Employees Retirement System of the City of St. Louis

CHEIRON

Classic Values, Innovative Advice.

Actuarial Experience Study

April 27, 2015

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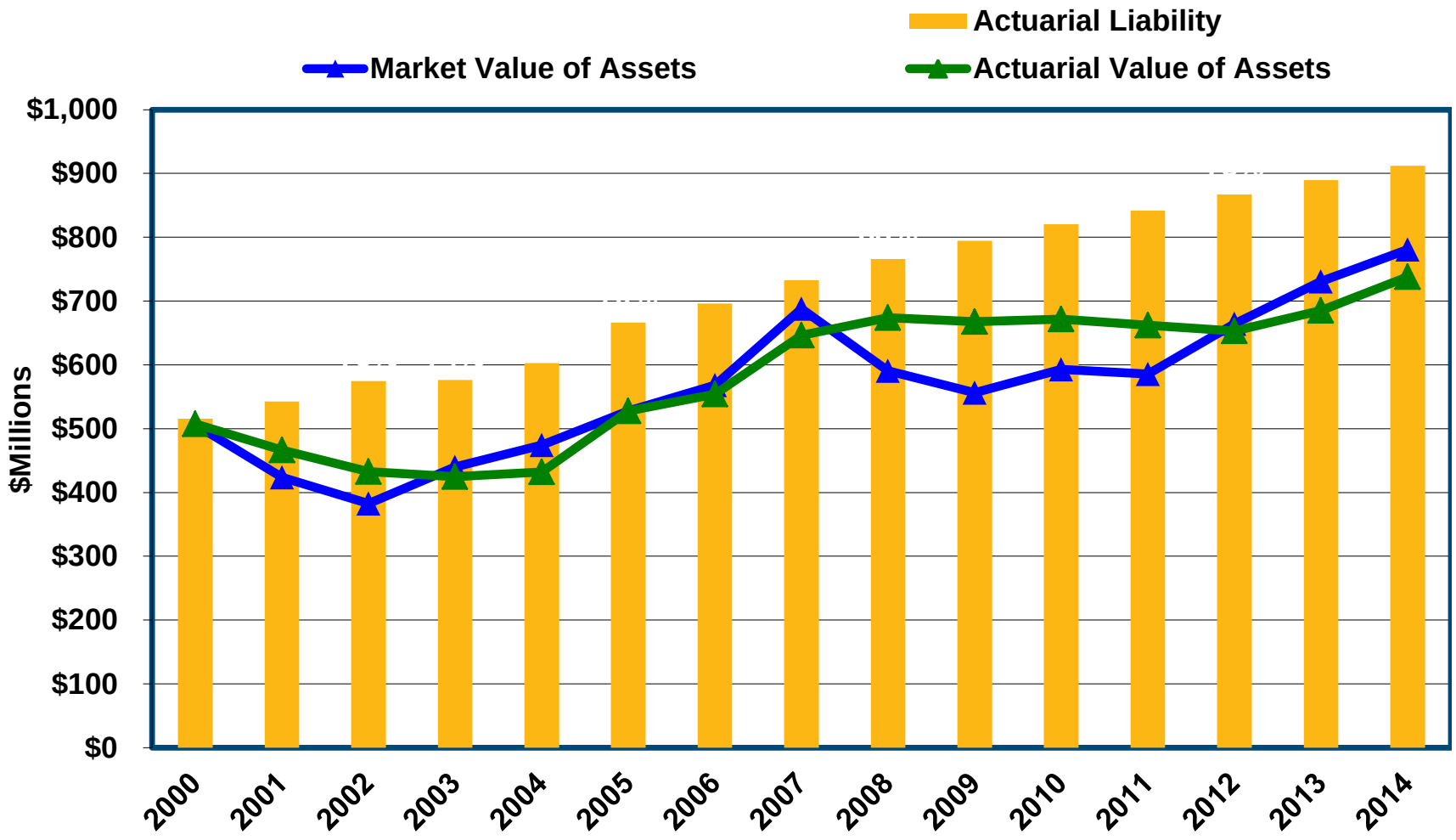
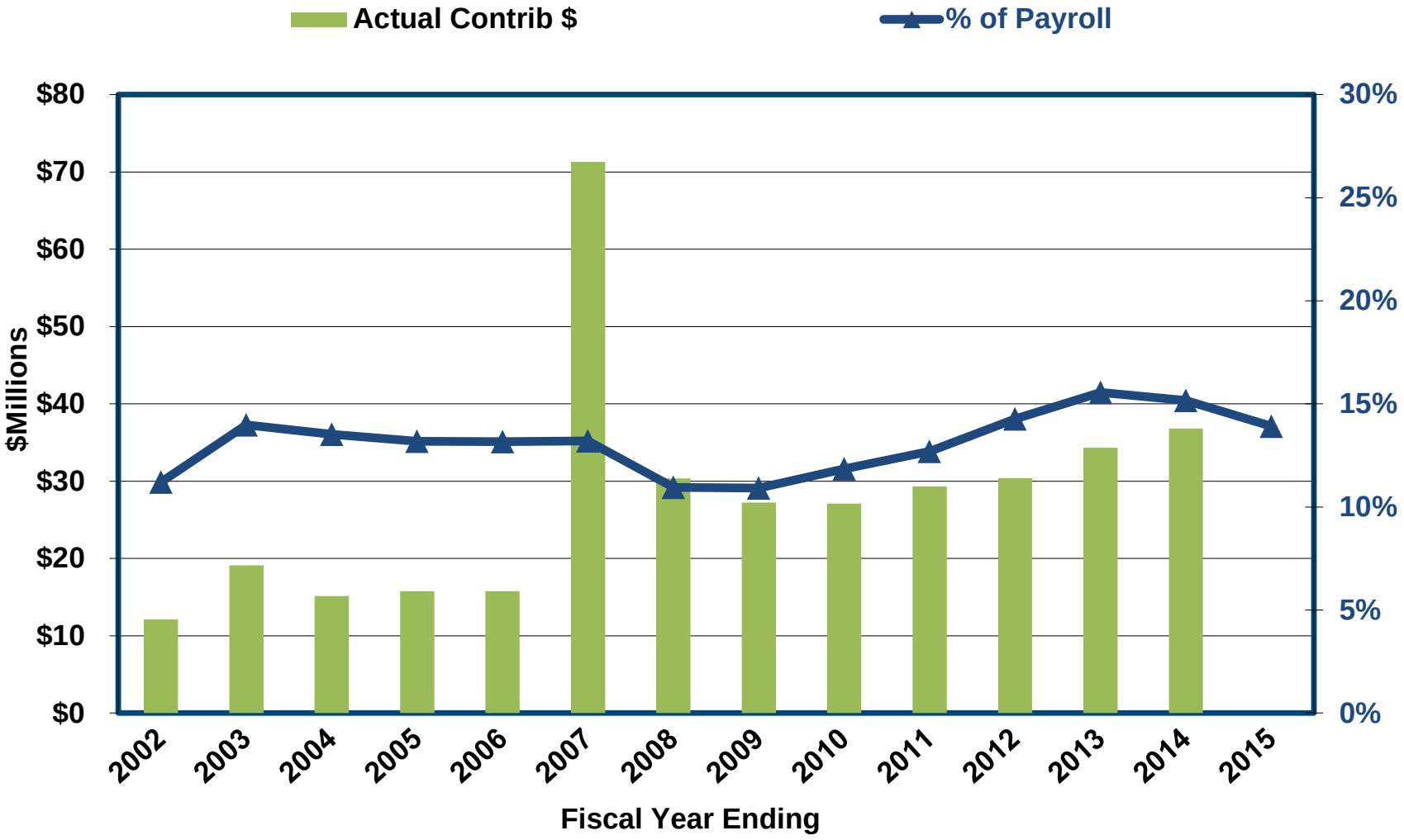
Topics of Discussion

- Historical Review
- Summary of Recommendations
- Demographic Assumptions
- Economic Assumptions
- Actuarial Methods
- Cost Impact

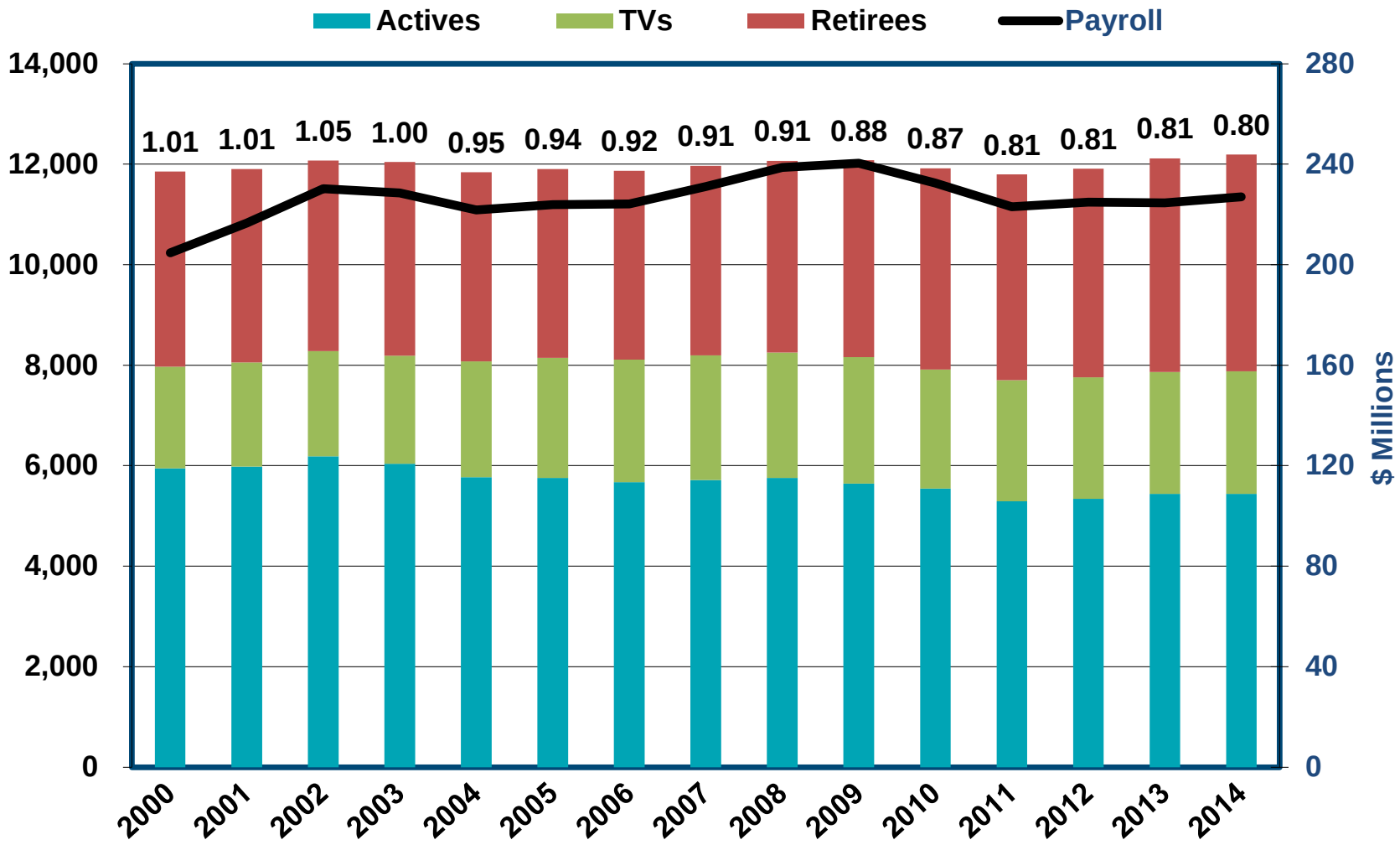
Asset and Liability Trends



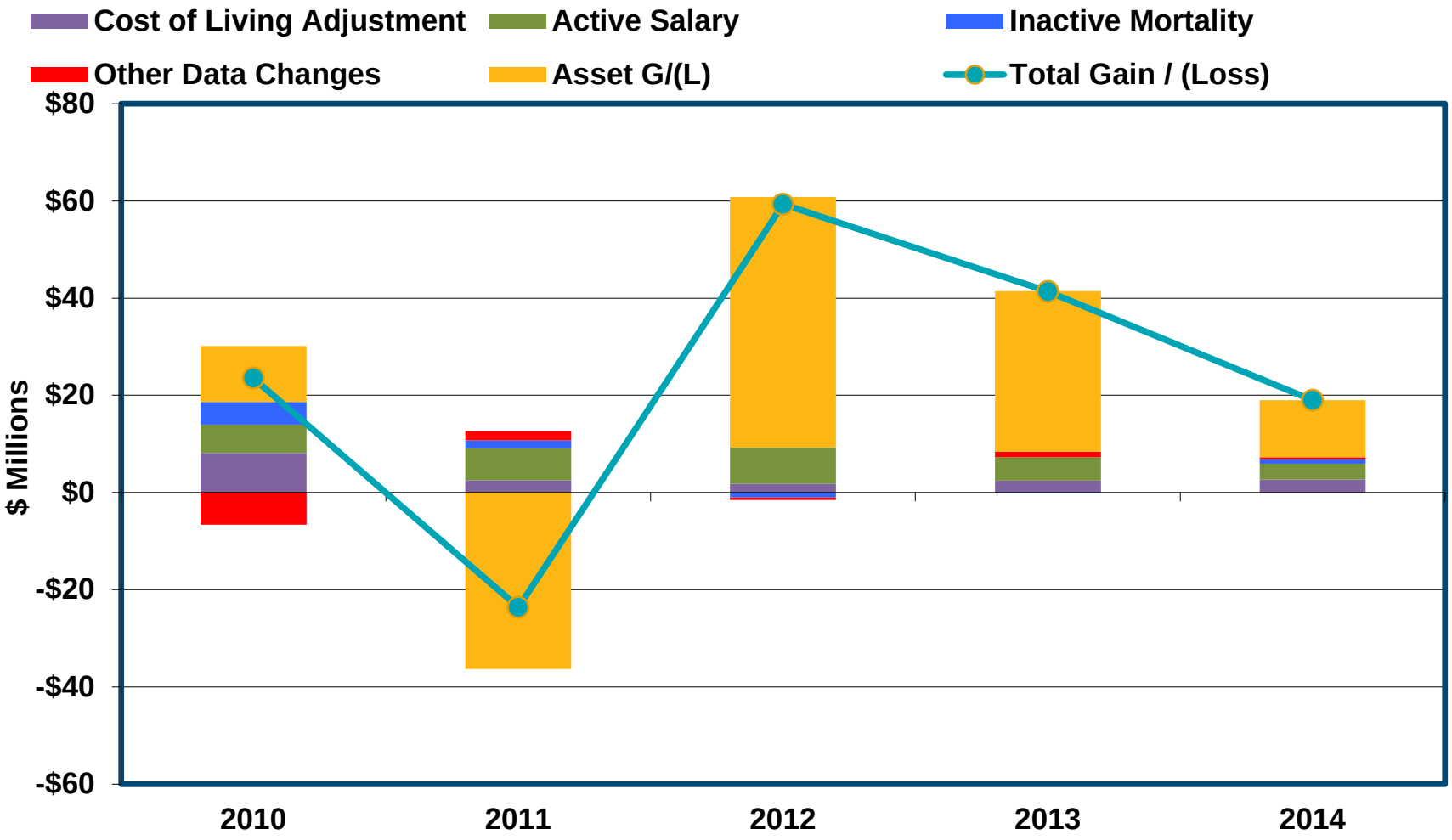
Contribution Trends



Participation Trends



Gain/Loss Trends



Summary of Recommendations

- Demographic Assumptions
  - Mortality: Update to RP2000 table with generational improvements
  - Disability: Adopt modified tables that better track recent experience
  - Termination: Change to unisex table fully based upon service
  - Retirement/DROP: Separate current combined assumptions into separate retirement and DROP assumptions

Summary of Recommendations

- Economic Assumptions
  - Inflation: Reduce from 3.125% to 2.5%
  - Wage growth: Reduce from 3.5% to 3.0%
  - Salary scale: Change from age-based rates to service-based rates
  - Investment return: Reduce from 8.0% to 7.5%
  - Administrative Expense: Add explicit assumption to normal cost

Demographic Assumptions

Demographic Assumptions

- Actuarial assumptions are long-term in nature
  - Must be individually reasonable, as well as consistent in aggregate
- Cheiron has evaluated current demographic assumptions against experience over the past five years
  - Actual/Expected (A/E) ratio gives a sense of how recent experience has matched assumption

Mortality Assumptions

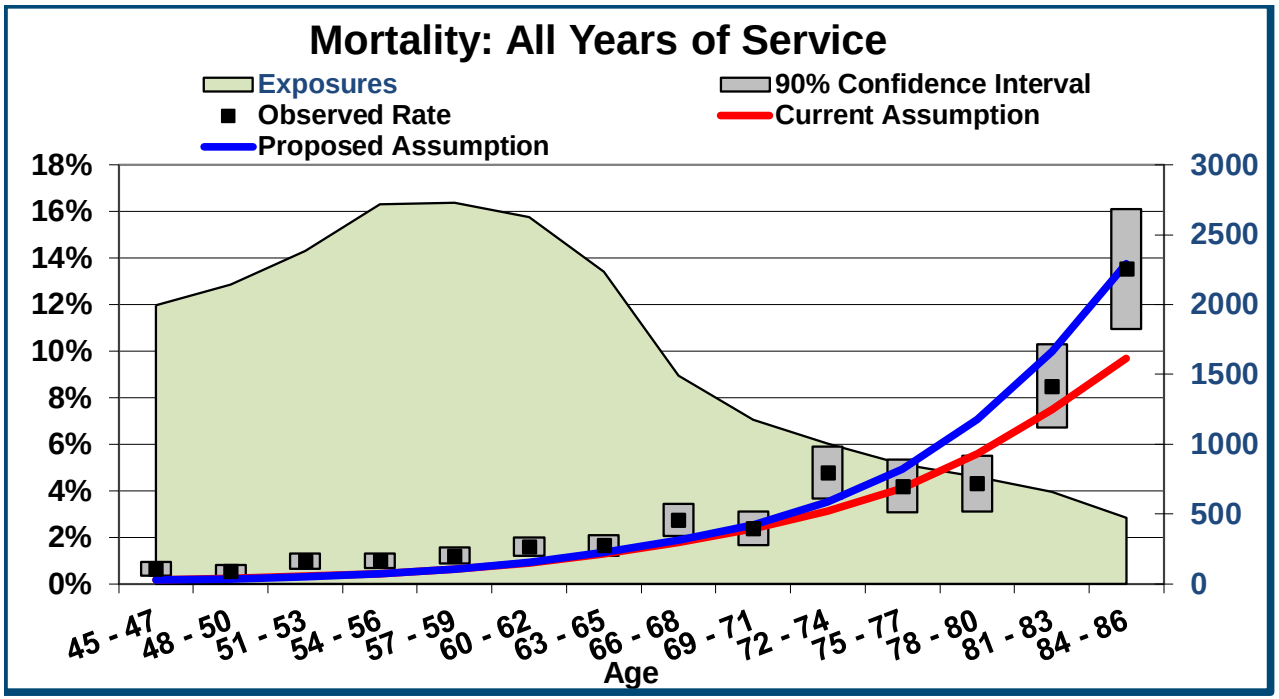
- Current Assumptions:
  - Healthy Retirees: 1994 Group Annuity Mortality Table
  - Disabled Retirees: 1983 Railroad Retirement Board Disabled Life Mortality Table
- Proposed Assumptions:
  - Healthy Retirees: RP2000 Combined Healthy Tables with 3-year set-forward, fully generational using scale AA
  - Disabled Retirees: RP2000 Combined Disabled Tables with 3-year set-forward, fully generational using scale AA

Mortality Assumptions

- Mortality rates for healthy and disabled annuitants should be modified to introduce anticipated future improvements in mortality
  - ASOP No. 35, *Selection of Demographic and Other Noneconomic Assumptions for Measuring Pension Obligations,* was revised to provide guidance regarding mortality improvements
  - Current best practice uses generational mortality improvements (which continually reflect mortality improvement) rather than projecting improvements to a specific year

Healthy Mortality - Male

- Recommend updated generational table
  - RP2000 Combined Healthy Table, 3-year set-forward, fully generational using scale AA

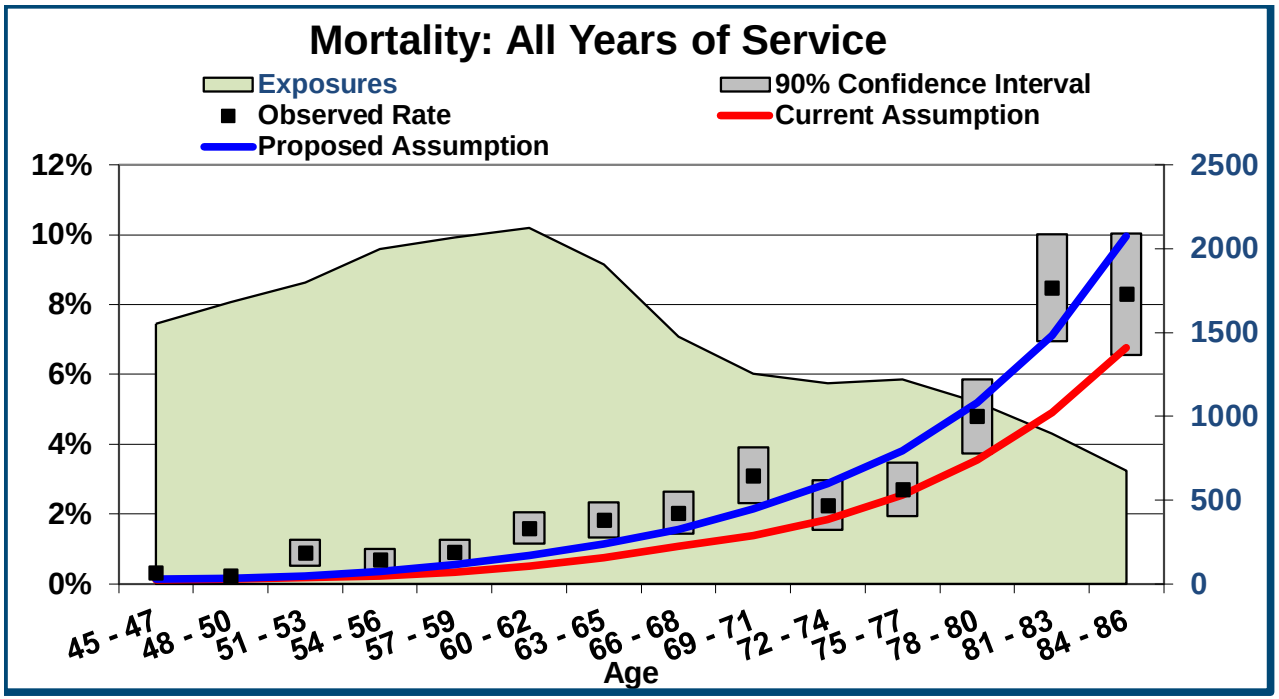


Age	Current	Proposed
45	0.16%	0.16%
48	0.21%	0.20%
51	0.29%	0.25%
54	0.40%	0.37%
57	0.56%	0.55%
60	0.80%	0.83%
63	1.15%	1.22%
66	1.62%	1.69%
69	2.17%	2.30%
72	2.85%	3.16%
75	3.72%	4.40%
78	5.02%	6.23%
81	6.86%	8.95%
84	8.96%	12.50%
87	11.57%	17.06%

Current A/E Ratio: 1.381 **Proposed A/E Ratio: 1.177**

Healthy Mortality - Female

- Recommend updated generational table
  - RP2000 Combined Healthy Table, 3-year set-forward, fully generational using scale AA

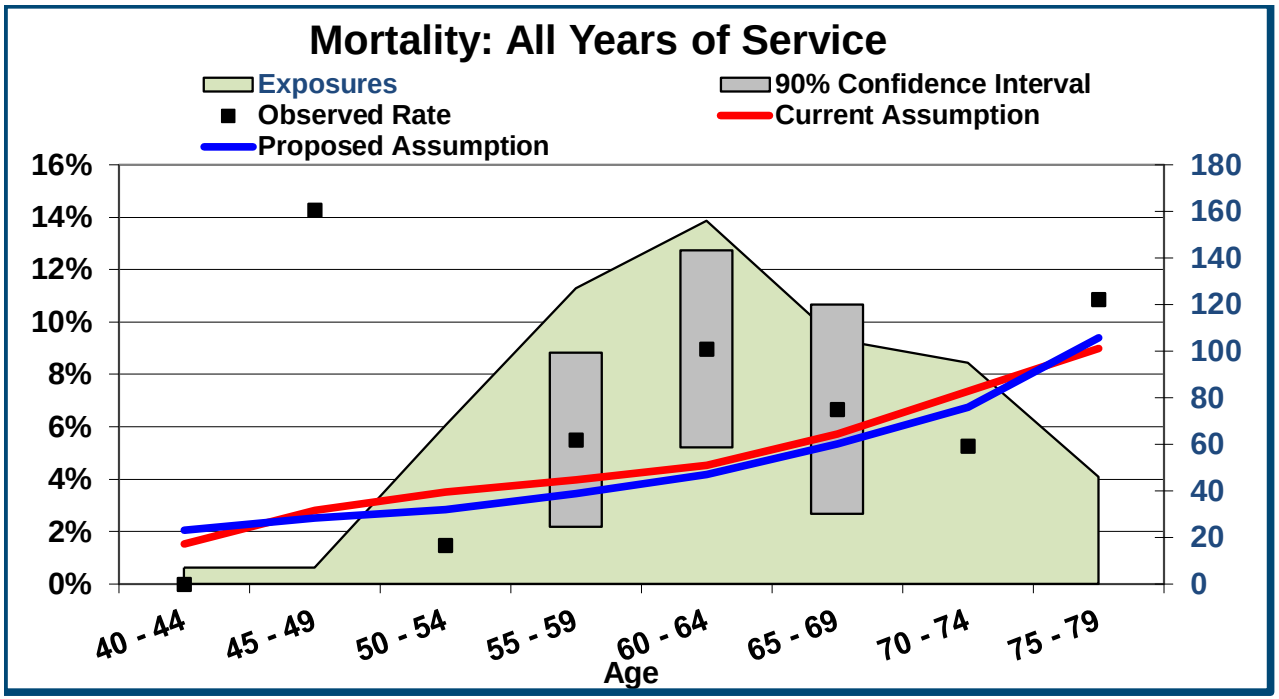


Age	Current	Proposed
45	0.10%	0.12%
48	0.12%	0.15%
51	0.16%	0.20%
54	0.21%	0.31%
57	0.29%	0.48%
60	0.44%	0.72%
63	0.67%	1.03%
66	0.97%	1.40%
69	1.27%	1.95%
72	1.65%	2.61%
75	2.27%	3.41%
78	3.17%	4.67%
81	4.40%	6.39%
84	6.10%	8.85%
87	8.40%	12.55%

Current A/E Ratio: 1.704 **Proposed A/E Ratio: 1.144**

Disabled Mortality - Male

- Recommend updated generational table
  - RP2000 Combined Disabled Table, 3-year set-forward, fully generational using scale AA

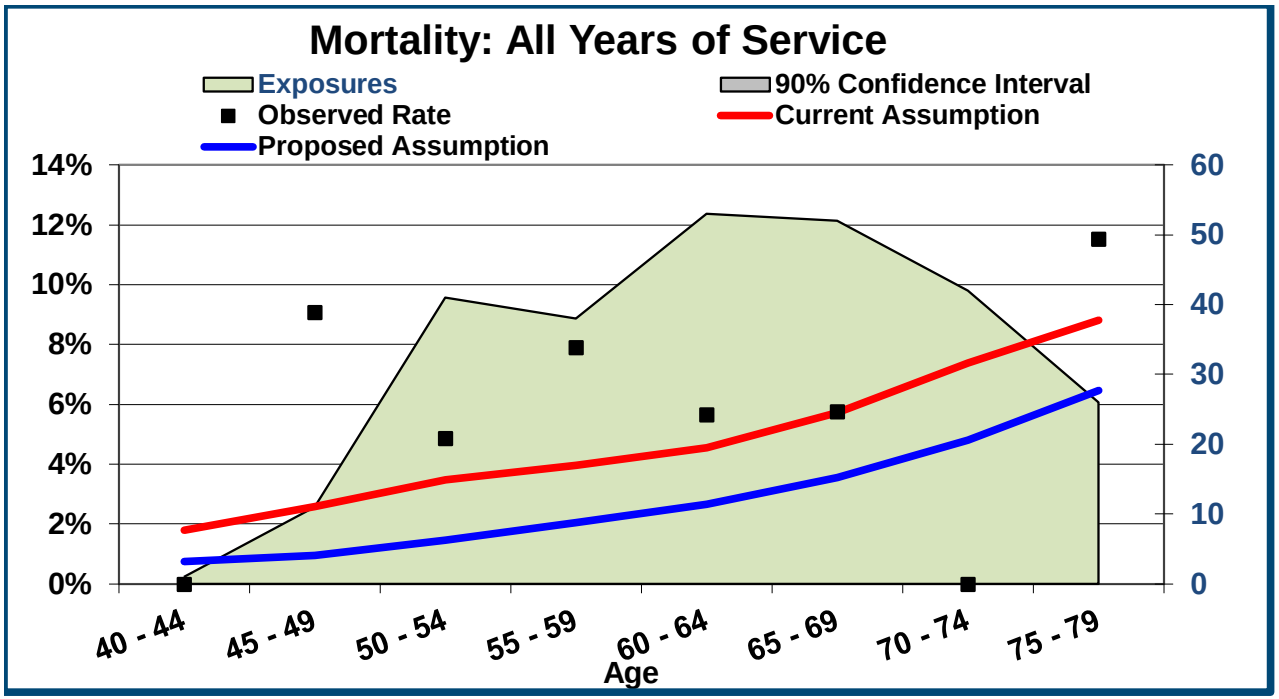


Age	Current	Proposed
40	1.35%	2.05%
45	2.00%	2.26%
50	3.16%	2.64%
55	3.78%	3.12%
60	4.25%	3.84%
65	5.12%	4.81%
70	6.75%	6.11%
75	8.28%	8.24%
80	10.77%	11.38%

Current A/E Ratio: 1.253 **Proposed A/E Ratio: 1.356**

Disabled Mortality - Female

- Recommend updated generational table
  - RP2000 Combined Disabled Table, 3-year set-forward, fully generational using scale AA



Age	Current	Proposed
40	1.35%	0.62%
45	2.00%	0.81%
50	3.16%	1.18%
55	3.78%	1.79%
60	4.25%	2.38%
65	5.12%	3.13%
70	6.75%	4.31%
75	8.28%	5.77%
80	10.77%	8.07%

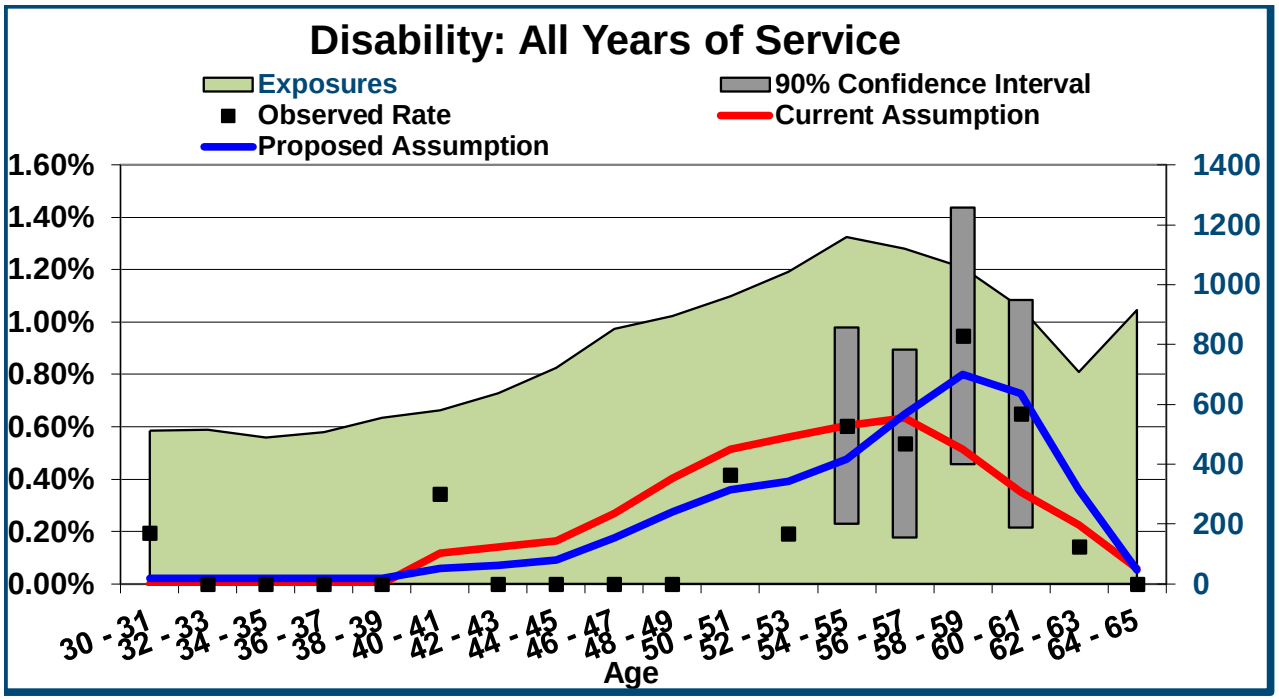
Current A/E Ratio:	1.070	Proposed A/E Ratio:	1.777

Disability Assumptions

- Current assumptions:
  - Age-based tables
  - Separate tables for males and females
- Recommended assumptions
  - Continue separate tables for males and females
  - Adjust rates to better track plan experience

Disability Rates – Male

- Recommend modified age-based table
  - Small probability prior to age 40
  - Change the shape of curve

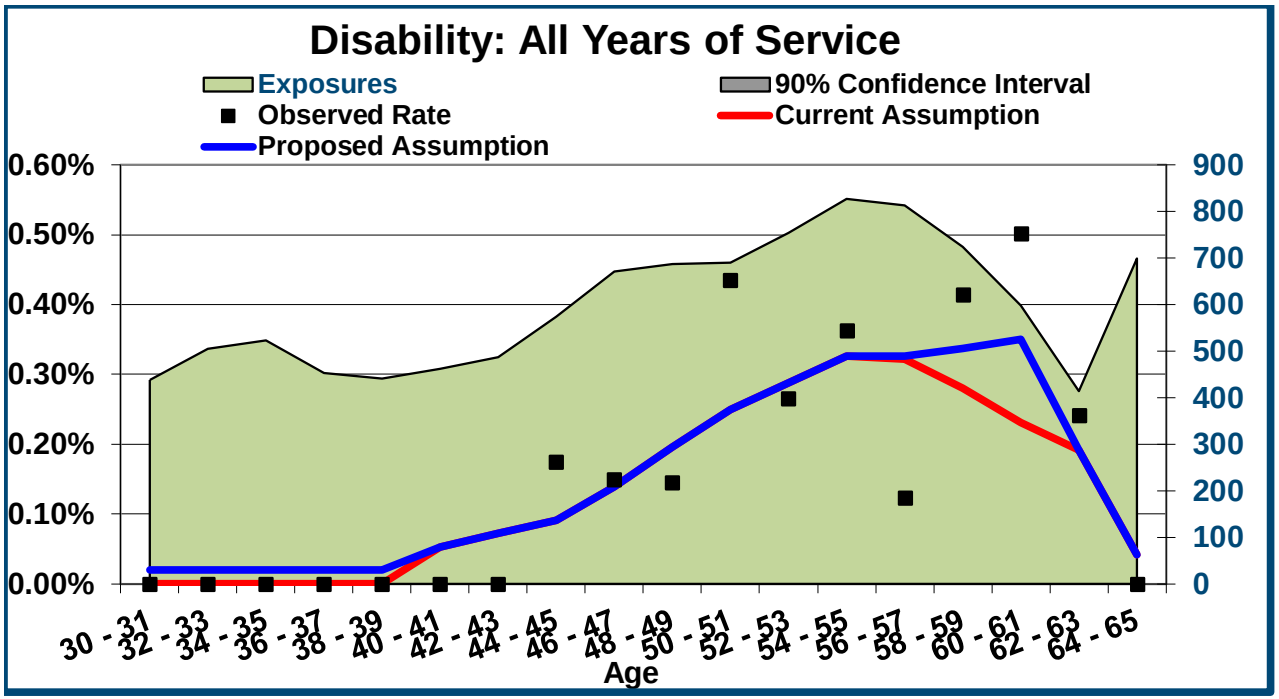


Age	Current	Proposed
30	0.00%	0.02%
32	0.00%	0.02%
34	0.00%	0.02%
36	0.00%	0.02%
38	0.00%	0.02%
40	0.11%	0.06%
42	0.13%	0.07%
44	0.16%	0.09%
46	0.24%	0.18%
48	0.37%	0.28%
50	0.50%	0.36%
52	0.55%	0.39%
54	0.59%	0.47%
56	0.63%	0.65%
58	0.56%	0.80%
60	0.39%	0.73%
62	0.22%	0.36%
64	0.22%	0.05%

Current A/E Ratio: 0.879 **Proposed A/E Ratio: 0.878**

Disability Rates – Female

- Recommend modified age-based table
  - Small probability prior to age 40
  - Change the shape of curve



Age	Current	Proposed
30	0.00%	0.02%
32	0.00%	0.02%
34	0.00%	0.02%
36	0.00%	0.02%
38	0.00%	0.02%
40	0.05%	0.05%
42	0.07%	0.07%
44	0.09%	0.09%
46	0.12%	0.14%
48	0.18%	0.20%
50	0.24%	0.25%
52	0.28%	0.29%
54	0.32%	0.33%
56	0.33%	0.33%
58	0.29%	0.34%
60	0.24%	0.35%
62	0.19%	0.19%
64	0.19%	0.04%

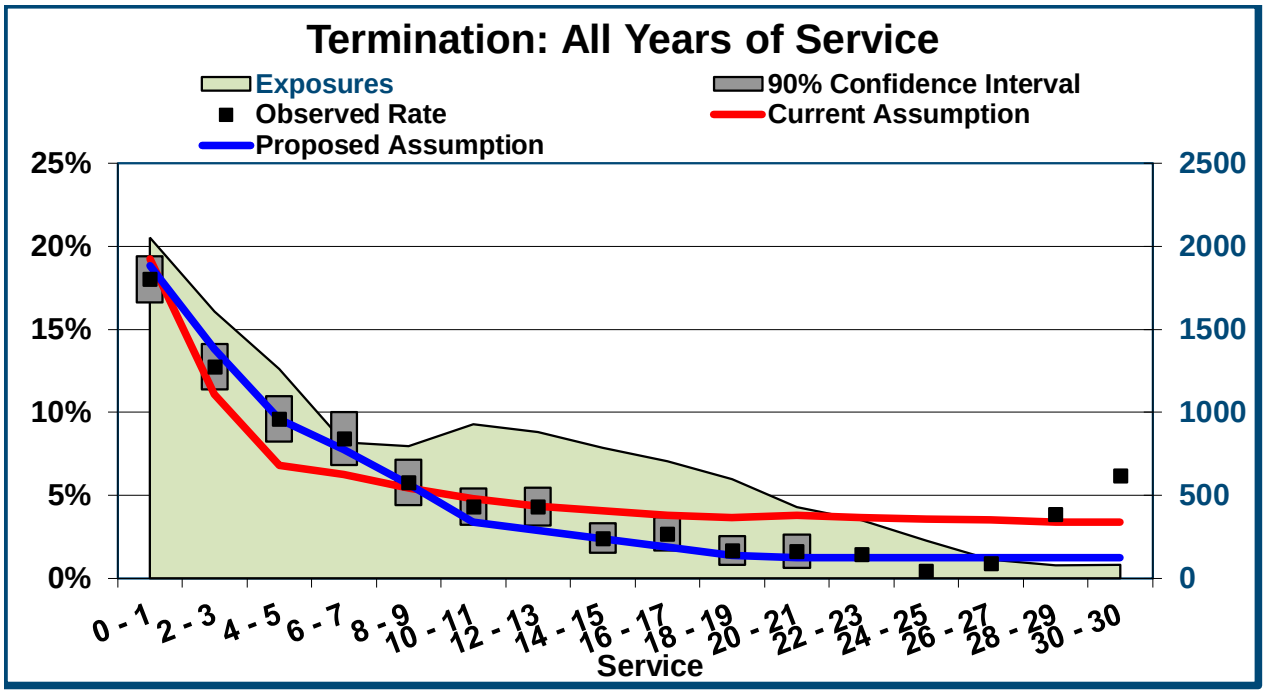
Current A/E Ratio: 1.110 **Proposed A/E Ratio: 1.014**

Termination Assumptions

- Current assumptions:
  - Four year select table followed by age-based rates
  - Separate tables for males and females
- Recommended assumptions
  - Service-based unisex table

Termination Rates - Male

- Recommend new unisex table
  - Shape closer to experience
  - Gender not a significant factor

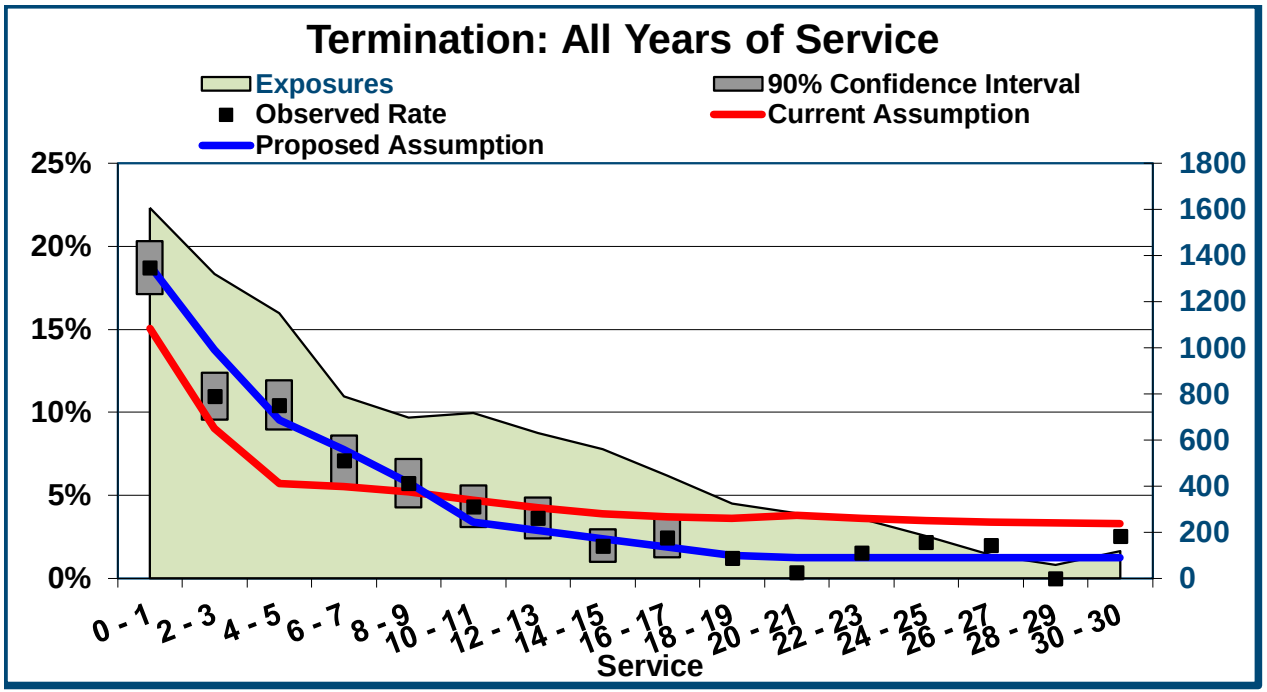


Service	Current	Proposed
0	22.00%	20.00%
2	12.00%	15.00%
4	6.79%	10.00%
6	6.54%	8.00%
8	5.65%	7.00%
10	4.89%	3.50%
12	4.44%	3.00%
14	4.13%	2.50%
16	3.86%	2.00%
18	3.69%	1.50%
20	3.81%	1.25%
22	3.68%	1.25%
24	3.60%	1.25%
26	3.51%	1.25%
28	3.43%	1.25%
30	3.37%	1.25%

Current A/E Ratio: 0.996 **Proposed A/E Ratio: 1.008**

Termination Rates – Female

- Recommend new unisex table
  - Shape closer to experience
  - Gender not a significant factor



Service	Current	Proposed
0	16.00%	20.00%
2	10.00%	15.00%
4	5.73%	10.00%
6	5.50%	8.00%
8	5.32%	7.00%
10	4.79%	3.50%
12	4.33%	3.00%
14	3.96%	2.50%
16	3.73%	2.00%
18	3.64%	1.50%
20	3.86%	1.25%
22	3.67%	1.25%
24	3.54%	1.25%
26	3.38%	1.25%
28	3.33%	1.25%
30	3.30%	1.25%

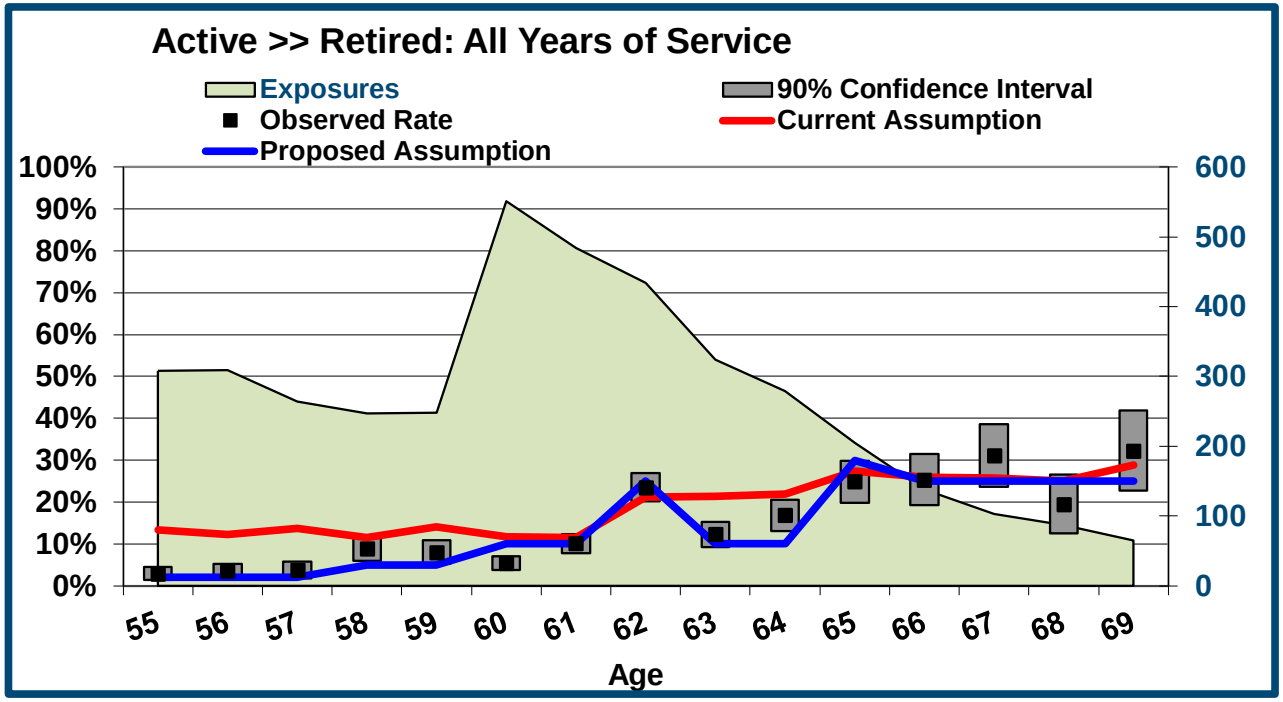
Current A/E Ratio: 1.158 **Proposed A/E Ratio: 0.974**

Retirement and DROP Assumptions

- Current assumption treats election of DROP the same as if member retired
  - Load of 3% on retirement liabilities to provide for return from DROP to full active status
- We recommend separating probabilities of DROP and retirement
  - DROP assumption will include an assumption that 50% of members will return to active status from DROP and will work an additional two years

Retirement Rates – Age Based

- Recommend separate retirement assumption based only on age

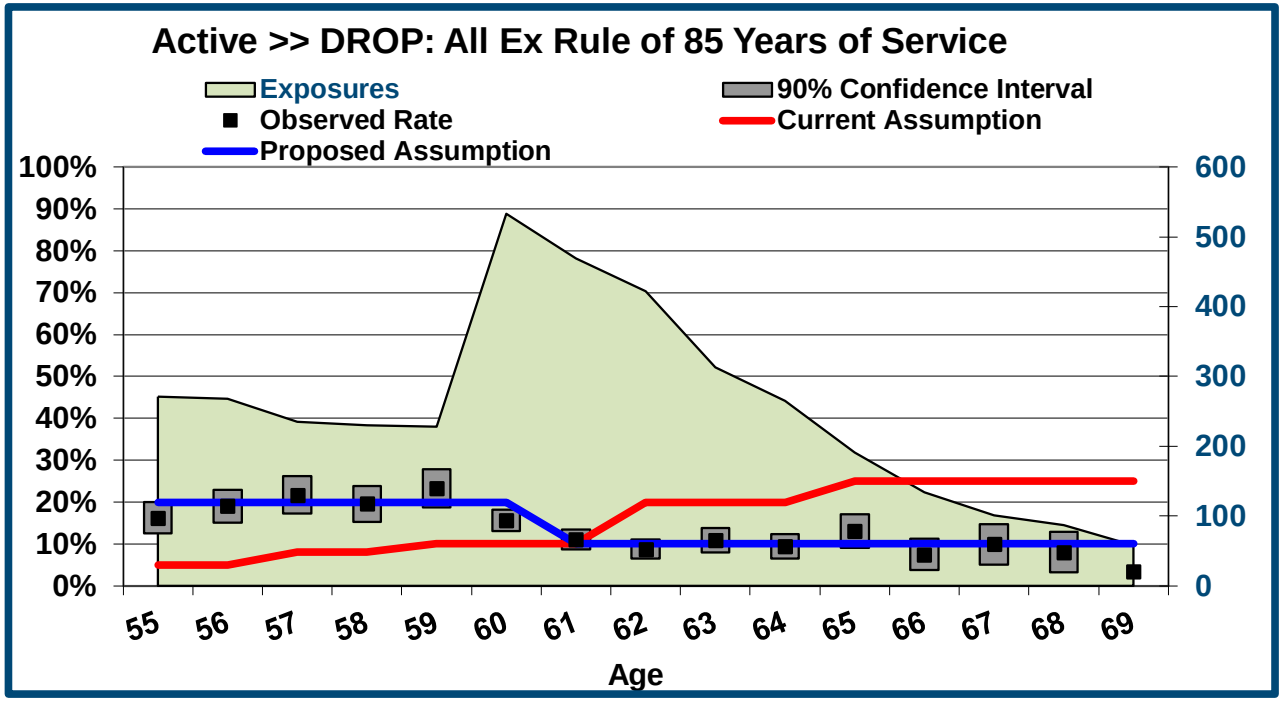


Age	Current	Proposed
<= 54	0.0%	0.0%
55	13.4%	2.0%
56	12.3%	2.0%
57	13.7%	2.0%
58	11.6%	5.0%
59	14.0%	5.0%
60	11.6%	10.0%
61	11.5%	10.0%
62	21.1%	25.0%
63	21.4%	10.0%
64	22.0%	10.0%
65	27.4%	30.0%
66	26.0%	25.0%
67	25.7%	25.0%
68	25.0%	25.0%
69	28.8%	25.0%

Current A/E Ratio: 0.729 **Proposed A/E Ratio: 1.045**

DROP Rates – Not Rule of 85

- Recommend separate DROP assumptions based on Rule of 85

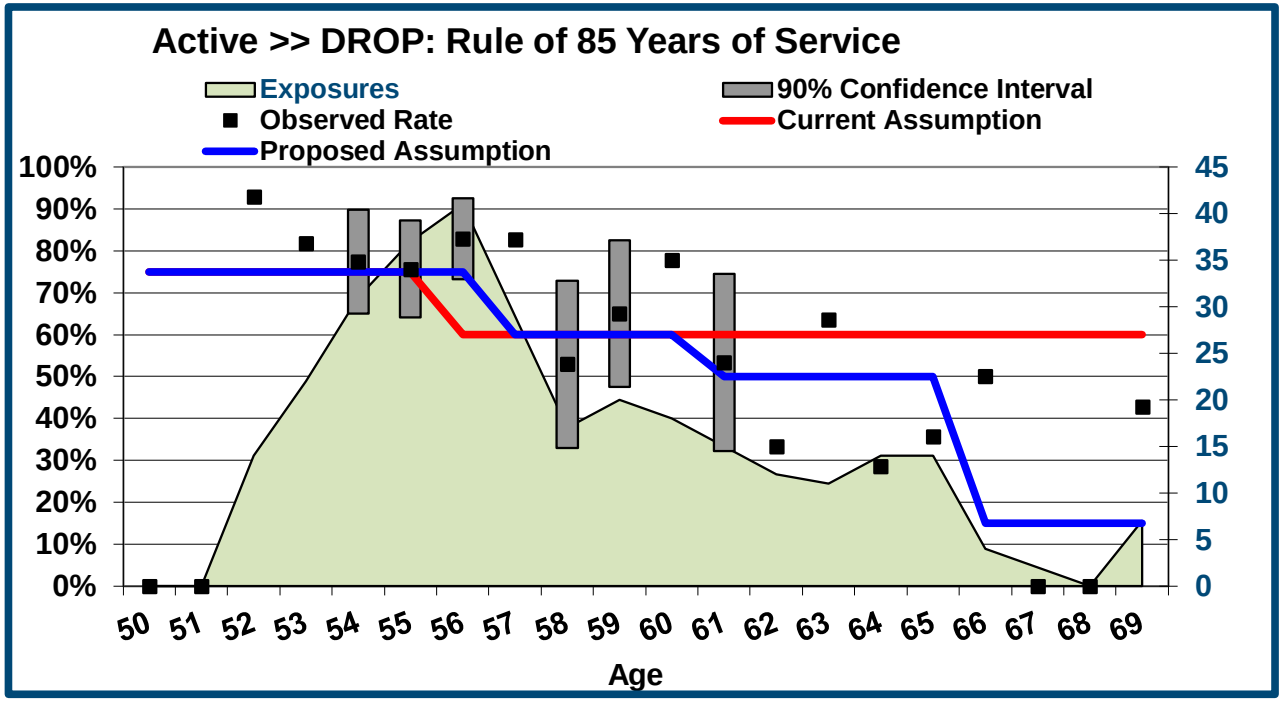


Age	Current	Proposed
<= 54	0.0%	0.0%
55	5.0%	20.0%
56	5.0%	20.0%
57	8.0%	20.0%
58	8.0%	20.0%
59	10.0%	20.0%
60	10.0%	20.0%
61	10.0%	10.0%
62	20.0%	10.0%
63	20.0%	10.0%
64	20.0%	10.0%
65	25.0%	10.0%
66	25.0%	10.0%
67	25.0%	10.0%
68	25.0%	10.0%
69	25.0%	10.0%

Current A/E Ratio: 0.998 **Proposed A/E Ratio: 0.950**

DROP Rates – Rule of 85

- Recommend separate DROP assumptions based on Rule of 85

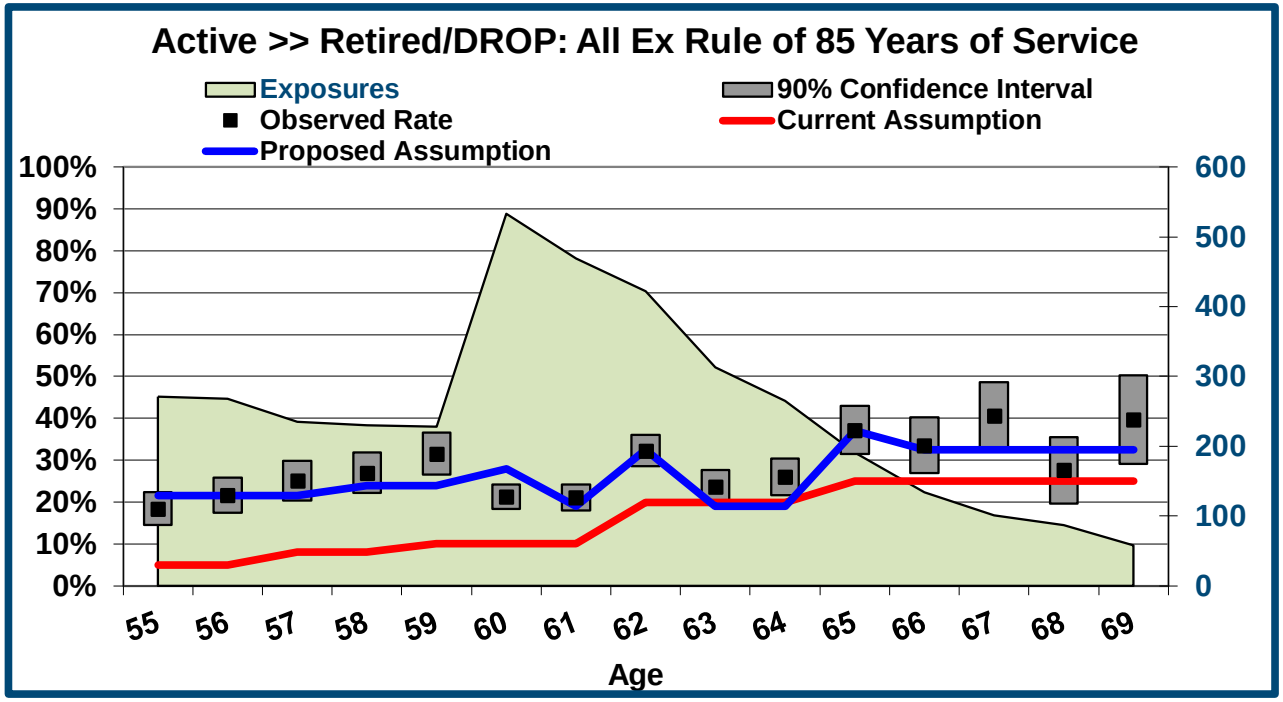


Age	Current	Proposed
<= 49	0.0%	0.0%
50	75.0%	75.0%
51	75.0%	75.0%
52	75.0%	75.0%
53	75.0%	75.0%
54	75.0%	75.0%
55	75.0%	75.0%
56	60.0%	75.0%
57	60.0%	60.0%
58	60.0%	60.0%
59	60.0%	60.0%
60	60.0%	60.0%
61	60.0%	50.0%
62	60.0%	50.0%
63	60.0%	50.0%
64	60.0%	50.0%
65	60.0%	50.0%
66	60.0%	15.0%
67	60.0%	15.0%
68	60.0%	15.0%
69	60.0%	15.0%

Current A/E Ratio:	1.048	Proposed A/E Ratio:	1.082

Comb. Ret./DROP – Not Rule of 85

- Blended rate for comparison

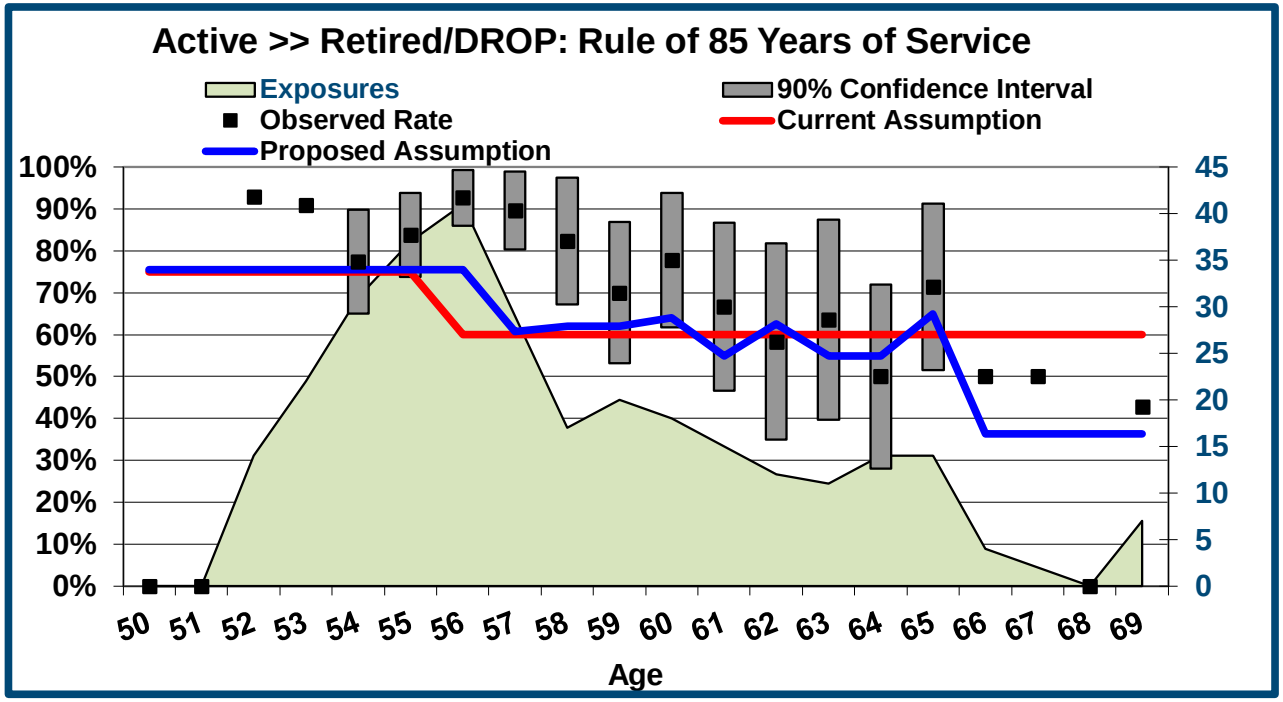


Age	Current	Proposed
<= 54	0.0%	0.0%
55	5.0%	21.6%
56	5.0%	21.6%
57	8.0%	21.6%
58	8.0%	24.0%
59	10.0%	24.0%
60	10.0%	28.0%
61	10.0%	19.0%
62	20.0%	32.5%
63	20.0%	19.0%
64	20.0%	19.0%
65	25.0%	37.0%
66	25.0%	32.5%
67	25.0%	32.5%
68	25.0%	32.5%
69	25.0%	32.5%

Current A/E Ratio: 1.880 **Proposed A/E Ratio: 1.041**

Comb. Ret./DROP – Rule of 85

- Blended rate for comparison



Age	Current	Proposed
<= 49	0.0%	0.0%
50	75.0%	75.5%
51	75.0%	75.5%
52	75.0%	75.5%
53	75.0%	75.5%
54	75.0%	75.5%
55	75.0%	75.5%
56	60.0%	75.5%
57	60.0%	60.8%
58	60.0%	62.0%
59	60.0%	62.0%
60	60.0%	64.0%
61	60.0%	55.0%
62	60.0%	62.5%
63	60.0%	55.0%
64	60.0%	55.0%
65	60.0%	65.0%
66	60.0%	36.3%
67	60.0%	36.3%
68	60.0%	36.3%
69	60.0%	36.3%

Current A/E Ratio:	1.203	Proposed A/E Ratio:	1.176

Other Demographic Assumptions

- Retirement age for terminated vested participants
  - Currently age 61
  - Experience study shows average age of 61.8
  - Recommend no change
- Remove current load of 0.4% being used to reflect cost of rehires

Other Demographic Assumptions

- Spouse age difference
  - Currently assume male is 3 years older
  - Actual average difference 3.4
  - Recommend no change
- Percent Married
  - Currently based on 1960 census study
    - Distinct by sex and age
  - Recommend 80% for all

Economic Assumptions

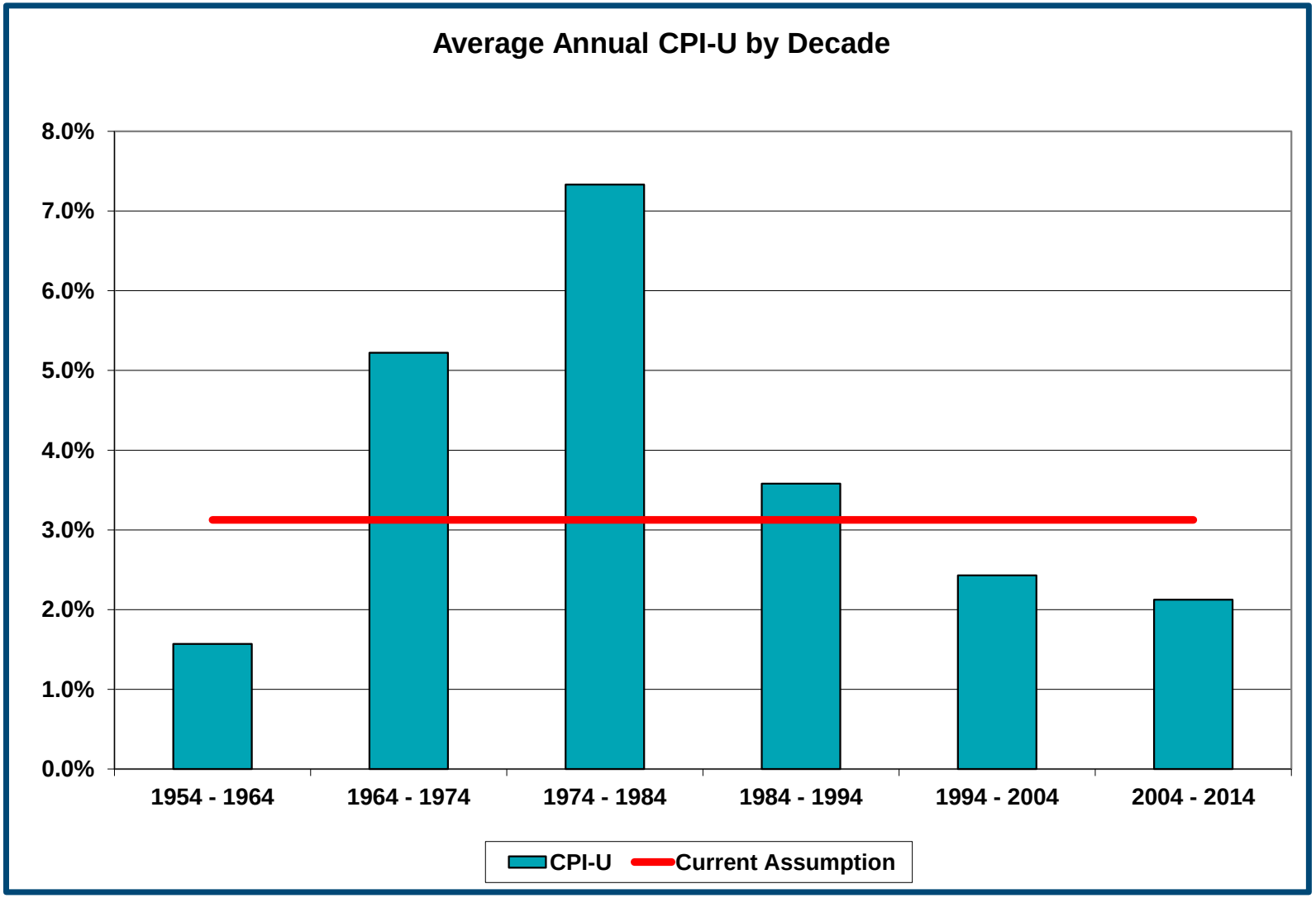
Economic Factors to Consider

- What other Funds are doing
- Past experience of the Fund
- Historical data in general
- Outlook for the future
- Risk preference of the Board

Economic Assumptions

- Inflation
- Salary Increases
  - Inflation component
  - Real wage growth
  - Merit or step increase
- Investment Return
- Administrative Expenses

Inflation (CPI – U)



Inflation - Outlook for the Future

Bond Yields as of December 31, 2014			
Time to Maturity	**Conventional Yield**	**TIPS Yield**	**Implied Inflation**
10 years	2.17%	0.49%	1.68%
20 years	2.54%	0.68%	1.86%
30 years	2.75%	0.83%	1.92%

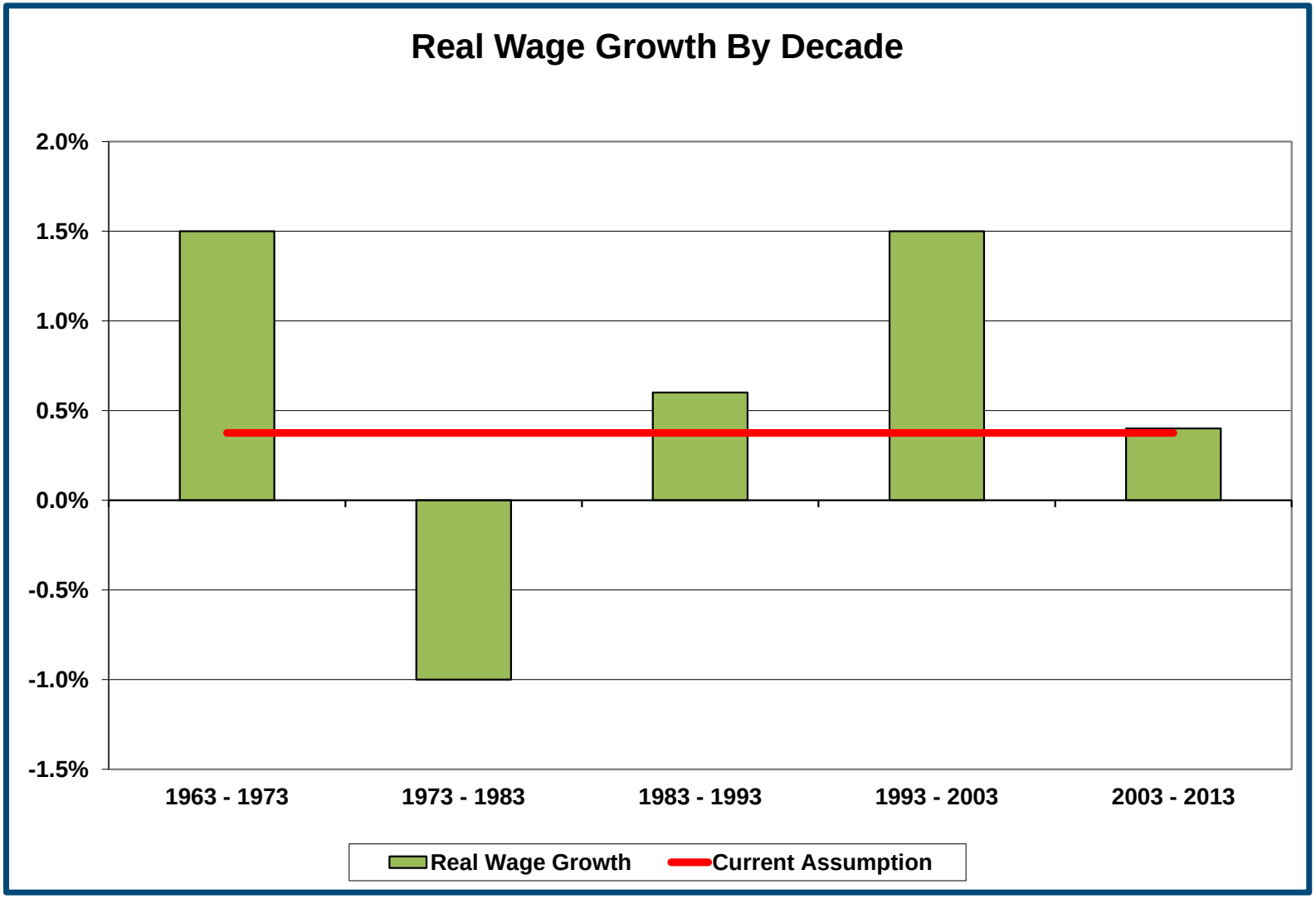
Inflation – NASRA Average by Year

Year	Average
2001	3.97%
2005	3.66%
2009	3.51%
2010	3.39%
2011	3.30%
2012	3.17%
2013	3.17%

Inflation – Comments

- Historical inflation by decade has varied widely
- Inflation in last two decades has been less than the current assumption of 3.125%
- Implied inflation in long-term bonds at December 31, 2013, was about 1.9%
- Most recent NASRA survey has an average inflation assumption of 3.2%
- Recommend lowering inflation assumption to 2.5%

Real Wage Growth

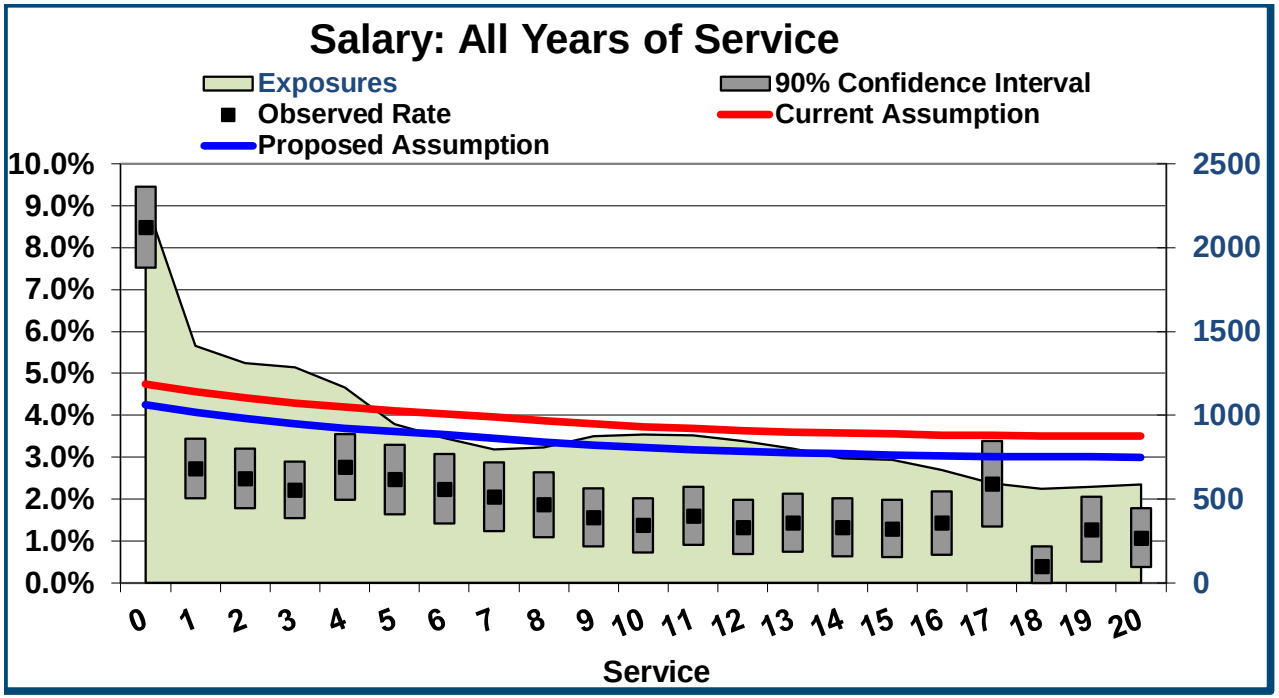


Real Wage Growth - Comments

- Current real wage growth assumption is 0.375% (ultimate payroll growth rate of 3.5% minus inflation rate of 3.125%)
  - It is part of the overall salary growth assumption
- Total salary growth equals:
  - Inflation (currently 3.125%), plus
  - Real wage growth (currently 0.375%), plus
  - Merit and promotional increases (currently from 0% to 3.52% based on age)

Salary Experience

- Recent experience may not be indicative of long term expectation



Current A/E Ratio:	0.662	Proposed A/E Ratio:	0.756

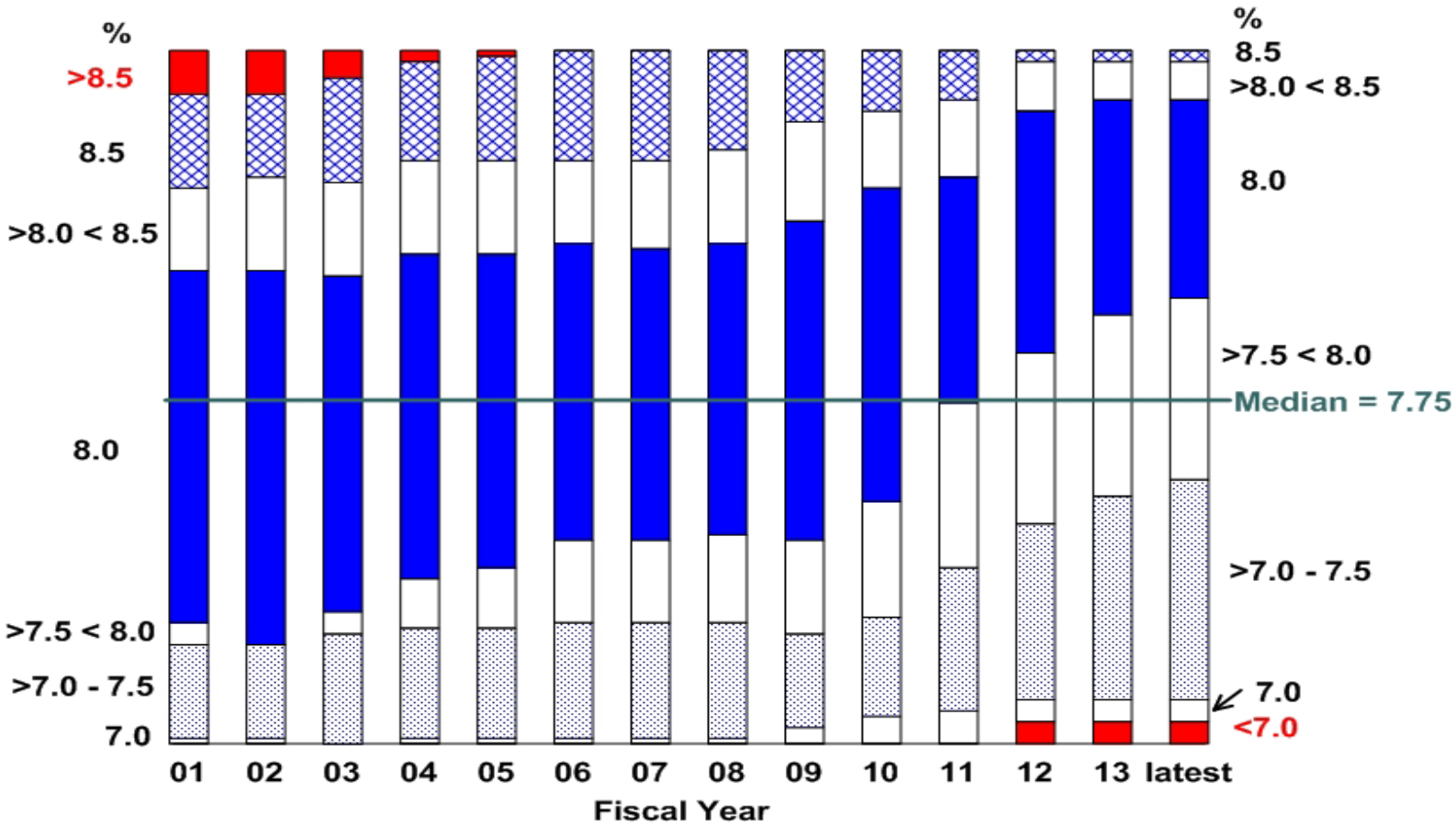
Service	Current	Proposed
0	4.7%	4.2%
1	4.6%	4.1%
2	4.4%	3.9%
3	4.3%	3.8%
4	4.2%	3.7%
5	4.1%	3.6%
6	4.0%	3.5%
7	4.0%	3.5%
8	3.9%	3.4%
9	3.8%	3.3%
10	3.7%	3.2%
11	3.7%	3.2%
12	3.6%	3.1%
13	3.6%	3.1%
14	3.6%	3.1%
15	3.6%	3.1%
16	3.5%	3.0%
17	3.5%	3.0%
18	3.5%	3.0%
19	3.5%	3.0%
20	3.5%	3.0%

Recommendations

- Recommend lowering inflation assumption from 3.125% to 2.5%
- Recommend changing real wage increase assumption from 0.375% to 0.50%
  - Total wage growth assumption will be 3.00%
  - Reduces plan liabilities by lowering projected salary growth
- Recommend changing merit and promotional increases to service based

Investment Return Assumption

- Comparison to other systems



Source: NASRA Public Fund Survey Summary of Findings

Investment Return – NASRA Average

Year	Average (Mean)
2001	8.06%
2005	7.98%
2009	7.96%
2010	7.91%
2011	7.85%
2012	7.75%
2013	7.72%
Latest	7.71%

Investment Return

- Other Retirement Systems in Missouri

System	Discount Rate
Kansas City Employees	7.500%
Kansas City Firefighters	7.500%
Kansas City Police	7.500%
St. Louis Firefighters (FRS & FPR)	7.625%
St. Louis Police	7.750%
MOSERS	8.000%
PSRS/PEERS	8.000%

Investment Return - History

- Annual Rates of Return

Plan Year Ending September 30,	Market Value	Actuarial Value
2014	9.6%	10.7%
2013	13.0%	1.6%
2012	1.8%	1.3%
2011	10.1%	3.4%
2010	-3.1%	1.5%
2009	-12.8%	5.9%
2008	14.7%	10.2%

Investment Consultant Input

- Summit Strategies has developed expected rates of return based on current asset allocation and their standard asset class assumptions
- Annualized expected 10-year returns:
  - Nominal: 6.8%
  - Real: 4.3%
- Annualized expected 30-year returns:
  - Nominal: 7.9%
  - Real: 5.4%

Other Considerations

- Negative cash flow (contributions minus benefit payments) of about 2.5% of plan assets
  - Tends to result in lower returns over time than the median returns developed by investment consultants
- Risk preference of plan sponsor
  - What is the effect on contribution levels if expected returns are not achieved?

Investment Return - Comments

- Actuarial Standard of Practice No. 27
  - Prior ASOP specified a “reasonable range,” which was generally considered to be between 25th and 75th percentiles
  - Revised ASOP states that the assumption should be appropriate for the measurement and reflect the actuary’s professional judgment
- Current assumption of 8.0% is higher than the average rate for large public retirement systems in NASRA survey and also higher than other local systems in St. Louis and Kansas City

Investment Return - Comments

- Current assumption is about at median based upon investment consultant 30-year capital market assumptions, but more than 1% above 10-year assumption
- Negative cash flow could cause expected returns to be lower
- Recommend lowering the rate to 7.5%
  - Would be about at the mid-point of the investment consultant 10-year and 30-year assumptions

Administrative Expenses

- Prior investment return assumption assumed that administrative expenses were to be deducted in determining the investment return assumption
- Under GASB 67, rate of return is assumed net of investment expenses, but not administrative expenses

Administrative Expenses

- Recommend a specific assumption for administrative expenses as an addition to normal cost
  - Administrative expenses were $671,000 (0.30% of payroll) in 2014 and $648,000 (0.29% of payroll) in 2013
  - Recommend using 0.30% of payroll for administrative expense assumption

Other Economic Assumptions

- IRS benefit and compensation limits
  - Current: 4.5%
  - Recommended: 2.5%
- Social Security Taxable Wage Base
  - Current: 3.5%
  - Recommended: 3.0%

Actuarial Methods

Actuarial Methods

- Actuarial Cost Method (specified in City Code)
  - Projected Unit Credit Method
- UAL Amortization Method (specified in City Code)
  - 30-year rolling level dollar amortization
- Actuarial Asset Method (adopted by ERS Board)
  - Five-year recognition of market value gains and losses

Actuarial Methods: Recommendations

- Actuarial Cost Method (requires change to City Code)
  - Entry Age Normal Method
  - EAN is used by about 70% of public retirement funds and is consistent with GASB 67
- UAL Amortization Method (requires change to City Code)
  - Shorter “layered” amortization periods as level percent of payroll
  - Would be more in line with current actuarial best practices
- Actuarial Asset Method
  - No change

Cost Impact

Impact on Actuarial Liability

($ in thousands)	Accrued Liability	Percent Change	Funded Ratio
10/1/2014 Valuation Results	**$911,979**		**80.92%**
Change 1 - Mortality	(29,877)	-3.28%	2.74%
Change 2 - Disability	(107)	-0.01%	0.01%
Change 3 - Termination	5,442	0.62%	-0.51%
Change 4 – Retirement/Drop	(17,898)	-2.02%	1.71%
Change 5 – Economic	22,935	2.64%	-2.18%
All Proposed Changes – 10/1/2014 Valuation Results	**$892,474**	**-2.14%**	**82.69%**

Impact on Annual Contribution

($ in thousands)	EAN NC	UAL Pmt	Total	% of Pay
10/1/2014 Valuation Results	**$16,688**	**$14,917**	**$31,605**	**13.93%**
Change 1 - Mortality	(158)	(2,561)	(2,719)	-1.20%
Change 2 - Disability	(9)	(9)	(18)	0.00%
Change 3 - Termination	386	467	853	0.37%
Change 4 – Retirement/Drop	(958)	(1,535)	(2,493)	-1.10%
Change 5 – Economic	492	1,374	1,866	0.82%
– Admin. Expense	681		681	0.30%
All Proposed Changes – 10/1/2014 Valuation Results	**$17,122**	**$12,653**	**$29,775**	**13.12%**

Reliance

- In preparing this presentation, we relied, without audit, on information supplied by the Employees Retirement System of the City of St. Louis.
- The actuarial assumptions, data and methods are those used in the preparation of the actuarial valuation report prepared for this System are as of October 1, 2014, except as discussed within.
- The assumptions reflect our understanding of the likely future experience of the System and the assumptions as a whole represent our best estimate for the future experience of the System. The results of this report are dependent upon future experience conforming to these assumptions. To the extent that future experience deviates from the actuarial assumptions, the true cost of the plan could vary from our results.
- To the best of our knowledge, this presentation and its contents, which are work products of Cheiron, Inc., have been prepared in accordance with generally recognized and accepted actuarial principles and practices that are consistent with the Code of Professional Conduct and applicable Actuarial Standards of Practice set out by the Actuarial Standards Board. Furthermore, as credentialed actuaries, we meet the Qualification Standards of the American Academy of Actuaries to render the opinion contained in this report. This presentation does not address any contractual or legal issues. We are not attorneys and our firm does not provide any legal services or advice.
- Cheiron's presentation was prepared solely for the Employees Retirement System of the City of St. Louis for the purposes described herein. It is not intended to benefit any third party, and Cheiron assumes no duty or liability to any such party.

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