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North Carolina Retirement Systems

Experience Study
for the
Five-Year Period from January 1, 2015 – December 31, 2019

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Agenda

- Discuss the Experience Review Process
- Review recommendations for:
  - Economic Assumptions
  - Demographic Assumptions
  - Funding Methods
  - Administrative Factors
- Review Cost Impact of Recommendations
- No Board decisions today
  - Boards to review today
  - Provide direction on additional analysis if needed
  - Board scheduled to adopt recommendations at the January Board meeting

The Actuarial Valuation Process

- Over the short term, employer contributions are determined by the annual actuarial valuation based on estimated benefits, expenses and investment return using Assumptions and Funding Methods recommended by the actuary and adopted by the Board through the Experience Review process
- Over the long term, employer contributions are adjusted to reflect actual benefits, expenses and investment return.

Inputs

Member Data
Asset Data
Benefit Provisions
Assumptions
Funding Methods

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Results

Actuarial Value of Assets
Actuarial Accrued Liability
Net Actuarial Gain or Loss
Funded Ratio
Benefit Enhancement
Additional Disclosures
Projections

Purpose of the Experience Study

- From GFOA Best Practice **Enhancing Reliability of Actuarial Valuations for Pension Plans:**
  - **Actuarial Experience Study.** While an actuarial gain/loss analysis helps provide a better understanding of a plan's assumed and actual experience during the year, this timeframe is not long enough to identify trends. An actuarial experience study reviews the differences between a plan's assumed and actual experience over multiple years (typically 3 to 5), with the goal of examining the trends related to actual experience and recommending changes to assumptions, if needed.
- The assumptions and funding methodology of the North Carolina Retirement Systems are reviewed every five years and documented in the Experience Study.
  - The last experience study was reviewed and adopted in January 2016 and first used in the December 31, 2015 valuations.
  - The results of this experience study will be used for the December 31, 2020 through 2024 actuarial valuations.

Experience Study Process

- Based on five-year period from January 1, 2015 – December 31, 2019
  - Compare Experience ("Actual") with Assumptions ("Expected")
  - Consider trends observed during the previous Experience Study
- Make Judgments About Future Trends:
  - Plan-Specific Experience vs. National Trends
  - Long-Term vs. Short-Term Factors
- Recommend changes in assumptions and funding methodology as needed based on Actuarial Standards of Practice
  - ASOP 4 - Measuring Pension Obligations and Determining Pension Plan Costs or Contributions
  - ASOP 27 - Selection of Economic Assumptions for Measuring Pension Obligations
  - ASOP 35 – Selection of Demographic and Other Noneconomic Assumptions for Measuring Pension Obligations
  - ASOP 44 - Selection and Use of Asset Valuation Methods for Pension Valuations
- Implement effective with the December 31, 2020 Actuarial Valuation, which determines contribution rates effective July 1, 2022
- Next Experience Review is scheduled to be implemented effective with the December 31, 2025 Actuarial Valuation.

Demographic Assumptions

- Post-retirement mortality rates
- Active mortality
- Mortality improvement
- Service retirement
- Disability retirement
- Termination from active employment

Demographic Assumptions are assumptions related to people. They tend to be established based on behavior of the members of the retirement system.

Demographic assumptions are set based on ASOP 35 and tend to involve a review of census information over the experience review period.

Economic Assumptions

- Investment return
- Inflation
- Individual pay increases
- Productivity growth

Economic Assumptions are assumptions related to money. They tend to be subject to control outside of the control of stakeholders and driven by external factors.

Economic Assumptions are set based on ASOP 27. They tend to be based on the future economic environment.

Funding Methodology

- Amortization method
- Actuarial cost method
- Asset valuation method
- Administrative expenses
- Employer contribution direct rate smoothing
- Employer contribution stabilization policies

Once the assumptions are determined, the next step is to systematically fund the benefits expected to be paid.

The components of the Funding Methodology determine how benefits are systematically funded.

Administrative

- Assumptions used for DC transfer benefit
- Assumptions used for withdrawal liability
- CBBC cap factor
- COLA assumption used in service purchases
- Mortality and interest used for optional forms

While not intuitive, these items are reviewed during the experience review. They tend to be based on the recommendations made for the actuarial valuations, with some adjustments.

Key Takeaways

Teachers' and State Employees' Retirement System

Valuation Component Reviewed	Observation	Recommendation	Financial Impact
Demographic Assumptions			
1 Post-Retirement Mortality Rates	Fewer deaths	Decrease rates	Slight increase
2 Active Mortality	Limited exposures	Decrease rates	Slight increase
3 Mortality improvement	SOA projects lower improvement	Update from MP-2015 to MP-2019	Decrease
4 Service retirement	Fewer retirements	Decrease rates	Slight decrease
5 Disability retirement	Limited exposures	Decrease rates	Immaterial
6 Termination from active employment	More terminations	Increase rates	Slight decrease
Economic Assumptions			
7 Investment return	Lower projected returns	Reduce 0.50% (Alt 1)/ 0.25% (Alt 2)	Increase
8 Inflation	SSA predicts lower	Lower by 0.50%	Slight increase
9 Individual pay increases	Mixed increases	Adjust closer to experience	Slight increase
10 Productivity growth	Decrease not as much as inflation	Increase by 0.25%	Slight increase
Funding Method			
11 Amortization Method	Current method reasonable	No change	No change
12 Actuarial Cost method	Current method reasonable	Refine method - see below	Decrease
13 Asset valuation method	Current method reasonable	No change	No change
14 Administrative expenses	Expenses lower than assumed	Keep at 0.10% of payroll	No change

Notes:

1. The Pub-2010 Public Retirement Plans Mortality Tables published by the Society of Actuaries in January 2019 provided a closer fit than the previous table which were based on corproate plan expereince, resulting in less modifications.

3. For the fifth consecutive year, the SOA has reduced its projection of mortality improvement, resultings in lower liabilities.

7. Lower investment returns are the largest single source of liability and cost increases

12. The load on normal cost to account for new entrants was increased.

12. The method for calculating terminated vested liability was refined, resulting in a large liability reduction.

Financial Impact

Teachers' and State Employees' Retirement System

Had the proposed assumptions and methods been reflected for the December 31, 2019 Actuarial Valuation, the financial impact would have been as follows:

- The AAL would increase by 2.9% from $84.87 billion to $87.32 billion under Alternative 1; under Alternative 2, it would increase by 0.1% to $84.94 billion.
- The ADEC would increase by 3.01% of payroll from 15.74% to 18.75% under Alternative 1; under Alternative 2, it would increase by 0.63% of payroll to 16.37%.
- The Employer Contribution would increase by 0.60% of payroll from 15.74% to 16.34% under Alternative 1; under Alternative 2 it would increase by 0.13% of payroll to 15.87%.

	Current Valuation	Reflect Alternative 1 Economic Assumptions	Reflect Demographic Assumptions	Reflect Funding Method	Alternative 1 w/ Five-year Direct Rate Smoothing	Alternative 2 w/ Five-year Direct Rate Smoothing
Employer Contribution						
Employer Normal Cost	5.16%	6.49%	5.96%	6.40%	6.40%	5.78%
Payment for UAAL	10.58%	13.96%	13.62%	12.35%	12.35%	10.59%
Preliminary ADEC*	15.74%	20.45%	19.58%	18.75%	18.75%	16.37%
Impact of Direct Rate Smoothing	0.00%	0.00%	0.00%	0.00%	-2.41%	-0.50%
Impact of Rate Stabilization Policy	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Employer Contribution	15.74%	20.45%	19.58%	18.75%	16.34%	15.87%
Cumulative Δ in Employer Contribution		4.71%	3.84%	3.01%	0.60%	0.13%
Actuarial Accrued Liability (AAL)	$ 84,873,315,272	$ 89,361,980,053	$ 88,935,609,166	$ 87,319,940,006	$ 87,319,940,006	$ 84,941,027,914
Actuarial Value of Assets (AVA)	73,353,759,963	73,353,759,963	73,353,759,963	73,353,759,963	73,353,759,963	73,353,759,963
Unfunded Accrued Liability (UAAL)	11,519,555,309	16,008,220,090	15,581,849,203	13,966,180,043	13,966,180,043	11,587,267,951
Funded Ratio (AVA / AAL)	86.4%	82.1%	82.5%	84.0%	84.0%	86.4%
Cumulative Δ in UAAL		$ 4,488,664,781	$ 4,062,293,894	$ 2,446,624,734	$ 2,446,624,734	$ 67,712,642

* Actuarially Determined Employer Contribution. Note that the employer normal cost includes administrative expenses.

Key Takeaways

Consolidated Judicial Retirement System

	Valuation Component Reviewed	Observation	Recommendation	Financial Impact
Demographic Assumptions				
1	Post-Retirement Mortality Rates	Fewer deaths	Decrease rates	Slight increase
2	Active Mortality	Limited exposures	Decrease rates	Slight increase
3	Mortality improvement	SOA projects lower improvement	Update from MP-2015 to MP-2019	Decrease
4	Service retirement	Fewer retirements	Decrease rates	Slight decrease
5	Disability retirement	Fewer disabilities	Decrease rates	Immaterial
6	Termination from active employment	More terminations	Increase rates	Slight decrease
Economic Assumptions				
7	Investment return	Lower projected returns	Reduce 0.50% (Alt 1)/ 0.25% (Alt 2)	Increase
8	Inflation	SSA predicts lower	Lower by 0.50%	Slight increase
9	Individual pay increases	Lower Increases	Decrease rates	Slight increase
10	Productivity growth	Decrease not as much as inflation	Increase by 0.25%	Slight increase
Funding Method				
11	Amortization Method	Current method reasonable	No change	No change
12	Actuarial Cost method	Current method reasonable	Refine method - see below	Increase
13	Asset valuation method	Current method reasonable	No change	No change
14	Administrative expenses	Expenses lower than assumed	Reduce to 0.05% of payroll	Slight decrease

Notes:

1. The Pub-2010 Public Retirement Plans Mortality Tables published by the Society of Actuaries in January 2019 provided a closer fit than the previous table which were based on corproate plan expereince, resulting in less modifications.

3. For the fifth consecutive year, the SOA has reduced its projection of mortality improvement, resultings in lower liabilities.

7. Lower investment returns are the largest single source of liability and cost increases

12. The load on normal cost to account for new entrants was increased.

12. Revised for eligibility service which increased AAL and reduced normal cost.

Financial Impact

Consolidated Judicial Retirement System

Had the proposed assumptions and methods been reflected for the December 31, 2019 Actuarial Valuation, the financial impact would have been as follows:

- The AAL would increase by 6.6% from $725.45 million to $773.26 million under Alternative 1; under Alternative 2, it would increase by 4.0% to $754.7 million.
- The ADEC would increase by 3.03% of payroll from 38.70% to 41.73% under Alternative 1; under Alternative 2, it would decrease by 0.68% of payroll to 38.02%.
- The Employer Contribution would increase by 0.61% of payroll from 38.70% to 39.31% under Alternative 1; under Alternative 2 it would decrease by 0.68% of payroll to 38.02%.

	Current Valuation	Reflect Alternative 1 Economic Assumptions	Reflect Demographic Assumptions	Reflect Funding Method	Alternative 1 w/ Five-year Direct Rate Smoothing	Alternative 2 w/ Five-year Direct Rate Smoothing
Employer Contribution						
Employer Normal Cost	17.59%	18.17%	12.60%	13.16%	13.16%	12.18%
Payment for UAAL	21.11%	25.80%	28.57%	28.57%	28.57%	25.84%
Preliminary ADEC*	38.70%	43.97%	41.17%	41.73%	41.73%	38.02%
Impact of Direct Rate Smoothing	0.00%	0.00%	0.00%	0.00%	-2.42%	0.00%
Impact of Rate Stabilization Policy	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Employer Contribution	38.70%	43.97%	41.17%	41.73%	39.31%	38.02%
Cumulative Δ in Employer Contribution		5.27%	2.47%	3.03%	0.61%	-0.68%
Actuarial Accrued Liability (AAL)	$ 725,452,544	$ 756,085,704	$ 773,258,310	$ 773,258,310	$ 773,258,310	$ 754,695,935
Actuarial Value of Assets (AVA)	621,547,192	621,547,192	621,547,192	621,547,192	621,547,192	621,547,192
Unfunded Accrued Liability (UAAL)	103,905,352	134,538,512	151,711,118	151,711,118	151,711,118	133,148,743
Funded Ratio (AVA / AAL)	85.7%	82.2%	80.4%	80.4%	80.4%	82.4%
Cumulative Δ in UAAL		$ 30,633,160	$ 47,805,766	$ 47,805,766	$ 47,805,766	$ 29,243,391

* Actuarially Determined Employer Contribution. Note that the employer normal cost includes administrative expenses.

Key Takeaways

Legislative Retirement System

Valuation Component Reviewed	Observation	Recommendation	Financial Impact
Demographic Assumptions			
1 Post-Retirement Mortality Rates	Fewer deaths	Decrease rates	Slight increase
2 Active Mortality	Limited exposures	Decrease rates	Slight increase
3 Mortality improvement	SOA projects lower improvement	Update from MP-2015 to MP-2019	Decrease
4 Service retirement	Fewer retirements	Decrease rates	Slight decrease
5 Disability retirement	Fewer disabilities	Decrease rates	Immaterial
6 Termination from active employment	More terminations	Increase rates	Slight decrease
Economic Assumptions			
7 Investment return	Lower projected returns	Reduce 0.50% (Alt 1)/ 0.25% (Alt 2)	Increase
8 Inflation	SSA predicts lower	Lower by 0.50%	Slight increase
9 Individual pay increases	Lower Increases	Increase rates	Slight increase
10 Productivity growth	Decrease not as much as inflation	Increase by 0.25%	Slight increase
Funding Method			
11 Amortization Method	Current method reasonable	No change	No change
12 Actuarial Cost method	Current method reasonable	Refine method - see below	Increase
13 Asset valuation method	Current method reasonable	No change	No change
14 Administrative expenses	Expenses lower than assumed	No change	No change

Notes:

1. The Pub-2010 Public Retirement Plans Mortality Tables published by the Society of Actuaries in January 2019 provided a closer fit than the previous table which were based on corproate plan expereince, resulting in less modifications.
3. For the fifth consecutive year, the SOA has reduced its projection of mortality improvement, resultings in lower liabilities.
7. Lower investment returns are the largest single source of liability and cost increases
12. The load on normal cost to account for new entrants was increased.

Financial Impact

Legislative Retirement System

Had the proposed assumptions and methods been reflected for the December 31, 2019 Actuarial Valuation, the financial impact would have been as follows:

- The AAL would decrease by 0.4% from $30.27 million to $30.14 million under Alternative 1; under Alternative 2, it would decrease by 2.6% to $29.5 million..
- The ADEC would decrease by 2.98% of payroll from 27.15% to 24.17% under Alternative 1; under Alternative 2, it would decrease by 3.77% of payroll to 23.38%.
- The Employer Contribution would decrease by 2.98% of payroll from 27.15% to 24.17% under Alternative 1; under Alternative 2 it would decrease by 3.77% of payroll to 23.38%.

	Current Valuation	Reflect Alternative 1 Economic Assumptions	Reflect Demographic Assumptions	Reflect Funding Method	Alternative 1 w/ Five-year Direct Rate Smoothing	Alternative 2 w/ Five-year Direct Rate Smoothing
Employer Contribution						
Employer Normal Cost	19.77%	17.86%	15.95%	17.35%	17.35%	16.49%
Payment for UAAL	7.38%	9.91%	6.82%	6.82%	6.82%	6.89%
Preliminary ADEC*	27.15%	27.77%	22.77%	24.17%	24.17%	23.38%
Impact of Direct Rate Smoothing	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Impact of Rate Stabilization Policy	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Employer Contribution	27.15%	27.77%	22.77%	24.17%	24.17%	23.38%
Cumulative Δ in Employer Contribution		0.62%	-4.38%	-2.98%	-2.98%	-3.77%
Actuarial Accrued Liability (AAL)	$ 30,269,003	$ 31,066,842	$ 30,136,751	$ 30,136,751	$ 30,136,751	$ 29,495,518
Actuarial Value of Assets (AVA)	28,028,978	28,028,978	28,028,978	28,028,978	28,028,978	28,028,978
Unfunded Accrued Liability (UAAL)	2,240,025	3,037,864	2,107,773	2,107,773	2,107,773	1,466,540
Funded Ratio (AVA / AAL)	92.6%	90.2%	93.0%	93.0%	93.0%	95.0%
Cumulative Δ in UAAL		$ 797,839	$ (132,252)	$ (132,252)	$ (132,252)	$ (773,485)

* Actuarially Determined Employer Contribution. Note that the employer normal cost includes administrative expenses.

Key Takeaways

National Guard Pension Fund

	Valuation Component Reviewed	Observation	Recommendation	Financial Impact
Demographic Assumptions				
1	Post-Retirement Mortality Rates	More deaths	Increase rates	Slight decrease
2	Active Mortality	Limited exposures	Decrease rates	Slight increase
3	Mortality improvement	SOA projects lower improvement	Update from MP-2015 to MP-2019	Decrease
4	Service retirement	More retirements	Increase rates	Slight increase
5	Disability retirement	N/A	Decrease rates	Immaterial
6	Termination from active employment	More terminations	Increase rates	Slight decrease
Economic Assumptions				
7	Investment return	Lower projected returns	Reduce 0.50% (Alt 1)/ 0.25% (Alt 2)	Increase
8	Inflation	SSA predicts lower	Lower by 0.50%	Slight increase
9	Individual pay increases	Not applicable	Not applicable	Not applicable
10	Productivity growth	Decrease not as much as inflation	Increase by 0.25%	Not applicable
Funding Method				
11	Amortization Method	Current method reasonable	No change	No change
12	Actuarial Cost method	Current method reasonable	Refine method - see below	Increase
13	Asset valuation method	Current method reasonable	No change	No change
14	Administrative expenses	Expenses volatile	Assume $150,000 per year	Immaterial

Notes:

1. The Pub-2010 Public Retirement Plans Mortality Tables published by the Society of Actuaries in January 2019 provided a closer fit than the previous table which were based on corproate plan expereince, resulting in less modifications.
3. For the fifth consecutive year, the SOA has reduced its projection of mortality improvement, resultings in lower liabilities.
7. Lower investment returns are the largest single source of liability and cost increases
12. The normal cost was increased by $725,000 to account for new hires with less than 7 years of service.

Financial Impact

National Guard Pension Fund

Had the proposed assumptions and methods been reflected for the December 31, 2019 Actuarial Valuation, the financial impact would have been as follows:

- The AAL would increase by 3.4% from $161.8 million to $167.24 million under Alternative 1; under Alternative 2, it would increase by 0.5% to $162.58 million.
- The ADEC would increase by $1,498,074 from $6,382,278 to $7,880,352 under Alternative 1; under Alternative 2, it would increase by $176,633 to $6,558,911.
- The Employer Contribution would remain unchanged at $11,031,715 under Alternative 1; under Alternative 2 it would remain unchanged at $11,031,715.

	Current Valuation	Reflect Alternative 1 Economic Assumptions	Reflect Demographic Assumptions	Reflect Funding Method	Alternative 1 w/ Five-year Direct Rate Smoothing	Alternative 2 w/ Five-year Direct Rate Smoothing
Employer Contribution						
Employer Normal Cost	329,704	388,825	321,745	1,149,734	1,149,734	1,124,904
Payment for UAAL	$ 6,052,574	$ 7,260,973	$ 6,730,608	$ 6,730,618	$ 6,730,618	$ 5,434,007
Preliminary ADEC*	6,382,278	7,649,798	7,052,353	7,880,352	7,880,352	6,558,911
Impact of Direct Rate Smoothing	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0
Impact of Rate Stabilization Policy	4,649,437	3,381,917	3,979,362	3,151,363	3,151,363	4,472,804
Employer Contribution	$ 11,031,715	$ 11,031,715	$ 11,031,715	$ 11,031,715	$ 11,031,715	$ 11,031,715
Cumulative Δ in Employer Contribution		$ 0	$ 0	$ 0	$ 0	$ 0
Actuarial Accrued Liability (AAL)	$ 161,797,526	$ 171,305,597	$ 166,092,709	$ 167,242,623	$ 167,242,623	$ 162,583,545
Actuarial Value of Assets (AVA)	142,486,044	142,486,044	142,486,044	142,486,044	142,486,044	142,486,044
Unfunded Accrued Liability (UAAL)	19,311,482	28,819,553	23,606,665	24,756,579	24,756,579	20,097,501
Funded Ratio (AVA / AAL)	88.1%	83.2%	85.8%	85.2%	85.2%	87.6%
Cumulative Δ in UAAL		$ 9,508,071	$ 4,295,183	$ 5,445,097	$ 5,445,097	$ 786,019

* Actuarially Determined Employer Contribution. Note that the employer normal cost includes administrative expenses.
Direct rate smoothing is not applicable due to Rate Stabilization Policy.

Key Takeaways

Disability Income Plan

Valuation Component Reviewed	Observation	Recommendation	Financial Impact
Demographic Assumptions			
1 Post-Retirement Mortality Rates	Fewer deaths	Decrease rates	Slight increase
2 Active Mortality	Limited exposures	Decrease rates	Slight increase
3 Mortality improvement	SOA projects lower improvement	Update from MP-2015 to MP-2019	Decrease
4 Service retirement	Fewer retirements	Decrease rates	Slight decrease
5 Disability retirement	Fewer disabilities	Decrease rates	Immaterial
6 Termination from active employment	More terminations	Increase rates	Slight decrease
Economic Assumptions			
7 Investment return	Lower projected returns	Reduce 0.75% (Alt 1)/ 0.50% (Alt 2)	Increase
8 Inflation	SSA predicts lower	Lower by 0.50%	Slight increase
9 Individual pay increases	Mixed increases	Adjust closer to experience	Slight increase
10 Productivity growth	Decrease not as much as inflation	Increase by 0.25%	Slight increase
Funding Method			
11 Amortization Method	Current method reasonable	No change	No change
12 Actuarial Cost method	Current method reasonable	Refine method - see below	Increase
13 Asset valuation method	Current method reasonable	No change	No change
14 Administrative expenses	Current assumption reasonable	No change	No change

Notes:

1. The Pub-2010 Public Retirement Plans Mortality Tables published by the Society of Actuaries in January 2019 provided a closer fit than the previous table which were based on corproate plan expereince, resulting in less modifications.
3. For the fifth consecutive year, the SOA has reduced its projection of mortality improvement, resultings in lower liabilities.
7. Lower investment returns are the largest single source of liability and cost increases
12. The load on normal cost to account for new entrants was increased.

Financial Impact

Disability Income Plan

Had the proposed assumptions and methods been reflected for the December 31, 2019 Actuarial Valuation, the financial impact would have been as follows:

- The AAL would decrease by 0.1% from $326.43 million to $326.08 million under Alternative 1; under Alternative 2, it would decrease by 0.6% to $324.31 million..
- The ADEC would increase by 0.02% of payroll from 0.09% to 0.11% under Alternative 1; under Alternative 2, it would increase by 0.02% of payroll to 0.11%.
- The Employer Contribution would remain unchanged at 0.09% under Alternative 1; under Alternative 2 it would remain unchanged at 0.09%.

	Current Valuation	Reflect Alternative 1 Economic Assumptions	Reflect Demographic Assumptions	Reflect Funding Method	Alternative 1 w/ Five-year Direct Rate Smoothing	Alternative 2 w/ Five-year Direct Rate Smoothing
Employer Contribution						
Employer Normal Cost	0.09%	0.10%	0.11%	0.11%	0.11%	0.11%
Payment for UAAL	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Preliminary ADEC*	0.09%	0.10%	0.11%	0.11%	0.11%	0.11%
Impact of Direct Rate Smoothing	0.00%	0.00%	0.00%	0.00%	-0.02%	-0.02%
Impact of Rate Stabilization Policy	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Employer Contribution	0.09%	0.10%	0.11%	0.11%	0.09%	0.09%
Cumulative Δ in Employer Contribution		0.01%	0.02%	0.02%	0.00%	0.00%
Actuarial Accrued Liability (AAL)	$ 326,431,066	$ 330,991,993	$ 326,079,778	$ 326,079,778	$ 326,079,778	$ 324,311,575
Actuarial Value of Assets (AVA)	361,335,426	361,335,426	361,335,426	361,335,426	361,335,426	361,335,426
Unfunded Accrued Liability (UAAL)	(34,904,360)	(30,343,433)	(35,255,648)	(35,255,648)	(35,255,648)	(37,023,851)
Funded Ratio (AVA / AAL)	110.7%	109.2%	110.8%	110.8%	110.8%	111.4%
Cumulative Δ in UAAL		$ 4,560,927	$ (351,288)	$ (351,288)	$ (351,288)	$ (2,119,491)

* Actuarially Determined Employer Contribution. Note that the employer normal cost includes administrative expenses.

Key Takeaways

Fire and Rescue Squad Workers Pension Fund

	Valuation Component Reviewed	Observation	Recommendation	Financial Impact
Demographic Assumptions				
1	Post-Retirement Mortality Rates	More deaths	Increase rates	Slight decrease
2	Active Mortality	Limited exposures	Decrease rates	Slight increase
3	Mortality improvement	SOA projects lower improvement	Update from MP-2015 to MP-2019	Decrease
4	Service retirement	Fewer retirements	Decrease rates	Slight decrease
5	Disability retirement	Small group	Decrease rates	Immaterial
6	Termination from active employment	Fewer terminations	Decrease rates	Slight increase
Economic Assumptions				
7	Investment return	Lower projected returns	Reduce 0.50% (Alt 1)/ 0.25% (Alt 2)	Increase
8	Inflation	SSA predicts lower	Lower by 0.50%	Slight increase
9	Individual pay increases	Not applicable	Not applicable	Not applicable
10	Productivity growth	Decrease not as much as inflation	Increase by 0.25%	Not applicable
Funding Method				
11	Amortization Method	Current method reasonable	No change	No change
12	Actuarial Cost method	Current method reasonable	Refine method - see below	Increase
13	Asset valuation method	Current method reasonable	No change	No change
14	Administrative expenses	Expenses somewhat consistent	no change	No change

Notes:

1. The Pub-2010 Public Retirement Plans Mortality Tables published by the Society of Actuaries in January 2019 provided a closer fit than the previous table which were based on corproate plan expereince, resulting in less modifications.
3. For the fifth consecutive year, the SOA has reduced its projection of mortality improvement, resultings in lower liabilities.
7. Lower investment returns are the largest single source of liability and cost increases
12. The load on normal cost to account for new entrants was increased.

Financial Impact

Fire and Rescue Squad Workers Pension Fund

Had the proposed assumptions and methods been reflected for the December 31, 2019 Actuarial Valuation, the financial impact would have been as follows:

- The AAL would increase by 1.7% from $482.82 million to $490.81 million under Alternative 1; under Alternative 2, it would decrease by 1.2% to $476.87 million..
- The ADEC would increase by $960,533 from $15,182,523 to $16,143,056 under Alternative 1; under Alternative 2, it would decrease by $1,335,686 to $13,846,837.
- The Employer Contribution would remain unchanged at $19,352,208 under Alternative 1; under Alternative 2 it would remain unchanged at $19,352,208.

	Current Valuation	Reflect Alternative 1 Economic Assumptions	Reflect Demographic Assumptions	Reflect Funding Method	Alternative 1 w/ Five-year Direct Rate Smoothing	Alternative 2 w/ Five-year Direct Rate Smoothing
Employer Contribution						
Employer Normal Cost	5,899,243	6,891,433	5,842,163	5,842,163	5,842,163	5,365,284
Payment for UAAL	$ 9,283,280	$ 12,990,298	$ 10,300,893	$ 10,300,893	$ 10,300,893	$ 8,481,553
Preliminary ADEC*	15,182,523	19,881,731	16,143,056	16,143,056	16,143,056	13,846,837
Impact of Direct Rate Smoothing	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0
Impact of Rate Stabilization Policy	4,169,685	(529,523)	3,209,152	3,209,152	3,209,152	5,505,371
Employer Contribution	$ 19,352,208	$ 19,352,208	$ 19,352,208	$ 19,352,208	$ 19,352,208	$ 19,352,208
Cumulative Δ in Employer Contribution		$ 0	$ 0	$ 0	$ 0	$ 0
Actuarial Accrued Liability (AAL)	$ 482,816,865	$ 511,409,026	$ 490,805,882	$ 490,805,882	$ 490,805,882	$ 476,866,566
Actuarial Value of Assets (AVA)	445,876,956	445,876,956	445,876,956	445,876,956	445,876,956	445,876,956
Unfunded Accrued Liability (UAAL)	36,939,909	65,532,070	44,928,926	44,928,926	44,928,926	30,989,610
Funded Ratio (AVA / AAL)	92.3%	87.2%	90.8%	90.8%	90.8%	93.5%
Cumulative Δ in UAAL		$ 28,592,161	$ 7,989,017	$ 7,989,017	$ 7,989,017	$ (5,950,299)

* Actuarially Determined Employer Contribution. Note that the employer normal cost includes administrative expenses.
Direct rate smoothing is not applicable due to Rate Stabilization Policy.

Key Takeaways

Local Governmental Employees Retirement System - General Employees and Firefighters

Valuation Component Reviewed	Observation	Recommendation	Financial Impact
Demographic Assumptions			
1 Post-Retirement Mortality Rates	Fewer deaths	Decrease rates	Slight increase
2 Active Mortality	Limited exposures	Decrease rates	Slight increase
3 Mortality improvement	SOA projects lower improvement	Update from MP-2015 to MP-2019	Decrease
4 Service retirement	Fewer retirements	Decrease rates	Slight decrease
5 Disability retirement	Fewer disabilities	Decrease rates	Immaterial
6 Termination from active employment	More terminations	Increase rates	Slight decrease
Economic Assumptions			
7 Investment return	Lower projected returns	Reduce 0.50% (Alt 1)/ 0.25% (Alt 2)	Increase
8 Inflation	SSA predicts lower	Lower by 0.50%	Slight increase
9 Individual pay increases	Higher Increases	Increase rates	Slight increase
10 Productivity growth	Decrease not as much as inflation	Increase by 0.25%	Slight increase
Funding Method			
11 Amortization Method	Current method reasonable	No change	No change
12 Actuarial Cost method	Current method reasonable	Refine method - see below	Decrease
13 Asset valuation method	Current method reasonable	No change	No change
14 Administrative expenses	Expenses lower than assumed	Decrease to 0.13% of payroll	Slight decrease

Notes:

1. The Pub-2010 Public Retirement Plans Mortality Tables published by the Society of Actuaries in January 2019 provided a closer fit than the previous table which were based on corproate plan expereince, resulting in less modifications.
3. For the fifth consecutive year, the SOA has reduced its projection of mortality improvement, resultings in lower liabilities.
7. Lower investment returns are the largest single source of liability and cost increases
12. The load on normal cost to account for new entrants was increased.
12. The method for calculating terminated vested liability was refined, resulting in a large liability reduction.

Financial Impact

Local Governmental Employees Retirement System - General Employees and Firefighters

Had the proposed assumptions and methods been reflected for the December 31, 2019 Actuarial Valuation, the financial impact would have been as follows:

- The AAL would increase by 3.8% from $30.7 billion to $31.85 billion under Alternative 1; under Alternative 2, it would increase by 0.8% to $30.94 billion.
- The ADEC would increase by 3.21% of payroll from 11.27% to 14.48% under Alternative 1; under Alternative 2, it would increase by 0.53% of payroll to 11.80%.
- The Employer Contribution would increase by 0.63% of payroll from 11.35% to 11.98% under Alternative 1; under Alternative 2 it would increase by 0.09% of payroll to 11.44%.

	Current Valuation	Reflect Alternative 1 Economic Assumptions	Reflect Demographic Assumptions	Reflect Funding Method	Alternative 1 w/ Five-year Direct Rate Smoothing	Alternative 2 w/ Five-year Direct Rate Smoothing
Employer Contribution						
Employer Normal Cost	5.44%	6.78%	6.15%	6.58%	6.58%	5.97%
Payment for UAAL	5.83%	9.25%	9.09%	7.90%	7.90%	5.83%
Preliminary ADEC*	11.27%	16.03%	15.24%	14.48%	14.48%	11.80%
Impact of Direct Rate Smoothing	0.08%	0.00%	0.00%	0.00%	-2.50%	-0.36%
Impact of Rate Stabilization Policy	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Employer Contribution	11.35%	16.03%	15.24%	14.48%	11.98%	11.44%
Cumulative Δ in Employer Contribution		4.68%	3.89%	3.13%	0.63%	0.09%
Actuarial Accrued Liability (AAL)	$ 30,700,921,303	$ 32,580,352,904	$ 32,495,359,213	$ 31,853,585,336	$ 31,853,585,336	$ 30,939,433,947
Actuarial Value of Assets (AVA)	27,435,046,235	27,435,046,235	27,435,046,235	27,435,046,235	27,435,046,235	27,435,046,235
Unfunded Accrued Liability (UAAL)	3,265,875,068	5,145,306,669	5,060,312,978	4,418,539,101	4,418,539,101	3,504,387,712
Funded Ratio (AVA / AAL)	89.4%	84.2%	84.4%	86.1%	86.1%	88.7%
Cumulative Δ in UAAL		$ 1,879,431,601	$ 1,794,437,910	$ 1,152,664,033	$ 1,152,664,033	$ 238,512,644

* Actuarially Determined Employer Contribution. Note that the employer normal cost includes administrative expenses.
Note that the AAL and AVA above is for all of LGERS.

Key Takeaways

Local Governmental Employees Retirement System - Law Enforcement Officers

Valuation Component Reviewed	Observation	Recommendation	Financial Impact
Demographic Assumptions			
1 Post-Retirement Mortality Rates	More deaths	Increase rates	Slight decrease
2 Active Mortality	Limited exposures	Decrease rates	Slight increase
3 Mortality improvement	SOA projects lower improvement	Update from MP-2015 to MP-2019	Decrease
4 Service retirement	More retirements	Increase rates	Slight increase
5 Disability retirement	Fewer disabilities	Decrease rates	Immaterial
6 Termination from active employment	More terminations	Increase rates	Slight decrease
Economic Assumptions			
7 Investment return	Lower projected returns	Reduce 0.50% (Alt 1)/ 0.25% (Alt 2)	Increase
8 Inflation	SSA predicts lower	Lower by 0.50%	Slight increase
9 Individual pay increases	Higher Increases	Increase rates	Slight increase
10 Productivity growth	Decrease not as much as inflation	Increase by 0.25%	Slight increase
Funding Method			
11 Amortization Method	Current method reasonable	No change	No change
12 Actuarial Cost method	Current method reasonable	Refine method - see below	Decrease
13 Asset valuation method	Current method reasonable	No change	No change
14 Administrative expenses	Expenses lower than assumed	Keep at zero.	No change

Notes:

1. The Pub-2010 Public Retirement Plans Mortality Tables published by the Society of Actuaries in January 2019 provided a closer fit than the previous table which were based on corproate plan expereince, resulting in less modifications.
3. For the fifth consecutive year, the SOA has reduced its projection of mortality improvement, resultings in lower liabilities.
7. Lower investment returns are the largest single source of liability and cost increases
12. The load on normal cost to account for new entrants was increased.
12. The method for calculating terminated vested liability was refined, resulting in a large liability reduction.

Financial Impact

Local Governmental Employees Retirement System - Law Enforcement Officers

Had the proposed assumptions and methods been reflected for the December 31, 2019 Actuarial Valuation, the financial impact would have been as follows:

- The AAL would increase by 3.8% from $30.7 billion to $31.85 billion under Alternative 1; under Alternative 2, it would increase by 0.8% to $30.94 billion.
- The ADEC would increase by 3.99% of payroll from 12.94% to 16.93% under Alternative 1; under Alternative 2, it would increase by 1.09% of payroll to 14.03%.
- The Employer Contribution would increase by 0.97% of payroll from 12.10% to 13.07% under Alternative 1; under Alternative 2 it would increase by 0.39% of payroll to 12.49%.

	Current Valuation	Reflect Alternative 1 Economic Assumptions	Reflect Demographic Assumptions	Reflect Funding Method	Alternative 1 w/ Five-year Direct Rate Smoothing	Alternative 2 w/ Five-year Direct Rate Smoothing
Employer Contribution						
Employer Normal Cost	7.11%	8.84%	8.60%	9.03%	9.03%	8.20%
Payment for UAAL	5.83%	9.25%	9.09%	7.90%	7.90%	5.83%
Preliminary ADEC*	12.94%	18.09%	17.69%	16.93%	16.93%	14.03%
Impact of Direct Rate Smoothing	-0.84%	0.00%	0.00%	0.00%	-3.86%	-1.54%
Impact of Rate Stabilization Policy	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Employer Contribution	12.10%	18.09%	17.69%	16.93%	13.07%	12.49%
Cumulative Δ in Employer Contribution		5.99%	5.59%	4.83%	0.97%	0.39%
Actuarial Accrued Liability (AAL)	$ 30,700,921,303	$ 32,580,352,904	$ 32,495,359,213	$ 31,853,585,336	$ 31,853,585,336	$ 30,939,433,947
Actuarial Value of Assets (AVA)	27,435,046,235	27,435,046,235	27,435,046,235	27,435,046,235	27,435,046,235	27,435,046,235
Unfunded Accrued Liability (UAAL)	3,265,875,068	5,145,306,669	5,060,312,978	4,418,539,101	4,418,539,101	3,504,387,712
Funded Ratio (AVA / AAL)	89.4%	84.2%	84.4%	86.1%	86.1%	88.7%
Cumulative Δ in UAAL		$ 1,879,431,601	$ 1,794,437,910	$ 1,152,664,033	$ 1,152,664,033	$ 238,512,644

* Actuarially Determined Employer Contribution. Note that the employer normal cost includes administrative expenses.
Note that the AAL and AVA above is for all of LGERS.

Key Takeaways

Register of Deeds' Supplemental Pension Fund

	Valuation Component Reviewed	Observation	Recommendation	Financial Impact
Demographic Assumptions				
1	Post-Retirement Mortality Rates	Fewer deaths	Decrease rates	Slight increase
2	Active Mortality	Limited exposures	Decrease rates	Slight increase
3	Mortality improvement	SOA projects lower improvement	Update from MP-2015 to MP-2019	Decrease
4	Service retirement	Fewer retirements	Decrease rates	Slight decrease
5	Disability retirement	Fewer disabilities	Decrease rates	Immaterial
6	Termination from active employment	More terminations	Increase rates	Slight decrease
Economic Assumptions				
7	Investment return	Lower projected returns	Reduce 0.75% (Alt 1)/ 0.50% (Alt 2)	Increase
8	Inflation	SSA predicts lower	Lower by 0.50%	Slight increase
9	Individual pay increases	Higher Increases	Increase rates	Slight increase
10	Productivity growth	Decrease not as much as inflation	Increase by 0.25%	Slight increase
Funding Method				
11	Amortization Method	Current method reasonable	No change	No change
12	Actuarial Cost method	Current method reasonable	Refine method - see below	Increase
13	Asset valuation method	Current method reasonable	No change	No change
14	Administrative expenses	Expenses lower than assumed	Decrease rate	Slight decrease

Notes:

1. The Pub-2010 Public Retirement Plans Mortality Tables published by the Society of Actuaries in January 2019 provided a closer fit than the previous table which were based on corproate plan expereince, resulting in less modifications.
3. For the fifth consecutive year, the SOA has reduced its projection of mortality improvement, resultings in lower liabilities.
7. Lower investment returns are the largest single source of liability and cost increases
12. The load on normal cost to account for new entrants was increased.
12. Previously unreflected provisions included.

Financial Impact

Register of Deeds' Supplemental Pension Fund

Had the proposed assumptions and methods been reflected for the December 31, 2019 Actuarial Valuation, the financial impact would have been as follows:

- The AAL would increase by 5.8% from $30.91 million to $32.71 million under Alternative 1; under Alternative 2, it would increase by 3.1% to $31.86 million.
- The ADEC would remain unchanged at $0 under Alternative 1; under Alternative 2, it would remain unchanged at $0.
- The Employer Contribution would remain unchanged at $0 under Alternative 1; under Alternative 2 it would remain unchanged at $0.

	Current Valuation	Reflect Alternative 1 Economic Assumptions	Reflect Demographic Assumptions	Reflect Funding Method	Alternative 1 w/ Five-year Direct Rate Smoothing	Alternative 2 w/ Five-year Direct Rate Smoothing
Employer Contribution						
Employer Normal Cost	1,079,297	1,249,870	1,308,822	1,353,046	1,353,046	1,292,084
Payment for UAAL	$ (1,079,297)	$ (1,249,870)	$ (1,308,822)	$ (1,353,046)	$ (1,353,046)	$ (1,292,084)
Preliminary ADEC*	0	0	0	0	0	0
Impact of Direct Rate Smoothing	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0
Impact of Rate Stabilization Policy	0	0	0	0	0	0
Employer Contribution	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0
Cumulative Δ in Employer Contribution		$ 0	$ 0	$ 0	$ 0	$ 0
Actuarial Accrued Liability (AAL)	$ 30,907,611	$ 33,374,940	$ 33,107,362	$ 32,708,957	$ 32,708,957	$ 31,858,185
Actuarial Value of Assets (AVA)	50,389,452	50,389,452	50,389,452	50,389,452	50,389,452	50,389,452
Unfunded Accrued Liability (UAAL)	(19,481,841)	(17,014,512)	(17,282,090)	(17,680,495)	(17,680,495)	(18,531,267)
Funded Ratio (AVA / AAL)	163.0%	151.0%	152.2%	154.1%	154.1%	158.2%
Cumulative Δ in UAAL		$ 2,467,329	$ 2,199,751	$ 1,801,346	$ 1,801,346	$ 950,574

* Actuarially Determined Employer Contribution. Note that the employer normal cost includes administrative expenses.

Financial Impact

Death Benefit Plans

	Current Valuation	Alternative 1	Alternative 2
Teachers' and State Employees' Retirement System Death Benefit Plan			
Liabilities	$ 169,651,732	$ 163,695,331	$ 160,918,265
Current Assets	58,812,369	58,812,369	58,812,369
Present Value of Future Contributions	256,670,319	254,505,681	249,644,940
Surplus / (Deficit)	145,830,956	149,622,719	147,539,044
Δ in Surplus/(Deficit		3,791,763	1,708,088
Local Governmental Employees' Retirement System Death Benefit Plan			
Liabilities	$ 58,975,706	$ 52,993,061	$ 52,025,503
Current Assets	88,568,566	88,568,566	88,568,566
Present Value of Future Contributions	43,141,531	39,207,132	38,400,828
Surplus / (Deficit)	72,734,391	74,782,637	74,943,891
Δ in Surplus/(Deficit		2,048,246	2,209,500
Separate Insurance Benefits Plan for Law Enforcement Officers			
Liabilities	$ 37,917,284	$ 46,212,762	$ 43,414,858
Current Assets	59,136,649	59,136,649	59,136,649
Present Value of Future Contributions	0	0	0
Surplus / (Deficit)	21,219,365	12,923,887	15,721,791
Δ in Surplus/(Deficit		(8,295,478)	(5,497,574)
Retirees' Contributory Death Benefit Plan			
Liabilities	$ 1,266,494,557	$ 1,458,950,966	$ 1,375,347,090
Current Assets	271,691,476	271,691,476	271,691,476
Present Value of Future Contributions	967,643,306	1,039,448,340	992,257,484
Surplus / (Deficit)	(27,159,775)	(147,811,150)	(111,398,130)
Δ in Surplus/(Deficit		(120,651,375)	(84,238,355)

Next Steps

- Provide direction on additional analysis if needed
- Boards scheduled to adopt recommendations at the January Board meeting

Actuarial Certification

- The results were prepared under the direction of actuaries who meet the Qualification Standards of the American Academy of Actuaries to render the actuarial opinions contained herein. These results have been prepared in accordance with all applicable Actuarial Standards of Practice, and we are available to answer questions about them.
- Future actuarial measurements may differ significantly from current measurements due to plan experience differing from that anticipated by the economic and demographic assumptions, increases or decreases expected as part of the natural operation of the methodology used for these measurements, and changes in plan provisions or applicable law.

Larry Langer, ASA, EA, MAAA, FCA
Principal and Consulting Actuary

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