1994-1998 SERS EXPERIENCE STUDY

SUMMARY OF RESULTS

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PERSONAL & CONFIDENTIAL

State of Connecticut
State Employees Retirement Commission
55 Elm Street
Hartford, CT 06106

Re: 1994-1998 SERS Experience Study – Final Results

Members of the Commission:

We are pleased to present the results of the 1994-1998 SERS Experience Study.

Section I contains a discussion of the demographic assumptions used in the actuarial valuation. Details regarding economic assumptions are found in Section II. Section III deals with Actuarial Cost Methods.

Respectfully submitted,

MILLIMAN & ROBERTSON, INC.

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SECTION I
DEMOGRAPHIC ASSUMPTIONS

A. Turnover and Preretirement Mortality

As in the past, we have studied the combined forces of turnover and preretirement mortality. This is because the majority of terminating members and beneficiaries of members who die prior to retirement receive a refund of member contributions rather than a deferred benefit. Since we do not receive census data on members who have received refunds, we cannot distinguish between terminated and deceased members once they have left the System.

Current Assumption

Three-year select and ultimate rates developed for nonhazardous duty males per the following table; rates are multiplied by 110% for females and by 60% for hazardous duty members:

Service	Age									
	<=24	25-29	30-34	35-39	40-44	45-49	50-54	55-59	60-64	65+
0	24.80%	16.20%	14.20%	11.80%	8.00%	4.20%	2.60%	1.20%	1.20%	1.20%
1	24.00%	13.40%	10.60%	9.60%	8.60%	7.20%	5.20%	2.40%	2.40%	2.40%
2	16.00%	9.20%	8.00%	7.60%	6.60%	5.20%	3.20%	1.20%	1.20%	1.20%
3	9.20%	6.80%	4.20%	3.00%	2.60%	2.00%	1.20%	0.00%	0.00%	0.00%
4	9.20%	6.80%	4.20%	3.00%	2.60%	2.00%	1.20%	0.00%	0.00%	0.00%
5	9.20%	6.80%	4.20%	3.00%	2.60%	2.00%	1.20%	0.00%	0.00%	0.00%
6 - 9	9.20%	6.80%	4.20%	3.00%	2.60%	2.00%	1.20%	0.00%	0.00%	0.00%
10 +	9.20%	6.80%	4.20%	3.00%	2.60%	2.00%	1.20%	0.00%	0.00%	0.00%

Study Design

The assumption prior to the 1993 experience study was a five-year select and ultimate table, but the 1993 experience study indicated that the experience in years 3, 4 and 5 could be collapsed, leading to the current three-year assumption. We wanted to reexamine years 3, 4 and 5, and also look at the combined experience for years 6-9 and for years 10+ to determine whether there were observable differences in turnover at these higher service levels.

In addition to length of service, we looked at the experience by 5-year age groups, by hazardous versus nonhazardous members, and by sex.

SECTION I
DEMOGRAPHIC ASSUMPTIONS

A. Turnover and Preretirement Mortality

Results

Please note that all graphs show the ***numbers*** of actual and expected withdrawals, not the rates. Actual experience is shown in black; results predicted by the current assumptions are shown in red; results predicted by the actuary's recommended changes are shown in blue. There are eight graphs for each combination of hazardous/nonhazardous and male/female. Each graph shows the experience for a different service group.

Observations

- The current assumptions understated actual terminations for nonhazardous members across all service groups except for years 10+.
- Male and female experience was similar, indicating that dropping the current 10% additional turnover assumption for females would be appropriate.
- Experience for years 3 and 4 was similar, but experience for year 5, years 6-9, and years 10+ were successively lower, indicating that a ten-year select and ultimate assumption would be appropriate.

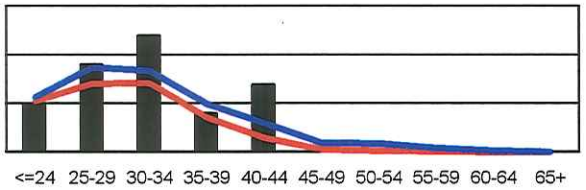
Actuary's Recommended Assumption

Ten-year select and ultimate rates developed for nonhazardous duty members per the following table; rates are multiplied by 40% for hazardous duty members:

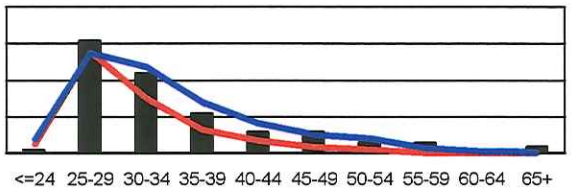
Service	Age									
	<=24	25-29	30-34	35-39	40-44	45-49	50-54	55-59	60-64	65+
0	40.00%	30.00%	25.00%	25.00%	25.00%	25.00%	25.00%	25.00%	25.00%	25.00%
1	40.00%	30.00%	25.00%	25.00%	25.00%	25.00%	25.00%	25.00%	25.00%	25.00%
2	30.00%	20.00%	20.00%	20.00%	20.00%	20.00%	20.00%	20.00%	20.00%	20.00%
3	20.00%	10.00%	10.00%	10.00%	10.00%	10.00%	10.00%	10.00%	10.00%	10.00%
4	20.00%	10.00%	10.00%	10.00%	10.00%	10.00%	10.00%	10.00%	10.00%	10.00%
5	15.00%	8.00%	8.00%	8.00%	8.00%	8.00%	8.00%	8.00%	8.00%	8.00%
6 - 9	5.00%	5.00%	5.00%	5.00%	5.00%	5.00%	5.00%	5.00%	5.00%	5.00%
10 +	5.00%	5.00%	4.20%	3.00%	2.60%	2.00%	1.20%	0.00%	0.00%	0.00%

SECTION I
DEMOGRAPHIC ASSUMPTIONS

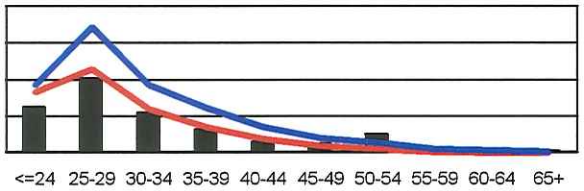
A. Turnover and Preretirement Mortality
Hazardous, Male



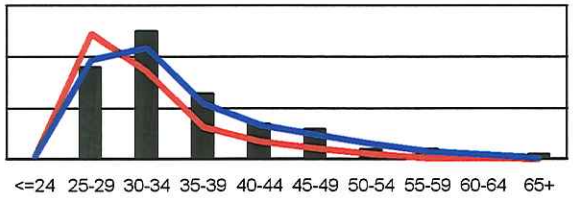
Year 0	
37	
25	
33	



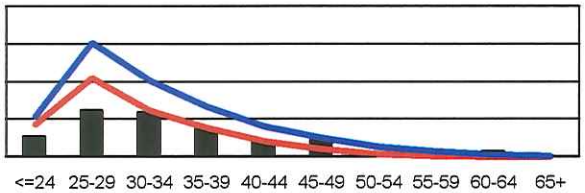
Year 4	
85	
59	
89	



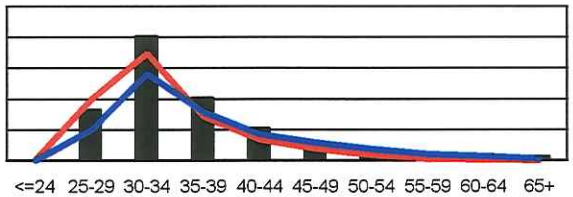
Year 1	
126	
130	
197	



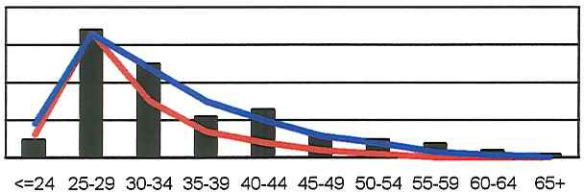
Year 5	
74	
56	
70	



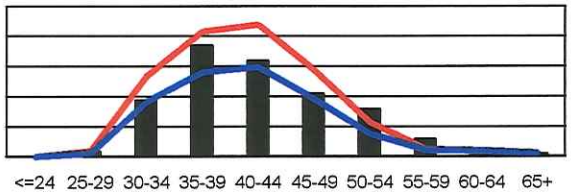
Year 2	
96	
113	
184	



Years 6-9	
204	
167	
152	



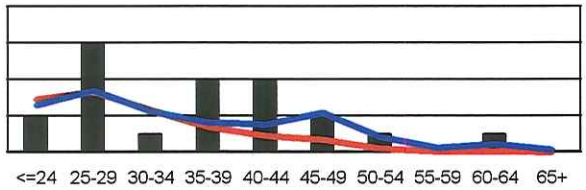
Year 3	
106	
69	
103	



Years 10+	
135	
160	
109	

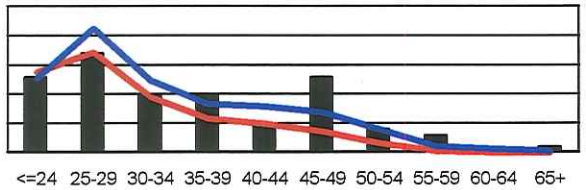
SECTION I
DEMOGRAPHIC ASSUMPTIONS

A. Turnover and Preretirement Mortality
Hazardous, Female



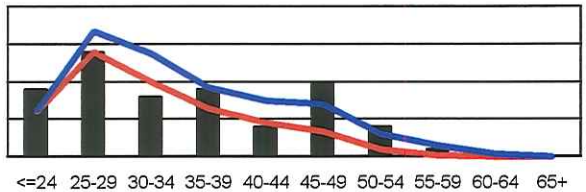
Year 0

21	
12	
15	



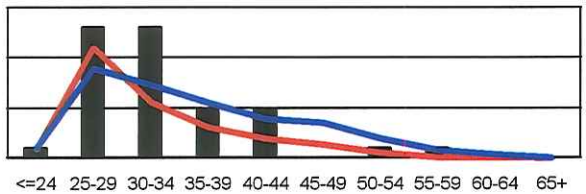
Year 1

76	
57	
75	



Year 2

59	
45	
65	

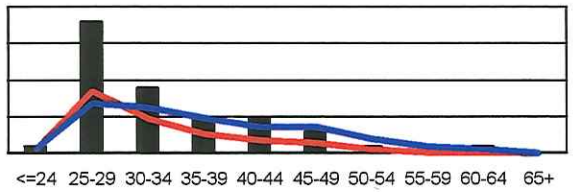


Year 3

39	
24	
33	

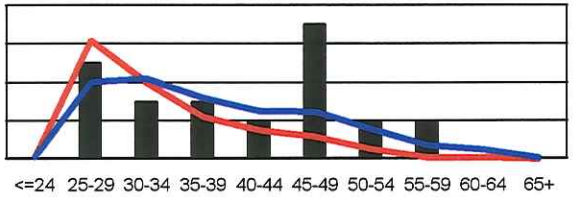
Year 4

43	
20	
29	



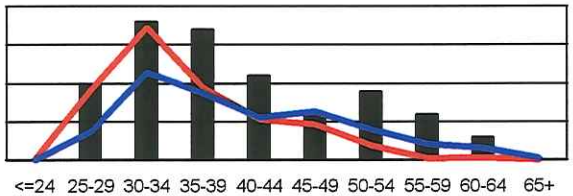
Year 5

24	
16	
19	



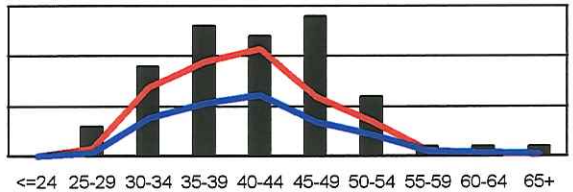
Years 6-9

80	
49	
44	



Years 10+

60	
38	
22	

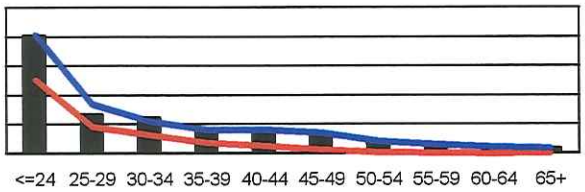


1994-1998 SERS EXPERIENCE STUDY
SUMMARY OF RESULTS

SECTION I
DEMOGRAPHIC ASSUMPTIONS

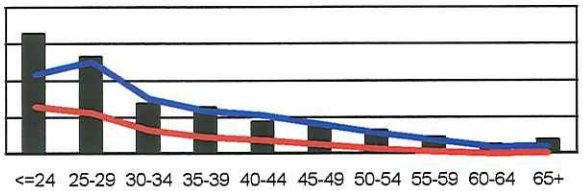
A. Turnover and Preretirement Mortality
Nonhazardous, Male

Year 0



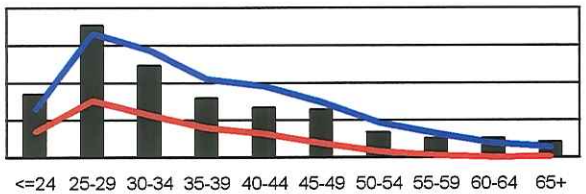
488	
247	
516	

Year 1



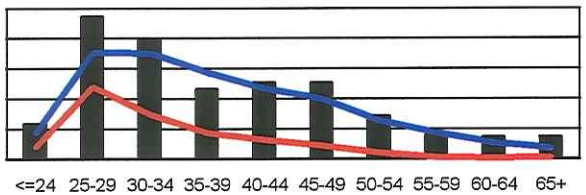
1,199	
431	
1,051	

Year 2



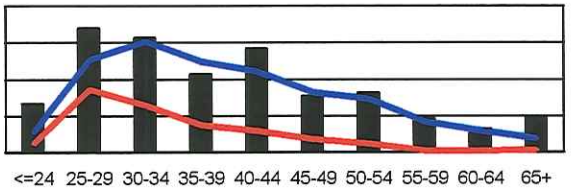
704	
274	
761	

Year 3



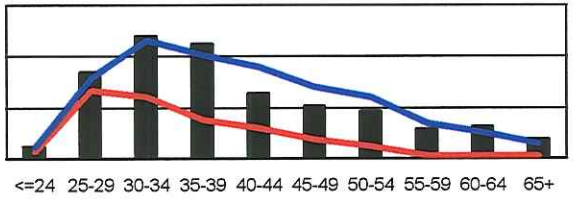
423	
133	
363	

Year 4



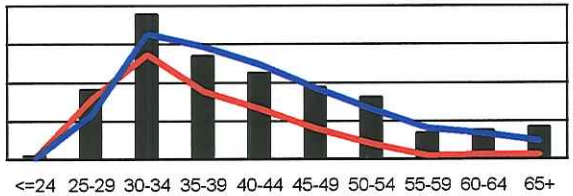
374	
109	
315	

Year 5



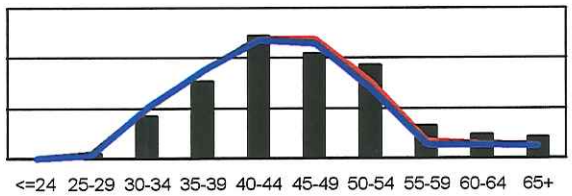
231	
98	
241	

Years 6-9



824	
454	
751	

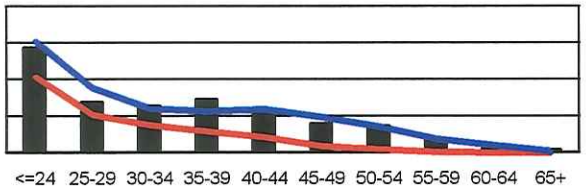
Years 10+



1,051	
1,005	
963	

SECTION I
DEMOGRAPHIC ASSUMPTIONS

A. Turnover and Preretirement Mortality
Nonhazardous, Female

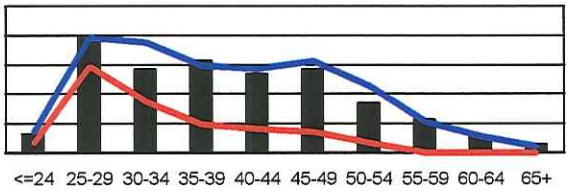


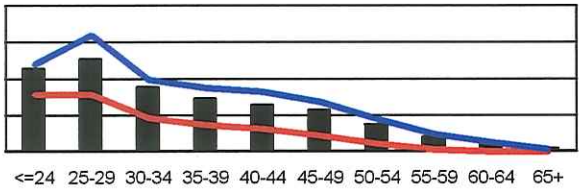
Year 0

516	
258	
528	

Year 4

397	
160	
430	



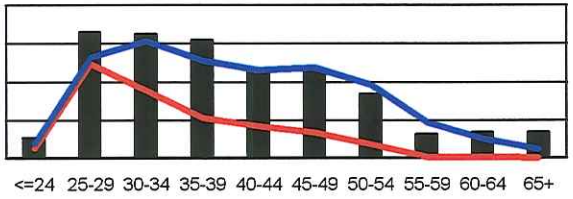


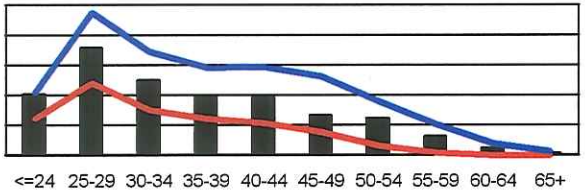
Year 1

1,206	
614	
1,398	

Year 5

369	
151	
339	



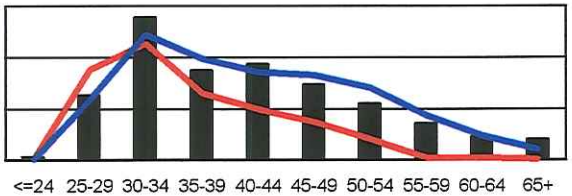


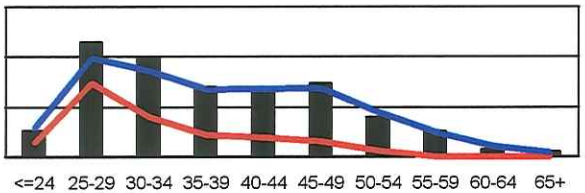
Year 2

782	
430	
1,102	

Years 6-9

1,195	
766	
1,197	



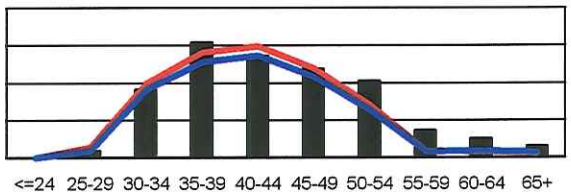


Year 3

532	
195	
504	

Years 10+

1,390	
1,234	
1,125	



SECTION I
DEMOGRAPHIC ASSUMPTIONS

B. Disability

Current Assumption

Annual rates per the following table; service connected disabilities are assumed to comprise 50% of all disabilities for hazardous members and 20% for nonhazardous members.

	Age						
	<=24	25-29	30-34	35-39	40-44	45-49	50-54
Hazardous	0.095%	0.108%	0.128%	0.169%	0.256%	0.445%	0.811%
Nonhazardous	0.040%	0.045%	0.054%	0.071%	0.107%	0.186%	0.338%

Study Design

We looked at the overall rates of disability by 5-year age groups and by hazardous versus nonhazardous members. We also examined our assumption regarding service-connected disabilities. Our hypothesis was that the incidence of service connected disabilities was not related to age.

Results

Please note that all graphs show the ***numbers*** of actual and expected disabilities, not the rates. Actual experience is shown in black; the results predicted by the current assumptions are shown in red; the results predicted by the actuary's recommended changes are shown in blue. There are two graphs for each combination of hazardous/nonhazardous and with/without service disabilities.

Observations

- The number of service connected disabilities was small, but confirmed our hypothesis that the incidence showed no relationship to age.
- The majority (75%) of hazardous disabilities were service-connected, compared to 17% of nonhazardous disabilities.
- The rates of non-service disabilities followed a pattern similar to the United Auto Workers Disability Table, although the level of the SERS rates was much lower than the level of the UAW rates.

SECTION I
DEMOGRAPHIC ASSUMPTIONS

B. Disability

Actuary's Recommended Assumption

Service connected disabilities:

Hazardous employees:	0.07% at all ages
Nonhazardous employees:	0.02% at all ages

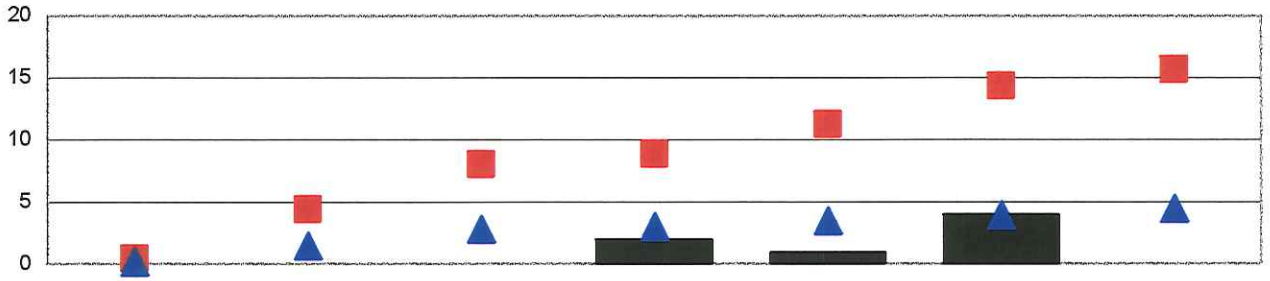
Non-service connected disabilities: 25% of United Auto Workers Disability Table

SECTION I
DEMOGRAPHIC ASSUMPTIONS

B. Disability
Service Disabilities Not Included

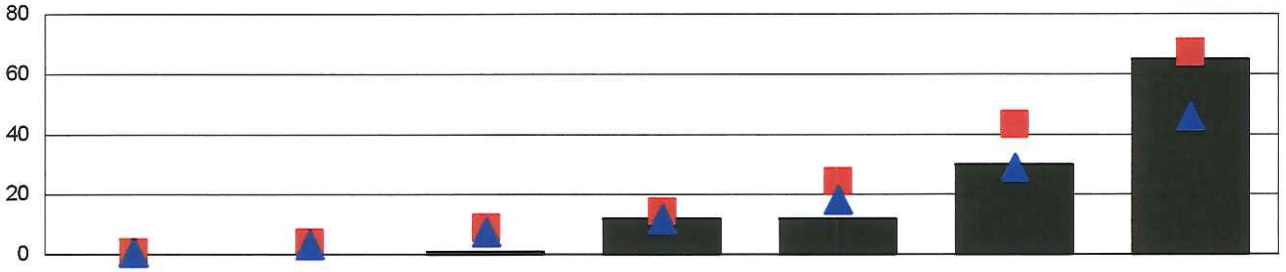
Hazardous

Actual	7	+ 21 = 28
Current	63	
Proposed	19	



Non Hazardous

Actual	120	+ 25 = 145
Current	163	
Proposed	116	



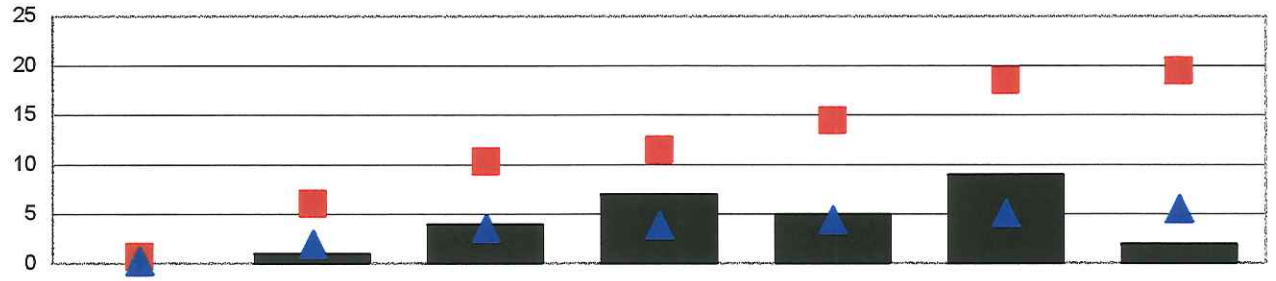
Age <=24 25-29 30-34 35-39 40-44 45-49 50-54

SECTION I
DEMOGRAPHIC ASSUMPTIONS

B. Disability
Service Disabilities Included

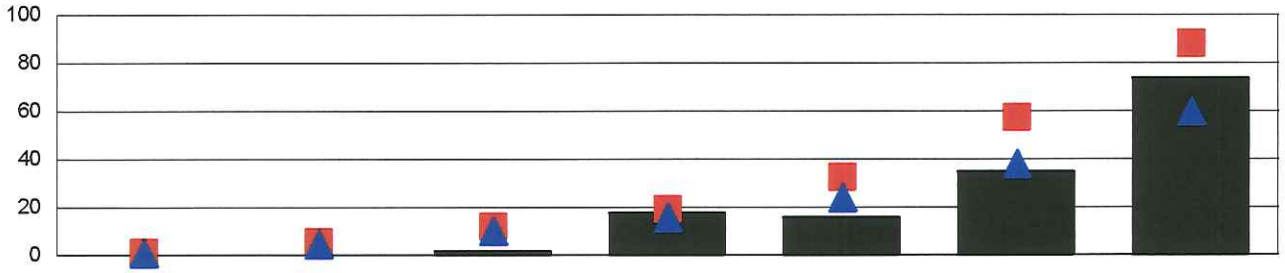
Hazardous

Actual	**28**
Current	**81**
Proposed	**25**



Non Hazardous

Actual	**145**
Current	**216**
Proposed	**154**



Age **<=24** **25-29** **30-34** **35-39** **40-44** **45-49** **50-54**

SECTION I
DEMOGRAPHIC ASSUMPTIONS

C. Retirement

Current Assumption

Rates per the following table vary by age, separately for hazardous and nonhazardous members; there are different rates for the first year in which the member is eligible for a benefit and for ages thereafter.

Nonhazardous

Age	First Year Eligible	Thereafter
47	0	0
50	0	0
55	20	0
60	20	15
62	40	40
65	80	60
70	100	100

Hazardous

Age	First Year Eligible	Thereafter
47	40	30
50	40	30
55	60	30
60	80	50
62	100	100

Study Design

We looked at the rates of retirement separately for the first year in which the member is eligible for an early (reduced) retirement benefit and for a normal (unreduced) retirement benefit, as well as for all other ages. We also looked at the experience both with and without retirements that occurred during the 1996-97 fiscal year, since there was an early retirement incentive program during that period. The 1997 ERIP complicates the analysis of the retirement experience, both because an unusually high number of retirements took place that would not ordinarily have occurred, and because unusually low retirements can be expected to follow an incentive program.

Results

Please note that all graphs show the ***numbers*** of actual and expected retirements, not the rates. Actual experience is shown in black; the results predicted by the current assumptions are shown in red; the results predicted by the actuary's recommended assumptions are shown in blue. There are graphs for each combination of hazardous/nonhazardous and include/exclude 1997 experience.

SECTION I
DEMOGRAPHIC ASSUMPTIONS

C. Retirement

Observations

- The current assumptions matched the experience ***with*** the 1997 results included, but with the 1997 results excluded, the current assumptions overstated actual retirements across all categories in the study, most noticeably at the "key" nonhazardous ages of 55, 60, and 62. Since incentive programs accelerate the retirement of members who might not otherwise retire, this suggests that it would be appropriate to lower the assumed retirement rates at the younger ages.
- There are clear "spikes" of retirements both when members are first eligible for early retirement and when they are first eligible for normal retirement, indicating that splitting the assumption along these lines is appropriate.
- There are quite a few members who delayed retirement beyond age 70, indicating that it would be appropriate to assume that some members will continue in active employment at these later ages.

Actuary's Recommended Assumption

Rates per the following table vary by age, separately for hazardous and nonhazardous members; there are different rates for the first year in which the member is eligible for a benefit and for ages thereafter.

Nonhazardous

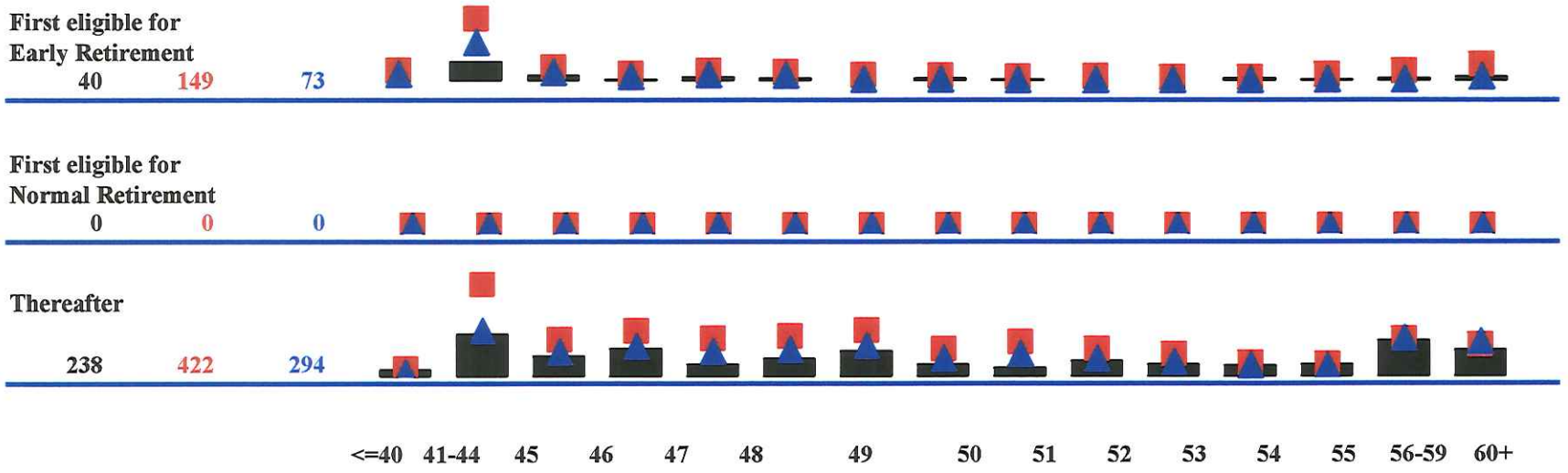
Age	First Year Eligible For		Thereafter
	Reduced Benefits	Unreduced Benefits	
55	17.5	15.0	12.5
56-60	15.0	15.0	12.5
61	25.0	25.0	15.0
62	40.0	30.0	30.0
63	35.0	35.0	25.0
64	45.0	45.0	25.0
65	65.0	65.0	40.0
66-69	60.0	65.0	40.0
70	100.0	100.0	100.0

Hazardous

Age	First Year Eligible	Thereafter
Through 44	0.0	0.0
45-48	0.0	0.0
49-53	20.0	0.0
54-55	20.0	15.0
56-59	40.0	40.0
60-69	80.0	60.0
70	100.0	100.0

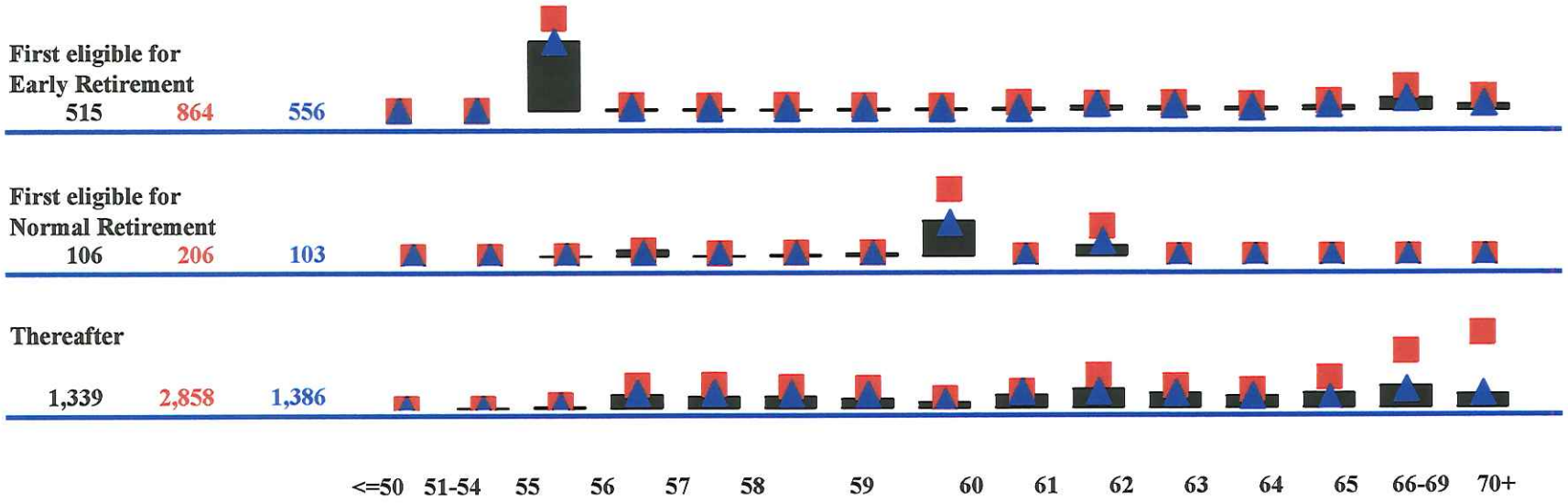
SECTION I
DEMOGRAPHIC ASSUMPTIONS

C. Retirement
Hazardous, 1997 Excluded



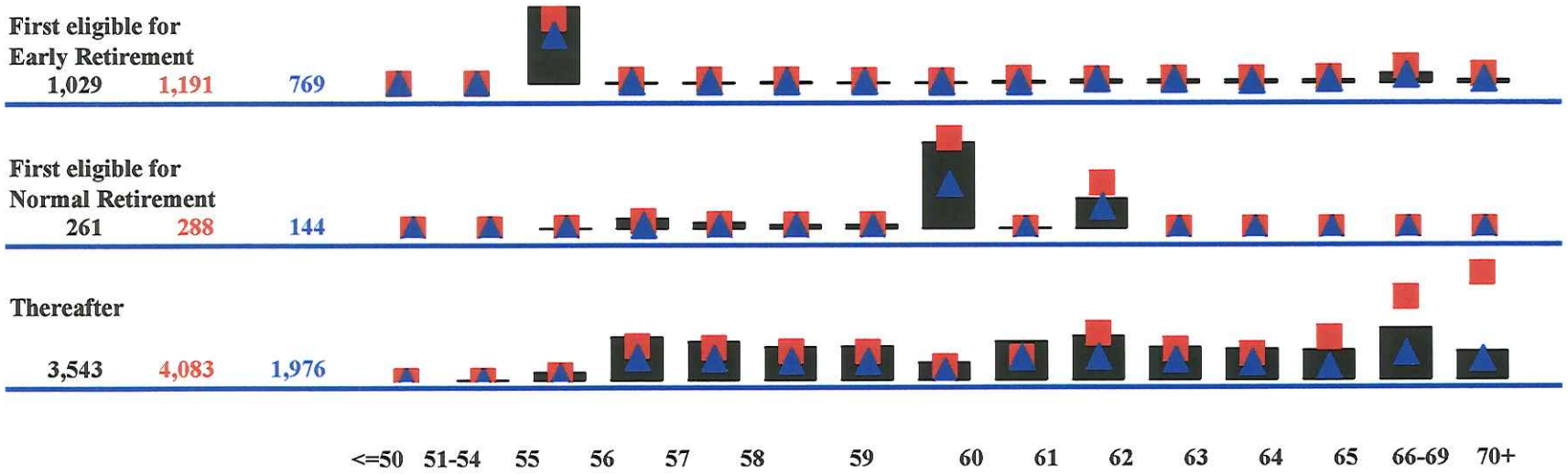
SECTION I
DEMOGRAPHIC ASSUMPTIONS

C. Retirement
Nonhazardous, 1997 Excluded



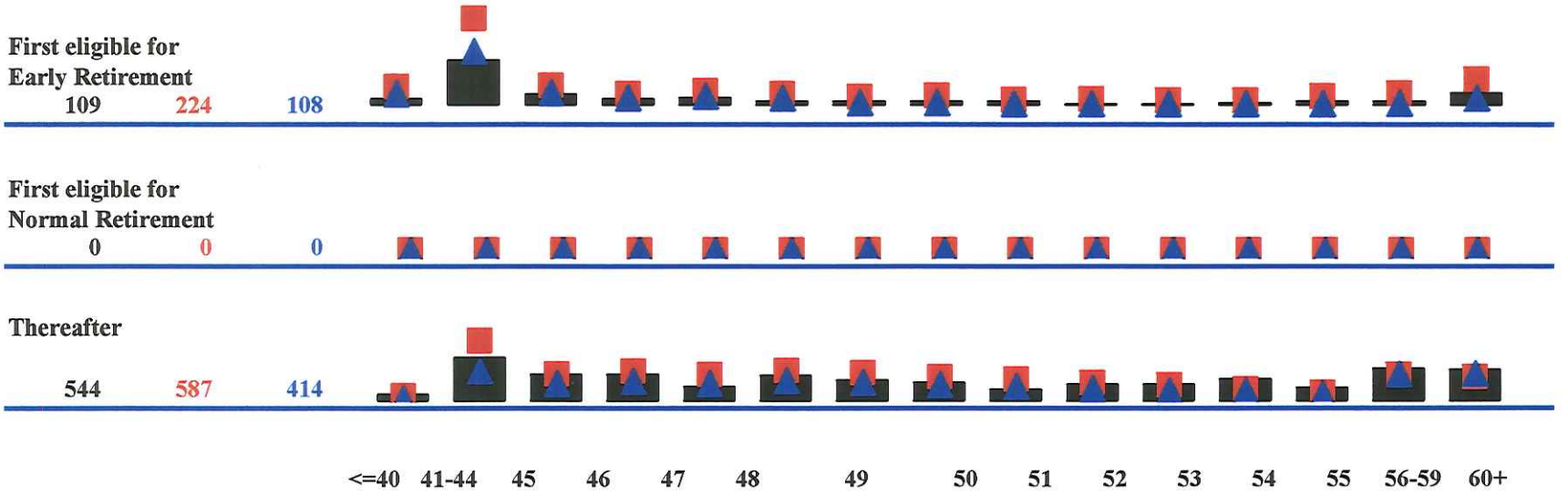
SECTION I
DEMOGRAPHIC ASSUMPTIONS

C. Retirement
Nonhazardous, 1997 Included



SECTION I
DEMOGRAPHIC ASSUMPTIONS

C. Retirement
Hazardous, 1997 Included



SECTION I
DEMOGRAPHIC ASSUMPTIONS

D. Post-Retirement Healthy Mortality

Current Assumption

The 1983 Group Annuity Mortality Table, separately for males and females.

Study Design

We looked at the rates of mortality among non-disabled retirees and beneficiaries, separately for males and females.

Results

Please note that all graphs show the ***numbers*** of actual and expected deaths, not the rates. Actual experience is shown in black; the results predicted by the current assumptions are shown in red; the results predicted by the actuary's recommended assumptions are shown in blue. There are separate graphs for males and females.

Observations

The 1983 GAM table overstated male deaths by 9% and understated female deaths by 10%. While the results for females indicates that there is still a margin for future mortality improvement, the results for males indicates that the current assumption is inadequate currently, as well as leaving no margin for future mortality improvement.

Actuary's Recommended Assumption

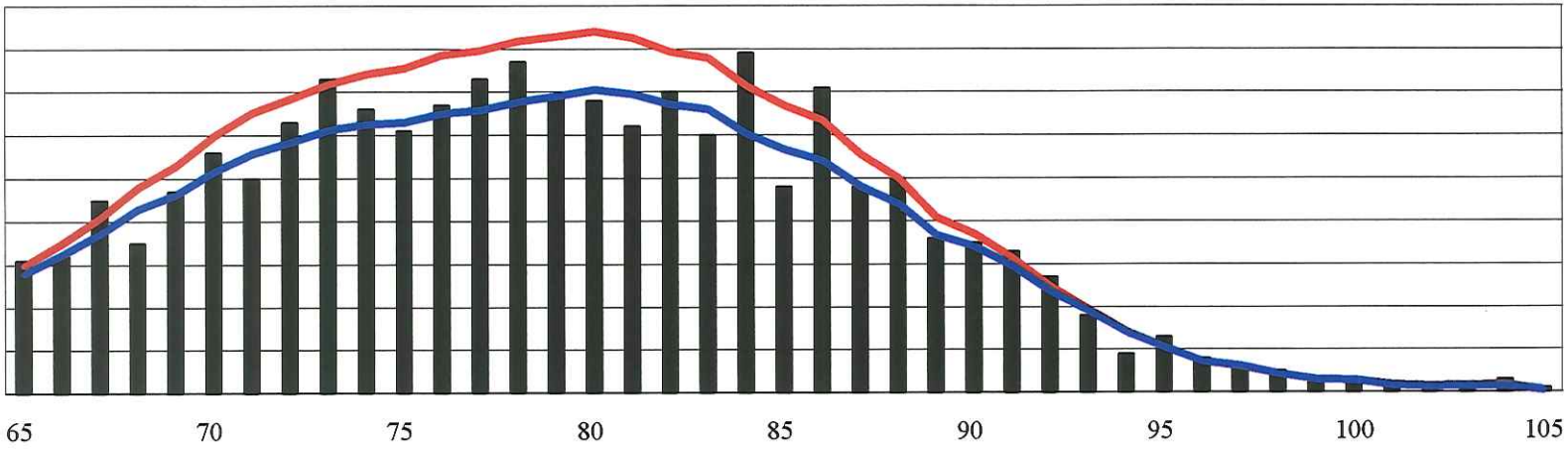
The 1994 Group Annuity Mortality Table, separately for males and females.

SECTION I
DEMOGRAPHIC ASSUMPTIONS

D. Post-Retirement Healthy Mortality

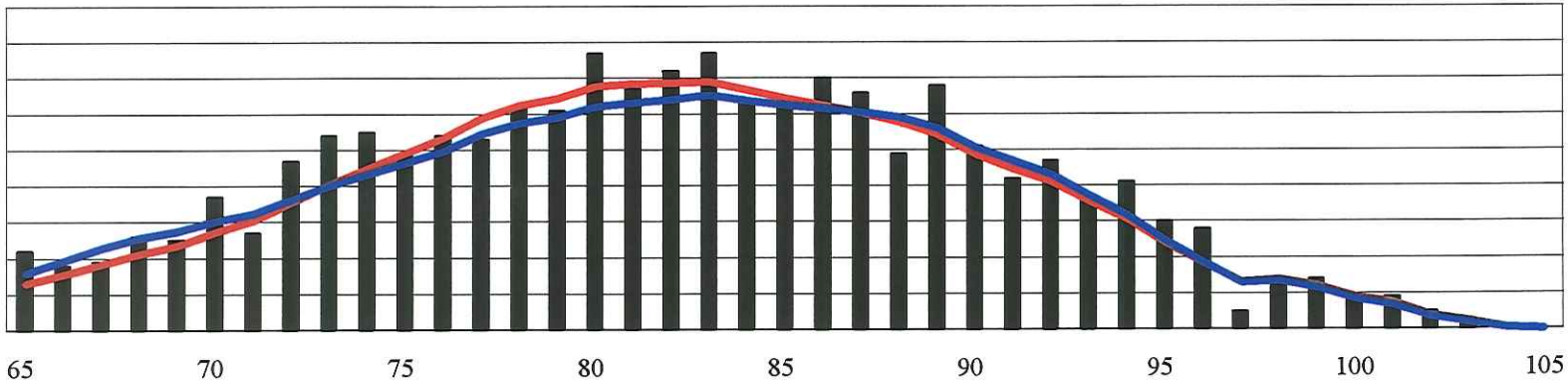
Males

1,784
1,952
1,676



Females

1,733
1,560
1,547



SECTION I
DEMOGRAPHIC ASSUMPTIONS

E. Post-Retirement Disabled Mortality

Current Assumption

The 1965 Railroad Retirement Board Disabled Mortality Table.

Study Design

We looked at the rates of deaths among disabled retirees, separately for males and females. Because the study population is relatively small, we used a chi-square test to determine how well various standard published tables of disabled mortality fit the SERS experience.

Results

Please note that all graphs show the ***numbers*** of actual and expected deaths, not the rates. Actual experience is shown in black; the results predicted by the current assumptions are shown in red; the results predicted by the actuary's recommended assumptions are shown in blue. There are separate graphs for males and females.

Observations

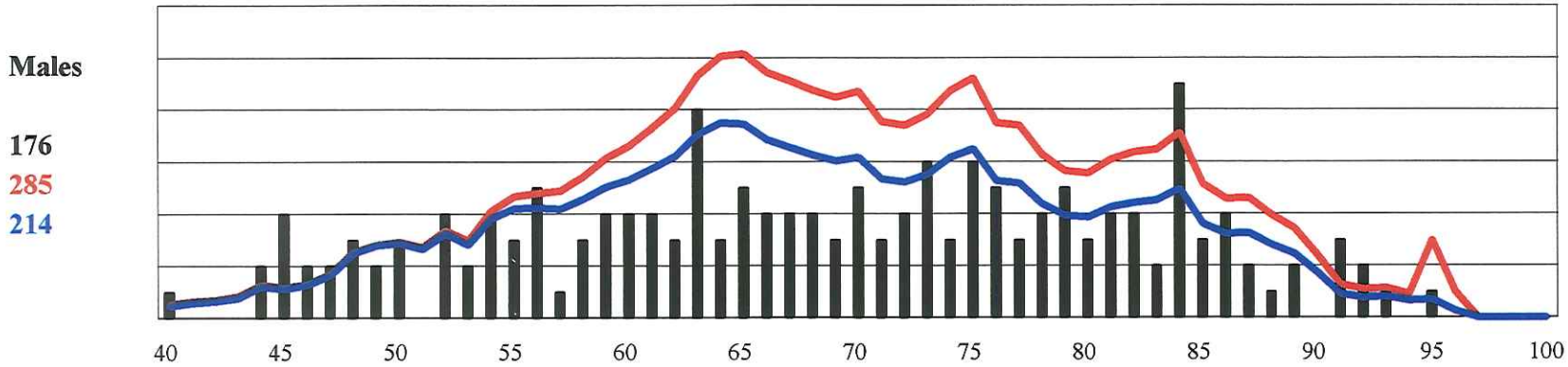
- The current assumption overstated disabled deaths by a considerable margin for both males and females.

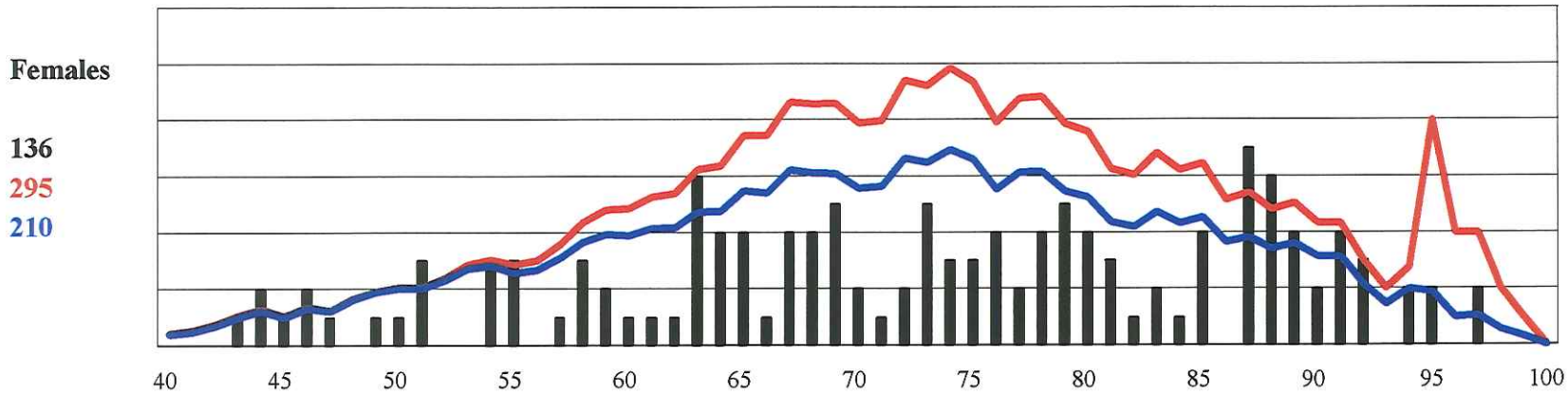
Actuary's Recommended Assumption

Males:	80% of PBGC Disabled Mortality with Social Security for Males
Females:	60% of PBGC Disables Mortality with Social Security for Females

SECTION I
DEMOGRAPHIC ASSUMPTIONS

E. Post-Retirement Disabled Mortality





SECTION II
ECONOMIC ASSUMPTIONS

A. Salary Growth

Current Assumption

Rates that vary by length of service per the following table:

Years	Rate	Years	Rate	Years	Rate	Years	Rate	Years	Rate
0	14.00%	5	7.50%	10	5.45%	15	4.45%	20	3.75%
1	12.00%	6	6.90%	11	5.20%	16	4.30%	21	3.65%
2	10.00%	7	6.40%	12	4.95%	17	4.15%	22	3.55%
3	9.00%	8	6.00%	13	4.75%	18	4.00%	23	3.45%
4	8.20%	9	5.70%	14	4.60%	19	3.85%	24	3.35%
								25	3.25%

Study Design

We looked at the impact of both service and age on annual salary increases for each individual in our study. The results indicate the combined impact of general wage growth, merit increases, and longevity increases.

There were a number of individual annual salary increases that we identified as "outliers" – increases of more than 50% or decreases of more than 20% - particularly in the first two years of service. We suspect that many of these reflect breaks in service due to terminations and rehires, leaves of absence, periods out on workers compensation, periods of part time employment, and so forth. When we remove these outliers, we still have somewhat anomalous looking results for the first two years of service.

Results

There are eight graphs on each of the following pages, for the various service groupings. Each graph shows the results by age groups, with the clear bar to the left indicating the experience across all age groups. Actual experience is shown as black bars; the results predicted by the current assumptions are shown as red lines; the results predicted by the actuary's recommended assumptions are shown as blue lines. There are separate pages of graphs for with/without outliers. The figures graphed are ***not*** net of wage inflation.

SECTION II
ECONOMIC ASSUMPTIONS

A. Salary Growth

Observations

- The current assumption overstated salary increases in years 3-5 and slightly overstated salary increases in years 6-9.
- The current assumption continues to vary the salary increases out to 25 years of service. The experience beyond 15 years of service indicates that there is little variability by length of service beyond this point (for the sake of clarity we have not shown this experience separately on the graphs above). The experience also indicates that the current assumption's ultimate rate of salary increase (3.25%) understates the rates at the longer service periods, which seem to stabilize at around 4.25%.

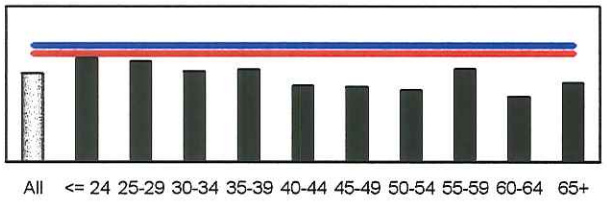
Actuary's Recommended Assumption

Rates that vary by length of service per the following table:

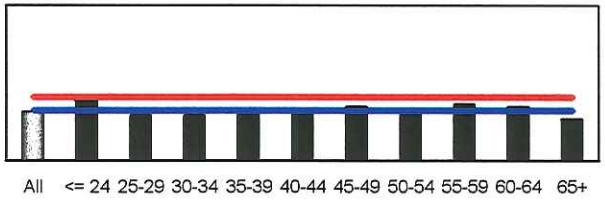
Years	Rate	Years	Rate	Years	Rate	Years	Rate	Years	Rate
0	15.00%	5	6.00%	10	5.50%	15	4.25%	20	4.25%
1	15.00%	6	6.00%	11	5.00%	16	4.25%	21	4.25%
2	10.00%	7	6.00%	12	5.00%	17	4.25%	22	4.25%
3	7.00%	8	6.00%	13	4.50%	18	4.25%	23	4.25%
4	6.50%	9	5.50%	14	4.50%	19	4.25%	24	4.25%
								25	4.25%

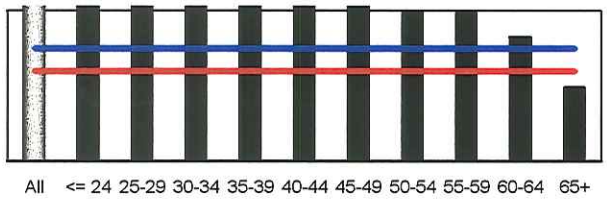
SECTION II
ECONOMIC ASSUMPTIONS

A. Salary Growth
With Outliers Excluded

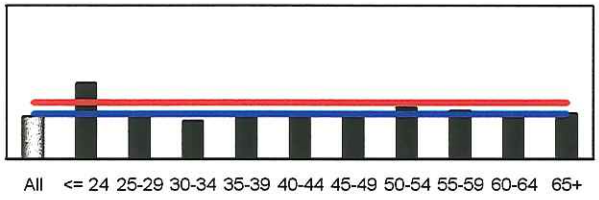


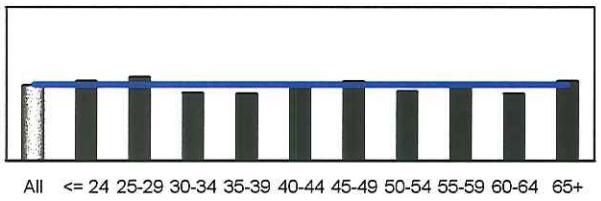
Year 0	Year 4
11.48%	6.31%
14.00%	8.20%
15.00%	6.50%



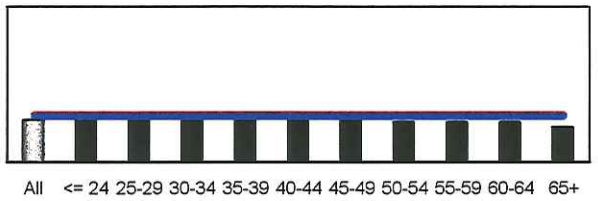


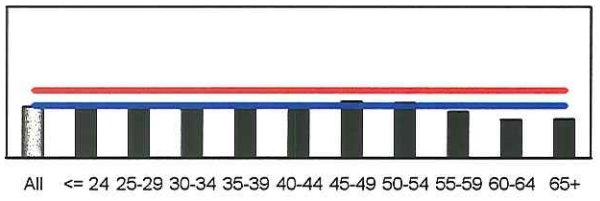
Year 1	Year 5
21.89%	5.67%
12.00%	7.50%
15.00%	6.00%



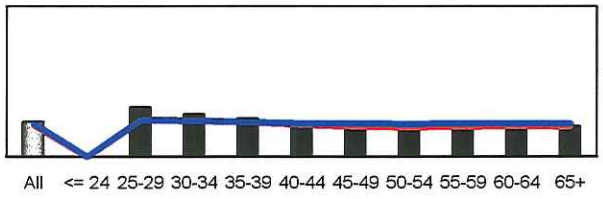


Year 2	Years 6-9
9.83%	5.47%
10.00%	6.25%
10.00%	6.00%



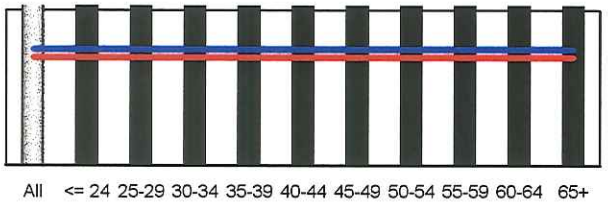


Year 3	Years 10+
6.82%	5.10%
9.00%	4.99%
7.00%	6.00%



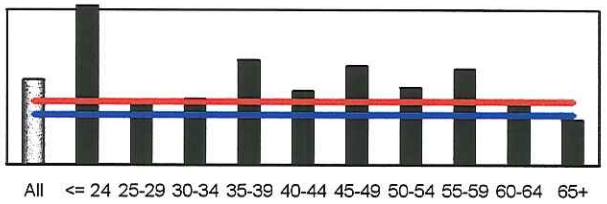
SECTION II
ECONOMIC ASSUMPTIONS

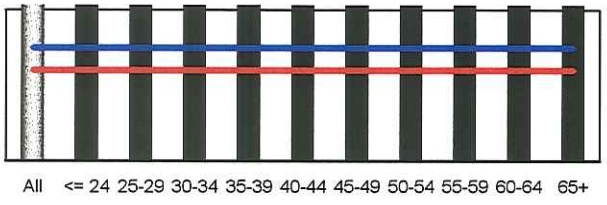
A. Salary Growth
With Outliers Included



Year 0
240.40%
14.00%
15.00%

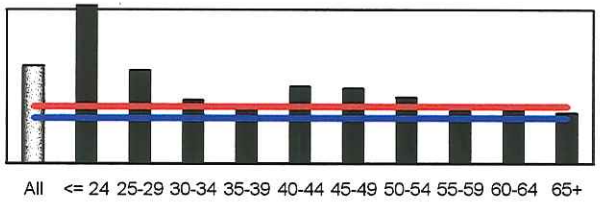
Year 4
11.00%
8.20%
6.50%

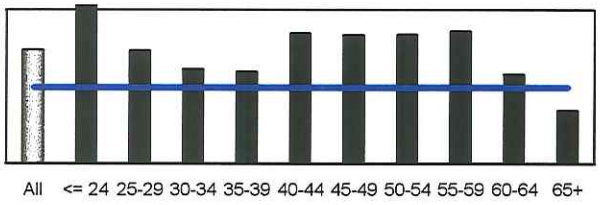




Year 1
58.60%
12.00%
15.00%

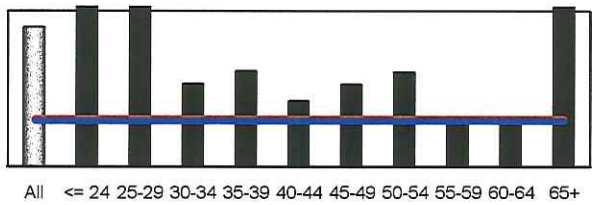
Year 5
12.74%
7.50%
6.00%

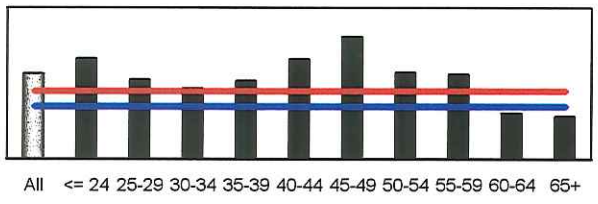




Year 2
14.87%
10.00%
10.00%

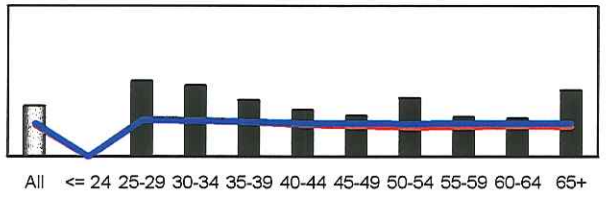
Years 6-9
17.96%
6.25%
6.00%





Year 3
11.32%
9.00%
7.00%

Years 10+
8.52%
4.99%
6.00%



SECTION II
ECONOMIC ASSUMPTIONS

B. Inflation

Current Assumption

Inflation is incorporated into the current assumptions indirectly, through the assumptions for future cost of living adjustments for retired members:

Retiree Group	***COLA Provision***	***Current Assumption***
Retired prior to 7/1/80	CPI-U, but not less than 3% or more than 5% (6% for certain members)	4.0%
Retired 7/1/80 – 7/1/99	3%	3.0%
Retired after 7/1/99	60% of CPI-U up to 6% plus 75% of CPI-U above 6%, but not less than 2.5% or more than 6%; members can elect instead to receive a fixed 3%	2.5%

Study Design

We applied the COLA formulas for the pre-1980 and post-1999 retiree groups to historical CPI-U data, and used a chi-square test to determine what single rate would best approximate the resulting COLA rates.

We also examined inflation by itself, to develop a long-term inflation assumption.

Results

The graph on the following page shows the two COLAs along with historical CPI-U data. The CPI-U figures are shown in black. The pre-1980 COLA is shown in pink, with the historical results shown as a solid line and the current assumption shown as a dashed line. The post-1999 COLA is shown in green, again with the historical results shown as a solid line and the current assumption shown as a dashed line.

SECTION II
ECONOMIC ASSUMPTIONS

B. Inflation

We also looked at pure inflation over a variety of time periods to help eliminate the effect of short-term economic situations.

Period	***Inflation***
Ten year periods	
1989-99	3.0%
1979-89	5.6
1969-79	7.0
1959-69	2.3
1949-59	2.0
Longer periods	
1989-99	3.0
1979-99	4.3
1969-99	5.2
1959-99	4.5
1949-99	4.0
1931-99	3.6
1944-99	4.2
1944-99, excluding 1974-75 and 1979-81	3.5

Observations

- The current assumption for the pre-1980 COLA slightly overstates the long-term hypothetical results under the COLA formula for this group.
- The current assumption for the post-1999 COLA understates the long-term hypothetical results under the COLA formula for this group.
- A reasonable range of assumptions for inflation is 3.0% to 4.5%.

SECTION II
ECONOMIC ASSUMPTIONS

B. Inflation

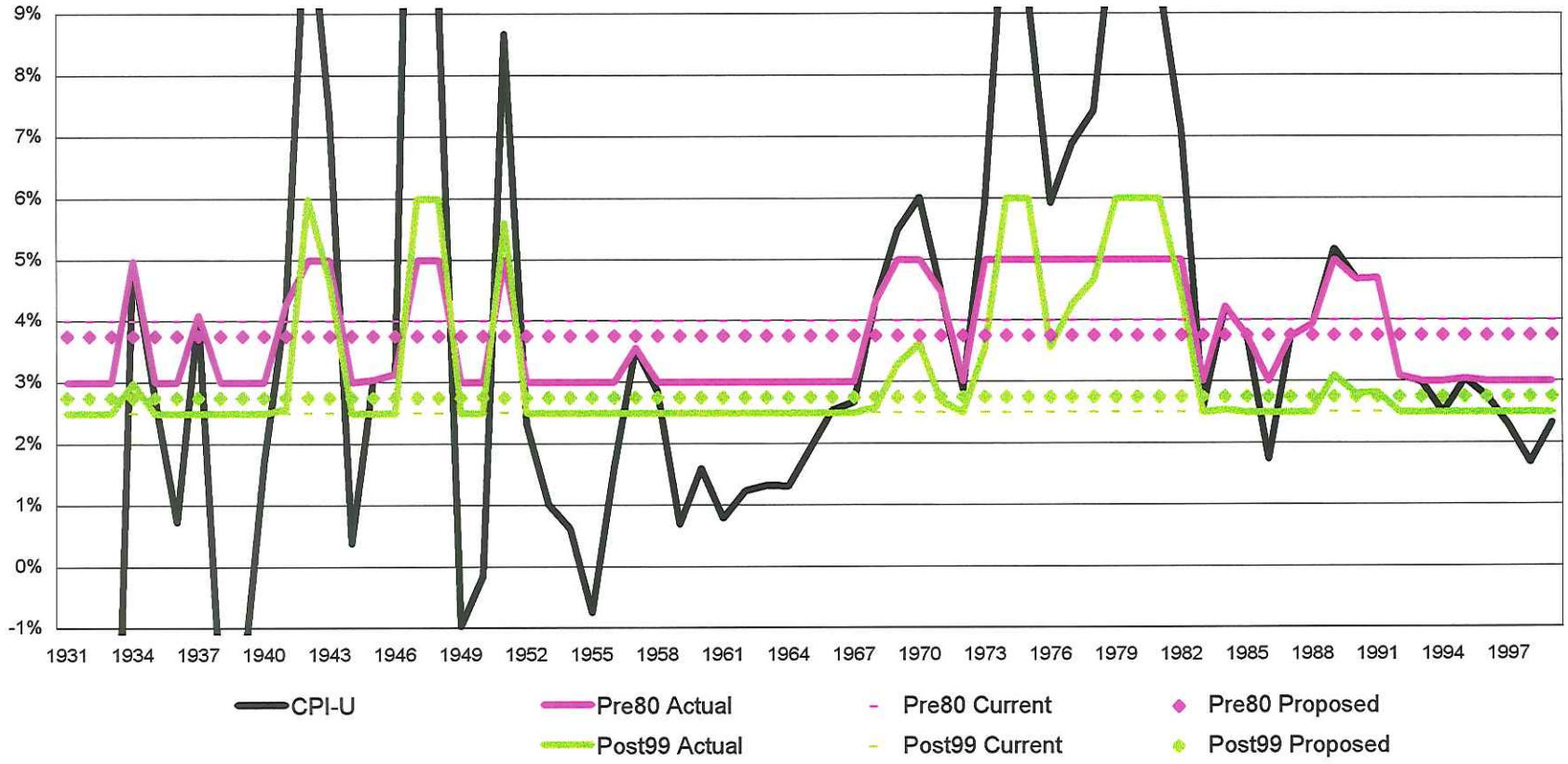
Actuary's Recommended Assumption

Inflation is incorporated into the current assumptions indirectly, through the assumptions for future cost of living adjustments for retired members:

Retiree Group	*COLA Provision*	*Actuary's Recommended Assumption*
Retired prior to 7/1/80	CPI-U, but not less than 3% or more than 5% (6% for certain members)	3.75%
Retired 7/1/80 – 7/1/99	3%	3.00%
Retired after 7/1/99	60% of CPI-U up to 6% plus 75% of CPI-U above 6%, but not less than 2.5% or more than 6%; members can elect instead to receive a fixed 3%	2.75%

SECTION II
ECONOMIC ASSUMPTIONS

B. Inflation



SECTION II
ECONOMIC ASSUMPTIONS

C. Payroll Growth

Current Assumption

We assume that total payroll will increase by 6% per year, for purposes of amortizing the Unfunded Actuarial Liability.

Study Design

We examined historical statistics from the Social Security System on national average wage increases from 1951 through 1997. For years prior to 1951 we used the Total Private Nonagricultural Wages as published in the Historical Statistics of the U.S. Colonial Times to 1970. We also examined more recent (1982 on) data on wage and salary growth for state and local government employees published by the Bureau of Labor Statistics. We also factored out the effect of inflation (measured by CPI-U) to arrive at real rates of wage growth.

Results

We looked at increases over a variety of time periods to help eliminate the effect of short-term economic situations, such as the very high wage growth in the early 1980s and the very low wage growth in the early 1990s.

Period	*Wage Growth*	*Inflation*	*Real Wage Growth*
Ten year periods			
1987-97	4.1%	3.5%	0.6%
1977-87	6.5	6.5	0.0
1967-77	6.5	6.1	0.4
1957-67	3.7	1.7	2.0
1947-57	5.2	2.3	2.9
Longer periods			
1987-97	4.1	3.5	0.6
1977-97	5.3	5.0	0.3
1967-97	5.7	5.4	0.3
1957-97	5.2	4.5	0.7
1947-97	5.2	4.0	1.2
1926-97	4.6	3.1	1.5
Government wage data			
1987-97	3.7	3.5	0.2
1988-98	3.6	3.3	0.3
1989-99	3.4	3.0	0.4
1981-99	4.4	3.5	0.9

SECTION II
ECONOMIC ASSUMPTIONS

C. Payroll Growth

Observations

- Government sector wage growth was generally higher than national wage growth during the 1980s and generally lower than national wage growth during the 1990s. Changes in the level of government sector wages generally lagged behind changes in the level of national wages.
- A reasonable range of assumptions for the rate of real wage growth is 0.5% to 1.0%. As indicated above, a reasonable range of assumptions for inflation is 3.0% to 4.5%. Combining these ranges, a reasonable range of assumptions based on national, historical data for the payroll growth rate is 3.5% to 5.5%.
- The salary increases experienced at the higher service levels appear to tail off at around 4.25%, a figure that should represent overall inflation and productivity growth without a merit component.

Actuary's Recommended Assumption

We assume that total payroll will increase by 5% per year, for purposes of amortizing the Unfunded Actuarial Liability.

SECTION II
ECONOMIC ASSUMPTIONS

D. Investment Return

Current Assumption

The actuarial value of assets will earn 8.5%, net of expenses.

Study Design

For this component of the experience study, we used information from July 1, 1976 through June 30, 1999.

Since the composition of the SERS portfolio has changed over time, we broke the portfolio down into seven categories of investments, and assigned a commonly used market index to each category. We calculated the actual SERS investment returns on a market value basis, and then calculated the returns using a weighted average of the market indices. This allows us to assess how the SERS portfolio has performed relative to the market.

Results

The graphs on the following page show the investment allocation as percentages of the total portfolio (which shows how the investment mix has changed over time) and as dollar amounts (which shows how the portfolio has increased over time). The graphs on the succeeding page show the investment returns on a market value basis compared to the returns for the weighted average of the market indices, both in nominal and real (net of inflation) terms.

SECTION II
ECONOMIC ASSUMPTIONS

D. Investment Return

Observations

- The SERS portfolio performance has been consistently close to the performance of the weighted-average market index performance throughout the 22 year period, and especially so for the last ten years. Where the SERS portfolio has deviated from the market, it has generally underperformed the market in good years and outperformed the market in bad years.
- The SERS portfolio has outperformed the current assumption for most of the past 15 years. However, the most recent 15-year period may not be the best period to study when setting long-term actuarial assumptions. When historical rates of return are studied over longer periods, especially periods that exclude the most recent 15 years, the results are generally much lower average rates of return than have been experienced more recently.
- A 1996 comparative study performed by the State of Wisconsin on 84 statewide retirement systems showed a range of investment assumptions from 7.0% to 9.0%, with an average of 8.0%. Over half of the systems used 8.0%, 20% used 7.5%, and another 20% used 8.5%.
- The investment return assumption and the wage growth assumption both have an underlying inflation component. Actuarial Standard of Practice No. 27 requires the actuary to judge whether each economic assumption is consistent with every other economic assumption. If we net inflation out of our investment return and wage growth assumptions, and also examine the spread between the two assumptions, we can assess the consistency of these interrelated assumptions:

	Nominal Assumption	*Inflation*	*Real Assumption*
Current investment return	8.50%	3.75%	4.75%
Current payroll growth	6.00%	3.75%	2.25%
Experience at tail end of salary scale	4.25%	3.75%	0.50%

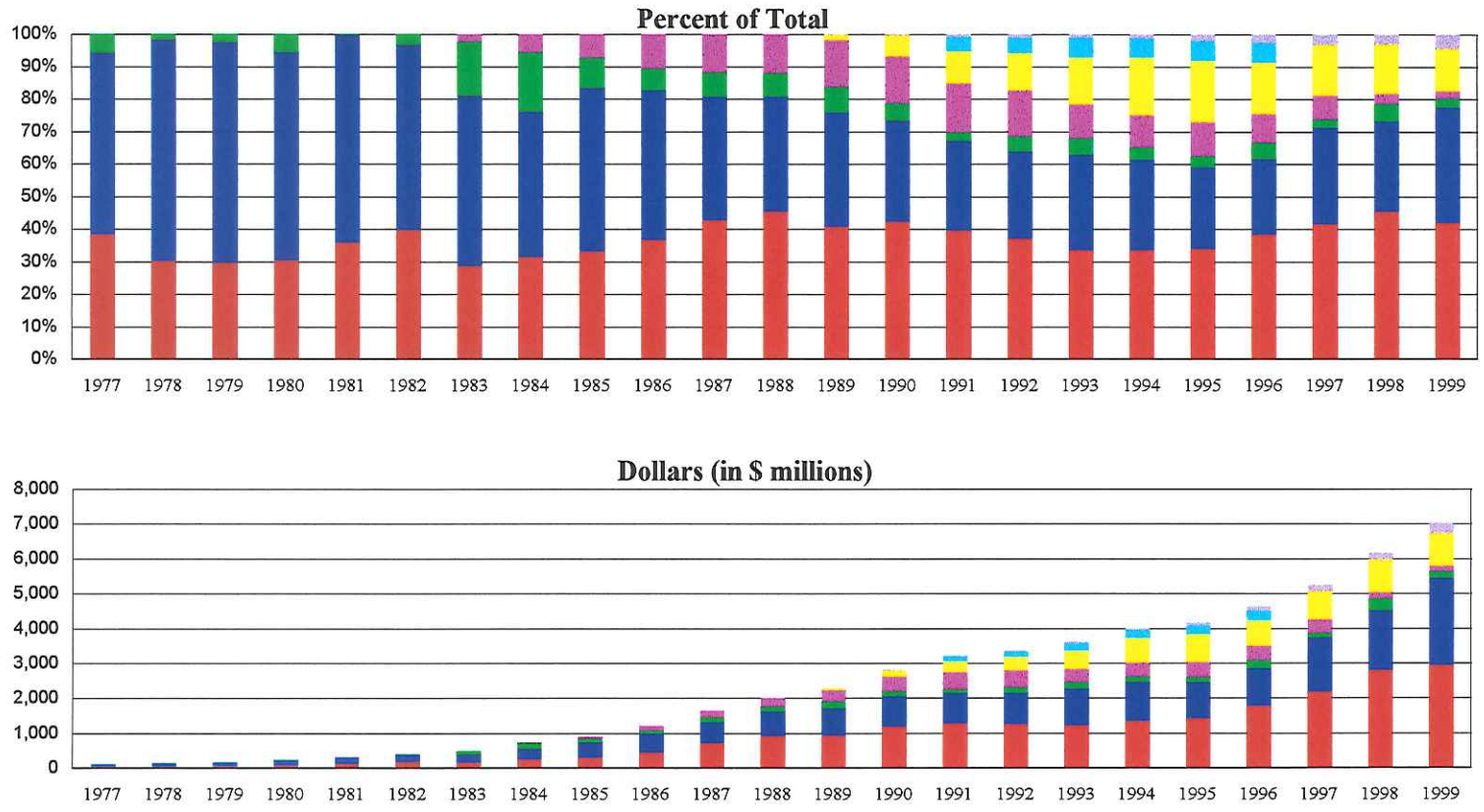
In the Wisconsin study, the spreads between investment return and wage growth were 4% or more for about 30% of the statewide systems, between 2.75% and 3.75% for 40% of the systems, and 2.5% or less for 30% of the systems.

Actuary's Recommended Assumption

There are no recommended changes.

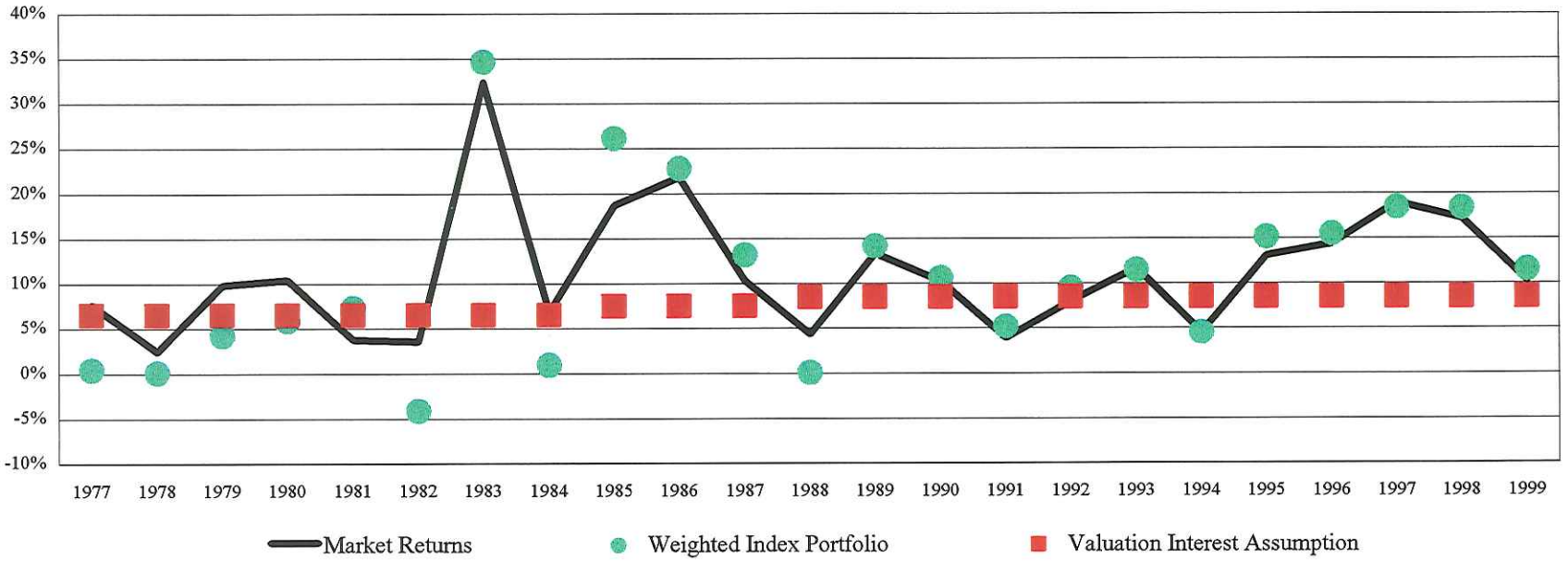
SECTION II
ECONOMIC ASSUMPTIONS

D. Investment Return



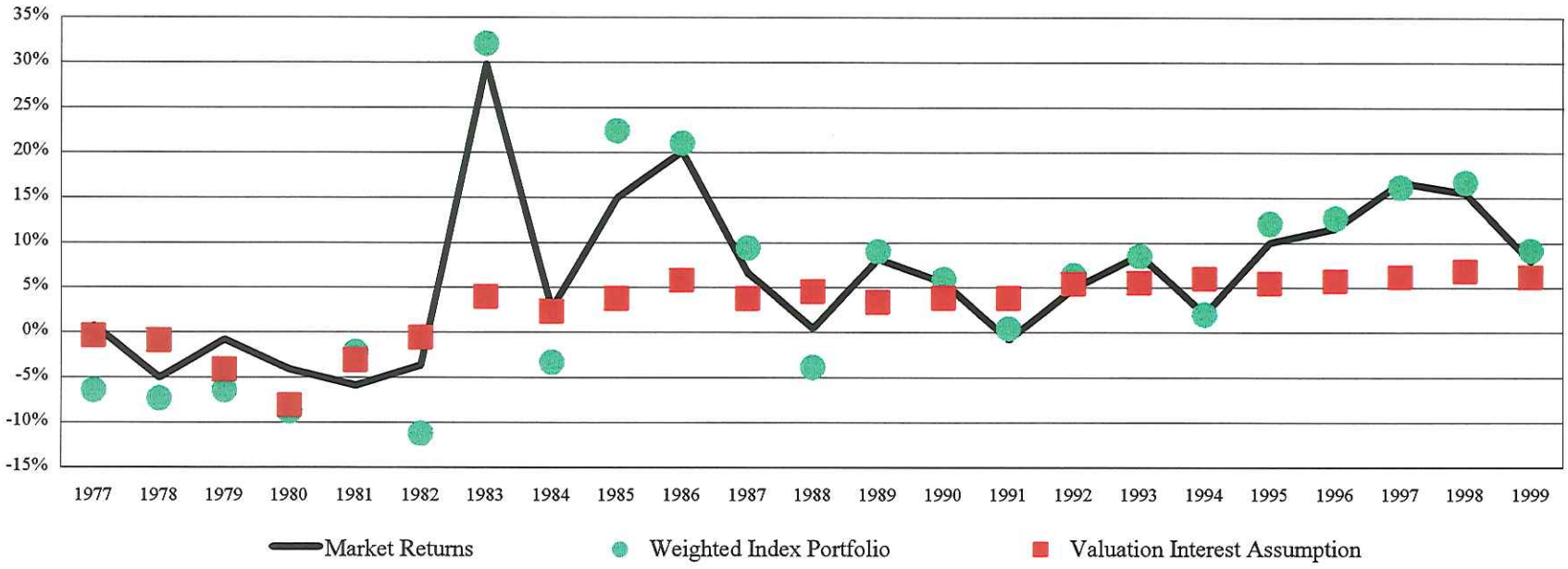
SECTION II
ECONOMIC ASSUMPTIONS

D. Investment Return
Nominal Returns



SECTION II
ECONOMIC ASSUMPTIONS

D. Investment Return
Real Returns (Net of Inflation)



SECTION III
ACTUARIAL COST METHODS

A. Asset Smoothing

Current Method

Capital gains and losses are realized over a five-year period; the resulting actuarial value of assets is constrained to be within 20% of market value.

Study Design

An ideal asset valuation method should:

- Produce values that are relatively stable from year to year to avoid having temporary fluctuations in the market lead to fluctuations in the funding requirements.
- Be easily understood.
- Produce realistic results that comply with all applicable accounting requirements, actuarial standards, and state statutes.
- Be independent of investment decisions with respect to asset allocations and asset turnover.
- Produce results that do not lead or lag the market value by too wide a margin.

The current asset valuation method falls short of this ideal with respect to the last two points. Since only capital gains and losses are smoothed, assets that produce mainly cash flow (interest and dividends) are treated differently than assets that produce mainly appreciation (realized and unrealized gains and losses). This means that some of the sources of investment gains and losses and fluctuations are being smoothed while others are not. The current method also has been lagging the market value for the last fifteen years, with the gap widening considerably during the recent market run-up.

We looked at how a number of different asset smoothing techniques would have performed over the study period, comparing both their rates of returns and their relationship to market value.

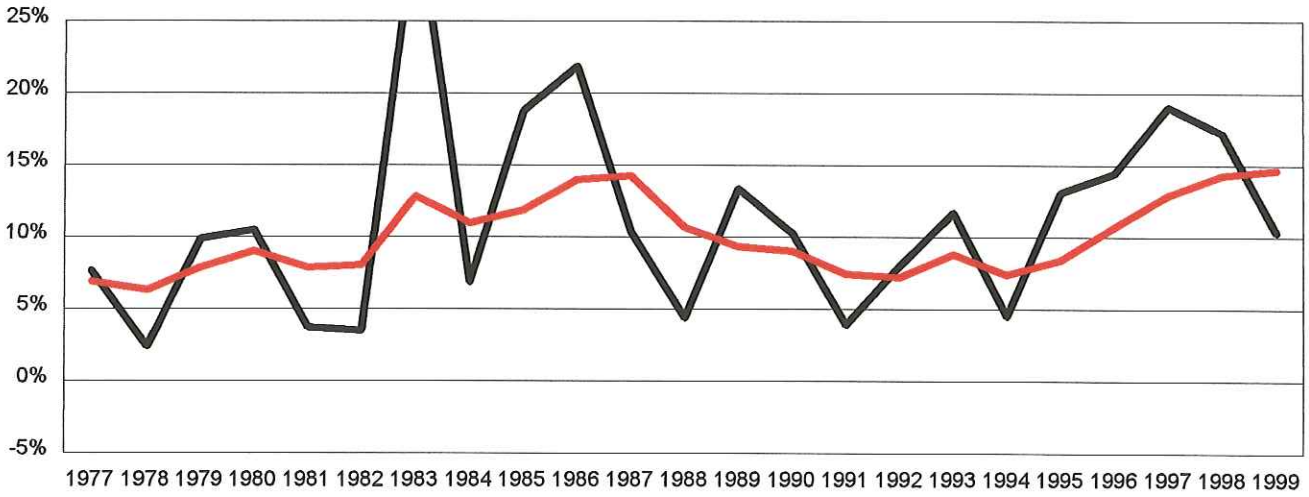
Results

The first graph on the following page shows how the rate of return on an actuarial value basis has compared historical with the rate of return on a market value basis. The second graph plots the actuarial value of assets as a percentage of the market value of assets. Market value is shown in black with the actuarial value shown in red.

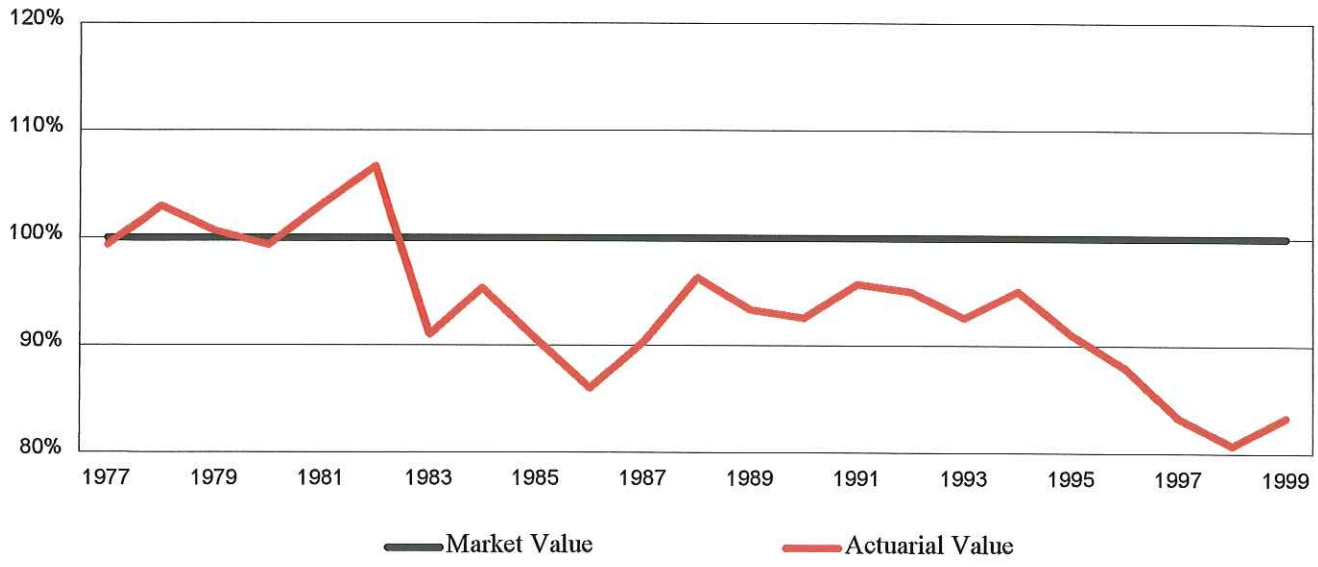
SECTION III
ACTUARIAL COST METHOD

A. Asset Smoothing

Rate of Return



Actuarial Value as a Percent of Market Value



SECTION III
ACTUARIAL COST METHOD

A. Asset Smoothing

Observations

- Decreasing the corridor from 20% to 15% would help keep the actuarial value closer to the market value, but it would also introduce more fluctuation into the actuarial value.
- Decreasing the smoothing period from 5 years to 3 or 4 years would help keep the actuarial value closer to the market value, but it would also introduce more fluctuation into the actuarial value.
- Expanding the universe of gains and losses that are smoothed would make the asset smoothing technique more independent of the asset allocation and the asset turnover.

Actuary's Recommended Method

The difference between the expected actuarial value of assets (based on the prior year actuarial value) and the actual market value is recognized over five years, subject to a 20% corridor around the market value.

SECTION III
ACTUARIAL COST METHOD

B. Projection to Following Fiscal Years

Current Method

- We take a snapshot of the System's census on July 1 and use this information to calculate the normal cost and the normal cost as a percent of payroll [the "normal cost rate"] for each Tier / Group within the System. We then project the salaries to the following fiscal year by Tier/Group. The normal cost for the following fiscal year equals the normal cost rate at the current valuation date multiplied by projected salary.

Observations

- The normal cost rates for the closed Tiers will increase each year as the remaining members age.
- Our current method does not use our valuation assumptions with respect to the rate with which members are expected to leave active status or with respect to the rate of salary increases.

Actuary's Recommended Method

We will use our new valuation assumptions to project changes in the current population over the next several years. We will build a demographic profile of new employees based on the demographic profile of employees hired in the past year, such that the total population remains constant in number and the total payroll increases according to our payroll growth assumption. From this constructed hypothetical future population, we will calculate normal costs for each Tier/Group within the System directly.