Public Agenda Item #3.1

Review and Discussion of the Pension Experience Study
Preliminary Results

July 10, 2017

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Ryan Falls, and Joe Newton, Gabriel Roeder Smith
Agenda

• Review of Purpose
• General Findings and Recommendations
• Individual Assumptions
  – Inflation
  – Investment Return
  – Wage Assumptions
  – Mortality
  – Other Demographic Assumptions
• Illustrative Impact
Reminder

- The *primary* purpose of the annual actuarial valuation is to either (1) set or (2) assess the adequacy of the contribution policy
  - “Funding” or “contribution allocation procedure”
- For ERS, the historical funding policy has been a level “fixed rate” from the employer, and so the valuation is assessing the appropriateness of the current fixed rate
Purpose of Experience Study

- Actuarial assumptions and methods are utilized to develop each of the outputs of actuarial valuation process
- Experience Study is a regularly scheduled review of the assumptions and methods
  - GFOA recommends at least once every five years
  - ERS will now conduct studies every four years based on recent statutory changes
- General process for setting assumptions and methods
  - Actuary makes recommendations
  - Board considers actuary’s recommendation and makes the final decision for the system
Inside the Actuarial Valuation at the System Level

Benefit and Contribution Projection as a Percentage of Covered Payroll

- Benefits for Current Retirees
  - 10.0% Employer and 9.5% Member
- Benefits for Current Active Employees
- Benefits for Future Hires

Investment Earnings
Contributions
Inside the Actuarial Valuation: Projecting the Liability for each Member

What is the probability the member reaches retirement? (Termination assumption)

When will the member retire? (Retirement assumption)

How much will the benefit be? (Salary increase assumption)

How long will the benefit be paid? (Mortality assumption)

Hired at age 30

Retire at age 60 with annual benefit

Receive benefit for remaining lifetime

• Assumptions must be made to project:
  – Future behavior
    o Voluntary or Involuntary
  – Life expectancy
  – Economic growth
The “Perfect” Assumption Set

Level of Conservatism

- Investment Return
- Life Expectancy
- General Wage Inflation
- Individual Salary Increases
- Retirement Behavior
- Termination Behavior
- Service Purchase/Portability Assumptions
- Funding Method
- Active Disability and Mortality
- Total Assumption Set

- Conservative
- Perfect Fit/Crystal Ball
- Aggressive
General Findings

• Reviewed ERS-specific experience from August 31, 2011 through August 31, 2016
• Future economic growth likely to continue to be suppressed compared to historical levels
  – Future price inflation, investment returns, overall wage growth, and individual salary increases are likely to be lower than currently assumed
• Retirees continue to live longer, and the expectations for the rates of future improvement should be updated for more recent information
• Several of the assumptions/methods can be simplified
• Most of the other assumptions continue to either be appropriate, or only need minor changes
Experience versus the Current Assumption Set

Experience versus Current Assumption

- Investment Return
- Life Expectancy
- General Wage Inflation
- Individual Salary Increases
- Retirement Behavior
- Termination Behavior
- SVC Purchase/Portability
- Funding Method
- Active Disability and Mortality
- Total Assumption Set

Conservative

Perfect Fit/Crystal Ball

Aggressive

Impact on Funding Period to bring back to “perfect” assumption set

- Large Decrease
- Large Increase
Summary of Recommendations

• Major Recommendations
  – Reduce the nominal investment return assumption to no more than 7.25%
    o Impact on results at 7.00% has also been provided
  – Decrease core inflation assumption from 3.50% to 2.50%
  – Set the general wage inflation (GWI) assumption to 0.50% above inflation
    o Nominal GWI becomes 3.00% (Inflation + 0.50%)
  – For regular State employees, decrease individual salary increase assumption schedules by the same 1.00% as the change in core inflation
    o Nominal annual increase for long service employees decreases from 5.00% to 4.00%
  – For LECOs, decrease individual salary increase assumption schedules by 0.50%
    o 1.00% decrease due to change in core inflation but 0.5% increase in the individual merit and promotion component
    o Nominal annual increase for long service employees decreases from 5.00% to 4.50%
  – Update mortality tables, including the assumption for continued future mortality improvement
    o Proposed assumption based on actual experience of ERS annuitants
Summary of Recommendations

• Minor Recommendations
  – Change the asset smoothing method to a traditional individual year deferral method, but allow direct offsetting of gains and losses
  – Change actuarial cost method to Individual EAN (from Ultimate EAN)
  – Reduce rates of disability and retirement
  – Slightly increase rates of termination
  – Increase administrative expense load from 0.25% of payroll to 0.33% for ERS
    o Lower LECOSRF from 0.10% to 0.08% and JRS2 from 0.50% to 0.33%
Recommendations: Methods

• It is likely that the current actuarial cost method will be deemed unreasonable by the Actuarial Standards Board at some point in the next few years
  – We believe it would be better to not be using it when/if that occurs
  – Changing from ultimate EAN to individual EAN does not materially change the funding period or contribution requirements, mostly impacts our internal processes

• The current asset smoothing method produces undesirable results after a large event such as the 2008 financial crisis
  – Recommend a closed base method, with direct offsetting of gains and losses, to ensure that a large event is fully recognized within a 5 year period, but still eliminate artificial volatility

• Currently, still $2 billion in deferred investment losses (some from 2008) under current smoothing method

• If proposed asset smoothing method had been in place since 2012, there would only be $700 million in deferred losses as of August 31, 2016

• Board also has option to set actuarial (smoothed) value of assets equal to market value (mark to market) on August 31, 2017 and apply smoothing method prospectively
Inflation

• The assumed core inflation rate (currently 3.50% per year) is not used directly in the actuarial valuation, but it impacts the development of:
  – Investment return assumption
  – Salary increase assumptions
  – Overall payroll growth rate
  – Inflation assumption has a different impact on a plan like ERS compared to one that has a regular CPI based COLA

• Held constant in last experience study

• Actual core inflation measured by the CPI-U during:
  – Last 10 years: 1.68%
  – Last 20 years: 2.15%
  – Last 30 years: 2.66%
Inflation is the first building block for other economic assumptions

Current Assumption Set for ERS
Decreasing the inflation assumption, by default, lowers the nominal values for the other economic assumptions.

Alternative assumption set for ERS based on a 2.50% inflation assumption and no change to any of the spreads.
Historical Inflation

Average Annual Inflation
CPI-U, Five-Year Averages Ending August 31

<table>
<thead>
<tr>
<th>Period</th>
<th>Average Inflation</th>
</tr>
</thead>
<tbody>
<tr>
<td>1982-1986</td>
<td>3.51%</td>
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<tr>
<td>1987-1991</td>
<td>4.48%</td>
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<tr>
<td>1992-1996</td>
<td>2.86%</td>
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<tr>
<td>1997-2001</td>
<td>2.45%</td>
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<tr>
<td>2002-2006</td>
<td>2.81%</td>
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<tr>
<td>2007-2011</td>
<td>2.13%</td>
</tr>
<tr>
<td>2012-2016</td>
<td>1.23%</td>
</tr>
</tbody>
</table>
Bond Market Expectations

Market Implied Inflation - US Treasury Bond Market

- Implied Inflation 20-year Bonds
- Implied Inflation 30-Year Bonds
Sources (Inflation)

- ERS Investment Staff is using 2.50% in the asset allocation process
- GRS Survey of Investment firms: 2.00% - 2.75%, 2.29% average
- Social Security Trustee’s Report: 2.60% (intermediate)
- TIPs vs. Nominal US Treasuries: 2.06% (20 year) - 2.23% (30 year)
- Professional forecasters: 2.30% (10 year)
- Horizon Survey (Summer 2016): 2.16% (10 year) to 2.31% (20 year)
Recommendation (Inflation)

• We are recommending the same 2.50% assumption used the asset allocation process
  – A little higher, but close to most sources
  – Very recent movement in the “sources” was to increase this assumption (most increased in last 12 months)
    o For example, the average from the investment firms in our data set increased by 0.10% from 2016 to 2017
  – Several peer systems have recently lowered, but few below 2.50%
  – Reasonable range is 2.20% - 2.50%

• Not a requirement to change in 0.25% increments, however do not want to give the illusion of being too precise
Investment Return Assumption

• This assumption is used to predict what percentage of a future benefit payments will be covered by investment return and what percentage by contributions.

• Lower Returns/Higher Contributions
Investment Return Assumption

- The assumption selected should be reasonable
  - Not necessarily a single “correct” answer
- Assumption is selected using a process that considers:
  - ERS target asset allocation
  - Capital market expectations
    - Utilize a building block approach that reflects expected inflation, real rates of return, and plan related expenses
    - Take into account the volatility of the expected returns produced by the investment portfolio
- Other factors to consider
  - Historical investment performance
  - Comparison with peers
Per ASOP 27: Reasonable Assumptions

• An assumption is reasonable if
  – It is appropriate for the purpose of the measurement
  – It reflects the actuary’s professional judgement
  – It takes into account historical and current economic data that is relevant as of the measurement date
  – It reflects the actuary’s estimate of future experience
  – It has no significant bias (i.e., it is not significantly optimistic or pessimistic)
    o Although some allowance for adverse experience may be appropriate

• The standard explicitly advises an actuary not to give undue weight to recent experience
Illustrative Decision Tree

- **Is the current assumption supportable per the ASOPs?**
  - Yes:
    - Does the actuary believe this is appropriate for the intended purpose?
      - Yes:
        - Is the Board comfortable with the assumption?
          - Yes:
            - Does the Board feel it is the best strategic choice?
              - Yes:
                - Actuary should again confirm the assumption is reasonable per the ASOPs
                - Board formally adopts the Assumption
              - No: What is the Board’s best strategic choice?
                - What is the Board comfortable with?
                  - What is/are the appropriate choices?
                    - What assumptions are supportable per the ASOPs?
                      - Typically before draft experience study is issued
                  - Yes: Input from Investment Staff and Consultant, Actuary, and Other Stakeholders
                - No: What is the Board’s best strategic choice?
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                  - What assumptions are supportable per the ASOPs?
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              - Yes: Input from Investment Staff and Consultant, Actuary, and Other Stakeholders
            - No: What is the Board’s best strategic choice?
Historical Volatility Scenarios

• Investment Risk is typically illustrated based on absolute return
  – If the System actually earns 7% over time, the outcome would look like this.....

• However, there is more than that, especially when negative cash flows are introduced
  – Volatility can put a drag on actual asset values
  – Order matters

• To illustrate these other areas of risk, we have prepared illustrative projections using a sample client
  – Scenarios that all achieve an 8% return over a 20 year time horizon
  – However, the scenarios incorporate historical volatility patterns that annualize to 8% returns
Projection Scenarios Based on Historical Volatility Patterns

The above scenarios all achieve an 8% compound return over a 20 year period. Actual returns each year are based on the actual historical pattern during the range provided, with an overall adjustment to achieve an 8% return.
The above scenarios all achieve an 8% compound return over a 20 year period. Actual returns each year are based on the actual historical pattern during the range provided, with an overall adjustment to achieve an 8% return.
Historical Volatility Scenarios

• Takeaway:
  – Without cash flows, order doesn’t matter when compounding returns
  – With cash flows, ORDER MATTERS!
  – Benefits will be paid with trust assets (dollars), not returns
  – Two scenarios can have the same “return” and produce very different ending asset values
  – Not enough to just say, we are “long term” investors, must also pay attention to the shorter to intermediate term
Annualized Yields Based on Market Value of Assets

Rolling Period Ending August 31, 2016

Based on historical information prepared by Aon
Investment Return Assumption

Comparison to Peers

Source: 2017 Public Plans Database
Investment Return Assumption

Comparison to Peers

“Recent Exp Studies” is the compilation from Systems that have performed experience studies in the last 24 months.
Current Target Portfolio

- Global Equity, 45%
- Private Equity, 10%
- Global Credit, 10%
- Real Estate, 10%
- Infrastructure, 4%
- Opportunistic Credit, 0%
- Rates, 15%
- Absolute Return, 5%
- Cash, 1%

7.0% expected return per asset allocation study
(Based on summaries prepared by Aon)
Proposed Target Portfolios

Diversified
7.1% Expected Return per AAS

Enhanced Return
7.2% Expected Return per AAS
We performed the analysis on the two proposed asset allocations.

Projected real returns were developed using ERS’s target investment allocations and 2017 capital market return assumptions developed by eleven investment consulting firms:

- 7 have 7-10 year time horizons
  - Average expected inflation of 2.28%
- 4 have 20+ year time horizons
  - Average expected inflation of 2.29%
- Horizon survey of 29 firms with 5-20+ year time horizons
  - From before the election

This process typically has a “mapping bias”, meaning asset classes always don’t map one-to-one, and the industry average will typically underestimate the expected returns when compared to the individual System’s consultant.
Distribution of Expected Returns (Nominal)

- Enhanced return portfolio
- Nominal return comparisons
- 7-10 year time horizons
- Average Expected Real Return of 4.27%
- Based on each individual consultants’ inflation assumption, average 2.28%

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<thead>
<tr>
<th>Investment Consultant</th>
<th>Distribution of 10-Year Average Geometric Net Nominal Return</th>
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<th>Probability of exceeding</th>
<th>Probability of exceeding</th>
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<tr>
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<tr>
<td>(1)</td>
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<tr>
<td>1</td>
<td>5.1%</td>
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<td>6.8%</td>
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<td>5.7%</td>
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<tr>
<td>7</td>
<td>6.6%</td>
<td>7.4%</td>
<td>8.1%</td>
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<td>Average</td>
<td>5.61%</td>
<td>6.55%</td>
<td>7.50%</td>
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# Range of Expected Returns

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<thead>
<tr>
<th>Study</th>
<th>Current</th>
<th>Diversified</th>
<th>Enhanced Return</th>
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</thead>
<tbody>
<tr>
<td>ERS Asset Allocation Study</td>
<td>7.0%</td>
<td>7.1%</td>
<td>7.2%</td>
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<tr>
<td>10 year survey – Nominal</td>
<td>6.48%</td>
<td>6.53%</td>
<td>6.55%</td>
</tr>
<tr>
<td>20+ year survey – Nominal</td>
<td>7.00%</td>
<td>7.02%</td>
<td>7.02%</td>
</tr>
<tr>
<td>10 year survey – Real with 2.5% inflation</td>
<td>6.70%</td>
<td>6.75%</td>
<td>6.77%</td>
</tr>
<tr>
<td><strong>20+ year survey – Real with 2.5% inflation</strong></td>
<td><strong>7.21%</strong></td>
<td><strong>7.23%</strong></td>
<td><strong>7.23%</strong></td>
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<tr>
<td>Horizons Survey (10 year) Nominal</td>
<td>6.78%</td>
<td>6.89%</td>
<td>6.93%</td>
</tr>
<tr>
<td>Horizons survey (10 year) – Real with 2.5% inflation</td>
<td>7.08%</td>
<td>7.19%</td>
<td>7.23%</td>
</tr>
</tbody>
</table>
Time Horizon

• Several of the sets of capital market assumptions provided by the investment consultants have 5-10 year time horizons
• The average duration of the System is ~20 years
  – This is the amount of time until the average interest-discounted benefit payment will be made on an open group basis
• Using Treasury yields: The average expected mean is made up of the risk-free rate and a risk premium
  – The 10-year zero coupon US Treasury yield is currently 2.35%
  – The 20-year zero coupon US Treasury yield is currently 2.85%
  – The difference in the yield curve from “10 to 20” is “2.85% less 2.35%” which equals 0.50%
• We believe this validates the approximate 0.50% difference in the surveys based on time horizon
Distribution of Expected Returns
Longer Time Horizon and Inflation Adjustment

- Enhanced return portfolio
- Real return plus 2.50% comparisons
- 15-20+ year time horizons
- Average Expected Real Return of 4.73%
- Based on proposed inflation assumption of 2.50%

<table>
<thead>
<tr>
<th>Investment Consultant</th>
<th>Distribution of 20-Year Average Geometric Net Nominal Return</th>
<th>Probability of exceeding 8.00%</th>
<th>Probability of exceeding 7.25%</th>
<th>Probability of exceeding 7.00%</th>
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</thead>
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<tr>
<td></td>
<td>40th</td>
<td>50th</td>
<td>60th</td>
<td>(1)</td>
</tr>
<tr>
<td>1</td>
<td>7.54%</td>
<td>6.89%</td>
<td>6.25%</td>
<td>33.25%</td>
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<tr>
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<td>7.77%</td>
<td>7.10%</td>
<td>6.43%</td>
<td>36.69%</td>
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<tr>
<td>3</td>
<td>8.01%</td>
<td>7.30%</td>
<td>6.60%</td>
<td>40.09%</td>
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<tr>
<td>4</td>
<td>8.37%</td>
<td>7.62%</td>
<td>6.88%</td>
<td>44.90%</td>
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<tr>
<td>Average</td>
<td>7.92%</td>
<td>7.23%</td>
<td>6.54%</td>
<td>38.73%</td>
</tr>
</tbody>
</table>
**Actuary’s Recommendation**

- Based on either proposed portfolio, GRS recommends decreasing the current investment return assumption from 8.00% to no higher than 7.25%
  - 7.25% is close to the expected return in the asset allocation study in our survey over a longer time horizon and with the 2.50% inflation assumption
  - If the Board is uncomfortable increasing the real return assumption, should consider 7.00%
  - If the Board is uncomfortable with approximate 50% probability achieving assumption over the longer term, should consider 7.00%
  - If the Board is uncomfortable with much lower probability achieving assumption over the shorter term, should consider 7.00%
  - If the Board feels the likelihood of having to eventually decrease to 7.00% in a future experience study is high, should consider 7.00% now

<table>
<thead>
<tr>
<th>Inflation</th>
<th>Current</th>
<th>Recommended @7.25%</th>
<th>Consideration @7.00%</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>3.50%</td>
<td>2.50%</td>
<td>2.50%</td>
</tr>
<tr>
<td>Real Return</td>
<td>4.50%</td>
<td>4.75%</td>
<td>4.50%</td>
</tr>
<tr>
<td>Nominal Return</td>
<td>8.00%</td>
<td>7.25%</td>
<td>7.00%</td>
</tr>
</tbody>
</table>
Wage Assumptions

- Building block approach to assumptions for projecting wages
  - Should be consistent and tied to inflation
  - General Wage Inflation (GWI): Core Inflation plus increases in Productivity
  - Individual Salary Scale: Core Inflation plus Productivity plus Individual Merit, Promotion, and Steps
    - 3.50% + 1.50% (Regular EEs) = 5.00% Ultimate Salary Increase Assumption after 30 years of service
    - 5.90% average increase over member’s career
General Wage Inflation (GWI)

- Under Individual EAN, will be used to index the pay for each new group of new entrants in the open group projection used to determine the funding period
- Could be viewed as “the change in average salary for the group”
  - Similar to the National Average Wage statistic (NAW)
- Over last 20 years, the average salary for an ERS member has increased 3.0% per year, 2.9% over last 10
- Over last 20 years, the average NAW has changed 3.4% per year, 2.7% over last 10
- Over the past 10 years, the average salary for an ERS member with less than 5 years of service has changed 2.5% per year
- The last 10 years especially have been a low inflation environment, which would put a downward bias in the rates of increase
- The last 10 – 20 years has had an aging bias in the national and ERS populations, which would put an upward bias in the rates of increase
- We recommend 3.0% per year GWI assumption (0.5% + inflation)
Individual Salary Increases

• Used to project future benefits
• Core Inflation plus Productivity plus Individual Merit, Promotion, and Steps
• Implicitly reflects all of the following:
  – Across-the-board increases for all employees;
  – Across-the-board increases for a given group of employees;
  – Increases to a minimum salary schedule;
  – Additional pay for additional duties;
  – Step or service-related increases;
  – Increases for acquisition of advanced degrees or specialized training;
  – Promotions;
  – Overtime, if applicable;
  – Bonuses, if available; or
  – Merit increases, if available
Structure of Assumptions for Individuals

Current Assumption for Regular Class Employees
Adjusted for 2.5% inflation

Years of Service

- Inflation
- General Productivity
- Individual Merit and Promotion
- Regular Class Step Schedule

Annual Salary Increase

0% 1% 2% 3% 4% 5% 6% 7% 8% 9%
1 3 5 7 9 11 13 15 17 19 21 23 25 27 29

2.5% 0.5% 1.0%
ERS Member-Specific Experience for Last 5 Years

Average Individual Salary Increases by Service

<table>
<thead>
<tr>
<th>Service</th>
<th>Average Annual Increase</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-5</td>
<td>6.0%</td>
</tr>
<tr>
<td>6-10</td>
<td>5.0%</td>
</tr>
<tr>
<td>11-15</td>
<td>4.0%</td>
</tr>
<tr>
<td>16-20</td>
<td>3.0%</td>
</tr>
<tr>
<td>21-25</td>
<td>2.0%</td>
</tr>
<tr>
<td>26-30</td>
<td>1.0%</td>
</tr>
</tbody>
</table>

- Regular State Employees
- LECOs
## ERS Member-Specific Experience for Long Service

- Overall, current nominal assumptions have been lower than expected
- However, due to very low inflation, the increases *above inflation* have been higher than expected (real)
  - Especially so for LECOs

### Long Service Individual Salary Scale (5-Year Experience)

<table>
<thead>
<tr>
<th></th>
<th>Regular State Employees</th>
<th>LECOs</th>
<th>Judges</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Current Assumption</strong></td>
<td>5.00%</td>
<td>5.00%</td>
<td>3.50%</td>
</tr>
<tr>
<td><strong>Less Assumed Inflation</strong></td>
<td>3.50%</td>
<td>3.50%</td>
<td>3.50%</td>
</tr>
<tr>
<td><strong>Assumed Productivity/Merit/Promotion above Inflation</strong></td>
<td>1.50%</td>
<td>1.50%</td>
<td>0.00%</td>
</tr>
<tr>
<td><strong>Actual Nominal Experience</strong></td>
<td>3.28%</td>
<td>3.84%</td>
<td>2.51%*</td>
</tr>
<tr>
<td><strong>Less Actual Inflation</strong></td>
<td>1.23%</td>
<td>1.23%</td>
<td>2.24%*</td>
</tr>
<tr>
<td><strong>Actual Productivity Above Inflation for last 5 Years</strong></td>
<td>2.05%</td>
<td>2.61%</td>
<td>0.27%*</td>
</tr>
</tbody>
</table>

* Experience based on 20 year history of pay for District court judge
Recommendation

• Being an economic assumption, short term trends do not necessarily reflect long term expectations

• We typically like to have 10 years of reconciled experience to make a significant change to the step-rate or merit assumptions

• For regular State employees, we are reducing the entire schedule by the 1% change in the underlying inflation assumption, but making no other changes
  – Nominal assumption for long service members decreasing from 5.0% to 4.0%

• For LECOs, we are increasing the individual merit component by 0.5% and extending out the step portion from 10 to 20 years
  – Nominal assumption for long service members decreasing from 5.0% to 4.5%
Post-retirement mortality

• Nationally, life expectancies continue to improve
• This assumption was materially changed in the 2008 experience study, with built-in continuous improvement
  – Generational mortality based on Scale AA
  – ERS was a very early adopter of this approach
• The assumption was only slightly modified in the 2013 experience study
• There has been a significant amount of activity on this assumption in the industry with new tables published as of 2014 (RP-2014), along with four sets of improvement scales
  – Improvement Scale BB, MP-14, MP-15, and MP-16
Life Expectancy for the General US Population - from Age 65

Source: National Vital Statistics Reports
In setting the longevity assumption, the actuary must make two decisions:

- How long are annuitants currently living?
  - Heavily dependent on actual data

- What improvement in longevity is expected in the future?
  - Heavily dependent on the underlying trends in the data, as well as more subjective decisions

We already use a generational approach to this assumption
- Assumption that life expectancy will continue to improve in the future

The amount of data dictates how much credibility the actuary can apply to the results
- ERS has full credibility for determining current longevity, but less credibility for determining future rates of improvement
Life Expectancy by State

Legend:

- Dark Brown: 80.0–81.3
- Brown: 79.5–80.0
- Orange: 78.4–79.5
- Light Orange: 77.2–78.4
- Light Beige: 75.0–77.2

Data from National Vital Statistics
Post Retirement Mortality

Actual Average Life Expectancy in Years from Current Age 65

Male Regular Employees: 19.6, 19.1
Female (All): 21.4, 20.4
Male LECOs: 19.0, 19.1

- Actual 2012-2016
- Current Base Assumption
Options for post-retirement mortality assumptions

<table>
<thead>
<tr>
<th>Current Life Expectancy</th>
<th>Future Improvement in Life Expectancy</th>
</tr>
</thead>
<tbody>
<tr>
<td>RP 2014 Tables:</td>
<td>Very High (MP-2014)</td>
</tr>
<tr>
<td>High (White Collar adjustments)</td>
<td>High (Scale BB, MP-2015)</td>
</tr>
<tr>
<td>Medium (No Collar adjustment)</td>
<td>Medium (Ultimate MP, MP-2016)</td>
</tr>
<tr>
<td>Low (Blue Collar adjustments)</td>
<td>Low (Scale AA)</td>
</tr>
<tr>
<td>Variant of one of the above</td>
<td>Custom Scale</td>
</tr>
<tr>
<td>Custom table based on plan experience</td>
<td></td>
</tr>
</tbody>
</table>
Post-retirement Mortality – Base Table

• Recommend a base mortality table developed using ERS experience
  – 2017 State Retirees of Texas (2017 SRT)
  – Separate tables for males and females
  – For LECOs, will make an adjustment to reflect slightly impaired mortality for males

• We are recommending ERS continue to use a fully generational approach to project future mortality improvement
  – With this fully generational projection approach, a gradual and consistent improvement over time would be incorporated into the valuation process
  – Greatly diminishes the risk of having to have another large update to mortality in a future experience study

• For the projected improvement assumption, we are recommending the ultimate rates of the most recently published improvement scales
  – Ultimate MP improvement rates (medium, don’t change annually)
New Base Tables

Base Mortality Assumption
Female State Retirees

Retiree Age
Actual Experience  Current Assumption  New Assumption
Proposed Life Expectancies

Average Life Expectancy in Years from Current Age 65

- Male (Regular Employees): 20.9, 21.7, 22.5
- Female (All): 22.9, 23.6, 24.4

Legend:
- Dark Blue: Proposed Projected Assumption, Baseline 2017
- Light Blue: Proposed Projected Assumption, Baseline 2027
- Gray: Proposed Projected Assumption, Baseline 2037
Other Demographic Assumptions and Methods

• Most other changes were less significant, simplifications or adjusting a method to better fit GRS software processes

• As we are already on page 55, we will not go into detail on these but can answer any questions
Recommendations from Actuarial Audit Regarding Assumptions

- Complete experience study, and consider
  - Lower discount rate
  - Lower expected inflation assumption
  - Update retirement assumptions
  - Update mortality assumptions to current, pension plan related mortality experience and mortality improvement
  - Revise mortality assumption for employees to reflect significantly lower mortality than that for retirees

- Add mortality improvement assumption to disability mortality assumptions
Current Membership

Percentage of Current Membership Expected to Leave Active Service Due to:

**Current Assumptions**

- Retirement: 58.7%
- Termination - Vested: 10.6%
- Termination - Nonvested: 27.0%
- Disability: 1.6%
- Death: 2.1%

**Proposed Assumptions**

- Retirement: 58.3%
- Termination - Vested: 13.2%
- Termination - Nonvested: 26.1%
- Disability: 0.9%
- Death: 1.5%
New Entrants

Percentage of Future Members Expected to Leave Active Service Due to:

**Current Assumptions**
- Retirement, 21.7%
- Vested Termination, 6.0%
- Nonvested Termination, 69.4%
- Death, 1.7%
- Disability, 1.1%

**Proposed Assumptions**
- Retirement, 22.6%
- Vested Termination, 8.9%
- Nonvested Termination, 66.6%
- Death, 1.2%
- Disability, 0.7%
Projected Contributions, in millions

Current Rates

<table>
<thead>
<tr>
<th>Year</th>
<th>Current Assumption Set</th>
<th>Proposed Assumption Set</th>
</tr>
</thead>
<tbody>
<tr>
<td>2017</td>
<td>$1,500</td>
<td>$1,000</td>
</tr>
<tr>
<td>2020</td>
<td>$1,750</td>
<td>$1,250</td>
</tr>
<tr>
<td>2023</td>
<td>$2,000</td>
<td>$1,500</td>
</tr>
<tr>
<td>2026</td>
<td>$2,250</td>
<td>$1,750</td>
</tr>
<tr>
<td>2029</td>
<td>$2,500</td>
<td>$2,000</td>
</tr>
<tr>
<td>2032</td>
<td>$2,750</td>
<td>$2,250</td>
</tr>
<tr>
<td>2035</td>
<td>$3,000</td>
<td>$2,500</td>
</tr>
</tbody>
</table>
Projected Benefit Payments, in millions
Current Rates

<table>
<thead>
<tr>
<th>Fiscal Year</th>
<th>Current Assumption Set</th>
<th>Proposed Assumption Set</th>
</tr>
</thead>
<tbody>
<tr>
<td>2017</td>
<td>$2,000</td>
<td>$2,500</td>
</tr>
<tr>
<td>2020</td>
<td>$2,500</td>
<td>$3,000</td>
</tr>
<tr>
<td>2023</td>
<td>$3,000</td>
<td>$3,500</td>
</tr>
<tr>
<td>2026</td>
<td>$3,500</td>
<td>$4,000</td>
</tr>
<tr>
<td>2029</td>
<td>$4,000</td>
<td>$4,500</td>
</tr>
<tr>
<td>2032</td>
<td>$4,500</td>
<td>$5,000</td>
</tr>
<tr>
<td>2035</td>
<td>$5,000</td>
<td>$5,500</td>
</tr>
</tbody>
</table>
Projected Funded Ratio
Based on MVA as of August 31, 2016

- **Earning 8.00%**
  - Current Assumption Set
  - Proposed Assumption Set

- **Earning 7.25%**

Assumes current contribution rates remain in place.
Projected Funded Ratio
Based on MVA as of August 31, 2016

Current Assumption Set, Only Earning 7.25%
Assumes current contribution rates remain in place
Discussion and Next Steps

• The Board will be asked to adopt a new set of assumptions at the August meeting
• The new assumptions will be used in the August 31, 2017 valuations
Actuary’s Qualifications

• We believe the recommended set of actuarial assumptions should present a more accurate portrayal of ERS’s financial condition and should reduce the magnitude of future experience gains and losses.

• The study was conducted in accordance with generally accepted actuarial principles and practices and with the Actuarial Standards of Practice issued by the Actuarial Standards Board.

• All signing actuaries meet the Qualification Standards of the American Academy of Actuaries.
Questions?