may have a material effect on the System's financial condition. Refer to Appendix F for further discussion on risk.

The findings in this report are based on census and financial data and other information through June 30, 2019. Future actuarial measurements may differ significantly from the current measurements presented in this report due to such factors as the following: plan experience differing from that anticipated by the economic or demographic assumptions; changes in economic or demographic assumptions; increases or decreases expected as part of the natural operation of the methodology used for these measurements (such as the end of an amortization period or additional cost or contribution requirements based on the System's funded status); and changes in plan provisions or applicable law. The scope of an actuarial valuation does not include an analysis of the potential range of such future measurements.

This valuation assumed the continuing ability of the participating employers to make the contributions necessary to fund this plan. A determination regarding whether or not the plan sponsors are actually able to do so is outside our scope of expertise and was not performed.

The valuation was based upon information furnished by the System and its actuary concerning plan benefits, financial transactions, plan provisions, active members, terminated members, retirees, and beneficiaries. 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 the System or its actuary.

Summary and Conclusions

This report 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 the actuarial position of the System as of the valuation date. All calculations have been made in conformity with generally accepted actuarial principles and practices, with the Actuarial Standards of Practice issued by the Actuarial Standards Board, and with applicable statutes.

This valuation report was prepared jointly by James J. Rizzo, Senior Consultant and Actuary employed by Gabriel, Roeder, Smith & Company (GRS), and by Piotr Krekora, Consultant and Actuary also employed by GRS. GRS serves as staff for the LLA Actuarial Services section. Both Mr. Rizzo and Mr. 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 plan sponsor and the System.

This actuarial valuation and contribution determination were prepared and completed by us or under our direct supervision, and we acknowledge responsibility for the results. To the best of our knowledge, the results are complete and accurate. In our opinion, the techniques and assumptions used are reasonable, meet the requirements and intent of relevant Louisiana Statutes, and are based on generally accepted actuarial principles and practices.

There is no benefit or expense to be provided by the System and/or paid from the System's assets for which liabilities or current costs have not been established or otherwise taken into account in the valuation. All known events or trends which may require a material increase in plan costs or required contribution rates have been considered in the valuation.

The authors of this report will be pleased to review this valuation with PRSAC and to answer any questions pertaining to the valuation.

Respectfully submitted,

On behalf of the ACTUARY FOR THE LOUISIANA LEGISLATIVE AUDITOR

Gabriel, Roeder, Smith & Company

By: James J. Rizzo, ASA, MAAA

By: Piotr Krekora, ASA, MAAA, PhD

Date: January 14, 2020

SECTION I:
DEVELOPMENT OF EMPLOYER CONTRIBUTIONS

1. Analysis of Actuarially Determined Contributions

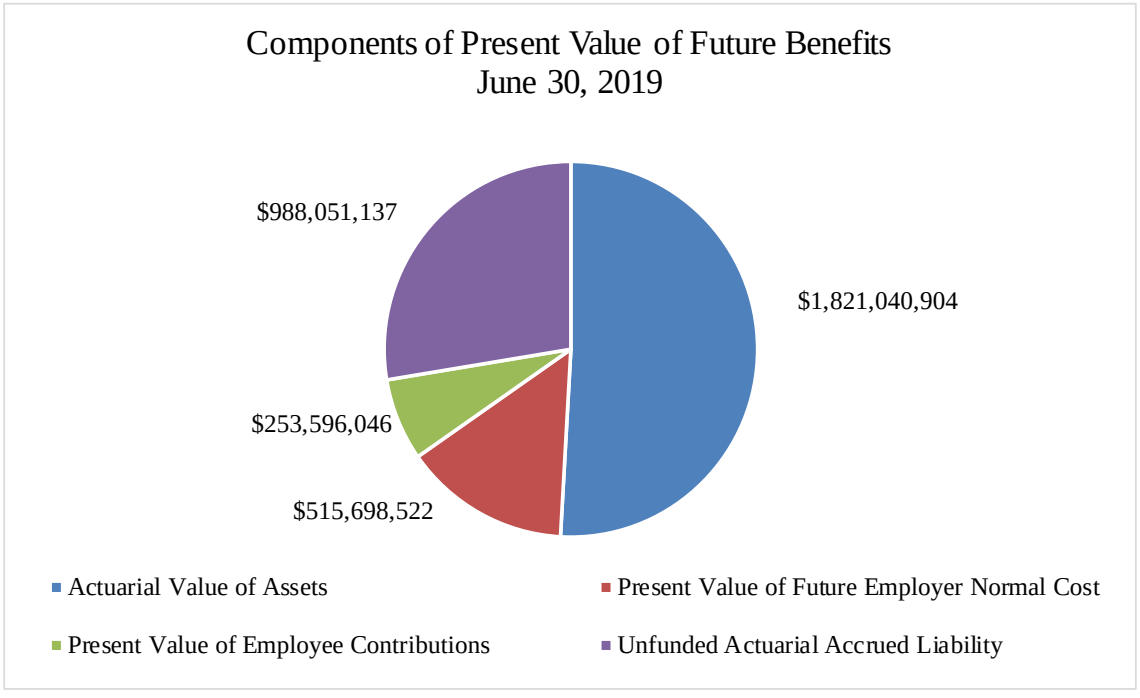
1. Present Value of Future Benefits	$	3,578,386,609
2. Funding Deposit Account Credit Balance	$	-
3. Unfunded Actuarial Accrued Liability	$	988,051,137
4. Actuarial Value of Assets	$	1,821,040,904
5. Present Value of Future Employee Contributions	$	253,596,046
6. Present Value of Future Employer Normal Costs (1 + 2 - 3 - 4 - 5)	$	515,698,522
7. Present Value of Future Salaries	$	2,535,960,460
8. Employer Normal Cost Accrual Rate (6 / 7)		20.335432%
9. Projected Fiscal 2020 Salary for Current Membership	$	237,345,790
10. Employer Normal Cost as of July 1, 2019 (8 x 9)	$	48,265,292
11. Employer Normal Cost Interest Adjusted for Mid-year Payment	$	49,809,221
12. Amortization Payment on Remaining Frozen Unfunded Accrued Liability Interest Adjusted for Mid-year Payment	$	110,319,170
13. Total Employer Normal Cost and Amortization Payment (11 + 12)	$	160,128,391
14. Estimated Administrative Cost for Fiscal 2020	$	1,937,980
15. Gross Employer Actuarially Determined Contribution for Fiscal 2020 (13 + 14)	$	162,066,371
16. Projected Insurance Premium Taxes for Fiscal 2020	$	28,017,672
17. Net Direct Employer Actuarially Determined Contribution for Fiscal 2020 (15 - 16)	$	134,048,699
18. Projected Payroll for Fiscal 2020	$	246,180,693
19. Employers' Minimum Net Direct Actuarially Determined Contribution as a % of Projected Payroll for Fiscal 2020 (17 / 18)		54.45%
20. Board Adopted Employer Contribution Rate for Fiscal 2020		27.75%
21. Contribution Shortfall (Excess) as a Percentage of Payroll (19 - 20)		26.70%
22. Increase (Reduction) to Following Year Payment for Contribution Shortfall (Excess)		2.50%
23. Minimum Recommended Net Direct Employer Contribution Rate for Fiscal 2021 (19 + 22, rounded to nearest 0.25%)		57.00%

* The above rates are for members with earnings greater than the Department of HHS poverty guidelines. For members with earnings below the poverty guidelines, employer rates will be 2.0% higher and employee rates will be 2.0% lower.

2. Present Value of Future Benefits

PRESENT VALUE OF FUTURE BENEFITS

PRESENT VALUE OF FUTURE BENEFITS FOR ACTIVE MEMBERS		
Retirement Benefits	$ 2,124,410,946	
Survivor Benefits	23,982,485	
Disability Benefits	30,588,413	
Vested Termination Benefits (including Refunds of Contributions)	56,458,373	
TOTAL Present Value of Future Benefits for Active Members		$ 2,235,440,217
PRESENT VALUE OF FUTURE BENEFITS FOR TERMINATED MEMBERS		
Terminated Vested Members Due Benefits at Retirement	$ 22,813,201	
Terminated Members with Reciprocals Due Benefits at Retirement	0	
Terminated Members Due a Refund	3,554,200	
TOTAL Present Value of Future Benefits for Active Members		$ 26,367,401
PRESENT VALUE OF FUTURE BENEFITS FOR RETIREES		
Regular Retirees	$ 1,091,812,442	
Disability Retirees	40,033,808	
Survivors & Widows	80,183,279	
DROP Account Balances Payable to Retirees	101,323,990	
IBO Retirees' Account Balance	3,225,472	
TOTAL Present Value of Future Benefits for Retirees & Survivors		$ 1,316,578,991
TOTAL Present Value of Future Benefits		$ 3,578,386,609

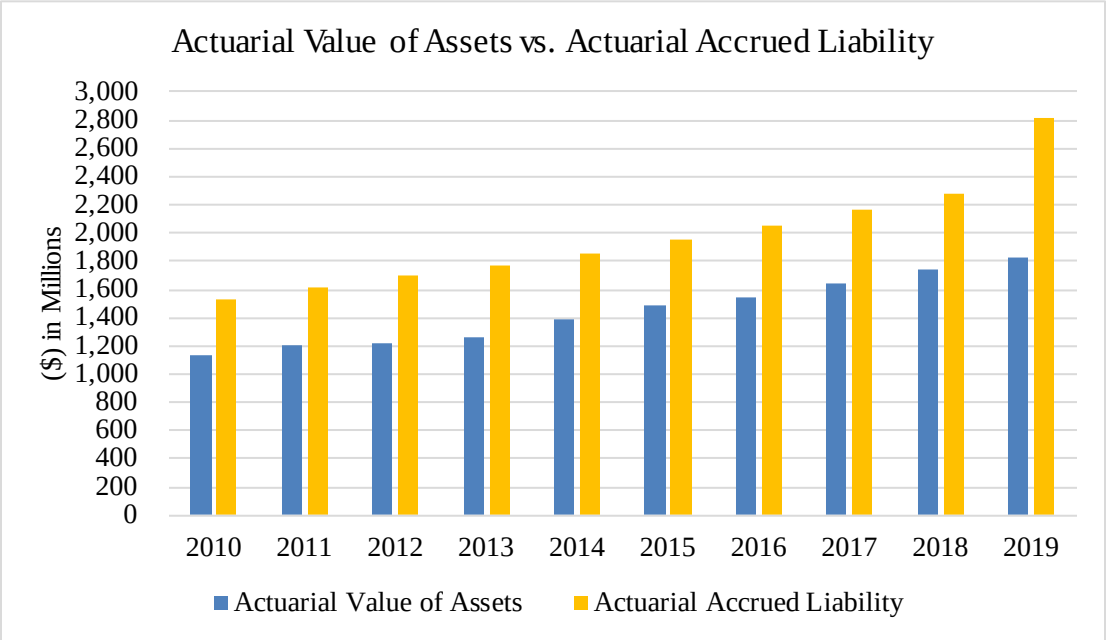


3a. Market Value of Assets

CURRENT ASSETS:			
Cash in Banks	$	10,478,895	
Contributions and Taxes Receivable		7,879,490	
Accrued interest and dividends		8,902,096	
Investments Receivable		592,368	
Prepaid Expenses		22,762	
TOTAL CURRENT ASSETS			$ 27,875,611
Property Plant & Equipment			$ 642,415
INVESTMENTS:			
Cash Equivalents	$	45,086,310	
Equities		833,285,347	
Fixed Income		517,074,790	
Real Estate		121,217,001	
Alternative Investments		66,160,569	
Tactical Allocation		168,013,876	
Other Investments		(25,969)	
TOTAL INVESTMENTS			$ 1,750,811,924
MERGER NOTES			$ 2,480,853
DEFERRED OUTFLOWS OF RESOURCES			$ -
TOTAL ASSETS			$ 1,781,810,803
CURRENT LIABILITIES			
Accounts Payable	$	1,266,641	
Investments Payable		955,257	
Other Post-Employment Benefits		566,955	
TOTAL CURRENT LIABILITIES			$ 2,788,853
DEFERRED INFLOWS OF RESOURCES			$ 90,636
MARKET VALUE OF ASSETS			$ 1,778,931,314

3b. Actuarial Value of Assets

Excess/(Shortfall) of invested income for current and previous 4 years:		
Fiscal Year 2019	$	(50,158,174)
Fiscal Year 2018		(13,637,997)
Fiscal Year 2017		85,071,538
Fiscal Year 2016		(139,144,339)
Fiscal Year 2015		(109,387,912)
Total for five years	$	(227,256,884)
Deferral of Excess/(Shortfall) of invested income:		
Fiscal Year 2019 (80%)	$	(40,126,539)
Fiscal Year 2018 (60%)		(8,182,798)
Fiscal Year 2017 (40%)		34,028,615
Fiscal Year 2016 (20%)		(27,828,868)
Fiscal Year 2015 (0%)		-
Total deferred for year	$	(42,109,590)
Market value of plan net assets, end of year	$	1,778,931,314
Preliminary actuarial value of plan assets, end of year	$	1,821,040,904
Actuarial value of assets corridor		
85% of market value, end of year	$	1,512,091,617
115% of market value, end of year	$	2,045,771,011
Net Valuation Assets, end of year	$	1,821,040,904

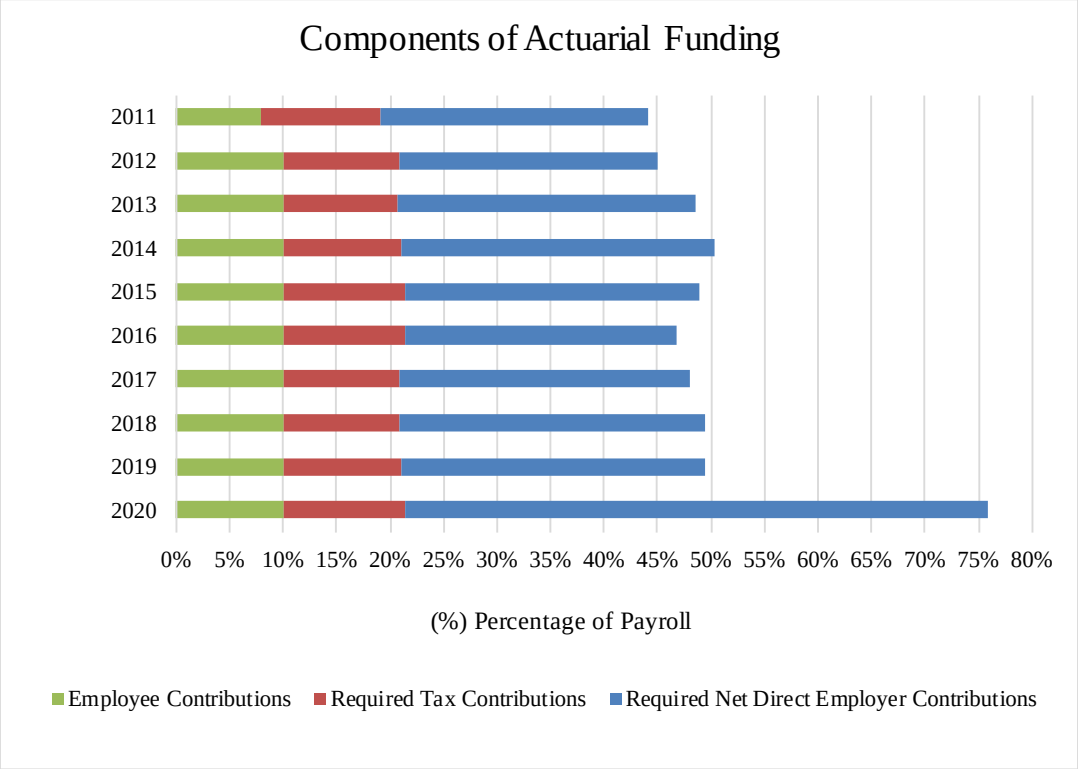


4. Present Value of Future Contributions

Employee Contributions to the Annuity Savings Fund	$ 253,596,046
Employer Normal Contributions to the Pension Accumulation Fund	769,294,568
Employer Amortization Payments to the Pension Accumulation Fund	$988,051,137
TOTAL PRESENT VALUE OF FUTURE CONTRIBUTIONS	$ 2,010,941,751

5a. Change in Unfunded Actuarial Accrued Liability

PRIOR YEAR UNFUNDED ACCRUED LIABILITY		$537,805,006
Interest on Unfunded Accrued Liability	$ 39,259,765	
Investment Experience Loss	48,181,781	
Liability Assumption Loss	432,709,120	
Contribution Shortfall with Accrued Interest	4,708,679	
TOTAL Interest Adjusted Cost Elements		$ 524,859,345
Liability Experience Gain	13,797,929	
Interest Adjusted Amortization Payments	60,815,285	
TOTAL Reductions to UAL		$ 74,613,214
NET Change in Unfunded Accrued Liability		$ 450,246,131
CURRENT YEAR UNFUNDED ACCRUED LIABILITY		$ 988,051,137


Components of Actuarial Funding
2011
2012
2013
2014
2015
2016
2017
2018
2019
2020
0% 5% 10% 15% 20% 25% 30% 35% 40% 45% 50% 55% 60% 65% 70% 75% 80%
(%) Percentage of Payroll
Employee Contributions
Required Tax Contributions
Required Net Direct Employer Contributions

5b. Amortization of Unfunded Actuarial Accrued Liability

AMORTIZATION OF UNFUNDED ACTUARIAL ACCRUED LIABILITY

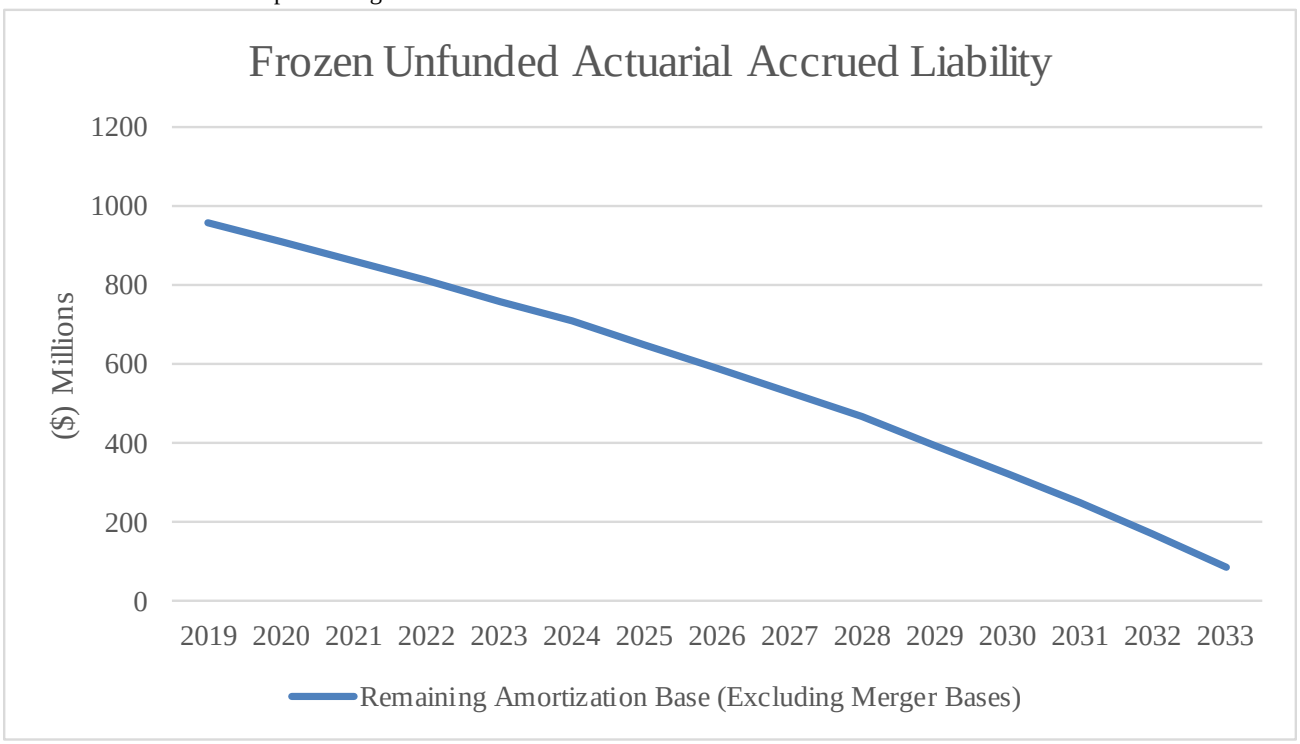
Fiscal Year	Description	Amortization Period	Initial Balance	Years Remaining	Remaining Balance	Amortization Payments
1993	Merger Loss (Gain)	30	$ 13,485,002	4	$ 3,767,523	$ 1,065,662
1995	Merger Loss (Gain)	30	41,779,611	6	16,403,693	3,283,451
1996	Merger Loss (Gain)	30	1,772,399	7	786,286	138,921
1997	Merger Loss (Gain)	30	890,324	8	437,342	69,601
1998	Merger Loss (Gain)	30	1,602,435	9	858,294	124,951
1999	Merger Loss (Gain)	30	14,104,876	10	8,139,151	1,097,100
2001	Merger Loss (Gain)	30	3,117,590	12	2,031,898	241,326
2007	Merger Loss (Gain)	30	1,065,812	18	875,200	81,292
2008	Merger Loss (Gain)	30	1,556,324	19	1,311,347	118,373
2011	Merger Loss (Gain)	30	329,132	22	295,674	24,838
			Total Outstanding Merger Bases		34,906,408	6,245,515
2002	Cumulative Non-Merger Bases	27	175,578,584	10	104,886,513	
2004	Contribution Loss (Gain)	15	2,129,874	0	0	
2004	Experience Loss (Gain)	15	1,570,785	0	0	
2005	Experience Loss (Gain)	15	(24,922,321)	1	(2,622,895)	
2005	Assumption Loss (Gain)	15	(57,207,831)	1	(6,020,715)	
2005	Contribution Loss (Gain)	15	(2,457,193)	1	(258,602)	
2006	Experience Loss (Gain)	15	(30,043,731)	2	(6,103,381)	
2006	Benefits/COLA Loss (Gain)	15	12,495,729	2	2,538,507	
2006	Assumption Loss (Gain)	15	7,880,410	2	1,600,904	
2006	Contribution Loss (Gain)	15	(3,044,474)	2	(618,485)	
2007	Contribution Loss (Gain)	15	(3,684,696)	3	(1,084,158)	
2007	Experience Loss (Gain)	15	(19,348,466)	3	(5,692,953)	
2007	Benefits/COLA Loss (Gain)	15	13,421,495	3	3,949,043	
2008	Assumption Loss (Gain)	15	(138,425)	4	(52,459)	
2008	Contribution Loss (Gain)	15	(4,399,499)	4	(1,667,265)	
2008	Experience Loss (Gain)	15	11,244,458	4	4,261,280	
2008	Benefits/COLA Loss (Gain)	15	15,006,752	4	5,687,066	
2009	Asset Assumption Loss (Gain)	15	(121,695,690)	5	(55,711,792)	
2009	Asset Experience Loss (Gain)	20	261,874,151	10	176,139,439	
2009	COLA Loss (Gain)	20	15,784,880	10	10,617,084	
2009	Experience Loss (Gain)	20	(3,921,422)	10	(2,637,591)	
2009	Contribution Loss (Gain)	20	993,536	10	668,263	
2010	Liability Assumption Loss (Gain)	15	37,843,942	6	20,100,081	
2010	Asset Experience Loss (Gain)	19	14,930,089	10	10,279,518	
2010	Experience Loss (Gain)	19	985,441	10	678,485	
2010	Contribution Loss (Gain)	19	11,264,571	10	7,755,773	
2011	Asset Experience Loss (Gain)	18	34,204,316	10	24,164,052	
2011	Experience Loss (Gain)	18	(13,197,519)	10	(9,323,547)	
2011	Contribution Loss (Gain)	18	6,777,563	10	4,788,091	
2012	Asset Experience Loss (Gain)	17	93,583,915	10	68,020,016	
2012	Experience Loss (Gain)	17	(21,072,289)	10	(15,316,066)	
2012	Contribution Loss (Gain)	17	2,867,982	10	2,084,548	
2013	Asset Experience Loss (Gain)	16	61,647,815	10	46,241,238	
2013	Experience Loss (Gain)	16	(30,226,604)	10	(22,672,589)	
2013	Contribution Loss (Gain)	16	9,431,584	10	7,074,511	
2013	Assumption Loss (Gain)	15	1,290,257	9	931,398	

AMORTIZATION OF UNFUNDED ACTUARIAL ACCRUED LIABILITY

Fiscal Year	Description	Amortization Period	Initial Balance	Years Remaining	Remaining Balance	Amortization Payments
2014	Asset Experience Loss (Gain)	15	(16,528,266)	10	(12,839,196)	
2014	Experience Loss (Gain)	15	(12,708,035)	10	(9,871,630)	
2014	Contribution Loss (Gain)	15	3,117,549	10	2,421,720	
2014	Liability Assumption Loss (Gain)	15	(318,965)	10	(247,771)	
2015	Asset Experience Loss (Gain)	15	11,058,278	11	9,155,218	
2015	Experience Loss (Gain)	15	(18,187,590)	11	(15,057,622)	
2015	Contribution Loss (Gain)	15	(5,158,272)	11	(4,270,565)	
2015	Liability Assumption Loss (Gain)	15	7,891,805	11	6,533,675	
2015	COLA Loss (Gain)	15	17,767,886	11	14,710,143	
2016	Asset Experience Loss (Gain)	15	65,389,778	12	57,245,434	
2016	Experience Loss (Gain)	15	(6,578,348)	12	(5,759,010)	
2016	Contribution Loss (Gain)	15	(6,794,080)	12	(5,947,872)	
2017	Liability Assumption Loss (Gain)	15	22,708,091	13	20,884,168	
2017	Asset Experience Loss (Gain)	15	27,265,283	13	25,075,324	
2017	Experience Loss (Gain)	15	(13,331,207)	13	(12,260,438)	
2017	Contribution Loss (Gain)	15	3,496,362	13	3,215,533	
2018	Asset Experience Loss (Gain)	15	29,194,603	14	28,059,395	
2018	Experience Loss (Gain)	15	(22,251,659)	14	(21,386,422)	
2018	Contribution Loss (Gain)	15	6,228,012	14	5,985,841	
2018	Liability Assumption Loss (Gain)	15	23,944,920	14	23,013,841	
2019	Asset Experience Loss (Gain)	15	48,181,781	15	48,181,781	
2019	Experience Loss (Gain)	15	(13,797,929)	15	(13,797,929)	
2019	Contribution Loss (Gain)	15	4,708,679	15	4,708,679	
2019	Liability Assumption Loss (Gain)	15	28,739,403	15	28,739,403	
2019	Liabiltty Assumption Loss (Gain)*	15	403,969,717	15	403,969,717	
			Total Outstanding Non-Merger Bases		953,144,729	104,073,655

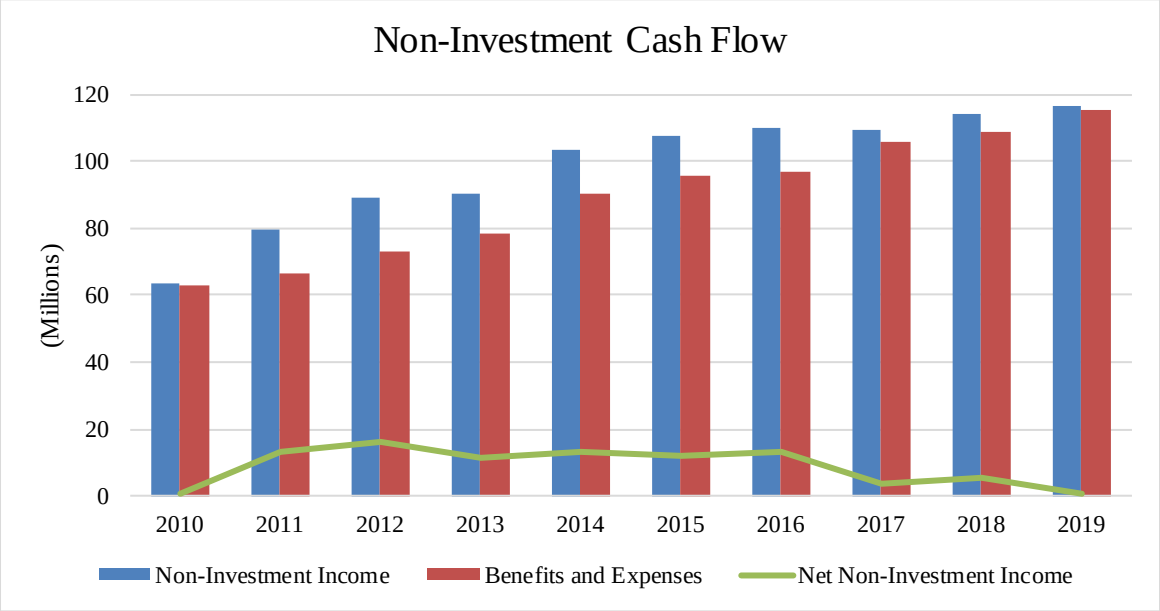
TOTAL Unfunded Actuarial Liability	$ 988,051,137	
TOTAL Fiscal 2020 Amortization Payments adjusted to Mid-Year		$110,319,170

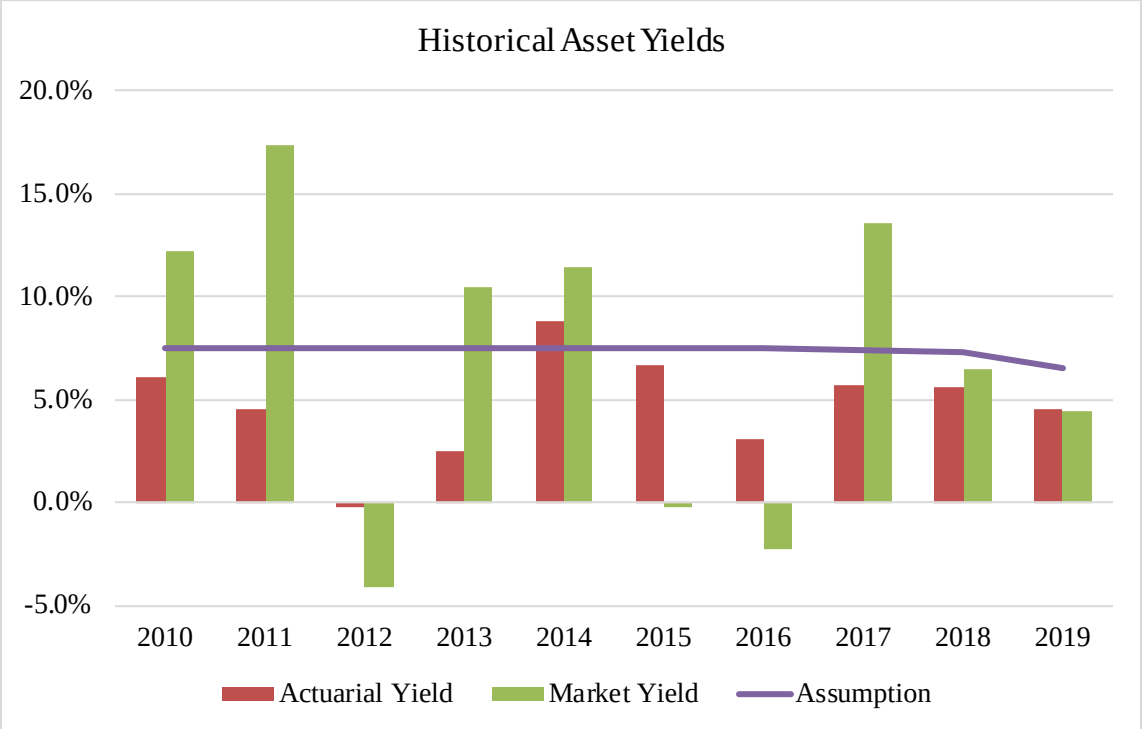
* Reflects the LLA's assumption changes



6. Analysis of Change in Assets

Actuarial Value of Assets (June 30, 2018)		$ 1,741,451,961
INCOME:		
Member Contributions	$ 24,230,606	
Employer Contributions	64,205,763	
Irregular Contributions	398,390	
Insurance Premium Taxes	26,807,631	
Transfers from Other Systems	227,123	
Other Income	380,811	
Total Contributions		$ 116,250,324
INVESTMENTS:		
Net Appreciation of Investments	$ 55,066,870	
Interest & Dividends	23,804,887	
Legal Settlement	5,381,951	
Investment Expense	(9,993,975)	
Net Investment Income		74,259,733
TOTAL Income		190,510,057
EXPENSES:		
Retirement Benefits	$ 111,352,185	
Refunds of Contributions	2,216,744	
Transfers to another System	173,522	
Administrative Expenses	1,885,460	
TOTAL EXPENSES:		$ 115,627,911
Net Market Value Income for Fiscal 2019 (Income - Expenses)		$ 74,882,146
Unadjusted Fund Balance as of June 30, 2019 (Fund Balance Previous Year + Net Income)		$ 1,816,334,107
Income Adjustment for Actuarial Smoothing		$ 4,706,796
Actuarial Value of Assets (June 30, 2019)		$ 1,821,040,904


Non-Investment Cash Flow
120
100
80
60
40
20
0
(Millions)
2010
2011
2012
2013
2014
2015
2016
2017
2018
2019
Non-Investment Income
Benefits and Expenses
Net Non-Investment Income


Historical Asset Yields
20.0%
15.0%
10.0%
5.0%
0.0%
-5.0%
2010
2011
2012
2013
2014
2015
2016
2017
2018
2019
Actuarial Yield
Market Yield
Assumption

7. Pension Benefit Obligation

Present Value of Credited Projected Benefits Payable to Current Employees	$1,437,694,919
Present Value of Benefits Payable to Terminated Employees	26,367,401
Present Value of Benefits Payable to Current Retirees and Beneficiaries	1,316,578,991
Total Pension Benefit Obligation	$2,780,641,311
Net Actuarial Value of Assets	$1,821,040,904
Ratio of Net Actuarial Value of Assets to Pension Benefit Obligation	65.49%

8. Census Reconciliation

	Active	Terminated with Funds on Deposit	DROP	Retired	Total
Number of Members as of June 30, 2018	**4,424**	**732**	**192**	**2,327**	**7,675**
Additions to Census					
Initial Membership	298	27	0	0	325
Omitted in error last year	0	0	0	1	1
Death of another member	0	0	0	17	17
Adjustment for multiple records	0	0	0	0	0
Total Additions	**298**	**27**	**0**	**18**	**343**
Change in Status during the Year					
Active terminating service	(87)	87	0	0	0
Active who retired	(54)	0	0	54	0
Active entering DROP	(89)	0	89	0	0
Terminated members rehired	26	(26)	0	0	0
Terminated members who retire	0	(1)	0	1	0
Retirees who are rehired	1	0	0	(1)	0
Refunded who are rehired	3	0	0	0	3
DROP participants retiring	0	0	(61)	61	0
DROP returned to work	11	0	(11)	0	0
Omitted in error last year	0	0	0	0	0
Total Changes	**(189)**	**60**	**17**	**115**	**3**
Eliminated from Census					
Refund of contributions	(82)	(63)	0	0	(145)
Deaths	(5)	(1)	(1)	(49)	(56)
Included in error last year	0	0	0	0	0
Adjustment for multiple records	0	0	0	(4)	(4)
Total Eliminated	**(87)**	**(64)**	**(1)**	**(53)**	**(205)**
Number of Members as of June 30, 2019	**4,446**	**755**	**208**	**2,407**	**7,816**

9. Year-to-Year Comparison

	Fiscal 2019	Fiscal 2018	Fiscal 2017	Fiscal 2016
Number of Active Members	4,446	4,424	4,429	4,362
Number of Retirees & Survivors	2,407	2,327	2,289	2,213
DROP Participants	208	192	173	173
Number of Terminated Due Deferred Benefits	84	76	72	72
Number Terminated Due Refunds	671	656	597	558
Active Lives Payroll (excluding DROP payroll)	$ 240,413,972	$ 236,005,445	$ 232,500,397	$ 225,301,112
Retiree Benefits in Payment	$ 97,547,088	$ 91,808,883	$ 88,444,685	$ 83,899,034
Market Value of Assets	$ 1,778,931,314	$ 1,704,049,168	$ 1,593,696,648	$ 1,399,892,212
Ratio of AVA to EAN Accrued Liability	64.83%	76.40%	75.82%	75.48%
Actuarial Accrued Liability (EAN)	$ 2,809,092,041	$ 2,279,256,967	$ 2,166,881,556	$ 2,053,982,618
Actuarial Value of Assets	$ 1,821,040,904	$ 1,741,451,961	$ 1,643,007,075	$ 1,550,261,745
Unfunded (Excess) Actuarial Accrued Liability	$ 988,051,137	$ 537,805,006	$ 523,874,481	$ 503,720,873
Present Value of Future Employer Normal Cost	$ 769,294,568	$ 346,076,765	$ 328,942,059	$ 305,570,473
Present Value of Future Employee Contributions	$ 253,596,046	$ 240,713,969	$ 238,106,260	$ 230,423,085
Present Value of Future Benefits	$ 3,578,386,609	$ 2,866,047,701	$ 2,733,929,875	$ 2,589,976,176

	Fiscal 2020	Fiscal 2019	Fiscal 2018	Fiscal 2017
Statutory Employee Contribution Rate for Members with Earnings Above Poverty Level *	10.00%	10.00%	10.00%	10.00%
Required Tax Contributions as a % of Projected Payroll	11.38%	11.04%	10.85%	10.91%
Actuarially Determined Employer Contribution as a % of Projected Payroll	54.45%	28.32%	28.67%	27.09%
Board Approved Employer Contribution as a % of Projected Payroll	27.75%	26.50%	26.50%	25.25%

Fiscal 2015	Fiscal 2014	Fiscal 2013	Fiscal 2012	Fiscal 2011	Fiscal 2010
4,192	4,098	4,063	4,056	4,020	3,989
2,139	2,057	1,958	1,875	1,802	1,749
166	185	221	217	225	162
81	9	71	70	68	59
523	472	450	398	418	442
$ 211,963,892	$ 203,333,976	$ 199,129,982	$ 198,112,999	$ 193,136,985	$ 189,542,210
$ 79,924,818	$ 73,404,453	$ 67,678,016	$ 62,975,274	$ 58,699,965	$ 56,056,554
$ 1,419,138,769	$ 1,410,307,198	$ 1,253,213,084	$ 1,122,864,548	$ 1,154,482,040	$ 971,775,080
76.09%	74.66%	71.13%	71.66%	74.33%	74.21%
$ 1,958,850,006	$ 1,855,298,538	$ 1,771,931,777	$ 1,700,643,083	$ 1,621,007,988	$ 1,536,258,543
$ 1,490,408,510	$ 1,385,135,204	$ 1,260,348,240	$ 1,218,618,308	$ 1,204,830,245	$ 1,140,054,175
$ 468,441,496	$ 470,163,334	$ 511,583,537	$ 482,024,775	$ 416,177,743	$ 396,204,368
$ 286,640,979	$ 315,734,786	$ 310,702,226	$ 325,616,184	$ 305,540,215	$ 335,984,027
$ 216,351,986	$ 213,279,261	$ 210,842,508	$ 211,015,125	$ 206,989,105	$ 160,939,180
$ 2,461,842,971	$ 2,384,312,585	$ 2,294,778,794	$ 2,223,486,329	$ 2,133,537,308	$ 2,033,181,750

Fiscal 2016	Fiscal 2015	Fiscal 2014	Fiscal 2013	Fiscal 2012	Fiscal 2011
10.00%	10.00%	10.00%	10.00%	10.00%	8.00%
11.33%	11.39%	11.05%	10.72%	10.93%	11.09%
25.44%	27.50%	29.23%	27.77%	24.02%	24.97%
27.25%	29.25%	28.25%	24.00%	23.25%	21.50%

SECTION II
BASIS FOR THE VALUATION

1. Introduction

The June 30, 2019, valuation is used to determine actuarial liabilities as of June 30, 2019, the updated actuarially determined employer contribution for FYE 2020, and the minimum recommended net direct employer contribution rate for FYE 2021. Census data, actuarial methods, and actuarial assumptions used in the preparation of June 30, 2019, assets, liabilities, and employer contribution requirements for FYE 2020 are shown in this section of the report. Additional information is provided with respect to changes made in actuarial valuation software systems, assumptions, and methods since the June 30, 2018, valuation.

2. Census Data

Census data used in the preparation of the June 30, 2019, valuation is summarized below. The census data was provided by FRS. A comparison with census summaries prepared by the FRS actuary confirmed the reasonability of the census data used in preparing this report.

Actives Census by Age

Ages	Number Male	Number Female	Total Number	Average Salary	Total Salary
(15-20]	13	0	13	$ 32,506	$ 422,576
(20-25]	367	14	381	36,739	13,997,386
(25-30]	688	39	727	41,153	29,918,535
(30-35]	771	43	814	46,851	38,136,391
(35-40]	669	51	720	53,617	38,604,120
(40-45]	590	33	623	60,443	37,655,861
(45-50]	558	39	597	67,376	40,223,314
(50-55]	307	31	338	71,123	24,039,728
(55-60]	112	21	133	70,311	9,351,368
(60-65]	31	11	42	72,018	3,024,753
(65-99]	2	1	3	79,006	237,018
TOTAL	4,108	283	4,391	$ 53,658	$ 235,611,050

DROP Return to Work Actives

Ages	Number Male	Number Female	Total Number	Average Salary	Total Salary
(50-55]	7	0	7	$ 77,606	$ 543,245
(55-60]	24	3	27	81,302	2,195,146
(60-65]	15	0	15	93,696	1,405,433
(65-70]	4	0	4	106,466	425,865
(70-99]	2	0	2	116,617	233,233
TOTAL	52	3	55	$ 87,326	$ 4,802,922

DROP Participants

Ages	Number Male	Number Female	Total Number	Average Benefit	Total Benefit
(50-55]	126	8	134	$ 64,412	$ 8,631,161
(55-60]	58	4	62	63,734	3,951,485
(60-65]	11	0	11	65,898	724,875
(65-99]	1	0	1	65,986	65,986
TOTAL	196	12	208	$ 64,296	$ 13,373,505

Terminated Members Due a Deferred Retirement Benefit

Ages	Number Male	Number Female	Total Number	Average Benefit	Total Benefit
(30-35]	2	0	2	$ 20,664	$ 41,328
(35-40]	10	1	11	27,380	301,176
(40-45]	16	2	18	24,451	440,110
(45-50]	21	0	21	27,984	587,662
(50-55]	28	2	30	29,415	882,442
(55-60]	2	0	2	82,561	165,123
TOTAL	79	5	84	$ 28,784	$ 2,417,842

Regular Retirees

Ages	Number Male	Number Female	Total Number	Average Benefit	Total Benefit
(45-50]	19	1	20	$ 50,490	$ 1,009,803
(50-55]	146	6	152	51,534	7,833,192
(55-60]	383	16	399	51,190	20,424,997
(60-65]	402	20	422	50,400	21,268,968
(65-70]	345	12	357	45,048	16,082,157
(70-75]	252	5	257	38,873	9,990,476
(75-80]	152	3	155	38,717	6,001,085
(80-85]	77	0	77	34,757	2,676,324
(85-90]	28	0	28	27,112	759,144
(90-110]	21	0	21	24,878	522,437
TOTAL	1,825	63	1,888	$ 45,852	$ 86,568,583

Disability Retirees

Ages	Number Male	Number Female	Total Number	Average Benefit	Total Benefit
(40-45]	7	2	9	$ 26,569	$ 239,117
(45-50]	18	1	19	27,876	529,645
(50-55]	21	3	24	24,955	598,922
(55-60]	19	2	21	22,915	481,212
(60-66]	19	1	20	20,643	412,860
(65-70]	18	2	20	21,523	430,454
(70-75]	9	0	9	21,843	196,590
(75-80]	6	0	6	13,360	80,161
(80-85]	6	0	6	12,845	77,072
(85-90]	4	0	4	20,495	81,979
TOTAL	127	11	138	$ 22,667	$ 3,128,011

Survivors

Ages	Number Male	Number Female	Total Number	Average Benefit	Total Benefit
(0-25]	15	25	40	$ 5,686	$ 227,421
(25-30]	0	1	1	1,638	1,638
(30-35]	1	3	4	22,271	89,083
(35-40]	0	5	5	24,887	124,435
(40-45]	1	6	7	25,843	180,900
(45-50]	1	14	15	27,657	414,848
(50-55]	0	13	13	26,694	347,020
(55-60]	1	23	24	27,893	669,440
(60-66]	2	28	30	30,700	920,999
(65-70]	1	48	49	23,093	1,131,534
(70-75]	1	39	40	21,106	844,239
(75-80]	0	49	49	21,448	1,050,964
(80-85]	0	44	44	20,086	883,785
(85-90]	0	45	45	16,373	736,776
(90-110]	0	15	15	15,161	227,411
TOTAL	23	358	381	$ 20,605	$ 7,850,494

Active Members

Member Count
Average Salary

Age/Service	0	1	2	3	4	[5-9)	[10-14)	[15-19)	[20-24)	[25-29)	[30+)	TOTAL
[0-20)	37	11	2									50
	32,094	32,499	38,177									$ 32,427
[21-25)	114	101	84	90	51	38						478
	32,326	34,450	39,946	40,936	41,220	42,759						37,514
[26-30)	73	70	97	94	65	320	38					757
	32,843	35,546	40,536	41,950	41,948	45,985	49,459					42,381
[31-35)	43	30	48	50	56	263	292	15				797
	32,550	36,748	44,037	42,015	44,567	47,446	53,806	60,735				48,072
[36-40)	18	12	21	27	23	148	229	203	20			701
	33,204	42,601	40,449	42,554	45,738	48,515	58,017	61,140	69,702			54,823
[41-45)	9	5	8	7	6	81	119	184	180	9		608
	38,964	32,856	38,772	53,805	42,673	51,158	56,941	63,199	72,525	78,518		62,117
[46-50)	9	5	6	6	6	34	60	113	216	121	1	577
	40,890	49,093	44,298	38,717	44,080	52,691	59,319	66,262	73,272	77,918	75,808	68,536
[51-55)	1			4	1	22	28	65	79	85	11	296
	51,554			41,914	49,744	52,346	54,472	63,312	78,442	79,350	82,019	70,625
[56-60)						7	16	20	15	24	13	95
						52,038	57,091	62,003	68,486	85,724	80,898	70,043
[61-65)							4	13	6	6	2	31
							64,098	71,339	77,416	88,154	72,415	74,905
[66+)								1				1
								38,539				38,539
TOTAL	304	234	266	278	208	913	786	614	516	245	27	4,391
	33,019	35,678	40,989	41,920	43,014	47,590	55,861	63,127	73,574	79,452	80,538	$ 53,658

3. Plan Provisions (from the System's actuary, confirmed with the statutes)

FRS was established as of January 1, 1980, for the purpose of providing retirement allowances and other benefits as described under R.S. 11:2256 – 11:2259. The following summary of plan provisions is for general informational purposes only and does not constitute a guarantee of benefits. The provisions contained within this section are as of June 30, 2019.

MEMBERSHIP:

All full-time firefighters or any person in a position as defined in the municipal fire and police civil service system who is employed by a fire department of any municipality, parish, or fire protection district of the state of Louisiana, except Orleans and East Baton Rouge Parishes, who earns at least three hundred seventy-five dollars per month excluding state supplemental pay are required to be members of this retirement System. Employees of the System are eligible, at their option, to become members of the System. Persons must be under the age of fifty to be eligible for System membership unless they become members through merger.

CONTRIBUTION RATES:

Under the provisions of R.S. 11:62, 11:103 and 22:1476A(3), the fund is financed by a combination of employee contributions, employer contributions, and insurance premium taxes. The employee contribution rate is set by R.S. 11:62 but cannot be less than 8% or more than 10% of earnable compensation. The employee contribution rate is fixed at 8% for members whose earnable compensation is less than or equal to the poverty guidelines issued by the U. S. Department of Health and Human Services. Gross employer contributions are determined by actuarial valuation and are subject to change each year in accordance with R.S. 11:103, 11:105, 11:107, and 11:107.1. The employee contribution rate is set at 8% when gross employer contributions total 25% or less of earnable compensation. The employee rate then increases 0.25% for each 0.75% increase in the total rate, subject to a maximum rate of 10%. Insurance premium taxes are allocated to the System based on available funds and the statutory provisions as described in R.S. 22:1476A(3).

CONTRIBUTION REFUNDS:

Upon withdrawal from service, members not entitled to a retirement allowance may receive a refund of accumulated contributions. Refunds are payable 90 days after the effective date of withdrawal from service.

RETIREMENT BENEFITS:

Members with 12 years of creditable service may retire at age 55; members with 20 years of service may retire at age 50; members with 25 years of service may retire regardless of age, provided that they have been a member of this System for at least one year. The retirement allowance is equal to three and one-third percent of the member's average final compensation multiplied by his years of creditable service, not to exceed one hundred percent of his average final compensation.

OPTIONAL ALLOWANCES:

Members may receive their benefits as a life annuity, or in lieu of such receive a reduced benefit according to the option selected, which is the actuarial equivalent of the maximum benefit.

Option 1 - If the member dies before he has received in annuity payments the present value of his member's annuity as it was at the time of retirement, the balance is paid to his beneficiary.

Option 2 - Upon retirement, the member receives a reduced benefit. Upon the member's death, the designated beneficiary will continue to receive the same reduced benefit.

Option 3 - Upon retirement, the member receives a reduced benefit. Upon the member's death, the designated beneficiary will receive one-half of the member's reduced benefit.

Option 4 - Upon retirement, the member elects to receive a board-approved benefit payable to the member, the member's spouse, or the member's dependent child, which is actuarially equivalent to the maximum benefit.

A member may also elect to receive an actuarially-reduced benefit, which provides for an automatic 2.5% annual compound increase in monthly retirement benefits based on the reduced benefit and commencing on the later of age 55 or retirement anniversary; this COLA is in addition to any ad hoc COLAs which are payable.

Initial Benefit Option – This option is available only to regular retirees who have not participated in the Deferred Retirement Option Plan. Under this option members may receive an initial benefit plus a reduced monthly retirement allowance which, when combined, equal the actuarially equivalent amount of the maximum retirement allowance. The initial benefit may not exceed an amount equal to 36 payments of the member's maximum retirement allowance. The initial benefit can be paid either as a lump-sum payment or placed in an account called an "initial benefit account" with interest credited thereto and monthly payments made from the account.

DISABILITY BENEFITS:

Any member who has been officially certified as totally disabled solely as the result of injuries sustained in the performance of his official duties, or for any cause, provided the member has a least five years of creditable service and provided that the disability was incurred while the member was an active contributing member, is entitled to disability benefits. Any member under the age of 50 who becomes totally disabled will receive a disability benefit equal to 60% of final compensation for an injury received in the line of duty; or 75% of his accrued retirement benefit with a minimum of 25% of average salary for any injury received, even though not in the line of duty. Any member age 50 or older who becomes totally disabled from an injury sustained in the line of duty is entitled to a disability benefit equal to the greater of 60% of final compensation or his accrued retirement benefit. Any member age 50 or older who becomes totally disabled as a result of any injury, even though not in the line of duty, is entitled to a disability benefit equal to his accrued retirement benefit with a minimum of 25% of average salary. The surviving spouse of a member who was on disability retirement at the time of death receives a benefit of $200 per month. When the member takes disability retirement, he may in addition take an actuarially-reduced benefit, in which case the member's surviving spouse receives 50% of the disability benefit being paid immediately prior to the death of the disability retiree. The retirement System may reduce benefits paid to a disability retiree who is also receiving workers compensation payments.

SURVIVOR BENEFITS:

Benefits are payable to survivors of a deceased member who dies and is not eligible for retirement as follows. If any member is killed in the line of duty and leaves a surviving eligible spouse, the spouse is entitled to an annual benefit equal to two-thirds of the deceased member's final compensation. If any member dies from a cause not in the line of duty, the surviving spouse is entitled to an annual benefit equal to 3% of the deceased member's average final compensation multiplied by his total years of creditable service; however, in no event is the annual benefit less than 40% nor more than 60% of the deceased member's average final compensation. Children of the deceased member who are under the age of 18 years are entitled to the greater of $200 per month or 10% of average final compensation (not to exceed 100% of average final compensation) until reaching the age of 18 or until the age of 22 if enrolled full-time in an institution of higher learning, unless the surviving child is physically handicapped or mentally retarded, in which case the benefit is payable regardless of age. If a deceased member dies leaving no surviving spouse, but at least one minor child, each child is entitled to receive forty percent of the deceased's average final compensation, not to exceed an aggregate of sixty percent of average final compensation.

DEFERRED RETIREMENT OPTION PLAN (DROP):

In lieu of terminating employment and accepting a service retirement allowance, any member of the System who has at least twenty years of creditable service and who is eligible to receive a service retirement allowance may elect to participate in DROP for up to thirty-six months and defer the receipt of benefits. Upon commencement of participation in the plan, membership in the System terminates and neither the employee, nor employer contributions are payable. Compensation and creditable service will remain as they existed on the effective date of commencement of participation in the plan. The monthly retirement benefits that would have been payable, had the member elected to cease employment and receive a service retirement allowance, are paid into the DROP account. Upon termination of employment at the end of the specified period of participation, a participant in the program may receive, at his option, a lump-sum payment from the account equal to the payments to the account, or a true annuity based upon his account, or he may elect any other method of payment if approved by the Board of Trustees. The monthly benefits that were being paid into the fund during the period of participation will begin to be paid to the retiree. If employment is not terminated at the end of the 36 months, payments into the account cease and the member resumes active contributing membership in the System. If the participant dies during the period of participation in the program, a lump-sum payment equal to his account balance is paid to his named beneficiary or, if none, to his estate; in addition, normal survivor benefits are payable to survivors of retirees.

COST-OF-LIVING INCREASES (COLAs):

The Board of Trustees is authorized to grant retired members and widows of members who have retired an annual COLA of up to 3% of their current benefit, and all retired members and widows who are 65 years of age and older a 2% increase in their original benefit. In order for the Board to grant either of these increases, the System must meet certain criteria detailed in the statute related to funding status and interest earnings. In lieu of these COLAs, the Board may also grant an increase in the form based on a formula equal to up to $1 times the total of the number of years of credited service accrued at retirement or at death of the member or retiree plus the number of years since retirement or since death of the member or retiree to the System's fiscal year-end preceding the payment of the benefit increase.

4. Funding Policies

FRS' funding policy is generally described in Section 103 of Title 11 of Louisiana Revised Statutes. FRS is funded from employee and employer contributions using the Frozen Initial Liability Actuarial Cost Method. The total contribution requirement consists of the normal cost (the value of benefits earned by current active employees allocated to the current year) and the amortization cost (amortization payments necessary to liquidate the unfunded accrued liability). The total contribution percentage is determined as the total contribution requirement divided by the payroll applicable to active members. Employee contribution requirements are set forth in R.S. 11:62. The employer contribution rate is equal to the total contribution rate minus the employee rate.

Employer contribution requirements are determined one year in advance of the fiscal year for which the requirement is used. Differences between projected contributions and actual contributions are defined as a contribution Gain or as a contribution Loss. The contribution process is defined below:

A. **Minimum Recommended Net Direct Employer Dollar Contribution for FYE 2020** The June 30, 2018, valuation established the minimum recommended employer contribution rate for FYE 2020. The minimum recommended contribution for FYE 2020 is equal to the minimum recommended net direct employer contribution rate multiplied by the projected active member payroll for FYE 2020.

B. **Gross Employer Actuarially Required Contribution for FYE 2020** – The actuarially-determined net direct employer contribution rate for FYE 2020 is determined by the June 30, 2019, valuation. The total contribution is the sum of the benefit normal cost, the assumed administrative expense, and the amortization payment.

C. **Net Direct Employer Actuarially-Required Contribution Rate for FYE 2020 –** The Net Direct Employer Actuarially-Required Contribution is developed by subtracting Insurance Premium Taxes expected for FYE 2020 from the Gross Employer Actuarially-Required Contribution for FYE 2020. Net Direct Employer Actuarially-Required Contribution Rate for FYE 2020 is computed by dividing the Net Direct Employer Actuarially-Required Contribution for that year by the Payroll projected to the middle of 2020.

C. **Contribution Shortfall (Excess)** – The difference between the Net Direct Employer Actuarially-Required Contribution Rate for FYE 2020 and the Board Adopted Employer Contribution Rate for Fiscal 2020 is equal to the Contribution Shortfall (Excess) as a Percentage of Payroll.

D. **Minimum Recommended Net Direct Employer Contribution Rate for FYE 2021** – The minimum recommended net direct employer contribution rate for FYE 2021 is determined by the June 30, 2019, valuation. It is developed as a sum of the Net Direct Employer Actuarially-Required Contribution Rate for FYE 2020 and a contribution shortfall amortized over the future working lifetime of current participants.

5. Actuarial Methods

Cost Method

Frozen Initial Liability Actuarial Cost Method with allocation of cost based on earnings. The frozen unfunded accrued liability was calculated based upon the entry age normal cost method, initially established as of June 30, 2019.

Asset Valuation Method

The actuarial value of assets is equal to the market value of assets for the current valuation date plus an adjustment to phase in investment gains and losses occurring over the past four years. For June 30, 2019, the preliminary actuarial value is equal to the market value of assets on June 30, 2019, plus 80% of investment gains/losses for FYE 2019, plus 60% of investment gains/losses for FYE 2018, plus 40% of investment gains/losses for FYE 2017, plus 20% of investment gains/losses for FYE 2016.

If the preliminary actuarial value of assets exceeds 115% of the market value on June 30, 2019, then the actuarial value is equal to the average of the preliminary value and 115% of the market value. If the preliminary value is less than 85% of the market value, then the actuarial value is equal to the average of the preliminary value and 85% of the market value. Otherwise, the actuarial value is equal to the preliminary value.

Asset valuation formulas are shown in Section I(3).

Benchmarking

Valuation results were tested by comparing actuarial calculations produced in this valuation with values produced by FRS' retained actuary. Comparisons of values were made for each type of decrement.

In aggregate, this valuation's present value of benefits, normal cost and accrued liability values (using old assumptions) as of June 30, 2019, were within acceptable margins of the value produced by the FRS' retained actuary. Comparisons of values by status category and by decrement showed larger deviations, but on the whole produced values acceptable for valuation purposes.

6. Actuarial Assumptions

Unless otherwise indicated, all assumptions adopted by the FRS Board for its June 30, 2019, valuation are implemented in this valuation. The prior assumptions and rate tables are illustrated at the end of this section.

Valuation Interest Rate

The assumed rate of return on the actuarial value of assets used for all purposes in this valuation is 6.50%. This rate is net of investment expenses. This 6.50% rate is based on research undertaken by the office of the LLA's actuary. Refer to Appendices B through D for further details.

Assumed Rate of Inflation

The assumed annual rate of inflation is 2.20% and is a component of the assumed rate of return and of individual members' salary increase assumption.

Please refer to Appendix B for further details.

Mortality Assumption

Mortality assumptions used in this valuation have been updated to use more recent tables as those adopted by the System and based on its most recent experience study.

Active employees (including DROP Return to Work Employees) use the PubS-2010(B): Amount-Weighted, Below-Median Income, Safety, Employee table for males and females projected generationally using SOA Scale MP-2018.

Disabled Members use the Pub-2010 Safety Disabled Retirees Amount-Weighted Mortality table for males and females with no projection.

All other retirees (including Current DROP), beneficiaries, survivors, and vested terminated members awaiting a benefit use the PubS-2010(B), Amount-Weighted, Below-Median Income, Safety, Healthy Retiree table for males and females projected generationally using SOA Scale MP-2018.

Please refer to Appendix A for comments on selection of demographic assumptions.

Cost-of-Living Adjustments/Increases

Unfunded actuarial accrued liabilities as of June 30, 2019, and contribution rates for FYE 2020 and FYE 2021 were developed based on FRS' gain-sharing COLA program using an explicit approach. The future benefits expected to be paid under the System's complex gain-sharing program are approximated with a fixed annual COLA equal to 0.60% prior to age 65 and 0.90% thereafter.

Please refer to Appendix E for further details.

Annual Salary Increase Rate

The rates of annual salary increases were developed in the most recent experience study and are the same as adopted by FRS. These rates include anticipated productivity growth, merit adjustments, and an inflation component of 2.20% for all purposes in this valuation, which is consistent with the inflation assumptions used to develop the return assumption. The following table gives the gross rates including inflation, anticipated productivity growth and merit adjustments:

Years of Service	Salary Growth Rate
1 – 2	14.41%
3 – 14	5.19%
15 – 24	4.69%
25 & over	4.19%

Please refer to Appendix B further details concerning inflation assumptions.

Retirement Rates

The retirement rates were developed in the most recent experience study and are the same as adopted by FRS. The table of these rates through age 75 is included later in the report. These rates apply only to those individuals eligible to retire.

Retirement Rates for Active Former DROP Participants

Retirement rates for active former DROP participants were developed in the most recent experience study and are the same as adopted by FRS.

Ages	Retirement Rates
74 & Under	0.25
75 & Over	1.00

Disability Rates

Disability incidence assumptions used in this valuation are the same as adopted by FRS and based on the System's most recent experience study. The rates used are 55% of the disability rates used for the 21st valuation of the Railroad Retirement System for individuals with 10-19 years of service. The table of these rates through age 75 is included later in this report. 20% of total disabilities are assumed to be in the line of duty.

Withdrawal Rates

Voluntary termination or withdrawal rates were developed in the most recent experience study and are the same as adopted by FRS. In addition, the withdrawal rate for individuals eligible to retire is assumed to be zero.

The following rates of withdrawal are applied based upon completed years of service:

Service	Rate	Service	Rate
< 1	0.075	6	0.050
1	0.065	7	0.040
2	0.065	8	0.030
3	0.065	9	0.020
4	0.050	>9	0.010
5	0.050		

Vesting Electing Percentage

Any member who terminates service credit after reaching the vesting threshold may receive a refund of employee contributions. Thus, we recognize that 70% of such employees will wait to receive a vested benefit. This percentage is the same as adopted by the System based on the most recent experience study.

DROP Entry Rates

The table of rates reflecting the probability of an active participant entering the DROP is included later in this report. These rates apply only to those individuals eligible to participate.

DROP Participation Period

All DROP participants are assumed to participate for three years and retire at the end of this participation period.

Retirement Limitations

Projected retirement benefits are not subject to IRS Section 415 limits.

Marriage Statistics

70% of the members are assumed to be married (same assumption adopted by the System based on the most recent experience study); husbands are assumed to be three years older than wives.

Family Statistics

Assumptions utilized in determining the costs of various survivor benefits as listed below, and are the same as adopted by the System based on the most recent experience study:

Member's Age	% With Children	Number of Children	Average Age
25	70%	1.84	5
35	86%	2.13	9
45	75%	1.70	12
55	22%	1.42	14
65	4%	1.45	15

"In the Line of Duty" Death

20% of the active deaths are assumed to occur while in the line of duty (service connected). This percentage is the same as adopted by the System based on the most recent experience study.

"In the Line of Duty" Disability

20% of the active disabilities awarded by the Board of Trustees are assumed to have occurred while in the line of duty (service related). This percentage is the same as adopted by the System based on the most recent experience study.

Administrative Expenses

Administrative expenses have been accounted for by explicitly recognizing them as an addition to normal cost, as one of the three components of the employer contribution. For FYE 2020, administrative expenses are assumed to be $1,937,980.

ACTUARIAL TABLES AND RATES

Age	Male Mortality Rates	Female Mortality Rates	Retirement Rates	DROP Entry Rates	Disability Rates
18	0.00017	0.00012	0.000000	0.000000	0.000825
19	0.00018	0.00012	0.000000	0.000000	0.000825
20	0.00019	0.00012	0.000000	0.000000	0.000825
21	0.00020	0.00011	0.000000	0.000000	0.000825
22	0.00022	0.00011	0.000000	0.000000	0.000825
23	0.00023	0.00012	0.000000	0.000000	0.000825
24	0.00025	0.00013	0.000000	0.000000	0.000825
25	0.00028	0.00013	0.000000	0.000000	0.000825
26	0.00031	0.00015	0.000000	0.000000	0.000825
27	0.00033	0.00015	0.000000	0.000000	0.000825
28	0.00034	0.00016	0.000000	0.000000	0.000825
29	0.00035	0.00017	0.000000	0.000000	0.000825
30	0.00062	0.00021	0.000000	0.000000	0.000825
31	0.00068	0.00026	0.000000	0.000000	0.000825
32	0.00075	0.00029	0.000000	0.000000	0.000825
33	0.00081	0.00031	0.000000	0.000000	0.000825
34	0.00087	0.00034	0.000000	0.000000	0.000825
35	0.00093	0.00037	0.000000	0.000000	0.000935
36	0.00098	0.00040	0.000000	0.000000	0.001045
37	0.00103	0.00043	0.000000	0.000000	0.001155
38	0.00105	0.00046	0.000000	0.000000	0.001320
39	0.00106	0.00050	0.000000	0.000000	0.001485
40	0.00107	0.00055	0.000000	0.000000	0.001705
41	0.00108	0.00061	0.060000	0.150000	0.001925
42	0.00110	0.00067	0.060000	0.150000	0.002145
43	0.00113	0.00074	0.060000	0.150000	0.002420
44	0.00116	0.00080	0.060000	0.150000	0.002750
45	0.00120	0.00084	0.060000	0.150000	0.003135
46	0.00122	0.00088	0.060000	0.150000	0.003575
47	0.00126	0.00091	0.060000	0.150000	0.004015
48	0.00129	0.00097	0.060000	0.150000	0.004565
49	0.00133	0.00104	0.060000	0.150000	0.005170
50	0.00137	0.00115	0.060000	0.170000	0.005885
51	0.00151	0.00127	0.060000	0.170000	0.006710
52	0.00160	0.00145	0.060000	0.170000	0.007590
53	0.00176	0.00166	0.060000	0.170000	0.008635
54	0.00195	0.00190	0.060000	0.170000	0.009790
55	0.00232	0.00218	0.060000	0.170000	0.011110
56	0.00283	0.00254	0.060000	0.170000	0.012650
57	0.00331	0.00290	0.060000	0.170000	0.014355
58	0.00388	0.00325	0.060000	0.170000	0.016280
59	0.00440	0.00369	0.060000	0.170000	0.018535
60	0.00502	0.00424	0.060000	0.170000	0.026840
61	0.00590	0.00496	0.060000	0.170000	0.026840
62	0.00674	0.00581	0.060000	0.170000	0.026840
63	0.00795	0.00683	0.060000	0.170000	0.026840
64	0.00892	0.00782	0.060000	0.170000	0.026840
65	0.01004	0.00890	0.500000	0.170000	0.026840
66	0.01170	0.01013	0.500000	0.170000	0.026840
67	0.01303	0.01131	0.500000	0.170000	0.026840
68	0.01400	0.01260	0.500000	0.170000	0.026840
69	0.01547	0.01403	0.500000	0.170000	0.026840
70	0.01675	0.01595	0.500000	0.000000	0.026840
71	0.01836	0.01721	0.500000	0.000000	0.026840
72	0.02015	0.01914	0.500000	0.000000	0.026840
73	0.02216	0.02056	0.500000	0.000000	0.026840
74	0.02444	0.02267	0.500000	0.000000	0.026840
75	0.02786	0.02408	0.500000	0.000000	0.026840

PRIOR ASSUMPTIONS
(Revised Effective in this Valuation)

Cost Method:

Individual Entry Age Normal with allocation of cost based on earnings. Entry and Attained Ages calculated on an age near birthday basis.

Valuation Interest Rate

7.30% (Net of investment expenses) as of 6/30/2018
6.50% (Net of investment expenses) as of 6/30/2019

Assumed Rate of Inflation

2.70% as of 6/30/2018
2.20% as of 6/30/2019

Annual Salary Increase Rate

Salary increase rates include anticipated productivity growth, merit adjustments, and an inflation component of 2.70% and 2.20% for all purposes in the 6/30/2018 and 6/30/2019 valuations, respectively, which is consistent with the inflation assumptions used to develop the return assumption. The following table gives the rates for anticipated productivity growth and merit adjustments used by the System actuary in the 6/30/2018 valuation:

Years of Service	Salary Growth Rate
1 – 2	14.75%
3 – 14	5.50%
15 – 24	5.00%
25 & over	4.50%

Active, Annuitant and Beneficiary Mortality

RP-2000 Combined Healthy with Blue Collar Adjustment Sex Distinct Mortality Tables Projected to 2031 using Scale AA.

Disabled Lives Mortality

RP-2000 Disabled Lives Mortality Tables set back 5 years for males and set back 3 years for females.

Retiree Cost of Living Increases

The present values, accrued liabilities and contribution development in the 6/30/2018 valuation did not recognize any future COLA increases.

APPENDIX A
BASIS FOR MORTALITY ASSUMPTIONS

Appendix A: Basis for Mortality Assumptions

Demographic assumptions employed by the System actuary were reviewed for reasonableness and, with exception of the assumed rates of mortality, continue to be appropriate for use in the valuation by the LLA. For this valuation, the LLA chose to implement updated mortality tables.

The size of FRS lacks sufficient data to apply actuarial "credibility" of the System's own mortality experience. The mortality assumption used in this 2019 actuarial valuation prepared by the LLA is based on the most recently developed broad-based mortality table (Pub-2010) without attempting to collect additional data from the System for the mortality experience study.

The Pub-2010 Public Retirement Plans Mortality Tables Report was published in January 2019 and was accompanied by an ensemble of tables with mortality rates varying due to job category and income levels. These tables were developed by the Society of Actuaries (SOA) based on data obtained from public sector pension plans across the US. It is the most recent reliable broad-base set of mortality tables available for purposes of national estimates of mortality for public pension plans. For the base mortality, the LLA selected rates from tables developed for the public safety members with below-median benefit incomes, often referred to as PubS-2010(B). This was not selected because FRS members have below-median benefit incomes, but because the below-median benefit income mortality rates are a reasonable proxy for the geographic variation in Louisiana (per the Centers for Disease Control and Prevention).

Data for the SOA study were collected from public pension systems from across the country, which allowed an opportunity to investigate whether geographic region is an effective predictor of relative mortality experience. Although some subsets of the data exhibited some variation in mortality by geographic region, SOA's analysis showed that the explanatory power of geography was considerably lower than that of both the job category and income-based quartile covariates. Given that the PubS-2010(B) mortality rates already reflect variations due to job category and below-median income levels (details not previously published for broad-based tables), the LLA believes that there is no need to further adjust those rates for geographical differences in order to avoid double counting the impact of those covariates.

With respect to accounting for future changes in mortality, the MP-2018 improvement scale, released in October 2018, is the most recent improvement scale available as of the valuation date and is also used in this 2019 actuarial valuation prepared by the LLA.

Actuarial Practice

Actuarial Standard of Practice (ASOP) No. 35, *Selection of Demographic and Other Noneconomic Assumptions for Measuring Pension Obligations*, states that at each measurement date the actuary should determine whether the assumptions continue to be reasonable, which includes the requirement to consider historical and current demographic data that is relevant as of the measurement date.

We believe the updated mortality table used in this 2019 actuarial valuation prepared by the LLA is the most current available, satisfies ASOP No. 35 and was developed in a manner consistent with current actuarial literature. All other demographic assumptions were developed by the System actuary in an actuarial experience study based on the System's own data submitted for the fiscal 2009 through fiscal 2014 valuations. Those assumptions were used by the LLA without further adjustments.

APPENDIX B
BASIS FOR INFLATION ASSUMPTION

Appendix B: Basis for Inflation Assumption

Perspectives: Where Should Actuaries Look for Input on Inflation Assumptions?

There are two types of perspectives to consider when defending or determining an assumed rate of future inflation: Do we look more to historical rates to inform decision-makers; or more to forward-looking forecasts of the future? Secondly, do we look more to what other retirement systems are doing; or look more to what expert inflation forecasters are expecting?

Past Returns? Looking backwards at historical inflation rates is not considered to be reliable supporting documentation for current pension actuarial assumptions of future inflation. Historical inflation rates are viewed more as information, than used to defend or determine a current inflation assumption. The past is indeed useful for understanding historical relationships among various economic forces.

The current economic environment is not like the past 10, 30, or 50 years; and the future economic environment is certain to be different from the past. The role of the Federal Reserve Board and other factors are different than they used to be years ago.

A forward-looking perspective should drive the defense or determination of an inflation assumption for pension actuarial valuations. Strategically selecting historical rates (an X-year period ending on Y-date) to justify a return assumption being applied to the next 10, 20, or 30-year period is not valid.

Therefore, historical CPI rates of increase have minimal relevance to us. We chose instead to develop our inflation assumptions based on *forward-looking* forecasts from subject matter experts.

Other Retirement Systems? Looking to what other peer retirement systems are assuming for future inflation rates is generally not a well-placed focus for defending or determining a future inflation rate.

While it may be interesting, even important, to know what inflation assumptions are used by other large public sector retirement systems, that information is not useful for discharging our duties for adopting an inflation assumption for the System's actuarial valuation. It is not useful for actually informing us concerning the economic forecasts applicable to this valuation.

a. *Different Environments*. Public retirement systems across the United States each have their own politics, environments and sets of agency risk. Their assumption-setters may not have adhered to mainstream and objective forecasts of experts, but may have been influenced by budgets, protectionism, and politics. These are not best practices to be emulated when setting assumptions. Since it is impossible to determine which retirement systems applied a robust, analytical process and which were more influenced by budgets, it is best not to select the inflation assumption based on what other retirement systems assume.

b. *Different Horizon*. Other retirement systems may have been influenced by their consultants advocating a long-term horizon for the net investment return assumption. This is fairly common, but as discussed below, a mid-term horizon (or a blend) is more

appropriate for the reasons stated. A single equivalent rate between the mid-term consensus and the longer term consensus, derived from a system's own respective cash flow demands, may be the most appropriate return assumption.

Looking at other retirement systems is important and useful for knowing what others are doing; but it is not appropriate as a driving factor in defending or determining an inflation assumption for this retirement System.

Expert sources of inflation forecasts (from large, independent, unbiased, and reputable inflation forecasting organizations) are the best places to look for input when setting an inflation 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 and independent 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 our primary duty to set an inflation assumption as an unbiased best estimate (or most appropriate) of the future inflation.

Inflation Forecasts from Independent Experts

Expected rates of inflation are critical components of expected rates of return. In a building block approach it forms the starting point for building up the final choice for the return assumption, salary scale increases for individuals, cost-of-living adjustment benefits, general wage inflation and a payroll growth rate assumption when applicable.

We applied considerable care to obtain relevant research and opinions from independent inflation forecasting experts for this fundamental component.

There are many professional sources available to actuaries and investment consultants that forecast inflation on a forward-looking basis.

Inflation forecasting is mostly the domain of *economists*, particularly those specializing in that area. In our opinion, as mentioned earlier, forward-looking forecasts from subject matter experts are much more appropriate than historical rates or peer groups.

Consider the forward-looking forecasts from the following ten (10) subject matter experts (eight organizations providing 10 sources), comprising hundreds of economists' opinions.

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	Social Security Trustees Report
Investment Forecaster Survey (GRS)	U.S. Department of the Treasury

Some of these organizations provide multiple forecasts of inflation for different time horizons, making a total of 17 forecasts from ten (10) reputable sources.

June 2019 Forward-looking Forecasts of CPI Inflation		
Horizon	**Average**	**Sources**
26 - 30+ yrs	2.25%	5
20 yrs	1.81%	2
10 -15 yrs	2.16%	10

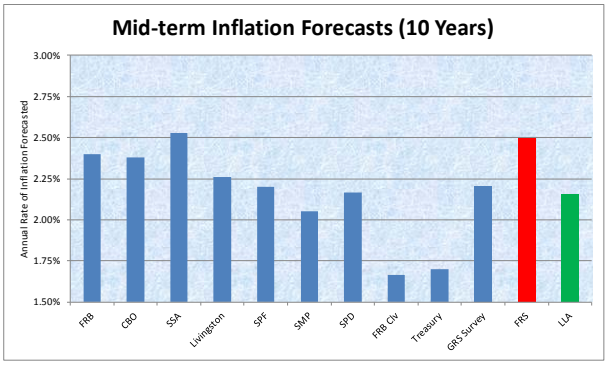
Our preferred inflation assumption for a 10 year horizon would be 2.16%, the consensus average directly from ten (10) expert sources of mid-term inflation forecasts.

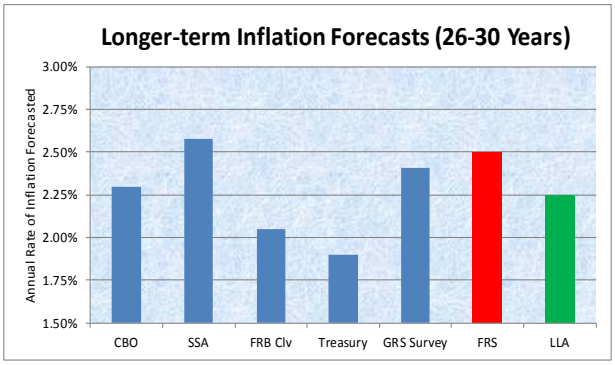
Our preferred inflation assumption for a 30 year horizon would be 2.25%, the consensus average directly from five (5) expert sources of long-term inflation forecasts

Both mid-term and long-term horizons of inflation forecasts are used in developing our final net return assumption. It would be a false choice to be forced to pick between mid-term and long-term for the net return assumption. The composite single equivalent benefit horizon turns out to be much closer to the mid-term horizon than the long-term horizon, due to the expected future benefits stream, and the long-term forecasts are less reliable for reasons discussed in Appendix D. Nevertheless, our final development of the net return assumption is a blend or the single equivalent net return assumption (between the mid-term and long-term census averages).

Consider the exhibit on the following page, which shows the detailed inflation forecasts of these ten large reputable expert organizations in the field of inflation forecasting.

2019 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 (<10 years):	
Objective since Jan 2012; Personal Consumer Expenditures (PCE)	2.00%
Consumer Price Index Inflation Objective (CPI = PCE + approx 40 bps)	2.40%
Congressional Budget Office: *The Budget and Economic Outlook*	
Overall Consumer Price Index (January 2019; Ultimate)	2.30%
Overall Consumer Price Index (January 2019; 10 Years)	2.38%
2019 Social Security Trustees Report	
CPI-W 10-Year Intermediate Assumption	2.53%
CPI-W 30-Year Intermediate Assumption	2.58%
Federal Reserve Bank of Philadelphia	
Livingston Survey: 10-Year Median Forecast (June 2019)	2.26%
Survey of Professional Forecasters: 10-Year Median Forecast (2Q2019)	2.20%
Federal Reserve Bank of New York's Trading Desk (June 2019)	
Survey of Market Participants: 10-Year Median Expectation	2.05%
Survey of Primary Dealers: 10-Year Median Expectation	2.16%
Federal Reserve Bank of Cleveland (July 1, 2019)	
10-Year Expectation	1.67%
20-Year Expectation	1.88%
30-Year Expectation	2.05%
U.S. Department of the Treasury (Ave in June 2019)	
10-Year Breakeven Inflation	1.70%
20-Year Breakeven Inflation	1.74%
30-Year Breakeven Inflation	1.90%
2019 GRS Survey of Investment Consultants and Forecasters	
Median expectation among 14 firms (averaging a 10-year horizon)	2.21%
Median expectation among 6 firms (averaging a 26-year horizon)	2.41%





Note the System's inflation assumption makes no distinction between mid-term or longer-term; but is just a single 2.50% rate for its 2019 valuation.

Clearly, it is difficult to defend an inflation assumption of 2.50% for a mid-term horizon of 10 years. An inflation assumption of 2.50% for a long-term assumption of 30 years might also seem excessive high compared to the experts.

For this valuation, the LLA adopted an inflation assumption of 2.20%, a weighted average between near and long-term forecasts from external sources.

APPENDIX C
BASIS FOR NET INVESTMENT RETURN ASSUMPTION

Principles for Setting Pension Return Assumptions

The purpose of the return assumption is to forecast what the pension portfolio is expected to earn in the future. While we are cognizant of the financial burden that pension contributions place on participating employers, our responsibility is to measure costs and liabilities without being unduly influenced by the resulting contribution requirement for a given return assumption. The role of the LLA is to make an unbiased measurement of the retirement program's expected future cost to taxpayers, without regard whether the contributions are affordable. This role is not to set or recommend assumptions to assist the employers in balancing their current budgets.

The pension return assumption should be a reasonable and defensible best estimate of the future net investment return of the pension portfolio over the given horizon. It should be based on the professional forecasts of *independent* subject matter experts and should be appropriate for use in an actuarial valuation of a retirement system. While we understand that different professionals may have differing opinions about the future, we do not consider the pension return assumption to be a lever to adjust up or down depending on what is affordable at the time.

Our primary focus is on following a robust and analytical process for objectively adopting an appropriate forecast of the pension portfolio's future earnings. We recognize the initial contribution shock caused by a large change in the return assumption. But we choose to separate the setting of the most appropriate return assumption from budget implications; not to ignore the budget implications, but to address them separately, after the most appropriate return assumptions is derived.

Nevertheless, a reasonable and defensible "most appropriate" assumption for future net investment returns:

a. Provides the most unbiased measure of the unfunded actuarial liability that is reported to the public;

b. Provides the most responsible funding levels for the benefit security of plan members;

c. Achieves an appropriate balance of intergenerational equity (does not unduly "kick the can down the road"); and

d. Moves the System toward attaining and maintaining actuarial soundness, as required by the Louisiana Constitution.

Process for Setting the Pension Return Assumption

We follow a robust and disciplined process for setting the return assumption (including the inflation assumption). The process includes these elements:

1. Perspectives: Where Should Actuaries Look for Input?
2. Inflation Forecasts from *Independent* Experts.
3. Asset Allocation.
4. Investment Return Forecasts from *Independent* Experts.
5. Consensus of Multiple Independent Experts.
6. Appropriate Horizon.
7. Most Appropriate Return Assumption

Perspectives: Where Should Actuaries Look for Input on Return Assumptions?

This section on "perspectives" for return assumptions is similar, but not identical to, the previous section on perspectives for inflation assumptions.

There are two types of perspectives to consider when defending or determining an assumed rate of future net investment returns of a pension fund: Do we look more to historical rates to inform decision-makers; or more to forward-looking forecasts of the future? Secondly, do we look more to what other retirement systems are doing; or look more to what expert forecasters would expect for the System's own portfolio in the future?

Past Returns? Looking backwards at historical rates of return is not considered to be reliable supporting documentation for current pension actuarial assumptions of future net returns. Historical rates of return are viewed more as information, than used to defend or determine a current net return 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.

The current economic environment is not like the past 10, 30, or 50 years; and the future economic environment is certain to be different from the past. The role of the Federal Reserve Board and other factors are different than they used to be years ago. The System's portfolio and its managers are not even the same now as they were in the past; nor are they likely to be the same in the future as they are now.

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 return assumption being applied to the next 10, 20, or 30 year period is not valid.

Therefore, historical returns for this System or investments in general have minimal relevance to us. We chose instead to develop our net return assumptions based on *forward-looking* forecasts from subject matter experts, then apply this System's own characteristics to arrive at a final assumption.

Other Retirement Systems? Looking to what other peer retirement systems are assuming for future investment returns is generally not a well-placed focus.

While it may be interesting, even important, to know what investment return assumptions are used by other large public sector retirement systems, that information is not useful for discharging our duties for adopting a net investment return assumption for the System's actuarial valuation. It is not useful for actually informing us concerning the economic forecasts applicable to this valuation.

a. *Different Environments*. Public retirement systems across the United States each have their own politics, environments and sets of agency risk. Their assumption-setters may not have adhered to mainstream and objective forecasts of experts, but may have been influenced by budgets, protectionism, and politics. These are not best practices to be emulated when setting assumptions. Since it is impossible to determine which retirement systems applied a robust, analytical process and which were more influenced by budgets, we felt it best not to select the return assumptions based on what other retirement systems assume.

b. *Different Asset Allocations*. Other retirement systems are certain to have different asset allocations than this System, either more aggressive or less aggressive. That would make it a false comparison. A system's own table of asset allocation targets is a major input factor into the selection process.

c. *Different Horizon*. Other retirement systems may have been influenced by their consultants advocating a long-term horizon for the net investment return assumption. This is fairly common, but as discussed below, a mid-term horizon (or a blend) is more appropriate for the reasons stated. A single equivalent rate between the mid-term consensus and the longer term consensus, derived from a system's own respective cash flow demands, may be the most appropriate return assumption.

Looking at other retirement systems is important and useful for knowing what others are doing; but is not appropriate as a driving factor in defending or determining a return assumption for this retirement System.

Expert sources of investment return forecasts (from large, independent, unbiased and, reputable investment forecasting firms) are the best places to look for input when setting a 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 and independent 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 our primary duty to set a return assumption as the most appropriate rate of future earnings of the portfolio.

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 assumed future returns.

We relied on the 11 target asset allocation percentages set forth in the System's formal Investment Policy Statement last updated March 14, 2019.

2019 FRS Target Asset Allocation			
Risk Assets		**Fixed Income Assets**	
Large Cap U.S. Equities	19.9%	Core Fixed Income	23.0%
Small to Mid Cap U.S Equities	6.8%	US TIPS	3.0%
International Equities	15.3%	Emerging Market Debt (Local Currency)	5.0%
Emerging Markets Int'l Equities	7.0%		
Private Equity	4.0%		
Real Estate	6.0%		
Global Tactical Asset Allocation (GTAA)	5.0%	*Total Fixed Income Assets*	*31.0%*
Risk Parity	5.0%		
Total Risk Assets	*69.0%*		
		Total Asset Allocation	*100.0%*

Source: Current FRS Investment Policy Statement (updated March 14 2019) and in accordance with a recent report ("2019 Asset Allocation Update") from the System's investment consultant: "We encourage a global equity target weight of 52% to the US, 33% EAFE, and 15% to the EM."

Input from Independent Experts

We applied the target asset allocations to the expectations in the GRS Survey of 14 major national investment consultants and forecasters.

External Forecasters

These 14 firms are independent of the LLA and GRS. This way, all parties can be assured there is no real or perceived agency risk or bias in the selection of the most appropriate return assumption by the LLA.

All 14 investment consultants/forecasters provided GRS with their mid-term (10 years) horizon forecasts, and six 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 the fund's asset classes to the investment consultant's asset classes may not be exact.

Listed below are the national firms in our 2019 GRS Survey. These are very large and reputable investment consultants and forecasters.

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]	Summit[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.*

Number of Experts

A caution is in order against including too many in the consensus survey. GRS includes 14 large forecasting firms, each with large research staffs, robust methodologies and peer accountability.

If the number of firms in the survey were too high, it would include firms with smaller research staffs, much less robust methodologies and less peer accountability. Furthermore, smaller firms often rely on some of the same research information and forecasts developed by the larger firms and, therefore, create overlap in the survey.

Methodology

The LLA adopts a methodology that minimizes "mapping error" and selects experts for inflation forecasting separate from investment return forecasting:

1. *Mapping error* refers to the slippage that sometimes occurs when mapping asset allocations from one list of asset classes to another. Not all asset class lists are identical. For example, one list might include international debt while another might fold its holdings in international debt into an asset class called merely core fixed income. A reasonable proxy must be substituted. This creates some amount of uncertainty in the process.

   The LLA minimized this mapping error by using only a single mapping.

   Other methodologies first create a standardized set of asset classes and map all forecasters' asset classes into this single standardized list of asset classes. The *first source of mapping error* occurs when each such standardized asset class is assigned a composite expected arithmetic return, a composite standard deviation and a composite expected geometric return (without the original connection between arithmetic return and standard deviation) from those forecasters who all have different lists of asset classes. A *second source of mapping error* arises from trying to create a single standardized composite set of correlation coefficients across mismatched sets of asset classes. These two sources of mapping error distort each forecaster's original capital market assumptions and their own considered relationships among asset classes. Then a *third source of mapping error* occurs when a system's own asset class list is mapped to the standardized set of asset classes with their composite expected returns, standard deviations and correlation coefficients.

The methodology employed by the LLA maps the System's asset allocation directly to each of the 14 forecasters' asset classes separately, without the interim steps discussed above, thereby preserving the integrity of each such forecaster's capital market assumptions' inter-relationships. This methodology also generates useful information about what each forecaster would say is their own expectation of the System's portfolio returns in the future.

2. As described in detail in Appendix B, the LLA turned to professional inflation forecasters for estimates of future inflation rates for this actuarial valuation report. Investment consultants and managers all have some expectations of future inflation, and usually include those expectations in their capital market assumptions for their investment forecasts. As mentioned previously, while investment forecasters are one source for inflation forecasting, they are not considered the best source.

   Economists are the best source of inflation forecasting. Economists often specialize in a wide range of subtopics (labor markets, tax revenue, etc.). Economists who publish inflation forecasts (specialists) are the best sources, not investment consultants.

Independent Experts' Forecasts for FRS

We mapped the System's most recent target asset allocation to each of these 14 investment forecasters' expected returns by asset class.

We replaced the mid-term investment forecasters' respective mid-term inflation assumptions with 2.16%, our preferred mid-term assumption based on the consensus of expert inflation forecasters' expectations presented above in order to normalize for a consistent inflation assumption across all forecasters.

Likewise, we replaced the long-term investment forecasters' respective long-term inflation assumptions with 2.25%, our preferred long-term assumption based on the consensus of expert inflation forecasters' expectations presented above in order to normalize for a consistent inflation assumption across all forecasters.

This process results in normalized expected returns for any one given year in each of the two forecast horizons (mid-term and long-term). These are called the expected arithmetic returns. 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. These are called the expected geometric returns, or 50^{th} percentiles.

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

Investment Forecaster	Distribution of 10-Year Compound Average Percentile Expectations 40th	50th	60th	Probability of exceeding 7.15%
(1)	(2)	(3)	(4)	(5)
1	3.60%	4.52%	5.44%	23.72%
2	4.32%	5.24%	6.16%	30.11%
3	4.62%	5.55%	6.49%	33.33%
4	4.92%	5.65%	6.38%	30.23%
5	5.06%	5.95%	6.85%	36.83%
6	5.19%	5.96%	6.73%	34.82%
7	5.31%	6.18%	7.07%	39.09%
8	5.29%	6.21%	7.13%	39.81%
9	5.27%	6.22%	7.18%	40.32%
10	5.51%	6.38%	7.26%	41.20%
11	5.74%	6.65%	7.56%	44.44%
12	5.86%	6.67%	7.49%	44.13%
13	6.04%	6.90%	7.76%	47.02%
14	6.22%	7.07%	7.93%	49.06%
Average	**5.21%**	**6.08%**	**6.96%**	**38.15%**

There are three important takeaways from this exhibit:

a. Over the mid-term horizon, the range of expert expectations of the 50th percentile of compound average return runs from 4.52% to 7.07%.

b. The 50th percentile consensus expert mid-term forecast is 6.08%.

c. The consensus of these experts is that there is only a 38.15% chance of achieving at least the current 7.15% over the mid-term horizon. This does not mean a 38.15% chance of achieving the 7.15% assumption in any year during the horizon; it means that the compound return over the next 10 years has a 38.15% of achieving at least the 7.15% assumption.

This is why, actuarially speaking, the 6.08% rate of return is the preferred assumption for a mid-term horizon, because it is the 50th percentile expectation of compound returns over a mid-term horizon. The consensus average is that there is a 50-50 chance of returning at least 6.08% when compounded over the next 10 years.

Applying a similar process to longer-term forecasts (averaging 26 years) results in a consensus average of 6.76%.

However, as discussed in a later 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.

A new pension plan with very little in benefits paid until the third decade can comfortably use a long-term horizon. But a mature 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 closer to the mid-term than to the long-term. This derives from basic actuarial principles.

Refer to the Appendix D below on the appropriate horizon and recognition of cash flow for more actuarial details.

Consensus of Multiple Independent Experts

Rather than rely on just one or two experts, we follow conventional wisdom and track the consensus (average) of several expert forecasts.

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 reliable than any one of those experts.

This ensures the final selection of the return assumption is consistent with the mainstream consensus of reputable national experts.

As described in the section above on "Perspectives: Where Should Actuaries Look for Input on Return Assumptions," it is more important to be in (a) the mainstream of what forecasting experts say about this System's portfolio than to be in (b) the mainstream of what other retirement systems say about their own systems.

APPENDIX D
HORIZON AND CASH FLOW CONSIDERATIONS FOR THE NET INVESTMENT RETURN ASSUMPTION

Appendix D: Horizon and Cash Flow Considerations for the Net Investment Return Assumption

It is often said that projecting pension costs is a long-term proposition. Forecasts of future inflation and future returns come in short-term horizons (1-5 years), mid-term horizons (5-10 years), and longer-term horizons (20-30 years). Long-term forecasts are appealing and tempting, usually producing higher returns than mid-term horizon forecasts.

While it may be argued that reliance should be placed on the longest-term horizons, there are at least four compelling reasons not to do so:

Reason 1: Underperformance in the Mid-term is Not Sustainable.

If the forecasting experts are right, there may be a decade or two of lower pension plan returns, with a need for very high returns thereafter if their longer-term forecasts are to hold up.

For example, in correspondence dated May 6, 2016, the U.S. Treasury Department denied the application of the Board of Trustees of the Central States, Southeast and Southwest Areas Pension Plan for rolling back benefits under the Multiemployer Pension Reform Plan Act of 2014 in order to avoid insolvency. One of the reasons given in the ruling[1] was that the 7.5% and other embedded return assumptions were "significantly optimistic" and were "not reasonable." More specifically, the ruling stated that the return assumptions used to support the application were not reasonable or appropriate for the purpose of the measurement, did not take into account relevant current economic and investment forecast data, and had significant bias by being significantly optimistic. This three-fold denouncement was made primarily on the basis of the assumption's failure to recognize the lower expected returns in the first 10 to 20 years of the longer term horizon.

Even though pensions are long-term propositions, we live in a short-term and mid-term world. We should not need to wait 20 or 30 years to be vindicated for an assumption for which we have so little confidence in anyway. In *The Tract on Monetary Reform (*1923), John Maynard Keynes said, "*But this long run is a misleading guide to current affairs. In the long run we are all dead. Economists set themselves too easy, too useless a task if in tempestuous seasons they can only tell us that when the storm is past the ocean is flat again.*" Many financial economists, many in the press and many academics are calling for much lower investment return assumptions. The optics are not good for continuing to hold to a long-term horizon of 20-30^{+} years, when so many mid-term years are forecasted by the experts to be underperforming against the long-term.

Repeated underperformance (for the next decade or so) of actual returns compared to the assumed return undermines the confidence in defined benefit plans. If the experts are right about the next 10 years but the return assumption is significantly higher, legislators and taxpayers might insist on a retirement plan that transfers the investment risk onto the members. Repeated increases in contribution rates and repeated additions to the unfunded actuarial liability may not be tolerable.

It is better to be more conservative in the return assumption over the mid-term time horizon while experts are forecasting lower compound annual returns.

[1] https://www.treasury.gov/services/Responses2/Central%20States%20Notification%20Letter.pdf

Reason #2: Over-reliance on Reversion to Mean Returns.

Long-term investment return forecasts (20-30 year horizons) often use a different methodology than mid-term forecasts. They often rely on the concept of "reversion to mean returns." While almost everything about the future is not known for certain, at least two things are known for sure – (1) The long-term picture will not be like the past, and (2) Neither will the steps leading through it. Reversion to mean returns depends on the future environment being like the past.

The number of heads we see in an unbiased coin-flip experiment exhibits reversion to the mean. Given a large enough number of coin-flips, we can reasonably expect the future number of heads to be approximately the same as in the past (half the number of coin-flips), because the coin is unbiased and the future is very much like the past. This cannot be said of investment markets.

This weakness of long-term forecasts may not, by itself, sufficient to *disregard* experts' long-term forecasts of the future entirely. But it should not inform us to rely on it to the exclusion of mid-term forecasts.

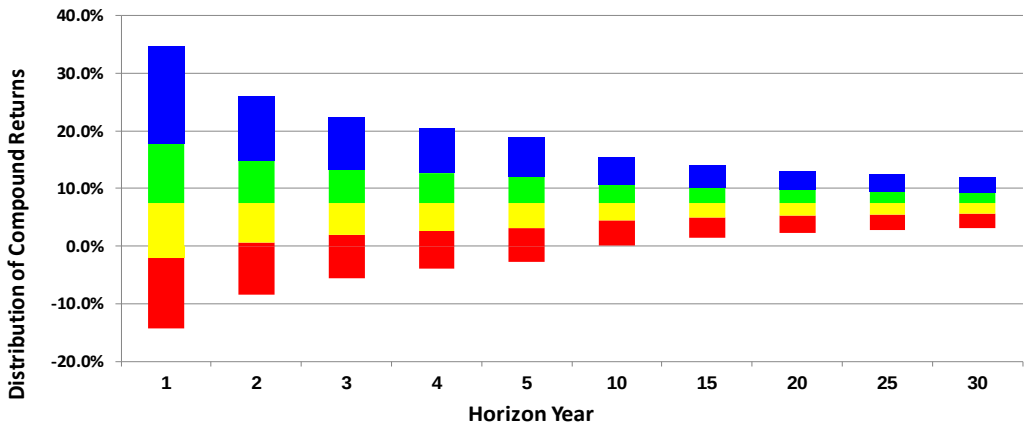
Reason #3: Return Forecasts Over a Longer-term Horizon are Less Reliable.

There is less certainty in the longer-term forecasts. Conventional risk management says that in the face of uncertainty, investors become more conservative. Thus, decision-makers should consider being more conservative than the longer-term forecasts because the longer-term forecasts are more uncertain. This is a principle in any forecasting profession, whether investment forecasting, election forecasting or hurricane forecasting. Longer-term forecasts are less reliable than mid-term forecasts.

There are two types of statistical error in forecasting –

1. Error around the mean (some have called this "risk") and
2. Error in the mean (and some call this "uncertainty").

Consider the following graph of the expected dispersion of forecasted compound returns around the forecasted compound mean. This shows that the compounded error around the compounded mean decreases over time. This is a common graph. But that type of error is not the one that brings the most uncertainty.



This dispersion graph *presumes* we know for certain what the statistical mean is for the ever-varying future investment returns, and illustrates merely what we think about how the varying returns will behave around that anchor-mean. The biggest uncertainty, here, is that no one knows for certain what the anchor-mean will be.

Many unexpected events will happen in the future that will throw off the anchor from our *presumption*. Even though the experts are reasonably accurate about the dispersion around the mean, they are likely to be off for their expectation of the future mean.

Many more things can insert themselves into our future over the next 30 years than over the next 10 years. So when we say, "*Return forecasts over a longer-term horizon are the less reliable,*" we do not refer to the dispersion illustrated in this graph (which might be misunderstood as proving the opposite). We are referring to how confident (or not) we are in the mean itself.

We can mitigate some of the uncertainty by aggregating the opinions or several experts as to what the long-term compound annual return will be, i.e., calculate the average (or consensus) of their forecasts. However, the consensus of long-term forecasts is still more unreliable than the consensus of mid-term forecasts. There will be many events in years 1-10 that will undermine the mid-term outcome, making the final result either higher or lower than the mid-term consensus forecast. But add other 20 years on top of that (years 11-30) and many more events can insert themselves in years 11-30 to undermine any such long-term forecast.

Reason #4: The System's Own Cash Flow Demands.

Possibly the most compelling reason *not* to accept the long-term forecasts without regard to the mid-term forecasts is a purely actuarial reason. It is fundamental in setting actuarial assumptions to incorporate (explicitly so) a retirement system's own characteristics into the process.

- The most obvious factor is to incorporate a system's own investment policy's asset allocation, as required by ASOP 27 Section 3.8.3(a). It is an actuarial weakness to either select or defend a system's return assumption without explicitly incorporating the fund's own asset allocation into the math.

- Secondly, a system's own cash demands upon the fund should explicitly be incorporated into the assumption-setting math, as required by ASOP 27 Section 3.8.3(f). The timing of when benefit and expense payments place a drain on the fund affects how much the fund should be expected to earn while those assets are still in the fund.

Experts currently forecast investment returns to be lower over the mid-term horizon (say, years 1-10) than over the long-term (years 11-30). They generally expect the later years to boost the compound average over 30 years compared to the compound average over the first 10 years.

Cash Flow Hypothetical #1: Consider a newly formed retirement system (system A), which is expected to pay very little in benefits over the mid-term horizon and most of its benefits beginning in year 25. Consider another retirement system (system B) that is a "mature" retirement system. This is not so extreme, but actually quite common. A mature retirement system is expected to pay a significant amount of its current accrued and projected benefits over

years 1-10. Mature retirement systems often pay out more in benefits than they take in from contributions (from employees, employers or other sources). Refer to Appendix F for statistics demonstrating that FRS is a mature plan (although not quite as mature as others).

Retirement system A can comfortably adopt a longer-term horizon for its expected investment return assumption because it has a long time to make up for the lower earnings that are expected in the mid-term (e.g., years 1-10) before it has to actually pay benefits out of the fund.

A large portion of retirement system B's current assets will not be around in years 11-30. They will be paid out of the fund over the next 1-10 years. Those assets will be earning only what is available in the marketplace over the next 1-10 years. They will not be around to make up for the lower earnings that are expected in the mid-term (e.g., years 1-10).

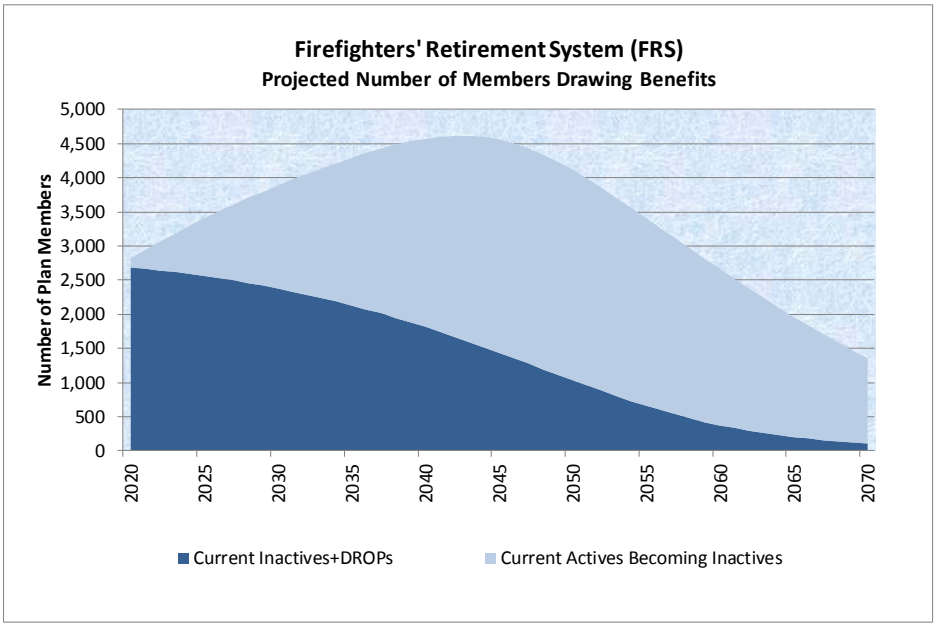
Cash Flow Hypothetical #2: Consider a state-run program that has been operational for 50 years and is fully expected to continue in operation. It is a "long-term proposition" (as is often said to describe pension systems). Since inception, this program has received a large infusion of capital at the beginning of each of the past 10-year periods, then pays disbursements every month until the end of the 10-year period when the assets are depleted. This infusion and payout occur in each 10-year period and are expected to continue in the same pattern.

While this hypothetical program is a long-term proposition, long-term expected rates of return should not be employed in forecasting future returns. The program's cash flow must be considered in estimating future returns.

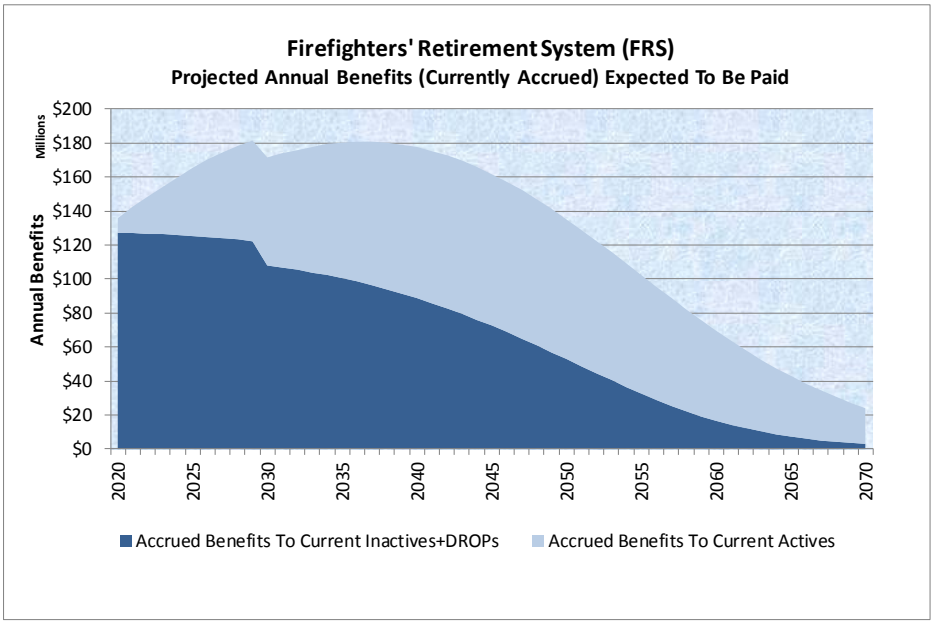
Even if one were to accept a long-term horizon for setting return assumptions (which we do not), in disregard of the first three arguments outlined in the immediately preceding pages, he or she would need to take into account the system's own benefit demands and adopt a return assumption somewhere between the mid-term and long-term expectations, so as to recognize the investment horizon or timetable for the benefit payments to be made over the next 10 years.

Furthermore, even the benefits expected to be paid out in years 11-20 will not be around for those last 10 years (years 20-30) and the first 10 years of earnings will drag down their average compounded return for the time remaining in the fund (years 1-20).

There is a not-so-complicated actuarial projection of a retirement system's future benefit demands. Consider the following graphs illustrating these points.

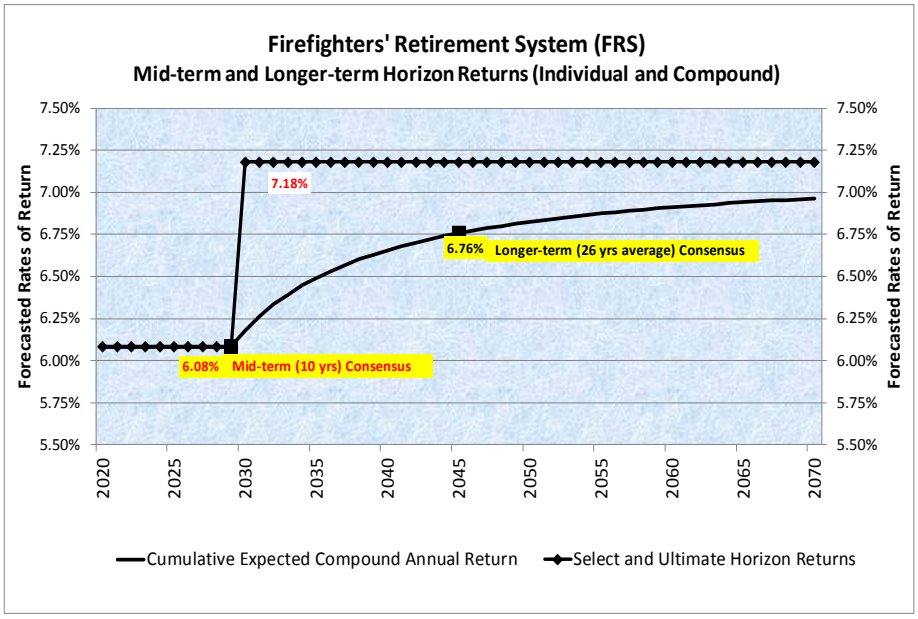


More than 2,500 current retirees are drawing benefits and will continue to do so until death. More retirees will be added to the roll from current active employees retiring in the years ahead, and then they will continue to receive benefits until death.



Currently, over $120 million per year in benefits are being paid to current retirees. Their benefits will continue until death. More benefits will be paid to current active who will retire in the years ahead. This, of course, is the purpose of retirement systems – to pay benefits to retiring public servants.

In the next few years, the benefits and expenses paid are expected to exceed the contributions made from employees, employers and other sources (i.e., negative cash flow). The cash demands upon the fund need to be recognized in setting or defending the return assumptions.

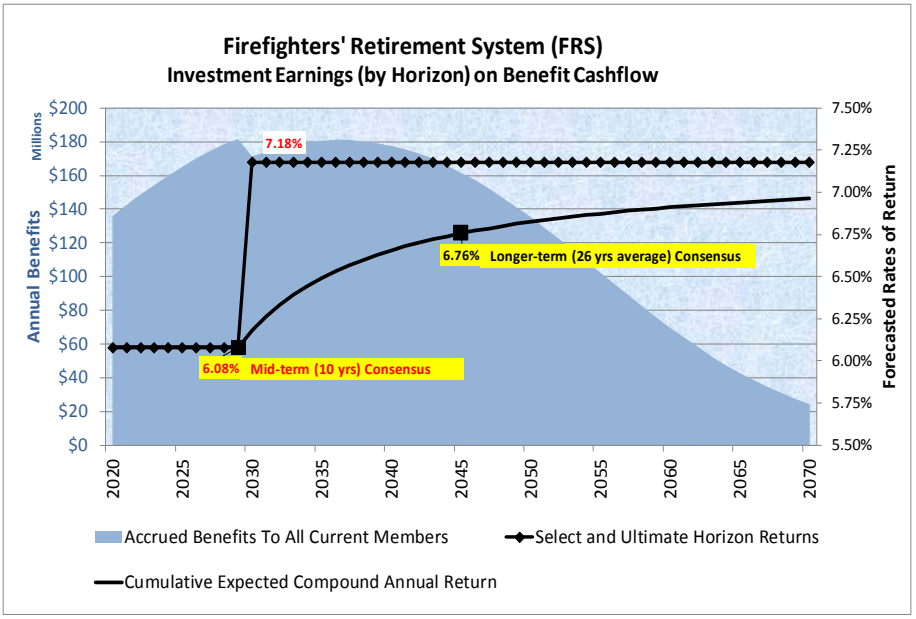


As presented previously in Appendix C, the consensus 50th percentile expectation for the compound annual returns over the next 10 years (years 1-10) is 6.08%, and over the full 30 years (years 1-30) it is 6.76%. In order for the 30-year average to be 6.76%, the returns during each of the years 11-30 need to be 7.18% (in order to make up for drag in returns for years 1-10).

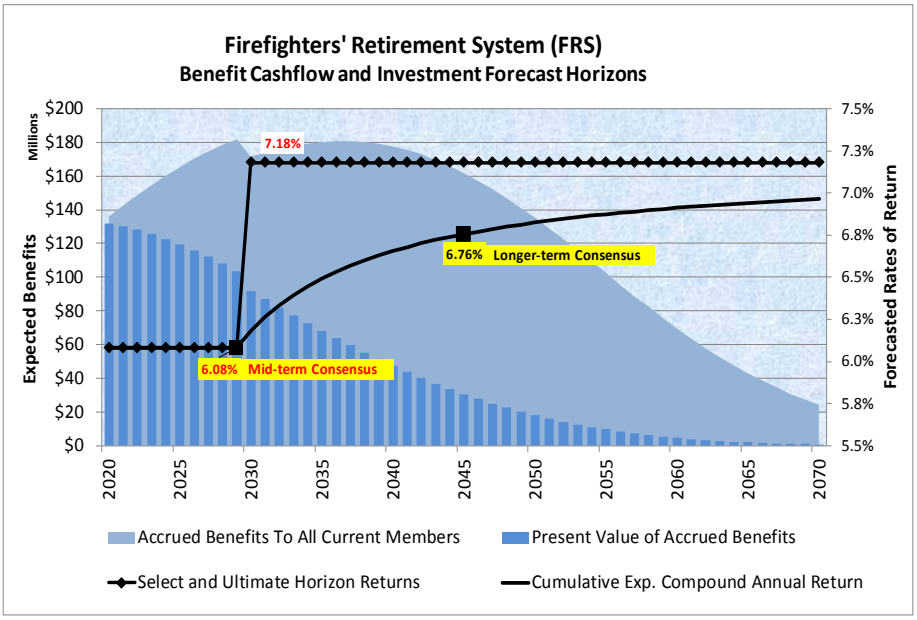
The curved line from 2029 through 2070 represents the cumulative compound average returns at each point, comprised of returns of 6.08% per year for years 1-10 compounded with returns of 7.18% each year thereafter. Notice at 26 years, the compound average return is the forecasted 6.76%.

This separate forecast of returns for years 1-10 and years 11-30 is necessary to measure the earnings generated by the fund's current assets from the valuation date through the year when the benefits are expected to be paid.

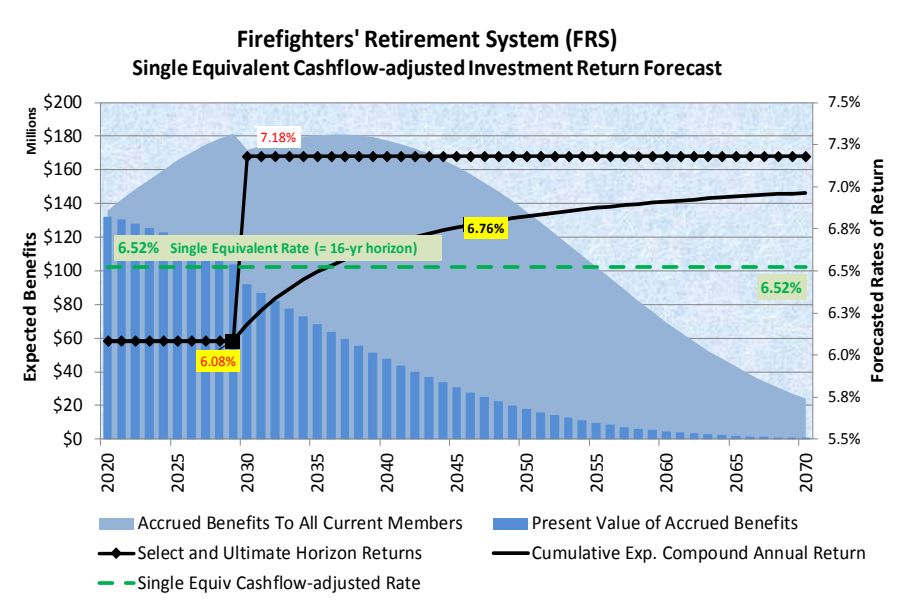
The graph below overlays the total annual benefits (accrued to current retirees and current actives becoming retired) to illustrate the time when the benefit assets are still in the fund.



The graph below overlays the present value (dark blue region) of those annual benefit payments to illustrate the effect in terms of current dollars, i.e., current assets that will ultimately pay those benefits (light blue region). Again, the current assets that will pay these expected benefits for years 1-10 will only be earning 6.08% per year, while assets that will pay the benefits for years 11-20 will be earning only 6.08% for years 1-10 and 7.18% for the balance of years until payment.



Recognizing the System's own benefit demand timing 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 6.52%.



We tested this same procedure with projected benefits (not just accrued) and with new hires (not just current members). The result was very little difference. Adding those other two benefits streams does not move the needle much.

All of these last several pages demonstrate how it is not appropriate to simply adopt a 30-year horizon for setting the net investment return assumption for an actuarial funding valuation.

To summarize, adopting a return assumption should incorporate in an explicit manner:

1. A retirement system's own investment policy (target asset allocation) and
2. A retirement system's own expected benefit stream.

Notice the horizon associated with the single equivalent expected return is 16 years. Therefore, the mid-term forecast consensus should have a strong influence over the final assumption that incorporates the system's own cash benefit demands.

Some might argue, based on the first three compelling reasons not to consider long-term horizon forecasts at all, i.e., that the 6.08% consensus of 10-year expectations is even more appropriate than the 6.52% single equivalent return assumption. There is merit in that position for those three compelling reasons.

The LLA chose to use a rounded-down assumption of 6.50% as the "most appropriate" return assumption.

Appendix E
Measuring Future
Gain-Sharing Cost-of-Living Benefits

Appendix E: Measuring Future Gain-sharing COLA Benefits

Cost-of-living adjustment (COLA) benefits derived from investment earnings above the valuation rate are commonly called "gain-sharing" COLAs. This term "gain-sharing" derives from plan provisions that "share" investment gains with members rather than using them, as is typically done, to help pay (indirectly) the employer's required contribution. But there is a cost to that "sharing." Measuring that cost is the subject of this Appendix E.

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. However, the System's retirees are likely to receive COLA benefit increases with some regularity. This likelihood comes from the workings of the relevant state statutes coupled with the tendency 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 recommend and 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 template was designed to prevent benefit increases during periods when investment returns fall below expectations or the system falls below certain thresholds. Governing bodies 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. Generally speaking, board members may feel beholden to plan members to provide them benefits they might feel entitled to.

d. All Social Security recipients receive regular and guaranteed cost-of-living increases. But 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, COLAs 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, it may embolden FRS plan members to pressure FRS board members to grant a COLA if permitted. It is a "me too" phenomenon.

Following is a table that illustrates the recent history of the statutory conditions and board actions concerning the FRS COLA benefit program.

Appendix E: Measuring Future Gain-sharing COLA Benefits

COLA History for the Firefighters' Retirement System								
	Statutory Conditions for Gain-Sharing COLA Under:		Authorizing COLA Statute Pct and Recipients[2]					
Actuarial Measurement Date	The Window Rule[3]	The Sufficient Actuarial Return Rule[4]	R.S. 11:2260(A)(7) COLA [Up to 3%, to All Elg]	R.S. 11:246 COLA [2% or Nothing, to Elg Over 65]	Amount Granted by Board	Date Approved by Board	Effective Date of COLA	Comments
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[5]	**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.

[2] Per R.S. 11:2260(A)(7), the Board is authorized to provide a supplemental COLA of up to 3% to all eligible pensioners. Additionally, per R.S. 11:246, the Board is authorized to provide an additional 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.

[3] Per R.S. 11:243, the Board may grant a benefit increase if any of the following apply: (1) 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, (2) 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 (3) 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. 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.

[4] 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.

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

Given the one example of granting a COLA when permitted (measured at the fiscal year ending June 30, 2014), coupled with the analysis above, it is our opinion that there is a reasonable likelihood that the board will grant a COLA when permitted. It seems unreasonable to "assume" a 0% chance of granting a COLA in future years when otherwise permitted. Something is better than nothing.

In addition, the COLA provisions are in the Louisiana statutes for a reason: To pay COLAs – sometimes. The sponsors and other legislators presume COLAs to be granted periodically, even if only every few years. If not, these statutory provisions probably would not have been codified.

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 (even if making only a rough estimate) material costs and liabilities of the statutes' COLA provisions is to deny the purpose of the statutes.

COLAs do not have to be guaranteed before adopting prudent 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 benefits are material, actuarially measurable and reasonably likely, they should be recognized in advance in actuarial valuations of costs and liabilities. That serves to move 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, 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.

It is clear that not recognizing future COLA benefits does not reflect the reasonable likelihood that COLAs will be granted in the future. Thus, in this valuation, all actuarially expected COLA benefits are assumed to be granted in accordance with the statutory template. This is a change in the actuarial assumptions from the previous PRSAC-adopted valuations.

The mathematical and logical rules set forth in the statutory template lend themselves to actuarial modeling. The frequency and magnitude of the future COLAs can be modelled actuarially using well-accepted techniques. Given the presumption that board members will grant COLAs whenever permitted by the statutes, it is actuarially appropriate to recognize the frequency and magnitude of future COLAs when performing an annual actuarial valuation of the System's costs and liabilities.

Even if the assumption were to be that the board of trustees would grant COLAs half of the time when permitted, that would be an improvement over the current practice. Again, something is better than nothing. For the purpose of this actuarial valuation, the LLA adopts the assumption

that a COLA will be granted to the extent they are permitted.

Furthermore, for FRS, the statutes do not permit COLAs to be funded with the balance in a Funding Deposit Account, as with certain other statewide retirement systems. Thus, if COLAs are to be granted for FRS, the only current mechanism is by way of "excess interest" (i.e., "gain-sharing") described above.

Modeling Gain-sharing COLA Benefits

There are at least two preferred approaches to actuarially measuring the cost and liabilities of FRS' COLA provisions. Both preferred approaches use explicit, stochastic methods and involve running actuarial simulations of the future.

1. *Single equivalent annual COLA assumption.* The simulation spins off information about the frequency and magnitude of each year's permitted gain-sharing COLA. The mean (average) transfer amount can be considered a benefit stream. Solving for X, it determines what would be the single annual equivalent COLA, e.g., 0.35%, or some other such estimated equivalent annual COLA. Solve for the X% that has the same actuarial present value over the next 30 years as the average simulated transfer amount. In some systems, like FRS, it may be necessary to solve for two equivalent COLA rates if eligibility differs between segments of population.

2. *Single equivalent benefit load assumption.* Dividing that same mean (average) transfer stream for each year by its regular benefits projected to be payable for that year, as spun off from the open group forecast valuation, provides an estimate of the load (X%) on benefits that approximates the average transfer amount, e.g., 7% or some other such percent load.

Either of these two alternative *actuarial methods* is acceptable in our opinion. Both of these methods are transparent and explicit *actuarial methods* for recognizing the actuarially measurable likelihood of future gain sharing COLAs for funding purposes.

The first method presented above (single equivalent annual COLA rates) provides a reasonable proxy for what would likely actually happen in the years to come. Members age 65 or older are eligible for COLA under two different statutes, while younger members may benefit only from one of them. Values of X% annual COLA to all eligible members and Y% to all eligible members over age 65 serve as an equivalent COLA assumption, and can be treated in the valuation "as if" these were regular annual COLA increases. The only challenge is to make a reasonable estimate of X% and Y% which scientific actuarial methods enable us to do.

Modeling Results for the First Actuarial Method

The first actuarial method (preferred) projects the expected streams of future gain-sharing COLAs using the investment-related assumptions adopted by the LLA.

The application of this explicit model stochastically generated net investment returns for the next 30 years, and did so 500 times (i.e., 500 trials). A total of 15,000 annual rates of return (single-year market rates) were randomly selected from a lognormal distribution with these parameters:

- A mean of 6.65% during years 1-10,
- A mean of 7.89% during years 11-30, and
- A standard deviation of 11.25% for years 1-30.

These lognormal parameters (arithmetic means - one year) are not to be confused with the 50th percentile expectations (geometric means - compounded) over similar time periods addressed in Appendices B and through D.

The computer-generated market returns were used as the base input to the model which simulated the operation of the System's complex gain-sharing COLA program over time. The means were not the expected compound returns over time (as discussed in Appendices B and C), which is much lower and more appropriate for actuarial valuations. These means are the forecaster's consensus expectations for each one year standing on its own.

It assumes that every year for which the statutes permit a permanent benefit increase to be granted, it will be granted and will be the maximum allowed. The model built for this purpose includes the following primary steps, as well as numerous other intermediary tests and calculations:

a. Modeling future new hires and future actuarial valuations,
b. Modeling the markets and future rates of return using generally acceptable techniques,
c. Modeling the smoothed actuarial rate of return,
d. Modeling the maximum allowed on the COLA rate,
e. Modeling the frequency rules for granting a COLA and
f. Modeling the amount of the COLA rate.

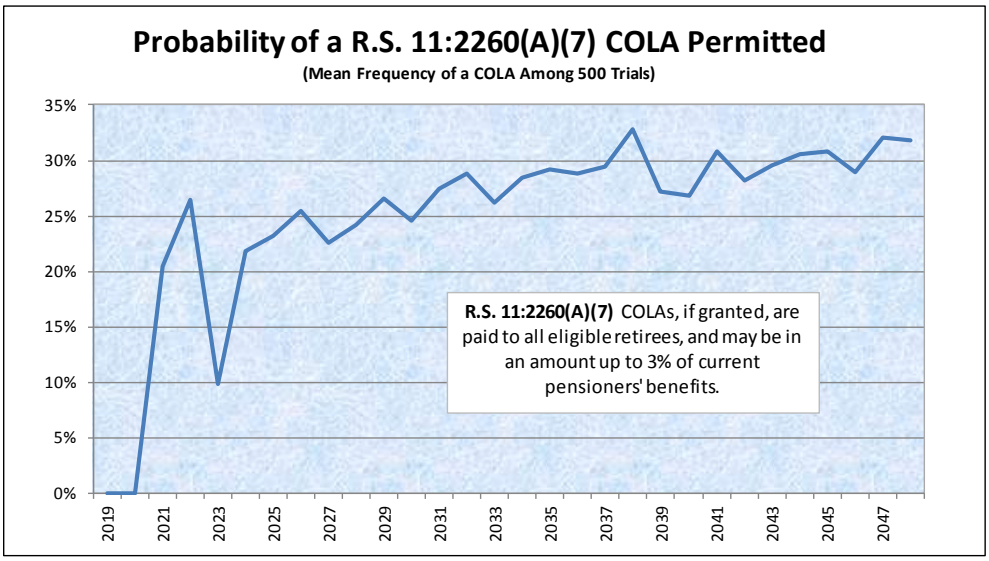
In some years, the model expects a COLA to be granted and in some years the model expects none. For each year in which the model expects a COLA, the amount can vary widely.

The mean (average) amount expected to be granted each year was captured and their present value calculated. *It was determined that an R.S. 11:2260(A)(7) COLA of 0.60% for eligible pensioners under the age of 65 and an R.S. 11:246 COLA of 0.30% for eligible pensioners age 65 or older would produce the same additional present values.* These are the fixed annual COLA rates that approximate the statutory COLA template.

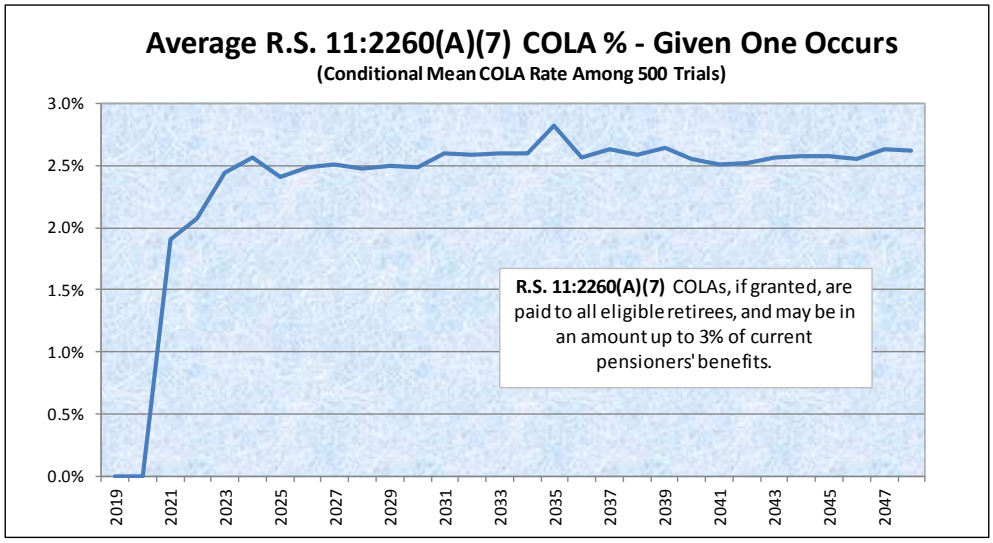
They are, therefore, considered the single equivalent COLAs this year representing the future working of the statutory gain-sharing mechanism.

R. S. 11:2260(A)(7) COLA (up to 3.0%, for all eligible retirees)

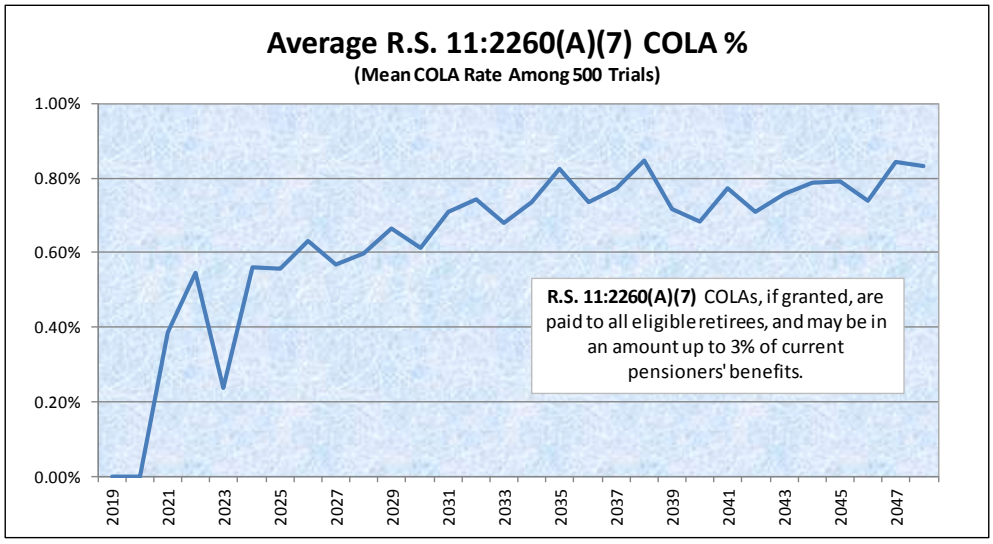
Consider the following graphs illustrating the results of the simulations in the stochastic model of FRS' gain-sharing COLA program under R.S. 11:2260(A)(7).



Based on the graph above, the probabilities that a COLA described in R.S. 11:2260(A)(7) will be permitted and granted each year lie mostly between 20% and 25% in each of the next 10 years, and lie mostly between 25% and 32% in years 11-30.



Based on the graph above, over the next 30 years, when an R.S. 11:2260(A)(7) COLA is granted, according to the model, the percent increase will lie mostly between 2.0% and 2.6% of all pensioners' current benefits (averaging 2.3% overall). Recall that R.S. 11:2260(A)(7) permits COLA up to 3% of benefits for all eligible retirees.

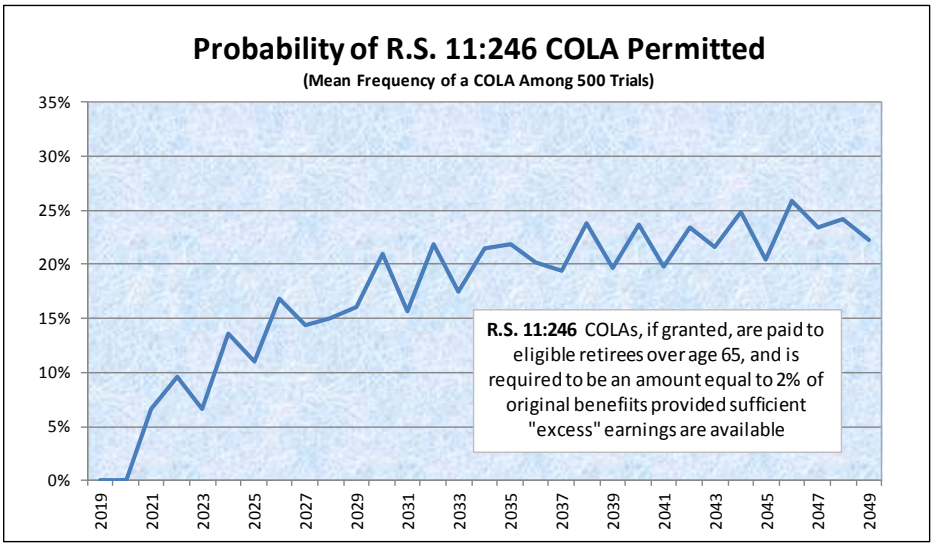


Based on present values of future expected COLAs, therefore, the final assumption used in this first actuarial method is to include a fixed annual R.S. 11:2260(A)(7) COLA of 0.60% as a reasonable approximation of the future workings of the actual statutory gain-sharing COLA template.

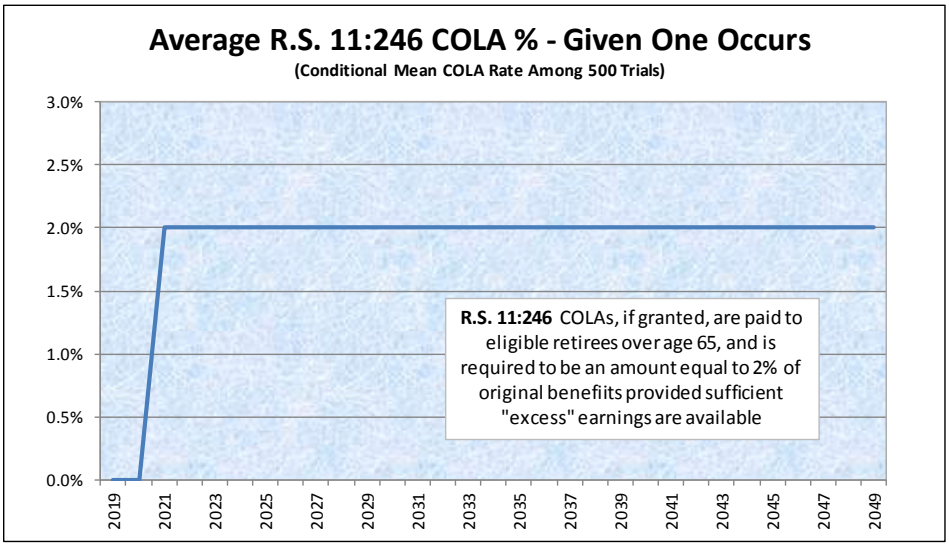
The frequency and amounts of gain-sharing COLAs for FRS are both (a) predictable and (b) material, under R.S. 11: 2260(A)(7).

R. S. 11:246 COLA (2.0% or none, for all eligible retirees over age 65)

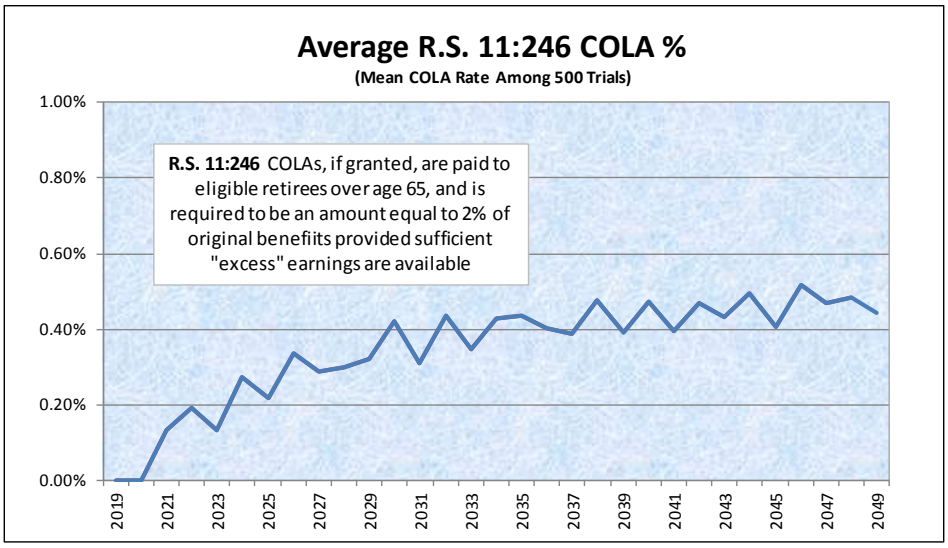
Consider the following graphs illustrating the results of the simulations in the stochastic model of FRS' gain-sharing COLA program under R.S. 11:246.



Based on the graph above, the probabilities that COLA described in R.S. 11:246 will be permitted and granted each year lie mostly between 10% and 15% in each of the next 10 years, and lie mostly between 15% and 25% in years 11-30.



Based on the graph above, over the next 30 years, when an R.S. 11:246 COLA is granted, according to the model, it will be a 2.0% COLA (by design; 2.0% of eligible pensioners' original benefits). Recall that R.S. 11:246 permits COLAs equal to 2.0% (and never less) of original benefits for all eligible retirees over age 65.



Based on present values of future expected COLAs, therefore, the final assumption used in this first actuarial method is to include a fixed annual R.S. 11:246 COLA of 0.30% as a reasonable approximation of the future workings of the actual statutory gain-sharing COLA template.

The frequency and amounts of gain-sharing COLAs for FRS are both (a) predictable and (b) material, under R.S. 11:246.

Compliance with Actuarial Standards of Practice

The method employed for recognizing the gain-sharing COLA benefits as described above complies with the Actuarial Standards of Practice.

According to Section 3.5.3 of Actuarial Standards of Practice No. 4:

> *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 plan 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.*

According to Section 2.1 of Actuarial Standards of Practice No. 1:

> *The words "must" and "should" are used to provide guidance in the ASOPs. "Must" as used in the ASOPs means that the ASB does not anticipate that the actuary will have any reasonable alternative but to follow a particular course of action. In contrast, the word "should" indicates what is normally the appropriate practice for an actuary to follow when rendering actuarial services. Situations may arise where the actuary applies professional judgment and concludes that complying with this practice would be inappropriate, given the nature and purpose of the assignment and the principal's needs, or that under the circumstances it would not be reasonable or practical to follow the practice.*
>
> *Failure to follow a course of action denoted by either the term "must" or "should" constitutes a deviation from the guidance of the ASOP. In either event, the actuary is directed to ASOP No. 41, Actuarial Communications.*
>
> *The terms "must" and "should" are generally followed by a verb or phrase denoting action(s), such as "disclose," "document," "consider," or "take into account." For example, the phrase "should consider" is often used to suggest potential courses*

> *of action. If, after consideration, in the actuary's professional judgment an action is not appropriate, the action is not required and failure to take this action is not a deviation from the guidance in the standard.*

Bold and underline have been added for emphasis and identification.

APPENDIX F
RISKS ASSOCIATED WITH MEASURING THE ACCRUED LIABILITY AND ACTUARIALLY DETERMINED CONTRIBUTIONS

Appendix F: Risks Associated with Actuarial Measurements

The determination of the accrued liability and the actuarially determined contribution requires the use of assumptions regarding future economic and demographic experience. Risk measures, as illustrated in this report, are intended to aid in the understanding of the effects of future experience differing from the assumptions used in the course of the actuarial valuation. Risk measures may also help with illustrating the potential volatility in the accrued liability and the actuarially determined contribution that result from the differences between actual experience and the actuarial assumptions.

Future actuarial measurements may differ significantly from the current measurements presented in this report due to such factors as the following: plan experience differing from that anticipated by the economic or demographic assumptions; changes in economic or demographic assumptions due to changing conditions; increases or decreases expected as part of the natural operation of the methodology used for these measurements (such as the end of an amortization period, or additional cost or contribution requirements based on the plan's funded status); and changes in plan provisions or applicable law. The scope of an actuarial valuation does not include an analysis of the potential range of such future measurements.

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

1. Investment risk – actual investment returns may differ from the expected returns;
2. Asset/Liability mismatch – changes in asset values may not match changes in liabilities, thereby altering the gap between the accrued liability and assets and consequently altering the funded status and contribution requirements;
3. Contribution risk – actual contributions may differ from expected future contributions. For example, actual contributions may not be made in accordance with the plan's funding policy or material changes may occur in the anticipated number of covered employees, covered payroll, or other relevant contribution base;
4. Salary and Payroll risk – actual salaries and total payroll may differ from expected, resulting in actual future accrued liability and contributions differing from expected;
5. Longevity risk – members may live longer or shorter than expected and receive pensions for a period of time other than assumed;
6. Other demographic risks – members may terminate, retire or become disabled at times or with benefits other than assumed resulting in actual future accrued liability and contributions differing from expected.

The effects of certain trends in experience can generally be anticipated. For example if the investment return since the most recent actuarial valuation is less (or more) than the assumed rate, the cost of the plan can be expected to increase (or decrease). Likewise, if longevity is improving (or worsening), increases (or decreases) in cost can be anticipated.

The computed contribution rates presented in this actuarial valuation report may be considered as a minimum contribution rate that complies with state statute. The timely receipt of actuarially determined contributions is critical to support the financial health of the plan. Users of this report should be aware that contributions made at the actuarially determined rate do not necessarily guarantee benefit security.

Plan Maturity Measures

Risks facing a pension plan evolve over time. A young plan with virtually no investments and paying few benefits may experience little investment risk. An older plan with a large number of members in pay status and a significant trust may be much more exposed to investment risk. This System is considered to be mature, requiring extra attention to various actuarial risks.

Generally accepted plan maturity measures include the following:

Risk Measures	2019	2018	2017	2016	2015
Ratio of the market value of assets to total payroll	7.4	7.2	6.9	6.2	6.7
Ratio of actuarial accrued liability to payroll	10.0	9.7	9.3	9.1	9.2
Funded ratio	74%	75%	74%	68%	72%
Ratio of actives to inactives receiving benefits	1.7	1.8	1.8	1.8	1.8
Net cash in (out) flow: in millions	$0.6	$5.8	$3.6	$13	$12
Ratio of net cash flow to market value of assets	0.0%	0.3%	0.2%	0.9%	0.8%
Duration of the actuarial accrued liability	12.5	NA	NA	NA	NA

Ratio of Market Value of Assets to Payroll

The relationship between assets and payroll is a useful indicator of the potential volatility of contributions. For example, if the market value of assets is 2.0 times the payroll, a return on assets 5% different than assumed would equal 10% of payroll. A higher or increasing level of this maturity measure generally indicates a higher or increasing volatility in plan sponsor contributions as a percentage of payroll, and vice versa.

Ratio of Actuarial Accrued Liability to Payroll

The relationship between actuarial accrued liability and payroll is a useful indicator of the potential volatility of contributions for a fully funded plan. A funding policy that targets a funded ratio of 100% is expected to result in the ratio of assets to payroll and the ratio of liability to payroll converging over time.

The ratio of liability to payroll may also be used as a measure of sensitivity of the liability itself. For example, if the actuarial accrued liability is 2.5 times the payroll, a change in liability 2% different than assumed would equal 5% of payroll. A higher or increasing level of this maturity measure generally indicates a higher or increasing volatility in liability (and plan sponsor contributions) as a percentage of payroll, and vice versa.

Ratio of Actives to Retirees and Beneficiaries

A young plan with many active members and few retirees will have a high ratio of active to retirees. A mature open plan may have close to the same number of actives to retirees, resulting in a ratio near 1.0. A super-mature or closed plan may have significantly more retirees than actives resulting in a ratio below 1.0.

Ratio of Net Cash Flow to Market Value of Assets

A positive net cash flow means contributions exceed benefits and expenses. A negative cash flow means existing funds are being used to make payments. A certain amount of negative net cash flow is generally expected to occur when a plan is mature. Large negative net cash flows as a percent of assets may indicate a super-mature plan or a need for additional contributions. As a plan matures, it takes on more actuarial risk.

Duration of Actuarial Accrued Liability

The duration of the actuarial accrued liability may be used to approximate the sensitivity to a 1% change in the assumed rate of return. For example, duration of 10 indicates that the liability would increase approximately 10% if the assumed rate of return were lowered 1%.

Additional Risk Assessment

Additional risk assessment is outside the scope of the annual actuarial valuation. Additional assessment may include scenario tests, sensitivity tests, stochastic modeling, stress tests, and a comparison of the present value of accrued benefits at low-risk discount rates with the actuarial accrued liability.

Useful risk metrics include unfunded actuarial liability (and net pension liability), funded ratio (on actuarial value or market value basis), and actuarially determined employer contribution rates required.

APPENDIX G
PRESS CLIPPINGS FOR OTHER RETIREMENT SYSTEMS LOWERING THEIR RETURN ASSUMPTIONS (2015-2019)

Other retirement systems and state officials have characterized their decisions to lower pension return assumptions as being positive actions for plan members and taxpayers.

Appendix G: Press Clippings for Retirement Systems Lowering Return Assumptions

New Jersey

The New Jersey Pension Fund's assumed rate of return has been reduced to 7% from 7.65% by state Treasurer Ford M. Scudder, the second rate cut he has enacted this year. Mr. Scudder had cut the rate to 7.65% from 7.9% in February 2017.
"Given the current elevated level of asset values across the board, long-run expected returns have diminished, so it is appropriate to lower the assumed rate of return," Mr. Rijksen wrote [Willem Rijksen, a Treasury Department spokesman]. "Our actuaries have suggested doing so, and it is the unmistakable trend in public pension plans across the country."
Pensions and Investments Online (pionline.com), 12/22/17

The move increases the pension tab for state and local governments by more than $800 million for the fiscal year that begins in July, according to an NJ Advance Media analysis of state actuary reports released Tuesday.
The change was praised by the pension fund actuaries, who say a 7 percent assumed rate of return is in line with other large funds and is a more conservative estimate of what pension investments can achieve over the long term. In contrast, assuming the investments will earn a high rate makes the pension fund look healthier than it really is and doesn't reflect the reality of the state's investment outcomes, actuaries say.
The state contributes less than what's recommended by actuaries. This year, it's expected to kick in about $2.5 billion, or half of what's recommended, and it is on track to contribute 60 percent next year.
NJ.com, New Jersey Online, 12/22/17

Notice a couple observations: (1) Down from 7.9% to 7.65% to 7.0% in 10 months, (2) The change will increase the contribution requirement by more than $800 million and (3) NJ is roughly tied (with Kentucky) for the worst-funded pension system in the country (30.9% in 2016) and has been contributing only about half the actuarially required contribution under their previously high return assumption, yet they did the "appropriate" thing and lowered the return assumption from 7.9% to 7.0%.
*Notice the **positive statements** about this decision: (1) "a 7 percent assumed rate of return is a more conservative estimate of what pension investments can achieve" (2) "Given the current elevated level of asset values across the board, long-run expected returns have diminished, so it is appropriate to lower the assumed rate of return."*

Kentucky

Since the last actuarial valuation the Board adopted changes to certain economic assumptions for KERS, CERS and SPRS. Specifically, the Board decreased the price inflation assumption to 2.30% for all funds. The assumed rate of return was decreased to 5.25% for two of its pension funds, and to 6.25% for the three other pension funds and all the insurance funds associated with the systems.
2017 Actuarial Valuation Report

He admonished, "We need to use real numbers . . . We need to use actual data. We need to use true rates of return, and not hypothetical ones."
Huffingtonpost.com, 4/4/17, quote from Gov. Matt Bevin

"The most important function of our board is to give correct numbers to the legislature," Farris said. "If we don't do that, if we continue to rely on aggressively optimistic assumptions, then we will continue to fall behind.",
Kentucky.com, 5/20/17, quote from board chairman John Farris

"We're trying to make the assumptions more realistic and from an investment standpoint, more in line with structure and expectations of the portfolios," Mr. Eager said.
pionline.com, 7/14/17, quote from Interim Executive Director David Eager

[State Budget Director John] Chilton said that Gov. Matt Bevin and state lawmakers believe it is important to embrace the revised financial assumptions. "No more pretending that everything is just fine," he wrote. "Everyone needs to understand the severity of the situation. To do otherwise will lead to solutions that fall short of solving the problem." Kentucky.com, 9/9/17

Note a couple observations: (1) Down from 7.5% to 6.35% for some plans and 5.25% for others and (2) KY is roughly tied (with New Jersey) for the worst-funded pension system in the country (31.4% in 2016), yet they did the "more realistic" thing and lowered the return assumption from 7.5% to 6.25% and 5.25%.
*Notice the **positive statements** said: (1) "The most important function of our board is to give correct numbers to the legislature", (2) "We're trying to make the assumptions more realistic and from an investment standpoint, more in line with structure and expectations of the portfolios,"*

Appendix G: Press Clippings for Retirement Systems Lowering Return Assumptions

Arkansas

The trustees last week voted to reduce the system's projected annual investment returns from 7.25 percent to 6.25 percent at the recommendation of actuary Gabriel, Roeder, Smith & Co. of Southfield, Mich., . . . [Gail Stone, executive director for the judicial retirement system,] explained that "10-year capital market predictions from a basket of 8 different public fund investment consultants did not support a 7.25 [percent investment] return, given the AJRS fund's very conservative asset allocation."
Arkansasonline.com, 8/14/15

*Notice the **positive statement**: The executive director wanted the return assumption to be consistent with the "10-year capital market assumptions of a basket of 8 different public fund investment consultants."*

New York

New York State Common Retirement Fund, Albany, is lowering its assumed rate of return to 7% from 7.5%. "Lowering the assumed rate of return is fiscally prudent and will better position the state pension fund for the future. This strategic decision is consistent with the tougher investment climate ahead."
pionline.com, 9/9/15, quote from Thomas DiNapoli (State Comptroller and sole trustee)

*Notice the **positive statements**: (1) Lowering it is fiscally prudent, (2) Lowering the return assumption will put the state pension fund in a better position for the future."*

California Teachers

CalSTRS on Wednesday approved lowering the pension fund's assumed rate of return to 7% from 7.5% over the next two years because of diminished capital market and inflation forecasts. Milliman, the board's actuarial consultant, last month had recommended a reduction to 7.25%, but also offered the board the option of a 7% rate of return.
The plan approved by the board of the $196.4 billion California State Teachers' Retirement System would lower the rate of return to 7.25% as of July 1, and 7% as of July 1, 2018.
The vote for the more aggressive reduction came at a meeting in San Diego after a report from one of CalSTRS' investment consultants, Pension Consulting Alliance, that the pension fund had a less than 50% chance of meeting the 7.25% rate of return long term. "It's responsible," said board member Harry M. Keiley of the move to 7%. Mr. Keiley said it was necessary to ensure the long-term financial stability of the retirement system.
pionline.com, 2/4/17

"Going to 7.00% would be an acceptable alternative if the board wanted to add another level of conservatism in the actuarial assumptions by increasing the likelihood the investment assumption will be met long term," the report said.
calpensions.com, 1/28/17, quote from the Milliman actuarial experience study

Note a couple observations: (1) CalSTRS investment consultant said there was less than a 50% chance of meeting a 7.25% assumption and (2) The board's investment consultant directed attention to the probability of the compound average return over time reaching the assumption.
*Notice the **positive statements** the Board member made about this move: (1) "It's responsible." and (2) "It was necessary to ensure the long-term financial stability of the retirement system."*

Oregon

The Oregon Public Employees Retirement Fund's board lowered the assumed rate of return for the $73 billion pension fund to 7.2% from 7.5%, said James Sinks, spokesman for the Oregon State Treasury, in an email. Return projections for the next 10 years are lower than in the prior decade, according to a report presented at the pension fund's July 28 meeting.
pionline.com, 8/1/17

Appendix G: Press Clippings for Retirement Systems Lowering Return Assumptions

Article about Alaska that mentions California

The nation's largest public employee retirement system has just cut its long-term predictions of how much it expects to earn on its investments to 6.5 percent, raising a caution flag for Alaska, which still has expectations of 8 percent returns.

The assumed long-range investment returns are a key indicator of the financial health of the state retirement programs. Pick a number that is too high and the systems give a false image of financial strength. In addition, it could force a pattern of more aggressive and risky investments.

It is generally easier to get agreement on optimistic numbers, especially when budgets are tight. The difficulty is that you never really know what returns will be until the future becomes the past.

While other states have trimmed back their long-term earnings estimates since 2008, Alaska is still using 8 percent as its target, which is on the high end of pension systems in the United States.

"Some critics of current public pension investment return assumption levels say that current low interest rates and volatile investment markets require public pension funds to take on excessive investment risk to achieve their assumption," the National Association of State Retirement Administrators said in May.

But California Gov. Jerry Brown says the new plan is irresponsible because of the slow pace in lowering expectations, a claim that the California Public Employees Retirement System denies. A more rapid reduction in investment return projections would have increased the strain on local governments, it said. But Brown, expressing more caution than his state's retirement board, said the CalPERS plan is based on "unrealistic investment returns" and assumes an "unacceptable level of risk in the coming years."

Alaska Dispatch News, 12/9/15

Iowa

Iowa Public Employees' Retirement System, Des Moines, lowered its assumed rate of return to 7% from 7.5%, said a news release from the $28.5 billion pension fund.

Under the changes, the pension fund's funding ratio is expected to fall by roughly four basis points to 80% and liabilities are expected to increase by $1.4 billion.

The changes follow a review of economic assumptions from actuarial firm Cavanaugh Macdonald Consulting.

"Even though these changes will have a negative impact on IPERS' funded ratio, the investment board believes that these modifications will provide a more accurate valuation of future liabilities," IPERS said in the news release.

pionline.com, 3/28/17

*Notice the **positive statement** about the decision "Even though these changes will have a negative impact on IPERS' funded ratio, the investment board believes that these modifications will provide a more accurate valuation of future liabilities,"*

Maryland

"The action taken by the Board is part of its overall strategy to increase the probability of achieving investment returns required to improve the health of the retirement System and meet its obligations to its members," says State Treasurer Nancy K. Kopp, chair of the MSRPS Board of Trustees. "Recognizing that both the inflation experience and expectations for future inflation remain lower than the rate currently assumed, the Board felt it reasonable to reduce the expected return accordingly."

plansponsor.com, 8/2/17

*Notice those two **positive statements** about their changes.*

San Mateo County

San Mateo County Employees' Retirement Association, Redwood City, Calif., lowered its assumed rate of return to 7% from 7.25%.

"In the coming years, lowering the rate will add to the financial strength and stability of the retirement fund by mitigating the effects of future returns that are lower than current expectations."

SamCERA.org News, 7/6/16

Appendix G: Press Clippings for Retirement Systems Lowering Return Assumptions

North Carolina
"We need to make realistic assumptions regarding our ability to achieve expected returns in the future. We owe it to the General Assembly, taxpayers, public employees and future generations to be transparent and realistic about the true valuation of the pension plans," pionline.com, 5/1/18, State Treasurer Dale Folwell

Texas Teachers
Brian Guthrie, TRS executive director, told trustees the consensus among outside parties was that market returns will be significantly lower, and he stressed that "not taking action" to lower the assumed rate of return would not be prudent. Cypen & Cypen E-Newsletter, 8/16/18

Ohio Public Employees
"We are long-term investors, but investment returns over the next 10 to 15 years are very important to our plan," said Karen Carraher, executive director, in the news release. pionline.com, 10/22/18

Colorado
In the race for Colorado treasurer, Republican Brian Watson is in favor or raising the retirement age to at least to 67 — to match Social Security — as well as reducing or freezing cost-of-living adjustments and dropping Colorado PERA's assumed rate of return from 7.25% to something more "realistic," according to his campaign website. pionline.com, 10/30/18

Other Positive Statements about Lowering the Return Assumption
Harrisburg cannot take advantage of the Act 44 MMO reduction and does not set unrealistically high investment return assumptions which, Mr. McAneny said, has been a key factor in its success in managing its pension funds. Scranton Times-Tribune, 7/9/15
“If we do lower that assumed rate, that would certainly be a conservative approach. And one that I think would be reasonable,” he continued. “The stock market can’t stay up as high as it has forever. I think being a little more conservative would be prudent.” pension360.org, 7/24/15, quotes from Thomas DiNapoli
“But with the volatile market environment we have seen this year, and will likely see for the next several years, changing the assumed rate of return was a prudent decision," stated Chief Investment Officer Craig Husting [of Missouri’s school and teacher retirement systems]. psrs.peers.org 6/17/16
The $7.8 billion pension fund’s board approved the change at its June 16 meeting, Ms. Smith said, to “put the system on a path that reflects the current and expected low-return capital markets and to ensure adequate funding to pay future benefits.” pionline.com, 7/13/16, quote from Candy Smith, Spokeswoman for the Missouri State Employees’ RS
“This more conservative assumption will require additional state investments into the retirement systems, helping to ensure that available funds will be sufficient to pay the benefits that have been earned,” said a summary of the governor's proposed budget changes. pionline.com, 2/10/17, Michigan Gov. Rick Snyder

Appendix G: Press Clippings for Retirement Systems Lowering Return Assumptions

General
"The use of such high assumptions is deceptive because it keeps the funded level looking higher than it should be," said David Crane, public policy lecturer at Stanford University who worked as an adviser to former California Gov. Arnold Schwarzenegger. "Too high a return is dishonest." news.bna.com, 8/19/15
A lower rate of return can force issuers to face up to their funding commitments," said Tom Aaron, vice president with Moody's Investors Service. news.bna.com, 8/19/15
Lockhart also discussed the correlation between macroeconomic growth and pension funding. He recommended that public pension funds align their overall investment return assumptions with realistic assumptions related to macroeconomic momentum and trends. frbatlanta.org, 8/28/15, quote from Dennis Lockhart, President and CEO of Atlanta Federal Reserve Bank

Florida
Senate Appropriations Chairman Rob Bradley, a Clay County Republican, says he supports efforts to continue to lower the assumed rate, although it could impact the budgets of the various governments that rely on the fund. But he says a lower rate is more realistic given the fact that the pension investment returns may not be as robust if the economy declines in the long term. "It's always a concern when you create policies that require cash to be produced in a short period of time for governments that don't have a lot of cash," Bradley said in an interview with the Florida Phoenix. "That being said, what I do see is an economy that will inevitably cool off. "Therefore, at the end of the day, it doesn't bother me that we moved down the assumption rate a little bit because I think it's reasonable in light of what I think is ahead when I look at the overall health of the economy," he said. Floridapheonix.com, 11/06/19
As state analysts debated their pension recommendations last month, Ben Watkins, head of the state Division of Bond Finance, warned that the state's top-level credit ratings could be in jeopardy if the credit-rating agencies believe Florida's pension projections were built on unrealistic financial expectations. "What I see is this is that our credit rating is vulnerable because of the assumptions and the methodologies that we're using that are inconsistent with what they say are prudent and responsible approaches to funding the pension," Watkins said in support of adjusting the pension fund calculations. Floridapheonix.com, 11/06/19