

*Presentation to the Retirement Board*  
**Revision of Actuarial Assumptions and  
the Estimated Range of the Next  
Employer Contribution Rate**



---

**Richard A. Young, Chief Actuary**  
**Melody Prangle, Deputy Chief Actuary**

**October 28, 2021**

# Current ECR

## June 30, 2020 Actuarial Valuation

---

**Employer Contribution Rate (ECR) = 9.80%**

- Applicable to 7/1/2021 – 6/30/2022 member salaries
- Payable in the Fall of 2022

# ECR – Where are we going?

---

## The *Estimated Range* of the next Employer Contribution Rate:

**June 30, 2021, Actuarial Valuation**

**10.00% to 10.50%**

Estimated range of ECR includes the proposed revision to actuarial assumptions and all actuarial gains/losses

# Application Dates

---

- Will be multiplied by 2022 – 2023 fiscal year salaries
- Will be collected in 2023 – 2024 fiscal year (Sept/Oct/Nov 2023)

**2023**

September

October

November

# Employer Dollars Contributed

Collection Date	Employer Contributions	ECR
Fall 2018	\$1.6 billion	9.80%
Fall 2019	\$1.8 billion	10.62%
Fall 2020	\$1.5 billion	8.86%
Fall 2021	\$1.6 billion	9.53%
Fall 2022	\$1.7 billion*	9.80%
Fall 2023	\$1.7 - \$1.8 billion*	10.00 – 10.50%

*\*estimated*

'72 – '73	18.80%	'85 – '86	21.40%	'98 – '99	1.42%	'11 – '12	11.11%
'73 – '74	18.80%	'86 – '87	18.80%	'99 – '00	1.43%	'12 – '13	11.84%
'74 – '75	18.80%	'87 – '88	16.83%	'00 – '01	0.43%	'13 – '14	16.25%
'75 – '76	19.40%	'88 – '89	14.79%	'01 – '02	0.36%	'14 – '15	17.53%
'76 – '77	19.40%	'89 – '90	6.87%	'02 – '03	0.36%	'15 – '16	13.26%
'77 – '78	20.40%	'90 – '91	6.84%	'03 – '04	2.52%	'16 – '17	11.72%
'78 – '79	21.40%	'91 – '92	6.64%	'04 – '05	5.63%	'17 – '18	9.80%
'79 – '80	22.49%	'92 – '93	8.00%	'05 – '06	7.97%	'18 – '19	10.62%
'80 – '81	23.49%	'93 – '94	8.41%	'06 – '07	8.60%	'19 – '20	8.86%
'81 – '82	23.49%	'94 – '95	7.24%	'07 – '08	8.73%	'20 – '21	9.53%
'82 – '83	23.49%	'95 – '96	6.37%	'08 – '09	7.63%	'21 – '22	9.80%
'83 – '84	22.90%	'96 – '97	3.57%	'09 – '10	6.19%		
'84 – '85	22.80%	'97 – '98	1.25%	'10 – '11	8.62%		

# Historic 50 Years of ECR

# NYSTRS Funded Ratio History

Funded Ratio is the ratio of plan assets to accrued liabilities

FYE	Funded Ratio Based on MVA	Funded Ratio Based on AVA
6/30/2016	98.4%	97.9%
6/30/2017	99.8%	97.7%
6/30/2018	100.9%	99.2%
6/30/2019	101.2%	99.6%
6/30/2020	97.3%	98.9%
6/30/2021*	113%	99%

*\*estimated*

# Rates of Return

Fiscal Year	Market Value Rate of Return (net of fees)
2016 – 2017	12.5%
2017 – 2018	9.0%
2018 – 2019	7.1%
2019 – 2020	3.5%
<b>2020 – 2021</b>	<b>29.0%</b>
<b>5-year average:</b>	<b>11.9%</b>

5-year geometric average:  $[(1.125) \times (1.09) \times (1.071) \times (1.035) \times (1+0.29)]^{(1/5)} - 1 = 11.9\%$

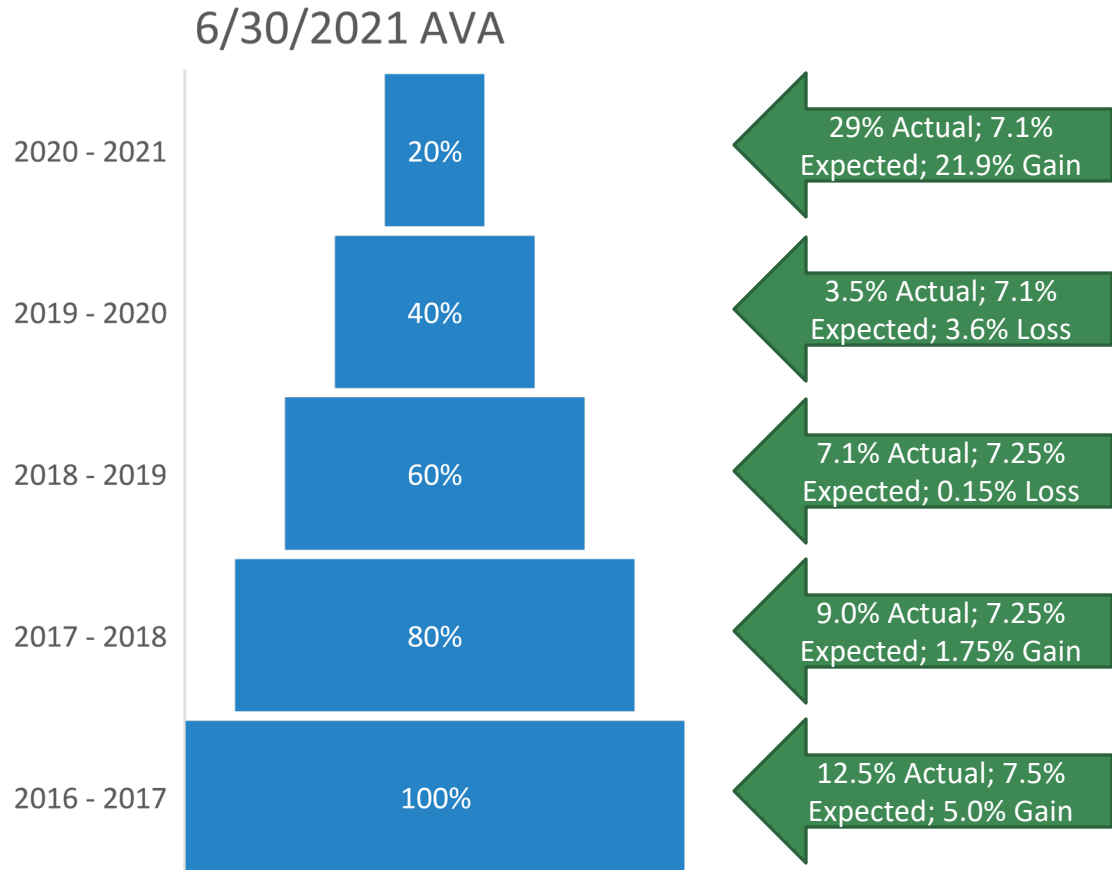


# ACTUARIAL VALUE OF ASSETS (AVA)

AVA smoothes the effects of short-term market volatility

NYSTRS' AVA method:

- 5-year smoothing
- The difference between expected and actual return is recognized 20% per year



# Revision of Actuarial Assumptions

Actuarial projections are all based upon **assumptions** – the assumed rates (probabilities) of future events, such as retirement, death and disability. They are typically revised every five years.

Actuarial assumptions are typically grouped as:

- Demographic; or
- Economic

Actuarial assumptions are a key component in:

- Determination of Employer Contribution Rate
- Fiscal Note Costs
- Factors – Loan Default, De Minimis Lump Sum, etc.

# Types of Actuarial Assumptions

---

## Economic:

- Valuation Rate of Interest
- Salary Scale
- Assumed rate of COLA increase

## Demographic:

- Mortality
  - Active Member Mortality
  - Healthy Annuitant Mortality
  - Disabled Annuitant Mortality
  - Survivor & Beneficiary Mortality
- Retirement
  - Service Retirement
  - Disability Retirement
- Withdrawal



# Valuation Rate of Interest

Cost Impact: ECR Increase of 2.03%

---

**Rate recommended to be lowered from 7.10% to 6.95%**

Rate of return assumption equals long-term expected return on plan assets

Used to discount future liabilities to determine their present value

Key assumption - most impactful of the assumptions - large impact on the ECR

# 2021 Callan CMAs and Target Allocation



Callan Asset Class (20 year Horizon)	Target Allocation	Arithmetic Return	Geometric Return	Standard Deviation
Broad US Equity <sup>1</sup>	33.0%	8.55%	7.20%	17.95%
Global Ex-US Equity <sup>2</sup>	16.0%	9.30%	7.40%	20.70%
Global Equity	4.0%	8.85%	7.45%	18.25%
Real Estate Equity <sup>3</sup>	11.0%	8.35%	7.20%	16.75%
Private Equity	8.0%	11.80%	8.30%	27.80%
Private Credit	2.0%	7.70%	6.85%	14.60%
Core US Fixed Income	16.0%	2.70%	2.65%	3.75%
Global Fixed Income <sup>4</sup>	2.0%	2.15%	2.15%	3.10%
Real Estate Debt <sup>5</sup>	6.0%	4.20%	4.15%	4.65%
High Yield Bonds	1.0%	5.50%	5.05%	10.75%
Cash Equivalents	1.0%	1.60%	1.60%	0.90%
Inflation	N/A	N/A	2.00%	1.50%
<b>Total Portfolio</b>	<b>N/A</b>	<b>7.48%</b>	<b>6.76%</b>	<b>13.53%</b>

1 Modeled as 80% large cap / 20% mid and small cap

2 Modeled as 75% non-US developed markets / 25% emerging markets

3 Modeled as 55% core real estate / 30% non-core real estate / 15% REITs

4 Modeled as 60% non-US developed market bonds / 40% core US fixed income

5 Modeled as 80% commercial mortgages / 20% private mezzanine debt

Source: Callan LLC

# 2021 Callan CMAs and Target Allocation



Callan Asset Class (30 year Horizon)	Target Allocation	Arithmetic Return	Geometric Return	Standard Deviation
Broad US Equity <sup>1</sup>	33.0%	8.95%	7.60%	17.95%
Global Ex-US Equity <sup>2</sup>	16.0%	9.75%	7.90%	20.70%
Global Equity	4.0%	9.30%	7.95%	18.25%
Real Estate Equity <sup>3</sup>	11.0%	8.65%	7.50%	16.75%
Private Equity	8.0%	12.20%	8.75%	27.80%
Private Credit	2.0%	8.10%	7.25%	14.60%
Core US Fixed Income	16.0%	3.50%	3.50%	3.75%
Global Fixed Income <sup>4</sup>	2.0%	2.95%	2.95%	3.10%
Real Estate Debt <sup>5</sup>	6.0%	5.50%	5.50%	4.65%
High Yield Bonds	1.0%	6.00%	5.55%	10.75%
Cash Equivalents	1.0%	2.00%	2.00%	0.90%
Inflation	N/A	N/A	2.00%	1.50%
<b>Total Portfolio</b>	<b>N/A</b>	<b>8.01%</b>	<b>7.32%</b>	<b>13.53%</b>

1 Modeled as 80% large cap / 20% mid and small cap

2 Modeled as 75% non-US developed markets / 25% emerging markets

3 Modeled as 55% core real estate / 30% non-core real estate / 15% REITs

4 Modeled as 60% non-US developed market bonds / 40% core US fixed income

5 Modeled as 80% commercial mortgages / 20% private mezzanine debt

Source: Callan LLC

# Assumed Rate of Investment Return



- The table below shows the probability of meeting or exceeding a given investment return based on Callan's 20-year horizon CMAs with a 30-year measurement period

## Probabilities of Meeting Alternative Investment Return Assumptions

Investment Return Assumption	6.67%	6.75%	7.00%	7.10%	7.25%	7.50%
Probability of Meeting or Exceeding the Assumption	50%	49%	45%	43%	41%	37%

- The table below shows the probability of meeting or exceeding a given investment return based on Callan's 30-year horizon CMAs with a 30-year measurement period

## Probabilities of Meeting Alternative Investment Return Assumptions

Investment Return Assumption	7.20%	6.75%	7.00%	7.10%	7.25%	7.50%
Probability of Meeting or Exceeding the Assumption	50%	57%	53%	52%	49%	45%

# Stochastic Analysis

Cheiron performed a stochastic analysis projecting over 5,000 future investment return outcomes based on NYSTRS' asset allocation using capital market assumptions from Callan and from the Horizon Survey

## Projected Average Annual Investment Return

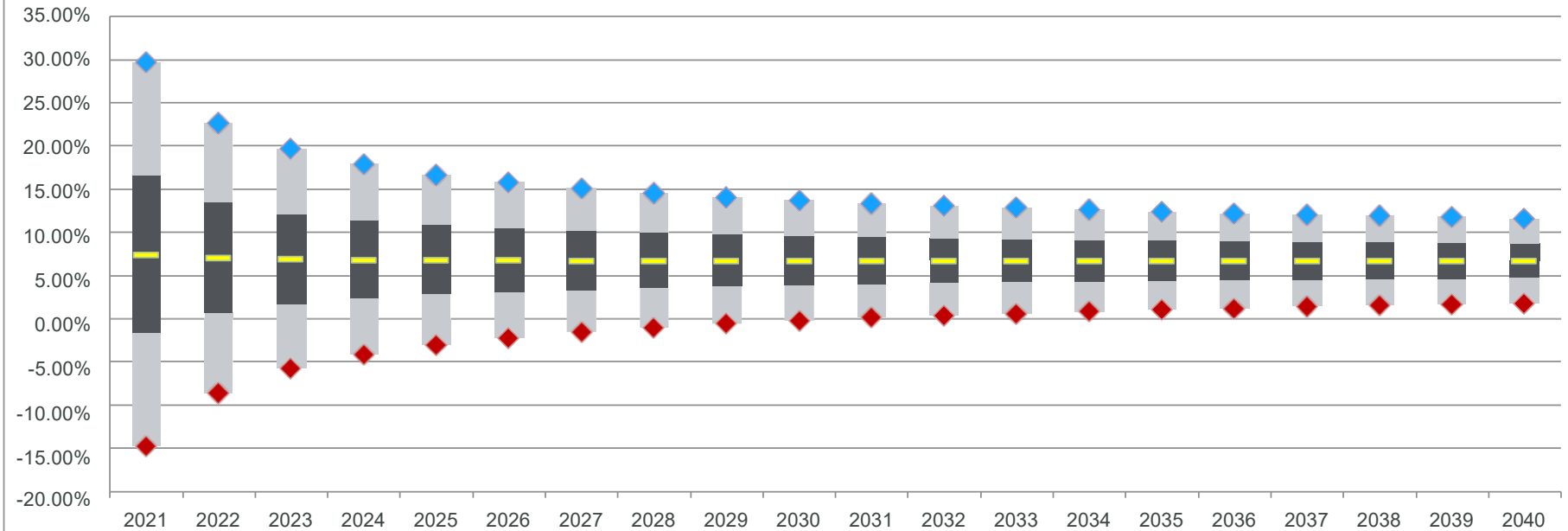
Percentile	25 <sup>th</sup>	50 <sup>th</sup>	75 <sup>th</sup>
Callan 20-year	4.7%	6.7%	8.7%
Callan 30-year	5.2%	7.2%	9.2%
Horizon Survey	4.9%	6.7%	8.6%



# Investment Return – Callan 20-Yr CMAs



## Projected Cumulative Investment Return for Plan Years Ending June 30

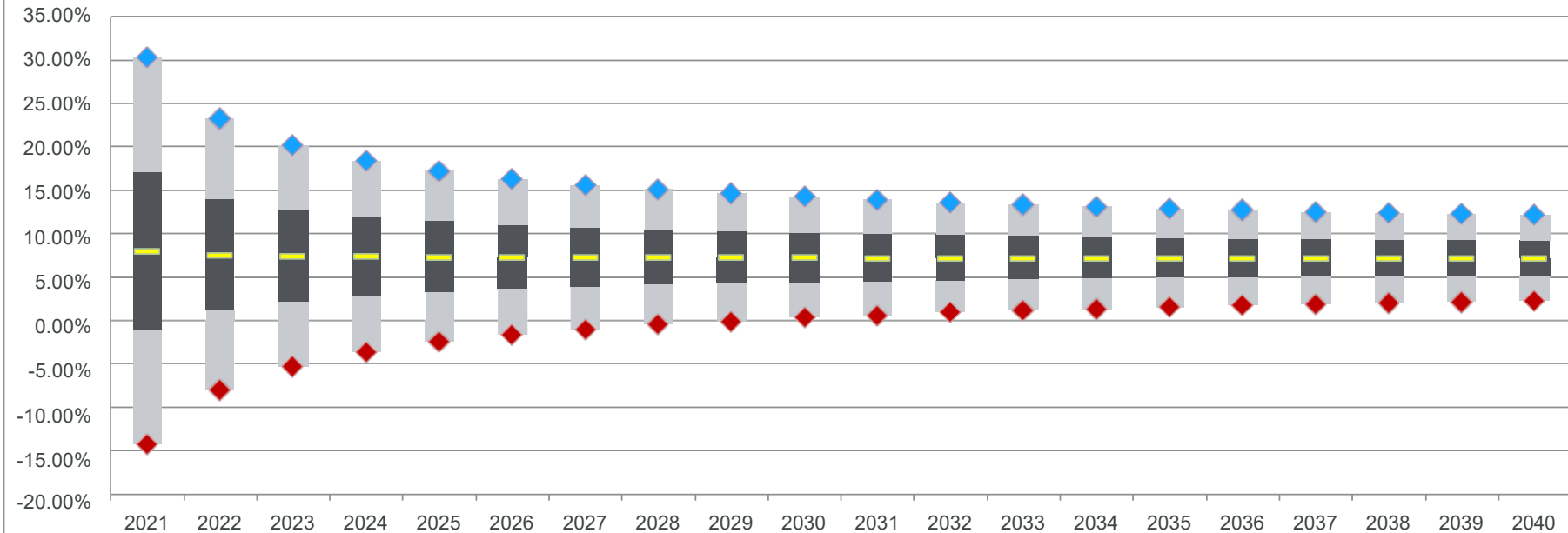


95%	◆	29.7%	22.7%	19.7%	17.9%	16.7%	15.8%	15.1%	14.5%	14.1%	13.7%	13.3%	13.1%	12.8%	12.6%	12.4%	12.2%	12.0%	11.9%	11.7%	11.6%
75%		16.6%	13.5%	12.1%	11.4%	10.8%	10.5%	10.2%	9.9%	9.7%	9.6%	9.4%	9.3%	9.2%	9.1%	9.0%	8.9%	8.9%	8.8%	8.8%	8.7%
50%	—	7.5%	7.1%	6.9%	6.8%	6.8%	6.8%	6.8%	6.7%	6.7%	6.7%	6.7%	6.7%	6.7%	6.7%	6.7%	6.7%	6.7%	6.7%	6.7%	6.7%
25%		-1.6%	0.6%	1.7%	2.3%	2.8%	3.1%	3.3%	3.6%	3.7%	3.9%	4.0%	4.1%	4.2%	4.3%	4.4%	4.4%	4.5%	4.6%	4.6%	4.7%
5%	◆	-14.8%	-8.6%	-5.8%	-4.2%	-3.0%	-2.2%	-1.6%	-1.0%	-0.6%	-0.2%	0.1%	0.4%	0.6%	0.8%	1.0%	1.2%	1.4%	1.5%	1.6%	1.8%

# Investment Return – Callan 30-Yr CMAs



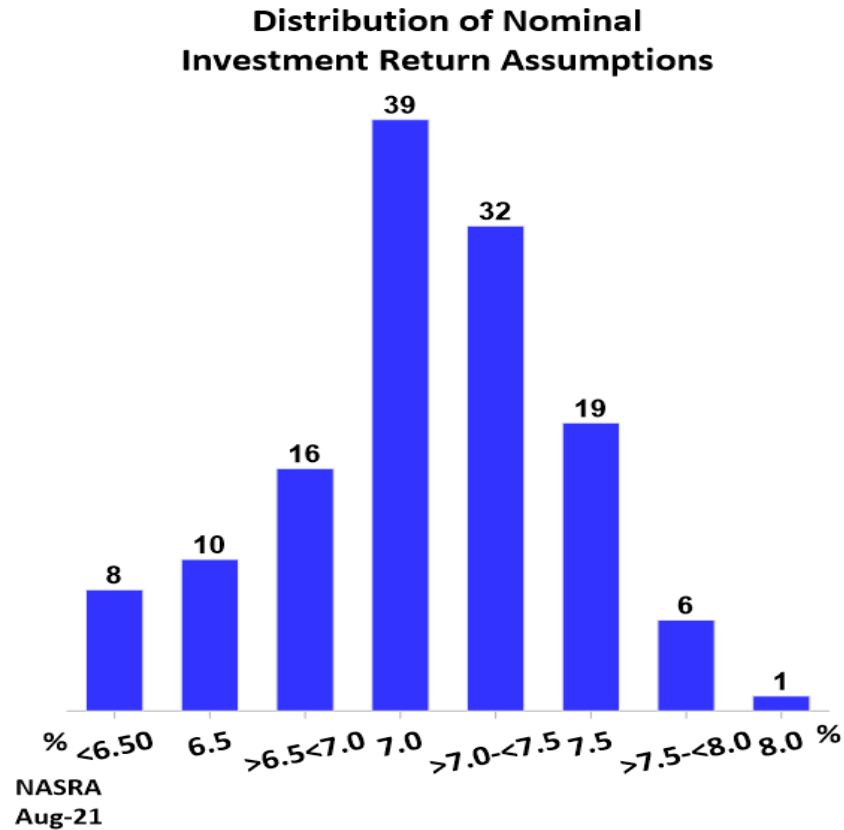
## Projected Cumulative Investment Return for Plan Years Ending June 30



95%	◆	30.2%	23.2%	20.2%	18.4%	17.2%	16.3%	15.6%	15.1%	14.6%	14.2%	13.9%	13.6%	13.3%	13.1%	12.9%	12.7%	12.6%	12.4%	12.3%	12.1%
75%		17.1%	14.0%	12.7%	11.9%	11.4%	11.0%	10.7%	10.5%	10.3%	10.1%	10.0%	9.8%	9.7%	9.6%	9.6%	9.5%	9.4%	9.3%	9.3%	9.2%
50%	—	8.0%	7.6%	7.4%	7.4%	7.3%	7.3%	7.3%	7.3%	7.3%	7.3%	7.2%	7.2%	7.2%	7.2%	7.2%	7.2%	7.2%	7.2%	7.2%	7.2%
25%		-1.1%	1.2%	2.2%	2.9%	3.3%	3.6%	3.9%	4.1%	4.3%	4.4%	4.5%	4.6%	4.7%	4.8%	4.9%	5.0%	5.0%	5.1%	5.1%	5.2%
5%	◆	-14.2%	-8.1%	-5.3%	-3.6%	-2.5%	-1.7%	-1.0%	-0.5%	-0.1%	0.3%	0.6%	0.9%	1.1%	1.3%	1.5%	1.7%	1.9%	2.0%	2.2%	2.3%

# Survey of Other Public Plans

- Average Return Assumption: 7.06%
- Median Return Assumption: 7.00%



Source: NASRA Public Fund Survey, August 2021

# Peer Assumption Comparison

(1) Current rate or the rate scheduled in an upcoming year.

\* Plans have a fixed rate employer contribution rate.

Retirement System	Rate <sup>(1)</sup>
California Public Employees	6.8%
California State Teachers*	7.0%
New York State and Local Retirement System	5.9%
New York City Retirement System	7.0%
Florida Retirement System	7.0%
Ohio Public Employees*	7.2%
Ohio State Teachers*	7.0%
Texas Teachers*	7.25%
Wisconsin Retirement System	7.0%
North Carolina Retirement System	6.5%
Washington State	7.5%
New Jersey Public Employees	7.3%
Oregon Public Employees	6.9%
Virginia Retirement	6.75%

# Long-Term Annualized Rates of Return as of June 30, 2021

---

Period	Market Value Rate of Return (net of fees)
5 year	11.9%
10 year	10.1%
15 year	8.1%
20 year	7.8%
25 year	8.5%
30 year	9.2%

# NYSTRS Return Assumption History

---

Fiscal Year	Return Assumption
1980	4.50%
1981 - 1984	6.75%
1985 - 1987	7.25%
1988 - 2014	8.00%
2015 - 2016	7.50%
2017 - 2018	7.25%
2019 - 2020	7.10%

# Rate of COLA Increase

Cost Impact: None (No change recommended)

---

- Given recent upticks in inflation, it is recommended that the inflation assumption be increased from the current rate of 2.20% to 2.40%.
- The average annual COLA percentage since 2001 is 1.27%, and the average increase over the last 5 years was 1.16%. COLA has a floor of 1.0% and a ceiling of 3.0%.
- It is recommended that our “bounded-CPI” increase percentage assumption be maintained at the current rate of 2.6%. This will maintain the future projected COLA assumed rate of 1.3%.

# Salary Scale

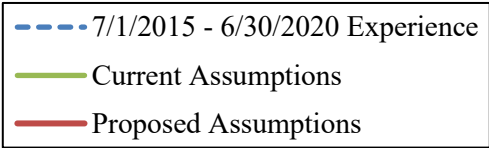
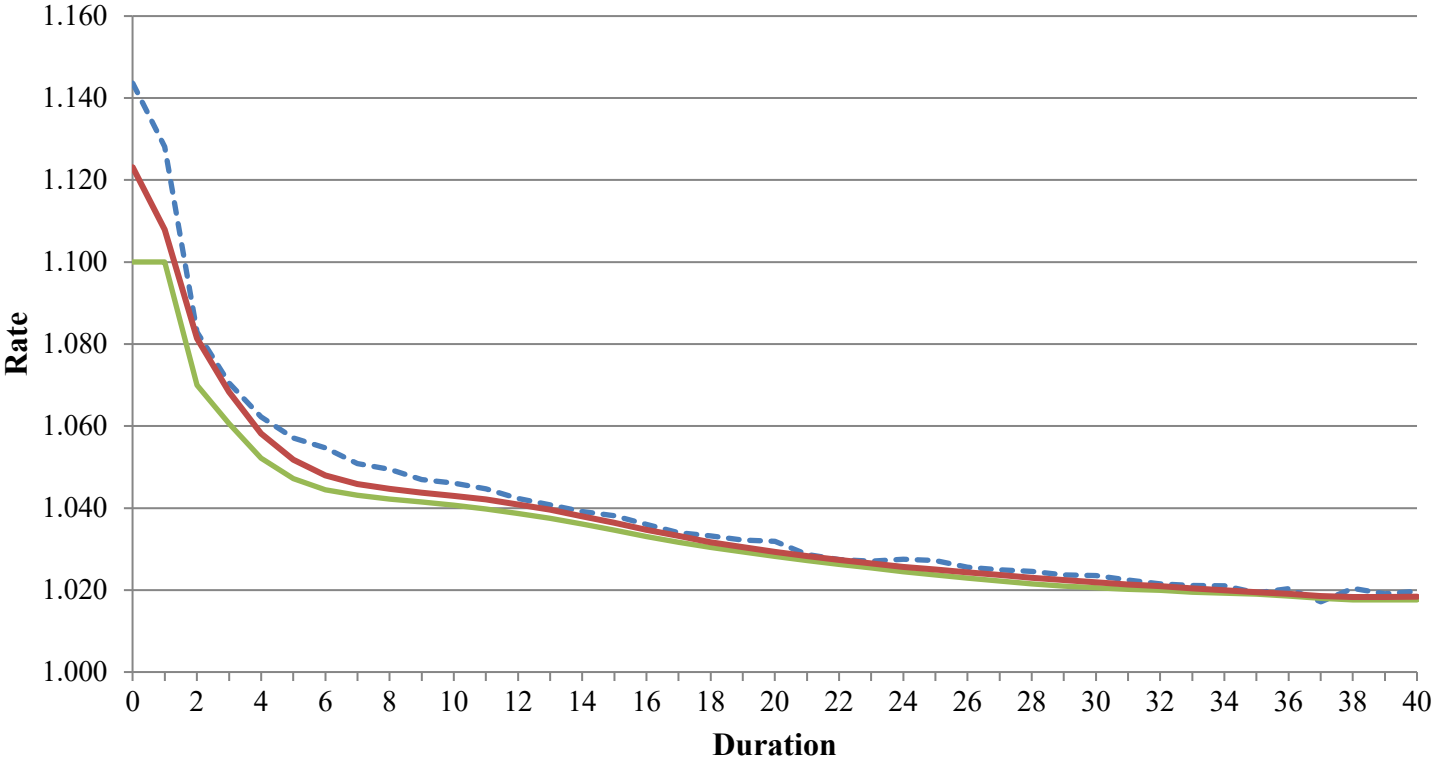
Cost Impact: ECR Increase of 0.45%

---

- Rates vary by a member's years of service and are independent of the member's gender and age
- Tables developed from actual experience of NYSTRS membership from the last five years (2015 – 2020) and blended with the previous five years (2009 – 2014)
  - The blend provides broad experience with both a period of modest salary raises after the global financial crisis and a period of more generous pay increases
- The geometric average annual proposed increase is 3.7%, up from the previous assumption of 3.3%



# Salary Scale



# Mortality Assumption

Cost Impact: ECR Increase of 0.36%

---

The proposed mortality assumption includes four separate tables representing four different populations:

- Active Mortality – current members
- Healthy Annuitant Mortality – retired members
- Disabled Mortality – members retired on account of disability
- Survivor & Beneficiary Mortality – new mortality table for beneficiaries of retired members

The new Healthy Annuitant Mortality rates increase the ECR by 0.46% and will be reviewed further today

The new rates for the remaining three tables decrease the ECR by 0.10%

# Healthy Annuitant Mortality

Cost Impact: ECR Increase of 0.46%

---

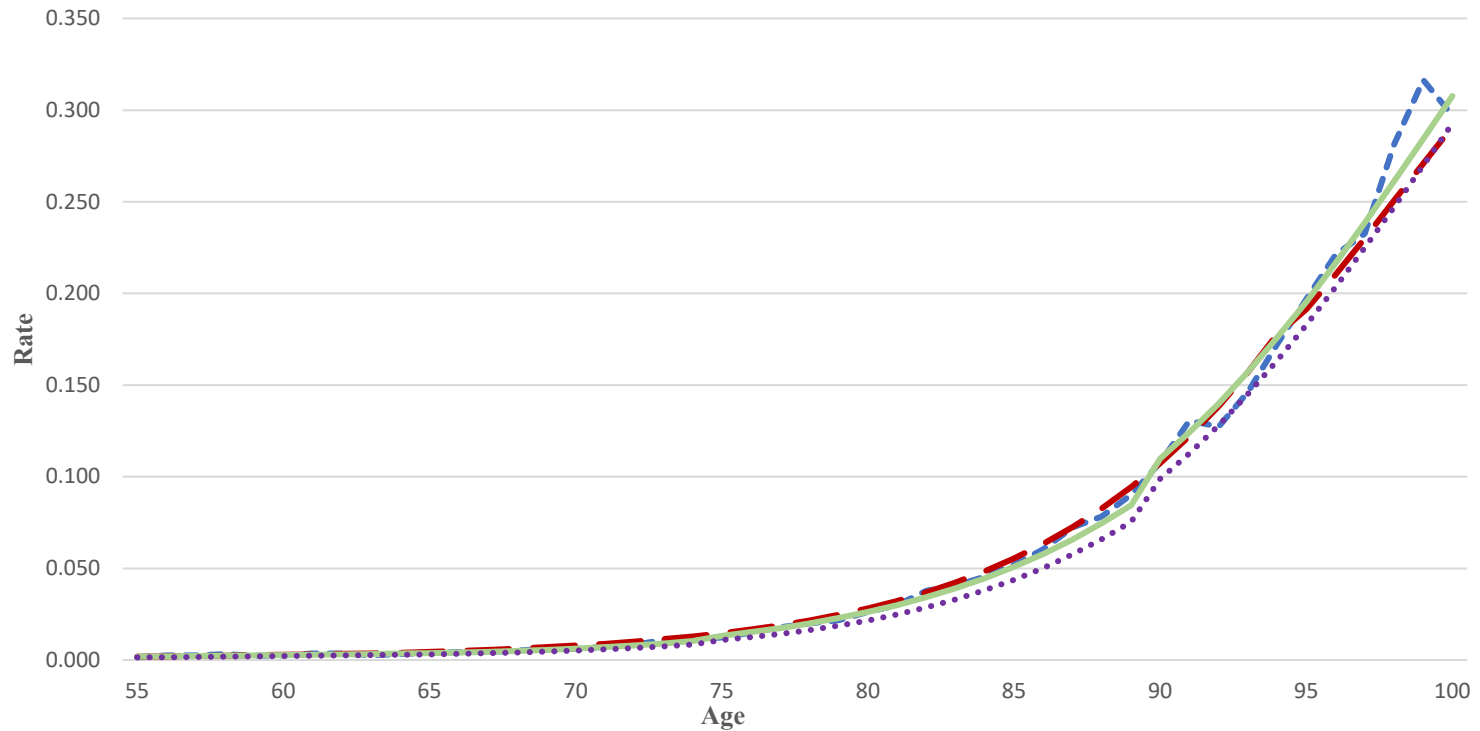
Proposed rates consist of two assumptions:

1. Base mortality tables developed from actual experience of NYSTRS membership, blended with a published table
2. Mortality improvement scales based largely on data from Social Security Administration (published by the SOA)
  - Need to incorporate an assumption that recognizes that those born in more recent years will enjoy longer life expectancy
  - Proposed rates will incorporate scale MP-2020 to anticipate future mortality improvement

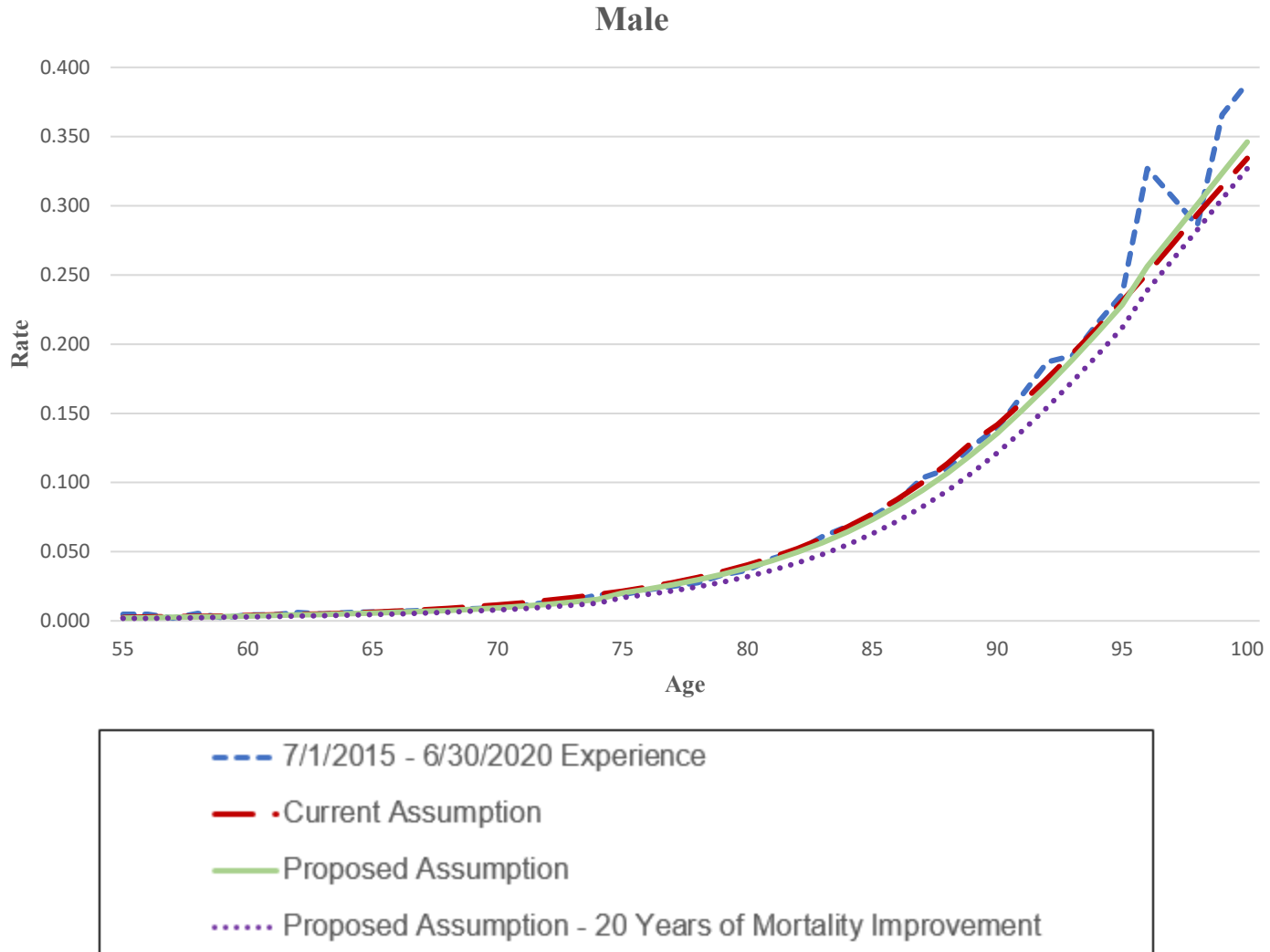
Mortality experience has generally been close to expected

# Healthy Annuitant Mortality - Female

Female



# Healthy Annuitant Mortality - Male



# Retirement

Cost Impact: ECR Increase of 1.32%

---

The proposed retirement rates are two tables that project the probabilities at each age of members retiring on account of:

- Service Retirement (normal retirement)
- Disability

The new service retirement rates increase the ECR by 1.28%.

The new disability retirement rates increase the ECR by 0.04%.

# Service Retirement

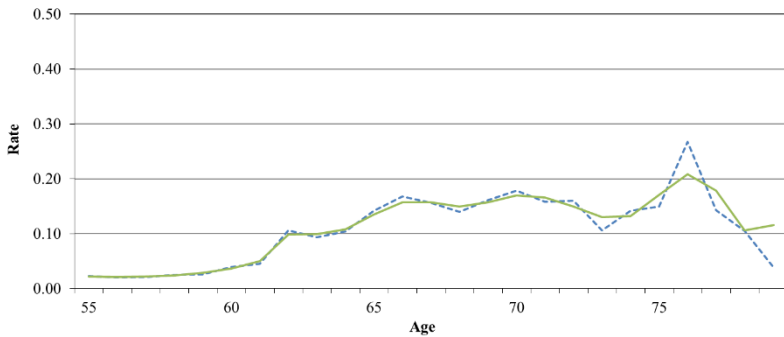
Cost Impact: ECR Increase of 1.28%

---

- Current rates vary by gender, age, service and tier
- There have been more retirements at most ages than expected over the last five years
- Proposed rates are based on recent retirements and vary by gender, age and service; removed the tier breakdown and replaced with service bands: 5-19 years/ 20-29 years/ 30+ years
- In general, more retirements (across all ages) = higher plan costs

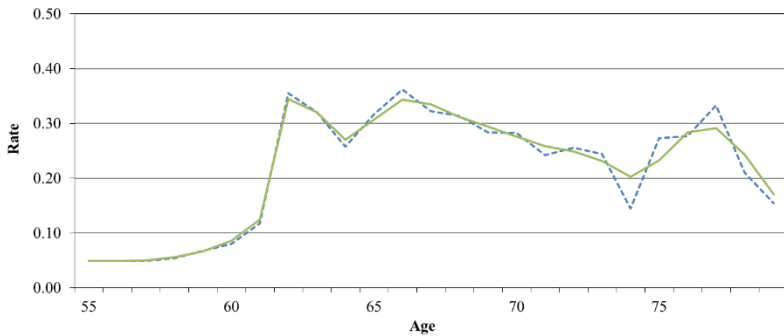
Female

$5 \leq \text{Service} < 20$



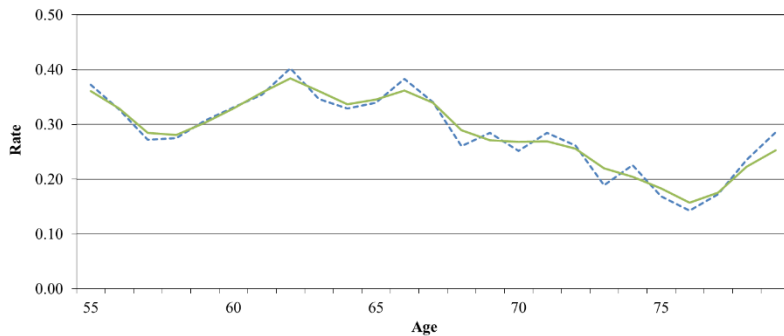
Female

$20 \leq \text{Service} < 30$



Female

$30 \leq \text{Service}$



# Service Retirement

Male service retirement rates are generally similar and can be found in the detailed report.



# Retired Members' Characteristics

## By Year of Retirement

Retired in Fiscal Year Ended	Number of Retired Members	Average Age at Retirement (yrs.- mos.)	Average Service at Retirement (yrs.- mos.)	Average Final Average Salary	Average Maximum Annual Benefit
2012	6,033	60-9	26-3	\$82,461	\$45,759
2013	6,330	60-10	25-6	81,987	44,768
2014	6,547	61-0	25-4	84,545	44,978
2015	6,161	60-11	25-4	84,362	44,487
2016	6,245	61-2	25-0	84,308	44,215
2017	6,396	61-3	25-0	85,242	45,049
2018	6,416	61-1	25-1	86,910	45,725
2019	6,890	61-0	25-1	87,085	45,713
2020	7,642	61-4	25-8	90,228	48,273
2021	7,617	61-5	26-3	91,713	49,145

\*Averages are for service and vested retirees.

# Disability Retirement

Cost Impact: ECR Increase of 0.04%

---

- Current rates vary by gender and age
- There have been more disability retirements at most ages than expected over the last five years
- Proposed rates are based on disability retirements over the last ten years; period expanded due to limited disability experience
- In general, more retirements (across all ages) = higher plan costs
- Rates have been extended to continue to apply after retirement eligibility

# Disability Retirement



Male disability retirement rates are generally similar and can be found in the detailed report.

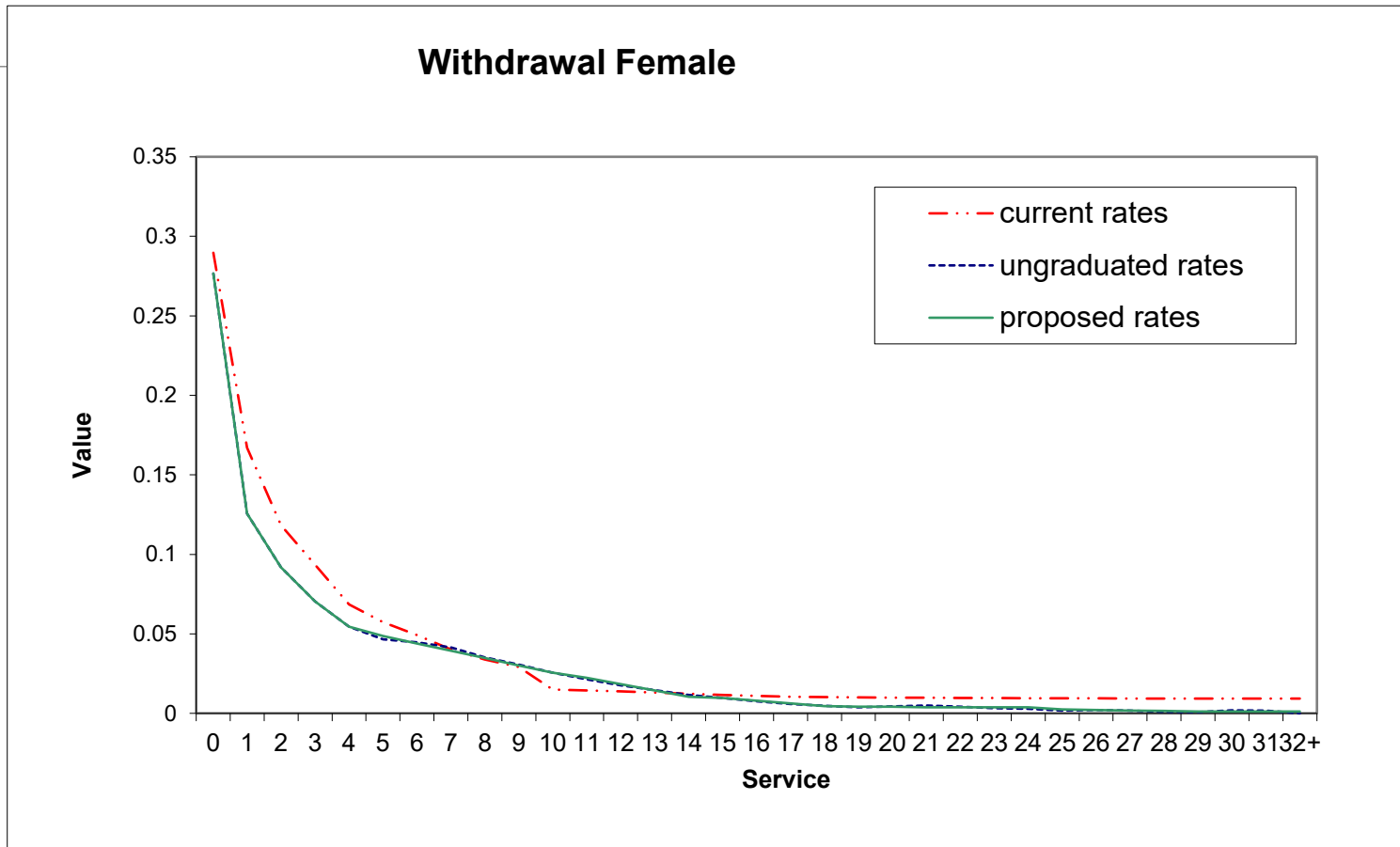
# Withdrawal

Cost Impact: ECR Increase of 0.40%

---

- Rates vary by a member's years of service, gender and age
- Tables developed from actual experience of NYSTRS membership from the last 5 years (2015 – 2020)
- Recent experience has generally been that members are withdrawing at lower rates than expected
- Rates have been extended to continue to apply after retirement eligibility

# Withdrawal



Male withdrawal rates are generally similar and can be found in the detailed report.

Economic	
Valuation Rate of Interest	+2.03%
Salary Scale	+0.45%
Demographic	
Active Member Mortality	-0.04%
Healthy Annuitant Mortality	+0.46%
Disabled Annuitant Mortality	+0.09%
Survivor & Beneficiary Annuitant Mortality	-0.15%
Service Retirement	+1.28%
Disability Retirement	+0.04%
Withdrawal	+0.40%
Estimated Compounding Effect	-0.05%
<b>Overall Estimated Impact on ECR</b>	<b>+4.51%</b>

# Estimated Cost Impact of Proposed Actuarial Assumptions

---

# Summary

---



No matter how much precision goes into their development, the assumptions are estimates



Valuation completed every year and the ECR adjusts for our experience



Continue to monitor plan experience regularly and update assumptions periodically or when warranted