



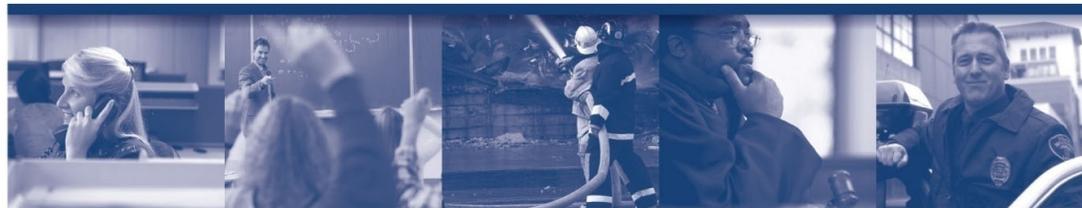
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Teachers' and State Employees' Retirement System Principal Results of Actuarial Valuation as of December 31, 2020

October 28, 2021 Board of Trustees Meeting

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Purpose of the Annual Actuarial Valuation

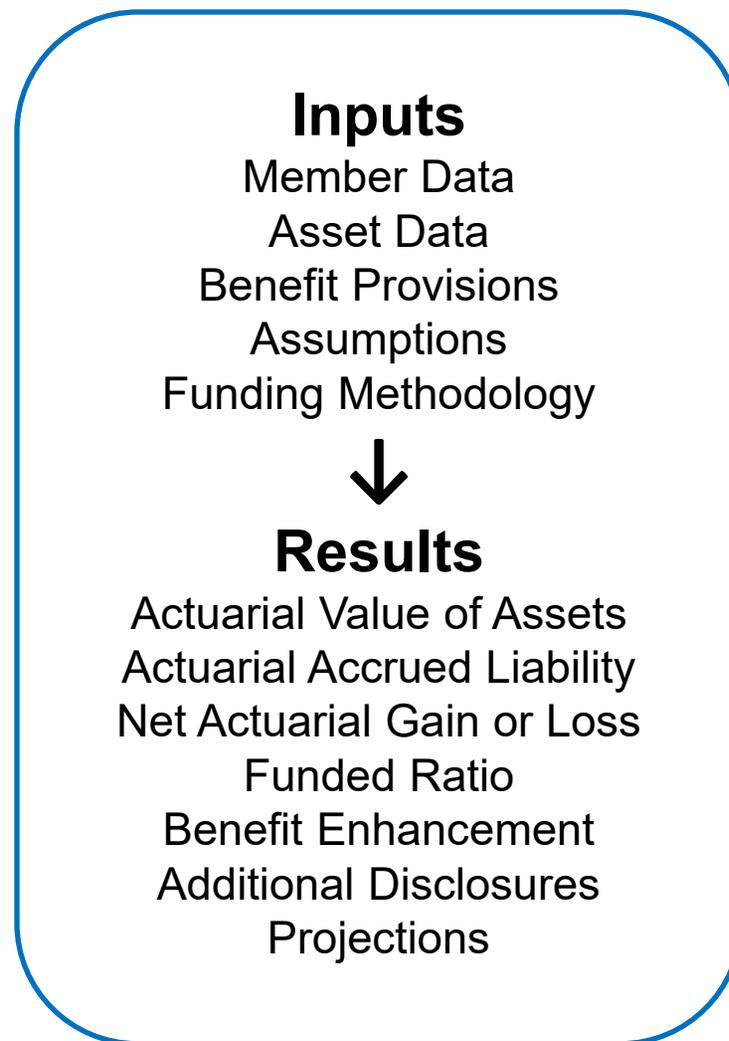


- As of the end of each calendar year:
 - An annual actuarial valuation is performed on TSERS
 - The actuary determines the amount of employer contributions to be made to TSERS during each member's career that, when combined with investment return and member contributions, are expected to be sufficient to pay for retirement benefits.
- • In addition, the annual actuarial valuation is performed to:
 - Determine the progress on funding TSERS
 - Explore why the results of the current valuation differ from the results of the valuation of the previous year
 - Satisfy regulatory and accounting requirements



The Valuation Process

- The diagram to the right summarizes the inputs and results of the actuarial valuation process.
- A detailed summary of the valuation process and a glossary of actuarial terms are provided in Appendix A of the actuarial report.
- This diagram will appear throughout the presentation to designate where we are in the process.



Valuation Input

Member Data



Inputs

Membership Data

Asset Data

Benefit Provisions

Assumptions

Funding Methodology



Results

Actuarial Value of Assets

Actuarial Accrued Liability

Net Actuarial Gain or Loss

Funded Ratio

Employer Contributions

Benefit Enhancement

Additional Disclosures

Projections

The table below provides a summary of the membership data used in this valuation compared to the prior valuation.

Number as of	12/31/2020	12/31/2019
Active Members	302,771	305,962
Members currently receiving Disability Income Plan benefits	5,410	5,774
Terminated members and survivors of deceased members entitled to benefits but not yet receiving benefits	185,465	177,573
Retired members and survivors of deceased members currently receiving benefits	<u>233,751</u>	<u>228,291</u>
Total	727,397	717,600

The number of active members decreased by 1.0% from the previous valuation date.

The number of retired members and survivors of deceased members currently receiving benefits increased by 2.4% from the previous valuation.

The increase in retiree population is consistent with expectations.

A detailed summary of the membership data used in this valuation is provided in Section 3 and Appendix B.

Valuation Input



Active Members

Inputs

Membership Data

Asset Data

Benefit Provisions

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Funding Methodology



Results

Actuarial Value of Assets

Actuarial Accrued Liability

Net Actuarial Gain or Loss

Funded Ratio

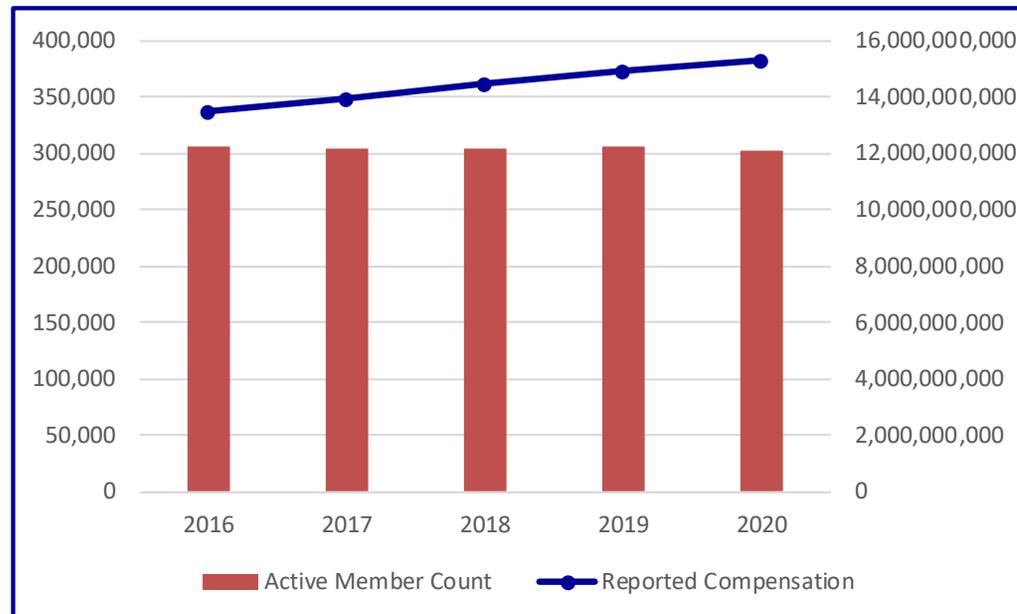
Employer Contributions

Benefit Enhancement

Additional Disclosures

Projections

The graph below provides a history of the number of active members and reported compensation over the past five years.



Reported compensation has increased by 2.7% and has averaged 3.2% over the past four years.

Covered payroll is expected to increase by approximately 3.25% annually in the future.

Payroll that is not increasing as fast as we assume results in less benefits accruing than we anticipate, but also fewer contributions supporting the system.

A detailed summary of the membership data used in this valuation is provided in Section 3 and Appendix B.



Membership Data

Inputs

Membership Data

Asset Data

Benefit Provisions

Assumptions

Funding Methodology



Results

Actuarial Value of Assets

Actuarial Accrued Liability

Net Actuarial Gain or Loss

Funded Ratio

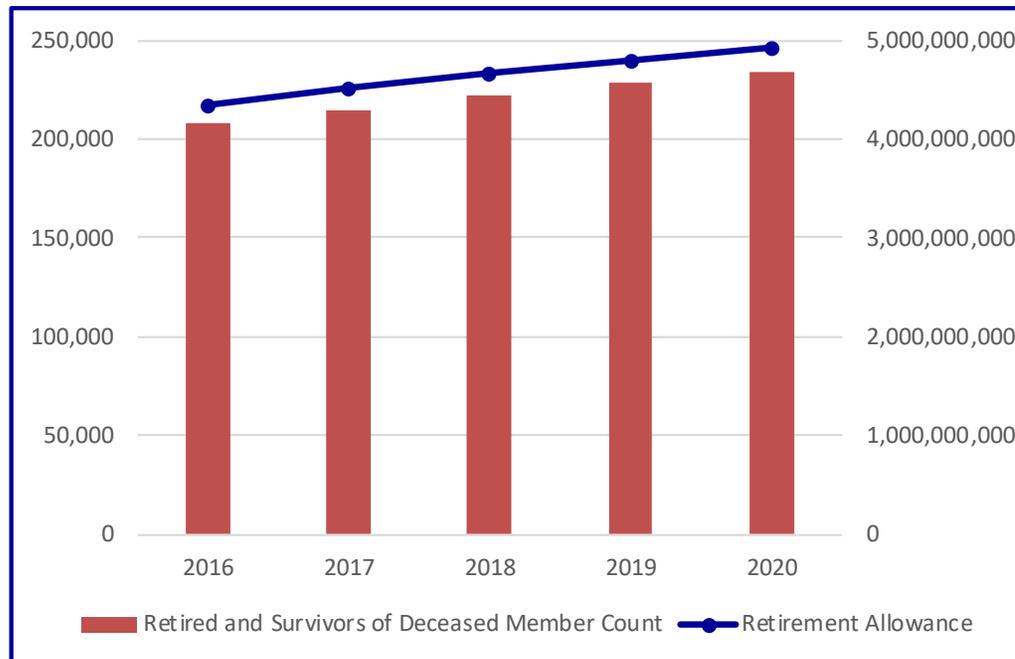
Employer Contributions

Benefit Enhancement

Additional Disclosures

Projections

The graph below provides a history of the number of retired members and survivors of deceased members and benefit amounts payable over the past five years.



The number of retired members and survivors of deceased members and the benefits paid to these members has been increasing steadily, as expected based on plan assumptions.

A detailed summary of the membership data used in this valuation is provided in Section 3 and Appendix B.

Valuation Input

Asset Data



Inputs

- Membership Data
- Asset Data**
- Benefit Provisions
- Assumptions
- Funding Methodology

↓

Results

- Actuarial Value of Assets
- Actuarial Accrued Liability
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The table below provides details of the Market Value of Assets for the current and prior year's valuations.

Asset Data as of	12/31/2020	12/31/2019
Beginning of Year Market Value of Assets	\$ 75,486,780,473	\$ 67,536,480,309
Employer Contributions	2,220,834,130	1,982,469,767
Employee Contributions	972,729,960	955,063,189
Benefit Payments Other Than Refunds	(4,890,953,170)	(4,757,088,409)
Refunds	(99,462,455)	(102,281,124)
Administrative Expenses	(13,461,042)	(12,107,623)
Investment Income	8,292,957,190	9,884,244,364
Net Increase / (Decrease)	6,482,644,613	7,950,300,164
End of Year Market Value of Assets	\$ 81,969,425,086	\$ 75,486,780,473
Estimated Net Investment Return	11.12%	14.85%

TSERS assets are held in trust and are invested for the exclusive benefit of plan members.

Incoming contributions cover over 60% of outgoing benefit payments and administrative expenses.

Over the long term, benefit payments and administrative expenses not covered by contributions are expected to be covered with investment income, illustrating the benefits of following actuarial pre-funding since inception.

A detailed summary of the market value of assets is provided in Section 4.

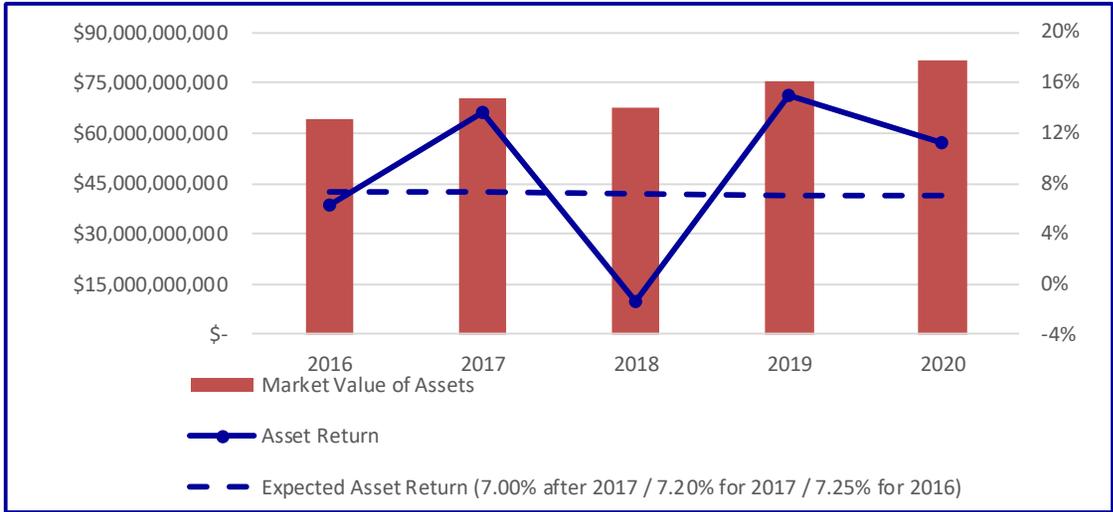
Valuation Input



Asset Data

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The graph below provides a history of the market value of assets and asset returns over the past five years.



The investment return for the market value of assets for 2020 was 11.12%, well above the expected return of 7.00%.

The return on the actuarial value of assets which is used to determine the contribution rates also exceeded the 7.00% expected return at 8.80%.

This resulted in an increase in the UAAL of \$1.3 billion.

Market value returns have exceeded expectations three times in the last five years.

A detailed summary of the market value of assets is provided in Section 4.

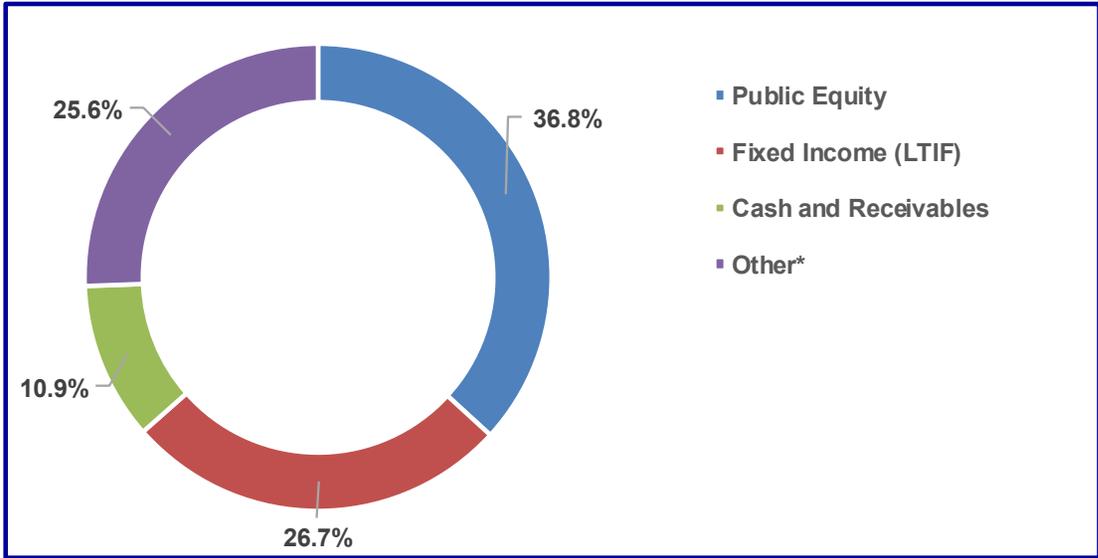
Valuation Input

Asset Data



- Inputs
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The graph below provides the breakdown of the market value of assets at December 31, 2020 by asset category.



*Real Estate, Alternatives, Inflation and Credit

Based on historical market returns, the current asset allocation, the current investment policy, and the expectation of future asset returns, as reviewed in the recent experience study, the 6.50% discount rate used in this valuation is reasonable and appropriate.

A detailed summary of the market value of assets is provided in Section 4.



Benefit Provisions

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Benefit provisions are described in North Carolina General Statutes, Chapter 135.

- There have been no changes to the benefit provisions since the last valuation.

Many Public Sector Retirement Systems in the United States have undergone pension reform where the benefits of members (active or future members) have been reduced.

Because of the well-funded status of TSERS due to the legislature contributing the actuarially determined employer contribution, benefit cuts have not been made in North Carolina as they have been in most other states.

Instead, we have seen a modest expansion of benefits in recent years based on sound plan design.

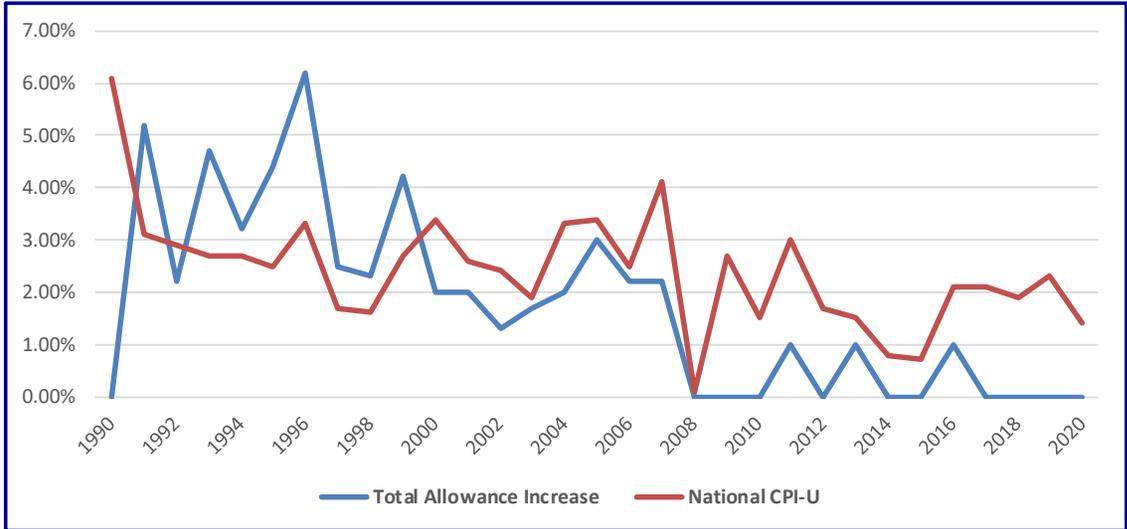
A detailed summary of the benefit provisions is provided in Appendix C.



Benefit Provisions

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The graph below provides a 30-year history of allowance increases for TSERS and the national CPI-U. It does not include one-time supplements granted in recent years.



Prior to 2000, asset returns generally exceeded expectations and allowance increases exceeded the cost of living.

Subsequently, asset returns on average have been lower than expected leading to lower allowance increases.

This graph does not include one-time pension supplements that are sometimes granted.

A detailed summary of the benefit provisions is provided in Appendix C of the actuarial report.



Actuarial Assumptions

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Actuarial assumptions bridge the gap between the information that we know with certainty as of the valuation date and what may happen in the future. The assumptions used include the following:

- **Demographic**
 - Retirement
 - Termination
 - Disability
 - Death
- **Economic**
 - Interest rate – 6.50% per year
 - Salary increase (individual, varies by service)
 - Inflation – 2.50%
 - Real wage growth – 0.75%

The assumptions used for the December 31, 2020 actuarial valuation are based on the experience study prepared as of December 31, 2019 and adopted by the Board of Trustees on January 28, 2021.

The discount rate was updated to be 6.50% and mortality was updated to the PUB-2010 Public Plan mortality tables.

The impact on the contribution rate was direct-rate smoothed over a five-year period.

A detailed summary of the actuarial assumptions and methods is provided in Appendix D.



Funding Methodology

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Funding Methodology



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The Funding Methodology is the payment plan for TSERS and is composed of the Actuarial Cost Method, the Asset Valuation Method and Amortization Method.

- Actuarial Cost Methods allocate costs to the actuarial accrued liability (i.e. the amount of money that should be in the fund) for past service and normal cost (i.e. the cost of benefits accruing during the year) for current service.
 - The Board of Trustees has adopted Entry Age Normal as its actuarial cost method
 - This method develops normal costs that stay level as a percent of payroll

The following “Objectives and Principles for Funding Public Sector Pension Plans” provides information on funding of Public Plans:

https://www.actuary.org/sites/default/files/files/Public-Plans_IB-Funding-Policy_02-18-2014.pdf.

Page 15 of the following - https://www.ccactuaries.org/Portals/0/pdf/CCA_PPC_White_Paper_on_Public_Pension_Funding_Policy.pdf - denotes Entry Age as a model practice for cost methods.

A detailed summary of the actuarial assumptions and methods is provided in Appendix D.



Funding Methodology

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Funding Methodology



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The Funding Methodology is the payment plan for TSERS and is composed of the Actuarial Cost Method, the Asset Valuation Method and Amortization Method.

- Asset Valuation Methods smooth or average the market value returns over time to alleviate contribution volatility that results from market returns.
 - Asset returns in excess of or less than the expected return on market value of assets reflected over a five-year period
 - Assets corridor: not greater than 120% of market value and not less than 80% of market value

Page 20 of the following https://www.ccactuaries.org/Portals/0/pdf/CCA_PPC_White_Paper_on_Public_Pension_Funding_Policy.pdf denotes the policy being used is an acceptable policy.

Almost all Public Sector Retirement Systems in the United States use asset valuation methods to alleviate contribution volatility. The use of a four- or five-year period is most common.

A detailed summary of the actuarial assumptions and methods is provided in Appendix D.



Funding Methodology

Inputs

Membership Data
Asset Data
Benefit Provisions
Assumptions

Funding Methodology



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The Funding Methodology is the payment plan for TSERS and is composed of the Actuarial Cost Method, the Asset Valuation Method and Amortization Method.

- Amortization Methods determine the payment schedule for unfunded actuarial accrued liability (i.e. the difference between the actuarial accrued liability and actuarial value of assets)
 - Payment level: the payment is determined as a level dollar amount, like a mortgage payment
 - Payment period: a 12-year closed amortization period was adopted for fiscal year ending 2012. A new amortization base is created each year based on the prior years' experience.
- For fiscal years beginning after January 1, 2017, the sum of the "normal contribution" and the "accrued liability contribution" shall not be less than the employee contribution.

Page 26 of the following - https://www.ccactuaries.org/Portals/0/pdf/CCA_PPC_White_Paper_on_Public_Pension_Funding_Policy.pdf - suggests the Amortization Method is an acceptable practice.

When compared to other Public Sector Retirement Systems in the United States, the Amortization Method results in higher pension debt payments. This is because of:

- A shorter period of 12 years compared to a national average of 24
- Level dollar payments instead of payments designed to increase which is more typical in the Public Sector

A detailed summary of the actuarial assumptions and methods is provided in Appendix D.



Actuarial Value of Assets

Inputs

- Membership Data
- Asset Data
- Benefit Provisions
- Assumptions
- Funding Methodology



Results

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

The table below provides the calculation of the Actuarial Value of Assets (AVA) at the valuation date.

Asset Data as of	12/312020
Beginning of Year Actuarial Value of Assets	\$73,353,759,963
Beginning of Year Market Value of Assets	75,486,780,473
Total Contributions	3,193,564,090
Benefit Payments, Refunds and Administrative Expenses	<u>(5,003,876,667)</u>
Net Cash Flow	(1,810,312,577)
Expected Investment Return	5,221,785,320
Expected End of Year Market Value of Assets	78,898,253,216
End of Year Market Value of Assets	81,969,425,086
Excess of Market Value over Expected Market Value of Assets	3,071,171,870
80% of 2020 Asset Gain/(Loss)	2,456,937,496
60% of 2019 Asset Gain/(Loss)	3,133,940,387
40% of 2018 Asset Gain/(Loss)	(2,335,638,492)
20% of 2017 Asset Gain/(Loss)	<u>792,115,656</u>
Total Deferred Asset Gain/(Loss)	4,047,355,047
Preliminary End of Year Actuarial Value of Assets	77,922,070,039
Final End of Year Actuarial Value of Asset (not less than 80% and not greater than 120% of Market Value)	77,922,070,039
Estimated Net Investment Return on Actuarial Value	8.80%

The actuarial value of assets smooths investment gains/losses, resulting in less volatility in the employer contribution.

The asset valuation recognizes asset returns in excess of or less than the expected return on the market value of assets over a five-year period.

Higher than expected market returns in 2017, 2019, and 2020 resulted in an actuarial value of asset return for calendar year 2020 of 8.80% and a recognized actuarial asset gain of \$1.3 billion during 2020.

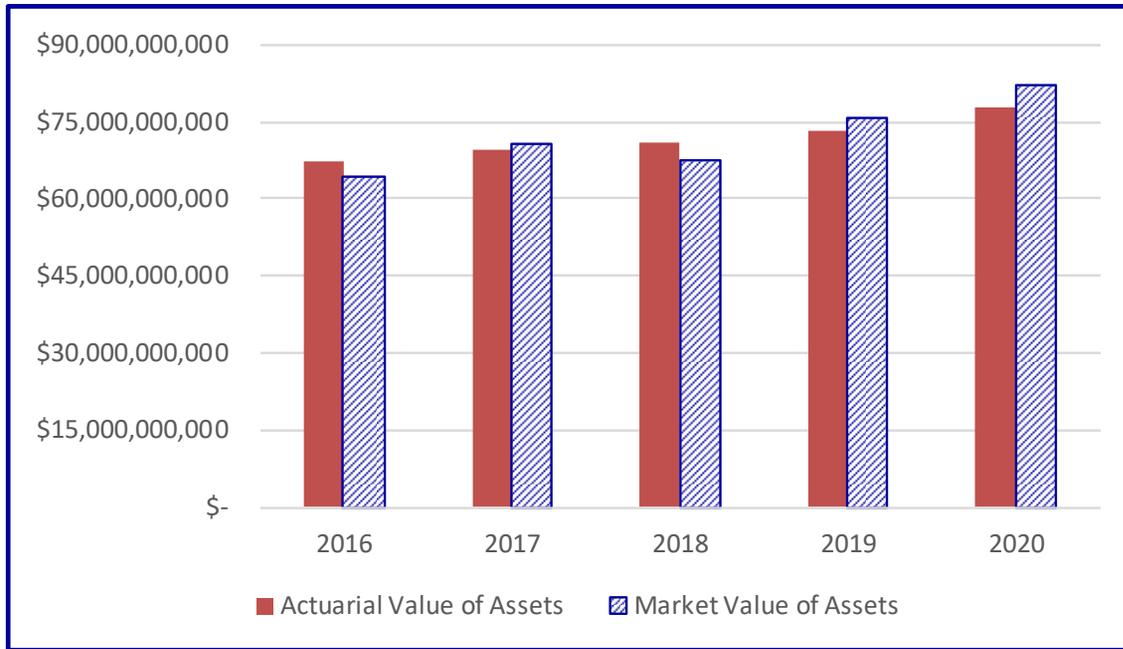
A detailed summary of the Actuarial Value of Assets is provided in Section 4.



Actuarial Value of Assets

- Inputs**
- Membership Data
- Asset Data
- Benefit Provisions
- Assumptions
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- Results**
- Actuarial Value of Assets**
- Actuarial Accrued Liability
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The graph below provides a history of the market value and actuarial value of assets over the past five years.



The market value of assets is higher than the actuarial value of assets, which is used to determine employer contributions.

This indicates that overall there are unrecognized asset gains to be recognized in future valuations.

In fact, if the investments earn the expected 6.50% over the next four years, a gain will be recognized each of those years.

A detailed summary of the Actuarial Value of Assets is provided in Section 4.

Valuation Results



Actuarial Value of Assets

Inputs

- Membership Data
- Asset Data
- Benefit Provisions
- Assumptions
- Funding Methodology

↓

Results

- Actuarial Value of Assets**
- Actuarial Accrued Liability
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- Projections

Calendar Year	Expected Asset Return	Actuarial Value of Asset Return	Market Value of Asset Return	20 Year Average Market Return
1996	7.50%	10.18%	9.39%	NA
1997	7.25%	10.18%	18.16%	NA
1998	7.25%	9.92%	16.66%	NA
1999	7.25%	10.60%	10.15%	NA
2000	7.25%	11.55%	2.50%	NA
2001	7.25%	8.51%	-1.87%	NA
2002	7.25%	5.66%	-5.21%	NA
2003	7.25%	7.98%	18.23%	NA
2004	7.25%	8.56%	10.73%	NA
2005	7.25%	8.26%	6.97%	NA
2006	7.25%	8.94%	11.41%	NA
2007	7.25%	8.87%	8.38%	NA
2008	7.25%	2.89%	-19.50%	NA
2009	7.25%	4.74%	14.84%	NA
2010	7.25%	5.89%	11.47%	NA
2011	7.25%	5.15%	2.19%	NA
2012	7.25%	6.32%	11.82%	NA
2013	7.25%	7.43%	12.21%	NA
2014	7.25%	7.19%	6.21%	NA
2015	7.25%	5.87%	0.36%	6.86%
2016	7.25%	5.32%	6.22%	6.71%
2017	7.25%	6.56%	13.49%	6.49%
2018	7.20%	5.10%	-1.39%	5.60%
2019	7.00%	6.18%	14.85%	5.82%
2020	7.00%	8.80%	11.12%	6.25%
20-Yr Average	7.22%	6.70%	6.25%	NA
Range	0.25%	6.05%	37.73%	NA

The average investment return recognized for purposes of determining the annual change in contribution each year is the actuarial value of assets return.

Currently, the average actuarial return over the past 20 years of 6.70% compares with an average market return of 6.25%.

The range of returns is markedly more volatile in the market value of assets at 37.73% versus 6.05% for actuarial value.

Using the actuarial value of assets versus market value results in much lower employer contribution volatility while ensuring that the actuarial needs of TSERS are met.

A detailed summary of the Actuarial Value of Assets is provided in Section 4.



Actuarial Value of Assets

Inputs

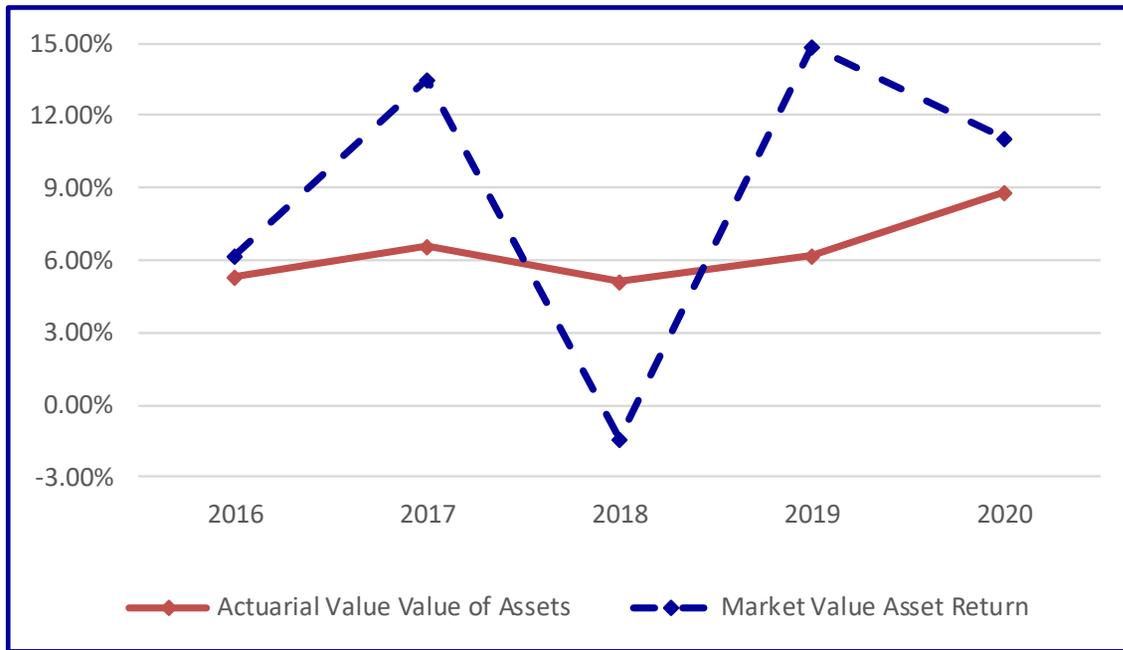
- Membership Data
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↓

Results

- Actuarial Value of Assets**
- Actuarial Accrued Liability
- Net Actuarial Gain or Loss
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- Employer Contributions
- Benefit Enhancement
- Additional Disclosures
- Projections

The graph below provides a history of the market value and actuarial value of asset returns over the past five years.



The investment return for the market value of assets for calendar year 2020 was 11.12%.

The actuarial value of assets smooths investment gains and losses.

Higher than expected market returns in 2017, 2019, and 2020 resulted in an actuarial value of asset return for calendar year 2020 of 8.80% and a recognized actuarial asset gain of \$1.3 billion during 2020.

A detailed summary of the Actuarial Value of Assets is provided in Section 4.



Actuarial Accrued Liability

Inputs

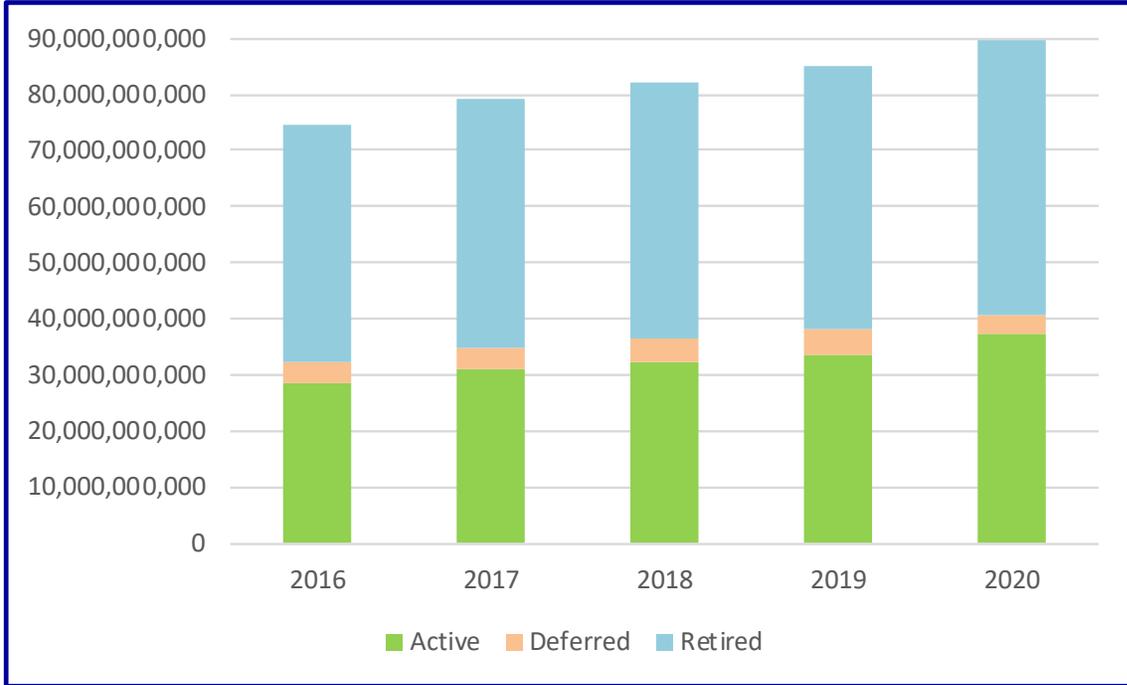
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The graph below provides a history of the actuarial accrued liability (AAL) over the past five years.



The AAL increased from \$84.9 billion to \$89.8 billion during 2020.

The Retirement System is an open plan, which means that new members enter the plan each year.

In an open plan, liabilities are expected to grow from one year to the next as more benefits accrue and the membership approaches retirement.

The AAL was \$2.33 billion higher than expected resulting primarily from changes in assumptions and methods.

A detailed summary of the Actuarial Accrued Liability is provided in Section 5.

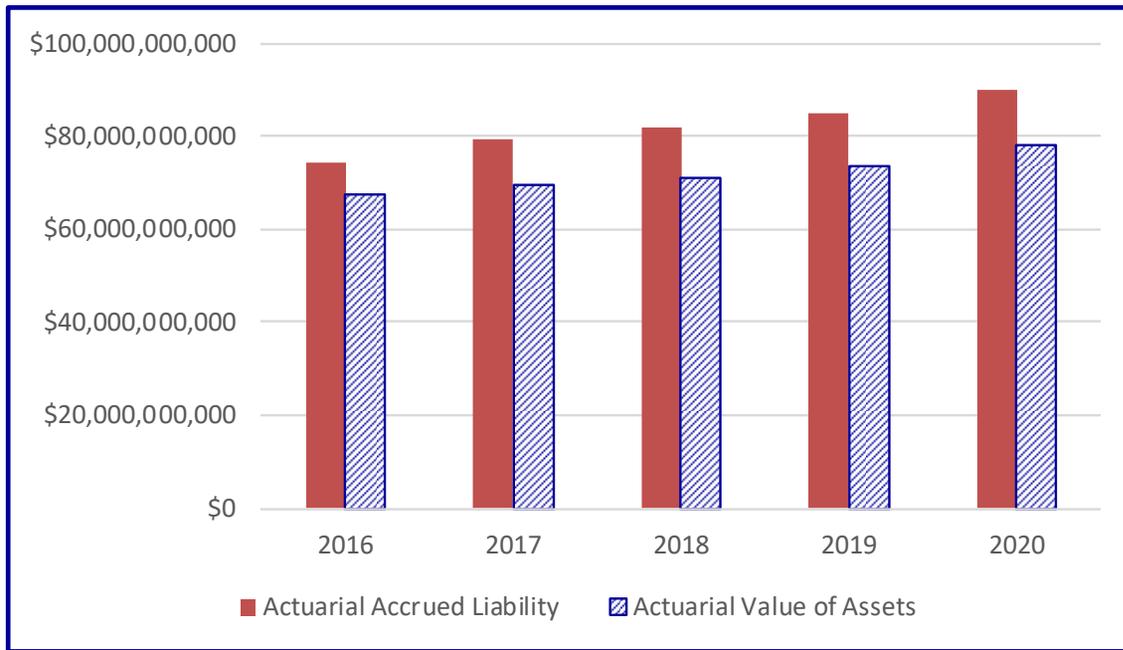


Valuation Results

AVA and AAL

- Inputs
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The graph below provides a history of the actuarial accrued liability and actuarial value of assets.



The difference in the actuarial accrued liability and the actuarial value of assets is known as the Unfunded Actuarial Accrued Liability (UAAL).

The UAAL is \$11.89 billion as of 12/31/2020 and is to be paid off over a 12-year period.

Detailed summaries of the AVA and AAL are provided in Sections 4 and 5 respectively.



Net Actuarial Gain or Loss

Inputs
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 Asset Data
 Benefit Provisions
 Assumptions
 Funding Methodology

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 Actuarial Accrued Liability
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The table below provides a reconciliation of the prior year's unfunded actuarial accrued liability to the current year's unfunded actuarial accrued liability.

(in millions)	
Unfunded Actuarial Accrued Liability (UAAL) as of 12/31/2019	\$ 11,520
Normal Cost and Administrative Expense during 2020	1,775
Reduction due to Actual Contributions during 2020	(3,194)
Interest on UAAL, Normal Cost, and Contributions	758
Asset (Gain) / Loss	(1,306)
Actuarial Accrued Liability (Gain) / Loss	(76)
Impact of Assumption Changes	2,410
Impact of Legislative Changes	-
Unfunded Actuarial Accrued Liability (UAAL) as of 12/31/2020	\$ 11,887

During 2020, the UAAL increased more than expected due to the assumption changes of \$2.4 billion.

This was offset by an asset gain during the year of \$1.3 billion.

Additionally demographic experience further decreased the UAAL by \$76 million.

A detailed summary of the net actuarial gain or loss is provided in Section 5.

Valuation Results

Funded Ratio



Inputs

Membership Data
Asset Data
Benefit Provisions
Assumptions
Funding Methodology



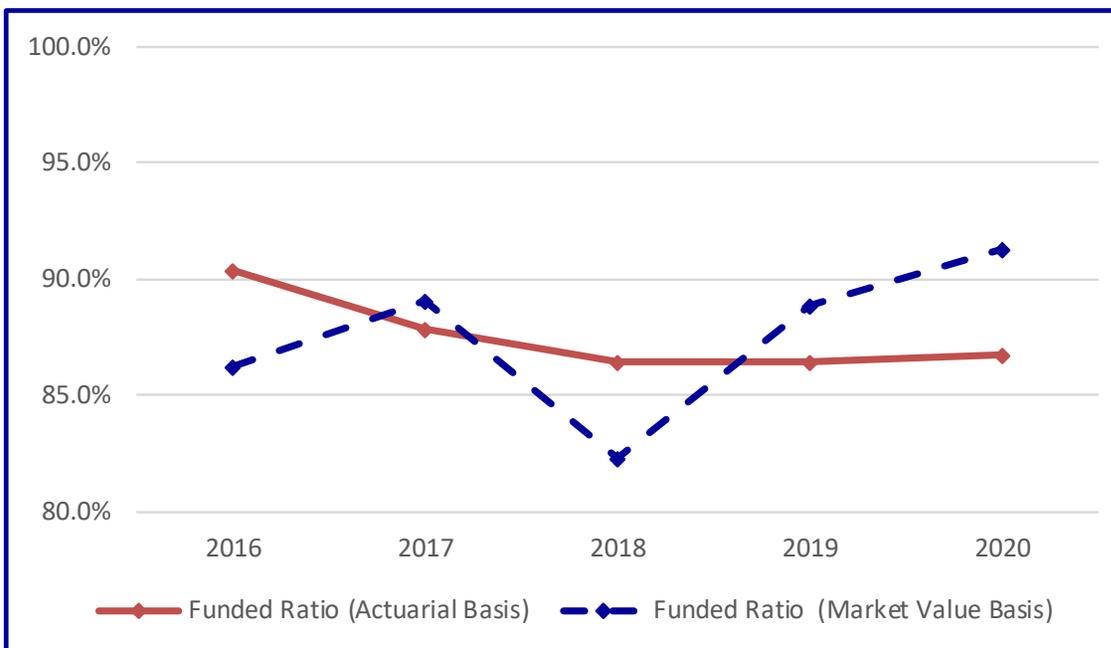
Results

Actuarial Value of Assets
Actuarial Accrued Liability
Net Actuarial Gain or Loss

Funded Ratio

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The graph below provides a history of the funded ratio on a market and actuarial basis over the past five years.



The ratio of assets to liabilities shows the health of the plan on an accrued basis.

The funded ratio on an actuarial basis increased slightly from change from 86.4% at December 31, 2019 to 86.8% at December 31, 2020.

A detailed summary of the funded ratio is provided in Section 5.

Valuation Results



Employer Contributions

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The graph below provides a history of actuarially determined employer contribution rates over the past five years before applying funding policy minimums.



*Subject to the impact of future legislative changes effective before or during that fiscal year

The rates are split into the normal rate and the accrued liability rate.

The normal rate is the employer's portion of the cost of benefits accruing after reducing for the member contribution.

The accrued liability rate is the payment toward the unfunded liability. See slide 26 for more detail.

The actuarially determined employer contribution rate is the amount needed to pay for the cost of the benefits accruing and to pay off the unfunded liability over a 12- year period, offset for the 6% of pay contribution the members make.

The 12-year period is a short period for Public Sector Retirement Systems in the United States, with the funding period for most of these Systems much longer. The shorter period results in higher contributions and more benefit security.

A detailed summary of the actuarially determined employer contribution rates is provided in Section 6.



Employer Contributions

Inputs

- Membership Data
- Asset Data
- Benefit Provisions
- Assumptions
- Funding Methodology



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- Actuarial Value of Assets
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The ECRSP (Employer Contribution Rate Stabilization Plan) would result in a recommended contribution rate of 16.09% of payroll for fiscal year ending 2023.

- 17.52% is the actuarially determined employer contribution calculated in this most recent valuation prior to direct – rate smoothing.
- 15.13% is the actuarially determined employer contribution after direct-rate smoothing of the assumption and method changes.
- The minimum is 16.09%; the appropriated contribution from last year of 15.74% plus 0.35%. *
- The maximum is approximately 84.73%; the estimated actuarially determined employer contribution using a discount rate equal to the long-term Treasury bond yield (1.65%).

* Appropriation for the FYE 2022 contribution rate is still pending

The ECRSP adopted by the Board of Trustees on April 29, 2021 requires that recommended contributions be 0.35% of payroll greater than the appropriated contribution during the prior year, with the following bounds:

- (1) contributions may not be less than the actuarially determined employer contribution (ADEC) and
- (2) contributions may not be greater than a contribution determined using the same assumptions used to calculate the ADEC based on the long-term Treasury bond yield.

A detailed summary of the actuarially determined employer contribution rates is provided in Section 6.

Valuation Results



Employer Contributions

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The table below provides a history of the actuarially determined employer contribution and the corresponding appropriated rate.

Valuation Date	Fiscal Year Ending	Normal Rate	Accrued Liability Rate	Change due to Legislation*	Final ADEC**	Appropriated Rate
12/31/2020	06/30/2023	6.39%	11.13%	N/A	N/A	N/A
12/31/2019	06/30/2022	5.16%	10.58%	N/A	N/A	N/A
12/31/2018	06/30/2021	5.18%	10.19%	0.00%	15.37%	14.78%
12/31/2017	06/30/2020	5.17%	8.99%	0.00%	14.16%	12.97%
12/31/2016	06/30/2019	4.48%	7.50%	0.31%	12.29%	12.29%
12/31/2015	06/30/2018	4.31%	5.77%	0.45%	10.53%	10.78%

*The change due to legislation for the contribution for fiscal year ending 6/30/2019 includes a 0.31% increase in the ADEC due to the one-time cost-of-living supplement payable in October 2018.

**Final ADEC reduced for direct-rate smoothing of discount rate change for FYE 2020, 2021 and 2023.

The appropriated rate for fiscal year ending 2022 is 15.74% of payroll.

The preliminary ADEC for fiscal year ending 2023 is 16.09% of payroll.

In addition to calculating the ADEC, we calculated the increase in ADEC for a 1% COLA to be 0.42% of payroll and the increase in UAAL to be \$540 million.

We also calculated the increase in ADEC for a 0.1% increase in the Defined Benefit Formula to be 0.44% of payroll and the increase in UAAL to be \$490 million.

A detailed summary of the actuarially determined employer contribution rates is provided in Section 6.



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The table below provides a reconciliation of the actuarially determined employer contribution rate shown as a percentage of covered payroll.

Fiscal year ending June 30, 2022 Preliminary ADEC (based on December 31, 2019 valuation)	15.74%
Impact of Legislative Changes	<u>0.00%</u>
Fiscal year ending June 30, 2022 ADEC for Reconciliation	15.74%
Change Due to Anticipated Reduction in UAAL*	(0.21%)
Change Due to Demographic (Gain)/Loss	(0.06%)
Change Due to Investment (Gain)/Loss	(1.03%)
Change Due to Contributions Less (Greater) than ADEC	0.09%
Impact of Assumption Change	2.99%
Impact of Direct Rate Smoothing	(2.39%)
Fiscal year ending June 30, 2023 Preliminary ADEC (based on December 31, 2020 valuation)	15.13%

* Amortization of the UAAL is determined as a level dollar amount with payments expected to remain the same over the amortization period but was calculated as a percentage of valuation payroll in the previous valuation. Payroll is expected to increase annually while the expected amortization payment does not increase. This causes the expected amortization payment to be a lesser percentage of the expected payroll.

The change in rate due to investment loss is based on the actuarial value of assets return of 8.80%, which was greater than the 7.00% assumed return.

The change in rate due to assumption changes is due to the changes in the assumptions and methods in the December 31, 2019 experience study.

The impact of direct-rate smoothing is the first year of the five-year deferred recognition of these assumption changes.

A detailed summary of the actuarially determined employer contribution rates is provided in Section 6.



Potential COLAs

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- Based on the actuarial gains recognized in this December 31, 2020, valuation, a Cost-of-Living Adjustment (COLA) effective July 1, 2022, could be funded by actuarial investment gains. Considerations follow this slide.
- Based on the methods and assumptions used for the projections discussed later in the presentation, we estimate that a potential COLA effective July 1, 2023, may be funded by actuarial investment gains following the December 31, 2021, valuation in the following circumstances:
 - If calendar year 2021 market value returns exceed *negative* 2.69% (or about *negative* \$2.19B for TSERS), the plan is estimated to have an actuarial investment gain (rather than a loss) for 2021 and a COLA that would take effect on July 1, 2023, could be considered.
 - If calendar year 2021 market value returns exceed 0.73% (or about \$0.59B for TSERS), the plan is estimated to have an actuarial investment gain (rather than a loss) for 2021 and such gain may be enough to consider providing a 1% COLA that would take effect on July 1, 2023.
 - Estimated actuarial investment gain of \$554.9M
 - Estimated cost of 1% COLA payable to retirees effective July 1, 2023 of \$554.9M
- Note: CMC cannot provide legal advice. This slide should not be interpreted as legal advice as to the Board's ability to provide a COLA to retirees or recommend a COLA to the legislature

A detailed summary of the cost of benefit enhancements is provided in Section 6.



Potential COLA Considerations

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- Note that the TSERS Board can *recommend* COLAs to the General Assembly; the Board does not have the authority to *grant* COLAs
- G.S. 135-5(o) has various provisions related to COLAs, including a description of a permanent COLA limited to 4% or inflation (whichever is less) when the cost would not require an increase in the employer contribution rate.
- Type of increase
 - Supplement payable October 2022
 - Permanent effective July 1, 2022
- Immediate or 12-year funding
 - Immediate funding recommended for Supplement
 - 12-year funding could be considered for Permanent
 - The contribution increase is added to the ECRSP rate per policy adopted at April 2021 Board meeting

A detailed summary of the cost of benefit enhancements is provided in Section 6.

Valuation Results

Potential COLA Considerations

Actuarial Investment Gain to “Spend”



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The amount of actuarial investment gain for calendar 2020 is \$1,306,000,000. The maximum amount of COLA based on this amount is 2.41%, which may be limited by actual CPI for 2021. The increase in ECRSP rate would be 1.01% of pay, payable over 12 years.

Impact on Employee Contribution Rate Stabilization Policy (ECRSP) Rate of Alternate Permanent One-Time-Cost-of -Living Increases				
Amount	None	1.00%	2.00%	2.41%
<i>Increase in UAAL</i>	\$ -	\$ 540,027,000	\$ 1,080,054,000	\$ 1,301,465,070
<i>ECRSP Rate Effective 7/1/2022</i>				
Preliminary ECRSP Rate	15.74%	15.74%	15.74%	15.74%
Impact of COLA	<u>0.00%</u>	<u>0.42%</u>	<u>0.84%</u>	<u>1.01%</u>
ECRSP after impact of COLA	15.74%	16.16%	16.58%	16.75%

The cost of a 1% supplement cola is \$52.2 million, or 0.31% of pay, payable for one year.

Considerations on the amount to be recommended are noted on the next slide.

A detailed summary of the cost of benefit enhancements is provided in Section 6.



Valuation Results

Potential COLA Considerations

Actuarial Investment Gain to “Spend”

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- While recommending a 2.41% COLA is commensurate with the amount of investment gains recognized in 2020, the Board could consider the following reasons for recommending an amount less than the maximum:
 - Providing COLAs under gain sharing works best when:
 - The amount of benefits granted are limited
 - The investment return assumption is lower than the expected return adjusted by the expected COLA payouts
 - Is the investment gain permanent?
 - Each valuation is expected to generate an actuarial gain or loss on investments
 - Asset-Liability study being performed will measure likelihood of achieving 6.50% over different time horizons (short- vs. long-term)
 - Current gain may be needed to offset future losses to keep contributions from rising more than anticipated
 - Potential lower investment return
 - Board may decide to reduce investment return assumption further the next time it is revisited, based on Asset-Liability study or other inputs
 - If so, system’s liability increase could significantly exceed actuarial investment gains recognized in current valuation
 - Employer contributions accounted for about 65% of total contributions over the past 5 years
 - Any recommendation should come with the understanding that the General Assembly would need to appropriate the related cost through its budget process

A detailed summary of the cost of benefit enhancements is provided in Section 6.

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The table below illustrates the sensitivity of certain valuation results to changes in the discount rate on a market value of assets basis. All numbers in billions.

Discount Rate	1.65%	4.08%	6.50%	8.93%	11.35%
Market Value of Assets	\$ 81.97	\$ 81.97	\$ 81.97	\$ 81.97	\$ 81.97
Actuarial Accrued Liability	\$ 168.75	\$ 119.75	\$ 89.81	\$ 70.55	\$ 57.77
Unfunded Accrued Liability (AAL)	\$ 86.78	\$ 37.78	\$ 7.84	\$ (11.41)	\$ (24.20)
Funded Ratio	48.6%	68.5%	91.3%	116.2%	141.9%
20-Year Amortization of UAL	\$ 5.21	\$ 2.91	\$ 0.76	N/A	N/A
(as % of general state revenue)	15.9%	8.9%	2.3%	N/A	N/A

Section 6(c) of Session Law 2016-108 requires that the actuarial valuation report provide the valuation results using a 30-year Treasury rate as of December 31 of the year of the valuation as the discount rate.

The 30-year treasury rate is 1.65% as of December 31, 2020.

The difference between the UAAL measured at 6.50% and 1.65% is \$78.9 billion at December 31, 2020.

A detailed summary of the additional disclosures is provided in Appendix F.



Additional Disclosures

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The table below provides an estimate of future market value of asset returns based on the study performed in 2016.

Horizon	95% Chance (19 out of every 20 scenarios)	75% Chance (3 out of every 4 scenarios)	50% Chance (1 out of every 2 scenarios)	25% Chance (1 out of every 4 scenarios)	5% Chance (1 out of every 20 scenarios)
10 Years (2025)	0.2%	4.0%	5.9%	8.0%	11.5%
20 Years (2035)	2.2%	4.8%	6.7%	8.5%	11.8%
30 Years (2045)	3.1%	5.3%	7.1%	8.7%	12.0%

These results are summarized in the “TSERS Asset-Liability and Investment Strategy Project” report dated April 19th, 2016 prepared by Conduent, the prior actuary.

The lower bound of 1.65% falls below the 5th percentile of estimated future 30-year returns.

In other words, there is less than a 5% chance of seeing a 30-year return of 1.65% or lower based on the current portfolio structure.

A detailed summary of the additional disclosures is provided in Appendix F.

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- Projections of contribution requirements and funded status into the future can be helpful planning tools for stakeholders. This section provides such projections. The projections of the actuarial valuation are known as deterministic projections. Deterministic projections are based on one scenario in the future. The baseline deterministic projection is based on December 31, 2020 valuation results as assumptions.
- Key Projection Assumptions
 - Valuation interest rate of 6.50% for all years in conjunction with direct rate smoothing of the employer contribution rate over a 5-year period beginning July 1, 2023.
 - 6.50% investment return on market value of assets
 - Actuarial assumptions and methods as described in Appendix D of the valuation report. All future demographic experience is assumed to be exactly realized.
 - The contribution rate under the Employer Contribution Rate Stabilization Policy (ECRSP) is contributed until fiscal year ending 2027.
 - For fiscal years beginning subsequent to January 1, 2017, the sum of the "normal contribution" and the "accrued liability contribution" shall not be less than the employee contribution, which is currently 6%.
 - 0% increase in the total active member population
 - No cost-of-living adjustments granted
 - Future pay increases based on long-term salary increase assumptions
- The ECRSP adopted by the Board of Trustees on April 29, 2021 requires that recommended contributions be 0.35% of payroll greater than the appropriated contribution during the prior year, with the following bounds: (1) contributions may not be less than the actuarially determined employer contribution (ADEC) rate and (2) contributions may not be greater than a contribution determined using the same assumptions used to calculate the ADEC but using a discount rate equal to the long-term Treasury bond yield.
- In addition, we have provided two alternate deterministic projections. The first alternate deterministic projection is based on the same assumptions as the baseline deterministic projection except that it assumes a 0.0% asset return for calendar year 2021. The second alternate deterministic projection is based on the same assumptions as the baseline deterministic projection except that it assumes a 13.0% asset return for calendar year 2021.

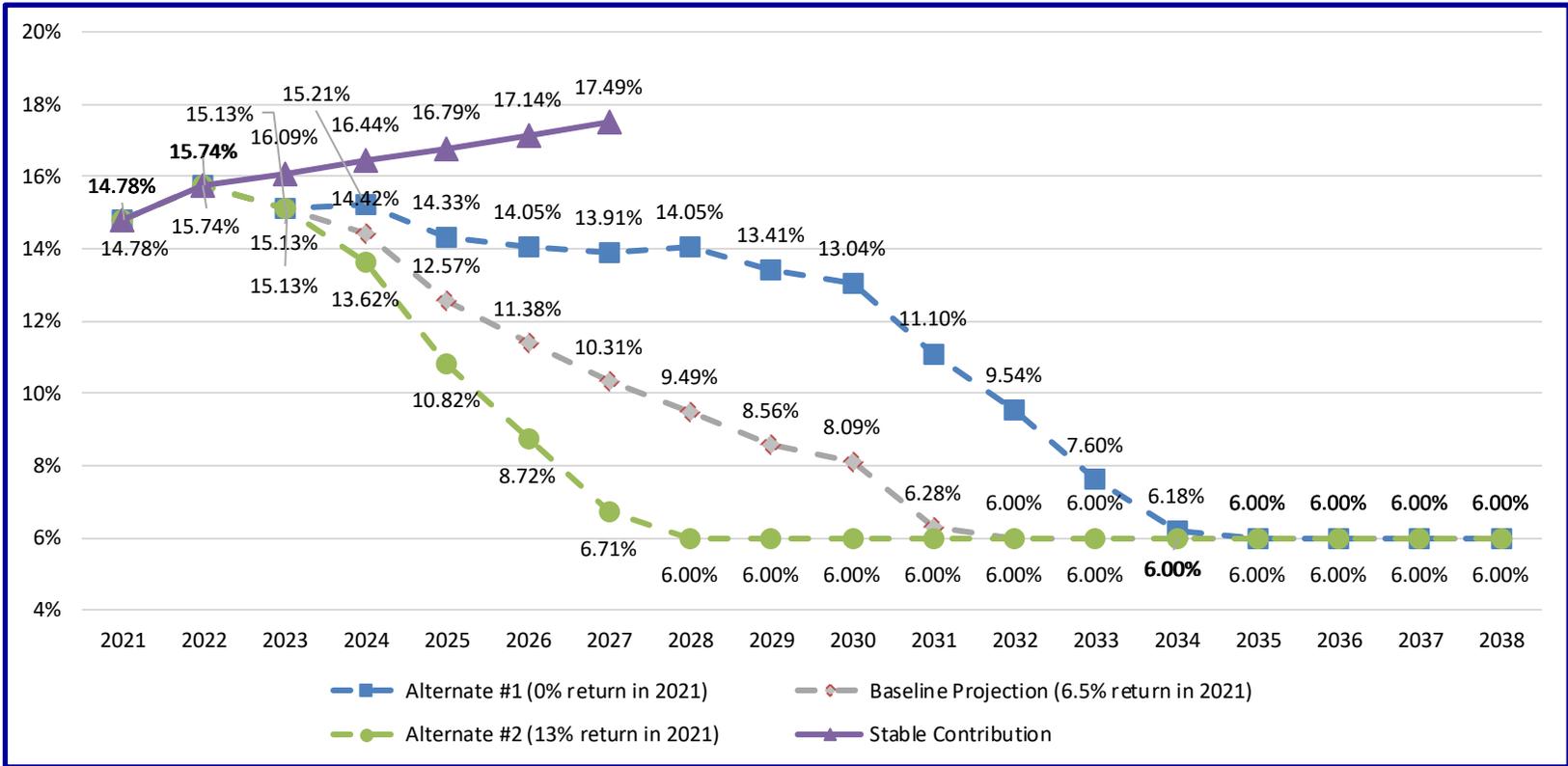
A detailed summary of the deterministic projections is provided in Section 9.



Valuation Results

Projected Contribution Rates

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Refer to slide 34 for the basis of the projection.

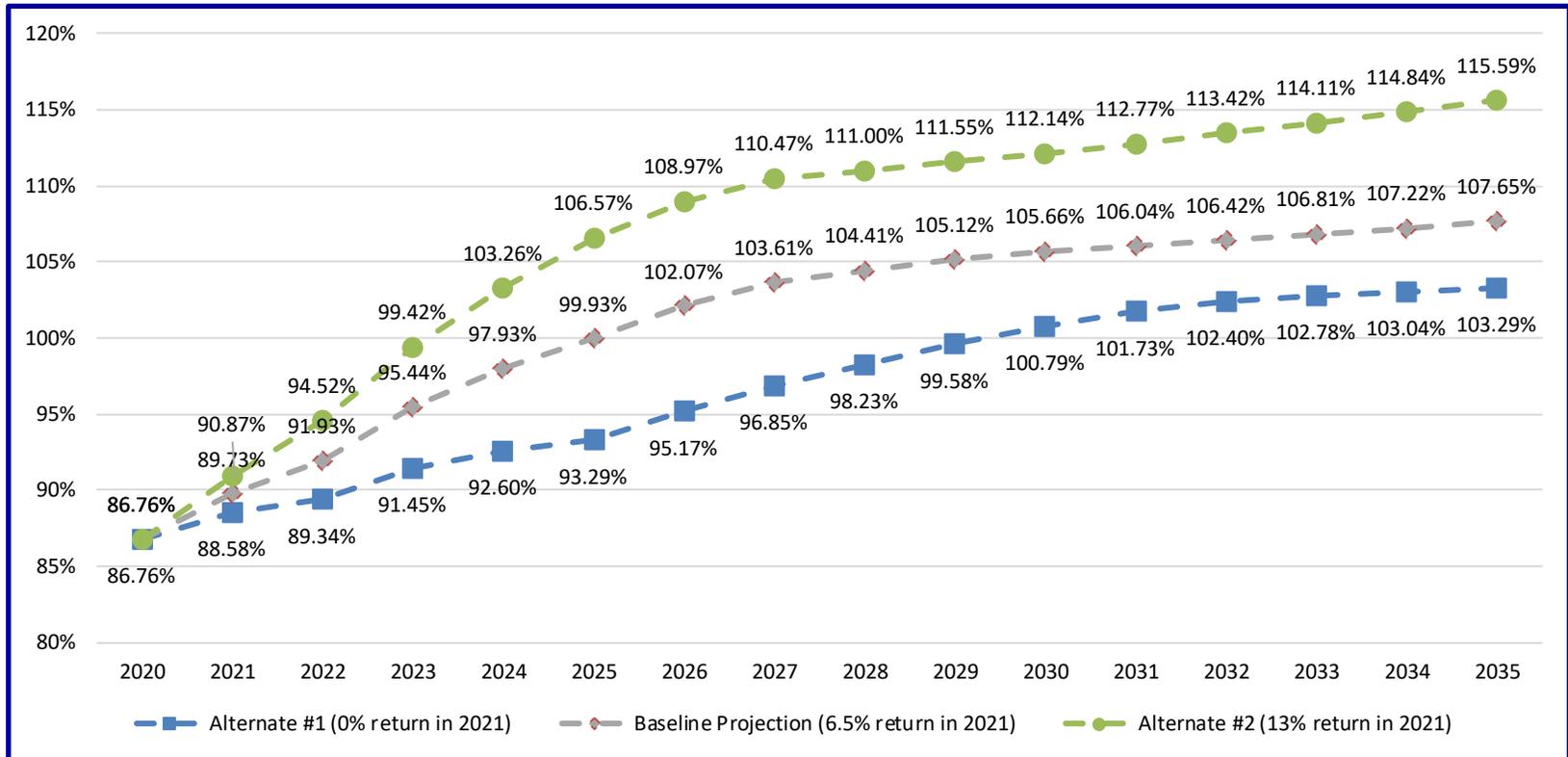
A detailed summary of the deterministic projections is provided in Section 9.

Valuation Results



Projected Funded Ratio

- Inputs**
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Refer to slide 34 for the basis of the projection.

A detailed summary of the deterministic projections is provided in Section 9.

Valuation Results

Projections



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- The baseline projection uses the same basis described earlier in this presentation. The alternate deterministic projection is based on the same assumptions as the baseline deterministic projection except that it assumes a 5.50% investment return on market value of assets for all calendar years starting in 2021.

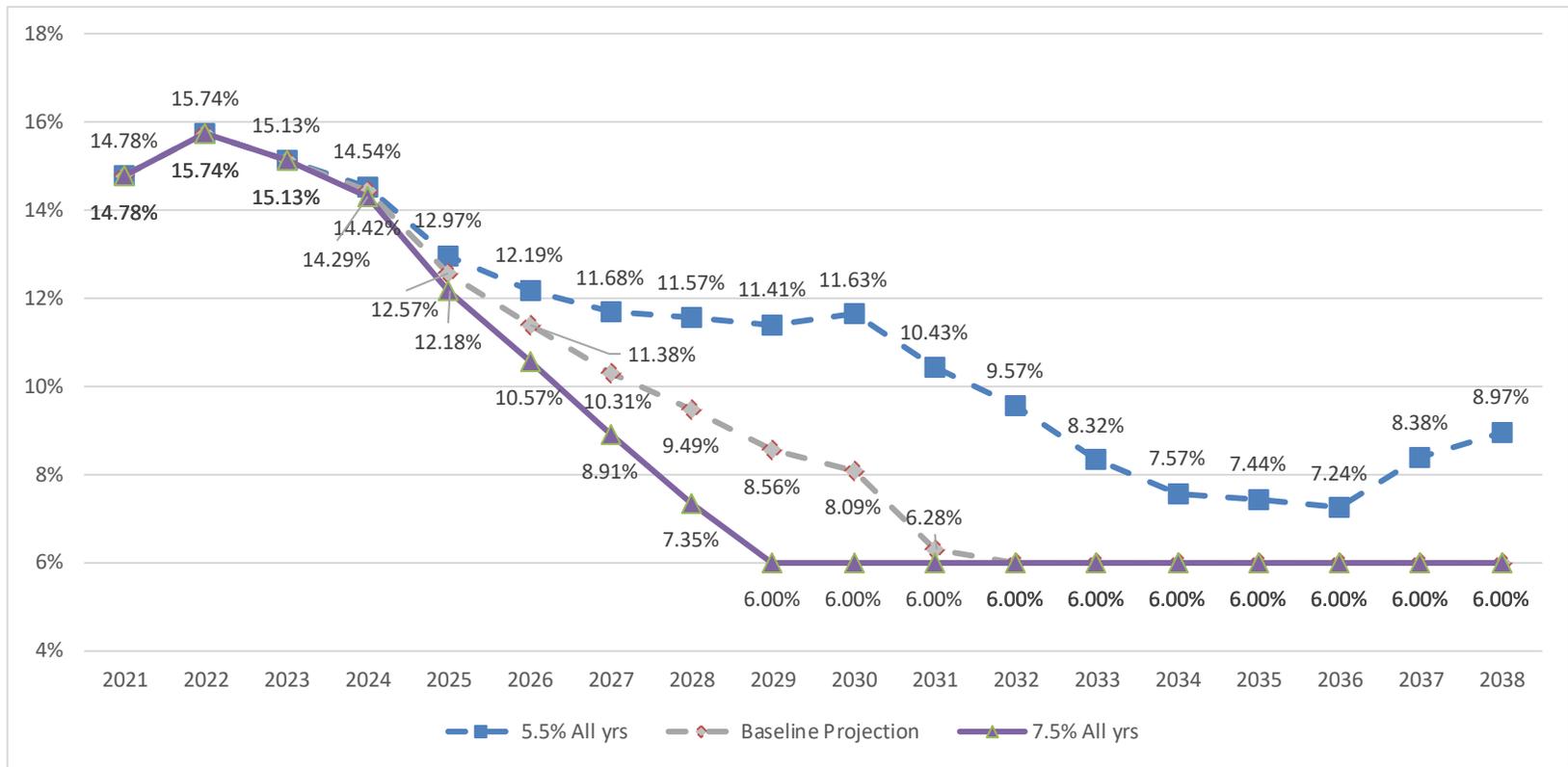
A detailed summary of the deterministic projections is provided in Section 9.

Valuation Results



Projected Contribution Rates

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Alternate Projection assumes 5.50% asset returns every year starting in 2021 compared to the 6.50% assumption in the Baseline Projection. As a result, the unfunded accrued liability will be higher resulting in higher projected contributions.

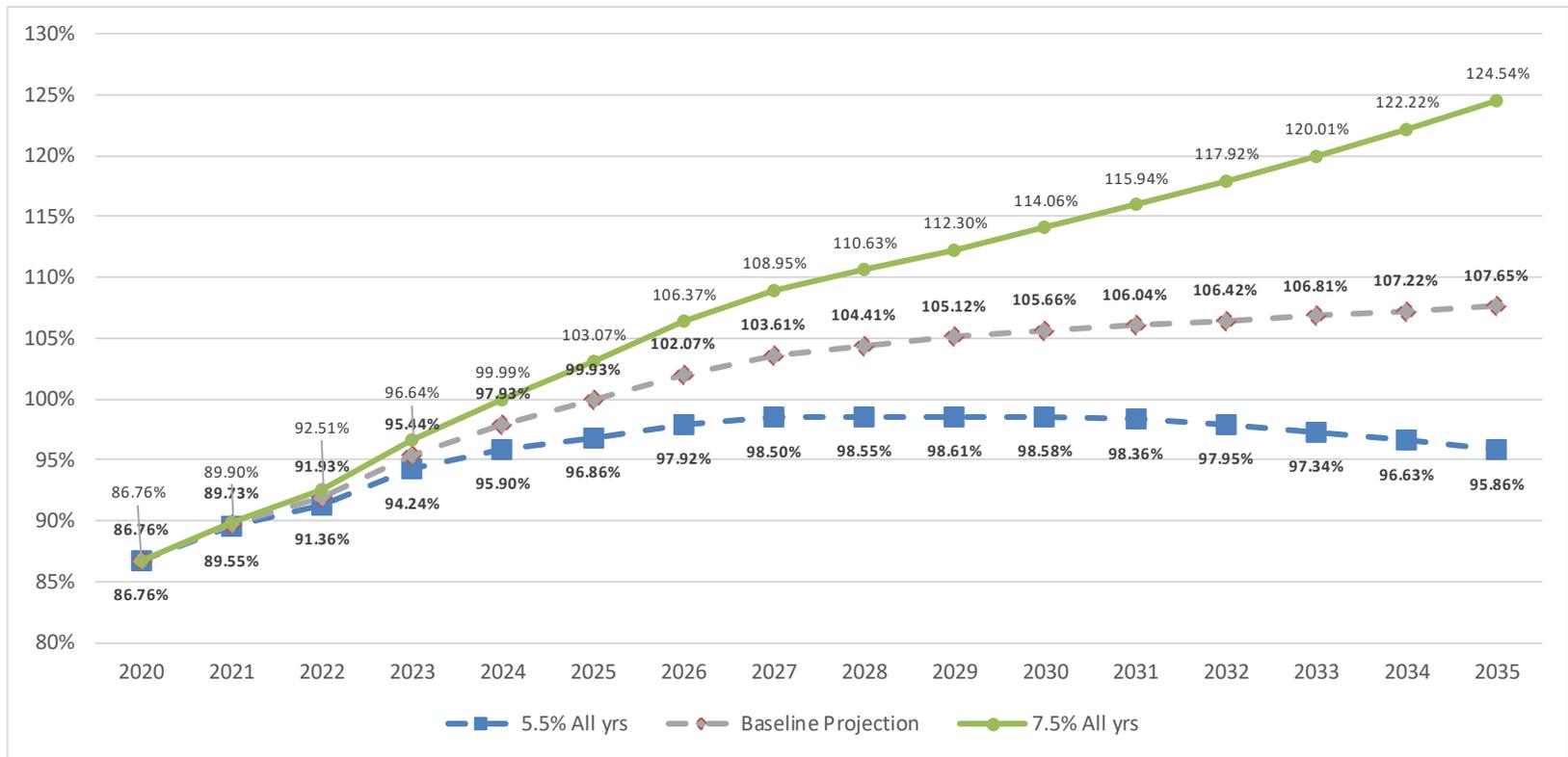
A detailed summary of the deterministic projections is provided in Section 9.

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Projected Funded Ratio

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Alternate Projection assumes 5.50% asset returns every year starting in 2021 compared to the 6.50% assumption in the Baseline Projection. As a result, the unfunded accrued liability will be higher resulting in a lower projected funded ratio.

A detailed summary of the deterministic projections is provided in Section 9.



Key Takeaways

- Key results of the December 31, 2020 valuation were:
 - Market value return of 11.12% compared to 7.00% assumed
 - Actuarial value return of 8.80% resulting in an decrease of the UAAL by \$1.3 billion and an decrease in the employer contribution rate of 1.03% of pay.
 - Assumption changes from the experience study increased the UAAL by \$2.4 billion and the employer contribution rate by 0.60% (after direct-rate smoothing.)

Key Takeaways (continued)



- When compared to the December 31, 2019 baseline projections, the above resulted in:
 - A lower funded ratio as of December 31, 2020 (86.8% in the valuation compared to 88.3% in the baseline projection)
 - Slightly higher actuarially determined employer contribution rate for fiscal year ending June 30, 2023 (15.13% in the valuation compared to 15.09% in the baseline projection)



Key Takeaways (continued)

- The assumptions used for the December 31, 2020 actuarial valuation are based on the experience study prepared as of December 31, 2019 and adopted by the Board of Trustees on January 28, 2021.

- Material assumptions and methods that were changed in the study include:
 - The investment return assumption was lowered from 7.00% to 6.50%
 - The inflation assumption was lowered from 3.00% to 2.50%
 - The real wage growth assumption was increased from 0.50% to 0.75%
 - The payroll growth assumption was lowered from 3.50% to 3.25%
 - The withdrawal rates, retirement rates, mortality assumption, annual rate of salary increase assumption, and leave conversion assumptions were changed
 - The marriage assumption was changed from assuming male spouses are four years older than female spouses to assume that male spouses are three years older than female spouses
 - The method for valuing inactive members was changed from 200% of the member's accumulated contributions, to using existing actual data and estimating earnings and average final compensation where actual data isn't available for members with five or more years of service, and using 100% of the member's accumulated contributions for members with less than five years of service

Key Takeaways (continued)



- TSERS is well funded compared to its peers. This is due to:
 - Stakeholders working together to keep TSERS well-funded since inception
 - A history of appropriating and contributing the recommended contribution requirements
 - Assumptions that in aggregate are more conservative than peers
 - A funding policy that aggressively pays down unfunded liability over a 12-year period
 - An ad hoc cost-of-living adjustment, which typically only provides benefit increases when certain financial conditions are met, supports the health of the system
 - Modest changes in benefits when compared to peers
- As has been done over the past nearly 80 years, continued focus on these measures will be needed to maintain the sustainability of TSERS well into the future

Certification



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. Because of limited scope, Cavanaugh Macdonald performed no analysis of the potential range of such future differences, except for some limited analysis in financial projections or required disclosure information. Results prior to December 31, 2017 were provided by the prior consulting actuary.

We meet the Qualification Standards of the American Academy of Actuaries to render the actuarial opinions contained in this report. This report has been prepared in accordance with all applicable Actuarial Standards of Practice, and we are available to answer questions about it.

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

Wendy T. Ludbrook, FSA, EA, FCA, MAAA
Consulting Actuary



Cavanaugh Macdonald
CONSULTING, LLC

The experience and dedication you deserve

Teachers' and State Employees' Retirement System of North Carolina

Report on the Seventy-Eighth Actuarial
Valuation

Prepared as of December 31, 2020

October 2021





Cavanaugh Macdonald

CONSULTING, LLC

The experience and dedication you deserve

October 20, 2021

Board of Trustees
Teachers' and State Employees'
Retirement System of North Carolina
3200 Atlantic Avenue
Raleigh, NC 27604

Members of the Board:

We submit herewith our report on the seventy-eighth annual valuation of the Teachers' and State Employees' Retirement System of North Carolina (referred to as "TSERS" or the "State Plan") prepared as of December 31, 2020. The report has been prepared in accordance with North Carolina General Statute 135-6(o). Information contained in our report for plan years prior to December 31, 2017 is based upon valuations performed by the prior actuary.

The primary purpose of the valuation report is to determine the required member and employer contribution rates, to describe the current financial condition of TSERS, and to analyze changes in such condition. In addition, the report provides information that the Office of the State Controller (OSC) requires for its Comprehensive Annual Financial Report and it summarizes census data. Use of this report for any other purposes or by anyone other than OSC and its auditors, or North Carolina Retirement System Division and Department of State Treasurer staff may not be appropriate and may result in mistaken conclusions because of failure to understand applicable assumptions, methods, or inapplicability of the report for that purpose. The attached pages should not be provided without a copy of this cover letter. Because of the risk of misinterpretation of actuarial results, you should ask Cavanaugh Macdonald Consulting (CMC) to review any statement you wish to make on the results contained in this report. CMC will not accept any liability for any such statement made without prior review.

The valuation is based upon membership data and financial information as furnished by the Retirement Systems Division and the Financial Operations Division and as summarized in this report. Although reviewed for reasonableness and consistency with the prior valuation, these elements have not been audited by CMC and we cannot certify as to the accuracy and completeness of the data supplied. Sometimes assumptions are made by CMC to interpret membership data that is imperfect. The valuation is also based on benefit and contribution provisions as presented in this report. If you have reason to believe that the plan provisions are incorrectly described, that important plan provisions relevant to this valuation are not described, or that conditions have changed since the calculations were made, you should contact the authors of this actuarial report prior to relying on this information.

The valuation is further based on the actuarial valuation assumptions, approved by the Board of Trustees, as presented in this report. We believe that these assumptions are appropriate and reasonable and also comply with the requirements of GASB Statement No. 67. We prepared this valuation in accordance with the requirements of this standard and in accordance with all applicable Actuarial Standards of Practice (ASOP).

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The assumptions used for the December 31, 2020 actuarial valuation are based on the experience study prepared as of December 31, 2019 and adopted by the Board of Trustees on January 28, 2021. The economic assumptions with respect to investment yield, salary increase and inflation have been based upon a review of the existing portfolio structure as well as recent and anticipated experience.

Where presented, references to “funded ratio” and “unfunded accrued liability” typically are measured on an actuarial value of assets basis. It should be noted that the same measurements using market value of assets would result in different funded ratios and unfunded accrued liabilities. Moreover, the funded ratio presented is appropriate for evaluating the need and level of future contributions but makes no assessment regarding the funded status of the plan if the plan were to settle (i.e. purchase annuities) for a portion or all of its liabilities. In various places in the report the results also show funded ratios and unfunded liabilities based upon varying sets of assumptions as well as market values of assets as that is required for certain disclosure information required per accounting rules or statutes. Where this has been done it has been clearly indicated.

In order to prepare the results in this report we have utilized appropriate actuarial models that were developed for this purpose. These models use assumptions about future contingent events along with recognized actuarial approaches to develop the needed results.

Future actuarial results may differ significantly from the current results presented in this report due to such factors as the following: fund experience differing from that anticipated by the economic or demographic assumptions; changes in economic or demographic assumptions; and changes in plan provisions or applicable law. Such changes in law may include additional costs resulting from future legislated benefit improvements or cost-of-living pension increases or supplements, which are not anticipated in the actuarial valuation. Because of limited scope, CMC performed no analysis of the potential range of such future differences, except for some limited analysis in financial projections or required disclosure information.

We meet the Qualification Standards of the American Academy of Actuaries to render the actuarial opinions contained in this report. This report has been prepared in accordance with all applicable Actuarial Standards of Practice, and we are available to answer questions about it.

Respectfully submitted,

A handwritten signature in blue ink, appearing to read 'LL'.

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

A handwritten signature in black ink, appearing to read 'Wendy Ludbrook'.

Wendy Ludbrook, FSA, EA, FCA, MAAA
Consulting Actuary



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Executive Summary

Overview

The North Carolina Retirement Systems Division (RSD) was established in 1941 to provide retirement benefits for public servants in the State of North Carolina. Today, under the management of the Department of State Treasurer, RSD administers seven public pension plans (defined benefit plans), three supplemental retirement plans (voluntary defined contributions plans), a health trust fund, a disability income plan, death benefit funds and a number of other benefit programs. As of December 31, 2020, the RSD defined benefit plans cover over one million current and prior public servants of the state of North Carolina. During the fiscal year ending June 30, 2021, RSD paid over \$6.7 billion in pensions to more than 330,000 retirees. And as of June 30, 2021, RSD's defined benefit plan assets were valued at over \$120 billion.

Under the supplemental retirement plans, the amount of contributions in any given year is defined by law. The amount of benefits derived is dependent on the investment returns the individual achieves. Conversely, under the pension plans, the amount of the benefit paid to a member upon retirement, termination, death or disability is defined by law. The amount of contributions needed to fund these benefits cannot be known with certainty. In North Carolina, like other states, these contributions are paid during a public servant's career so that upon retirement, termination, death, or disability, there are funds available to pay these benefits. These amounts are determined through an actuarial valuation. Actuarial valuations are performed for each of the pension plans administered by RSD and the results are contained in actuarial valuation reports like this.

In 1941, the Teachers' and State Employees' Retirement System (referred to as "TSERS" or the "State Plan") was established. TSERS provides benefits to all full-time teachers and state employees in all public school systems, universities, departments, institutions and agencies of the state. With \$82 billion in assets and over 720,000 members as of December 31, 2020, it is the largest pension plan within the NC Retirement Systems. This actuarial valuation report is our annual analysis of the financial health of TSERS. This report, prepared as of December 31, 2020, presents the results of the seventy-eighth annual valuation of TSERS.

Purpose

An actuarial valuation is performed on TSERS annually as of the end of the calendar year. The actuary determines the amount of contributions to be made to TSERS during each member's career that, when combined with investment return, will be sufficient to pay for retirement benefits.

In addition, the annual actuarial valuation is performed to:

- Determine the progress of funding TSERS,
- Explore why the results of the current valuation differ from the results of the valuation of the previous year, and
- Satisfy regulatory and accounting requirements.

A detailed summary of the valuation process and a glossary of actuarial terms are provided in Appendix A.



Executive Summary

Risk

Measuring pension obligations and actuarially determined contributions requires the use of assumptions regarding future economic and demographic experience. Whenever assumptions are made about future events, there is risk that actual experience will differ from expected. Actuarial valuations include the risk that actual future measurements will deviate from expected future measurements due to actual experience that is different than the actuarial assumptions.

The primary areas of risk in this actuarial valuation are:

- Investment Risk – the potential that investment returns will be different than expected. Section 9 of this report demonstrates the sensitivity of future projected results to asset returns deviating from expected returns.
- Longevity and Other Demographic Risks – the potential that mortality or other demographic experience will be different than expected.
- Interest Rate Risk – To the extent market rates of interest affect the expected return on assets, there is a risk of change to the discount rate which determines the present value of liabilities and actuarial valuation results. Table F-1 of this report demonstrates the sensitivity of valuation results to differing discount rates.
- Contribution Risk – The potential that actual contributions are different than the actuarially determined contributions.

Annual actuarial valuations are performed for RSD which re-measure the assets and liabilities and compute a new actuarially determined contribution. RSD also has experience studies performed every five years to analyze the discrepancies between actuarial assumptions and actual experience and determine if the actuarial assumptions need to be changed. Annual actuarial valuations and periodic experience studies are practical ways to monitor and reassess risk.



Executive Summary

Key Takeaways

The actuarial valuation is performed each year to replace the estimates the actuary assumed for the prior valuation with the actual events that happened. This past year, as expected, some of the assumptions used in the prior valuation were not realized. Key results of the December 31, 2020 valuation as compared to the December 31, 2019 valuation were:

- Changes in actuarial assumptions and methods, including a decrease in the discount rate from 7.00% to 6.50%, in accordance with the latest experience study prepared as of December 31, 2019, and adopted by the Board of Trustees on January 28, 2021
- Direct-rate smoothing of the change in the employer contribution rate due to the changes in assumptions and methods over a 5-year period
- Market value returns of 11.12% during calendar year 2020 compared to 7.00% assumed
- Updated Employer Contribution Rate Stabilization Rate Policy (ECRSP) adopted April 29, 2021

When compared to the December 31, 2019 projections, the above resulted in:

- A lower funded ratio as of December 31, 2020 (86.8% in the valuation compared to 88.3% in the baseline projection)
- A slightly higher actuarially determined employer contribution rate for fiscal year ending June 30, 2023 (15.13% in the valuation compared to 15.09% in the baseline projection)

TSERS is well funded compared to its peers. This is due to:

- Stakeholders working together to keep TSERS well-funded since inception
- A history of appropriating and contributing a minimum of the recommended contribution requirements
- Implementation of the ECRSP which provides additional funding of the System
- Assumptions that in aggregate are more conservative than peers
- A funding policy that aggressively pays down the unfunded liability over a 12-year period
- An ad hoc cost-of-living adjustment, which typically only provides benefit increases when certain financial conditions are met, that supports the health of the system
- Modest changes in benefits when compared to peers

As has been done over the past 80 years, continued focus on these measures will be needed to maintain the solid status of TSERS well into the future.

More details can be found later in this report. We encourage readers to start with Sections 1 and 2 and refer to other sections for additional details as needed.

This report, prepared as of December 31, 2020, presents the results of the annual valuation of the system. The principal results of the valuation and a comparison with the preceding year's results are summarized in the following table.



Section 1: Principal Results

Table 1: Summary of Principal Results

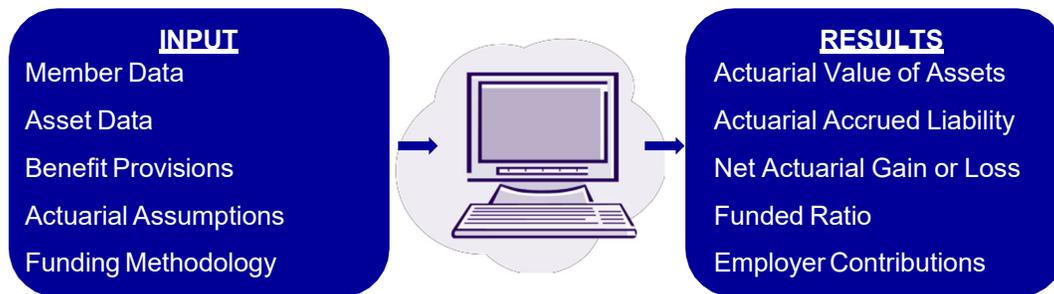
Valuation Results as of	12/31/2020	12/31/2019
Active Members		
Number	302,771	305,962
Reported Compensation	\$15,287,665,011	\$ 14,886,467,797
Valuation Compensation	\$16,446,271,542	\$ 16,112,232,177
Retired Members and Survivors of Deceased Members Currently Receiving Benefits		
Number	233,751	228,291
Annual Allowances	\$4,927,686,580	\$ 4,804,178,473
Assets		
Actuarial Value (AVA)	\$77,922,070,039	\$ 73,353,759,963
Market Value (MVA)	\$81,969,425,086	\$ 75,486,780,473
Actuarial Accrued Liability (AAL)	\$89,809,074,074	\$ 84,873,315,272
Unfunded Accrued Liability (AAL - AVA)	\$11,887,004,035	\$ 11,519,555,309
Funded Ratio (AVA / AAL)	86.8%	86.4%
Results for Fiscal Year Ending	6/30/2023	6/30/2022
Actuarially Determined Employer Contribution (ADEC), as a percentage of payroll		
Normal Cost	6.39%	5.16%
Accrued Liability	<u>11.13%</u>	<u>10.58%</u>
Total Preliminary ADEC	17.52%	15.74%
Total Based on Direct Rate Smoothing	15.13%	15.74%
Impact of Legislative Changes	<u>N/A</u>	<u>N/A</u>
Final ADEC	N/A	N/A
Board of Trustees Recommended Contribution under the Employer Contribution Rate Stabilization Policy (ECRSP)	16.09%	15.74%
Required Employer Contribution NCGS 135-8(d)	16.09%	15.74%
Appropriation Act for Fiscal Year Ending	6/30/2023	6/30/2022
Employer Contribution Rate as a percentage of payroll		
Normal Cost	6.39%	5.16%
Accrued Liability	<u>N/A</u>	<u>9.62%</u>
Total	N/A	14.78%

* Reported compensation annualized for new hires and projected for valuation purposes.

**The Funded Ratio on a Market Value of Assets basis is 91.3% at December 31, 2020.

Section 2: The Valuation Process

The following diagram summarizes the inputs and results of the actuarial valuation process.



A more detailed description of the valuation process is provided in Appendix A.

Valuation Input: Membership Data

As with any estimate, the actuary collects information that we know now. Under the actuarial valuation process, current information about TSERS members is collected annually by the Retirement Systems Division staff at the direction of the actuary. Membership data will assist the actuary in estimating benefits that could be paid in the future. Information about benefit provisions and assets held in the trust as of the valuation date is also collected.

The member information the actuary collects includes data elements such as current service, salary and benefit group identifier for members that have not separated service, and actual benefit amounts and form of payment for members that have separated service. Data elements such as gender and date of birth are used to determine when a benefit might be paid and for how long.



Section 2: The Valuation Process

Valuation Input: Membership Data (continued)

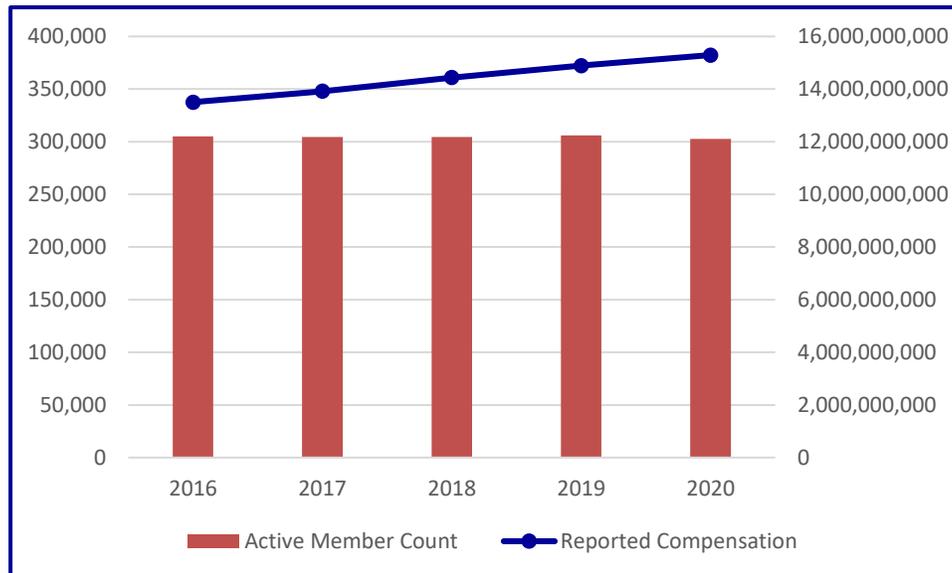
The table below provides a summary of the membership data used in this valuation compared to the prior valuation.

Number as of	12/31/2020	12/31/2019
Active Members	302,771	305,962
Members currently receiving Disability Income Plan benefits	5,410	5,774
Terminated members and survivors of deceased members Entitled to benefits but not yet receiving benefits	185,465	177,573
Retired members and survivors of deceased members currently receiving benefits	<u>233,751</u>	<u>228,291</u>
Total	727,397	717,600

Commentary: The number of active members decreased 1.0% from the previous valuation date. The number of retired members and survivors of deceased members currently receiving benefits increased by 2.4% from the previous valuation date. The increase in retiree population is consistent with expectations.

Graph 1: Active Members

The graph below provides a history of the number of active members and reported compensation over the past five years.



Commentary: Reported compensation has increased by 2.7% and the increase has averaged 3.2% over the past four years. Covered payroll was expected to increase annually by 3.50% for valuations prior to December 31, 2020 and 3.25% annually beginning with the December 31, 2020 valuation. Payroll that is not increasing as fast as we assume results in less benefits accruing than we anticipate, but also fewer contributions supporting the system.

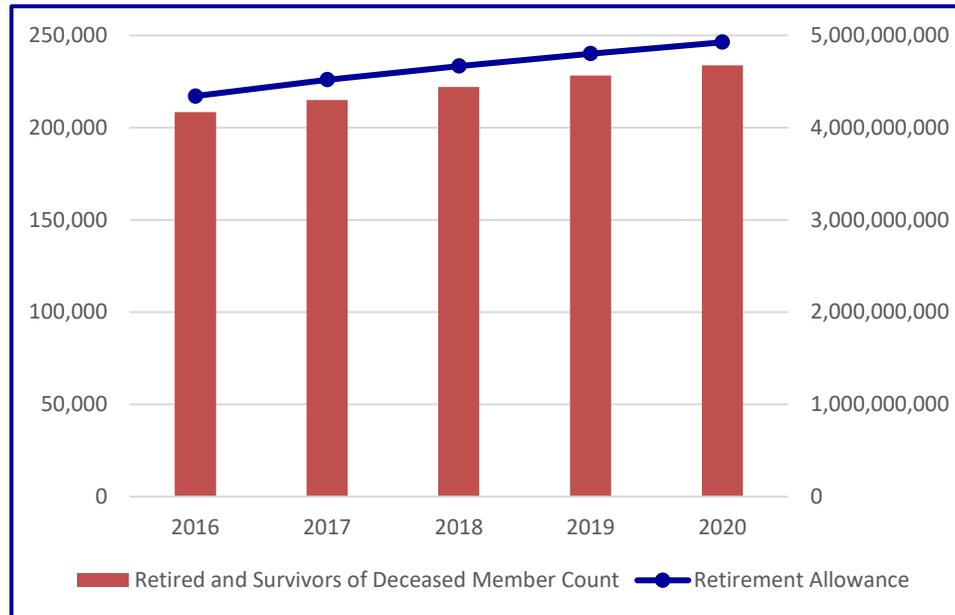


Section 2: The Valuation Process

Valuation Input: Membership Data (continued)

Graph 2: Retired Members and Survivors of Deceased Members

The graph below provides a history of the number of retired members and survivors of deceased members and benefit amounts payable over the past five years.



Commentary: The number of retired members and survivors of deceased members and the benefits paid to these members has been increasing steadily, as expected based on plan assumptions.

A detailed summary of the membership data used in this valuation is provided in Section 3 and Appendix B of this report.



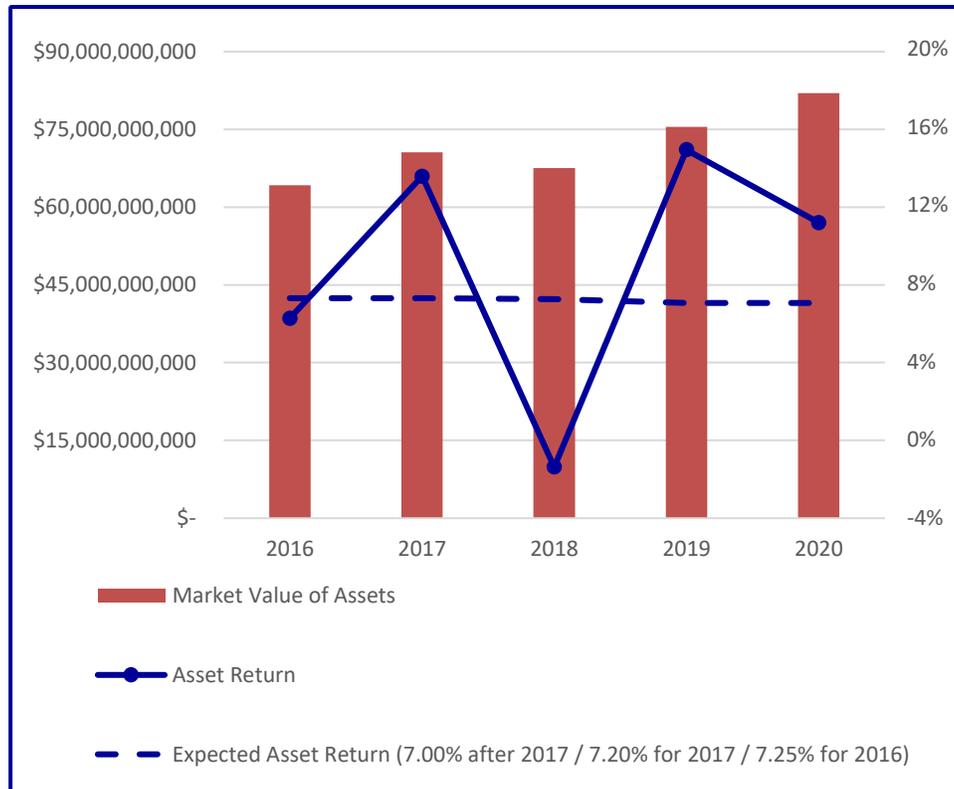
Section 2: The Valuation Process

Valuation Input: Asset Data

TSERS assets are held in trust and are invested for the exclusive benefit of plan members. The Market Value of Assets is \$82.0 billion as of December 31, 2020 and was \$75.5 billion as of December 31, 2019. The investment return for the market value of assets for calendar year 2020 was 11.12%.

Graph 3: Market Value of Assets and Asset Returns

The graph below provides a history of the market value of assets and asset returns over the past five years.



Commentary: Market value returns during 2020 were much greater than the 7.0% assumed rate of return. However, required contributions are higher and the funded ratio is lower than anticipated in the December 31, 2019 baseline projections presented in the December 31, 2019 actuarial report, due to the impact of the changes in assumptions and methods from the experience study.

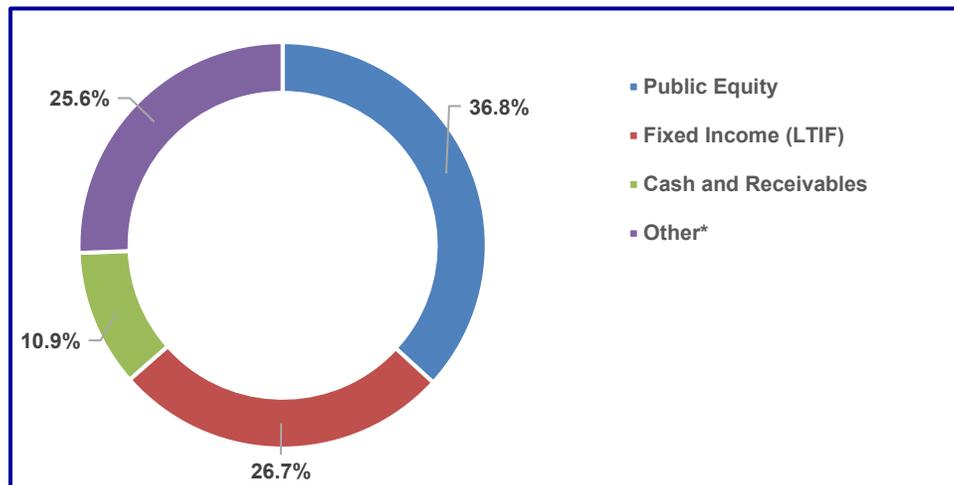


Section 2: The Valuation Process

Valuation Input: Asset Data (continued)

Graph 4: Allocation of Investments by Category

The graph below provides the breakdown of the market value of assets at December 31, 2020 by asset category.



* Real Estate, Alternatives, Inflation and Credit

Commentary: Based on historical market returns, the current asset allocation, the current investment policy, and the expectation of future asset returns, as reviewed in the recent experience study, the 6.50% discount rate used in this valuation is reasonable and appropriate.

A detailed summary of the market value of assets is provided in Section 4 of this report.



Section 2: The Valuation Process

Valuation Input: Benefit Provisions

Benefit provisions are described in North Carolina General Statutes, Chapter 135.

Highlights of the benefit provisions are described below.

- An unreduced retirement allowance is payable to non-law enforcement members who retire from service:
 - after attaining age 65 and five years of creditable service;
 - after attaining age 60 and 25 years of creditable service; or
 - after attaining 30 years of creditable service
- An unreduced retirement allowance is payable to law enforcement members who retire from service:
 - after attaining age 55 and five years of creditable service; or
 - after attaining 30 years of creditable service
- The unreduced retirement allowance is equal to 1.82% of a member's average final compensation multiplied by the number of years of creditable service. Average final compensation is based on the four highest consecutive years of compensation.
- A reduced retirement allowance is payable to non-law enforcement members who retire from service:
 - after attaining age 60 and five years of creditable service; or
 - after attaining age 50 and 20 years of creditable service
- A reduced retirement allowance is payable to law enforcement members who retire from service after attaining age 50 and 15 years of creditable service or after attaining 25 years of creditable service (15 as an officer).
- Ancillary benefits are also payable upon the death or disability of a member.
- TSERS does not provide for automatic cost of living increases as part of the benefit package. Instead, increases may be provided if certain financial conditions are met. More details on cost-of-living increases are provided in Graph 5.

Commentary: Many Public Sector Retirement Systems in the United States have undergone pension reform where the benefits of members (active or future members) have been reduced. Because of the well-funded status of TSERS, benefit cuts have not been made in North Carolina as they have been in most other states. However, if North Carolina's investment policy shifts substantively or if the system incurs other unfavorable investment, economic, or demographic experience, the system should review likely impacts of the shift and consider corresponding changes to actuarial assumptions, funding policy and/or benefit levels.



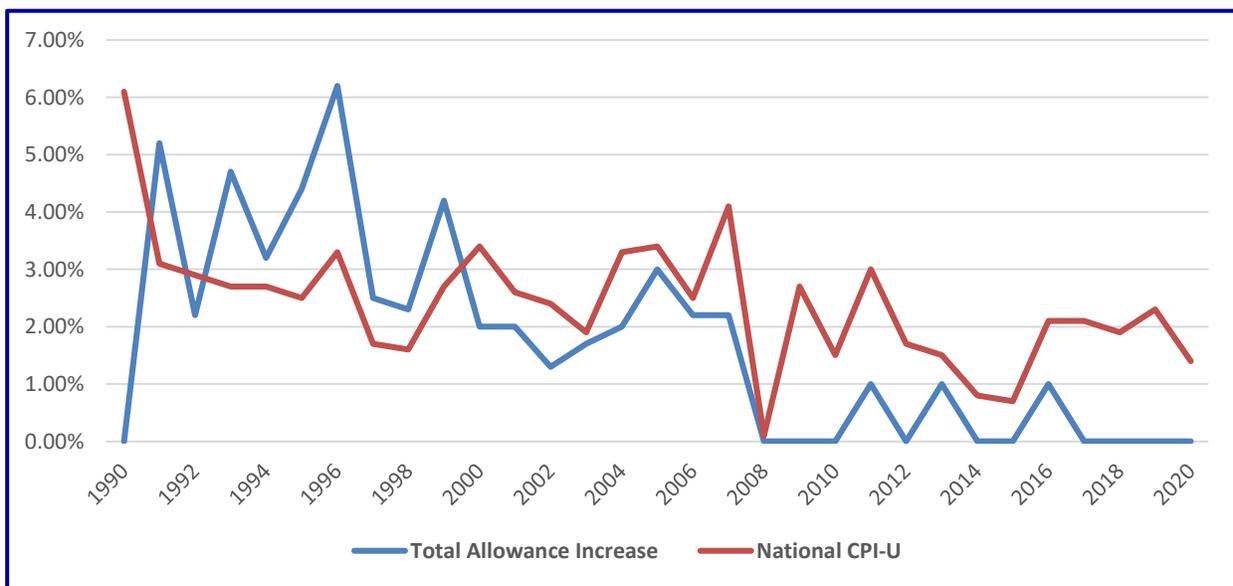
Section 2: The Valuation Process

Valuation Input: Benefit Provisions (continued)

As noted previously, cost-of-living increases are periodically considered by the Board of Trustees to the extent that certain financial conditions are met. Specifically, benefit allowance increases are generally considered when the trust experiences sufficient investment gains to cover the additional actuarial accrued liabilities created by providing the cost-of-living adjustment. In addition to employers consistently contributing the actuary's recommended contribution, this benefit increase policy has helped keep costs manageable when compared to other Public Sector Retirement Systems in the United States. That being said, post-retirement increases help to reduce the risk that the benefit will be eroded by inflation.

Graph 5: Cost-of-Living Increase and CPI-U History

The graph below provides a 30-year history of the allowance increases for TSERS and the national CPI-U.



* Allowance increases are effective at July 1 the following year

Commentary: Prior to 2000, asset returns generally exceeded expectations and allowance increases exceeded the cost of living. Subsequently, asset returns on average have been lower than expected leading to lower allowance increases. Graph shows only permanent increases to the retirement allowance and not one-time supplements that have been granted.

A detailed summary of the benefit provisions is provided in Appendix C of this report.

Valuation Input: Actuarial Assumptions

Actuarial assumptions bridge the gap between the information that we know with certainty as of the valuation date (age, gender, service, pay, and benefits of the members) and what may happen in the future. The actuarial assumptions of TSERS are reviewed at least every five years. Based on this review, the actuary will make recommendations on the demographic and economic assumptions.

Demographic assumptions describe future events that relate to people such as retirement rates, termination rates, disability rates, and mortality rates. Economic assumptions describe future events such as the interest rate, salary increases, the real return, and payroll growth.



Section 2: The Valuation Process

Valuation Input: Actuarial Assumptions (continued)

The assumptions used for the December 31, 2020 actuarial valuation are based on the experience study prepared as of December 31, 2019 and adopted by the Board of Trustees on January 28, 2021. Material assumptions and methods that were changed since the prior valuation:

- The investment return assumption was lowered from 7.00% to 6.50%
- The inflation assumption was lowered from 3.00% to 2.50%
- The real wage growth assumption was increased from 0.50% to 0.75%
- The payroll growth assumption was lowered from 3.50% to 3.25%
- The withdrawal rates, retirement rates, mortality assumption, annual rate of salary increase assumption, and leave conversion assumptions were changed
- The marriage assumption was changed from assuming male spouses are four years older than female spouses to assume that male spouses are three years older than female spouses
- The method for valuing inactive members was changed from 200% of the member's accumulated contributions, to using existing actual data and estimating earnings and average final compensation where actual data isn't available for members with five or more years of service, and using 100% of the member's accumulated contributions for members with less than five years of service
- Estimated compensation for members receiving DIPNC benefits was updated such that the compensation earned as of the disability benefit effective date is increased by inflation to the valuation date

Valuation Input: Funding Methodology

The Funding Methodology is the payment plan for TSERS and is composed of the following three components:

- Actuarial Cost Methods allocate costs to the actuarial accrued liability (i.e. the amount of money that should be in the fund) for past service and normal cost (i.e. the cost of benefits accruing during the year) for current service.
 - The Board of Trustees has adopted Entry Age Normal as its actuarial cost method
 - Develops normal costs that stay level as a percent of payroll
- Asset Valuation Methods smooth or average the market value returns over time to alleviate contribution volatility that results from market returns. The Board of Trustees has adopted the following:
 - Asset returns in excess of or less than the expected return on market value of assets reflected over a five-year period
 - Asset corridor: not greater than 120% of market value and not less than 80% of market value
- Amortization Methods determine the payment schedule for unfunded actuarial accrued liability (i.e. the difference between the actuarial accrued liability and actuarial value of assets). The Board of Trustees has adopted the following:
 - Payment level: the payment is determined as a level dollar amount, similar to a mortgage payment
 - Payment period: a 12-year closed amortization period was adopted for fiscal year ending 2012. A new amortization base is created each year based on the prior year experience



Section 2: The Valuation Process

These elements form the traditional components of the actuarially determined employer contribution. In the addition to the policies above there are also Direct-Rate Smoothing and ECRSP policies which are used in the determination of the final employer contribution rate. The Direct-Rate Smoothing and ECRSP are discussed in more length in Section 6.

Commentary: When compared to other Public Sector Retirement Systems in the United States, the funding policy for TSERS is quite aggressive in that the policy pays down the unfunded accrued liability over a much shorter period of time (12 years) compared to the longer funding periods of most Public Sector Systems. As such it is a best practice in the industry.

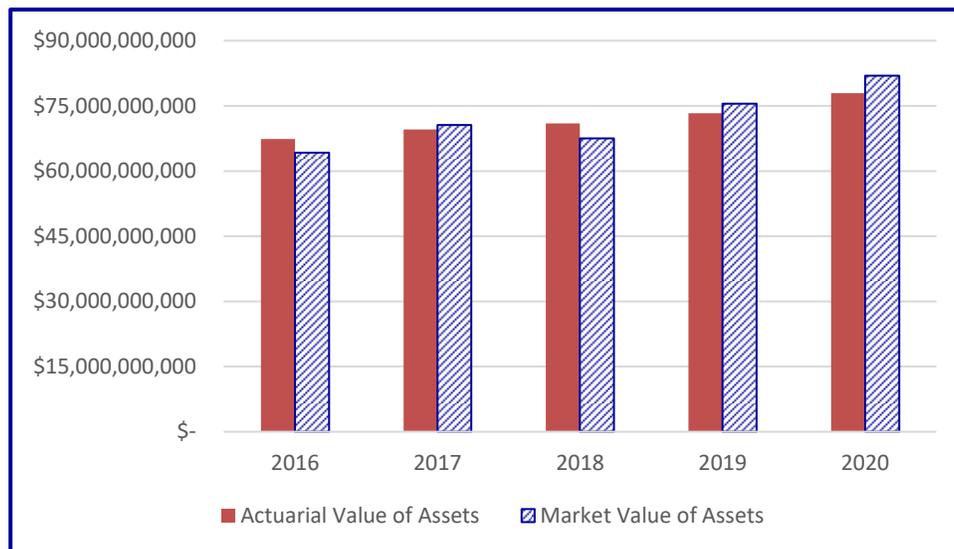
A detailed summary of the actuarial assumptions and methods is provided in Appendix D of this report.

Valuation Results: Actuarial Value of Assets

In order to reduce the volatility that investment gains and losses can have on required contributions and funded status of TSERS, the Board adopted an asset valuation method to determine the Actuarial Value of Assets used for funding purposes. The Actuarial Value of Assets is \$77.9 billion as of December 31, 2020 and \$73.4 billion as of December 31, 2019.

Graph 6: Actuarial Value and Market Value of Assets

The graph below provides a history of the market value and actuarial value of assets over the past five years.



Commentary: The market value of assets is higher than the actuarial value of assets, which is used to determine employer contributions. This indicates that overall there are unrecognized asset gains to be recognized in future valuations.

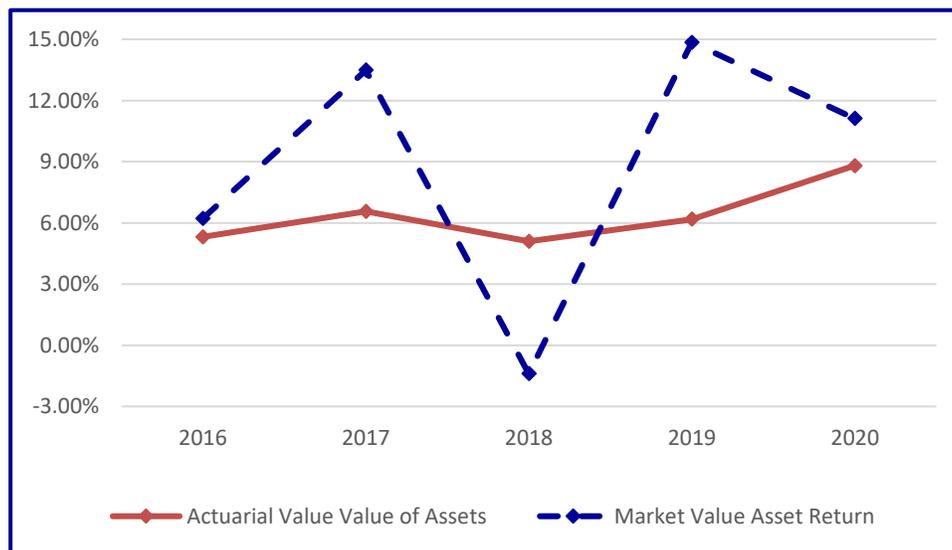


Section 2: The Valuation Process

Valuation Results: Actuarial Value of Assets (continued)

Graph 7: Asset Returns

The graph below provides a history of the market value and actuarial value of asset returns over the past five years.



Commentary: The investment return for the market value of assets for calendar year 2020 was 11.12%. The actuarial value of assets smooths investment gains and losses. Higher than expected market returns, in 2017, 2019, and 2020, resulted in an actuarial value of asset return for calendar year 2020 of 8.80% and a recognized actuarial asset gain of \$1.3 billion during 2020.

A detailed summary of the Actuarial Value of Assets is provided in Section 4 of this report.



Section 2: The Valuation Process

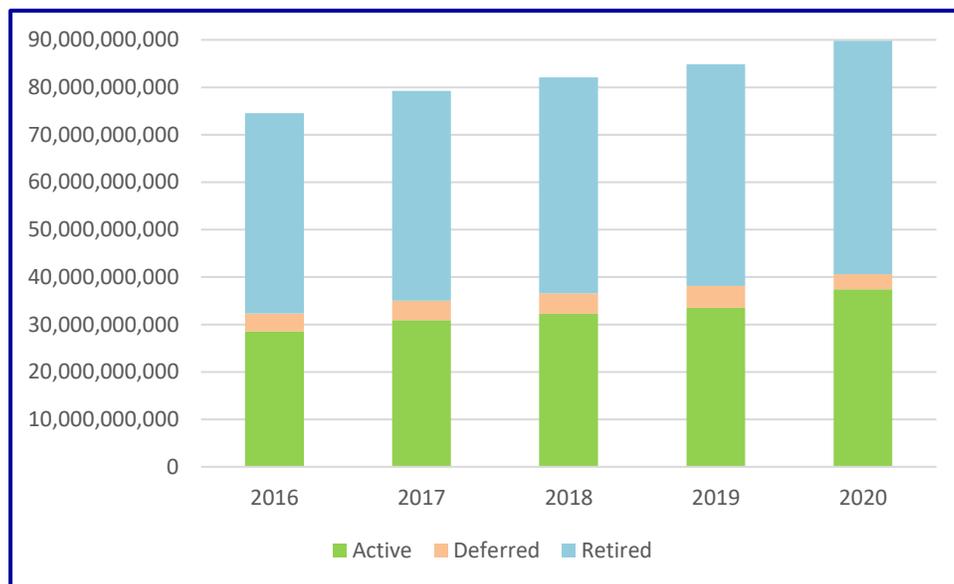
Valuation Results: Actuarial Accrued Liability

Using the provided membership data, benefit provisions, and actuarial assumptions, the future benefit payments of TSERS are estimated. These projected future benefit payments are discounted into today's dollars using the assumed rate of investment return assumption to determine the Present Value of Future Benefits (PVFB) of TSERS. The PVFB is an estimate of the current value of the benefits promised to all members as of a valuation date.

Once the PVFB is developed, an actuarial cost method is used to allocate the PVFB. Under the actuarial cost method, the PVFB is allocated to past, current and future service, respectively known as the actuarial accrued liability (AAL), normal cost (NC) and present value of future normal costs (PVFNC). The AAL is also referred to as the amount of money TSERS should ideally have in the trust. The NC is also referred to as the cost of benefits accruing during the year.

Graph 8: Actuarial Accrued Liability

The graph below provides a history of the actuarial accrued liability over the past five years.



Commentary: The AAL increased from \$84.9 billion to \$89.8 billion during 2020. The Retirement System is an open plan, which means that new members enter the plan each year. In an open plan, liabilities are expected to grow from one year to the next as more benefits accrue and the membership approaches retirement. The AAL was \$2,334 million higher than expected, resulting primarily from changes in assumptions and methods.

A detailed summary of the AAL is provided in Section 5 of this report.



Section 2: The Valuation Process

Valuation Results: Funded Ratio

The funded ratio is a measure of the progress that has been made in funding the plan as of the valuation date. It is the ratio of how much money TSERS actually has in the fund to the amount TSERS should have in the fund.

Graph 9: Actuarial Accrued Liability and Actuarial Value of Assets

The graph below provides a history of the actuarial accrued liability compared to the actuarial value of assets over the past five years.



Commentary: The actuarial value of assets basis is used for computing contributions to alleviate contribution volatility. The difference in the actuarial accrued liability and the actuarial value of assets is the amount of unfunded actuarial accrued liability to be paid off over a 12-year period.

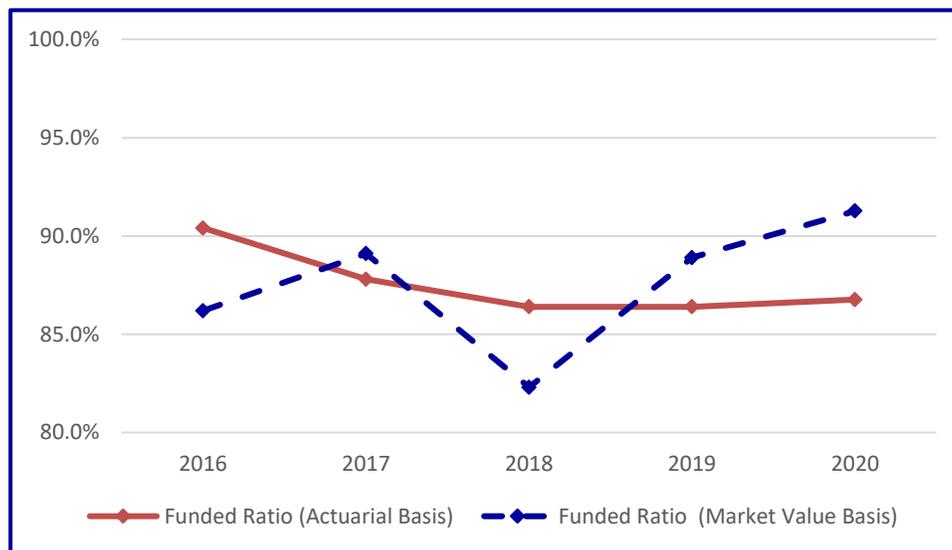


Section 2: The Valuation Process

Valuation Results: Funded Ratio (continued)

Graph 10: Funded Ratios

The graph below provides a history of the funded ratio on a market and actuarial basis over the past five years.



Commentary: The ratio of assets to liabilities shows the health of the plan on an accrued basis. The funded ratio on an actuarial basis increased slightly from 86.4% at December 31, 2019 to 86.8% at December 31, 2020.



Section 2: The Valuation Process

Valuation Results: Employer Contributions

The North Carolina General Statutes provide that the contributions of employers shall consist of a normal contribution and an accrued liability contribution. G.S. 135-8(g) allows for the Board of Trustees of TSERS to make changes to accounting methods and procedures that, in its opinion, are in the interest of sound and proper administration of TSERS.

The December 31, 2019 valuation suggested that the preliminary total employer contribution rate be set at 15.74% of payroll for the fiscal year ending June 30, 2022. As a result of this December 31, 2020 valuation, the preliminary actuarially determined employer contribution rate is 15.13% of payroll for the fiscal year ending June 30, 2023, subject to the impact of any future legislative changes effective during that fiscal year and application of the ECRSP.

Graph 11: Actuarially Determined Employer Contribution Rates Before Applying Funding Policy Minimums

The graph below provides a history of actuarially determined employer contribution rates over the past five years.



* Subject to the impact of future legislative changes effective before or during that fiscal year

Commentary: The actuarially determined employer contribution rate is the amount needed to pay for the cost of the benefits accruing and to pay off the unfunded actuarial accrued liability over a 12-year period, offset for the 6% of pay contribution the members make. The 12-year period is a relatively short period for Public Sector Retirement Systems in the United States, with the funding period for most of these Systems much longer. The shorter period results in higher contributions and more benefit security.

A detailed summary of the actuarially determined employer contribution rates is provided in Section 6 of this report.



Section 2: The Valuation Process

Valuation Results: Projections

Projections of contribution requirements and funded status into the future can be helpful planning tools for stakeholders. This section provides such projections. The projections of the actuarial valuation are known as deterministic projections. Deterministic projections are based on one scenario in the future. The baseline deterministic projection is based on December 31, 2020 valuation results and assumptions.

Key Projection Assumptions:

- Valuation interest rate of 6.50% for all years, with direct rate smoothing of the employer contribution rates over a five-year period beginning July 1, 2022.
- 6.50% investment return on market value of assets
- Actuarial assumptions and methods as described in Appendix D. All future demographic experience is assumed to be exactly realized.
- The contribution rate under the Employer Contribution Rate Stabilization Policy (ECRSP) is contributed until fiscal year ending 2027.
- The actuarially determined contribution rate is contributed for fiscal years ending 2028 and beyond.
- 0% increase in the total active member population
- No cost-of-living adjustments granted
- Future pay increases based on long-term valuation assumptions

The ECRSP adopted by the Board of Trustees on April 29, 2021 for FYE 2023 through 2027 requires that recommended contributions be 0.35% of payroll greater than the appropriated contribution during the prior year, with the following bounds: (1) contributions may not be less than the actuarially determined employer contribution (ADEC) rate and (2) contributions may not be greater than a contribution determined using the same assumptions used to calculate the ADEC but using a discount rate equal to the long-term Treasury bond yield

In addition, we have provided two alternate deterministic projections. The first alternate deterministic projection is based on the same assumptions as the baseline deterministic projection except that it assumes a 0.0% asset return for calendar year 2021. The second alternate deterministic projection is based on the same assumptions as the baseline deterministic projection except that it assumes a 13.0% asset return for calendar year 2021.

Finally, stochastic projections, where hundreds of projections based on varying rates of return are performed and results are ordered, are periodically performed by the Investment Management Division and shared with the Board of Trustees and RSD staff.

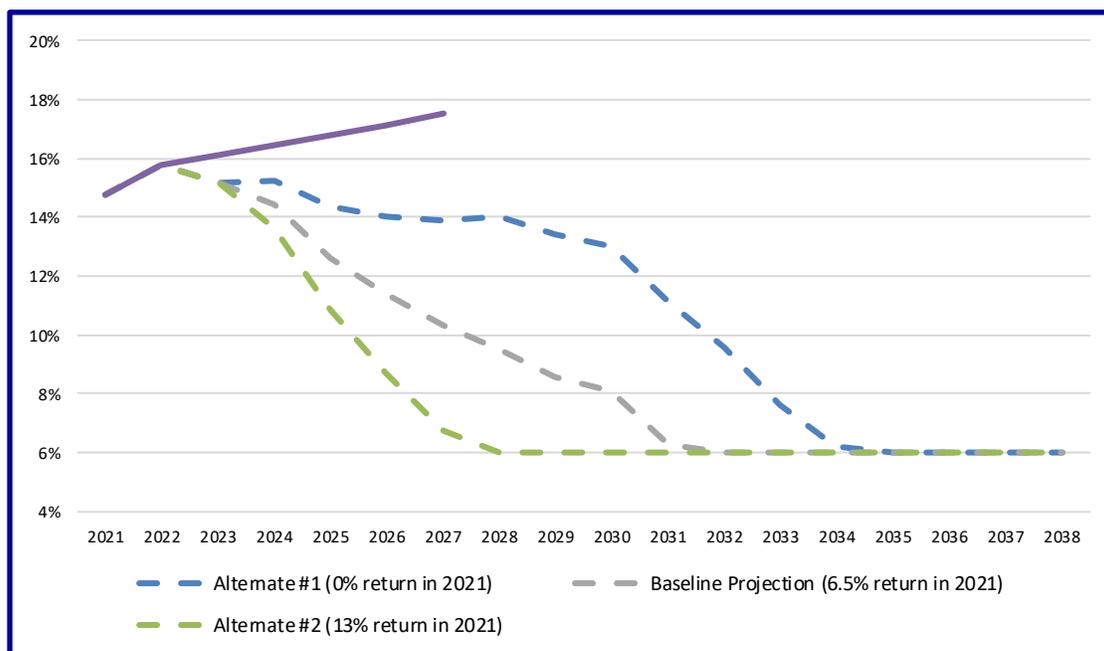


Section 2: The Valuation Process

Valuation Results: Projections (continued)

Graph 12: Projected Actuarially Determined Employer Contribution Rates

The graph below provides the actuarially determined employer contributions rates projected for 15 years.



Commentary: The minimum employer contribution rate is equal to the employee contribution rate of 6.00%.

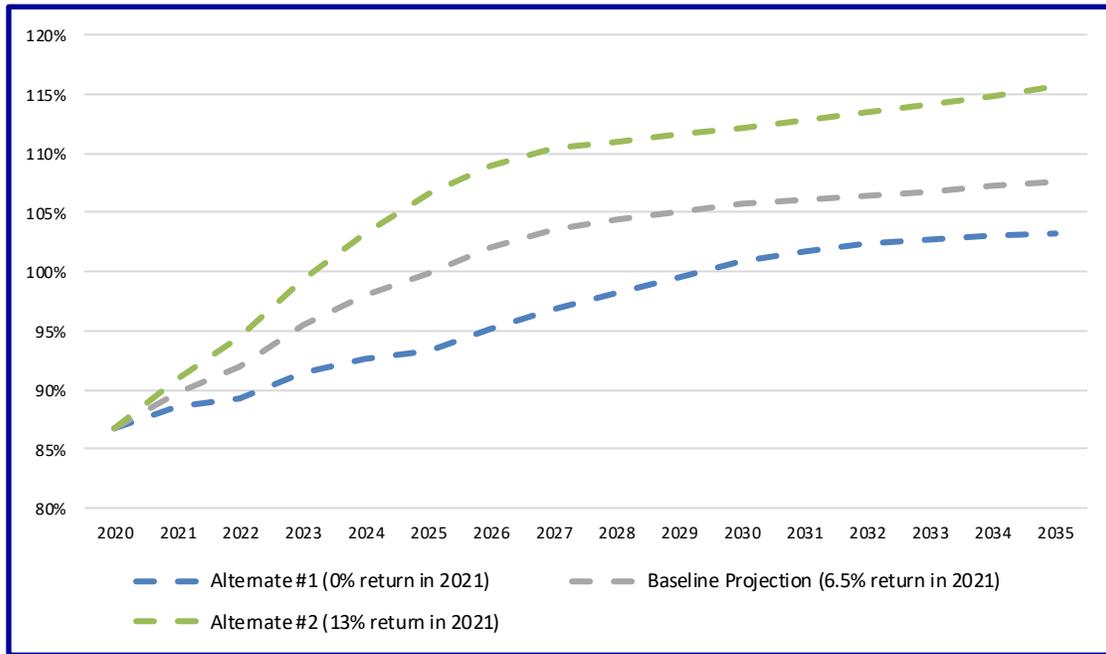


Section 2: The Valuation Process

Valuation Results: Projections (continued)

Graph 13: Projected Funded Ratio

The graph below provides the funded ratio projected for 15 years.



Commentary: Note that if the 6.50% return under the Baseline Projection is achieved, the funded ratio reaches the long-term target of 100% within 5 years. This is a direct result of using a 12-year period to pay off the unfunded actuarial accrued liability.

A detailed summary of the deterministic projections is provided in Section 9 of this report.

Valuation Results: Accounting Information

The Governmental Accounting Standards Board (GASB) issues statements which establish financial reporting standards for defined benefit pension plans and accounting for pension expenditures and expenses for governmental employers.

The valuation has been prepared in accordance with the parameters of Statement No. 67 of the GASB and all applicable Actuarial Standards of Practice. The Net Pension Liability (Asset) under GASB 67 for the fiscal year ending June 30, 2021, is \$4,682,601,000 (compared to \$12,081,997,000 for fiscal year ending June 30, 2020). The required financial reporting information for TSERS under GASB No. 67 can be found in Section 8 of this report.



Section 3: Membership Data

The Retirement Systems Division provided membership data as of the valuation date for each member of TSERS. The membership data assists the actuary in estimating benefits that could be paid in the future. The tables below provide a summary of the membership data used in this valuation. Detailed tabulations of data are provided in Appendix B.

Table 2: Active Member Data

	Member Count	Average Age	Average Service	Reported Compensation
Teachers, Librarians and Counselors	148,915	43.79	10.94	\$ 7,308,625,339
Other Education	46,965	49.69	11.62	2,114,081,030
General Employees	101,311	46.86	10.79	5,532,401,393
Law Enforcement Officers	<u>5,580</u>	<u>40.30</u>	<u>11.91</u>	<u>332,557,249</u>
Total	302,771	45.67	11.01	\$ 15,287,665,011

The table above includes members not in receipt of benefits who had reported compensation in 2020.

**Table 3: Disabled Member Data
(Receiving Benefit from the Disability Income Plan of North Carolina)**

	Member Count	Average Age	Average Service	Valuation Compensation
Teachers, Librarians and Counselors	1,788	55.70	14.24	\$ 70,738,124
Other Education	716	56.97	13.46	20,894,180
General Employees	2,876	56.14	13.10	107,247,593
Law Enforcement Officers	<u>30</u>	<u>50.50</u>	<u>16.99</u>	<u>2,001,122</u>
Total	5,410	56.08	13.55	\$ 200,881,019

The table above includes members not in receipt of benefits who did not have reported compensation in 2020 and who were reported as disabled in the current or prior valuations and not subsequently reported as returned to work.



Section 3: Membership Data

Table 4: Terminated Vested Member Data

	Member Count	Average Age	Average Service	Accumulated Contributions
Teachers, Librarians and Counselors	75,746	42.03	4.26	\$ 1,014,652,230
Other Education	19,113	46.39	4.00	221,593,689
General Employees	89,045	46.96	3.61	1,179,726,156
Law Enforcement Officers	<u>1,561</u>	<u>41.53</u>	<u>5.24</u>	<u>30,827,404</u>
Total	185,465	44.84	3.93	\$ 2,446,799,479

The table above includes members not in receipt of benefits who did not have reported compensation in 2020 and who were not valued as disabled members.

Table 5: Data for Members Currently Receiving Benefits

	Member Count	Average Age	Annual Retirement Allowances
<u>Retired Members (Healthy at Retirement)</u>			
Teachers and Other Education	116,372	71.11	\$ 2,790,263,310
General Employees	85,269	72.40	1,569,002,419
Law Enforcement Officers	<u>3,278</u>	<u>65.74</u>	<u>105,252,357</u>
Total	204,919	71.56	\$ 4,464,518,086
<u>Retired Members (Disabled at Retirement)*</u>			
Teachers and Other Education	4,526	71.60	\$ 88,212,216
General Employees	8,023	71.10	126,922,422
Law Enforcement Officers	<u>175</u>	<u>69.35</u>	<u>4,455,061</u>
Total	12,724	71.25	\$ 219,589,699
<u>Survivors of Deceased Members</u>			
Teachers and Other Education	5,538	73.28	\$ 101,330,696
General Employees	10,080	73.81	131,572,031
Law Enforcement Officers	<u>490</u>	<u>72.74</u>	<u>10,676,068</u>
Total	16,108	73.60	\$ 243,578,795
Grand Total	233,751	71.69	\$ 4,927,686,580

* Includes retired members reported as disabled in a prior valuation and not subsequently reported as returned to work.



Section 4: Asset Data

Assets are held in trust and are invested for the exclusive benefit of TSERS members. The tables below provide the details of the Market Value of Assets for the current and prior years' valuations.

Table 6: Market Value of Assets

Asset Data as of	12/31/2020	12/31/2019
Beginning of Year Market Value of Assets	\$ 75,486,780,473	\$ 67,536,480,309
Employer Contributions	2,220,834,130	1,982,469,767
Employee Contributions	972,729,960	955,063,189
Benefit Payments Other Than Refunds	(4,890,953,170)	(4,757,088,409)
Refunds	(99,462,455)	(102,281,124)
Administrative Expenses	(13,461,042)	(12,107,623)
Investment Income	<u>8,292,957,190</u>	<u>9,884,244,364</u>
Net Increase / (Decrease)	6,482,644,613	7,950,300,164
End of Year Market Value of Assets	\$ 81,969,425,086	\$ 75,486,780,473
Estimated Net Investment Return	11.12%	14.85%

Table 7: Allocation of Investments by Category of the Market Value of Assets

Asset Data as of	12/31/2020	12/31/2019
Allocation by Dollar Amount		
Public Equity	\$ 30,140,335,002	\$ 24,716,066,368
Fixed Income (LTIF)	21,884,828,690	19,902,316,895
Cash and Receivables	8,918,812,993	10,146,379,496
Other*	21,025,448,401	20,722,017,714
Total Market Value of Assets	\$ 81,969,425,086	\$ 75,486,780,473
Allocation by Percentage of Asset Value		
Public Equity	36.8%	32.7%
Fixed Income (LTIF)	26.7%	26.4%
Cash and Receivables	10.9%	13.4%
Other*	<u>25.6%</u>	<u>27.5%</u>
Total Market Value of Assets	100.0%	100.0%

* Real Estate, Alternatives, Inflation and Credit



Section 4: Asset Data

In order to reduce the volatility that investment gains and losses can have on the required contributions and funded status of TSERS, the Board adopted an asset valuation method to determine the Actuarial Value of Assets used for funding purposes. The table below provides the calculation of the Actuarial Value of Assets at the valuation date.

Table 8: Actuarial Value of Assets

Asset Data as of	12/31/2020
Beginning of Year Actuarial Value of Assets	\$ 73,353,759,963
Beginning of Year Market Value of Assets	75,486,780,473
Total Contributions	3,193,564,090
Benefit Payments, Refunds and Administrative Expenses	<u>(5,003,876,667)</u>
Net Cash Flow	(1,810,312,577)
Expected Investment Return	5,221,785,320
Expected End of Year Market Value of Assets	78,898,253,216
End of Year Market Value of Assets	81,969,425,086
Excess of Market Value of Assets over Expected Market Value of Assets	3,071,171,870
80% of 2020 Asset Gain / (Loss)	2,456,937,496
60% of 2019 Asset Gain / (Loss)	3,133,940,387
40% of 2018 Asset Gain / (Loss)	(2,335,638,492)
20% of 2017 Asset Gain / (Loss)	<u>792,115,656</u>
Total Deferred Asset Gain / (Loss)	4,047,355,047
Preliminary End of Year Actuarial Value of Assets	77,922,070,039
Final End of Year Actuarial Value of Assets (not less than 80% and not greater than 120% of Market Value of Assets)	\$ 77,922,070,039
Estimated Net Investment Return	8.80%

Commentary: The actuarial value of assets smooths investment gains/losses, resulting in less volatility in the employer contribution. The asset valuation recognizes asset returns in excess of or less than the expected return on the market value of assets over a five-year period. Actuarial value of assets was reset to the market value of assets at December 31, 2014.

Higher than expected market returns, in 2017, 2019, and 2020, resulted in an actuarial value of asset return for calendar year 2020 of 8.80% and a recognized actuarial asset gain of \$1.3 billion during 2020.



Section 4: Asset Data

The valuation assumed that the funds would earn a 7.00% asset return during 2020. The table below provides a history of the Actuarial Value and Market Value of Asset returns.

Table 9: Historical Asset Returns

Calendar Year	Expected Asset Return	Actuarial Value of Asset Return	Market Value of Asset Return	20 Year Average Market Return
1996	7.50%	10.18%	9.39%	NA
1997	7.25%	10.18%	18.16%	NA
1998	7.25%	9.92%	16.66%	NA
1999	7.25%	10.60%	10.15%	NA
2000	7.25%	11.55%	2.50%	NA
2001	7.25%	8.51%	-1.87%	NA
2002	7.25%	5.66%	-5.21%	NA
2003	7.25%	7.98%	18.23%	NA
2004	7.25%	8.56%	10.73%	NA
2005	7.25%	8.26%	6.97%	NA
2006	7.25%	8.94%	11.41%	NA
2007	7.25%	8.87%	8.38%	NA
2008	7.25%	2.89%	-19.50%	NA
2009	7.25%	4.74%	14.84%	NA
2010	7.25%	5.89%	11.47%	NA
2011	7.25%	5.15%	2.19%	NA
2012	7.25%	6.32%	11.82%	NA
2013	7.25%	7.43%	12.21%	NA
2014	7.25%	7.19%	6.21%	NA
2015	7.25%	5.87%	0.36%	6.86%
2016	7.25%	5.32%	6.22%	6.71%
2017	7.20%	6.56%	13.49%	6.49%
2018	7.00%	5.10%	-1.39%	5.60%
2019	7.00%	6.18%	14.85%	5.82%
2020	7.00%	8.80%	11.12%	6.25%
20-Yr Average	7.22%	6.70%	6.25%	NA
Range	0.25%	6.05%	37.73%	NA

Commentary: The average investment return recognized for purposes of determining the annual change in contribution each year is the actuarial value of assets return. Currently, the average actuarial return over the past 20 years of 6.70% compares with an average market return of 6.25%. The range of returns on market value of assets is markedly more volatile, 37.73% versus 6.05%. Using the actuarial value of assets instead market value results in much lower employer contribution volatility, while ensuring that the actuarial needs of TSERS are met.



Section 5: Liability Results

Using the provided membership data, benefit provisions, and actuarial assumptions, the Retirement System's future benefit payments are estimated. These projected future benefit payments are discounted into today's dollars using the assumed rate of investment return assumption to determine the Present Value of Future Benefits. The Present Value of Future Benefits is allocated to past, current and future service, respectively known as the actuarial accrued liability, normal cost and present value of future normal costs. The table below provides these liability numbers for the current and prior years' valuations.

Table 10: Liability Summary

Valuation Results as of	12/31/2020	12/31/2019
(a) Present Value of Future Benefits		
(a) Active Members	\$ 52,656,094,104	\$ 47,435,181,634
(b) Terminated Members	3,184,248,746	4,621,814,392
(c) Members Currently Receiving Benefits	<u>49,174,094,142</u>	<u>46,723,661,952</u>
(d) Total	\$ 105,014,436,992	\$ 98,780,657,978
(b) Present Value of Future Normal Costs		
(a) Employee Future Normal Costs	\$ 7,509,039,557	\$ 7,432,300,698
(b) Employer Future Normal Costs	<u>7,696,323,361</u>	<u>6,475,042,008</u>
(c) Total	\$ 15,205,362,918	\$ 13,907,342,706
(c) Actuarial Accrued Liability: (a4) – (b3)	\$ 89,809,074,074	\$ 84,873,315,272
(d) Actuarial Value of Assets	\$ 77,922,070,039	\$ 73,353,759,963
(e) Unfunded Actuarial Accrued Liability: (c) – (d)	\$ 11,887,004,035	\$ 11,519,555,309



Section 5: Liability Results

The table below provides a reconciliation of the prior year's unfunded actuarial accrued liability to the current year's unfunded actuarial accrued liability.

Table 11: Reconciliation of Unfunded Actuarial Accrued Liability

(in millions)	
Unfunded Actuarial Accrued Liability (UAAL) as of 12/31/2019	\$ 11,520
Normal Cost and Administrative Expense during 2020	1,775
Reduction due to Actual Contributions during 2020	(3,194)
Interest on UAAL, Normal Cost, and Contributions	758
Asset (Gain) / Loss	(1,306)
Actuarial Accrued Liability (Gain) / Loss	(76)
Impact of Assumption Changes	2,410
Impact of Legislative Changes	-
Unfunded Actuarial Accrued Liability (UAAL) as of 12/31/2020	\$ 11,887

Commentary: During 2020, the UAAL increased more than expected primarily due to the assumption changes of \$2,410. This was offset by an asset gain during the year of \$1,306 million. Additionally, demographic experience decreased the UAAL by \$76 million.



Section 6: Actuarially Determined Employer Contribution

The actuarially determined employer contribution consists of a normal cost rate, an accrued liability rate and an administrative expense rate. The normal cost rate is the employer's portion of the cost of benefits accruing during the year after reducing for the member contribution. The accrued liability rate is the payment toward the unfunded accrued liability in order to pay off the unfunded accrued liability over 12 years. The expense rate is the payment for expected administrative expenses.

The table below provides the calculation of the actuarially determined employer contribution for the current and prior years' valuations.

The Employer Contribution Rate Stabilization Policy (ECRSP) adopted by the Board of Trustees on April 29, 2021 requires that recommended contributions be 0.35% of payroll greater than the appropriated contribution during the prior year, with the following bounds: (1) contributions may not be less than the actuarially determined employer contribution (ADEC) calculated below and (2) contributions may not be greater than a contribution determined using the same assumptions used to calculate the ADEC but using a discount rate equal to the long-term Treasury bond yield.

The ECRSP would result in a recommended contribution rate of 16.09% of payroll for fiscal year ending 2023.

- The minimum (before considering the ADEC) is 16.09%; the appropriated contribution from last year of 15.74% plus 0.35%.
- 17.52% is the actuarially determined employer contribution calculated in this most recent valuation prior to direct-rate smoothing. 15.13% is the actuarially determined employer contribution after direct-rate smoothing of the assumption and method changes.
- The maximum is approximately 92.34%; the estimated actuarially determined employer contribution using a discount rate equal to the long-term Treasury bond yield (1.65%).

Table 12: Calculation of the Actuarially Determined Employer Contribution (ADEC)

Valuation Date ADEC for Fiscal Year Ending	12/31/2020 6/30/2023	12/31/2019 6/30/2022
Normal Cost Rate Calculation		
(a) Normal Cost Rate	6.29%	5.06%
(b) Expense Rate	<u>0.10%</u>	<u>0.10%</u>
(c) Total Normal Cost Rate	6.39%	5.16%
Accrued Liability Rate Calculation		
(d) Total Annual Amortization Payments*	\$ 1,888,258,829	\$ 1,769,941,231
(e) Projected Compensation**	16,966,950,517	16,733,893,898
(f) Accrued Liability Rate: (d) / (e)	11.13%	10.58%
Preliminary ADEC: (c) + (f)	17.52%	15.74%
ADEC With Direct Rate Smoothing	15.13%	15.74%
Impact of Legislative Changes	<u>N/A</u>	<u>N/A</u>
Final ADEC	N/A	N/A

*See Table 15 for more detail

** Beginning with the December 31, 2017 valuation, compensation is projected to the fiscal year over which contributions will occur



Section 6: Actuarially Determined Employer Contribution

The table below provides a reconciliation of the actuarially determined employer contributions.

Table 13: Reconciliation of the Change in the ADEC

Fiscal year ending June 30, 2022 Preliminary ADEC (based on December 31, 2019 valuation)	15.74%
Impact of Legislative Changes	<u>0.00</u>
Fiscal year ending June 30, 2022 ADEC for Reconciliation	15.74%
Change Due to Anticipated Reduction in UAAL*	(0.21)
Change Due to Demographic (Gain) / Loss	(0.06)
Change Due to Investment (Gain) / Loss	(1.03)
Change Due to Contributions Different than ADEC**	0.09
Impact of Assumption Change	2.99
Impact of Direct Rate Smoothing	(2.39)
Fiscal year ending June 30, 2023 Preliminary ADEC (based on December 31, 2020 valuation)	15.13%

*Amortization of the UAAL is determined as a level dollar amount with payments expected to remain the same over the amortization period, but was calculated as a percentage of valuation payroll in the previous valuation. Payroll is expected to increase annually while the expected amortization payment does not increase. This causes the expected amortization payment to be a lesser percentage of the expected payroll.

**Includes impact of direct rate smoothing of FYE 2020 contribution.



Section 6: Actuarially Determined Employer Contribution

Amortization methods determine the payment schedule for the unfunded actuarial accrued liability. TSERS adopted a 12-year closed amortization period for fiscal year ending 2012. A new amortization base is created each year based on the prior years' experience. The tables below provide the calculation of the new amortization base and the amortization schedule for the current year's valuation.

Table 14: Calculation of the New Amortization Base

Calculation as of	12/31/2020	12/31/2019
(a) Unfunded Actuarial Accrued Liability	\$ 11,887,004,035	\$ 11,519,555,309
(b) Prior Years' Outstanding Balance	\$ 10,745,847,397	\$ 10,653,623,411
(c) New Amortization Base: (a) – (b)	\$ 1,141,156,638	\$ 865,931,898
(d) New Amortization Payment	\$ 148,959,390	\$ 116,652,669

Table 15: Amortization Schedule for Unfunded Accrued Liability

Date Established	Original Balance	12/31/2020 Outstanding Balance	Annual Payment
December 31, 2009	\$ 2,360,173,025	\$ 738,050,538	\$ 319,114,350
December 31, 2010	242,581,914	102,682,097	32,694,487
December 31, 2011	911,037,989	479,580,474	122,405,196
December 31, 2012	78,277,759	48,734,299	10,485,336
December 31, 2013	(114,027,863)	(81,218,563)	(15,228,907)
December 31, 2014	(206,952,282)	(164,715,773)	(27,559,708)
December 31, 2015	2,586,581,023	2,260,120,234	343,435,477
December 31, 2016	1,983,860,720	1,876,090,210	262,453,830
December 31, 2017	2,551,629,668	2,583,252,521	336,317,586
December 31, 2018	1,836,431,391	1,976,724,229	241,617,831
December 31, 2019	865,931,898	926,547,131	113,563,961
December 31, 2020	1,141,156,638	<u>1,141,156,638</u>	<u>148,959,390</u>
Total		11,887,004,035	1,888,258,829

Commentary: This is the payment schedule for the unfunded actuarial accrued liability of TSERS.



Section 6: Actuarially Determined Employer Contribution

The tables below provide a history of the actuarially determined employer contribution and the corresponding appropriated rate.

Table 16: History of Actuarially Determined Employer Contribution and Appropriated Rates

Valuation Date	Fiscal Year Ending	Normal Rate	Accrued Liability Rate	Change due to Legislation*	Final ADEC**	Appropriated Rate
12/31/2020	06/30/2023	6.39%	11.13%	N/A	N/A	N/A
12/31/2019	06/30/2022	5.16%	10.58%	N/A	N/A	N/A
12/31/2018	06/30/2021	5.18%	10.19%	0.00%	15.37%	14.78%
12/31/2017	06/30/2020	5.17%	8.99%	0.00%	14.16%	12.97%
12/31/2016	06/30/2019	4.48%	7.50%	0.31%	12.29%	12.29%
12/31/2015	06/30/2018	4.31%	5.77%	0.45%	10.53%	10.78%

*The change due to legislation for the contribution for fiscal year ending June 30, 2019 includes a 0.31% increase in the ADEC due to the one-time cost-of-living supplement payable in October, 2018.

**Final ADEC reduced for direct-rate smoothing of discount rate change for FYE 2020, 2021, and 2023.

The following table shows estimates of the potential cost of two types of benefit improvements if they were enacted based on the results of the December 31, 2020 or December 31, 2019 valuations. The first benefit improvement is a permanent one-time cost-of-living increase and the second is an increase in the defined benefit formula multiplier.

Table 17: Cost of Benefits Enhancements

Calculation as of	12/31/2020	12/31/2019
Increase in UAAL for a 1% COLA	\$ 540,027,000	\$ 511,088,000
Increase in ADEC for a 1% COLA	0.42%	0.41%
Increase in UAAL for a 0.1% Increase in the Defined Benefit Formula	\$ 489,906,000	\$ 440,942,000
Increase in ADEC for a 0.1% Increase in the Defined Benefit Formula	0.44%	0.41%

The 1% COLA in the December 31, 2020 column would be effective July 1, 2022 and includes expected costs of COLAs paid for retirements after December 31, 2020 and before June 30, 2022. The COLA would be paid in full to retired members and survivors of deceased members on the retirement roll on July 1, 2021 and would be prorated for retired members and survivors of deceased members who commence benefits after July 1, 2021 but before June 30, 2022.

A corresponding increase in retirement allowances would be paid in the event of an increase in the defined benefit formula.



Section 7: Valuation Balance Sheet

The valuation balance sheet shows the projected assets and liabilities of TSERS. The items shown in the balance sheet are present values actuarially determined as of the relevant valuation date. The table below provides the valuation balance sheet for the current year and prior year.

Table 18: Valuation Balance Sheet on a Projected Basis

Balance Sheet as of	12/31/2020	12/31/2019
Assets		
Current Actuarial Value of Assets		
Annuity Savings Fund	\$ 14,412,915,570	\$ 13,893,664,489
Pension Accumulation Fund	<u>63,509,154,469</u>	<u>59,460,095,474</u>
Total	\$ 77,922,070,039	\$ 73,353,759,963
Future Member Contributions to the Annuity Savings Fund	\$ 7,509,039,557	\$ 7,432,300,698
Prospective Contributions to the Pension Accumulation Fund		
Normal Contributions	\$ 7,696,323,361	\$ 6,475,042,008
Unfunded Accrued Liability Contributions	<u>11,887,004,035</u>	<u>11,519,555,309</u>
Total	\$ 19,583,327,396	\$ 17,994,597,317
Total Assets	<u>\$ 105,014,436,992</u>	<u>\$ 98,780,657,978</u>
Liabilities		
Annuity Savings Fund		
Past Member Contributions	\$ 14,412,915,570	\$ 13,893,664,489
Future Member Contributions	<u>7,509,039,557</u>	<u>7,432,300,698</u>
Total Contributions	\$ 21,921,955,127	\$ 21,325,965,187
Pension Accumulation Fund		
Benefits Currently in Payment	\$ 49,174,094,142	\$ 46,723,661,952
Benefits to be Paid to Current Active and Inactive Members	33,918,387,723	30,731,030,839
Reserve for Increases in Retirement Allowances	<u>0</u>	<u>0</u>
Total Benefits Payable	\$ 83,092,481,865	\$ 77,454,692,791
Total Liabilities	<u>\$ 105,014,436,992</u>	<u>\$ 98,780,657,978</u>



Section 8: Accounting Results

This section contains the accounting information for Governmental Accounting Standards Board (GASB) Statement No. 67 for fiscal year ending June 30, 2021 based on a valuation date of December 31, 2020.

Please note that GASB Statement No. 67 (*Financial Reporting for Pension Plans*) is applicable for fiscal years ending 2014 and later.

The June 30, 2021 total pension liability presented in this section was determined by an actuarial valuation as of December 31, 2020, based on the assumptions, methods and plan provisions described in this report. The actuarial cost method used to develop the total pension liability is the Entry Age Normal Cost method, as required by GASB Statement No. 67.

GASB Statement No. 67 set forth certain items of information to be disclosed in the financial statements of the Plan. The tables below provide a distribution of the number of employees by type of membership.

Table 19: Number of Active and Retired Members as of December 31, 2020

Group	Number
Retired members and survivors of deceased members currently receiving benefit	233,751
Terminated members and survivors of deceased members entitled to benefits but not yet receiving benefits	185,465
Active Members*	<u>308,181</u>
Total	727,397

* Includes current recipients of DIP benefits.



Section 8: Accounting Results

GASB Statement No. 67 set forth certain items of information to be disclosed in the financial statements of the Plan. The tables below provide the schedule of changes in Net Pension Liability (Asset).

Table 20: Schedule of Changes in Net Pension Liability (Asset)

Schedule of Changes in Net Pension Liability as of June 30, 2021	
Total Pension Liability	
Service Cost	\$ 1,906,954,000
Interest	5,857,546,000
Changes of Benefit Terms	0
Difference between Expected and Actual Experience	(141,796,000)
Change of Assumptions	2,341,992,000
Benefit Payments, including Refund of Member Contributions	<u>(5,055,075,000)</u>
Net Change in Total Pension Liability	4,909,621,000
Total Pension Liability - Beginning of Year	\$ 86,164,011,000
Total Pension Liability - End of Year	\$ 91,073,632,000
Plan Fiduciary Net Position	
Employer Contributions	\$ 2,373,252,000
Member Contributions	981,051,000
Net Investment Income	14,023,684,000
Benefit Payments, including Refund of Member Contributions	(5,055,075,000)
Administrative Expenses	(13,870,000)
Other	<u>(25,000)</u>
Net Change in Plan Fiduciary Net Position	12,309,017,000
Plan Fiduciary Net Position - Beginning of Year	\$ 74,082,014,000
Plan Fiduciary Net Position - End of Year	\$ 86,391,031,000

Table 21: Net Pension Liability (Asset)

Net Pension Liability (Asset)		
	June 30, 2021	June 30, 2020
Total Pension Liability	\$ 91,073,632,000	\$ 86,164,011,000
Plan Fiduciary Net Position	<u>86,391,031,000</u>	<u>74,082,014,000</u>
Net Pension Liability (Asset)	\$ 4,682,601,000	\$ 12,081,997,000
Plan Fiduciary Net Position as a Percentage of the Total Pension Liability (Asset)	94.86%	85.98%



Section 8: Accounting Results

The table below is the sensitivity of the net pension liability to changes in the discount rate.

Table 22: Sensitivity of the Net Pension Liability (Asset) at June 30, 2021 to Changes in the Discount Rate

Sensitivity of the Net Pension Liability to Changes in the Discount Rate			
	1% Decrease	Current	1% Increase
Discount Rate	5.50%	6.50%	7.50%
Net Pension Liability (Asset)	\$ 15,707,208,000	\$ 4,682,601,000	\$ (4,481,611,000)

The discount rate used to measure the total pension liability was 6.50%. The projection of cash flows used to determine the discount rate assumed that for fiscal year ending 2022, System contributions will follow the Employer Contribution Rate Stabilization Policy as adopted by the Board of Trustees on January 21, 2016, and “direct-rate smoothing” as adopted by the Board of Trustees on April 26, 2018. It is assumed that for fiscal years ending 2023 through 2027, System contributions will follow the Employer Contribution Rate Stabilization Policy as adopted by the Board of Trustees on April 29, 2021, and “direct-rate smoothing” as adopted by the Board of Trustees on January 28, 2021. It is assumed that for fiscal years 2028 and beyond, System contributions will be based on the actuarially determined contribution rate with a minimum employer contribution rate of 6.00% of payroll in accordance with G.S 135-8(d)(1a). Based on those policies, the System’s fiduciary net position was projected to be available to make all projected future benefit payments of current plan members. Please see Appendix A for additional detail.

The table below provides the methods and assumptions used to calculate the actuarially determined contribution rate.

Table 23: Additional Information for GASB Statement No. 67

Valuation Date	12/31/2020
Actuarial Cost Method	Entry Age
Amortization Method	Level dollar closed
Amortization Period	12 year closed periods
Asset Valuation Method	Asset returns in excess of or less than the expected return on market value of assets reflected over a five-year period (not greater than 120% of market value and not less than 80% of market value)
Actuarial Assumptions:	
Investment Rate of Return*	6.50%
Projected Salary Increases**	3.25% - 8.05%
*Includes Inflation of	2.50%
**Includes Inflation and Productivity of	3.25%
Cost-of-living Adjustments	N/A



Section 9: Projections

Projections of contribution requirements and funded status into the future can be helpful planning tools for stakeholders. This section provides such projections. The projections of the actuarial valuation are known as deterministic projections. Deterministic projections are based on one scenario in the future. The baseline deterministic projection is based on December 31, 2020 valuation results and assumptions.

Key Projection Assumptions

- Valuation interest rate of 6.50% for all years in conjunction with direct rate smoothing of the employer contribution rate over a 5-year period beginning July 1, 2022.
- 6.50% investment return on market value of assets
- Actuarial assumptions and methods as described in Appendix D. All future demographic experience is assumed to be exactly realized.
- The contribution rate under the Employer Contribution Rate Stabilization Policy (ECRSP) is contributed until fiscal year ending 2027.
- The actuarially determined contribution rate is contributed for fiscal years ending 2028 and beyond.
- 0% increase in the total active member population
- No cost-of-living adjustments granted
- Future pay increases based on long-term salary increase assumptions

The ECRSP adopted by the Board of Trustees on April 29, 2021 for FYE 2023 through 2027 requires that recommended contributions be 0.35% of payroll greater than the appropriated contribution during the prior year, with the following bounds: (1) contributions may not be less than the actuarially determined employer contribution (ADEC) rate and (2) contributions may not be greater than a contribution determined using the same assumptions used to calculate the ADEC but using a discount rate equal to the long-term Treasury bond yield.

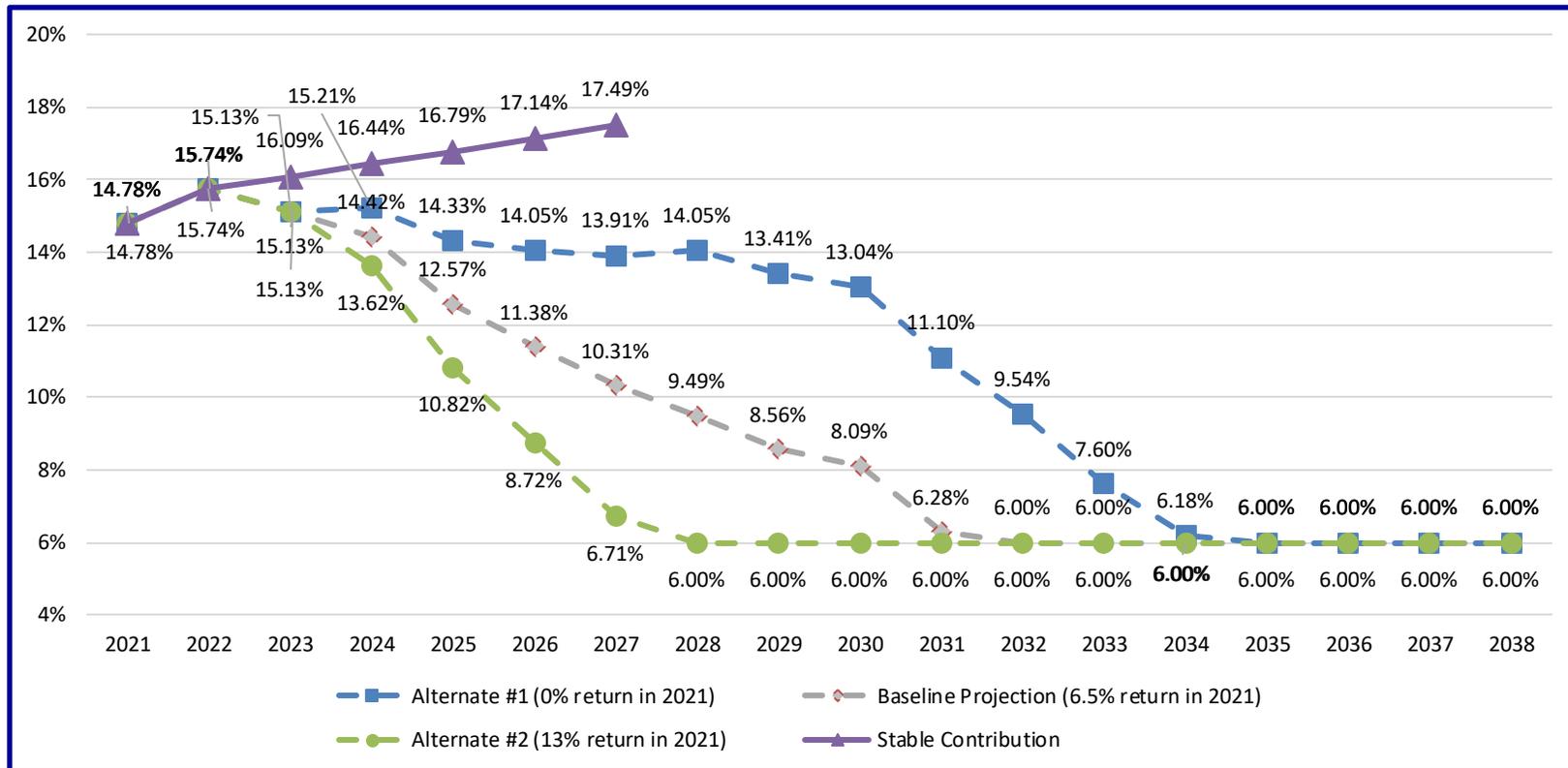
In addition, we have provided two alternate deterministic projections. The first alternate deterministic projection is based on the same assumptions as the baseline deterministic projection except that it assumes a 0.0% asset return for calendar year 2021. The second alternate deterministic projection is based on the same assumptions as the baseline deterministic projection except that it assumes a 13.0% asset return for calendar year 2021.



Section 9: Projections

The graph below provides the actuarially determined employer contribution rates projected for 15 years.

Projected Actuarially Determined Employer Contribution Rates

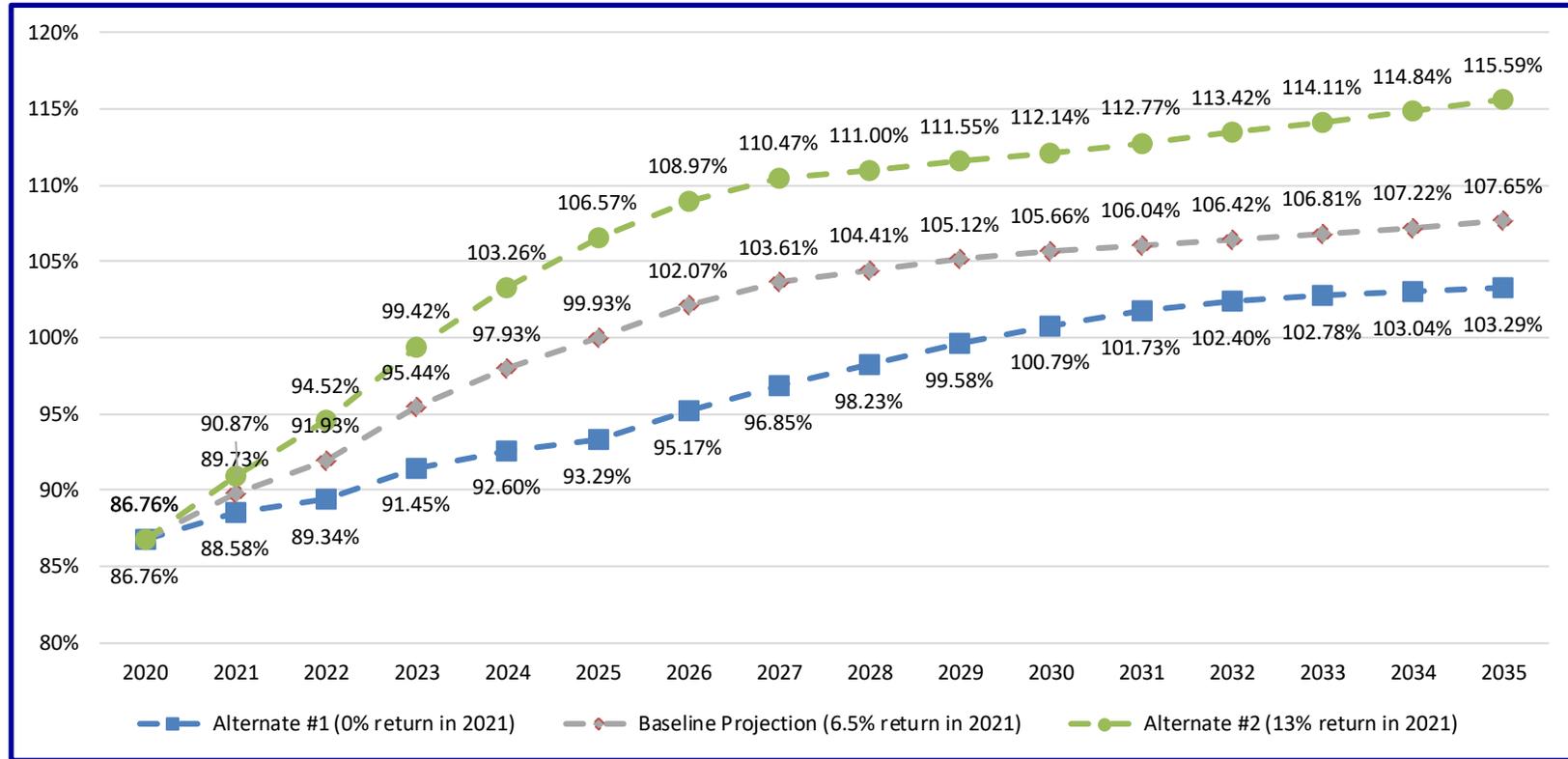




Section 9: Projections

The graph below provides the funded ratio projected for 15 years.

Projected Funded Ratio



Appendix A: Valuation Process and Glossary of Actuarial Terms

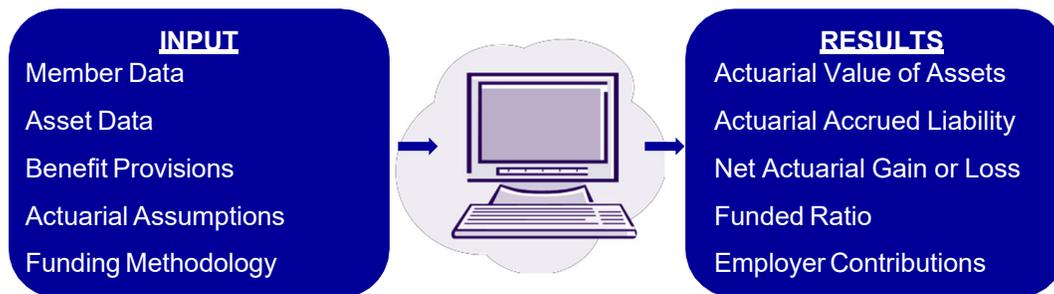
Purpose of an Actuarial Valuation

The majority of Public Sector Retirement Systems in the State of North Carolina are defined benefit (DB) retirement systems. Under a DB retirement system, the amount of benefits payable to a member upon retirement, termination, death or disability is defined in various contracts and legal instruments and is based, in part, on the member's years of credited service and final compensation. The amount of contribution needed to fund these benefits cannot be known with certainty. A primary responsibility of the Board of Trustees of a Retirement System is to establish and monitor a funding policy for the contributions made to the Retirement System.

While somewhat uncommon, in some jurisdictions, contributions are made by the plan sponsor as benefits come due. This is known as pay-as-you-go financing. More commonly, contributions for benefits are made in advance during the course of active employment of the members. This is known as actuarial pre-funding. For example, the State of North Carolina mandates for the Teachers' and State Employees' Retirement System ("TSERS") under G.S.135-8(d), that "on account of each member there shall be paid into the pension accumulation fund by employers an amount equal to a certain percentage of the actual compensation of each member to be known as the 'normal contribution' and an additional amount equal to a percentage of the member's actual compensation to be known as the 'accrued liability contribution'. The rate per centum of such contributions shall be fixed on the basis of the liabilities of the Retirement System as shown by actuarial valuation, duly approved by the Board of Trustees, and shall be called the 'actuarially determined employer contribution rate'...The actuarially determined employer contribution rate shall be calculated annually by the actuary using assumptions and a cost method approved by the Actuarial Standards Board of the American Academy of Actuaries and selected by the Board of Trustees."

The Actuarial Valuation Process

The following diagram summarizes the inputs and results of the actuarial valuation process. A narrative of the process follows the diagram. The reader may find it worthwhile to refer to the diagram from time to time.



Under the actuarial valuation process, current information about Retirement System members is collected annually by staff at the direction of the actuary, namely member data, asset data and information on benefit provisions. Member data is collected for each member of the Retirement System. The member data will assist the actuary in estimating benefits that could be paid in the future. The member information the actuary collects to estimate the amount of benefit includes elements such as current service, salary and benefit group identifier for members that have not separated service; for those that have, the actual benefit amounts are collected. The actuary collects information such as gender and date of birth to determine when a benefit might be paid and for how long.



Appendix A: Valuation Process and Glossary of Actuarial Terms

The actuary collects summary information about assets as of the valuation date and information on cash flows for the year ending on the valuation date. Information about benefit provisions as of the valuation date is also collected. To bridge the gap between the information collected and potential benefits to be paid in the future, the actuary must make assumptions about future activities. These assumptions are recommended by the actuary to the Boards based on the results of an experience review. An experience review is a review of the Retirement System over a period of time, typically five years, where the actuary analyzes the demographic and economic assumptions of the Retirement System. Based on this review, the actuary will make recommendations on the demographic assumptions, such as when members will be projected to retire, terminate, become disabled and/or die in the future, as well as the economic assumptions, such as what rate of return is projected to be earned by the fund based on the Retirement System investment policy and what level of future salary increases is expected for members. To maintain the assumptions, the Board should adopt a prudent policy of having an experience review being performed every five years. The next experience review for the North Carolina Retirement Systems will be based on the five-year period ending on December 31, 2024 and will be presented during 2025. Using these assumptions, the actuary is able to use the member data, asset data and benefit provision information collected to project the benefits that will be paid from the Retirement System to current members. These projected future benefit payments are based not only on service and pay through the valuation date but includes future pay and service, which has not yet been earned by the members but is expected to be earned.

These projected future benefit payments are discounted into today's dollars using the assumed rate of investment return assumption to determine the Present Value of Future Benefits (PVFB) of the Retirement System. The PVFB is an estimate of the value of the benefits promised to all members as of a valuation date. If the Retirement System held assets equal to the PVFB and all the assumptions were realized, there would be sufficient funds to pay off all the benefits to be paid in the future for members in the Retirement System as of the valuation date.

The PVFB is a large sum of money, typically much larger than the amount of Retirement System assets held in the trust. The next step is for the actuary to apply the Funding Policy as adopted by the Board to determine the employer contributions to be made to the Retirement System so that the gap between the PVFB and assets is systematically paid off over time. The Funding Policy is adopted by the Board based on discussions with the actuary. When the Board develops a funding policy, a balance between contributions which are responsive to the needs of the Retirement System yet stable should be struck. There are many different funding policies for the Board to consider, and the actuary is responsible for discussing the various features of the funding policies under consideration. Funding Policies are generally reviewed during an experience review, but it is not uncommon to review a funding policy in between, particularly during period where large increases or decreases in contributions are expected. The Funding Policy is composed of three components: the actuarial cost method, the asset valuation method, and the amortization method.

Once the PVFB is developed, an actuarial cost method is used to allocate the PVFB. Under the actuarial cost method, the PVFB is allocated to past, current and future service, respectively known as the actuarial accrued liability (AAL), normal cost (NC) and present value of future normal costs (PVFNC). The actuary computes the liability components (PVFB, NC, AAL, and PVFNC) for each participant in the Retirement System at the valuation date. These liability components are then totaled for the Retirement System. There are many actuarial cost methods. Different actuarial methods will produce different contribution patterns, but do not change the ultimate cost of the benefits. The entry age normal cost method is the most prevalent method used for public sector plans in the United States, because the expected normal cost is calculated in such a way that it will tend to stay level as a percent of pay over a member's career.



Appendix A: Valuation Process and Glossary of Actuarial Terms

The actuarial accrued liability (AAL) is also referred to as the amount of money the Retirement System should ideally have in the trust. The unfunded actuarial accrued liability (UAAL) is the portion of actuarial accrued liability that is not covered by the assets of the Retirement System. The UAAL can be a negative number, which means that the Retirement System has more assets than actuarial accrued liability. We refer to this condition as overfunded liability in this summary. Having UAAL does not indicate that the Retirement System is in failing actuarial health. Most retirement systems have UAAL. Another related statistic of the Retirement System is the funded ratio. The funded ratio is the percent of the actuarial accrued liabilities covered by the actuarial value of assets. The assets used for these purposes are an actuarial value of assets (AVA), not market. The actuarial value of assets is based on the asset valuation method as recommended by the actuary and adopted by the Board. An actuarial value of assets is a smoothed, or averaged, value of assets, which is used to limit employer contribution volatility. Typically, assets are smoothed, or averaged, over a period of 3 to 5 years. By averaging returns, the UAAL is not as volatile, which we will see later results in contributions that are not as volatile as well. The North Carolina Retirement Systems use an actuarial value of assets with a smoothing period of 5 years.

While having UAAL is common, it is acceptable only if it is systematically being paid off. The method by which the UAAL is paid off is known as the amortization method. The concept is similar to that of a mortgage payment. The Board adopts the amortization method used to pay off the UAAL over a period of time. The amortization method is composed of the amortization period, the amount of payment increase, whether the period is open or closed and by the amount of amortization schedules. The amortization period is the amount of time over which the UAAL will be paid off. This is generally a period of thirty years or less, but actuaries are beginning to recommend shorter periods. The payments can be developed to stay constant from year to year like a mortgage, but often they are developed to increase each year at the same level payroll increases. Amortization type can be closed or open. Under a closed period, the UAAL is expected to be paid off over the amortization period. This is similar to a typical mortgage. Under an open period, the amortization period remains unchanged year after year. The concept is similar to re-mortgaging annually. In many instances, an amortization schedule is developed, whereby the UAAL is amortized over a closed period from the point the UAAL is incurred. Finally, some amortization methods are defined by a schedule of payments, where a new schedule of payments is added with each valuation. Regardless of the amortization type or period, the funding policy should generate a contribution that pays off the UAAL, which results in the funded ratio trending to 100% over time. Caution should be used when an open method is used, because typically an open amortization policy does not result in the UAAL being paid off. North Carolina pays off a much larger amount of UAAL compared to other states. While many states struggle to pay a 30-year level percent of pay UAAL contribution, which doesn't even reduce the amount of UAAL, North Carolina pays down the UAAL with level dollar payments over a 12 year period. This aggressive payment schedule of the UAAL results in North Carolina being home to many of the best funded Public Retirement Systems in the United States.

To satisfy the requirements of the State of North Carolina, the actuary calculates the total annual contribution to the Retirement System as the normal cost plus a contribution towards UAAL. Said another way, this contribution is sufficient to pay for the cost of benefits accruing during the year (normal cost) plus the mortgage payment (UAAL payment). The total contribution is reduced by the amount of member contributions, if any, to arrive at the employer contribution. Continuing to follow the aggressive North Carolina contribution policy will keep the North Carolina Retirement Systems among the best funded in the United States.



Appendix A: Valuation Process and Glossary of Actuarial Terms

An actuarial valuation report is produced annually, which contains the contribution for the fiscal year as well as the funded ratio of the Retirement System. The primary purpose of performing an actuarial valuation annually is to replace the estimated activities from the previous valuation, which were based on assumptions, with the actual experience of the Retirement System for the prior year. The experience gain (loss) is the difference between the expected and the actual UAAL of the Retirement System. An experience loss can be thought of as the amount of additional UAAL over and above the amount that was expected from the prior year due to deviation of actual experience from the assumption. Similarly, an experience gain can be thought of as having less UAAL than that which was expected from the prior year assumptions. As an example, if the Retirement System achieves an asset return of 15% when the assumption was a 6.50% return, an actuarial gain is said to have happened, which typically results in lower contributions and higher funded ratio, all else being equal. Alternatively, a return of 2% under the same circumstances would result in an actuarial loss, requiring an increase in contributions and a funded ratio that is lower than anticipated. Experience gains and losses are common within the valuation process. Typically gains and losses offset each other over time. To the extent that does not occur, the reasons for the gains and losses should be understood, and appropriate recommendations should be made by the actuary after an experience review to adjust the assumptions.

The actuarial valuation report will contain histories of key statistics from prior actuarial valuation reports. In particular, a history of the funded ratio of the Retirement System is an important exhibit. Trustees should understand the reason for the trend of the funded ratio of the Retirement System over time. The actuary will discuss the reasons for changes in the funded ratio of the Retirement System with each valuation report. To the extent that there are unexplained changes in funded ratio corrective action should be explored and the actuary will make recommendations as to whether there should be changes in the assumptions, funding policy, or some other portion of the actuarial valuation process.

In addition to historical information, projections of contributions and funded ratio based on current assumptions can sometimes be found in an actuarial valuation report. Projections of contributions can allow the employer to plan their budget accordingly. Surprises in Retirement System contributions to be paid by the employer serve no one. A one-year projection based on “bad” asset returns can provide ample time for the employer to plan, or allow for a discussion of changing the funding policy to occur. Contribution surprises are a primary contributor to employers considering pension reform. It is important to keep the employer apprised of future contribution requirements. A projection of funded ratio can serve the Trustees by illustrating the trend of the funded ratio over time. The funded ratio, under a prudent funding policy, should trend to 100% over a period of less than 30 years. (It is worthwhile to note that while 30 years has served as an industry standard for the longest period over which 100% funding should be achieved, that period is coming under scrutiny by the actuarial community and will likely be shortened.) If a projection of funded ratio does not trend to 100% over time, consideration should be given to fixing the funding policy to achieve this goal. For the North Carolina Retirement Systems, projections are generally performed for the January board meetings.



Appendix A: Valuation Process and Glossary of Actuarial Terms

The actuarial report will contain schedules of information about the census, plan and asset information submitted by Retirement System staff upon which the actuarial valuation is based. It is important that the Board of Trustees review that information and determine if the information is consistent with their understanding of the Retirement System. If after questioning staff, the Board of Trustees is not comfortable that the information provided is correct, the actuary should be notified to determine if the actuarial valuation report should be corrected.

Finally, the valuation report and/or presentation should contain sufficient information in an understandable fashion to allow the Board to take action and adopt the contribution rate for the upcoming year. It should also allow stakeholders to understand key observations over the past year that resulted in contributions increasing (or decreasing) and where contributions are headed. The actuary is always open to making the results understandable. CMC works with the North Carolina Retirement Systems Division to make your reports and presentations understandable and actionable. If something doesn't make sense – speak up!!



Appendix A: Valuation Process and Glossary of Actuarial Terms

Glossary

Note that the first definitions given are the “official” definitions of the term. For some terms there is a second definition, in italics, which is the unofficial definition.

Actuarial Accrued Liability (AAL). The portion of the Present Value of Projected Benefits (PVFB) allocated to past service. Also difference between (i) the actuarial present value of future benefits, and (ii) the present value of future normal cost. Sometimes referred to as “accrued liability” or “past service liability.” The amount of money that should be in the fund. *The funding target.*

Actuarial Assumptions. Estimates of future plan experience with respect to rates of mortality, disability, retirement, investment income and salary increases. Demographic (“people”) assumptions (rates of mortality, separation, and retirement) are generally based on past experience, often modified for projected changes in conditions. Economic (“money”) assumptions (salary increases and investment income) consist of an underlying rate appropriate in an inflation-free environment plus a provision for a long-term average rate of inflation. *Estimates of future events used to project what we know now- current member data, assets, and benefit provisions – into an estimate of future benefits.*

Actuarial Cost Method. A mathematical budgeting procedure for allocating the dollar amount of the Present Value of Projected Benefits (PVFB) between the normal costs to be paid in the future and the actuarial accrued liability. Sometimes referred to as the “actuarial funding method.”

Actuarial Methods. The collective term for the Actuarial Cost Method, the Amortization Payment for UAAL Method, and the Asset Valuation Method used to develop the contribution requirements for the Retirement System. *The funding policy.*

Actuarial Equivalent. Benefits whose actuarial present values are equal.

Actuarial Present Value. The amount of funds presently required to provide a payment or series of payments in the future. It is determined by discounting the future payments at a predetermined rate of interest, taking into account the probability of payment.

Actuarial Value of Assets (AVA). A smoothed value of assets which is used to limit contribution volatility. Also known as the funding value of assets. *Smoothed value of assets.*

Amortization Payment for UAAL. Payment of the unfunded actuarial accrued liability by means of periodic contributions of interest and principal, as opposed to a lump sum payment. The components of the amortization payment for UAAL include:

- Amortization Period Length – Generally amortization periods up to 15 to 20 years (and certainly not longer than 30) are allowed. Similar to a mortgage, the shorter the amortization period, the higher the payment and the faster the UAAL is paid off.
- Amortization payment increases – Future payments can be level dollar, like a mortgage, or as a level percent of pay. Most Retirement Systems amortize UAAL as a level percent of pay which when combined with the employer normal cost that is developed as a level percent of pay can result in contributions that are easier to budget.
- Amortization type – An amortization schedule can be closed or open. A closed amortization schedule is similar to a mortgage – at the end of the amortization period the UAAL is designed to be paid off. An open amortization period is similar to refinancing the UAAL year after year.
- Amortization schedule – UAAL can be amortized over a single amortization period, or it can be amortized over a schedule.

The amortization payment for UAAL can be thought of as the UAAL mortgage payment.



Appendix A: Valuation Process and Glossary of Actuarial Terms

Asset Valuation Method. The components of how the actuarial value of assets is to be developed. TSERS uses a five-year smoothing of asset gains and losses, which is the most commonly used method

Experience Gain (Loss). A measure of the difference between actual experience and experience anticipated by a set of actuarial assumptions during the period between two actuarial valuation dates, in accordance with the actuarial cost method being used. *The experience Gain (Loss) represents how much the actuary missed the mark in a given year.*

Funded Ratio. The percent of the actuarial accrued liabilities covered by the actuarial value of assets. Also known as the funded status. *The ratio of how much money you actually have in the fund to the amount you should have in the fund.*

Normal Cost. The annual cost assigned, under the actuarial funding method, to current and subsequent plan years. Sometimes referred to as “current service cost.” An amortization payment toward the unfunded actuarial accrued liability is paid in addition to the normal cost to arrive at the total contribution in a given year. *The cost of benefits accruing during the year.*

Present Value of Future Normal Cost (PVFNC). The portion of the Present Value of Projected Benefits (PVFB) allocated to future service. *The value in today’s dollars of the amount of contribution to be made in the future for benefits accruing for members in the Retirement System as of the valuation date.*

Present Value of Future Benefits (PVFB). The projected future benefit payments of the plan are discounted into today’s dollars using an assumed rate of investment return assumption to determine the Present Value of Future Benefits (PVFB) of the Retirement System. The PVFB is the discounted value of the projected benefits promised to all members as of a valuation date, including future pay and service for members which has not yet been earned. *If the Retirement System held assets equal to the PVFB and all the assumptions were realized, there would be sufficient funds to pay off all the benefits to be paid in the future for members in the Retirement System as of the valuation date.*

Reserve Account. An account used to indicate that funds have been set aside for a specific purpose and are not generally available for other uses.

Unfunded Actuarial Accrued Liability (UAAL). The difference between the actuarial accrued liability (AAL) and actuarial value of assets (AVA). The UAAL is sometimes referred to as “unfunded accrued liability.” *Funding shortfall, or prefunded amount if negative.*

Valuation Date. The date that the actuarial valuation calculations are performed as of. *Also known as the “snapshot date”.*



Appendix B: Detailed Tabulation of Member Data

Table B-1: The Number and Average Reported Compensation of Active Members Distributed by Age and Service as of December 31, 2020

Age	Years of Service										Total
	Under 1	1 to 4	5 to 9	10 to 14	15 to 19	20 to 24	25 to 29	30 to 34	35 to 39	40 & Up	
Under 25	2,783	4,490	29	0	0	0	0	0	0	0	7,302
	13,172	34,496	35,313	0	0	0	0	0	0	0	26,372
25 to 29	2,589	17,247	4,578	14	0	0	0	0	0	0	24,428
	12,803	39,099	44,884	47,606	0	0	0	0	0	0	37,401
30 to 34	1,732	12,147	14,323	2,976	33	0	0	0	0	0	31,211
	13,140	40,810	48,272	53,521	46,646	0	0	0	0	0	43,917
35 to 39	1,294	9,780	9,307	9,665	4,355	40	0	0	0	0	34,441
	12,813	42,943	51,058	56,729	59,484	52,182	0	0	0	0	49,975
40 to 44	1,076	8,616	8,051	6,854	10,192	3,836	29	0	0	0	38,654
	13,350	43,437	51,255	57,857	62,319	63,078	56,177	0	0	0	53,722
45 to 49	927	8,003	7,658	6,557	7,585	9,333	3,046	9	0	0	43,118
	12,909	43,697	50,102	55,983	59,099	64,594	66,896	48,780	0	0	54,914
50 to 54	852	7,375	7,548	7,043	7,868	7,337	7,371	1,142	7	0	46,543
	12,730	43,988	49,270	54,039	56,534	60,356	68,736	70,837	67,949	0	55,076
55 to 59	645	5,829	6,100	6,005	7,150	6,327	4,334	1,841	268	6	38,505
	11,882	43,856	48,053	51,277	52,743	55,218	63,187	71,642	70,516	72,500	52,354
60 to 64	317	3,692	4,452	4,400	5,194	4,449	2,595	1,095	515	128	26,837
	12,710	45,211	48,500	52,277	52,430	55,100	60,941	70,967	78,667	68,634	52,893
65 to 69	112	1,072	1,663	1,700	1,584	1,108	698	385	209	163	8,694
	10,502	41,918	52,489	54,646	57,700	59,016	64,455	70,972	83,442	81,963	55,924
70 & Over	37	452	563	561	553	362	200	110	63	137	3,038
	6,941	36,418	43,540	50,138	52,390	62,117	62,594	76,711	101,064	88,556	52,756
Total	12,364	78,703	64,272	45,775	44,514	32,792	18,273	4,582	1,062	434	302,771
	12,896	41,641	49,200	54,865	57,479	60,140	65,755	71,301	78,808	79,982	50,493



Appendix B: Detailed Tabulation of Member Data

Table B-2: The Number and Reported Compensation of Active Member Distributed by Age as of December 31, 2020

Age	Men		Women	
	Number	Compensation	Number	Compensation
18	4	23,995	1	10,498
19	18	214,565	31	398,184
20	81	1,394,528	73	1,115,958
21	174	4,221,271	221	3,843,652
22	318	8,447,996	688	13,344,429
23	618	16,363,967	1,775	41,220,745
24	901	28,770,465	2,399	73,199,336
25	1,111	39,077,439	2,822	93,860,778
26	1,322	49,127,193	3,194	112,940,647
27	1,442	55,398,736	3,537	129,977,647
28	1,506	60,138,159	3,838	145,984,159
29	1,642	68,027,576	4,015	159,162,093
30	1,776	77,282,374	4,279	176,390,034
31	1,906	83,408,109	4,356	181,876,760
32	1,868	85,727,231	4,401	190,589,162
33	1,847	87,245,834	4,433	193,656,493
34	1,892	93,693,121	4,453	200,814,293
35	1,952	100,943,588	4,498	208,060,903
36	2,053	105,483,272	4,654	221,771,080
37	2,064	109,615,300	4,678	227,853,201
38	2,155	118,773,083	4,957	245,389,960
39	2,181	121,159,948	5,249	262,136,099
40	2,170	121,146,652	5,239	268,111,885
41	2,273	131,733,920	5,381	275,192,797
42	2,208	129,121,733	5,414	283,265,160
43	2,334	138,282,612	5,569	291,397,144
44	2,320	140,136,066	5,745	298,121,822
45	2,275	137,477,834	5,509	288,286,890
46	2,428	147,034,312	5,915	309,994,485
47	2,566	154,111,305	5,992	313,141,019
48	2,620	160,993,762	6,238	325,470,581
49	2,868	175,603,998	6,707	355,642,935
50	3,063	187,588,380	7,331	383,320,407
51	2,870	181,849,600	7,040	373,558,882
52	2,712	172,646,650	6,600	346,347,721
53	2,589	160,770,442	6,048	308,819,096
54	2,433	149,378,721	5,857	299,115,848
55	2,453	148,175,466	5,560	276,729,942



Appendix B: Detailed Tabulation of Member Data

Table B-2: The Number and Reported Compensation of Active Members Distributed by Age as of December 31, 2020 (continued)

Age	Men		Women	
	Number	Compensation	Number	Compensation
56	2,372	138,601,336	5,392	266,920,553
57	2,303	135,585,342	5,407	271,655,218
58	2,331	136,449,983	5,259	257,253,789
59	2,225	128,997,022	5,203	255,527,214
60	2,192	127,764,583	4,767	234,953,977
61	1,909	110,921,699	4,261	211,943,743
62	1,768	103,522,286	3,658	181,659,438
63	1,511	89,806,615	2,948	148,680,157
64	1,297	79,476,315	2,526	130,770,851
65	1,024	61,415,286	1,946	100,375,996
66	820	52,945,561	1,249	63,497,996
67	636	41,211,245	920	49,017,431
68	467	27,839,210	669	33,496,920
69	412	27,447,160	551	28,954,146
70	332	20,771,909	444	22,992,988
71	232	12,753,479	264	11,888,775
72	211	12,132,119	215	9,297,670
73	171	10,797,084	170	7,684,959
74	157	9,829,131	150	6,732,586
75	85	5,007,652	91	4,166,209
76	72	4,085,621	65	2,979,610
77	59	3,431,209	52	2,160,206
78	51	2,734,657	47	1,710,727
79	29	1,678,871	25	1,085,028
80	17	912,541	14	523,302
81	18	1,379,262	10	468,809
82	10	788,179	7	363,360
83	8	170,218	2	66,313
84	4	243,455	3	163,181
85	4	256,978	4	237,403
86	3	120,083	0	0
87	2	87,237	2	95,659
88	1	60,934	3	115,147
89	1	179,932	1	54,340
95	0	0	1	24,048
96	0	0	1	41,140
Total	91,747	5,099,993,397	211,024	10,187,671,614



Appendix B: Detailed Tabulation of Member Data

Table B-3: The Number and Reported Compensation of Active Members Distributed by Service as of December 31, 2020

Service	Men		Women	
	Number	Compensation	Number	Compensation
0	3,334	41,959,393	9,030	117,486,163
1	6,531	253,570,723	15,811	553,012,962
2	6,560	305,880,234	14,694	590,525,303
3	5,659	272,944,044	12,567	527,815,618
4	5,320	268,362,941	11,561	505,130,390
5	4,907	255,783,252	10,405	465,713,532
6	4,327	227,714,867	9,482	441,700,104
7	3,936	210,074,466	8,519	403,704,610
8	3,796	204,483,248	8,409	405,454,447
9	3,364	188,759,034	7,127	358,773,985
10	2,946	170,534,754	6,226	323,804,463
11	2,608	153,083,339	5,390	284,212,972
12	2,139	133,833,551	4,904	257,371,723
13	3,386	198,762,998	7,672	402,954,263
14	3,040	187,521,998	7,464	399,346,326
15	3,083	190,152,670	7,685	413,757,871
16	2,846	175,634,096	6,906	378,934,428
17	2,614	165,639,470	6,355	352,415,500
18	2,312	146,627,977	5,602	316,059,138
19	1,962	128,074,599	5,149	291,325,084
20	2,065	137,374,675	5,551	311,755,868
21	1,946	130,231,332	5,170	291,643,319
22	1,875	129,137,099	4,837	274,809,829
23	1,756	119,604,614	4,281	247,466,784
24	1,541	107,458,387	3,770	222,633,457
25	1,469	105,094,397	3,342	201,648,889
26	1,252	88,338,712	2,778	170,901,126
27	1,333	97,752,099	2,504	157,171,875
28	1,010	76,546,688	2,135	136,883,375
29	788	58,517,541	1,662	108,693,910
30	439	35,339,243	977	64,697,304
31	417	34,094,611	764	51,604,724
32	268	21,764,193	587	38,333,166
33	235	18,610,057	445	29,067,967
34	153	12,264,073	297	20,923,066
35	110	9,377,558	205	14,847,795



Appendix B: Detailed Tabulation of Member Data

Table B-3: The Number and Reported Compensation of Active Members Distributed by Service as of December 31, 2020 (continued)

Service	Men		Women	
	Number	Compensation	Number	Compensation
36	93	7,684,388	194	14,216,855
37	75	6,788,490	140	9,770,401
38	56	5,673,797	93	6,874,022
39	34	3,288,627	62	5,171,855
40	39	3,354,868	54	3,696,472
41	21	2,303,676	40	2,514,640
42	29	2,891,325	43	3,052,094
43	15	1,440,620	42	2,814,072
44	8	640,135	28	2,292,953
45	9	923,189	11	949,427
46	8	627,736	9	851,703
47	9	763,263	14	906,301
48	6	617,527	7	442,663
49	7	651,643	7	487,530
50	2	318,598	5	342,080
51	4	438,298	7	415,678
52	1	174,126	0	0
53	2	306,768	2	114,600
54	1	100,870	0	0
58	0	0	1	45,192
59	0	0	1	58,373
60	1	102,520	0	0
65	0	0	1	73,367
Total	91,747	5,099,993,397	211,024	10,187,671,614



Appendix B: Detailed Tabulation of Member Data

Table B-4: The Number and Valuation Compensation of Disabled Members Distributed by Age as of December 31, 2020

Age	Men		Women	
	Number	Compensation	Number	Compensation
27	1	45,855	0	0
29	1	53,629	0	0
30	0	0	2	64,669
31	1	45,008	2	61,995
32	1	31,352	1	43,072
33	0	0	8	288,879
34	1	28,997	3	94,646
35	1	28,987	6	242,632
36	3	132,272	9	377,558
37	4	121,302	10	342,330
38	4	158,172	13	508,007
39	5	173,980	16	702,051
40	6	222,478	15	666,966
41	8	321,562	21	885,527
42	5	174,752	39	1,506,667
43	15	564,840	41	1,594,369
44	17	674,067	47	1,861,461
45	15	615,963	57	2,283,963
46	31	1,284,977	68	2,740,500
47	32	1,329,156	61	2,417,280
48	44	1,866,465	87	3,386,130
49	38	1,393,727	119	4,637,453
50	53	2,211,838	112	4,190,240
51	51	1,976,291	151	6,035,099
52	52	2,069,256	138	5,535,016
53	77	2,997,766	172	6,572,646



Appendix B: Detailed Tabulation of Member Data

Table B-4: The Number and Valuation Compensation of Disabled Members Distributed by Age as of December 31, 2020 (continued)

Age	Men		Women	
	Number	Compensation	Number	Compensation
54	64	2,966,138	164	6,093,037
55	70	2,908,882	202	7,508,786
56	93	3,593,457	222	8,060,443
57	82	3,080,753	232	7,904,787
58	105	3,985,781	232	8,567,829
59	113	4,263,920	263	8,630,332
60	104	3,979,295	310	10,474,709
61	92	3,704,942	221	7,727,779
62	102	3,790,734	200	6,867,569
63	108	4,188,304	227	8,005,432
64	110	4,085,695	206	6,896,661
65	73	2,778,875	131	4,580,868
66	3	140,555	3	110,616
67	1	66,898	1	12,311
68	2	29,798	1	65,264
69	1	44,318	2	25,782
70	1	22,081	1	47,469
71	0	0	3	88,585
79	0	0	1	20,486
Total	1,590	62,153,118	3,820	138,727,901



Appendix B: Detailed Tabulation of Member Data

Table B-5: The Number and Accumulated Contributions of Terminated Vested Members Distributed by Age as of December 31, 2020

Age	Men		Women	
	Number	Contributions	Number	Contributions
18	1	306	0	0
19	3	2,800	8	969
20	13	11,781	22	23,581
21	45	50,559	49	41,746
22	106	140,525	133	165,705
23	178	280,605	275	438,035
24	320	547,054	581	1,084,378
25	461	1,001,043	938	2,138,881
26	607	1,656,612	1,387	4,142,788
27	815	2,423,052	1,732	6,324,511
28	1,020	3,346,173	1,969	9,054,858
29	1,124	4,612,560	2,508	12,635,307
30	1,282	5,766,607	3,010	16,993,062
31	1,362	7,010,366	3,280	20,734,220
32	1,423	8,298,210	3,389	22,746,786
33	1,440	8,583,551	3,536	26,606,843
34	1,525	9,981,832	3,484	27,505,060
35	1,523	10,688,033	3,747	33,288,759
36	1,673	13,795,778	4,019	37,042,427
37	1,519	13,629,491	4,246	43,018,914
38	1,724	15,679,211	4,229	46,398,438
39	1,682	17,029,900	4,387	51,101,798
40	1,673	19,225,914	4,292	52,929,096
41	1,683	19,116,705	4,324	53,797,457
42	1,623	21,133,613	4,106	54,859,415
43	1,628	20,809,320	4,001	53,854,753
44	1,610	23,315,239	3,828	53,468,199
45	1,479	24,445,685	3,589	52,930,635
46	1,548	26,232,213	3,756	56,514,122
47	1,515	25,871,455	3,400	54,933,030
48	1,552	28,776,032	3,404	55,856,236
49	1,602	30,856,792	3,492	58,568,951
50	1,742	33,238,774	3,767	65,086,820
51	1,563	29,608,199	3,675	61,269,568
52	1,420	26,336,474	3,273	58,907,001
53	1,369	26,191,799	3,076	53,519,929
54	1,305	25,727,040	2,841	50,337,767
55	1,271	24,062,306	2,694	47,706,737
56	1,226	25,504,394	2,885	50,474,337
57	1,216	24,922,412	2,766	51,625,366
58	1,181	26,638,733	2,718	52,395,778
59	1,096	23,814,219	2,712	51,951,963



Appendix B: Detailed Tabulation of Member Data

Table B-5: The Number and Accumulated Contributions of Terminated Vested Members Distributed by Age as of December 31, 2020 (continued)

Age	Men		Women	
	Number	Contributions	Number	Contributions
60	1,107	24,296,215	2,459	49,229,656
61	830	18,685,258	1,910	36,891,223
62	762	16,097,085	1,703	33,652,841
63	673	12,541,354	1,489	28,263,316
64	640	11,519,432	1,303	24,381,569
65	567	9,111,046	1,059	17,593,257
66	449	6,025,460	892	13,747,683
67	372	5,563,425	709	10,446,466
68	335	4,038,097	623	9,071,992
69	284	4,031,107	455	5,673,230
70	247	3,316,087	424	5,951,232
71	179	1,206,807	370	3,599,294
72	90	616,117	125	1,157,282
73	60	350,048	90	1,011,686
74	55	696,695	78	1,042,475
75	35	548,848	50	520,299
76	39	438,767	36	315,917
77	26	238,724	17	134,472
78	18	154,648	20	149,624
79	15	55,283	21	363,668
80	11	77,962	14	144,189
81	15	107,563	10	81,010
82	13	160,852	7	27,419
83	8	53,759	10	85,492
84	7	40,811	5	39,777
85	4	10,443	3	21,093
86	10	49,359	6	52,293
87	5	136,091	3	484
88	3	24,273	1	252
89	2	933	2	152
90	1	5,242	2	551
91	3	72,949	0	0
92	2	6,395	1	387
93	1	1	0	0
94	1	17,074	2	6,055
95	2	53	2	234
96	0	0	2	54
97	1	2,078	2	26
98	0	0	1	87
99	0	0	3	916
100+	2	1,542	6	6,350
Total	56,022	750,661,250	129,443	1,696,138,229



Appendix B: Detailed Tabulation of Member Data

Table B-6: The Number and Annual Retirement Allowances of Retired Members (Healthy at Retirement) and Survivors of Deceased Members Distributed by Age as of December 31, 2020

Age	Men		Women	
	Number	Allowances	Number	Allowances
<20	6	43,362	2	22,201
20	0	0	3	45,669
21	1	7,712	1	8,875
22	5	31,967	2	16,779
23	4	67,570	4	37,811
24	5	15,177	2	18,387
25	6	59,284	4	84,040
26	3	33,093	5	61,173
27	5	61,301	2	46,194
28	2	15,467	8	100,744
29	6	103,758	7	53,864
30	6	78,818	9	106,392
31	9	108,357	14	127,359
32	11	88,818	10	108,397
33	9	139,322	14	160,921
34	11	106,931	15	149,009
35	10	77,498	13	125,925
36	9	137,119	12	142,290
37	17	151,413	15	128,030
38	14	176,331	19	235,736
39	21	188,726	26	332,277
40	23	341,304	25	193,967
41	15	164,175	20	211,205
42	18	179,592	21	230,396
43	17	185,913	33	351,992
44	24	302,000	34	386,726
45	20	248,471	36	507,186
46	22	199,514	32	401,369
47	31	389,386	32	349,222
48	33	447,502	43	474,912
49	58	1,373,942	50	556,081
50	120	3,278,138	119	2,183,056
51	226	5,964,078	270	6,229,582
52	300	8,379,872	447	11,014,423
53	383	11,393,560	554	14,602,162
54	517	15,858,484	777	20,789,055
55	577	17,437,934	928	26,179,402
56	688	20,950,723	1,213	34,529,978
57	838	25,677,799	1,342	38,398,373
58	941	29,366,031	1,573	45,362,560
59	972	30,775,503	1,823	52,572,387
60	1,105	33,451,416	2,342	64,257,324



Appendix B: Detailed Tabulation of Member Data

Table B-6: The Number and Annual Retirement Allowances of Retired Members (Healthy at Retirement) and Survivors of Deceased Members Distributed by Age as of December 31, 2020 (continued)

Age	Men		Women	
	Number	Allowances	Number	Allowances
61	1,320	37,335,485	3,121	78,970,481
62	1,603	42,104,734	3,737	84,861,573
63	1,867	44,599,732	4,744	101,361,639
64	2,152	49,108,000	5,479	115,521,453
65	2,381	54,606,498	5,996	125,550,323
66	2,730	60,843,768	6,844	140,056,533
67	2,895	64,425,304	7,549	152,982,282
68	3,110	71,185,439	7,891	163,132,234
69	3,259	73,766,558	7,798	160,408,586
70	3,246	72,398,653	7,527	154,519,835
71	3,197	73,606,434	7,333	146,668,455
72	3,276	75,044,602	7,248	142,711,969
73	3,283	75,312,597	7,123	137,957,098
74	3,528	82,692,296	7,514	145,534,319
75	2,418	55,769,818	5,140	96,648,471
76	2,384	54,351,453	4,749	87,902,901
77	2,118	48,958,109	4,732	88,095,997
78	2,130	52,505,682	4,636	85,587,312
79	1,719	40,663,889	3,783	68,308,049
80	1,529	36,400,985	3,383	60,621,116
81	1,383	33,661,642	3,091	54,886,830
82	1,291	30,882,560	2,805	49,582,879
83	1,139	27,312,505	2,645	45,399,448
84	972	25,070,258	2,298	39,872,991
85	900	22,388,996	2,210	37,372,818
86	780	19,465,442	2,147	36,168,867
87	673	16,955,443	1,659	26,620,310
88	607	14,908,887	1,510	24,924,277
89	528	12,898,094	1,401	22,824,039
90	409	10,599,807	1,207	20,261,843
91	362	9,289,551	1,031	17,282,224
92	262	6,618,269	859	13,521,755
93	197	4,593,719	689	11,059,715
94	156	3,933,571	533	8,273,464
95	114	2,661,388	450	6,528,258
96	68	1,303,222	308	4,512,487
97	53	1,012,594	233	3,365,165
98	32	559,316	157	1,991,572
99	22	793,178	119	1,876,246
100+	37	742,343	229	3,089,454
Total	67,218	1,619,388,182	153,809	3,088,708,699



Appendix B: Detailed Tabulation of Member Data

Table B-7: The Number and Annual Retirement Allowances of Retired Members (Healthy at Retirement) and Survivors of Deceased Members Distributed by Annuity Type as of December 31, 2020

Annuity Type	Men		Women	
	Number	Allowances	Number	Allowances
0:Maximum	23,073	537,441,741	84,272	1,666,180,151
1:Option 1: 10-year guaranteed	475	14,165,471	1,942	33,775,475
2:Option 2: 100% joint and survivor	12,463	297,047,132	8,225	138,043,942
3:Option 3: 50% joint and survivor	3,442	100,884,228	3,670	76,766,631
4:Option 4: Social security leveling	8,956	221,700,735	23,853	531,534,779
5:Option 5- 2:100% joint and surv.	88	2,744,546	41	429,053
6:Option 5-3: 50% joint and surv.	59	1,977,671	59	1,077,302
7:Option 6-2: 100% joint and surv. w/ pop-up	10,561	265,602,116	11,631	245,671,941
8:Option 6-3: 50% joint and surv. w/ pop-up	4,187	128,459,997	7,915	200,808,461
9:Special	6	190,211	1	16,503
Survivors of Deceased Members	3,908	49,174,334	12,200	194,404,461
Total	67,218	1,619,388,182	153,809	3,088,708,699



Appendix B: Detailed Tabulation of Member Data

Table B-8: The Number and Annual Retirement Allowances of Retired Members (Disabled at Retirement) Distributed by Age of December 31, 2020

Age	Men		Women	
	Number	Allowances	Number	Allowances
50	2	45,939	2	35,472
51	4	86,539	5	84,845
52	10	223,541	4	59,699
53	10	213,230	6	135,179
54	20	456,259	19	461,200
55	20	382,349	17	425,636
56	27	583,925	39	916,014
57	31	714,781	39	816,015
58	38	819,758	57	1,218,869
59	43	877,643	81	1,748,755
60	50	1,036,922	122	2,421,543
61	73	1,613,952	138	2,686,083
62	96	1,853,430	179	3,344,558
63	107	2,153,366	195	3,861,665
64	112	2,210,373	200	3,792,272
65	141	2,628,949	342	6,177,682
66	209	3,448,315	468	7,761,516
67	213	3,645,900	522	8,876,035
68	231	3,941,329	529	9,469,745
69	237	4,155,975	567	10,172,933
70	239	4,138,371	606	10,621,297
71	250	4,201,128	528	9,017,325
72	233	4,089,093	497	9,018,939
73	283	5,156,667	509	8,705,318
74	244	4,560,072	515	8,873,226
75	171	3,059,611	355	5,908,529
76	137	2,350,987	357	5,669,690



Appendix B: Detailed Tabulation of Member Data

Table B-8: The Number and Annual Retirement Allowances of Retired Members (Disabled at Retirement) Distributed by Age of December 31, 2020 (continued)

Age	Men		Women	
	Number	Allowances	Number	Allowances
77	130	2,150,203	321	4,790,659
78	125	2,178,275	308	4,971,920
79	91	1,636,175	238	3,687,123
80	80	1,267,467	191	2,590,160
81	92	1,412,134	142	2,037,719
82	47	651,024	155	2,002,109
83	47	743,108	136	1,762,218
84	30	423,665	71	1,012,056
85	21	399,454	58	733,109
86	14	245,239	36	481,625
87	11	189,034	41	596,162
88	9	233,901	29	331,894
89	13	221,306	19	224,760
90	13	126,792	21	269,773
91	3	31,739	19	258,040
92	3	66,947	16	189,776
93	2	26,063	10	123,124
94	2	18,698	12	189,711
95	1	10,058	12	152,279
96	2	6,640	3	8,811
97	0	0	9	67,748
98	2	34,462	5	47,240
99	1	6,805	0	0
100	0	0	1	3,783
100+	0	0	3	50,267
Total	3,970	70,727,593	8,754	148,862,106



Appendix B: Detailed Tabulation of Member Data

**Table B-9: The Number and Annual Retirement Allowances of Retired Members
(Disabled at Retirement)
Distributed by Annuity Type of December 31, 2020**

Annuity Type	Men		Women	
	Number	Allowances	Number	Allowances
0:Maximum	1,981	37,627,273	6,175	108,051,454
1:Option 1: 10-year guaranteed	48	937,274	195	2,908,590
2:Option 2: 100% joint and survivor	780	11,191,814	696	9,363,014
3:Option 3: 50% joint and survivor	197	3,744,750	281	4,391,339
4:Option 4: Social security leveling	139	3,027,381	398	7,152,076
5:Option 5-2: 100% joint and surv.	2	25,156	1	8,214
6:Option 5-3: 50% joint and surv.	0	0	0	0
7:Option 6-2: 100% joint and surv. w/ pop-up	596	9,596,682	605	9,479,050
8:Option 6-3: 50% joint and surv. w/ pop-up	227	4,577,263	402	7,487,407
9:Special	0	0	1	20,962
Total	3,970	70,727,593	8,754	148,862,106



Appendix B: Detailed Tabulation of Member Data

Table B-10: The Number and Annual Retirement Allowances of Retired Members and Survivors of Deceased Members Distributed by Amount of Annual Retirement Allowance of December 31, 2020

Amount of Annual Retirement Allowance	Number of Retired Members and Survivors	Sum of Annual Retirement Allowances
\$0 - \$ 4,999	30,961	\$ 92,425,484
\$5,000 - \$9,999	38,326	284,037,761
\$10,000 - \$14,999	32,295	401,662,672
\$15,000 - \$19,999	25,654	446,184,556
\$20,000 - \$24,999	22,719	511,726,751
\$25,000 - \$29,999	22,462	617,005,037
\$30,000 - \$34,999	21,217	687,531,419
\$35,000 - \$39,999	14,971	558,787,602
\$40,000 - \$ 44,999	9,235	390,468,758
\$45,000 - \$49,999	5,476	258,817,189
\$50,000 & over	10,435	679,039,351
Total	233,751	\$ 4,927,686,580



Appendix C: Summary of Main Benefit & Contribution Provision

A summary of the main benefit provisions of the Retirement System and of the sources of revenue from which benefits are paid is presented in the following digest. Items in parentheses in the text are the provisions applicable to law enforcement officers.

"Average final compensation" as used in the summary means the average annual compensation during the four consecutive years of membership service which afford the highest such average. "Membership service" means service represented by regular contributions. "Creditable service" means membership service and may also include certain special purchased service.

BENEFITS

Unreduced Retirement Allowance

Condition for Allowance	An unreduced retirement allowance is payable to any member who retires from service: <ul style="list-style-type: none">(a) after age 65 (55) and completion of five years of creditable service;(b) after age 60 and completion of 25 years of creditable service (not applicable to law enforcement officers); or(c) after completion of 30 years of creditable service.
Amount of Allowance	1.82% of average final compensation multiplied by the number of years of creditable service. In no event will a member whose creditable service commenced on or before June 30, 1963 receive a smaller retirement allowance than he would have received under the benefit provisions of the system in effect on that date.



Appendix C: Summary of Main Benefit & Contribution Provision

Reduced Retirement Allowance

Condition for Allowance A reduced retirement allowance is payable to any member who retires from service prior to becoming eligible for an unreduced retirement allowance but after age 60 and completion of five years of membership service (age 55 and five years of creditable service).

Amount of Allowance The member's reduced retirement allowance is equal to 1.82% of average final compensation multiplied by the number of years of creditable service at date of retirement reduced by 1/4 of 1% for each month by which the member's age at retirement is less than age 65.

In no event will a member whose creditable service commenced on or before June 30, 1963 receive a smaller retirement allowance than he or she would have received under the benefit provisions of the system in effect on that date.

OR

Condition for Allowance A reduced retirement allowance is payable to any member who retires from service after age 50 and completion of 20 (15) years of creditable service, but prior to becoming eligible for a reduced or unreduced retirement allowance.

Amount of Allowance The member's reduced retirement allowance is equal to 1.82% of average final compensation multiplied by the number of years of creditable service at date of retirement reduced by the lesser of:

- (i) 5/12 (1/3) of 1% for each month by which his age is less than 60 (55), plus, if the member is not a law enforcement officer, 1/4 of 1% for each month by which age 60 is less than 65.
- (ii) 5% times the difference between 30 years and creditable service at retirement.

OR

Condition for Allowance A reduced retirement allowance is payable to any law enforcement officer who retires from service at any age with 25 years of service (15 years as an officer), but prior to becoming eligible for a reduced or unreduced retirement allowance.

Amount of Allowance The member's reduced retirement allowance is equal to 1.82% of average final compensation multiplied by the number of years of creditable service at date of retirement reduced by the lesser of:

- (i) 1/3 of 1% for each month by which his age is less than 55,
- (ii) 5% times the difference between 30 years and creditable service at retirement plus 4% times the difference between age 50 and the member's age at retirement.



Appendix C: Summary of Main Benefit & Contribution Provision

Deferred Retirement Allowance	Any member who separates from service after completing five or more years of membership service prior to becoming eligible for an unreduced or reduced retirement allowance and who leaves his or her total accumulated contributions in the system may receive a deferred retirement allowance, beginning at age 60 (55), computed in the same way as a reduced retirement allowance, or, if the member has 20 (15) or more years of service, at age 50 computed in the same way as a reduced service retirement allowance, on the basis of creditable service and compensation to the date of separation.
Return of Contributions	<p>Upon the withdrawal of a member without a retirement allowance and upon his or her request, the member's contributions are returned, together with accumulated regular interest.</p> <p>Upon the death of a member before retirement, his or her contributions, together with the full accumulated regular interest thereon, are paid to the estate or to person(s) designated by the member unless the designated beneficiary, if eligible, elects the survivor's alternate benefit described below.</p> <p>The current interest rate on member contributions is 4%.</p>
Survivor's Alternate Benefit	<p>Upon the death of a member in service who has met conditions (a) or (b) below, his designated beneficiary may elect to receive a benefit equal to that which would have been payable under the provisions of Option 2 had the member retired on the first day of the month following his death and elected such option, in lieu of the member's accumulated contributions, provided the member had not instructed the Board of Trustees in writing that he or she did not wish the alternate benefit to apply.</p> <p>(a) age 60 (55) and completion of five years of membership (creditable) service; or</p> <p>(b) completion of 20 years of creditable service.</p> <p>Members receiving a benefit from the Disability Income Plan are eligible for this benefit.</p>
Death After Retirement	Upon the death of a beneficiary who did not retire under an effective election of Option 2, 3, 5 or 6, an amount equal to the excess if any, of the member's accumulated contributions at retirement over the retirement allowance payments received is paid to a designated person or to the beneficiary's estate.



Appendix C: Summary of Main Benefit & Contribution Provision

Upon the death of the survivor of a beneficiary who retired under an effective election of Option 2, 3, 5 or 6, an amount equal to the excess, if any, of the beneficiary's accumulated contributions at retirement over the total retirement allowance payments received is paid to such other person designated by the beneficiary or to the beneficiary's estate.

Upon the death of a beneficiary, a benefit may be provided by the Retirees' Contributory Death Benefit Plan.

Other Death Benefits

Upon the death of a member in service, other benefits may be provided by the Death Benefit Plan or Separate Insurance Benefit Plan for Law Enforcement Officers.

Optional Arrangements at Retirement

In lieu of the full retirement allowance, any member may elect to receive a reduced retirement allowance equal in value to the full allowance, with the provision that:

Option 1 - A member retiring prior to July 1, 1993, may elect that at his or her death within 10 years from retirement date, an amount equal to the member's accumulated contributions at retirement, less 1/120 for each month he or she has received a retirement allowance, is paid to the estate, or to a person(s) designated by the member, or

Option 2 - At the death of the member his or her allowance shall be continued throughout the life of such other person as the member shall have designated at the time of retirement, or

Option 3 - At the death of the member one-half of his or her allowance shall be continued throughout the life of such other person as the member shall have designated at the time of retirement.

Option 4 - A member may elect to receive a retirement allowance in such amount that, together with his Social Security benefit, he or she will receive approximately the same income per annum before and after the earliest age at which he or she becomes eligible to receive the Social Security benefit.

Option 5 - A member retiring prior to July 1, 1993 may elect to receive a reduced retirement allowance under the provisions of Option 2 or Option 3 in conjunction with the provisions of Option 1.

Option 6 - A member may elect either Option 2 or Option 3 with the added provision that in the event the designated beneficiary predeceases the member, the retirement allowance payable to the member after the designated beneficiary's death shall be equal to the retirement allowance which would have been payable had the member not elected the option.



Appendix C: Summary of Main Benefit & Contribution Provision

Post-Retirement Increases in Allowances

Future increases in allowances may be granted at the discretion of the State.

Service Reciprocity

For the purpose of determining eligibility for a deferred, reduced or unreduced service retirement allowance, the membership and creditable service of a member shall include such prior service earned as a member of the Local Governmental Employees' Retirement System (LGERS), the Consolidated Judicial Retirement System (CJRS), or the Legislative Retirement System (LRS). In addition, if the member's accumulated contributions and reserves are transferred from the prior System to this System, the creditable service earned as a member of the prior System may be included for purposes of determining the amount of benefits payable under this System.

Military Service

Periods of active duty in the United States military may be counted as creditable service if the member was an employee upon entering the military and returned to employment within two years of discharge or for a period of 10 additional years.

Service Purchases

Additional creditable service may include service that the member purchased to restore a period of service for which the member (1) received a refund of contributions, (2) had a leave of absence for educational purposes, extended illness or parental or maternity reasons, (3) had full-time temporary or part-time local or State government employment, (4) was in a probationary or waiting period with a unit of the LGERS, (5) had a leave of absence under Workers' Compensation, (6) performed service with a unit of local government not covered by LGERS, (7) performed service with the federal government not covered by any other retirement system, (8) performed service with a public community service entity funded entirely with federal funds, (9) performed service as a member of the General Assembly, (10) performed service as a member of a charter school not participating in the system, (11) was employed by The University of North Carolina and participated in the Optional Retirement Program but not eligible to receive any benefits from that program, or (12) performed service which was omitted by reason of error.

Unused Sick Leave

Unused sick leave counts as creditable service at retirement. Sick leave which was converted from unused vacation leave is also creditable. One month of credit is allowed for each 20 days of unused sick leave, plus an additional month for any part of 20 days left over.



Appendix C: Summary of Main Benefit & Contribution Provision

Transfer of Defined Contribution Balances (Special Retirement Allowances)

A member may make a one-time election to transfer any portion of their eligible accumulated contributions to this plan on or after retirement. Eligible accumulated contributions are those from the Supplemental Retirement Income Plan or Public Employee Deferred Compensation Plan, not including Roth after-tax contributions. A member who became a member of the Supplemental Retirement Income Plan prior to retirement and who remains a member of the Supplemental Retirement Income Plan may also make a one-time election to transfer eligible balances, not including any Roth after-tax contributions, from any of the following plans to the Supplemental Retirement Income Plan, subject to the applicable requirements of the Supplemental Retirement Income Plan, and then through the Supplemental Retirement Income Plan to this Retirement System:

- (1) A plan participating in the North Carolina Public School Teachers' and Professional Educators' Investment Plan.
- (2) A plan described in section 403(b) of the Internal Revenue Code.
- (3) A plan described in section 457(b) of the Internal Revenue Code that is maintained by a state, political subdivision of a state, or any agency or instrumentality of a state or political subdivision of a state.
- (4) An individual retirement account or annuity described in Section 408(a) or 408(b) of the Internal Revenue Code that is eligible to be rolled over and would otherwise be includible in gross income.
- (5) A tax-qualified plan described in section 401(a) or 403(a) of the Internal Revenue Code.

The member may elect to convert the accumulated contributions to a life annuity with or without annual increases equal to the annual increase in the U.S. Consumer Price Index. Any ad-hoc COLA increases granted will not apply to benefits under this section. A member may elect Options 2, 3, or 6 under the Plan and may also elect either a guaranteed number of months of payments or a guarantee of total payments at least equal to the amount of contributions transferred to the Plan. In addition, any transfer may be paid in whole or in part with employer contributions paid directly to the Retirement System at the time of transfer.



Appendix C: Summary of Main Benefit & Contribution Provision

Contributions

Member Contributions Each member contributes 6% of his or her compensation.

Employer Contributions Employers make annual contributions consisting of a normal contribution and an accrued liability contribution. The normal contribution covers the liability on account of current service and is determined by the actuary after each valuation.

The accrued liability contribution covers the past service liability that exceeds the actuarial value of assets.

The minimum total employer contribution rate is 6.00%.

Changes Since Prior Valuation None.



Appendix D: Actuarial Assumptions and Methods

Assumptions are based on the experience investigation prepared as of December 31, 2019 and adopted by the Board of Trustees on January 28, 2021 for use beginning with the December 31, 2020 annual actuarial valuation.

Interest Rate: 6.50% per annum, compounded annually.

Price Inflation: 2.50% per annum, compounded annually.

Real Wage Growth: 0.75% per annum.

Payroll Growth: 3.25% per annum.

Separations from Active Service: Representative values of the assumed rates of separation from active service are as follows:

Annual Rates of Withdrawal								
Up to five years of membership								
	General Employees		Teachers, Librarians and Counselors		Law Enforcement Officers		Other Education	
Service	Male	Female	Male	Female	Male	Female	Male	Female
0	0.0900	0.0900	0.0500	0.0350	0.0350	0.0350	0.0900	0.0700
1	0.1700	0.1750	0.1750	0.1650	0.0925	0.0925	0.1900	0.1750
2	0.1500	0.1575	0.1550	0.1550	0.0925	0.0925	0.1700	0.1550
3	0.1250	0.1400	0.1450	0.1375	0.0950	0.0950	0.1300	0.1250
4	0.1100	0.1150	0.1150	0.1150	0.0800	0.0800	0.1100	0.1075
After five years of membership								
	General Employees		Teachers, Librarians and Counselors		Law Enforcement Officers		Other Education	
Age	Male	Female	Male	Female	Male	Female	Male	Female
25	0.2500	0.2500	0.3000	0.3500	0.0750	0.0750	0.2500	0.2500
30	0.1250	0.1200	0.0900	0.1000	0.0750	0.0750	0.1000	0.1500
35	0.0750	0.1000	0.0600	0.0575	0.0350	0.0350	0.0550	0.0750
40	0.0500	0.0575	0.0475	0.0400	0.0250	0.0250	0.0500	0.0650
45	0.0400	0.0400	0.0375	0.0350	0.0200	0.0200	0.0500	0.0475
50	0.0400	0.0400	0.0425	0.0400	0.0200	0.0200	0.0500	0.0450
55	0.0400	0.0400	0.0425	0.0400			0.0400	0.0350
60	0.0400	0.0400	0.0425	0.0400			0.0400	0.0350



Appendix D: Actuarial Assumptions and Methods

Annual Rates of Mortality for Employees								
(Base rates using Pub-2010 Amount weighted)								
Age	General Employees		Teachers, Librarians and Counselors		Law Enforcement Officers		Other Education	
	Male	Female	Male	Female	Male	Female	Male	Female
25	0.00028	0.00009	0.00016	0.00009	0.00037	0.00020	0.00028	0.00009
30	0.00036	0.00015	0.00022	0.00014	0.00041	0.00027	0.00036	0.00015
35	0.00047	0.00023	0.00030	0.00020	0.00047	0.00036	0.00047	0.00023
40	0.00066	0.00036	0.00042	0.00031	0.00059	0.00049	0.00066	0.00036
45	0.00098	0.00056	0.00067	0.00048	0.00082	0.00067	0.00098	0.00056
50	0.00149	0.00083	0.00111	0.00073	0.00120	0.00091	0.00149	0.00083
55	0.00219	0.00123	0.00172	0.00107	0.00175	0.00123	0.00219	0.00123
60	0.00319	0.00186	0.00264	0.00161	0.00264	0.00168	0.00319	0.00186
65	0.00468	0.00296	0.00435	0.00270	0.00410	0.00228	0.00468	0.00296
70	0.00703	0.00489	0.00709	0.00485	0.00766	0.00454	0.00703	0.00489
74	0.01001	0.00731	0.00993	0.00809	0.01263	0.00787	0.01001	0.00731

Annual Rates of Disability								
For active members								
with 5 or more years of service as of January 1, 1988								
Age	General Employees		Teachers, Librarians and Counselors		Law Enforcement Officers		Other Education	
	Male	Female	Male	Female	Male	Female	Male	Female
25	0.00020	0.00024	0.00006	0.00018	0.00330	0.00330	0.00020	0.00024
30	0.00040	0.00040	0.00012	0.00026	0.00430	0.00430	0.00040	0.00040
35	0.00100	0.00100	0.00030	0.00060	0.00600	0.00600	0.00100	0.00100
40	0.00300	0.00180	0.00066	0.00102	0.00790	0.00790	0.00300	0.00180
45	0.00500	0.00320	0.00138	0.00178	0.01100	0.01100	0.00500	0.00320
50	0.00840	0.00500	0.00234	0.00316	0.01760	0.01760	0.00840	0.00500
55	0.01440	0.00880	0.00474	0.00554	0.03070	0.03070	0.01440	0.00880
60	0.02400	0.01380	0.00768	0.01020	0.06010	0.06010	0.02400	0.01380
64	0.03160	0.01780	0.01124	0.01392	0.11210	0.11210	0.03160	0.01780



Appendix D: Actuarial Assumptions and Methods

Retirements: Representative values of the assumed rates of retirement from active service are as follows:

Annual Rates of Retirement

General Employees

Male	Service						
Age	5	10	15	20	25	30	35
50				0.030	0.040	0.600	0.600
55				0.030	0.040	0.400	0.350
60	0.090	0.070	0.070	0.100	0.225	0.400	0.270
65	0.180	0.250	0.250	0.300	0.400	0.275	0.300
70	0.180	0.250	0.225	0.225	0.250	0.300	0.300
75	1.000	1.000	1.000	1.000	1.000	1.000	1.000

Female	Service						
Age	5	10	15	20	25	30	35
50				0.035	0.040	0.400	0.400
55				0.040	0.040	0.400	0.250
60	0.070	0.080	0.090	0.095	0.200	0.400	0.250
65	0.200	0.250	0.300	0.300	0.350	0.350	0.300
70	0.150	0.200	0.225	0.250	0.350	0.300	0.300
75	1.000	1.000	1.000	1.000	1.000	1.000	1.000

Teachers, Librarians and Counselors

Male	Service						
Age	5	10	15	20	25	30	35
50				0.030	0.030	0.700	0.700
55				0.045	0.030	0.400	0.450
60	0.085	0.080	0.100	0.100	0.300	0.400	0.300
65	0.175	0.225	0.250	0.325	0.400	0.300	0.250
70	0.175	0.225	0.250	0.250	0.250	0.150	0.300
75	1.000	1.000	1.000	1.000	1.000	1.000	1.000

Female	Service						
Age	5	10	15	20	25	30	35
50				0.050	0.045	0.650	0.750
55				0.050	0.045	0.400	0.375
60	0.080	0.100	0.100	0.130	0.250	0.500	0.375
65	0.250	0.300	0.250	0.350	0.475	0.450	0.400
70	0.225	0.250	0.300	0.300	0.300	0.400	0.325
75	1.000	1.000	1.000	1.000	1.000	1.000	1.000



Appendix D: Actuarial Assumptions and Methods

Annual Rates of Retirement

Law Enforcement Officers

Age	Service						
	5	10	15	20	25	30	35
50			0.040	0.050	0.050	0.900	0.800
55	0.200	0.200	0.350	0.350	0.500	0.950	0.650
60	0.100	0.200	0.125	0.250	0.250	0.500	0.500
65	0.150	0.450	0.250	0.250	0.250	0.500	0.500
70	0.250	0.150	0.250	0.250	0.250	0.250	0.500
75	1.000	1.000	1.000	1.000	1.000	1.000	1.000

Other Education

Male Age	Service						
	5	10	15	20	25	30	35
50				0.035	0.045	0.500	0.500
55				0.040	0.050	0.300	0.300
60	0.080	0.070	0.100	0.090	0.200	0.300	0.275
65	0.100	0.250	0.250	0.300	0.275	0.250	0.275
70	0.100	0.250	0.250	0.225	0.300	0.250	0.350
75	1.000	1.000	1.000	1.000	1.000	1.000	1.000

Female Age	Service						
	5	10	15	20	25	30	35
50				0.045	0.045	0.400	0.500
55				0.045	0.060	0.300	0.300
60	0.070	0.090	0.100	0.100	0.300	0.375	0.300
65	0.175	0.250	0.250	0.300	0.350	0.300	0.350
70	0.150	0.200	0.225	0.200	0.275	0.200	0.350
75	1.000	1.000	1.000	1.000	1.000	1.000	1.000



Appendix D: Actuarial Assumptions and Methods

Salary Increases: Representative values of the assumed annual rates of salary increases are as follows:

Annual Rate of Salary Increase (Merit + Wage Inflation)				
Service	General Employees	Teachers, Librarians and Counselors	Law Enforcement Officers	Other Education
0	7.50%	7.30%	8.05%	7.50%
5	5.90%	6.12%	6.35%	5.90%
10	5.10%	5.29%	5.25%	5.10%
15	4.58%	4.38%	4.05%	4.58%
20	4.08%	3.25%	4.05%	4.08%
25	3.58%	3.25%	4.05%	3.58%
30	3.25%	3.25%	3.65%	3.25%
>=35	3.25%	3.25%	3.25%	3.25%



Appendix D: Actuarial Assumptions and Methods

Post-Retirement Mortality: Representative values of the assumed post-retirement mortality rates as of 2010 (the most recent developed Public Pension mortality tables) prior to any mortality improvements are as follows:

Annual Rates of Post-Retirement Mortality								
(Members Healthy at Retirement)								
	General Employees		Teachers, Librarians and Counselors		Law Enforcement Officers		Other Education	
Age	Male	Female	Male	Female	Male	Female	Male	Female
55	0.00455	0.00272	0.00335	0.00266	0.00327	0.00279	0.00455	0.00272
60	0.00649	0.00365	0.00471	0.00344	0.00549	0.00482	0.00649	0.00365
65	0.00963	0.00582	0.00672	0.00456	0.00957	0.00832	0.00963	0.00582
70	0.01610	0.01010	0.01183	0.00789	0.01711	0.01438	0.01610	0.01010
75	0.02818	0.01789	0.02187	0.01499	0.03085	0.02483	0.02818	0.01789
80	0.05037	0.03360	0.04030	0.02895	0.05571	0.04287	0.05037	0.03360

Annual Rates of Post-Retirement Mortality						
	(Contingent Survivors of Deceased members)		(Members Disabled at Retirement)			
	All Survivors		Non - Law Enforcement Officers		Law Enforcement Officers	
Age	Male	Female	Male	Female	Male	Female
55	0.01147	0.00742	0.02355	0.01692	0.01818	0.01587
60	0.01450	0.00975	0.02785	0.01914	0.02280	0.01833
65	0.02086	0.01332	0.03524	0.02178	0.02677	0.02051
70	0.03221	0.01931	0.04599	0.02706	0.03353	0.02450
75	0.04971	0.02946	0.06347	0.03718	0.04344	0.03239
80	0.07802	0.04698	0.09259	0.05517	0.05921	0.04678

Mortality Assumption: All mortality rates use Pub-2010 amount-weighted tables.

Mortality Projection: All mortality rates are projected from 2010 using generational improvement with Scale MP-2019.

Deaths After Retirement (General Employees and Other Education): Mortality rates are based on the General Mortality Table for Retirees. Rates for male members are multiplied by 105.5% at all ages. Rates for female members are multiplied by 95% for ages under 76, increased by 1% for each age up to age 90 and by 110% for all ages greater than 89. Because the retiree tables have no rates prior to age 50, the General Mortality Table for Employees is used for ages less than 50.



Appendix D: Actuarial Assumptions and Methods

Deaths After Retirement (Teachers): Mortality rates are based on the Below-median Teachers Mortality Table for Retirees. Rates for male members are multiplied by 96% for ages under 83, increased by 2% for each age up to 87 and by 106% for all ages greater than 86. Rates for female members are multiplied by 101% for age 81, increased by 1% for each age up to 85, and by 105% for all ages greater than 84. Because the retiree tables have no rates prior to age 55, the Below-median Teachers Mortality Table for Employees is used for ages less than 55.

Deaths After Retirement (Law Enforcement Officers): Mortality rates are based on the Safety Mortality Table for Retirees. Rates for all members are multiplied by 97% and Set Forward by 1 year. Because the retiree tables have no rates prior to age 45, the Safety Mortality Table for Employees is used for ages less than 45.

Deaths After Retirement (Survivors of Deceased Members): Mortality rates are based on the Below-median Teachers Mortality Table for Contingent Survivors. Rates for male members are Set Forward 3 years. Rate for female members are Set Forward 1 year. Because the contingent survivor tables have no rates prior to age 45, the Below-median Teachers Mortality Table for Employees is used for ages less than 45.

Deaths After Retirement (Disabled Members at Retirement): Mortality rates are based on the General Mortality Table for Disabled Retirees. Rates for male members not in Law Enforcement are Set Forward 3 years, while male members in Law Enforcement are Set Back 3 years. Rates for female members not in Law Enforcement are Set Back 1 year, while female members in Law Enforcement are Set Back 3 years.

Deaths Prior to Retirement: Mortality rates are based on the General Mortality Table for Employees for all employees except law enforcement officers. Mortality rates for law enforcement officers are based on the Safety Mortality Table for Employees.

Timing of Assumptions: All withdrawals, deaths, disabilities, retirements and salary increases are assumed to occur July 1 of each year. The timing of retirement changes from mid-year to beginning of year at and after the 100% retirement age.

Leave Conversions: Sick leave can be converted to increase creditable service and used to meet the eligibility requirements for retirement. Unused vacation leave can be converted to increase creditable service or compensation, but does not add to the eligibility service. The assumed impact of these conversions is shown in the table below.

	General Employees		Teachers, Librarians and Counselors		Law Enforcement Officers		Other Education	
	Male	Female	Male	Female	Male	Female	Male	Female
Increase in AFC (percentage) – Unused Vacation Leave								
	2.50%	2.50%	2.00%	2.00%	1.75%	1.75%	1.75%	1.75%
Increase in Service (years) – Unused Sick Leave								
Credited	0.85	0.55	0.90	0.70	1.50	1.50	1.05	0.80
Eligibility	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Liability for Inactive Members: For inactive members with five or more years of service, without actual deferred benefit amounts a deferred benefit amount is estimated based on available data and contribution balances projecting backwards assuming 4% salary growth and 4% interest on contribution balances where necessary. For inactive members with less than five years of service the liability is equal to the member's accumulated contributions.



Appendix D: Actuarial Assumptions and Methods

Administrative Expenses: 0.10% of payroll added to the normal cost rate.

Marriage Assumption: 100% married with male spouses three years older than female spouses.

Missing Gender Code: For members reported on the data without a gender code, we use the prior year's code where available or assign a code based on inspection.

Reported Compensation: Calendar year compensation as furnished by the system's office.

Valuation Compensation: Reported compensation adjusted to reflect the assumed rate of pay as of the valuation date and the probability of decrement during the year.

Compensation for members receiving DIPNC benefits: Compensation earned as of the disability benefit effective date is increased by inflation to the valuation date.

Compensation Limits: No compensation limits are applied.

Actuarial Cost Method: Entry age normal cost method. Entry age is established on an individual basis.

Normal Cost: Normal cost rate reflects the impact of new entrants during the year.

Amortization Period: 12-year closed, level-dollar amount. The first amortization base was created for the contribution payable for fiscal year ending 2012.

Asset Valuation Method: Actuarial value, as developed in Table 8. The actuarial value of assets is based upon a smoothed market value method. Under this method, asset returns in excess of or less than the expected return on market value of assets will be reflected in the actuarial value of assets over a five-year period. The Actuarial Value of Assets was reset to the market value of assets at December 31, 2014. The calculation of the Actuarial Value of Assets is based on the following formula:

$$MV - 80\% \times G/(L)_1 - 60\% \times G/(L)_2 - 40\% \times G/(L)_3 - 20\% \times G/(L)_4$$

MV = the market value of assets as of the valuation date

$G/(L)_i$ = the asset gain or (loss) for the i-th year preceding the valuation date



Appendix D: Actuarial Assumptions and Methods

Changes Since Prior Valuation:

The assumptions used for the December 31, 2020 actuarial valuation are based on the experience study prepared as of December 31, 2019 and adopted by the Board of Trustees on January 28, 2021. Material assumptions and methods that were changed since the prior valuation:

- The investment return assumption was lowered from 7.00% to 6.50%
- The inflation assumption was lowered from 3.00% to 2.50%
- The real wage growth assumption was increased from 0.50% to 0.75%
- The payroll growth assumption was lowered from 3.50% to 3.25%
- The withdrawal rates, retirement rates, mortality assumption, annual rate of salary increase assumption, and leave conversion assumptions were changed
- The marriage assumption was changed from assuming male spouses are four years older than female spouses to assume that male spouses are three years older than female spouses
- The method for valuing inactive members was changed from 200% of the member's accumulated contributions, to using existing actual data and estimating earnings and average final compensation where actual data isn't available for members with five or more years of service, and using 100% of the member's accumulated contributions for members with less than five years of service
- Estimated compensation for members receiving DIPNC benefits was updated such that the compensation earned as of the disability benefit effective date is increased by inflation to the valuation date



Appendix E: GASB 67 Fiduciary Net Position Projection

Table E-1: Projection of Fiduciary Net Positions (in thousands)

Calendar Year	Beginning Fiduciary Position	Member Contributions	Employer Contributions*	Benefit Payments	Administrative Expenses	Investment Earnings	Ending Fiduciary Position
2021	\$ 81,969,425	\$ 986,776	\$ 2,600,523	\$ 5,246,706	\$ 16,446	\$ 5,274,405	\$ 85,567,977
2022	85,567,977	931,549	2,669,781	5,421,601	15,526	5,503,194	89,235,374
2023	89,235,374	881,059	2,583,372	5,589,337	14,684	5,731,857	92,827,641
2024	92,827,641	835,599	2,238,950	5,753,219	13,927	5,947,665	96,082,709
2025	96,082,709	794,603	1,863,113	5,921,506	13,243	6,140,549	98,946,226
2026	98,946,226	755,616	1,587,018	6,105,790	12,594	6,310,725	101,481,201
2027	101,481,201	717,181	1,440,193	6,306,134	11,953	6,463,184	103,783,671
2028	103,783,671	679,093	1,404,710	6,510,325	11,318	6,603,979	105,949,810
2029	105,949,810	641,014	1,387,646	6,718,261	10,684	6,736,383	107,985,908
2030	107,985,908	602,627	1,191,494	6,927,076	10,044	6,854,568	109,697,477
2031	109,697,477	564,395	850,751	7,132,068	9,407	6,947,160	110,918,309
2032	110,918,309	526,832	526,832	7,327,654	8,781	7,008,714	111,644,253
2033	111,644,253	489,565	489,565	7,515,528	8,159	7,047,527	112,147,223
2034	112,147,223	452,633	452,633	7,693,488	7,544	7,072,184	112,423,641
2035	112,423,641	416,466	416,466	7,861,214	6,941	7,082,491	112,470,909
2036	112,470,909	381,054	381,054	7,947,080	6,351	7,080,570	112,360,156
2037	112,360,156	346,936	346,936	8,085,194	5,782	7,066,789	112,029,841
2038	112,029,841	314,149	314,149	8,197,838	5,236	7,039,635	111,494,700
2039	111,494,700	285,034	285,034	8,287,461	4,751	7,000,137	110,772,693
2040	110,772,693	257,057	257,057	8,367,716	4,284	6,948,864	109,863,672
2041	109,863,672	229,468	229,468	8,440,218	3,824	6,885,708	108,764,274
2042	108,764,274	202,555	202,555	8,506,506	3,376	6,810,419	107,469,921
2043	107,469,921	175,815	175,815	8,562,101	2,930	6,722,812	105,979,332
2044	105,979,332	150,089	150,089	8,601,453	2,501	6,623,032	104,298,588
2045	104,298,588	125,680	125,680	8,622,475	2,095	6,511,563	102,436,941
2046	102,436,941	103,134	103,134	8,620,857	1,719	6,389,177	100,409,810
2047	100,409,810	82,500	82,500	8,594,890	1,375	6,256,935	98,235,480
2048	98,235,480	64,120	64,120	8,546,463	1,069	6,115,987	95,932,174
2049	95,932,174	47,456	47,456	8,475,503	791	5,967,485	93,518,277
2050	93,518,277	32,896	32,896	8,376,431	548	5,812,827	91,019,917
2051	91,019,917	21,521	21,521	8,238,506	359	5,654,124	88,478,218
2052	88,478,218	14,577	14,577	8,063,962	243	5,494,056	85,937,223
2053	85,937,223	10,032	10,032	7,866,562	167	5,334,917	83,425,475
2054	83,425,475	6,930	6,930	7,653,000	115	5,178,289	80,964,509
2055	80,964,509	4,794	4,794	7,427,033	80	5,025,419	78,572,402
2056	78,572,402	3,313	3,313	7,191,025	55	4,877,387	76,265,335
2057	76,265,335	2,290	2,290	6,947,121	38	4,735,165	74,057,921
2058	74,057,921	1,576	1,576	6,695,999	26	4,599,671	71,964,719
2059	71,964,719	1,080	1,080	6,436,063	18	4,471,896	70,002,694
2060	70,002,694	736	736	6,171,954	12	4,352,791	68,184,991
2061	68,184,991	496	496	5,906,337	8	4,243,122	66,522,760
2062	66,522,760	332	332	5,640,714	6	4,143,563	65,026,267
2063	65,026,267	218	218	5,375,898	4	4,054,755	63,705,557
2064	63,705,557	140	140	5,112,628	2	3,977,325	62,570,532
2065	62,570,532	88	88	4,851,469	1	3,911,900	61,631,138
2066	61,631,138	53	53	4,592,937	1	3,859,107	60,897,412
2067	60,897,412	31	31	4,337,569	1	3,819,582	60,379,487
2068	60,379,487	18	18	4,085,905	-	3,793,966	60,087,584
2069	60,087,584	10	10	3,838,505	-	3,782,906	60,032,004
2070	60,032,004	5	5	3,595,930	-	3,787,053	60,223,137
2071	60,223,137	2	2	3,358,731	-	3,807,064	60,671,473
2072	60,671,473	1	1	3,127,439	-	3,843,604	61,387,641

*Employer contributions are not less than 6.00% of payroll in accordance with G.S. 135-8(d)(1a).



Appendix E: GASB 67 Fiduciary Net Position Projection

Table E-1: Projection of Fiduciary Net Positions (in thousands) (continued)

Calendar Year	Beginning Fiduciary Position	Member Contributions	Employer Contributions*	Benefit Payments	Administrative Expenses	Investment Earnings	Ending Fiduciary Position
2073	\$ 61,387,641	\$ -	\$ -	\$ 2,902,552	\$ -	\$ 3,897,349	\$ 62,382,437
2074	62,382,437	-	-	2,684,536	-	3,968,985	63,666,886
2075	63,666,886	-	-	2,473,822	-	4,059,214	65,252,278
2076	65,252,278	-	-	2,270,805	-	4,168,759	67,150,232
2077	67,150,232	-	-	2,075,851	-	4,298,362	69,372,743
2078	69,372,743	-	-	1,889,298	-	4,448,793	71,932,237
2079	71,932,237	-	-	1,711,456	-	4,620,849	74,841,630
2080	74,841,630	-	-	1,542,610	-	4,815,360	78,114,380
2081	78,114,380	-	-	1,383,015	-	5,033,194	81,764,560
2082	81,764,560	-	-	1,232,887	-	5,275,258	85,806,931
2083	85,806,931	-	-	1,092,395	-	5,542,507	90,257,043
2084	90,257,043	-	-	961,652	-	5,835,946	95,131,336
2085	95,131,336	-	-	840,706	-	6,156,644	100,447,275
2086	100,447,275	-	-	729,535	-	6,505,736	106,223,476
2087	106,223,476	-	-	628,047	-	6,884,436	112,479,864
2088	112,479,864	-	-	536,079	-	7,294,043	119,237,828
2089	119,237,828	-	-	453,400	-	7,735,955	126,520,383
2090	126,520,383	-	-	379,715	-	8,211,678	134,352,347
2091	134,352,347	-	-	314,655	-	8,722,837	142,760,529
2092	142,760,529	-	-	257,786	-	9,271,188	151,773,931
2093	151,773,931	-	-	208,618	-	9,858,632	161,423,945
2094	161,423,945	-	-	166,610	-	10,487,227	171,744,562
2095	171,744,562	-	-	131,184	-	11,159,200	182,772,579
2096	182,772,579	-	-	101,734	-	11,876,963	194,547,808
2097	194,547,808	-	-	77,632	-	12,643,124	207,113,301
2098	207,113,301	-	-	58,235	-	13,460,502	220,515,568
2099	220,515,568	-	-	42,902	-	14,332,140	234,804,805
2100	234,804,805	-	-	31,014	-	15,261,320	250,035,111
2101	250,035,111	-	-	21,985	-	16,251,579	266,264,705
2102	266,264,705	-	-	15,276	-	17,306,717	283,556,146
2103	283,556,146	-	-	10,405	-	18,430,817	301,976,558
2104	301,976,558	-	-	6,952	-	19,628,254	321,597,860
2105	321,597,860	-	-	4,566	-	20,903,715	342,497,008
2106	342,497,008	-	-	2,959	-	22,262,211	364,756,260
2107	364,756,260	-	-	1,903	-	23,709,096	388,463,453
2108	388,463,453	-	-	1,226	-	25,250,085	413,712,312
2109	413,712,312	-	-	799	-	26,891,275	440,602,788
2110	440,602,788	-	-	534	-	28,639,164	469,241,419
2111	469,241,419	-	-	368	-	30,500,680	499,741,731
2112	499,741,731	-	-	263	-	32,483,204	532,224,672
2113	532,224,672	-	-	194	-	34,594,597	566,819,075
2114	566,819,075	-	-	147	-	36,843,235	603,662,164
2115	603,662,164	-	-	112	-	39,238,037	642,900,088
2116	642,900,088	-	-	86	-	41,788,503	684,688,505
2117	684,688,505	-	-	66	-	44,504,751	729,193,190
2118	729,193,190	-	-	50	-	47,397,556	776,590,695
2119	776,590,695	-	-	38	-	50,478,394	827,069,052
2120	827,069,052	-	-	28	-	53,759,487	880,828,511

*Employer contributions are not less than 6.00% of payroll in accordance with G.S. 135-8(d)(1a).



Appendix E: GASB 67 Fiduciary Net Position Projection

Table E-2: Actuarial Present Value of Projected Benefit Payments (in thousands)

Calendar Year	Beginning Fiduciary Position	Benefit Payments	Funded Benefit Payments	Unfunded Benefit Payments	Present Value of Benefit Payments		
					Funded Payments at 6.50%	Unfunded Payments at 2.16%	Using Single Discount Rate of 6.50%
2021	\$ 81,969,425	\$ 5,246,706	\$ 5,246,706	\$ -	\$ 5,084,075	\$ -	\$ 5,084,075
2022	85,567,977	5,421,601	5,421,601	-	4,932,910	-	4,932,910
2023	89,235,374	5,589,337	5,589,337	-	4,775,142	-	4,775,142
2024	92,827,641	5,753,219	5,753,219	-	4,615,165	-	4,615,165
2025	96,082,709	5,921,506	5,921,506	-	4,460,247	-	4,460,247
2026	98,946,226	6,105,790	6,105,790	-	4,318,362	-	4,318,362
2027	101,481,201	6,306,134	6,306,134	-	4,187,846	-	4,187,846
2028	103,783,671	6,510,325	6,510,325	-	4,059,576	-	4,059,576
2029	105,949,810	6,718,261	6,718,261	-	3,933,555	-	3,933,555
2030	107,985,908	6,927,076	6,927,076	-	3,808,278	-	3,808,278
2031	109,697,477	7,132,068	7,132,068	-	3,681,668	-	3,681,668
2032	110,918,309	7,327,654	7,327,654	-	3,551,767	-	3,551,767
2033	111,644,253	7,515,528	7,515,528	-	3,420,498	-	3,420,498
2034	112,147,223	7,693,488	7,693,488	-	3,287,786	-	3,287,786
2035	112,423,641	7,861,214	7,861,214	-	3,154,426	-	3,154,426
2036	112,470,909	7,947,080	7,947,080	-	2,994,254	-	2,994,254
2037	112,360,156	8,085,194	8,085,194	-	2,860,368	-	2,860,368
2038	112,029,841	8,197,838	8,197,838	-	2,723,210	-	2,723,210
2039	111,494,700	8,287,461	8,287,461	-	2,584,960	-	2,584,960
2040	110,772,693	8,367,716	8,367,716	-	2,450,697	-	2,450,697
2041	109,863,672	8,440,218	8,440,218	-	2,321,062	-	2,321,062
2042	108,764,274	8,506,506	8,506,506	-	2,196,517	-	2,196,517
2043	107,469,921	8,562,101	8,562,101	-	2,075,937	-	2,075,937
2044	105,979,332	8,601,453	8,601,453	-	1,958,195	-	1,958,195
2045	104,298,588	8,622,475	8,622,475	-	1,843,175	-	1,843,175
2046	102,436,941	8,620,857	8,620,857	-	1,730,356	-	1,730,356
2047	100,409,810	8,594,890	8,594,890	-	1,619,853	-	1,619,853
2048	98,235,480	8,546,463	8,546,463	-	1,512,419	-	1,512,419
2049	95,932,174	8,475,503	8,475,503	-	1,408,321	-	1,408,321
2050	93,518,277	8,376,431	8,376,431	-	1,306,910	-	1,306,910
2051	91,019,917	8,238,506	8,238,506	-	1,206,939	-	1,206,939
2052	88,478,218	8,063,962	8,063,962	-	1,109,266	-	1,109,266
2053	85,937,223	7,866,562	7,866,562	-	1,016,068	-	1,016,068
2054	83,425,475	7,653,000	7,653,000	-	928,154	-	928,154
2055	80,964,509	7,427,033	7,427,033	-	845,773	-	845,773
2056	78,572,402	7,191,025	7,191,025	-	768,918	-	768,918
2057	76,265,335	6,947,121	6,947,121	-	697,500	-	697,500
2058	74,057,921	6,695,999	6,695,999	-	631,255	-	631,255
2059	71,964,719	6,436,063	6,436,063	-	569,719	-	569,719
2060	70,002,694	6,171,954	6,171,954	-	512,995	-	512,995
2061	68,184,991	5,906,337	5,906,337	-	460,956	-	460,956
2062	66,522,760	5,640,714	5,640,714	-	413,357	-	413,357
2063	65,026,267	5,375,898	5,375,898	-	369,907	-	369,907
2064	63,705,557	5,112,628	5,112,628	-	330,321	-	330,321
2065	62,570,532	4,851,469	4,851,469	-	294,317	-	294,317
2066	61,631,138	4,592,937	4,592,937	-	261,627	-	261,627
2067	60,897,412	4,337,569	4,337,569	-	232,001	-	232,001
2068	60,379,487	4,085,905	4,085,905	-	205,202	-	205,202
2069	60,087,584	3,838,505	3,838,505	-	181,011	-	181,011
2070	60,032,004	3,595,930	3,595,930	-	159,223	-	159,223
2071	60,223,137	3,358,731	3,358,731	-	139,643	-	139,643



Appendix E: GASB 67 Fiduciary Net Position Projection

Table E-2: Actuarial Present Value of Projected Benefit Payments (in thousands) (continued)

Calendar Year	Beginning Fiduciary Position	Benefit Payments	Funded Benefit Payments	Unfunded Benefit Payments	Present Value of Benefit Payments		
					Funded Payments at 6.50%	Unfunded Payments at 2.16%	Using Single Discount Rate of 6.50%
2072	\$ 60,671,473	\$ 3,127,439	\$ 3,127,439	\$ -	\$ 122,091	\$ -	\$ 122,091
2073	61,387,641	2,902,552	2,902,552	-	106,396	-	106,396
2074	62,382,437	2,684,536	2,684,536	-	92,399	-	92,399
2075	63,666,886	2,473,822	2,473,822	-	79,949	-	79,949
2076	65,252,278	2,270,805	2,270,805	-	68,909	-	68,909
2077	67,150,232	2,075,851	2,075,851	-	59,148	-	59,148
2078	69,372,743	1,889,298	1,889,298	-	50,547	-	50,547
2079	71,932,237	1,711,456	1,711,456	-	42,995	-	42,995
2080	74,841,630	1,542,610	1,542,610	-	36,388	-	36,388
2081	78,114,380	1,383,015	1,383,015	-	30,632	-	30,632
2082	81,764,560	1,232,887	1,232,887	-	25,640	-	25,640
2083	85,806,931	1,092,395	1,092,395	-	21,332	-	21,332
2084	90,257,043	961,652	961,652	-	17,633	-	17,633
2085	95,131,336	840,706	840,706	-	14,474	-	14,474
2086	100,447,275	729,535	729,535	-	11,794	-	11,794
2087	106,223,476	628,047	628,047	-	9,533	-	9,533
2088	112,479,864	536,079	536,079	-	7,641	-	7,641
2089	119,237,828	453,400	453,400	-	6,068	-	6,068
2090	126,520,383	379,715	379,715	-	4,772	-	4,772
2091	134,352,347	314,655	314,655	-	3,713	-	3,713
2092	142,760,529	257,786	257,786	-	2,856	-	2,856
2093	151,773,931	208,618	208,618	-	2,170	-	2,170
2094	161,423,945	166,610	166,610	-	1,627	-	1,627
2095	171,744,562	131,184	131,184	-	1,203	-	1,203
2096	182,772,579	101,734	101,734	-	876	-	876
2097	194,547,808	77,632	77,632	-	628	-	628
2098	207,113,301	58,235	58,235	-	442	-	442
2099	220,515,568	42,902	42,902	-	306	-	306
2100	234,804,805	31,014	31,014	-	208	-	208
2101	250,035,111	21,985	21,985	-	138	-	138
2102	266,264,705	15,276	15,276	-	90	-	90
2103	283,556,146	10,405	10,405	-	58	-	58
2104	301,976,558	6,952	6,952	-	36	-	36
2105	321,597,860	4,566	4,566	-	22	-	22
2106	342,497,008	2,959	2,959	-	14	-	14
2107	364,756,260	1,903	1,903	-	8	-	8
2108	388,463,453	1,226	1,226	-	5	-	5
2109	413,712,312	799	799	-	3	-	3
2110	440,602,788	534	534	-	2	-	2
2111	469,241,419	368	368	-	1	-	1
2112	499,741,731	263	263	-	1	-	1
2113	532,224,672	194	194	-	1	-	1
2114	566,819,075	147	147	-	-	-	-
2115	603,662,164	112	112	-	-	-	-
2116	642,900,088	86	86	-	-	-	-
2117	684,688,505	66	66	-	-	-	-
2118	729,193,190	50	50	-	-	-	-
2119	776,590,695	38	38	-	-	-	-
2120	827,069,052	28	28	-	-	-	-



Appendix F: Additional Disclosures

Table F-1 illustrates the sensitivity of certain valuation results to changes in the discount rate on a market value of assets basis. Table F-2 provides an estimate of future market value of asset returns based on the current portfolio structure and summarized in the “TSERS Asset-Liability and Investment Strategy Project” report dated April 19th, 2016.

Section 6(c) of Session Law 2016-108 requires that the actuarial valuation report provide the valuation results using a 30-year treasury rate as of December 31 of the year of the valuation as the discount rate. This is 1.65% at December 31, 2020 and has been used as the lower bound of the sensitivity analysis presented. The range between the current discount rate (6.50%) and the 30-year treasury rate (1.65%) was used to establish an upper bound for sensitivity analysis (11.35%). The remaining rates illustrated represent mid-points between the selected rates. Table F-2 illustrates our best estimate of the plausibility of such rates. The lower bound of 1.65% falls below the 5th percentile of estimated future 30-year returns while the upper bound of 11.35% falls between the 75th and 95th percentiles of estimated future 30-year returns.

Table F-1: Sensitivity of Valuation Results as of December 31, 2020

Discount Rate	1.65%	4.08%	6.50%	8.93%	11.35%
Market Value of Assets	\$ 81,969,425,086	\$ 81,969,425,086	\$ 81,969,425,086	\$ 81,969,425,086	\$ 81,969,425,086
Actuarial Accrued Liability	\$ 168,753,321,247	\$ 119,745,595,567	\$ 89,809,074,074	\$ 70,554,940,143	\$ 57,773,652,360
Unfunded Accrued Liability (AAL)	\$ 86,783,896,161	\$ 37,776,170,481	\$ 7,839,648,988	\$ (11,414,484,943)	\$ (24,195,772,726)
Funded Ratio	48.6%	68.5%	91.3%	116.2%	141.9%
20-Year Amortization of UAL	\$ 5,214,490,285	\$ 2,913,569,519	\$ 757,740,417	N/A	N/A
(as % of general state revenue)	15.9%	8.9%	2.3%	N/A	N/A



Appendix F: Additional Disclosures

Table F-2: Statistical Likelihood of Minimum Future Asset Returns as of 12/31/2015

Horizon	95% Chance (19 out of every 20 scenarios)	75% Chance (3 out of every 4 scenarios)	50% Chance (1 out of every 2 scenarios)	25% Chance (1 out of every 4 scenarios)	5% Chance (1 out of every 20 scenarios)
10 Years (2025)	0.2%	4.0%	5.9%	8.0%	11.5%
20 Years (2035)	2.2%	4.8%	6.7%	8.5%	11.8%
30 Years (2045)	3.1%	5.3%	7.1%	8.7%	12.0%

Other than the discount rate, these results are based on the other economic and demographic assumptions presented in the report. For purposes of simplicity in this disclosure, no adjustments to the valuation assumption for inflation were reflected in the sensitivities above. The statute also requires that the actuarial valuation report show the results using a market value of assets basis. The “funded ratio” and “unfunded accrued liability” in Table F-1 are based upon the market value of assets. In order to alleviate volatility, future employer contributions are determined based on the actuarial value of assets, which smooths market value returns.

None of the liability amounts shown are intended to imply the amount that might represent the cost of any settlement of the plan’s obligations. The various caveats, constraints, and discussions presented earlier in the report apply to these results as well.

This analysis was conducted by the prior actuary as of 12/31/2015, and capital market return expectations (including those of the Board of Trustees) have generally been reduced since that time. We understand that an updated study is being performed for DST.



Appendix G: Data for Section 2 Graphs

The tables below provide the numbers associated with the graphs in Section 2 of this report.

Graph 1: Active Members

	Active Member Count	Reported Compensation
2016	305,013	\$ 13,497,815,754
2017	304,554	13,914,085,325
2018	304,575	14,436,435,848
2019	305,962	14,886,467,797
2020	302,771	15,287,665,011

Graph 2: Retired Members and Survivors of Deceased Members

	Retired and Survivors of Deceased Member Count	Retirement Allowance
2016	208,443	\$ 4,343,259,132
2017	215,008	4,521,393,822
2018	222,084	4,668,925,869
2019	228,291	4,804,178,473
2020	233,751	4,927,686,580

Graph 3: Market Value of Assets and Asset Returns

	Market Value of Assets	Asset Return
2016	\$ 64,246,523,614	6.22%
2017	70,607,887,248	13.49%
2018	67,536,480,309	-1.39%
2019	75,486,780,473	14.85%
2020	81,969,425,086	11.12%



Appendix G: Data for Section 2 Graphs

Graph 5: Cost-of-Living Increase and CPI-U History

	Total Allowance Increase	National CPI-U
1990	0.00%	6.10%
1991	5.20%	3.10%
1992	2.20%	2.90%
1993	4.70%	2.70%
1994	3.20%	2.70%
1995	4.40%	2.50%
1996	6.20%	3.30%
1997	2.50%	1.70%
1998	2.30%	1.60%
1999	4.20%	2.70%
2000	2.00%	3.40%
2001	2.00%	2.60%
2002	1.30%	2.40%
2003	1.70%	1.90%
2004	2.00%	3.30%
2005	3.00%	3.40%
2006	2.20%	2.50%
2007	2.20%	4.10%
2008	0.00%	0.10%
2009	0.00%	2.70%
2010	0.00%	1.50%
2011	1.00%	3.00%
2012	0.00%	1.70%
2013	1.00%	1.50%
2014	0.00%	0.80%
2015	0.00%	0.70%
2016	1.00%	2.10%
2017	0.00%	2.10%
2018	0.00%	1.90%
2019	0.00%	2.30%
2020	0.00%	1.40%

* Allowance increases are effective at July 1 the following year



Appendix G: Data for Section 2 Graphs

Graph 6: Actuarial Value and Market Value of Assets

	Actuarial Value of Assets	Market Value of Assets
2016	\$ 67,376,892,466	\$ 64,246,523,614
2017	69,568,450,606	70,607,887,248
2018	70,959,093,440	67,536,480,309
2019	73,353,759,963	75,486,780,473
2020	77,922,070,039	81,969,425,086

Graph 7: Asset Returns

	Actuarial Value Value of Assets	Market Value Asset Return
2016	5.32%	6.22%
2017	6.56%	13.49%
2018	5.10%	-1.39%
2019	6.18%	14.85%
2020	8.80%	11.12%

Graph 8: Actuarial Accrued Liability

Fiscal Year Ending	Active	Deferred	Retired	Total
2016	\$ 28,548,308,913	\$ 3,764,216,305	\$ 42,235,329,807	\$ 74,547,855,025
2017	30,943,761,739	4,053,311,655	44,212,274,274	79,209,347,668
2018	32,234,081,882	4,337,483,404	45,534,377,845	82,105,943,131
2019	33,527,838,928	4,621,814,392	46,723,661,952	84,873,315,272
2020	37,450,731,186	3,184,248,746	49,174,094,142	89,809,074,074



Appendix G: Data for Section 2 Graphs

Graph 9: Actuarial Accrued Liability and Actuarial Value of Assets

	Actuarial Accrued Liability	Actuarial Value of Assets
2016	\$ 74,547,855,025	\$ 67,376,892,466
2017	79,209,347,668	69,568,450,606
2018	82,105,943,131	70,959,093,440
2019	84,873,315,272	73,353,759,963
2020	89,809,074,074	77,922,070,039

Graph 10: Funded Ratios

	Funded Ratio (Actuarial Basis)	Funded Ratio (Market Value Basis)
2016	90.4%	86.2%
2017	87.8%	89.1%
2018	86.4%	82.3%
2019	86.4%	88.9%
2020	86.8%	91.3%

Graph 11: Actuarially Determined Employer Contribution Rates

Fiscal Year Ending	Normal Rate	Accrued Liability Rate	Total ADEC
2018	4.48%	7.81%	12.29%
2019	5.17%	7.80%	12.97%
2020	5.18%	9.60%	14.78%
2021	5.16%	10.58%	15.74%
2022*	6.39%	8.74%	15.13%

* Subject to the impact of future legislative changes effective during that fiscal year



Appendix G: Data for Section 2 Graphs

Graph 12: Projected Actuarially Determined Employer Contribution Rates

	Alternate #1 (0.0% 2021 Return)	Baseline Projection	Alternate #2 (13.0% 2021 Return)
2021	14.78%	14.78%	14.78%
2022	15.74%	15.74%	15.74%
2023	15.13%	15.13%	15.13%
2024	15.21%	14.42%	13.62%
2025	14.33%	12.57%	10.82%
2026	14.05%	11.38%	8.72%
2027	13.91%	10.31%	6.71%
2028	14.05%	9.49%	6.00%
2029	13.41%	8.56%	6.00%
2030	13.04%	8.09%	6.00%
2031	11.10%	6.28%	6.00%
2032	9.54%	6.00%	6.00%
2033	7.60%	6.00%	6.00%
2034	6.18%	6.00%	6.00%
2035	6.00%	6.00%	6.00%
2036	6.00%	6.00%	6.00%
2037	6.00%	6.00%	6.00%
2038	6.00%	6.00%	6.00%

Graph 13: Projected Funded Ratio

	Alternate #1 (0.0% 2021 Return)	Baseline Projection	Alternate #2 (13.0% 2021 Return)
2020	86.76%	86.76%	86.76%
2021	88.58%	89.73%	90.87%
2022	89.34%	91.93%	94.52%
2023	91.45%	95.44%	99.42%
2024	92.60%	97.93%	103.26%
2025	93.29%	99.93%	106.57%
2026	95.17%	102.07%	108.97%
2027	96.85%	103.61%	110.47%
2028	98.23%	104.41%	111.00%
2029	99.58%	105.12%	111.55%
2030	100.79%	105.66%	112.14%
2031	101.73%	106.04%	112.77%
2032	102.40%	106.42%	113.42%
2033	102.78%	106.81%	114.11%
2034	103.04%	107.22%	114.84%
2035	103.29%	107.65%	115.59%



Appendix H: Participating Employers

Employer	Employer Code	Employer	Employer Code
A Childs Garden Charter (Aka Cross Creek Charter)	33501	Carteret Community College	31605
Academy of Moore County	36301	Carteret County Schools	31600
Administrative Office of the Courts	10800	Casa Esperanza Montessori	39209
Alamance Community College	30105	Caswell County Schools	31700
Alamance Community Schools	32915	Catawba County Schools	31800
Alamance County Schools	30100	Catawba Valley Community College	31805
Alexander County Schools	30200	Central Carolina Community College	35305
Alleghany County Schools	30300	Central Park School For Children	33202
American Renaissance Middle School	34901	Central Piedmont Community College	36005
Anson County Schools	30400	Chapel Hill - Carboro City Schools	36810
Appalachian State University	20100	Charlotte Secondary Charter	36009
Arapahoe Charter School	36901	Charlotte-Mecklenburg County Schools	36000
Arts Based Elementary Charter	33402	Chatham County Schools	31900
Ashe County Schools	30500	Cherokee County Schools	32000
Asheboro City Schools	37610	Childrens Village Academy	35401
Asheville City Schools	31110	Clay County Schools	32200
Asheville-Buncombe Technical College	31105	Cleveland County Schools	32300
Avery County Schools	30600	Cleveland Technical College	32305
Barber Examiners, State Board of	18600	Clinton City Schools	38210
Bear Grass Charter School	33206	Clover Garden Charter School	30102
Beaufort County Community College	30705	Coastal Carolina Community College	36705
Beaufort County Schools	30700	College of the Albemarle	37005
Bertie County Schools	30800	Columbus County Schools	32400
Bethany Community Middle School	37901	Community Colleges Administration	19005
Bladen Community College	30905	Community School of Davidson	36003
Bladen County Schools	30900	Cornerstone Academy	33027
Blue Ridge Community College	34505	Corvian Community School	36004
Brevard Academy Charter School	38801	Craven Community College	32505
Bridges Charter Schools	38601	Cumberland County Schools	32600
Brunswick Community College	31005	Currituck County Schools	32700
Brunswick County Schools	31000	Dare County Schools	32800
Buncombe County Schools	31100	Davidson County Community College	32905
Burke County Schools	31200	Davidson County Schools	32900
Cabarrus County Schools	31300	Davie County Schools	33000
Caldwell Community College	31405	Department of Administration	10900
Caldwell County Schools	31400	Department of Agriculture	18400
Camden County Schools	31500	Department of Commerce	12510
Cape Fear Community College	36505	Department of Cultural Resources	10700
Cape Fear Center For Inquiry	36501	Department of Justice	10400
Carolina International School	31301	Department of Public Instruction	22000



Appendix H: Participating Employers

Employer	Employer Code	Employer	Employer Code
Department of Public Safety	19100	Healthy Start Academy	33203
Discovery Charter	32904	Henderson Collegiate Charter School	39401
Duplin County Schools	33100	Henderson County Schools	34500
Durham Public Schools	33200	Hertford County Schools	34600
Durham Technical Institute	33205	Hickory City Schools	31810
East Carolina University	20300	Highway - Administrative	51000
East Wake Academy	39208	Hoke County Schools	34700
Edenton-Chowan County Schools	32100	Hyde County Schools	34800
Edgecombe County Schools	33300	Information Technology Services	10930
Edgecombe Technical College	33305	Insurance Department	12600
Elizabeth City and Pasquotank County Schools	37000	Invest Collegiate Charter (Buncombe)	33207
Elizabeth City State University	20400	Invest Collegiate Charter School	32901
Elkin City Schools	38620	Iredell County Schools	34900
Endeavor Charter School	39201	Isothermal Community College	38105
Environment and Natural Resources	11300	Jackson County Schools	35000
Evergreen Community Charter School	31102	James Sprunt Technical College	33105
F Delany New School For Children	31101	Johnston County Schools	35100
Fayetteville State University	20600	Johnston Technical College	35105
Fayetteville Technical Community College	32605	Jones County Schools	35200
Forsyth Technical Institute	33405	Kannapolis City Schools	31320
Franklin County Schools	33500	Labor Department	12700
Gaston College	33605	Lake Norman Charter School	36006
Gaston College Preparatory Charter	36601	Lenoir County Community College	35405
Gaston County Schools	33600	Lenoir County Schools	35400
Gates County Schools	33700	Lexington City Schools	32910
General Assembly	12160	Lincoln County Schools	35500
Governor's Office	12100	Lt Governor's Office	12150
Graham County Schools	33800	Macon County Schools	35600
Granville County Schools and Oxford Orphanage	33900	Madison County Schools	35700
Gray Stone Day School	38402	Martin Community College	35805
Greene County Schools	34000	Martin County Schools	35800
Guilford County Schools	34100	Mayland Technical College	36105
Guilford Technical Community College	34105	Mcdowell County Schools	35900
Halifax Community College	34205	Mcdowell Technical College	35905
Halifax County Schools	34200	Millennium Charter Academy	38602
Haliwa-Saponi Tribal Charter	39301	Mitchell Community College	34905
Harnett County Schools	34300	Mitchell County Schools	36100
Haywood County Schools	34400	Montgomery Community College	36205
Haywood Technical College	34405	Montgomery County Schools	36200
Health & Human Svcs	12220	Moore County Schools	36300



Appendix H: Participating Employers

Employer	Employer Code	Employer	Employer Code
Mooresville City Schools	34910	Pitt County Schools	37400
Mount Airy City Schools	38610	Polk County Schools	37500
Mountain Community School	34501	Randolph Community College	37605
Mtn Discovery Charter	38701	Randolph County Schools	37600
NC Auctioneers Licensing Board	18740	Revenue Department	13500
NC Central University	20800	Richmond County Schools	37700
NC Innovative School District	39220	Richmond Technical College	37705
NC School of Science & Mathematics	10950	River Mill Academy Charter	30103
NC School of the Arts	20200	Roanoke Rapids City Schools	34220
NC State Board of Examiners of Practicing Psychology	18780	Roanoke-Chowan Community College	34605
NC State University	21300	Robeson Community College	37805
N.E. Academy of Aerospace & Adv.Tech	37001	Robeson County Schools	37800
N.E. Regional School For Biotechnology	33001	Rockingham Community College	37905
Nash-Rocky Mount Schools	36400	Rockingham County Schools	37900
Nash Technical College	36405	Rowan-Cabarrus Community College	38005
NC A&T University	20700	Rowan-Salisbury School System	38000
NC Department of Military & Veterans Affairs	11050	Roxboro Community School	37301
NC Housing Finance Agency	11310	Rutherford County Schools	38100
Neuse Charter School	35106	Sampson Community College	38205
New Bern/Craven County Board of Education	32500	Sampson County Schools	38200
New Hanover County Schools	36500	Sandhills Community College	36305
Newton-Conover City Schools	31820	Sanford-Lee County Board of Education	35300
North Carolina Board of Opticians	18640	Scotland County Schools	38300
North Carolina Education Lottery	10200	Secretary of State	13700
Northampton County Schools	36600	Socrates Academy	36007
Office of Administrative Hearing	10850	South Piedmont Community College	30405
Office of State Budget & Management	10910	Southeastern Academy Charter School	37801
Office of State Controller	10940	Southeastern Community College	32405
Onslow County Schools	36700	Southern Wake Academy	39204
Orange Charter School	36802	Southwestern Community College	35005
Orange County Schools	36800	Stanly Community College	38405
Pamlico Community College	36905	Stanly County Schools	38400
Pamlico County Schools	36900	Stars Charter School	36302
Pender County Schools	37100	State Auditor	10500
Perquimans County Schools	37200	State Board of Elections	11900
Person County Schools	37300	State Division of Health Services	12200
Piedmont Community College	37305	State Treasurer	14300
Pine Lake Prep Charter	36008	Stokes County Schools	38500
Pinnacle Classical Academy	39703	Success Institute	34903
Pitt Community College	37405	Surry Community College	38605



Appendix H: Participating Employers

Employer	Employer Code	Employer	Employer Code
Surry County Schools	38600	Wake Technical College	39205
Swain County Schools	38700	Warren County Schools	39300
The Hawbridge School	30104	Washington County Schools	39400
The North Carolina Leadership Academy	36303	Watauga County Schools	39500
Thomasville City Schools	32920	Wayne Community College	39605
Transylvania County Schools	38800	Wayne County Schools	39600
Tri-County Community College	32005	Weldon City Schools	34230
Two Rivers Comm School	39501	Western Carolina University	21800
Tyrrell County Schools	38900	Western Piedmont Community College	31205
UNC - Pembroke	21200	Whiteville City Schools	32410
UNC Health Care System	21550	Wildlife Resources Commission	11600
UNC-Ch Cb 1260	21520	Wilkes Community College	39705
UNC-General Administration	21525	Wilkes County Schools	39700
Union County Schools	39000	Wilmington Prep Academy	36502
University of North Carolina at Asheville	23000	Wilson Community College	39805
University of North Carolina at Charlotte	23100	Wilson County Schools	39800
University of North Carolina at Greensboro	20900	Winston-Salem State University	21900
University of North Carolina at Wilmington	23200	Winston-Salem-Forsyth County Schools	33400
University of North Carolina Press	21570	Yadkin County Schools	39900
Uwharrie Charter Academy	37601	Yancey County Schools	30000
Vance Charter School	39101	Zeca School of the Arts and Technology	36701
Vance County Schools	39100		
Vance-Granville Community College	39105		
Voyager Academy	33204		
Wake County Schools	39200		