



The elements of success



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# Burlington Employees' Retirement System Public Sector Actuarial Science 101

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October 15, 2018



- Purpose of the Valuation
- Funding
- Actuarial Assumptions
- Traditional Valuation vs. Open-Group Forecast
- Financial Reporting

The ultimate cost of a pension plan is based primarily on the level of benefits promised by the plan. The pension fund's investment earnings serve to reduce the cost of plan benefits and expenses. Thus,

$$\text{City's Ultimate cost} = \text{Benefits Paid} + \text{Expenses Incurred} - \text{Investment Return} - \text{Employee Contributions}$$

- The Actuarial Valuation utilizes an actuarial cost method to assign a portion of this “ultimate cost” to the budget year. The valuation does not determine the ultimate cost of the plan but is a tool used to determine the appropriate level of City contributions.
- Actuarially Determined Employer Contribution (ADEC) developed from the valuation is comprised of two components: amortization of unfunded liability (*23 years, on average, for 2016 valuation*) & normal cost (assignment of benefits “earned” for the budget year).

- Public sector plans are not subject to Internal Revenue Code minimum required/maximum deductible contribution rules
- Historically, linked to the “parameters” under GASB 25/27 financial reporting standards
- GASB 67/68 replaced GASB 25/27 in 2014, but most plans continue to apply the GASB 25/27 parameters
- **ADEC:** Actuarially Determined Employer Contribution
- ADEC usually is Normal Cost + Past Service Payment

- Most common actuarial cost method used is **Entry Age Normal (EAN)** \*
- EAN: 72%; Projected Unit Credit: 13%; Aggregate: 8%; Other: 7%
- BERS valuation uses EAN, which also is the prescribed method under GASB 67/68 for financial reporting

\* Source: *Actuarial Inputs and the Valuation of Public Pension Liabilities and Contribution Requirements: A Simulation Approach* (Gang Chen and David S.T. Matkin, May 2017)

- Most public sector funds smooth investment gains/losses to reduce ADEC volatility
- Typically, 5-year smoothing (20%/year recognition)
- The two most common methods are to: (1) smooth actual vs. expected return on MVA, or (2) smooth expected AVA vs. actual MVA
- BERS valuation uses 10-year smoothing, and method (1) above
- In 2017 BERS valuation, AVA is \$183.8 million, vs. MVA of \$175.5 million (\$8.3 million in unrecognized losses)

# Development of Actuarial Value of Assets



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| Relationship of Actuarial Value to Market Value                           |                    |
|---------------------------------------------------------------------------|--------------------|
| 1. Market value 6/30/2017                                                 | \$175,471,299      |
| 2. Gain / (loss) not recognized in actuarial value 6/30/2017              | <u>(8,345,174)</u> |
| 3. Preliminary actuarial value 6/30/2017: (1) - (2)                       | 183,816,473        |
| 4. Preliminary actuarial value as a percentage of market value: (3) ÷ (1) | 104.8%             |
| 5. Gain / (loss) recognized for corridor minimum / maximum                | N/A                |
| 6. Actuarial value 6/30/2017 after corridor minimum / maximum: (3) + (5)  | 183,816,473        |
| 7. Actuarial value as a percentage of market value: (6) ÷ (1)             | 104.8%             |

| Development of Market Value Gain / Loss for 2016-2017 Plan Year  |                    |
|------------------------------------------------------------------|--------------------|
| 1. Market value 6/30/2016                                        | \$156,789,373      |
| 2. City contributions                                            | 9,219,098          |
| 3. Employee contributions                                        | 2,712,823          |
| 4. Benefit payments                                              | 14,770,644         |
| 5. Administrative expenses                                       | 361,811            |
| 6. Expected return at 8.00%                                      | <u>12,419,344</u>  |
| 7. Expected value 6/30/2017: (1) + (2) + (3) - (4) - (5) + (6)   | 166,008,183        |
| 8. Market value 6/30/2017                                        | <u>175,471,299</u> |
| 9. Market value gain / (loss) for 2016-2017 plan year: (8) - (7) | 9,463,116          |

| Recognition of Gain / Loss in Actuarial Value |                      |                                               |                                                     |                                                          |                                                        |
|-----------------------------------------------|----------------------|-----------------------------------------------|-----------------------------------------------------|----------------------------------------------------------|--------------------------------------------------------|
| Year                                          | (a)<br>Gain / (loss) | (b)<br>Total<br>recognized<br>as of 6/30/2016 | (c)<br>Recognized in<br>current year:<br>10% of (a) | (d)<br>Total recognized<br>as of 6/30/2017:<br>(b) + (c) | (e)<br>Not recognized<br>as of 6/30/2017:<br>(a) - (d) |
| 2012-2013                                     | (\$498,233)          | (\$199,293)                                   | (\$49,823)                                          | (\$249,116)                                              | (\$249,117)                                            |
| 2013-2014                                     | 8,081,381            | 2,424,414                                     | 808,138                                             | 3,232,552                                                | 4,848,829                                              |
| 2014-2015                                     | (13,616,950)         | (2,723,390)                                   | (1,361,695)                                         | (4,085,085)                                              | (9,531,865)                                            |
| 2015-2016                                     | (14,912,281)         | (1,491,228)                                   | (1,491,228)                                         | (2,982,456)                                              | (11,929,825)                                           |
| 2016-2017                                     | 9,463,116            | 0                                             | <u>946,312</u>                                      | 946,312                                                  | <u>8,516,804</u>                                       |
| Total                                         |                      |                                               | <u>(1,148,296)</u>                                  |                                                          | <u>(8,345,174)</u>                                     |



- Definition: *the length of time and the structure selected for increasing or decreasing contributions to systematically eliminate any unfunded actuarial liability or surplus* \*
- Similar to paying off a home mortgage

\* Source: *Spotlight on The Annual Required Contribution Experience of State Retirement Plans, FY 01 to FY 13* (Keith Brainard and Alex Brown, National Association of State Retirement Administrators, March 2015)



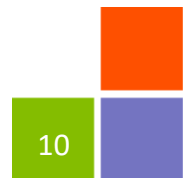
- Amortization period – generally not greater than 30 years
- Median amortization period is about 20 years for public sector pension plans
- Closed or Open amortization
- Method : Level Dollar or Level Percentage of Payroll
- Single amortization base or Layering/Separate bases
- Negative amortization – can occur if amortization period is long, and using level percentage of payroll amortization

# Funding – Amortization Policy (BERS)



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- Amortization period – 30 years
- Closed amortization
- Method: Level Dollar
- Layering/Separate bases
- For 2017 valuation – average amortization period is 20 years



# BERS 2017 Valuation - Executive Summary



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|                                                            | June 30, 2017 |             |             | June 30, 2016 |             |             |
|------------------------------------------------------------|---------------|-------------|-------------|---------------|-------------|-------------|
|                                                            | Class A       | Class B     | Total       | Class A       | Class B     | Total       |
| <b>Number of members</b>                                   |               |             |             |               |             |             |
| Active employees                                           | 179           | 666         | 845         | 174           | 680         | 854         |
| Terminated vested members                                  | 15            | 356         | 371         | 15            | 361         | 376         |
| Vested in employee contributions only                      | 9             | 115         | 124         | 6             | 74          | 80          |
| Retired, disabled and beneficiaries                        | 178           | 496         | 674         | 177           | 483         | 660         |
| Total                                                      | 381           | 1,633       | 2,014       | 372           | 1,598       | 1,970       |
| <b>Covered employee payroll</b>                            | 10,903,872    | 34,746,500  | 45,650,372  | 11,016,208    | 37,091,509  | 48,107,717  |
| <b>Average plan salary</b>                                 | 60,915        | 52,172      | 54,024      | 63,312        | 54,546      | 56,332      |
| <b>Actuarial present value of future benefits</b>          | 134,863,320   | 161,548,365 | 296,411,685 | N/A           | N/A         | N/A         |
| <b>Actuarial accrued liability</b>                         | 115,558,431   | 136,852,540 | 252,410,971 | 110,320,376   | 135,622,903 | 245,943,279 |
| <b>Plan assets</b>                                         |               |             |             |               |             |             |
| Market value of assets                                     | 75,014,835    | 100,456,464 | 175,471,299 | 67,913,439    | 88,875,934  | 156,789,373 |
| Actuarial value of assets                                  | 78,582,438    | 105,234,035 | 183,816,473 | 76,124,499    | 99,621,460  | 175,745,959 |
| <b>Unfunded accrued liability</b>                          | 36,975,993    | 31,618,505  | 68,594,498  | 34,195,877    | 36,001,443  | 70,197,320  |
| <b>Funded ratio</b>                                        | 68.0%         | 76.9%       | 72.8%       | 69.0%         | 73.5%       | 71.5%       |
| <b>Actuarially determined employer contribution (ADEC)</b> |               |             |             |               |             |             |
| Fiscal year ending                                         | 2019          | 2019        | 2019        | 2018          | 2018        | 2018        |
| ADEC                                                       | 4,805,619     | 5,378,047   | 10,183,666  | 4,355,137     | 5,621,518   | 9,976,655   |

# BERS – ADEC Calculation for Fiscal 2019



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|                                                                                     | Class A            | Class B BED       | Class B School    | Class B Other     | Class B            | Total              |
|-------------------------------------------------------------------------------------|--------------------|-------------------|-------------------|-------------------|--------------------|--------------------|
| Gross normal cost                                                                   | \$2,435,453        | \$798,644         | \$936,366         | \$2,029,696       | \$3,764,706        | \$6,200,159        |
| Estimated employee contributions                                                    | <u>(1,233,404)</u> | <u>(407,016)</u>  | <u>(321,304)</u>  | <u>(851,591)</u>  | <u>(1,579,911)</u> | <u>(2,813,315)</u> |
| City's normal cost                                                                  | 1,202,049          | 391,628           | 615,062           | 1,178,105         | 2,184,795          | 3,386,844          |
| Actuarial accrued liability                                                         | 115,558,431        | 46,911,562        | 24,744,888        | 65,196,090        | 136,852,540        | 252,410,971        |
| Actuarial value of assets                                                           | <u>78,582,438</u>  | <u>36,073,082</u> | <u>19,027,812</u> | <u>50,133,141</u> | <u>105,234,035</u> | <u>183,816,473</u> |
| Unfunded accrued liability                                                          | 36,975,993         | 10,838,480        | 5,717,076         | 15,062,949        | 31,618,505         | 68,594,498         |
| Amortization of unfunded accrued liability                                          | 3,561,498          | 1,068,400         | 563,559           | 1,484,825         | 3,116,784          | 6,678,282          |
| Contribution before adjustment as of the valuation date                             | 4,763,547          | 1,460,028         | 1,178,621         | 2,662,930         | 5,301,579          | 10,065,126         |
| Estimated valuation year payroll for actives not yet at 100% assumed retirement age | 11,212,762         | 8,274,687         | 7,651,713         | 20,280,238        | 36,206,638         | 47,419,400         |
| City's normal cost as a percentage of payroll                                       | 10.7%              | 4.7%              | 8.0%              | 5.8%              | 6.0%               | 7.1%               |
| Contribution as a percentage of payroll                                             | 42.5%              | 17.6%             | 15.4%             | 13.1%             | 14.6%              | 21.2%              |
| Fiscal year ending June 30, 2019                                                    |                    |                   |                   |                   |                    |                    |
| Adjustment for interest and inflation                                               | <u>42,072</u>      | <u>13,708</u>     | <u>21,527</u>     | <u>41,233</u>     | <u>76,468</u>      | <u>118,540</u>     |
| Actuarially determined employer contribution                                        | 4,805,619          | 1,473,736         | 1,200,148         | 2,704,163         | 5,378,047          | 10,183,666         |

- Most larger public retirement systems review actuarial assumptions on a regular basis through formal Experience Studies
- Many economic and demographic factors are taken into consideration
- The plan's actuary plays a significant role in the selection of actuarial assumptions
- Actuarial Standards of Practice ("ASOPs") provide professional guidance to actuaries during the assumption setting process

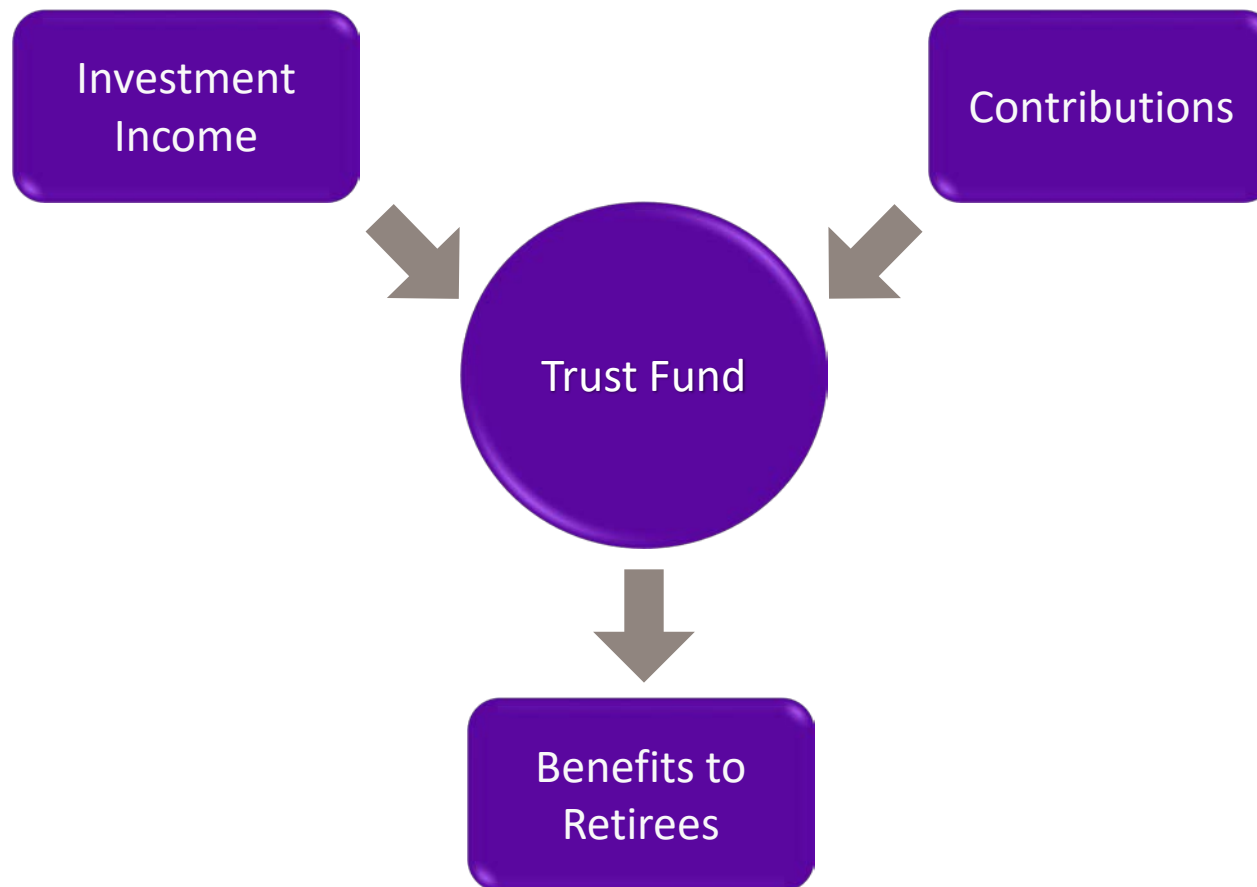


BERS most recent Experience Study was as of June 30, 2012

GFOA "BEST PRACTICE"

Perform an Experience Study at least once every 5 years

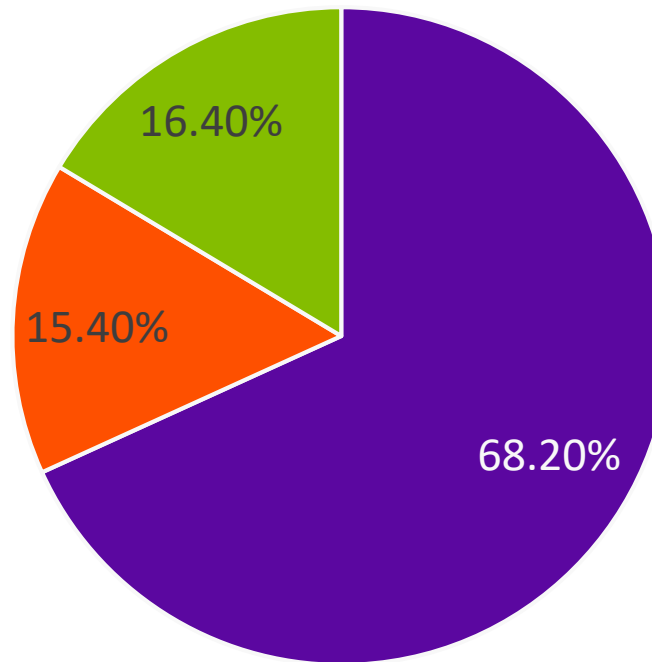
- ▶ Investment income and contribution provide the foundation for funding future benefits for plan members



# Why is the investment return assumption important?

► **Investment earnings account for the majority of revenues for most public pension plans**

Public Pension Fund Revenue 1993-2016



■ Investment Earnings   ■ Employer Contributions   ■ Employee Contributions

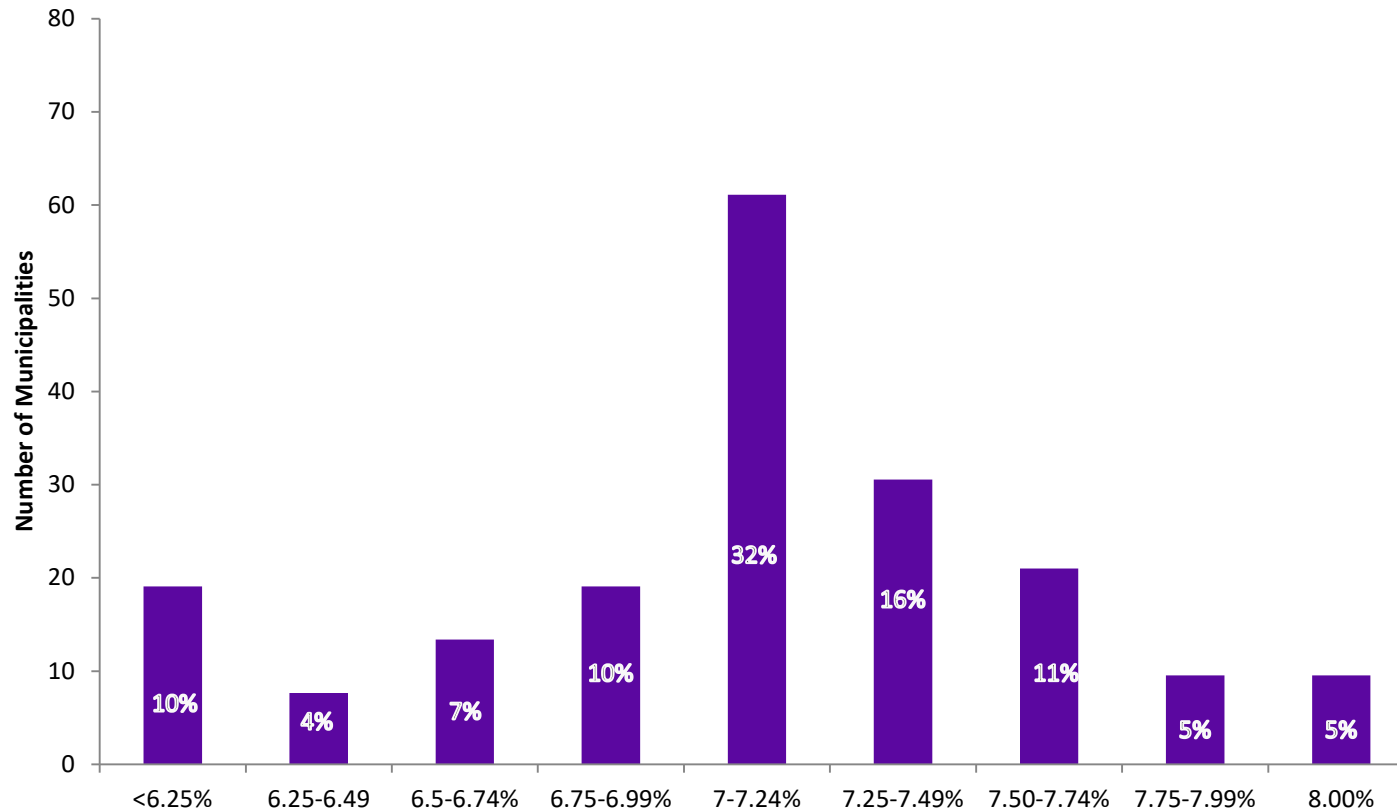
Source: US Census 2016 State & Local Public-Employee Retirement Systems Data



- Actuaries should consider a number of factors in setting the **investment return** assumption:
  - forecasts of inflation and of total returns for each asset class
  - current yields to maturity of fixed income securities such as government securities and corporate bonds
  - historical investment data
  - historical plan performance
- Actuaries may also consider historical statistical data showing standard deviations, correlations, and other statistical measures related to historical returns for each asset class and for inflation



## 2017 LTROR Assumption



- Average rate is **6.92%** for the 191 CT plans that we gathered data on (median = 7.00%)
- Down about 0.6% from 6 years ago from 7.49% (average)
- No one assumption dominates (unlike the 8.00% assumption that was pervasive 10+ years ago – partly due to phasing-in of lower rates)

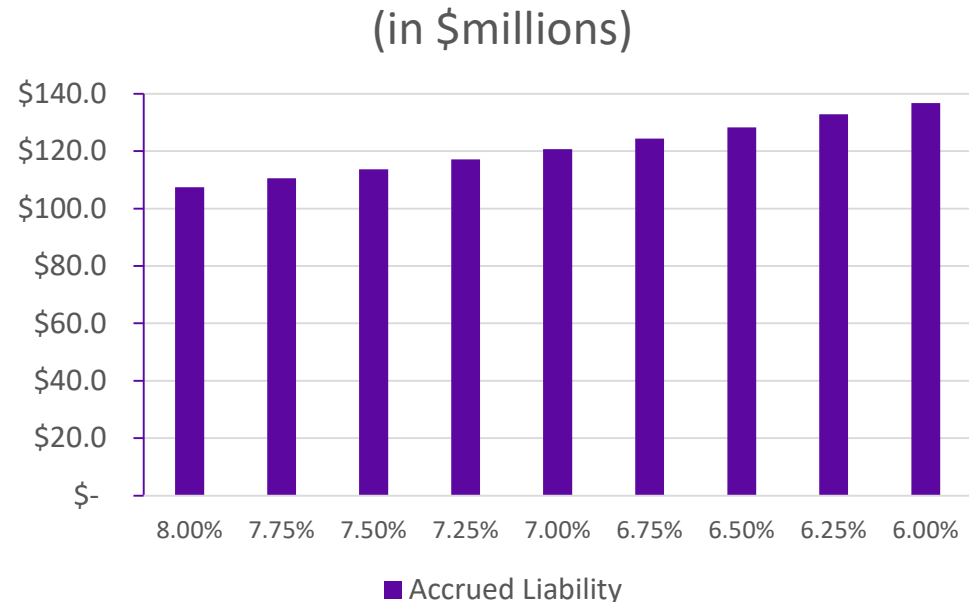
- **Alpha:** excess returns generated by active management
- Historically, alpha was expected to add 25-50 bps to returns
- Under ASOP 27, actuary may only include a margin for alpha if you can prove it exists
- Research supporting the ability of any particular active manager to consistently generate alpha is thin
- Actuaries in many cases have been lowering or eliminating the margin for alpha

- Downward trend in prospects for future investment returns
  - 100-150+ bps reduction in past decade
- No more alpha?
  - 25-50 bps reduction in expected returns
- End result: plan sponsors increasingly reviewing and lowering the investment return assumption

**BERS  
assumption:  
8.00%**

## ■ Short term

- Higher liabilities
- Lower funding ratios
- Larger contributions



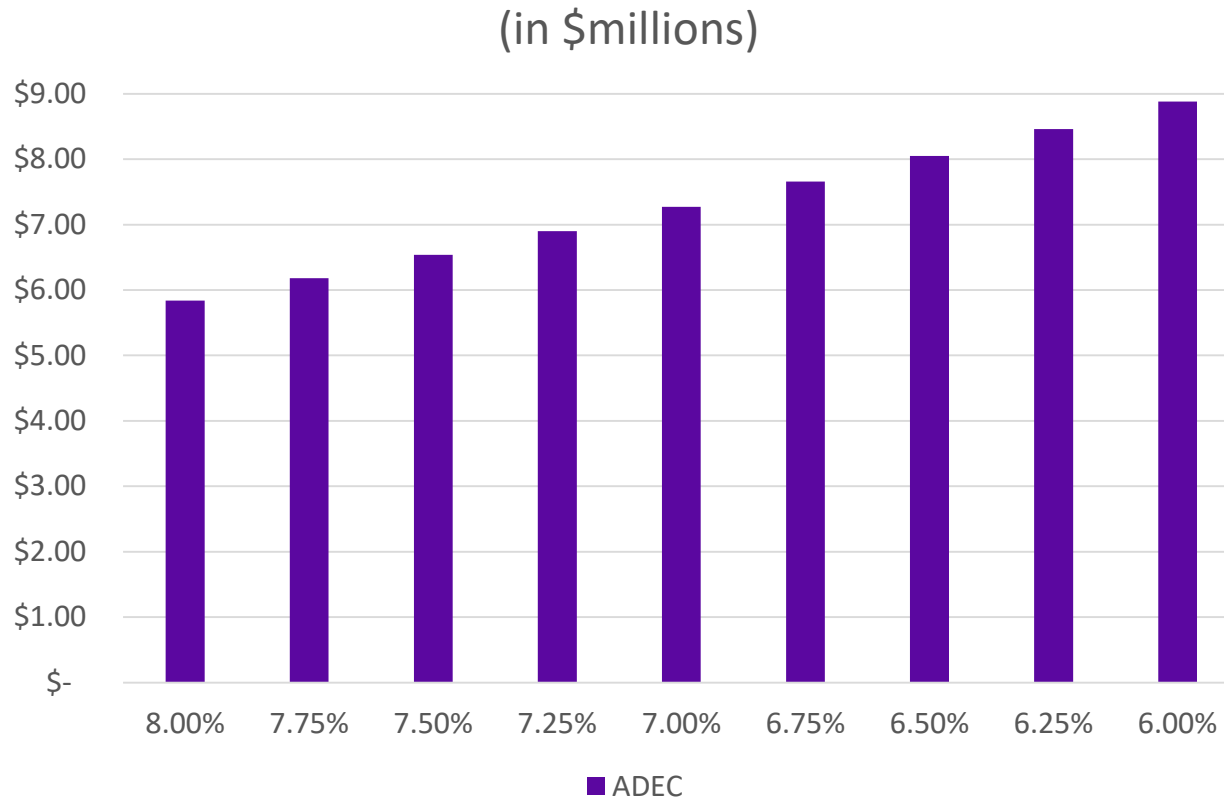
## ■ Long term

- More likely that investment returns will meet or exceed assumption
- Less likely that actuarial losses will accumulate
- Greater stability of contribution levels
- Decreased pressure on future taxpayers
- Credit positive

# Impact of Lowering the Investment Return Assumption



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# Impact on Hypothetical Plan

(\$ millions)

| Interest Rate | Accrued Liability | ADEC   |
|---------------|-------------------|--------|
| 8.00%         | \$107.4           | \$5.84 |
| 7.75%         | 110.5             | 6.18   |
| 7.50%         | 113.7             | 6.54   |
| 7.25%         | 117.1             | 6.90   |
| 7.00%         | 120.7             | 7.27   |
| 6.75%         | 124.4             | 7.66   |
| 6.50%         | 128.3             | 8.05   |
| 6.25%         | 132.5             | 8.46   |
| 6.00%         | 136.8             | 8.88   |

# Why is the mortality assumption important ?

- Pension benefits are generally payable for the lifetime of the member
- Mortality is the primary factor in determining how long the plan expects to pay benefits to a member
- Understating expected longevity will understate the current cost of pension liabilities and place additional burden on future taxpayers to fund pension obligations

# How is the mortality assumption developed ?

- Mortality assumption takes into consideration various demographic factors:
  - Gender
  - Status (e.g., active, retired, disabled)
  - Type of occupation (e.g. white vs. blue-collar; uniformed vs. non)
  - Plan experience
- The plan's actuary follows guidance under ASOP 35

## **BERS assumption:**

105% of RP-2000  
Combined Mortality  
Table, projected with  
Scale BB



- Society of Actuaries (SOA) published a major study in 2014
- **RP-2014 Mortality Table, with MP-2014 projection scale**
- Projection scale is now being updated annually – the most recent scale is **MP-2017**
- Neither the RP-2000 table nor the RP-2014 table explicitly incorporates public sector mortality experience
- SOA currently studying public sector mortality – exposure draft issued in August 2018
- Public safety vs. Teachers vs. General employees
- Exposure draft suggests 1-3% increase in actuarial liability for Public Safety, and 2-4% increase for General employees (vs. RP-2014 (MP-2017))

- ▶ **Traditional actuarial valuation reflects a “snapshot” of the current membership, plan provisions, and plan assets as of the valuation date**
  - Future hires – including any new “tiers” of lower benefits – are not reflected in the current valuation
  - As a result, it generally takes many years for significant reductions in the ADEC to be realized

- ▶ **Open Group forecast projects traditional valuation results many years into the future (75+ years), taking into account lower tiers of benefit for future new hires**
  - The projected future “traditional valuation” ADECs are translated into an equivalent long-term percentage of payroll contribution pattern
  - The resulting pattern of “open group” ADECs generally reflects lower employer contributions in earlier years, and higher contributions in the future
  - The open-group forecast technique **does not** change the plan sponsor’s long-term costs

## ▶ **CAFR: Comprehensive Annual Financial Report**

- CAFR is “a set of U.S. government financial statements comprising the financial report of a state, municipal or other governmental entity that complies with the accounting requirements promulgated by the Government Accounting Standards Board” \*
- Pension is just one item of many covered in the CAFR
- Different set of rules vs. funding

\* Source: Accounting for Governmental and Nonprofit Entities (15<sup>th</sup> Ed.) (Earl Wilson, 2010)

- **GASB 67/68** – current financial reporting standards for pension plans
- Balance sheet entry = Net Pension Liability (NPL)
- $\text{NPL} = \text{Total Pension Liability} - \text{Plan Fiduciary Net Position}$
- **NPL** is the unfunded actuarial liability determined on an EAN basis, and using Market Value of Assets
- Also calculate an annual “pension expense” amount that is recorded in the financials

\* Source: *Accounting for Governmental and Nonprofit Entities (15<sup>th</sup> Ed.)* (Earl Wilson, 2010)

- Additional disclosure items
  - Money-weighted rate of return (10 years)
  - ADEC vs. Actual Employer Contribution (10 years)
  - NPL, including annual reconciliation (10 years)
  - +/- 1% discount rate sensitivity : NPL
  - Target asset allocation and Expected Return basis
- Generally more rapid recognition of gains/losses, plan amendments, assumption changes
- Pension expense much more volatile than ADEC
- May need “depletion date projection” if not contributing ADEC



# Questions