GRS Gabriel Roeder Smith & Company
Consultants & Actuaries

ST. PAUL TEACHERS' RETIREMENT FUND ASSOCIATION

2012 ACTUARIAL EXPERIENCE STUDY

FOR THE PERIOD ENDING JUNE 30, 2011

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June 15, 2012

Mr. Paul V. Doane
Executive Director
St. Paul Teachers' Retirement Fund Association
1619 Dayton Avenue, Room 309
St. Paul, MN 55104-6206

Subject: Results of 2012 Experience Study

Dear Mr. Doane:

We are pleased to present our report of the 2012 Experience Investigation Study for the St. Paul Teachers' Retirement Fund Association (SPTRFA). Our report includes a discussion of the recent experience of the Fund, it presents our recommendations for new actuarial assumptions and methods, and it provides information about the actuarial impact of these recommendations on the liabilities and other key actuarial measures of SPTRFA.

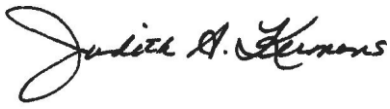
With the Board of Trustees' approval of the recommendations in this report, we believe the actuarial condition of the Fund will be more accurately measured and portrayed.

This experience investigation study was conducted in accordance with generally accepted actuarial principles and practices, the Actuarial Standards of Practice as issued by the Actuarial Standards Board, and with the Standards for Actuarial Work established by the State of Minnesota Legislative Commission on Pensions and Retirement. All of the undersigned are members of and meet the Qualification Standards of the American Academy of Actuaries.

We wish to thank the SPTRFA staff for their assistance in this project.

Sincerely,

Leslie Thompson, FSA, EA, MAAA
Senior Consultant



Judy Kermans, EA, MAAA
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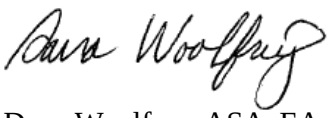

Dana Woolfrey, ASA, EA, MAAA
Consultant

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SECTION I

INTRODUCTION

Introduction

In determining liabilities, contribution rates and funding periods for retirement plans, actuaries must make assumptions about the future. Among the assumptions that must be made are:

- Retirement rates
- Mortality rates
- Termination rates
- Disability rates
- Investment return rate
- Salary increase rates
- Inflation rate

For some of these assumptions, such as the mortality rates, past experience provides important evidence about the future. For other assumptions, such as the investment return rate, the link between past and future results is much weaker. In either case, though, actuaries should review their assumptions periodically and determine whether these assumptions are consistent with actual past experience and with anticipated future experience.

This study is generally based on experience during the five-year period of July 1, 2006 to June 30, 2011. The last experience study was prepared in 2007, following completion of the July 1, 2006 actuarial valuation report. That report covered experience during the period of July 1, 2000 to June 30, 2006. Coordinated member data was used for the study of active decrements. With the exception of retirement, the recommended rates would apply to the coordinated members as well as the small remaining Basic active member group. We do not propose changing the retirement rates for the remaining Basic active member group.

In conducting experience studies, actuaries generally use data over a period of several years. This is necessary in order to gather enough data so that the results are statistically significant. In addition, if the study period is too short, the impact of the current economic conditions may lead to misleading results. It is known, for example, that the health of the general economy can impact salary increase rates and termination rates. Using results gathered during a short-term boom or bust will not be representative of the long-term trends in these assumptions. Also, the adoption of legislation, plan improvements or changes in salary schedules will sometimes cause a short-term distortion in the experience. For example, if an early retirement window was opened during the study period, we would usually see a short-term spike in the number of retirements followed by a dearth of retirements for the following two-to-four years. Using a longer period prevents giving too much weight to such short-term effects. On the other hand, using a much longer period increases the difficulty of identifying changes in behavior that may be occurring, such as mortality improvement or a change in the ages at which members retire. In our view, using a four to five-year period is reasonable.

In an experience study, we first determine the number of deaths, retirements, etc. that occurred during the period. Then we determine the number expected to occur, based on the current actuarial assumptions. The number "expected" is determined by multiplying the probability of the occurrence at the given age, by the "exposures" at that same age. For example, let's look at a rate of retirement at age 55. The number of exposures can only be those members who are age 55 and eligible for retirement at that time. Thus they are considered "exposed" to that assumption. Finally we calculate the A/E ratio, where "A" is the actual number (of retirements, for example) and "E" is the expected number. If the current assumptions were "perfect", the A/E ratio would be 100%. When it varies much from this figure, it is a sign that a new assumption may be needed. (However, in some cases we prefer to set our assumptions to produce an A/E ratio a little above or below 100%, in order to introduce some conservatism.) Of course we not only look at the assumptions as a whole, but we also review how well they fit the actual results by gender, by age, and by service.

Finally, if the data leads the actuary to conclude that new tables are needed, the actuary "graduates" or smoothes the results since the raw results can be quite uneven from age to age or from service year to service year.

Please bear in mind that, while the recommended assumption set represents our best estimate, there are other reasonable assumption sets that could be supported. Some reasonable assumption sets would show higher or lower liabilities or costs.

COORDINATION WITH STATUTE

MRS Chapter 356.215 "Actuarial Valuation and Experience Studies" sets forth the actuarial assumptions and actuarial methods to be used in the preparation of the annual valuation reports. These statutory assumptions may or may not reflect the best estimate of the experience for the St. Paul Teachers' Retirement Fund Association plan; rather, they are used consistently by all Minnesota systems so the legislature and stakeholders can make comparisons of the plans with each plan using the same actuarial assumptions and methods. The authors of this St. Paul Teachers' Retirement Fund Association experience study have conducted this study independent of the assumptions which are outlined in statute. Rather, the purpose of this experience study is to provide the best estimate for each assumption. We recognize that the valuations performed pursuant to Statute may not employ the assumptions that are recommended as a result of this experience study.

The process for changing actuarial assumptions (except for the pre and post retirement interest rates) is found in Ch 356.215 subdivision 18, "After July 1, 2010, the actuarial assumptions used for the preparation of actuarial valuations under this section that are other than postretirement interest and preretirement interest may be changed only with the approval of the Legislative Commission on Pensions and Retirement or after a period of one year has elapsed since the date on which the proposed assumption change or changes were received by the Legislative Commission on Pensions and Retirement without commission action."

If ultimately the recommended best estimates for the actuarial assumptions are not adopted, then we will perform the valuations with the caveat that the assumptions employed are those specified in the statute, and that those assumptions are not consistent with the recommendations contained in this experience study. We recommend that staff seek the advice of the Association's auditors to determine the appropriate values to be displayed within the CAFR.

ORGANIZATION OF REPORT

Section II of this report summarizes our recommended changes. Section III contains our findings and a more detailed analysis of our recommendation for each actuarial assumption. The impact of adopting our recommendations on liabilities and contribution rates is shown in Section IV. Section V shows a summary of the recommended assumptions.

SECTION II

SUMMARY OF RECOMMENDATIONS

Summary of Recommendations

Our recommended changes to the current major actuarial assumptions and methods may be summarized as follows:

Economic Assumptions

1. Set the implicit inflation assumption to 3.00%. This assumption was not stated in the prior valuation.

2. Set the net real return to 4.50% and accordingly reduce the nominal investment return assumption from 8.50% to 7.50%.

3. Set the productivity component of the salary scale assumption to 1.00%. This recommendation reflects the reduced spread between inflation and salary increases seen in the overall economy and the expectation of lower salary increases going forward. Combining with the inflation rate of 3.00% creates a wage inflation assumption of 4.00%. Also set total payroll growth to 4.0%. Both assumptions are currently 5.0%. This change is a decrease in assumed future pay increases and assumed total payroll growth.

4. In accordance with the observed experience and the format of the salary schedules included in the Collective Bargaining Agreements, extend the service-based promotional/longevity component of the salary scale from 10 to 15 years.

Mortality Assumptions

5. Update the mortality tables for non-disabled participants (both pre- and post-retirement) to the RP-2000 Combined Mortality Table projected with Scale AA to 2020 with setbacks of one year and three years for males and females. This increases the assumed life expectancy.

6. Update the disabled mortality assumption to the RP-2000 Disabled Life Mortality Table.

Other Demographic Assumptions

7. Based on generally observed trends, make retirement rates sex-distinct. Rates were changed to better fit the data. In general, less female retirements and slightly more male retirements are expected under the proposed rates.

8. Based on observed experience, increase termination rates. No change recommended to the rate structure.

9. Based on the limited exposure to potential increased costs from Combined Service for the post-

89 hire active member group, reduce the Combined Service load (which applies to accrued liabilities, normal costs and present value of future benefits) from 7.0% to 2.0%. Leave this load unchanged for other groups.

Actuarial Methods and Policies

10. Recommend no change to the use of the 5-year smoothing technique to determine the actuarial value of assets, used for determining the annual employer contribution rates.

11. Recommend continued use of the Entry Age Actuarial Cost Method. This method is most appropriate for a funding policy that seeks to stabilize contribution rates as a percentage of payroll.

SECTION III

ANALYSIS OF EXPERIENCE AND RECOMMENDATIONS

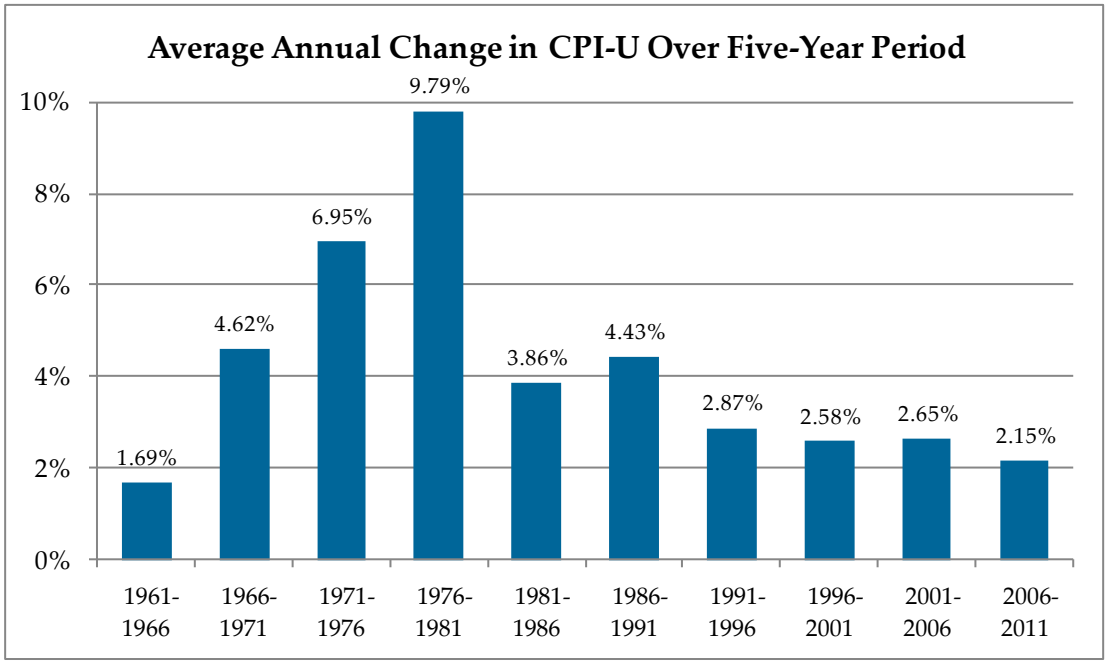
Analysis of Experience and Recommendations

We will begin by discussing the economic assumptions: inflation, expenses, the investment return rate, the salary increase assumption, and the rate of payroll growth. Next are the demographic assumptions: mortality, disability, termination and retirement. Finally, we will discuss all of the actuarial methods used.

INFLATION RATE

By "inflation," we mean price inflation, as measured by annual increases in the Consumer Price Index (CPI). This inflation assumption underlies all of the other economic assumptions we employ.

The chart below shows the average annual inflation in each of the ten consecutive five-year periods over the last fifty years:



The table on the next page shows the average inflation over various periods, ending June 30, 2011:

Periods Ending June 30, 2011	Average Annual Increase in CPI-U
Last five (5) years	2.15%
Last ten (10) years	2.40%
Last fifteen (15) years	2.46%
Last twenty (20) years	2.57%
Last twenty-five (25) years	2.94%
Last thirty (30) years	3.09%
Since 1913 (first available year)	3.25%

Source: Bureau of Labor Statistics, CPI-U, all items, not seasonally adjusted

While inflation has been relatively low over the last twenty years, if we look back over a period of 30 or more years, inflation has averaged slightly above 3.00% per year. However, it is difficult to ignore the steady march downwards in inflation statistics over the last 25 years shown in the charts above.

Most of the investment consulting firms, in setting their capital market assumptions, currently assume that inflation will be less than 3.00%. We examined the 2010 or 2011 capital market assumption sets for eight investment consulting firms. The average assumption for inflation was 2.65%, with a range of 2.40% to 3.01%. However, the investment consulting firms typically set their assumptions based on a five or ten year outlook, while actuaries must make much longer projections.

In the Social Security Administration's May 2011 Trustees Report, the Office of the Chief Actuary is projecting a long-term average annual inflation rate of 2.8% under the intermediate cost assumption. (The inflation assumption is 1.8% and 3.8% respectively in the low cost and high cost projection scenarios.) These inflation assumptions were unchanged from their prior year's report.

The Philadelphia Federal Reserve conducts a quarterly survey of the Society of Professional Forecasters. Their most recent forecast (first quarter of 2011) was for inflation over the next ten years to average 2.30%. Most observers expect inflation to continue to be low as the economy works out of the recession. (Short-term spikes in energy and food costs are possible, due to the disaster in Japan and current turmoil in the Mideast and North Africa, but core inflation remains very low.) However, the Society of Professional Forecasters is implicitly assuming a 2.50% inflation rate from 2016-2020, so it is not just the next 2-3 years that is depressing inflation forecasts.

Based on this information, we believe that an inflation rate of 2.50% to 3.0% is reasonable. In our analysis, we have used a 3.0% inflation assumption. This is the building block for all of the other economic assumptions.

INVESTMENT AND ADMINISTRATIVE EXPENSES

Since the trust fund pays expenses in addition to member benefits and refunds, we must make some assumption about these. Actuaries treat investment expenses as an offset to the investment return assumption. That is, the investment return assumption represents expected return after payment of investment expenses.

There are varying practices regarding administrative expenses. Some plans make an assumption that administrative expenses will be some fixed or increasing dollar amount. Others assume that the administrative expenses will be some percentage of the plan's actuarial liabilities or normal cost. Others treat administrative expenses like investment expenses, as an offset to the investment return assumption. The practice for SPTRFA is to include an additional percentage in the normal cost. We do not recommend any change to this practice. Because it is included in the normal cost, no provision for it need be made in determining the net investment return. Only investment expenses must be considered for that purpose.

This chart shows the investment expenses for the last five years expressed as a percentage of the assets, adjusted for cash flow, each year:

Annual Investment Expenses Expressed as a Percentage Assets	
Fiscal Year	Total
2011	0.57%
2010	0.62%
2009	0.36%
2008	0.42%
2007	0.52%
Average	0.50%

Based on this information, we are recommending an assumption that investment expenses will consume 0.50% (50 basis points) of each year's investment return. This assumption is then used in setting the annual investment return assumption.

INVESTMENT RETURN ASSUMPTION

The investment return assumption is one of the principal assumptions in any actuarial valuation of a retirement plan. It is used to discount future expected benefit payments to the valuation date, in order to determine the liabilities of the plan. Even a small change to this assumption can produce significant changes to the liabilities and contribution rates.

ASOP 27 – Current Standard of Practice

Actuaries are required to comply with Actuarial Standard of Practice No. 27 (ASOP 27) in setting economic assumptions for retirement plans, including the assumed investment return rate.

The standard requires the actuary to identify the components of each assumption, to evaluate relevant data, and to set a best-estimate range. Then the actuary selects a point within this best-estimate range. Alternatively, the actuary may simply set the assumption without specifying a best-estimate range. Additionally, the ASOP requires that all economic assumptions be consistent with one another.

The best-estimate range is "the narrowest range within which the actuary reasonably anticipates that the actual results, compounded over the measurement period, are more likely than not to fall." If the best-estimate range for the investment return assumption is from m% to n%, we must believe that just over half of the time the actual compound rate of return in the future will be within this range.

ASOP 27 – Proposed New Standard of Practice

For several reasons, the actuarial profession has decided that ASOP 27 should be updated, and a new exposure draft has been published. One criticism of the current standard is that the range of potential investment return assumptions that could be considered reasonable under the current standard is too wide. The "best estimate range" described above has been eliminated from the new draft standard. The new standard will likely still require the actuary to set an assumption, generally a single point estimate.

While the new standard is not effective yet, we have mentioned it because the new standard will likely be in effect for one of the next two actuarial valuations. Typically an experience study is only performed every four or five years, and a special review might be needed to ensure that assumptions comply with the new standard.

Structure of the Investment Return Assumption

We view the investment return assumption as having three components: the assumed rate of (price) inflation, the real return net of inflation, and an offset for expected investment expenses.

We have already discussed the inflation assumption and the offset for expenses. The next section is an analysis of the real rate of return.

Expected Real Returns

The allocation of assets within the universe of investment options will significantly impact the overall performance of the Fund. Therefore, it is meaningful to identify the range of expected returns based on the fund's targeted allocation of investments and an overall set of capital market assumptions.

Because GRS is a benefits consulting firm and does not provide investment advice, we reviewed capital market assumptions developed and published by eight independent investment consulting firms. These investment consulting firms periodically issue reports that describe their capital market assumptions, that is, their estimates of expected returns, volatility, and correlations.

Given the plan's current target asset allocation (shown below) and the investment consultant's capital market assumptions, the development of the average nominal return, net of investment expenses, is provided in the table on the following page.

Investment Policy Asset Allocation Targets	
Asset Class	Target Allocation
Global/Domestic Large Cap Equity	40.0%
Global/Domestic Non-Large Cap Equity	22.0%
Global/Domestic Fixed Income	18.0%
Inflation Hedged/Real Assets	10.0%
Private Equity/Alternatives	9.0%
Cash Equivalents	1.0%
	100.0%

Investment Consultant	Investment Consultant Expected Nominal Return	Investment Consultant Inflation Assumption	Expected Real Return (2)–(3)	Actuary Inflation Assumption	Expected Nominal Return (4)+(5)	Plan Incurred Expense Assumption	Expected Nominal Return Net of Expenses (6)-(7)
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
1	7.79%	2.75%	5.04%	3.00%	8.04%	0.50%	7.54%
2	8.24%	3.00%	5.24%	3.00%	8.24%	0.50%	7.74%
3	7.78%	2.40%	5.38%	3.00%	8.38%	0.50%	7.88%
4	8.43%	3.01%	5.42%	3.00%	8.42%	0.50%	7.92%
5	7.95%	2.50%	5.45%	3.00%	8.45%	0.50%	7.95%
6	8.01%	2.50%	5.51%	3.00%	8.51%	0.50%	8.01%
7	8.36%	2.50%	5.86%	3.00%	8.86%	0.50%	8.36%
8	8.40%	2.50%	5.90%	3.00%	8.90%	0.50%	8.40%
Average	**8.12%**	**2.65%**	**5.48%**	**3.00%**	**8.48%**	**0.50%**	**7.98%**

Note: Return assumption is based on the arithmetic average.

We have determined for each firm the expected nominal return rate, then subtracted that firm's expected inflation to arrive at their expected real return in col. (4). Then we have subtracted 0.50% for expenses to get a net real return. As the table shows, the average net one-year real return of the eight firms is 7.98%.

In addition to examining the expected one-year return, it is important to review anticipated volatility of the investment portfolio and understand the range of long-term net return that could be expected to be produced by the investment portfolio. Volatility reduces the overall return experienced by the Fund. As an example, returns of 12%, 4%, 12%, 4% in years 1-4 produce an overall return of 7.93% (rather than 8%).

Therefore, the table on the following page provides the 25th, 50th, and 75th percentiles of the 20-year geometric average of the expected nominal return (using a 3% inflation assumption), net of expenses.

Investment Consultant	Distribution of 20-Year Average Geometric Net Nominal Return 25th	50th	75th	Probability of exceeding 8.50%
(1)	(2)	(3)	(4)	(5)
1	4.84%	6.75%	8.70%	27.3%
2	4.61%	6.75%	8.93%	29.4%
3	5.52%	7.25%	9.00%	31.5%
4	4.87%	6.97%	9.11%	31.4%
5	5.02%	7.06%	9.13%	31.9%
6	4.58%	6.87%	9.21%	31.9%
7	5.03%	7.28%	9.57%	35.9%
8	5.23%	7.39%	9.60%	36.7%
Average	**4.96%**	**7.04%**	**9.16%**	**32.0%**

The analysis shows the median net nominal return averaged over the eight investment consultants is 7.04%. Under the proposed ASOP 27, the recommended assumption would not be less than 7.04% (the median geometric return) and not greater than 7.98% (the arithmetic return). The current investment return of 8.50% would not fall in the acceptable range. The analysis also shows that the probability of meeting or exceeding the 8.50% investment return is 32.0%.

Recommendation

We recommend lowering the nominal investment return assumption from 8.50% to 7.50%, net of expenses. This would be composed of an inflation rate of 3.00% and a real return of 5.00%, for a gross return of 8.00%. This would then be offset by 0.50% for investment expenses, for a nominal return assumption of 7.50%. The probability of meeting or exceeding the 7.50% investment return is 44.1%.

SALARY INCREASE RATES

In order to project future benefits, the actuary must project future salary increases. Salaries may increase for a variety of reasons:

- 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; or
- Merit increases, if available.

Our salary increase assumption is meant to reflect all of these types of increases. Salary increases are composed of both wage inflation and service-based or merit increases.

BUILDING BLOCKS FOR SALARY: WAGE INFLATION AND STEP-RATE/PROMOTION

Salary increase assumptions for long-service employees (wage inflation)

To develop the wage inflation component of the salary scale, the salary increases for long-service employees are examined.

Salary increases for longer-service employees are almost entirely driven by wage inflation. Many of the factors that result in pay increases are largely inapplicable or have diminished importance for longer-service employees. Step or service-related increases have ceased or are minimal. Promotions occur with less frequency. Additional training or acquisition of advanced degrees usually occurs early in the career. Thus, longer service employees' wages are assumed to grow at the overall rate of wage inflation. Wage inflation is also the increase in the average wage of all members of the workforce, and is also commonly known as the payroll growth assumption.

Historically, wage inflation almost always exceeds price inflation. This is because wage inflation is in theory the result of (a) price inflation, and (b) productivity gains being passed through to wages. For the last ten years, for the economy as a whole, wage inflation has outpaced price inflation by about 0.30%, and for the last twenty years, wage inflation has exceeded price inflation by about 0.79%. Since 1951, wage inflation has been about 1.00% a year larger than price inflation.

Wage inflation is currently assumed to be 5.00%, and this is also the assumed salary increase for longer-service members with at least 10 years of service.

Salary increases observed in the study level off after about fifteen years of service which is consistent with the salary schedules provided to us from the Collective Bargaining Agreements. For members with more than 15 years of service, the observed average salary increase during the five-year period was 3.38%. Inflation during this five-year period averaged 2.15%. Therefore, long-service employees received an average salary increase of 1.23% above inflation. We recommend a productivity increase of no more than 1.00%, the 50-year historical average.

We recommend wage inflation of 4.0%, composed of 3.00% inflation and 1.00% for productivity increases.

Salary increase assumptions for shorter-service employees (age and service component for step-rate/promotion portion of salary)

Members who are early in their career typically have salary increases that include both wage inflation as well as a component for promotion. This additional component is part of the age and service component of the salary scale.

To determine this portion of the salary increase assumption the following steps were taken

1. Calculate the excess in the average increases over wage inflation;
2. Examine these amounts by both age and by service.

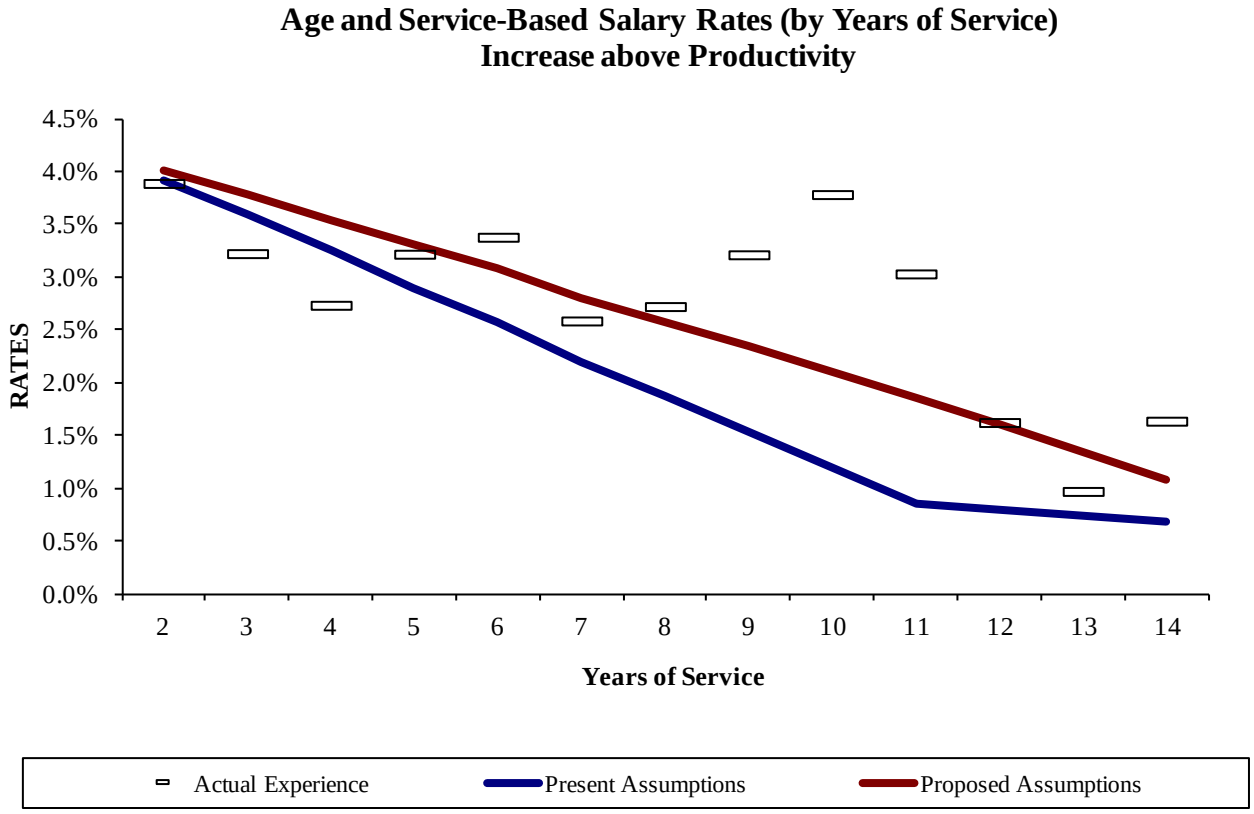
For example, as shown in the following table, active members with two years of service received an average increase of 7.27%, which was 3.89% more than the average increase of 3.38% for members with fifteen or more years of service. This would imply that the merit component for these members was 3.89% while current assumptions indicate that 3.91% is the expected merit increase.

We expected to see total salary increases at their highest early in the member's career, and then to steadily decline until salary increases stabilize at the wage inflation rate. Looking at the table below and the graph on page 18, the changes in salary increase rates did not entirely meet that expectation. We referred back to the salary schedules from the Collective Bargaining Agreements to confirm the findings from the data. The salary schedules did support the pattern observed in the data. We recommend keeping the age-based rates in place and modifying the service-related component to extend over 15 years instead of 10 to recognize the "flatness" in the overall salary increase rates. This 15 year period is consistent with the structure of the salary schedules in the Collective Bargaining Agreements. The proposed salary scale shown below illustrates the proposed rate of salary increase by years of service.

Age and Service-Based Salary Rates (by Years of Service)

	Current Salary Scale		**06/11 Actual Experience**			**Proposed Salary Scale**	
Years of Service	Total	Step Rate/ Promotional	Total	Above Inflation	Step Rate/ Promotional	Total	Step Rate/ Promotional
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
0	9.00%	4.00%	4.03%	1.87%	0.65%	8.00%	4.00%
1	9.21%	4.21%	10.39%	8.24%	7.01%	8.21%	4.21%
2	8.91%	3.91%	7.27%	5.12%	3.89%	8.01%	4.01%
3	8.59%	3.59%	6.61%	4.45%	3.22%	7.79%	3.79%
4	8.24%	3.24%	6.12%	3.96%	2.74%	7.54%	3.54%
5	7.90%	2.90%	6.60%	4.44%	3.22%	7.30%	3.30%
6	7.57%	2.57%	6.76%	4.61%	3.38%	7.07%	3.07%
7	7.20%	2.20%	5.97%	3.81%	2.59%	6.80%	2.80%
8	6.86%	1.86%	6.10%	3.95%	2.72%	6.56%	2.56%
9	6.54%	1.54%	6.59%	4.44%	3.21%	6.34%	2.34%
10	6.19%	1.19%	7.16%	5.01%	3.78%	6.09%	2.09%
11	5.85%	0.85%	6.41%	4.26%	3.03%	5.85%	1.85%
12	5.80%	0.80%	5.01%	2.85%	1.62%	5.60%	1.60%
13	5.75%	0.75%	4.35%	2.20%	0.97%	5.35%	1.35%
14	5.68%	0.68%	5.02%	2.86%	1.64%	5.08%	1.08%

Current Inflation Assumption	N/A	Proposed Inflation Assumption	3.00%
Current Productivity Component	N/A	Proposed Productivity Component	1.00%
Total Wage Inflation	5.00%	Proposed Total Wage Inflation	4.00%
Actual CPI-U Inflation for Period	2.15%		
Apparent Productivity Component	1.23%		



PAYROLL GROWTH RATE

The salary increase rates discussed above are assumptions applied to individuals and are used in projecting future benefits. We use a separate payroll growth assumption (currently 5.00% annually) in determining the annual payment needed to amortize the unfunded actuarial accrued liability. The amortization payments are calculated to be a level percentage of payroll. Therefore, as payroll increases over time, these amortization payments will also increase.

In theory, payroll growth in the absence of membership growth should approximate the wage inflation assumption (proposed to be 4.00%). The payroll for St. Paul Teachers' has actually decreased slightly over the last couple years; however, we do not expect this to be an indication of a long-term pattern and recommend continuing to use a payroll growth assumption equal to the wage inflation assumption (4.00%).

POST-RETIREMENT MORTALITY RATES (LIABILITY AND COST CALCULATIONS)

SPTRFA's actuarial liabilities depend in part on how long retirees live. If members live longer, benefits will be paid for a longer period of time, and the liability will be larger.

The mortality table currently being used for non-disabled retirees and for beneficiaries receiving benefits is the 1983 Group Annuity Mortality (GAM) table. This table has separate rates for males and females. Male rates are determined using a setback of four years and female rates are determined using a setback of one year.

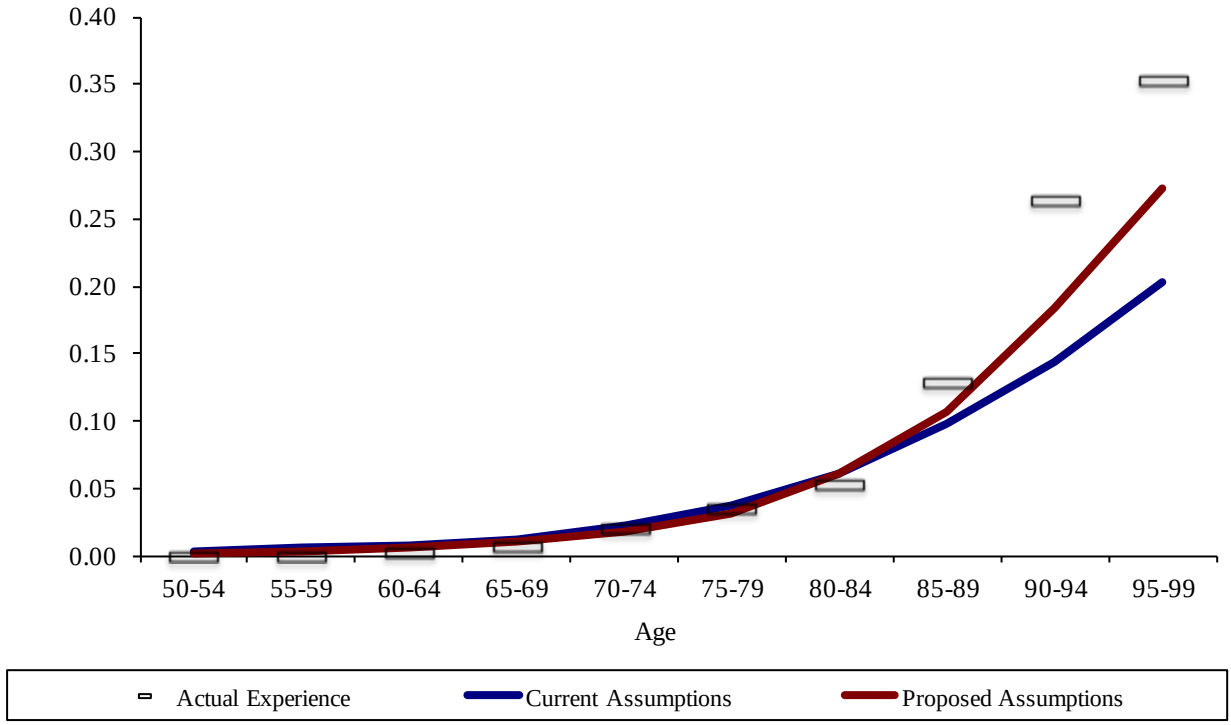
To analyze the data, we begin by determining the expected number of deaths in each year at each age for males and females. Then we compare the actual number to the expected number. The ratio of the actual deaths to the expected deaths—the A/E ratio—then tells us whether the assumptions are reasonable. For this assumption, using a static mortality table, an A/E ratio higher than 100% has traditionally been desired to build in a margin for continued future improvements in mortality rates.

There were 143 deaths among the male retirees and beneficiaries and 154 deaths among female retirees and beneficiaries during the study period. Based on the current mortality assumption, we expected 139.7 and 174.5 deaths, respectively. This produced A/E ratios of 102% for males, 88% for females. Based on these ratios, the female mortality assumption does not have any margin to allow for future mortality improvements, and the female mortality assumption is overly aggressive.

We recommend updating to the RP-2000 Combined Mortality Table projected with Scale AA to 2020 with a one year setback for males and a three setback for females. The resulting actual to expected ratios are 107% and 104%, respectively.

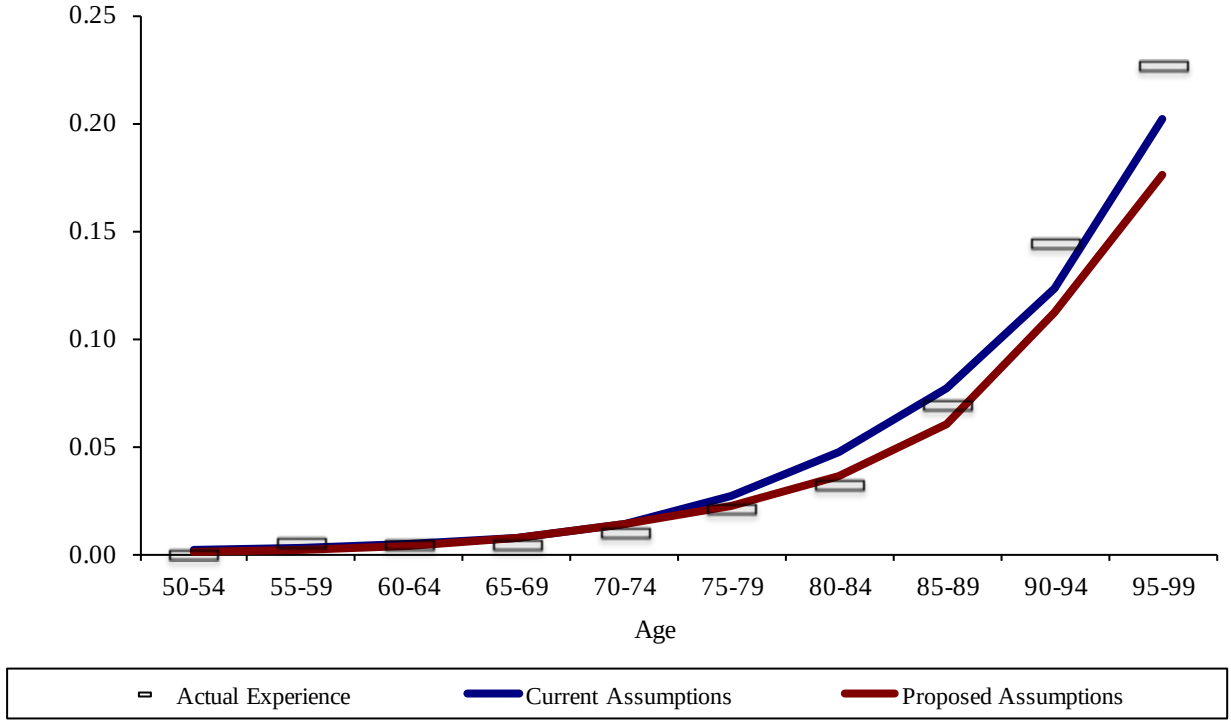
RATES OF MALE RETIRED LIVES MORTALITY EXPERIENCE

Age	Deaths	Exposure	Crude Rates	Sample Rates		Expected Deaths	
				Old	New	Old	New
50-54	-	-	N/A	0.003	0.002	-	-
55-59	-	202	0.000	0.005	0.003	1.2	0.7
60-64	3	927	0.003	0.008	0.006	7.4	5.5
65-69	9	1,119	0.008	0.012	0.011	14.0	12.2
70-74	20	932	0.021	0.022	0.018	20.7	17.1
75-79	28	785	0.036	0.037	0.032	28.8	25.2
80-84	27	512	0.053	0.061	0.060	30.8	30.5
85-89	35	271	0.129	0.098	0.107	25.4	28.0
90-94	15	57	0.263	0.144	0.184	7.9	9.9
95-99	6	17	0.353	0.203	0.273	3.3	4.4
100+	-	1	0.000	0.281	0.359	0.2	0.3
Totals	143	4,823	0.030	0.029	0.028	139.7	133.9



RATES OF FEMALE RETIRED LIVES MORTALITY EXPERIENCE

Age	Deaths	Exposure	Crude Rates	Sample Rates		Expected Deaths	
				Old	New	Old	New
50-54	-	3	0.000000	0.002	0.001	0.0	0.0
55-59	3	517	0.006	0.003	0.002	1.6	1.2
60-64	9	1,829	0.005	0.005	0.004	8.8	7.7
65-69	8	1,803	0.004	0.008	0.008	14.1	14.0
70-74	14	1,409	0.010	0.014	0.013	20.0	19.0
75-79	20	953	0.021	0.027	0.022	25.7	20.8
80-84	20	619	0.032	0.048	0.036	29.3	22.3
85-89	25	361	0.069	0.077	0.060	27.3	21.8
90-94	27	187	0.144	0.123	0.112	22.9	20.6
95-99	22	97	0.227	0.202	0.176	18.7	16.3
100+	6	20	0.300	0.325	0.227	6.1	4.4
Totals	154	7,798	0.020	0.022	0.019	174.5	148.1



DISABLED MORTALITY RATES

Currently, disabled retirees are valued using the 1977 Railroad Board Disabled Mortality Table. SPTRFA does not have enough disabled deaths to allow for assumption setting based on the actual data. We recommend updating this assumption to the RP-2000 Disabled Life Mortality Table.

ACTIVE MORTALITY RATES

SPTRFA has very limited active mortality experience to study. We recommend changing the active mortality to be the same as that recommended for retirees.

DISABILITY RATES

SPTRFA has very limited disability experience to study. There were 21 disabled retirements during the experience period. Under the current assumption, 11.9 disabled retirements were expected during the experience period. We recommend increasing the current rates by 40%. This results in expected disablements roughly halfway between the actual and expected decrements. Under the revised rates, 16.7 disabled retirements would have been expected during the experience period.

TERMINATION RATES

At times, a system can have gains or losses due to a particular decrement in spite of the fact that the number of decrements predicted was met. Our experience has shown that sometimes this is due to the relative magnitude of the liability of the members that decrement, rather than number counts alone. For example, consider a plan with only two members who are both the same age and assume member one has a liability of $10,000 and member two has a liability of $90,000. If one of the members leaves and forfeits all of their liability, the net rate of decrement is one out of two for a rate of 50%. However, the net gain or loss to the system will be less if the member with $10,000 in liability leaves than if the other member leaves. Perhaps the withdrawal rate should be set at 10% in this case ($10,000/($10,000+$90,000)). This practice is referred to as "liability weighting" and we have used this methodology to determine both the termination and retirement rates. Each "exposure", instead of being a count of a single person, corresponds to $100,000 in liability. This results in fractional exposures and actual decrements that we would not see under the traditional methodology.

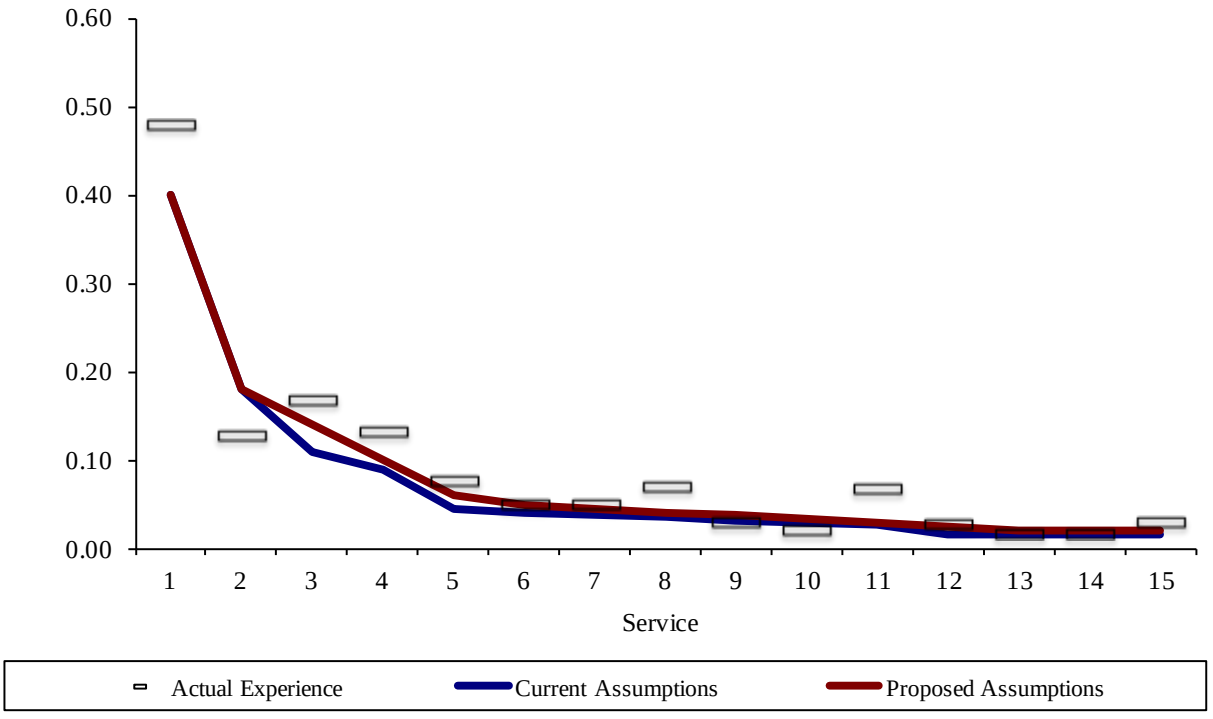
Termination rates reflect members who leave for any reason other than death, disability, or service retirement. They apply whether the termination is voluntary or involuntary, and whether the member takes a refund or keeps his/her account balance on deposit. The current termination rates reflect the member's service, and there are separate rates for males and females. The current termination rate structure appears to fit the observed data reasonably well, and we do not recommend any changes to the rate structure.

There were more terminations than expected, and we recommend a slight increase in the termination rates, for both males and females. The increase in termination rates decreased the A/E ratio from 146% to 122% for males and from 154% to 124% for female.

MALE RATES OF WITHDRAWAL

Service Index	Withdrawals*	Exposure*	Crude Rates*	Sample Rates		Expected Withdrawals	
				Old	New	Old	New
1	1.2	2.6	0.480	0.400	0.400	1.0	1.0
2	1.4	11.2	0.129	0.180	0.180	2.0	2.0
3	2.9	17.1	0.169	0.110	0.140	1.9	2.4
4	3.1	22.9	0.134	0.090	0.100	2.1	2.3
5	2.2	27.5	0.079	0.044	0.060	1.2	1.6
6	2.0	38.3	0.052	0.041	0.050	1.6	1.9
7	2.2	43.9	0.051	0.038	0.045	1.7	2.0
8	3.6	51.2	0.071	0.035	0.041	1.8	2.1
9	1.9	62.3	0.031	0.032	0.037	2.0	2.3
10	1.9	91.3	0.021	0.029	0.033	2.6	3.0
11	7.6	110.4	0.068	0.026	0.029	2.9	3.2
12	3.2	113.4	0.029	0.016	0.025	1.8	2.8
13	2.5	134.7	0.019	0.016	0.020	2.2	2.7
14	2.7	145.1	0.019	0.016	0.020	2.3	2.9
15	3.7	118.1	0.031	0.016	0.020	1.9	2.4
Totals	42.3	990.1	0.043	0.029	0.035	28.9	34.7

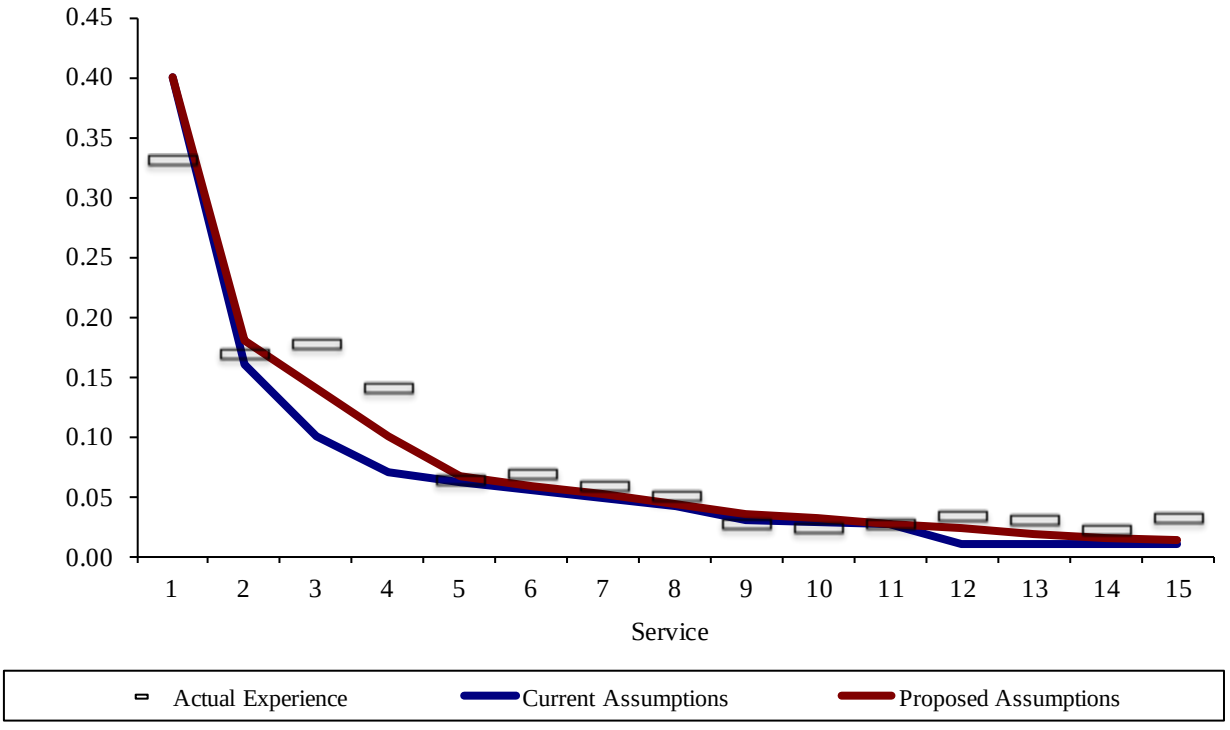
**Liability-weighted. $100,000 in liability valued as 1.0 exposure.*



FEMALE RATES OF WITHDRAWAL

Service Index	Withdrawals*	Exposure*	Crude Rates*	Sample Rates		Expected Withdrawals	
				Old	New	Old	New
1	1.7	5.0	0.332	0.400	0.400	2.0	2.0
2	5.0	29.5	0.169	0.160	0.180	4.7	5.3
3	8.1	45.5	0.179	0.100	0.140	4.6	6.4
4	9.3	65.2	0.142	0.070	0.100	4.6	6.5
5	5.1	77.6	0.066	0.062	0.067	4.8	5.2
6	7.9	113.8	0.070	0.055	0.059	6.3	6.7
7	8.8	146.7	0.060	0.048	0.051	7.0	7.5
8	9.3	180.6	0.051	0.041	0.043	7.4	7.8
9	6.2	224.6	0.028	0.030	0.035	6.7	7.9
10	7.1	276.4	0.026	0.028	0.031	7.7	8.6
11	8.8	303.1	0.029	0.026	0.027	7.9	8.2
12	11.9	334.5	0.035	0.010	0.023	3.3	7.7
13	11.2	363.1	0.031	0.010	0.019	3.6	6.9
14	7.7	336.3	0.023	0.010	0.015	3.4	5.0
15	11.2	335.4	0.033	0.010	0.013	3.4	4.4
Totals	119.2	2,837.3	0.042	0.027	0.034	77.4	96.0

**Liability-weighted. $100,000 in liability valued as 1.0 exposure.*



RETIREMENT RATES

Currently, SPTRFA has rates for Coordinated members that are age-based and separated by eligibility for Rule of 90. Members hired after July 1, 1989 always fall under the category of "Not Eligible for Rule of 90". We believe it continues to make sense to separate the rates, and we have studied them on that basis.

When we separated the data by male and female, we found that females were working longer than the males. Accordingly, we recommend separating the rates into male and female rates.

As with the development of the termination rates, we used the liability weighting approach.

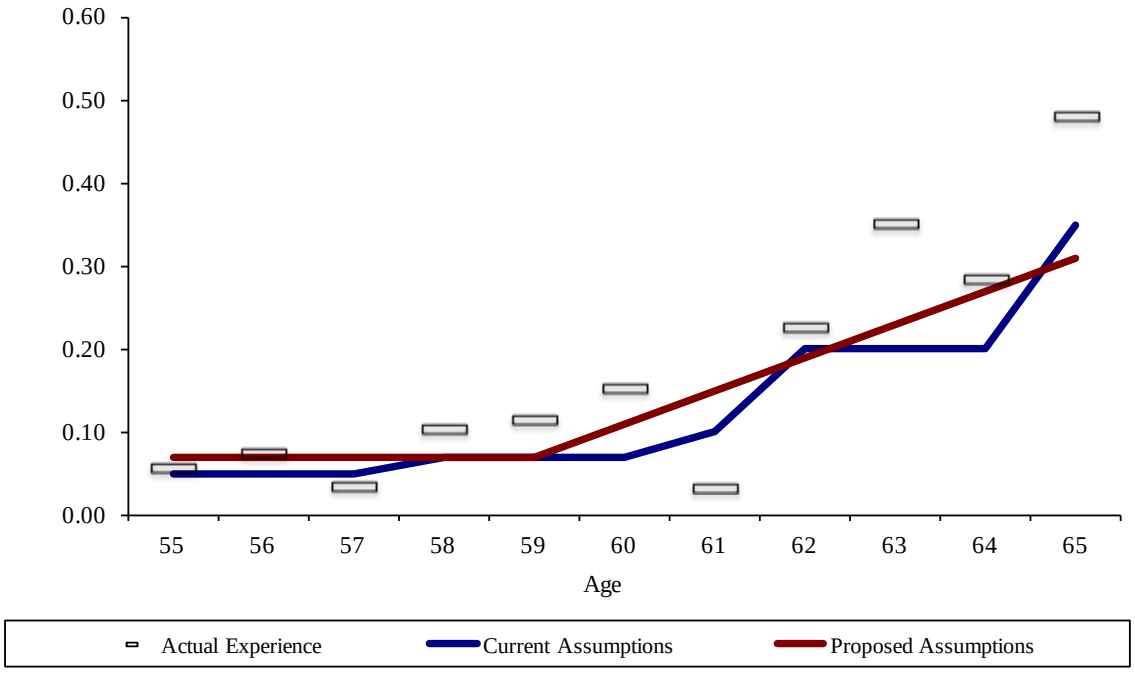
Our recommendations are as follows:

- Male Not Eligible for Rule of 90
  - Based on observed experience, increase rates across nearly all ages.
- Male Eligible for Rule of 90
  - Based on observed experience, reduce rates.
- Female Not Eligible for Rule of 90
  - Based on observed experience, extend lower retirement ages through early retirement ages and reduce rates overall.
- Female Eligible for Rule of 90
  - Better fit the retirement rates to observed experience. Overall expected number of retirements is similar.

MALE RATES OF RETIREMENT – NOT ELIGIBLE FOR RULE OF 90

Age	Retirements*	Exposure*	Crude Rates*	Sample Rates		Expected Retirements	
				Old	New	Old	New
55	10.2	175.9	0.0578	0.0500	0.0700	8.8	12.3
56	15.7	206.1	0.0762	0.0500	0.0700	10.3	14.4
57	6.8	185.4	0.0364	0.0500	0.0700	9.3	13.0
58	17.4	166.6	0.1044	0.0700	0.0700	11.7	11.7
59	14.4	125.3	0.1146	0.0700	0.0700	8.8	8.8
60	17.3	113.2	0.1530	0.0700	0.1100	7.9	12.4
61	3.0	86.0	0.0344	0.1000	0.1500	8.6	12.9
62	19.3	84.8	0.2271	0.2000	0.1900	17.0	16.1
63	19.5	55.6	0.3512	0.2000	0.2300	11.1	12.8
64	8.6	30.2	0.2846	0.2000	0.2700	6.0	8.1
65	9.3	19.3	0.4797	0.3500	0.3100	6.8	6.0
66	4.3	11.7	0.3669	0.3000	0.3500	3.5	4.1
67	0.7	6.2	0.1177	0.3000	0.3500	1.9	2.2
68	2.4	5.0	0.4821	0.3000	0.3500	1.5	1.8
69	0.2	1.3	0.1244	0.3000	0.3500	0.4	0.4
70	0.0	1.3	0.0383	1.0000	1.0000	1.3	1.3
Totals	148.9	1,273.8	0.1169			114.7	138.3

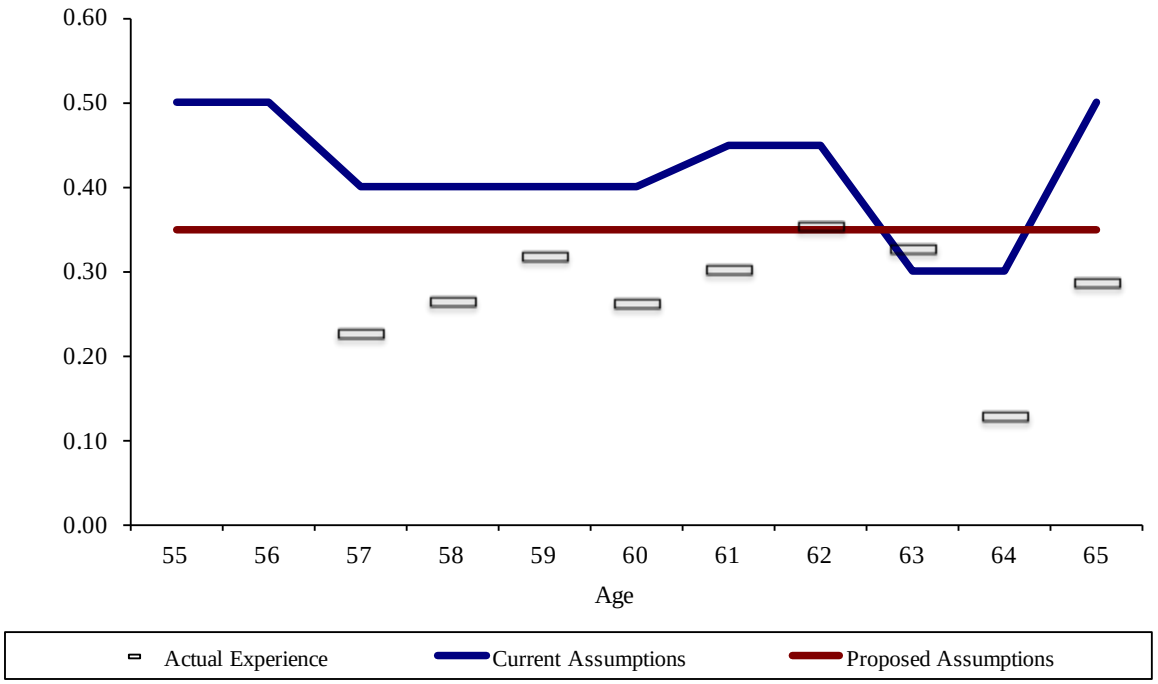
**Liability-weighted. $100,000 in liability valued as 1.0 exposure.*



MALE RATES OF RETIREMENT – ELIGIBLE FOR RULE OF 90

Age	Retirements*	Exposure*	Crude Rates*	Sample Rates		Expected Retirements	
				Old	New	Old	New
55	-	-		0.5000	0.3500	-	-
56	-	-		0.5000	0.3500	-	-
57	5.2	23.0	0.2276	0.4000	0.3500	9.2	8.1
58	13.8	52.2	0.2639	0.4000	0.3500	20.9	18.3
59	20.2	63.8	0.3169	0.4000	0.3500	25.5	22.3
60	17.2	65.6	0.2622	0.4000	0.3500	26.2	22.9
61	15.3	50.7	0.3022	0.4500	0.3500	22.8	17.7
62	15.3	43.4	0.3526	0.4500	0.3500	19.5	15.2
63	9.2	28.0	0.3275	0.3000	0.3500	8.4	9.8
64	3.1	23.9	0.1280	0.3000	0.3500	7.2	8.4
65	6.8	23.9	0.2868	0.5000	0.3500	11.9	8.4
66	2.9	16.7	0.1707	0.3000	0.3500	5.0	5.9
67	6.6	15.1	0.4361	0.3000	0.3500	4.5	5.3
68	-	3.7	0.0000	0.3000	0.3500	1.1	1.3
69	-	3.9	0.0000	0.3000	0.3500	1.2	1.3
70	3.6	3.6	1.0000	1.0000	1.0000	3.6	3.6
Totals	119.2	417.5	0.2855			167.1	148.5

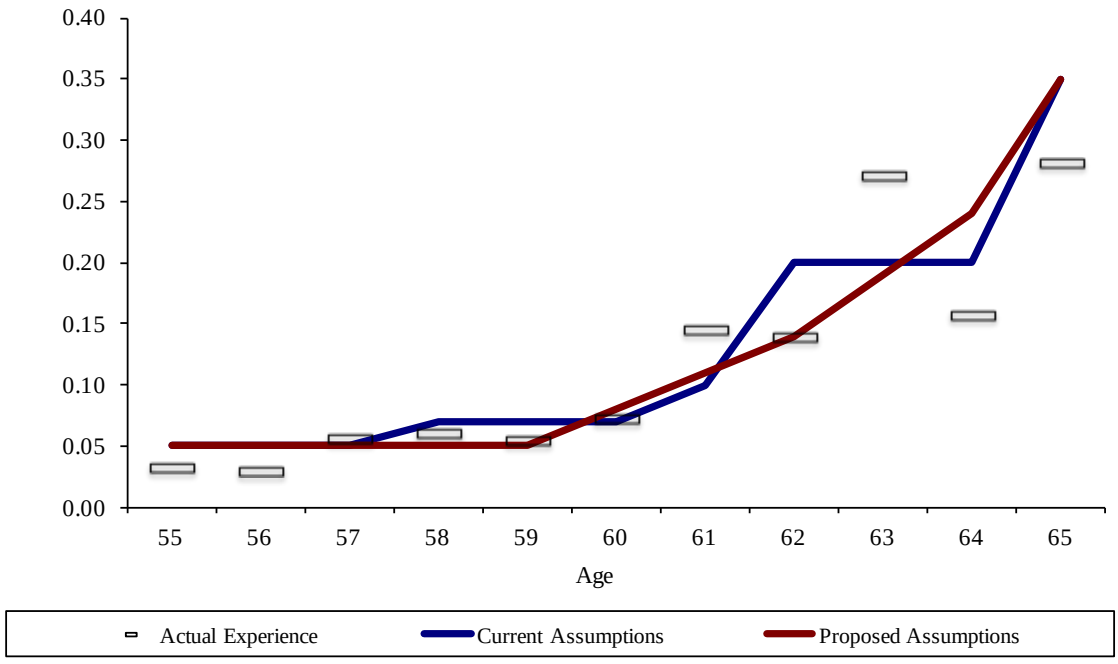
**Liability-weighted. $100,000 in liability valued as 1.0 exposure.*



FEMALE RATES OF RETIREMENT – NOT ELIGIBLE FOR RULE OF 90

Age	Retirements*	Exposure*	Crude Rates*	Sample Rates		Expected Retirements	
				Old	New	Old	New
55	20.7	643.3	0.0321	0.0500	0.0500	32.2	32.2
56	20.1	672.4	0.0299	0.0500	0.0500	33.6	33.6
57	31.9	563.5	0.0566	0.0500	0.0500	28.2	28.2
58	32.0	522.4	0.0613	0.0700	0.0500	36.6	26.1
59	24.4	441.1	0.0553	0.0700	0.0500	30.9	22.1
60	31.0	427.9	0.0725	0.0700	0.0800	30.0	34.2
61	51.4	353.2	0.1455	0.1000	0.1100	35.3	38.9
62	36.8	265.2	0.1389	0.2000	0.1400	53.0	37.1
63	61.5	226.4	0.2714	0.2000	0.1900	45.3	43.0
64	25.8	165.1	0.1565	0.2000	0.2400	33.0	39.6
65	33.2	117.8	0.2815	0.3500	0.3500	41.2	41.2
66	22.3	55.3	0.4035	0.3000	0.3500	16.6	19.4
67	15.4	26.9	0.5717	0.3000	0.3500	8.1	9.4
68	2.5	10.4	0.2383	0.3000	0.3500	3.1	3.7
69	1.0	5.2	0.1960	0.3000	0.3500	1.6	1.8
70	0.3	3.3	0.1029	1.0000	1.0000	3.3	3.3
Totals	410.3	4,499.7	0.0912			432.0	413.8

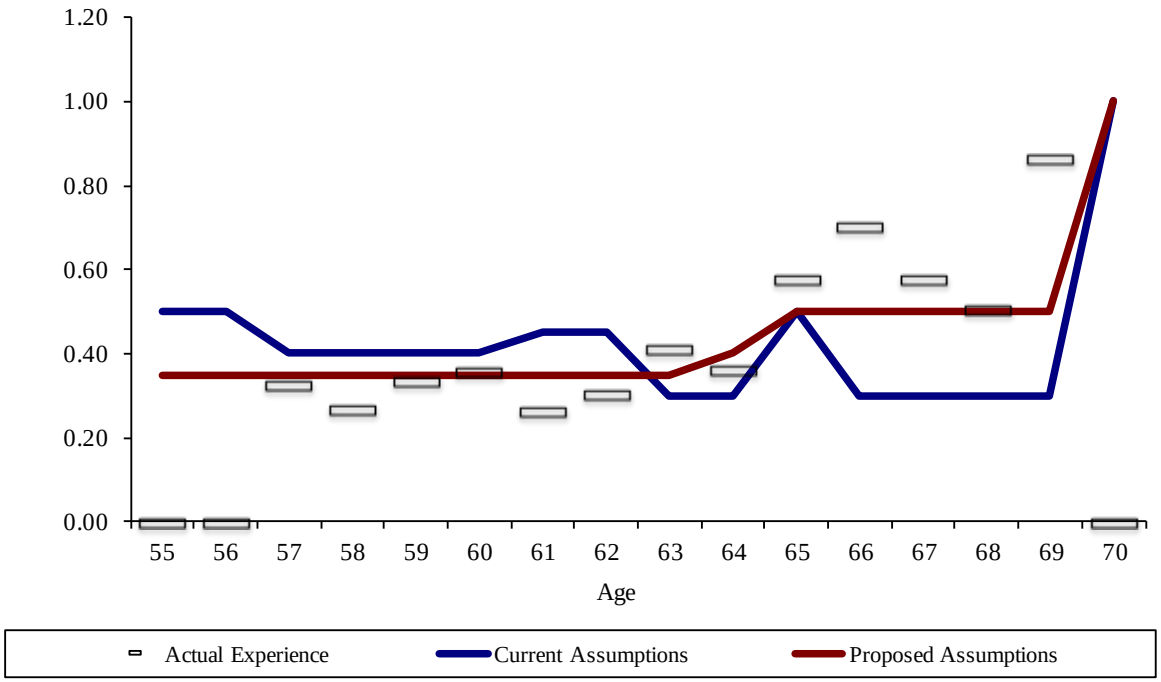
**Liability-weighted. $100,000 in liability valued as 1.0 exposure.*



FEMALE RATES OF RETIREMENT – ELIGIBLE FOR RULE OF 90

Age	Retirements*	Exposure*	Crude Rates*	Sample Rates		Expected Retirements	
				Old	New	Old	New
55	-	-	N/A	0.5000	0.3500	-	-
56	-	15.1	0.0000	0.5000	0.3500	7.6	5.3
57	36.0	110.5	0.3256	0.4000	0.3500	44.2	38.7
58	21.1	78.6	0.2679	0.4000	0.3500	31.5	27.5
59	36.4	109.0	0.3343	0.4000	0.3500	43.6	38.1
60	33.0	92.3	0.3572	0.4000	0.3500	36.9	32.3
61	28.7	109.2	0.2624	0.4500	0.3500	49.1	38.2
62	38.0	124.4	0.3053	0.4500	0.3500	56.0	43.5
63	42.2	102.5	0.4123	0.3000	0.3500	30.7	35.9
64	27.6	76.3	0.3619	0.3000	0.4000	22.9	30.5
65	33.2	57.6	0.5763	0.5000	0.5000	28.8	28.8
66	31.2	44.4	0.7022	0.3000	0.5000	13.3	22.2
67	13.0	22.5	0.5766	0.3000	0.5000	6.8	11.3
68	5.4	10.7	0.5045	0.3000	0.5000	3.2	5.4
69	11.4	13.3	0.8625	0.3000	0.5000	4.0	6.6
70	-	2.0	0.0000	1.0000	1.0000	2.0	2.0
Totals	357.2	968.5	0.3688			380.6	366.4

**Liability-weighted. $100,000 in liability valued as 1.0 exposure.*



COMBINED SERVICE

The Combined Service Annuity provision allows members to use service with other participating systems for purposes of meeting eligibility conditions and salary for final average compensation purposes, if higher. Currently, there is a 7.0% load on active member costs and a 30.0% load on deferred vested member costs. The higher deferred vested load represents the fact that salary earned under another participating system will likely increase the Final Average Salary calculation and by much higher magnitude than for an active member employed at St. Paul.

The current loads were developed in a study by Milliman many years ago. The study specifically studied combined service and looked at data from all the systems. Performing a similar study would be out of the scope of this experience study; however, we have identified some differences among the different active member groups which prompt us to recommend a change to the load used for the current active members hired after July 1, 1989.

Members hired after July 1, 1989, are not eligible for Rule of 90 (Tier 1 benefit with no actuarial reduction for early retirement if age plus service is greater than or equal to 90). Staff has confirmed that frequently it is the Rule of 90 where they see an increased benefit due to Combined Service. For members hired after July 1, 1989, retiring directly from active service, the circumstances under which the Combined Service provisions would come into play would be limited:

- The member has less than three years of St. Paul service and meets the three-year eligibility condition with the additional Combined Service.
- The member takes a St. Paul position late in their career at reduced pay, possibly moving from a teaching position to a teaching assistant position (sort of a phased retirement) and the salary at the prior position factors into the Final Average Salary.

Since the opportunities for the Combined Service to affect post-89 hires are much more limited without the Rule of 90, we feel that a load between 1.0% and 5.0% would be reasonable. We recommend reducing the load on active costs for this group from 7.0% to 2.0%.

OTHER ASSUMPTIONS

Deferred benefit commencement: Currently, Basic Plan members who terminate vested are assumed to commence benefits at age 60. Coordinated Plan members are assumed to commence benefits at age 63. Data for current retirees who retired from deferred status shows an average retirement age of 60.9 for Basic Plan retirees and 62.2 for Coordinated Plan members. Accordingly, we recommend changing to assumed benefit commencement ages of 61 and 62, respectively.

Marital status: Currently, it is assumed that 85% of male members and 60% of female members have an eligible spouse. The male spouse is assumed to be four years older than the female spouse. Married members are assumed to have two dependent children. Data for active members 45 years and older showed that 69% of males and 58% of females were married, with the male, on average, 1.92 years older than the spouse. We propose to assume that 75% of male members and 60% of female members have an eligible spouse, with a male spouse two years older than the female

spouse. No change is recommended for the dependent children assumption since no data is available upon which to base a recommendation.

The valuation assumes that the *optional form factors* are actuarial equivalent and no assumption is needed for benefit election. If the Board decides not to update the actuarial equivalence factors, we will need to reexamine this assumption and make a recommendation to account for this in the liabilities.

The *early retirement augmentation factors* (combination of early retirement reduction and augmentation) used in determining the valuation results were determined using the proposed assumptions. If the Board decides not to update the early retirement augmentation factors, we will need to update the valuation results to reflect the use of the old factors.

The *Cost of Living Adjustment* assumption is currently 1.0% per year. The benefit provisions reflect increased Cost of Living Adjustments when the Fund reaches an 80% funding level. We have included 30-year projections in Section IV of the report. This projections show a steadily declining funding level given the current statutory contribution schedule, thus we recommend no change to this assumption at this time.

ACTUARIAL METHODS

Salary history was collected for the past 10 years to fill in missing salary information for current deferred vested members where possible. This makes it possible to value an annuity benefit rather than just accumulated contributions. While there are still some deferred vested that terminated over 10 years ago with missing salary information, this is a refinement over the prior data set.

The Standards for Actuarial Work established by the State of Minnesota Legislative Commission on Pensions and Retirement require that the *Entry Age Normal Cost Method* be used. This method is designed to keep the normal cost level as a percent of payroll and is appropriate for SPTRFA.

The *asset valuation method* is prescribed in statute 356.215, Subdivision 1, Paragraph (f). It is a five-year smoothing of market value returns. This is a commonly used method in the public sector and is appropriate for SPTRFA.

We have incorporated recommendations from the most recent audit report and made minor technical changes in the valuation of member contribution account balances.

The census data as of July 1, 2011, reflects retirements and terminations occurring during the months of May and June; however, does not necessarily reflect the replacements hired to fill their position who may have hire dates in August and September. This results in an underestimation of the *Projected Covered Payroll* and the dollar normal cost (the normal cost rate is not impacted). It also results in an overestimate of the supplemental amortization rate (the dollar amount is not impacted). We recommend assuming the May and June retirements are replaced by members coming in at the

B.A. Step 1 salary level and augmenting the *Projected Covered Payroll* by this amount. The dollar normal cost and supplemental amortization rate are adjusted accordingly.

SECTION IV

ACTUARIAL IMPACT OF RECOMMENDATIONS

Determination of Unfunded Actuarial Accrued Liability and Supplemental Contribution Rate as of July 1, 2011 ($ in thousands)

	Baseline Valuation	Change Demographic Assumptions	Change Demographic and Economic Assumptions
A. DETERMINATION OF ACTUARIAL ACCRUED LIABILITY (AAL)			
1. Active Members*			
a. Retirement Benefits	$ 397,745	$ 387,797	$ 435,526
b. Disability Benefits	3,931	6,557	7,178
c. Surviving Spouse and Child Benefits	5,552	5,295	5,911
d. Vested Withdrawals	(3,976)	(2,535)	(802)
e. Refunds	(9,347)	(9,311)	(9,247)
f. Total	$ 393,905	$ 387,802	$ 438,567
2. Deferred Retirements	$ 54,475	$ 70,456	$ 78,320
3. Former Members Without Vested Rights	2,490	3,802	3,802
4. Annuitants	939,005	962,672	1,038,246
5. Total	$ 1,389,875	$ 1,424,731	$ 1,558,935
B. DETERMINATION OF UNFUNDED ACTUARIAL ACCRUED LIABILITY (UAAL)			
1. Actuarial Accrued Liability (A.5)	$ 1,389,875	$ 1,424,731	$ 1,558,935
2. Current Assets	$ 972,718	$ 972,718	$ 972,718
3. Unfunded Actuarial Accrued Liability (B.1 - B.2)	$ 417,157	$ 452,013	$ 586,217
4. Funded Ratio (B.2/B.1)	70.0%	68.3%	62.4%
C. DETERMINATION OF SUPPLEMENTAL CONTRIBUTION RATE			
1. Present Value of Future Payrolls Through the Amortization Date of June 30, 2036 (25-year rolling amortization)	3,975,095	4,083,901	4,033,558
2. Supplemental Contribution Rate (B.3 / C.1)	10.49%	11.07%	14.53%

**Includes members on leave of absence.*

Determination of Contribution Sufficiency as of July 1, 2011
($ in thousands)

	Baseline Valuation		Change Demographic Assumptions		Change Demographic and Economic Assumptions	
	Percent of Payroll	**Dollar Amount**	**Percent of Payroll**	**Dollar Amount**	**Percent of Payroll**	**Dollar Amount**
A. STATUTORY CONTRIBUTIONS - CHAPTER 354A						
1. Employee Contributions	5.78%	$ 13,838	5.78%	$ 14,215	5.78%	$ 14,085
2. Employer Contributions	8.63%	$ 20,661	8.63%	$ 21,224	8.63%	$ 21,030
3. Supplemental Contribution						
a. 1996 Legislation	0.51%	1,230	0.50%	1,230	0.50%	1,230
b. 1997 Legislation	1.18%	2,827	1.15%	2,827	1.16%	2,827
4. Total	16.10%	$ 38,556	16.06%	$ 39,496	16.07%	$ 39,171
B. REQUIRED CONTRIBUTIONS - CHAPTER 356						
1. Normal Cost						
a. Retirement Benefits	5.97%	$ 14,291	6.06%	$ 14,905	6.87%	$ 16,759
b. Disability Benefits	0.11%	$ 261	0.17%	$ 421	0.19%	$ 461
c. Surviving Spouse and Child Benefits	0.13%	$ 313	0.12%	$ 288	0.13%	$ 321
d. Vested Withdrawals	0.94%	$ 2,259	1.09%	$ 2,687	1.23%	$ 2,993
e. Refunds	0.44%	$ 1,041	0.50%	$ 1,241	0.51%	$ 1,246
f.. Total	7.59%	$ 18,165	7.94%	$ 19,542	8.93%	$ 21,779
2. Supplemental Contribution Amortization	10.49%	25,124	11.07%	27,238	14.53%	35,424
3. Allowance for Administrative Expenses	0.29%	694	0.29%	713	0.29%	707
4. Total	18.37%	$ 43,983	19.30%	$ 47,494	23.75%	$ 57,911
C. CONTRIBUTION SUFFICIENCY / (DEFICIENCY) (A.4 - B.4)	(2.27%)	(5,427)	(3.24%)	(7,998)	(7.68%)	(18,739)
Projected Annual Payroll for Fiscal Year Beginning on the Valuation Date:		$ 239,501		$ 246,057		$ 243,802

Incremental Impact to Valuation Results as of July 1, 2011 for Individual Assumption Changes
($ in millions)

	Unfunded Accrued Liability (1)	Funded Ratio (2)	Normal Cost Rate (3)	Supplemental Amortization Rate (4)	Required Contribution Rate (5)	
Baseline Valuation Results	$417.2	70.0%	7.59%	10.49%	18.37%	*
Assumption Changed						
1. Mortality	32.4	-1.6%	0.13%	0.82%	0.95%	
2. Retirement	0.1	0.0%	0.02%	0.00%	0.02%	
3. Termination	(0.1)	0.0%	-0.15%	0.00%	-0.15%	
4. Disability	0.1	0.0%	0.01%	0.00%	0.01%	
5. Service-based Salary Increase	(0.8)	0.0%	0.21%	-0.06%	0.15%	
6. Rate of Return	161.7	-7.0%	2.54%	2.63%	5.17%	
7. Other**	(1.1)	0.1%	-0.48%	-0.35%	-0.83%	
8. Payroll growth/ Underlying wage inflation	(23.3)	0.9%	-0.94%	1.00%	0.06%	
Final Recommendation	$586.2	62.4%	8.93%	14.53%	23.75%	*

**=(3) + (4) + 0.29% for admin expenses*
***Includes:*
- *Reduced Combined Service Load*
- *Marriage and Age Difference Assumption*
- *Deferred Benefit Commencement Age*
- *Improved Deferred Vested Salary Information*
- *Augmented Projected Payroll to Account for End of Year Retiree Replacements (new hires)*

In order to study the 1.0% COLA assumption which is contingent on the funded ratio of the Fund, we performed a 30-year projection using the recommended assumption set. We assumed there is no population growth (active member counts remain constant). The projection shows that under the recommended assumption set and assuming that statutory contributions continue as currently legislated, the Fund undergoes a steady decline in funded ratio. While the statutory contribution rates more than cover the normal cost rate for benefits being accrued by active members, the contribution rates are not enough to pay the normal cost rate and pay down the unfunded liabilities. The interest on the unfunded liabilities exceeds the remainder of the statutory contribution after paying the normal cost and the administrative expenses, thus the unfunded liabilities continue to grow over time. The assets decline from $950.1 to $631.8 million in nominal terms but the real decline, adjusted for inflation, is much greater.

Valuation Results ($ in millions)										Assets and Cash Flows ($ in millions)				
Valuation Date July 1,	Projected Payroll	Actuarial Value of Assets	Actuarial Accrued Liability	Funded Ratio	Normal Cost Rate*	Supp. Amort. Rate	Required Contrib. Rate	Statutory Contrib. Rate	Surplus/ (Shortfall)	Market Value of Assets	Following Valuation Date			
											EE Contribs.	ER Contribs.	Supp. Contribs.	Ben. Payments and Admin. Exp.
2011	$243.8	$972.7	$1,558.9	62.4%	9.22%	14.53%	23.75%	16.07%	-7.68%	$950.1	$14.1	$21.0	$4.1	$105.3
2012	253.4	917.1	1,586.9	57.8%	9.18%	15.98%	25.16%	16.48%	-8.68%	952.7	15.2	22.4	4.1	108.8
2013	261.6	896.0	1,614.5	55.5%	9.14%	16.60%	25.74%	16.91%	-8.83%	954.6	16.4	23.8	4.1	112.0
2014	269.8	930.3	1,641.8	56.7%	9.11%	15.94%	25.05%	17.36%	-7.69%	955.9	17.6	25.2	4.1	115.2
2015	278.3	956.6	1,668.7	57.3%	9.09%	15.46%	24.55%	17.31%	-7.24%	956.6	18.1	26.0	4.1	118.1
2016	287.1	955.9	1,695.8	56.4%	9.07%	15.57%	24.64%	17.26%	-7.38%	955.9	18.7	26.8	4.1	120.7
2017	296.4	953.7	1,723.0	55.4%	9.06%	15.69%	24.75%	17.21%	-7.54%	953.7	19.3	27.7	4.1	123.3
2018	306.3	950.3	1,750.8	54.3%	9.04%	15.80%	24.84%	17.17%	-7.67%	950.3	19.9	28.6	4.1	125.8
2019	316.4	945.6	1,779.0	53.2%	9.03%	15.92%	24.95%	17.12%	-7.83%	945.6	20.6	29.6	4.1	128.2
2020	327.0	939.8	1,807.9	52.0%	9.02%	16.05%	25.07%	17.08%	-7.99%	939.8	21.3	30.5	4.1	130.7
2021	338.2	932.6	1,837.6	50.8%	9.01%	16.17%	25.18%	17.04%	-8.14%	932.6	22.0	31.6	4.1	132.9
2022	350.2	924.5	1,868.6	49.5%	9.01%	16.29%	25.30%	17.00%	-8.30%	924.5	22.8	32.7	4.1	134.8
2023	363.0	915.8	1,901.4	48.2%	9.00%	16.41%	25.41%	16.96%	-8.45%	915.8	23.6	33.9	4.1	136.6
2024	376.3	906.6	1,936.2	46.8%	9.00%	16.54%	25.54%	16.92%	-8.62%	906.6	24.5	35.1	4.1	138.5
2025	390.2	896.9	1,973.0	45.5%	9.00%	16.67%	25.67%	16.88%	-8.79%	896.9	25.4	36.4	4.1	140.2
2026	404.8	887.1	2,012.3	44.1%	9.00%	16.80%	25.80%	16.84%	-8.96%	887.1	26.3	37.8	4.1	142.0
2027	419.9	877.0	2,054.2	42.7%	9.01%	16.95%	25.96%	16.81%	-9.15%	877.0	27.3	39.2	4.1	143.8
2028	435.6	866.7	2,098.8	41.3%	9.01%	17.10%	26.11%	16.77%	-9.34%	866.7	28.3	40.7	4.1	145.7
2029	451.8	856.4	2,146.3	39.9%	9.02%	17.26%	26.28%	16.74%	-9.54%	856.4	29.4	42.2	4.1	147.8
2030	468.4	845.7	2,196.7	38.5%	9.03%	17.43%	26.46%	16.71%	-9.75%	845.7	30.4	43.8	4.1	150.3
2031	485.6	834.4	2,249.9	37.1%	9.03%	17.62%	26.65%	16.68%	-9.97%	834.4	31.6	45.4	4.1	153.2
2032	503.4	822.0	2,305.7	35.7%	9.04%	17.82%	26.86%	16.65%	-10.21%	822.0	32.7	47.0	4.1	156.5
2033	521.8	808.3	2,364.1	34.2%	9.05%	18.02%	27.07%	16.62%	-10.45%	808.3	33.9	48.7	4.1	160.0
2034	541.0	792.9	2,425.0	32.7%	9.06%	18.23%	27.29%	16.59%	-10.70%	792.9	35.2	50.5	4.1	163.5
2035	561.1	775.9	2,488.7	31.2%	9.07%	18.45%	27.52%	16.56%	-10.96%	775.9	36.5	52.4	4.1	167.2
2036	582.2	757.1	2,555.2	29.6%	9.08%	18.67%	27.75%	16.54%	-11.21%	757.1	37.8	54.4	4.1	171.1
2037	604.3	736.2	2,624.8	28.0%	9.08%	18.89%	27.97%	16.51%	-11.46%	736.2	39.3	56.4	4.1	175.2
2038	627.6	713.1	2,697.5	26.4%	9.09%	19.11%	28.20%	16.49%	-11.71%	713.1	40.8	58.6	4.1	179.2
2039	652.1	688.0	2,773.8	24.8%	9.09%	19.34%	28.43%	16.46%	-11.97%	688.0	42.4	60.9	4.1	183.1
2040	677.7	661.0	2,854.2	23.2%	9.09%	19.56%	28.65%	16.44%	-12.21%	661.0	44.1	63.3	4.1	187.3
2041	704.9	631.8	2,938.7	21.5%	9.10%	19.78%	28.88%	16.42%	-12.46%	631.8	45.8	65.8	4.1	191.1

**Includes 0.29% of payroll for administrative expenses*

Actuarial Factors

In addition to updating the actuarial assumptions used in the actuarial valuations (beginning with valuations as of July 1, 2012), it is our recommendation that all actuarial factors be updated to reflect these new assumptions. Examples of such assumptions include:

- Benefit option factors (joint and survivor, etc.)
- Early retirement factors

As a matter of administrative convenience and practicality, it may be prudent to delay the effective date past July 1st, 2012.

SECTION V

SUMMARY OF NEW ASSUMPTIONS

I. ACTUARIAL COST METHOD

An Actuarial Cost Method is a set of techniques used by the actuary to develop contribution levels under a retirement plan. The Actuarial Cost Method used in this valuation for all purposes is the Entry Age Actuarial Cost Method. Under this Method, a Normal Cost is developed by amortizing the actuarial value of benefits expected to be received by each active participant (as a level percentage of pay) over the total working lifetime of that participant, from hire to termination.

To the extent that current assets and future Normal Costs do not support participants' expected future benefits, an Unfunded Actuarial Accrued liability ("UAAL") develops. The UAAL is amortized over the statutory amortization period using level percent of payroll assuming payroll increases of 4.00% per annum. The total contribution developed under this method is the sum of the Normal Cost and the payment toward the UAAL.

II. CURRENT ACTUARIAL ASSUMPTIONS

A. Demographic Assumptions

1. Healthy Pre-Retirement Mortality:
    a. Male: RP-2000 Combined Mortality Table for males projected with Scale AA to 2020 set back 1 year
    b. Female: RP-2000 Combined Mortality Table for females projected with Scale AA to 2020 set back 3 years
2. Disabled Mortality:
    i. Male: RP-2000 Disabled Life Mortality Table for males
    ii. Female: RP-2000 Disabled Life Mortality Table for females

Deaths Expressed as the Number of Occurrences per 10,000:

	Healthy Mortality		Disabled Mortality	
Age	**Male**	**Female**	**Male**	**Female**
20	2	1	226	74
25	3	1	226	74
30	4	2	226	74
35	6	3	226	74
40	9	4	226	74
45	11	6	226	74
50	14	9	290	115
55	21	15	354	165
60	43	31	420	218
65	85	60	502	280
70	149	110	626	376
75	251	183	821	522
80	464	296	1094	723
85	867	489	1416	1002
90	1505	889	1834	1400

3. Rates of Disability:

Sample Disability Rates Expressed as the Number of Occurrences per 10,000:

Age	Disability	Age	Disability
20	2	45	5
25	2	50	10
30	3	55	20
35	3	60	40
40	3	65	40

4. Rates of Termination:

Years of Service	Number of Terminations per 1,000 Active Members	
	Male	Female
0	400	400
1	180	180
2	140	140
3	100	100
4	60	67
5	50	59
6	45	51
7	41	43
8	37	35
9	33	31
10	29	27
11	25	23
12	20	19
13	20	15
14	20	13
15& Over	20	13

5. Rates of Retirement:

Retirements Expressed as the Number of Occurrences per 10,000:

Age	Basic Members Eligible for Rule of 90 Provision	Basic Members Not Eligible for Rule of 90 Provision	Male Coordinated Members Eligible for Rule of 90	Male Coordinated Members Not Eligible for Rule of 90 Provision	Female Coordinated Members Eligible for Rule of 90	Female Coordinated Members Not Eligible for Rule of 90 Provision
55	5,000	800	3,500	700	3,500	500
56	5,000	1,300	3,500	700	3,500	500
57	4,000	1,300	3,500	700	3,500	500
58	4,000	1,800	3,500	700	3,500	500
59	3,500	1,800	3,500	700	3,500	500
60	3,500	2,000	3,500	1,100	3,500	800
61	3,500	2,000	3,500	1,500	3,500	1,100
62	3,500	4,000	3,500	1,900	3,500	1,400
63	3,500	4,000	3,500	2,300	3,500	1,900
64	4,000	4,000	3,500	2,700	4,000	2,400
65	5,000	5,000	3,500	3,100	5,000	3,500
66	3,000	5,000	3,500	3,500	5,000	3,500
67	3,000	5,000	3,500	3,500	5,000	3,500
68	3,000	5,000	3,500	3,500	5,000	3,500
69	3,000	5,000	3,500	3,500	5,000	3,500
70 & Over	10,000	10,000	10,000	10,000	10,000	10,000

B. Economic Assumptions

Investment Return Rate: 7.50% per annum

Cost of Living Increases: 1.00% per annum

Future Salary Increases: In addition to the age-based rates shown below, during the first ten years of employment, a service-based component of 0.20% x (15-T), where T is completed years of service, is included in the salary increase used.

Annual Salary Increases

Age	Ultimate Rate of Annual Salary Increases	Age	Ultimate Rate of Annual Salary Increases
<22	6.90%	45	5.75%
23	6.85	46	5.70
24	6.80	47	5.65
		48	5.60
25	6.75	49	5.55
26	6.70		
27	6.65	50	5.50
28	6.60	51	5.45
29	6.55	52	5.40
		53	5.35
30	6.50	54	5.30
31	6.45		
32	6.40	55	5.25
33	6.35	56	5.20
34	6.30	57	5.15
		58	5.10
35	6.25	59	5.05
36	6.20		
37	6.15	60 & Over	5.00
38	6.10		
39	6.05		
40	6.00		
41	5.95		
42	5.90		
43	5.85		
44	5.80		

Salary increases shown include wage inflation of 4.0% per annum.

Asset Value: The actuarial value of assets is smoothed by using a five-year average market value.

C. Other Assumptions

Marital Status:	It is assumed that 75% of male members and 60% of female members have an eligible spouse. The male spouse is assumed two years older than the female spouse. Married members are assumed to have two dependent children.
Deferred Benefit Commencement:	Basic Plan members who terminate vested are assumed to commence benefits at age 61. Coordinated Plan members are assumed to commence benefits at age 62. If the member is already past the assumed deferral age, the member is assumed to commence benefits one year from the valuation date.
Administrative Expenses:	Prior year administrative expenses (excluding investment expenses) expressed as a percentage of prior year payroll.
Allowance for Combined Service Annuity:	7.00% load on liabilities for active members hired before July 1, 1989; 2.00% load on liabilities for active members hired after July 1, 1989; and 30.00% load on liabilities for former members.
Missing Salary and Salary Minimums:	Active members with reported salaries of $100 or less were assumed to have the average non-zero active salary. Deferred vested members without salary information were valued using accumulated contributions. For members on leave of absence at valuation date who were not on leave at the prior valuation date, the prior year's valuation pay was used. Active members with salaries less than those reported at the prior valuation date are valued using their prior salary amount.
Supplemental Contributions:	According to 1996 legislation, the St. Paul School District and the State of Minnesota are scheduled to make a combined annual supplemental contributions of $1,230,000. According to 1997 legislation, annual supplemental contributions of $2,827,000 are scheduled to be paid on October 1.
Decrement Timing:	Retirement and Termination: end of year - consistent with retirements and terminations occurring at the end of the school year. Death and Disability: middle of year.

APPENDIX

SUMMARY OF DATA AND EXPERIENCE

Male Retiree Mortality Experience - Year by Year						
Year	Exposure	Actual Decrements	Expected Decrements Current	Expected Decrements Proposed	Actual/ Expected Current	Actual/ Expected Proposed
2007	928	26	25.4	24.1	102%	108%
2008	949	31	27.1	25.9	114%	120%
2009	963	22	27.5	26.2	80%	84%
2010	983	24	29.3	28.4	82%	85%
2011	1000	40	30.4	29.3	132%	137%
Total	4823	143	139.7	133.9	102%	107%

Female Retiree Mortality Experience - Year by Year						
Year	Exposure	Actual Decrements	Expected Decrements Current	Expected Decrements Proposed	Actual/ Expected Current	Actual/ Expected Proposed
2007	1391	25	31.1	26.5	80%	94%
2008	1482	18	33.0	28.1	54%	64%
2009	1572	32	35.7	30.3	90%	106%
2010	1632	32	36.4	30.8	88%	104%
2011	1721	47	38.3	32.4	123%	145%
Total	7798	154	174.5	148.1	88%	104%

Disability Experience - Year by Year						
Year	Exposure	Actual Decrements	Expected Decrements Current	Expected Decrements Proposed	Actual/ Expected Current	Actual/ Expected Proposed
2007	3383	3	2.3	3.2	132%	94%
2008	3326	5	2.3	3.3	215%	153%
2009	3290	1	2.4	3.4	41%	30%
2010	3296	4	2.5	3.4	163%	116%
2011	3221	8	2.4	3.4	327%	233%
Total	16516	21	11.9	16.7	176%	126%

Male Termination Experience - Year by Year						
Year	Exposure	Actual Decrements	Expected Decrements Current	Expected Decrements Proposed	Actual/ Expected Current	Actual/ Expected Proposed
2007	187.9	11.6	6.2	7.3	188%	160%
2008	197.9	5.8	5.8	7.0	99%	82%
2009	207.4	8.8	6.1	7.4	144%	120%
2010	199.2	7.1	5.5	6.7	129%	106%
2011	197.7	9.0	5.3	6.4	170%	141%
Total	990.1	42.3	28.9	34.7	146%	122%

Female Termination Experience - Year by Year						
Year	Exposure	Actual Decrements	Expected Decrements Current	Expected Decrements Proposed	Actual/ Expected Current	Actual/ Expected Proposed
2007	565.3	30.8	16.8	20.5	183%	150%
2008	556.0	25.4	15.8	19.2	161%	132%
2009	572.4	18.7	15.8	19.4	118%	96%
2010	574.1	23.1	14.9	18.9	155%	122%
2011	569.5	21.2	14.1	18.0	150%	118%
Total	2,837.3	119.2	77.4	96.0	154%	124%

Male Retirement Experience, Not Eligible for Rule of 90 - Year by Year						
Year	Exposure	Actual Decrements	Expected Decrements Current	Expected Decrements Proposed	Actual/ Expected Current	Actual/ Expected Proposed
2007	219.8	22.6	18.2	22.4	124%	101%
2008	238.5	15.0	20.0	24.8	75%	61%
2009	261.6	29.2	25.2	29.5	116%	99%
2010	284.5	39.6	26.6	31.9	149%	124%
2011	269.3	42.5	24.8	29.7	172%	143%
Total	1,273.8	148.9	114.7	138.3	130%	108%

Male Retirement Experience, Eligible for Rule of 90 - Year by Year						
Year	Exposure	Actual Decrements	Expected Decrements Current	Expected Decrements Proposed	Actual/ Expected Current	Actual/ Expected Proposed
2007	57.1	5.4	22.5	20.0	24%	27%
2008	76.3	18.1	29.5	26.7	61%	68%
2009	95.9	26.4	38.2	33.6	69%	79%
2010	89.5	24.5	35.1	31.3	70%	78%
2011	98.7	44.8	41.8	36.9	107%	121%
Total	417.5	119.2	167.1	148.5	71%	80%

Female Retirement Experience, Not Eligible for Rule of 90 - Year by Year						
Year	Exposure	Actual Decrements	Expected Decrements Current	Expected Decrements Proposed	Actual/ Expected Current	Actual/ Expected Proposed
2007	735.6	56.2	65.7	62.9	86%	89%
2008	819.5	55.9	75.3	71.5	74%	78%
2009	917.8	76.8	89.9	84.8	85%	91%
2010	994.7	72.9	97.1	93.5	75%	78%
2011	1,032.0	148.4	104.0	101.1	143%	147%
Total	4,499.7	410.3	432.0	413.8	95%	99%

Female Retirement Experience, Eligible for Rule of 90 - Year by Year						
Year	Exposure	Actual Decrements	Expected Decrements Current	Expected Decrements Proposed	Actual/ Expected Current	Actual/ Expected Proposed
2007	124.6	60.6	48.5	48.4	125%	125%
2008	131.4	44.0	53.2	48.5	83%	91%
2009	182.5	46.4	72.1	69.4	64%	67%
2010	227.6	63.9	89.0	85.2	72%	75%
2011	302.4	142.4	117.7	114.8	121%	124%
Total	968.5	357.2	380.6	366.4	94%	97%