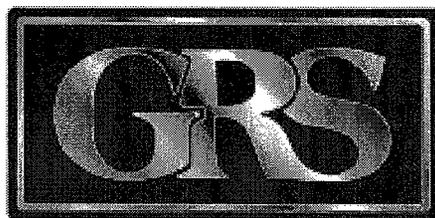




**NORTH DAKOTA
RETIREMENT AND
INVESTMENT OFFICE**

*Teachers' Fund for Retirement
State Investment Board*

*Actuarial Experience Study
For The Five-Year Period
Ending June 30, 2004*





GABRIEL, ROEDER, SMITH & COMPANY

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March 10, 2005

Board of Trustees
North Dakota Teachers' Fund for Retirement
P.O. Box 7100
Bismarck, ND 58507-7100

Subject: Results of 2004 Actuarial Experience Study

Dear Members of the Board:

We are pleased to present our report on the results of the 2004 Actuarial Experience Study of the North Dakota Teachers' Fund for Retirement (TFFR). It includes a discussion of experience during the last five years, it presents our recommendations for new actuarial assumptions and methods, and it provides information about the actuarial impact of these recommendations on the margin and other key actuarial measures.

With the Board's approval of the recommendations in this report, we believe the actuarial condition of the System will be more accurately portrayed.

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

Sincerely,
Gabriel, Roeder, Smith & Company

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TABLE OF CONTENTS

		<u>Page</u>
	Cover Letter	
Section I	Introduction.....	2
Section II	Analysis of Experience and Recommendations.....	4
Section III	Actuarial Impact of Recommendations.....	13
Section IV	Summary of Recommendations	15
Section V	Summary of Assumptions and Methods, Incorporating Recommended Assumptions	17

SECTION I
INTRODUCTION

Section I

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
- Turnover rates
- Disability rates
- Investment return rate
- Salary increase rates

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.

For this purpose, therefore, we have reviewed and analyzed TFFR's data for the period from June 30, 1999, through June 30, 2004. (In examining salary increase rates, however, we used the 10-year period from June 30, 1994 through June 30, 2004, in order to smooth some of the year-to-year fluctuations and in order to increase the soundness of our conclusions.) In our view, performing such experience reviews on a five-year interval is reasonable. Sufficient data can be gathered over a five-year period so that the results have statistical significance. Legislation, such as plan improvements or changes in statewide salary schedules, can sometimes affect the results; using a five-year period prevents giving too much weight to such short-term effects. Using a much longer period, on the other hand, could water down real changes that may be occurring, such as mortality improvement or a change in the ages at which teachers retire.

In an experience study, we first determine the number of deaths, retirements, etc. that occurred during the period. Then we determine the number expected based on the current actuarial assumptions. 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 100.0%. When it varies much from this figure, it is a sign that new assumptions may be needed.

Of course we not only look at the assumptions as a whole, but we also review how well they fit the actual results by sex, by age, and by service.

Finally, the actuary "graduates" or smoothes the results, since the raw results can be quite uneven from age to age or from service to service.

SECTION II

**ANALYSIS OF EXPERIENCE
AND RECOMMENDATIONS**

Section II

Analysis of Experience and Recommendations

We will begin by discussing the economic assumptions: inflation, the investment return rate, and the salary increase assumption. Then we will discuss the demographic assumptions: mortality, disability, termination and retirement. Finally we will discuss the actuarial methods used.

Inflation rate

By “inflation,” we mean price inflation, as measured by increases in the Consumer Price Index (CPI). The inflation assumption underlies all the other economic assumptions. It impacts both investment return and salary increases. The current inflation assumption is 3.00%.

Over the five-year period from June 1999 through June 2004, the CPI-U has increased at an average rate of 2.68%, and over the last ten years it has averaged 2.51% per year. The average over longer periods is shown in the table below.

Periods Ending June 2004	Average Increase in CPI-U
Last five (5) years	2.68%
Last ten (10) years	2.51%
Last fifteen (15) years	2.87%
Last twenty (20) years	3.07%
Last twenty-five (25) years	3.93%
Last fifty (50) years	3.98%
Since 1913 (91 years)	3.31%

As you can see, while inflation has been relatively low over the last five or ten years, if we look back over a period of 20 or more years, inflation has averaged above 3.00%.

We recognize that most of the investment consulting firms, in setting their capital market assumptions, currently assume that inflation will be less than 3.00%. For example, Callan assumes 2.60%, Watson Wyatt assumes 2.80%, and Wilshire assumes 2.25%. However, the investment consulting firms usually set assumptions based on a five or ten year outlook, while actuaries must make much longer projections.

Another source for predicting future inflation is the treasury bond market. The current inflation indexed bond yields for bonds maturing in 2032 is 1.85% plus actual inflation. The yield for long non-indexed treasury bonds maturing in 2031 is 4.74%. This means that the bond market is predicting long term (25 + years) inflation of about 2.89% (4.74 – 1.85).

The Public Funds survey prepared by Keith Brainard on behalf of NASRA and NCTR shows that the median inflation rate assumed for large statewide retirement systems is 3.75%, and that our current 3.00% assumption is among the lowest.

We believe that inflation over the next few years may continue to be less than 3.00%, but believe it would be more prudent to assume a 3.00% rate of inflation over the long term. This is in line with the average for the last 20 years, and a little below the long-term historical average. Therefore, we are not recommending a change in this assumption.

Investment return rate

Currently, we assume that future investment returns will average 8.00% per year, net of investment and administrative expenses. This is the rate used in discounting future payments in order to determine the actuarial present value of those payments. Since we assume that future inflation will average 3.00%, this means we anticipate a 5.00% real return, net of expenses.

While TFFR's average market return for the five years ending June 30, 2004 was only about 2.7%, over both the last ten years and the last fifteen years, TFFR has averaged an 8.4% return. These figures are gross returns, and must be reduced for the effect of investment and administrative expenses, which have averaged just over 0.4% of assets for these periods. Therefore, for the last ten and fifteen years, TFFR's net returns have averaged right about 8.00%.

However, for this assumption, past performance, even averaged over a ten- or a fifteen-year period, is not a reliable indicator of future performance. The asset allocation of the trust will impact the overall performance, so returns achieved under a different allocation are not meaningful. More significantly, though, the real rates of return for many asset classes, especially equities, vary so dramatically from year to year that even a fifteen-year period may not be long enough to provide reasonable guidance.

We have modeled the expected return for TFFR, given its current asset allocation, using various sets of capital market assumptions set by different investment consulting firms for 2005. These produce expected portfolio returns in the range from just under 8.00% to just over 9.00%. Then we have reduced the returns to reflect the fact that the fund's administrative and investment expenses have averaged about 0.45% over the last five years. The net returns, therefore, are forecast to fall somewhere between 7.25% and 8.75%. These different capital market assumptions generally have a lower inflation assumption, resulting in a net real return forecast of 5.00% to 6.15%. Our assumed net real return is 5.00%.

We have decided to recommend no change to the assumed investment return rate, because we believe that 8.00% is still roughly in the middle of the range of expected net returns produced using various investment consulting firms' capital market assumptions. The public plan survey mentioned previously shows that 8.00% remains the median investment return assumption for statewide retirement systems. However, because most investment consulting firms have reduced their expected returns for most asset classes, including traditional domestic equities and domestic fixed income investments, the current assumption is less conservative than it was five or ten years ago.

You should also keep in mind that actual returns can vary significantly from this assumption. For example, a Monte Carlo simulation on one of the capital market assumption sets produces a median net return of about 7.8%. The same analysis shows that even over a period as long as 20 years, there is still about a 25% chance that the average net return for the period could exceed 9.6% and about a 25% chance that it could be less than 6.1%.

Salary increase rates

In order to project future benefits, the actuary must project future salary increases. For the analysis of this assumption, we used data over the last ten years, rather than just the last five years, since in our experience, salary increases tend to vary significantly from year to year, and a longer period provides a more accurate picture.

The current salary increase rates vary by service. They range from 13.00% for new teachers to 4.00% for the teachers with 15 or more years of service. The average increase, taking into account TFFR's age/service distribution, is about 5.2%.

Salaries may increase for a variety of reasons:

- Across-the-board increases provided by the state for all teachers
- Across-the-board increases for all teachers in a district
- Increases to a statewide minimum teacher salary schedule
- Additional pay for additional duties, such as teaching in a summer program
- Step or service-related increases
- Increases for acquisition of advanced degrees or specialized training
- Promotions
- Bonuses, if available
- Merit increases, if available

Our salary increase assumption is meant to reflect all of these kinds of increases.

The actuary should not look at the overall increases in payroll in setting this assumption, because payroll can grow at a rate different from the average pay increase for individual members. There are two reasons for this. First, when older, longer-service members terminate, retire or die, they are generally replaced with new teachers who have a lower salary. Because of this, in most populations that are not growing in size, the growth in total payroll will be smaller than the average pay increase for members. Second, payroll can change due to an increase or decrease in the size of the group. Therefore, to analyze salary increases, we examine the actual increase in salary for each member who is active in two consecutive valuations.

Over the last ten years, the average pay increases for members active in both valuations were as follows:

Period	Increase
FY 1994 to FY 1995	4.16%
FY 1995 to FY 1996	4.98%
FY 1996 to FY 1997	4.45%
FY 1997 to FY 1998	4.91%
FY 1998 to FY 1999	5.54%
FY 1999 to FY 2000	5.99%
FY 2000 to FY 2001	5.34%
FY 2001 to FY 2002	6.56%
FY 2002 to FY 2003	7.42%
FY 2003 to FY 2004	5.01%
Average	5.44%

Increases for FY 2002 and FY 2003 were the largest in the last ten years, probably a reflection of the additional \$3,000 per teacher provided by the legislature for pay increases during that two-year period (\$1,000 in FY 2002 and an additional \$2,000 in FY 2003).

Salary increases are much larger for shorter-service employees than longer-service employees. Therefore, we have recommended the adoption of assumed salary increase rates which vary by service.

To determine the new rates, we first determined the average increase over the ten-year period for members grouped by service. Members with fifteen or more years of service were grouped together because additional service has only a very small effect on their increase rates. Next, we backed out actual inflation during the period (2.51%), arriving at the real rates of increase. We smoothed these rates, and then added back our assumed 3.00% inflation rate to arrive at the recommended rates. These new rates include an increase of 14.00% for new members after their first year of service, grading down to a 4.50% increase for members with 15 or more years of service. The average salary increase under the proposed schedule is 5.7%, which is a 50 basis point increase on average. The full schedule is shown in Section V.

The recommended assumption produces an average larger than the actual average for the last ten years, in part because we assume 3.00% inflation in the future while actual inflation was about 50 basis points less during the study period.

The change to the salary increase assumption was the single most significant recommendation to come out of the experience study. It accounts for most of the increase in costs and liabilities.

Post-retirement mortality

TFFR's liability depends 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 increase.

The mortality tables currently being used for non-disabled retirees and for beneficiaries receiving benefits are the 1994 Uninsured Pensioner Mortality Tables for males and females. These tables are then adjusted by using a two-year setback for males and a three-year setback for females. (Setbacks and setforwards are traditional actuarial techniques used to adjust a table to match the data. When a table is set back two years, the actuary uses the table's rate for an age two years younger. Therefore, the mortality rate used for a 60-year old male retiree is the rate in the 1994 Uninsured Pensioner Mortality Table for males at age 58.)

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. We generally want to keep the ratio for this assumption around 110% (i.e., 10% more deaths than expected) to introduce some conservatism, since we expect life expectancies to continue to increase in the future. When we prepared the last experience study five years ago, the A/E ratios were 111% for males and 113% for females.

The results of this analysis are shown below:

Retirees and beneficiaries (nondisabled)	Males	Females	Total
Number of actual deaths	229	733	962
Number of expected deaths (current assumptions)	227	596	823
A/E ratio	101%	123%	117%

As you can see, the A/E ratios have drifted from the 110% target that we aim for. This may reflect some real improvement for males, but we suspect some of the change is due to normal variability in results on groups this small. However, we have decided to recommend a change to both the male and female rates, since even if we combined results for the last ten years, the females would be above 110% and the males would be below 110%.

Therefore, we recommend that the mortality rates for nondisabled retirees and beneficiaries be changes to the 1994 Uninsured Pensioner Mortality Tables for males and females, with male rates set back three years (was two) and female rates set back two years (was three). On this basis, the A/E ratios become 111% for both males and females.

This change results in a very modest decrease in the costs and liabilities.

We also looked at mortality among the disabled retirees, but there were only eight deaths in this group. This is far too few to use in setting assumptions, so we recommend no change from the table currently being used. This is a published table derived from Social Security experience and used by the Pension Benefit Guaranty Corporation.

Active mortality

In the past, we have used the same mortality assumption for active members that we used for retirees and beneficiaries. This decision was made in part because this assumption has little impact on the valuation results. However, the reported number of active deaths during the last five years was 45, while the expected number was 69, for an A/E ratio of 65%. This difference is in line with what we have seen on other statewide retirement systems, so we have now decided to recommend modifying the active-member mortality rates by reducing them by 35%. This will produce an A/E ratio of 100%.

Disability

There were 40 members approved for a disability benefit during the five-year study period. Thirty of these retired during the period and ten were new retirees whose retirement dates were made retroactive to the sometime during the preceding five years. Over the last ten years there were a total of 86 disabled retirees vs. 101 expected and an A/E ratio of 85%. However, because it is common for the disability process to take some time, so the number of “actuals” could increase further, and because these are small numbers and variation is to be expected, we are not going to recommend a change in this assumption.

Termination

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 in the Fund. We are currently using separate tables for males and females. These tables are a function of both age and service. I.e., a female member age 35 with two years of service is expected to have a higher probability of termination than a female age 35 with eight years of service.

The current assumptions in the aggregate produce A/E ratios of 82% for both males and females. This suggests that the current rates are too high, and therefore understate the liability. This is because the current rates would predict that too many employees were terminating and receiving a refund, rather than remaining in service and receiving a retirement benefit. This continues a pattern we saw in the last study, when A/E ratios were under 100%. We made a decision five years ago to not recommend changing termination rates because the A/E ratios were around 90% at the time and because, for the members with ten or more years of service (a key group), they were over 100%. This time, though, A/E ratios have decreased further, and are now at 90% or below even for longer-service employees. Therefore, we are recommending reducing the termination rates by 20% for both males and females at all ages and services. This will produce an A/E ratio of 102% for both males and females.

This is the second most significant change recommended.

Retirement rates

We currently use rates of retirement that vary by age, sex and type of retirement (reduced or unreduced). In addition, we apply higher rates to members in the year they are first eligible for rule of 85 retirement, if this age is less than 65.

Our analysis showed about 1,250 retirees during the five-year period. This number excludes previously terminated members who are only now starting to draw their benefits, and it excludes members who retired effective July 1, 1999. There were six large groups of retirees in the five-year period. These occurred in July 1999, June 2000, July 2001, June 2002, June 2003, and June 2004. It was clear that most members who would have retired in June 1999 and June 2001 delayed their retirement by a month in order to receive the improved multipliers that became effective at those dates. If we did not exclude the July 1999 retirees, we would have had too many retirements to be representative of a five-year period.

A large portion of the TFFR retirees elect to retire at the end of the year in which they reach the rule of 85. During the study period, half the males retired at this point, as did 67% of the females. Our current assumptions produced an A/E ratio of 105% for males and 123% for females. In other words, more members were retiring at first eligibility than we were anticipating. Therefore, we recommend changing the assumption to assume that 50% of males retire when they reach the rule of 85 before age 65. For females, the recommended rate is 65% before age 65.

After first eligibility, we use separate age-related rates for males and females. The experience study showed that the ratio of retirements to expected retirements was 73% for males and 118% for females. As a result, we recommend modifying the rates to more closely track the data, by reducing some of the rates for males and increasing some of the rates for females. The new proposed rates are shown in Section V based on the recommended new retirement rates, the A/E ratios become 94% for males and 101% for females.

Finally, we examined the experience for reduced retirement. This is a minor assumption; less than one in ten retirees takes reduced retirement. Most of those who do retire with a reduced benefit wait until age 62 or later, when the early retirement reduction is smaller. The data showed A/E ratios of 167% and 87% for males and females respectively. Therefore, we recommend modifying the rates as shown in Section V. These recommended rates produce A/E ratios of 111% for males and 107% for females. (A ratio greater than 100% is slightly conservative.)

Revising the assumption also improves the match between the average age at which members retire and the expected retirement age. Based on the current assumptions, members were actually retiring a year or more younger than expected. The average retirement age for males is 58.1 and for females it is 58.9.

Other assumptions

There are other assumptions made in the course of a valuation, such as the percentage of members who are married, the age difference between husbands and wives, the likelihood that a terminating employee will take a refund, etc. We reviewed these, and decided to recommend no changes to these other assumptions.

Actuarial Cost Method

Although the actual contribution to TFFR is fixed by statute, we use the Entry Age actuarial funding cost method to determine the 20-year funding cost that is used both as the GASB Annual Required Contribution and as the Board's target contribution rate. The Entry Age method will generally produce relatively level contribution rates from year to year, and allocates costs among various generations of taxpayers in a reasonable fashion. It is far and away the most used actuarial cost method among statewide pension funds, and we recommend continuing to use this method.

New Entrant Profile

Under the particular version of the Entry Age actuarial funding method used for TFFR, we compute the normal cost for the plan based on a hypothetical population of new members. The population adopted during the last experience study was based on the age/sex/pay distribution of actual new members who joined TFFR during the 1999 fiscal year. We have updated this hypothetical population to reflect the actual distribution of new members who joined TFFR during the 2000 through 2004 fiscal years. The average hire age under the current profile is 31.4, while it is 31.6 under the proposed profile. In both profiles, 73% of new members are females. The average FY 2004 pay (annualized) for new members is \$23,987. We recommend changing to this updated "profile" of new members. This has almost no effect on the liabilities and costs, but reflects more current data.

Actuarial Value of Assets

Actuaries generally recommend using a smoothed actuarial value of assets (AVA), rather than market value (MVA), in order to dampen the fluctuations in measurements such as the margin and the funded status.

The current method smoothes all differences between the expected returns (based on the 8.00% investment return assumption) and actual returns, net of expenses, over a five-year period. For example, if the actual return is 13% in one year, then 8% is reflected immediately in the AVA, and the other 5% is recognized in 20% increments over five years.

As of June 30, 2004, the AVA was 105.2% of the MVA, because we are still smoothing losses from FY 2001, FY 2002 and FY 2003, which are not greater than the gain from FY 2004. (Note that a return less than 8.00% is considered a loss for this purpose, and a return greater than 8.00% is considered a gain.)

We continue to believe this method is appropriate. It does not distinguish between types of return (interest, dividends, realized gains/losses, and unrealized gains/losses), like some other methods. It treats different asset classes and different investment styles the same. We do not believe the method has a bias relative to market. In other words, we expect the ratio of the AVA to MVA to average about 100% over the very long term. Therefore, we are not recommending a change to this method.

SECTION III

**ACTUARIAL IMPACT
OF RECOMMENDATIONS**

Section III

Actuarial Impact of Recommendations

Shown below is a table that compares key results from the July 1, 2004 actuarial valuation with these same results redetermined using the recommended actuarial assumptions and methods. As you can see, the assumption changes produce a decrease of 242 basis points in the margin and a \$59.1 million increase in the unfunded actuarial accrued liability (UAAL).

Item	Current Assumptions and Methods	Recommended Assumptions and Methods	Increase/Decrease
Normal cost	10.29%	11.29%	1.00%
Unfunded actuarial accrued liability	\$354.8 million	\$413.9 million	\$59.1 million
Funded ratio	80.3%	77.7%	-2.6%
Funding period	Infinite	Infinite	NA
GASB 25 Annual Required Contribution	11.34%	13.76%	2.42%
Margin	-3.59%	-6.01%	-2.42%

The normal cost is the average expected cost for a typical new member. The normal cost includes both the 7.75% contribution paid by members and the balance to be paid by the employers. The unfunded actuarial accrued liability is the portion of the total present value of future benefits that is assigned to past years and is in excess of the actuarial value of assets. The funding period is the number of years that will be required to amortize the UAAL, assuming that the employer contribution rate remains at 7.75%, and assuming there are no gains, losses, benefit changes, assumption changes, etc. The amortization calculations are made assuming level payments. I.e., future payroll growth is ignored. The GASB annual required contribution is the 20-year funding rate that also serves as the Board's target rate. The margin is the excess (shortfall) between the actual employer contribution rate of 7.75% and the target rate.

Most of the increase in costs and liabilities is due to the change in our salary increase assumptions. The reduction in termination rates had a more minor effect, and the other items—retirement rates, mortality rates, and the updating of the new entrant profile—caused only very small changes.

The figures above were calculated as of July 1, 2004, using the same benefit provisions and the same member and financial data that were used to prepare the regular July 1, 2004 actuarial valuation report.

SECTION IV

SUMMARY OF RECOMMENDATIONS

Section IV

Summary of Recommendations

Our recommendations may be summarized as follows:

1. Change the salary increase assumption to the sum of (i) the 3.00% inflation assumption (unchanged), (ii) an additional 1.50% assumed increase applied to all members (increased from 1.00%), and (iii) a service-related increase applied to members with less than 15 years of service (modified), as shown in Section V.
2. Change the non-disabled post-retirement mortality assumption to the rates in the 1994 Uninsured Pensioner Mortality Table, set back three years for males and two years for females. (Previously the table used was the same 1994 Uninsured Pensioner Mortality Table, but set back two years for males and three years for females.)
3. Change the pre-retirement mortality rates from the same table used for nondisabled post-retirement mortality to 65% of those rates.
4. Decrease the termination assumptions for males and females by 20% at all ages and durations.
5. Change the retirement rates to new tables as shown in Section V, with rates a function of sex, age and type of retirement (reduced or unreduced).
6. Revise the age/sex/pay profile for new entrants—used to determine the normal cost—to one based on new members joining TFFR in fiscal years 2000 through 2004.

SECTION V

**SUMMARY AND COMPARISON
OF CURRENT AND RECOMMENDED
ACTUARIAL ASSUMPTIONS
AND METHODS**

Section V

SUMMARY AND COMPARISON OF CURRENT AND RECOMMENDED ACTUARIAL ASSUMPTIONS AND METHODS

ACTUARIAL ASSUMPTIONS

1. Investment Return Rate

Current: 8.00% per annum, compounded annually, composed of an assumed 3.00% inflation rate and a 5.00% real rate of return. The rate represents the return net of all administrative and investment expenses. (Adopted July 1, 1990; allocation between inflation and real rate of return modified July 1, 2000.)

Recommended: No Change

2. Mortality Rates

a. Post Retirement
Non-Disabled

Current: 1994 Uninsured Pensioner Mortality Table set back two years for males and three years for females. (Adopted July 1, 2000.)

Recommended: 1994 Uninsured Pensioner Mortality Table set back three years for males and set back two years for females.

b. Post Retirement
Disabled

Current: Pension Benefit Guaranty Corporation Disabled Life Mortality Tables Va and VIa.

Recommended: No Change

Age	Deaths per 100 Lives					
	Male Participants			Female Participants		
	Current <u>Non-Disabled</u>	Recommended <u>Non-Disabled</u>	<u>Disabled</u>	Current <u>Non-Disabled</u>	Recommended <u>Non-Disabled</u>	<u>Disabled</u>
20	.0495	.0463	4.83	.0281	.0293	2.63
25	.0633	.0598	4.83	.0311	.0313	2.63
30	.0811	.0782	3.62	.0324	.0338	2.37
35	.0912	.0902	2.78	.0427	.0454	2.14
40	.1010	.0958	2.82	.0593	.0643	2.09
45	.1454	.1346	3.22	.0888	.0943	2.24
50	.2260	.2042	3.83	.1196	.1297	2.57
55	.3854	.3455	4.82	.1864	.2051	2.95
60	.6774	.6001	6.03	.3139	.3612	3.31
65	1.2335	1.0911	6.78	.6271	.7179	3.70
70	2.1354	1.9391	7.39	1.1574	1.2648	4.11

c. Active mortality

Current: Same as post-retirement for nondisabled retirees

Recommended: Multiply nondisabled post-retirement rates by 65%

3. Retirement Rates

Current: The following rates of retirement are assumed for members eligible to retire. (Adopted July 1, 2000.)

Retirements Per 100 Members						
Age	Unreduced Retirement Ultimate Rate		Unreduced Retirement Initial Eligibility		Reduced Retirement*	
	Male	Female	Male	Female	Male	Female
50	17.0%	10.0%	40.0%	35.0%	0.0%	0.0%
51	17.5%	10.0%	40.0%	35.0%	0.0%	0.0%
52	18.0%	10.0%	40.0%	35.0%	0.0%	0.0%
53	18.5%	10.0%	40.0%	35.0%	0.0%	0.0%
54	19.0%	10.0%	40.0%	35.0%	0.0%	0.0%
55	19.5%	10.0%	50.0%	55.0%	2.0%	3.0%
56	20.0%	15.0%	50.0%	55.0%	2.0%	3.0%
57	20.5%	15.0%	50.0%	55.0%	2.0%	3.0%
58	21.0%	15.0%	50.0%	55.0%	2.0%	3.0%
59	21.5%	17.5%	50.0%	55.0%	2.0%	3.0%
60	25.0%	20.0%	75.0%	75.0%	4.0%	3.0%
61	50.0%	25.0%	50.0%	75.0%	16.0%	4.0%
62	75.0%	40.0%	75.0%	75.0%	30.0%	50.0%
63	60.0%	40.0%	60.0%	75.0%	16.0%	20.0%
64	60.0%	50.0%	60.0%	75.0%	16.0%	20.0%
65	60.0%	60.0%	60.0%	60.0%	--	--
66	40.0%	40.0%	40.0%	40.0%	--	--
67	40.0%	40.0%	40.0%	40.0%	--	--
68	40.0%	40.0%	40.0%	40.0%	--	--
69	40.0%	40.0%	40.0%	40.0%	--	--
70	100.0%	100.0%	100.0%	100.0%	--	--

* Rates are doubled for members who are closer to eligibility for the rule of 85, based on service at retirement, then they are to age 65.

3. Retirement Rates (con't)

Recommended: The following rates:

Retirements Per 100 Members				
Age	Unreduced Retirement Ultimate Rate*		Reduced Retirement	
	Male	Female	Male	Female
50	20.0%	25.0%	0.0%	0.0%
51	20.0%	25.0%	0.0%	0.0%
52	20.0%	25.0%	0.0%	0.0%
53	20.0%	25.0%	0.0%	0.0%
54	20.0%	25.0%	0.0%	0.0%
55	20.0%	25.0%	2.0%	1.5%
56	20.0%	25.0%	2.0%	1.5%
57	20.0%	25.0%	2.0%	1.5%
58	20.0%	25.0%	2.0%	1.5%
59	20.0%	20.0%	2.0%	1.5%
60	25.0%	25.0%	5.0%	2.0%
61	30.0%	30.0%	5.0%	2.0%
62	30.0%	50.0%	20.0%	10.0%
63	25.0%	25.0%	5.0%	5.0%
64	20.0%	50.0%	25.0%	20.0%
65	65.0%	50.0%	--	--
66	35.0%	30.0%	--	--
67	35.0%	30.0%	--	--
68	35.0%	30.0%	--	--
69	35.0%	30.0%	--	--
70	100.0%	100.0%	--	--

* If a member reaches eligibility for unreduced retirement under the rule of 85 before age 65, a retirement rate of 50.0% (for males) or 65.0% (for females) is used for that age only.

4. Disability Rates

Current: As shown below for selected ages.
(Adopted July 1, 2000.)

<u>Age</u>	<u>Disabilities Per 100 Members</u>
20	0.016
25	0.016
30	0.016
35	0.016
40	0.048
45	0.080
50	0.128
55	0.224
60	0.432
65	0.000

Recommended: No Change

5. Termination Rates

Current: The following withdrawal rates are used based on age. (For causes other than death, disability, or retirement.) (Adopted July 1, 1995.)

Males											
Age	Years of Service										
	0	1	2	3	4	5	6	7	8	9	10+
25	0.1420	0.1379	0.1366	0.1339	0.1220	0.1067	0.0896	0.0878	0.0860	0.0842	0.0598
30	0.1416	0.1376	0.1363	0.1336	0.1210	0.1053	0.0907	0.0889	0.0871	0.0853	0.0470
35	0.1359	0.1321	0.1308	0.1282	0.1141	0.0988	0.0867	0.0849	0.0832	0.0815	0.0343
40	0.1317	0.1280	0.1267	0.1243	0.1074	0.0928	0.0824	0.0808	0.0791	0.0775	0.0252
45	0.1282	0.1246	0.1234	0.1210	0.1002	0.0868	0.0777	0.0761	0.0746	0.0730	0.0196
50	0.1246	0.1211	0.1199	0.1176	0.0916	0.0809	0.0725	0.0710	0.0696	0.0681	0.0188
55	0.1444	0.1403	0.1390	0.1362	0.0974	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
60	0.1588	0.1544	0.1529	0.1499	0.1071	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
65	0.1747	0.1698	0.1681	0.1648	0.1178	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

Females											
Age	Years of Service										
	0	1	2	3	4	5	6	7	8	9	10+
25	0.1654	0.1607	0.1592	0.1560	0.1307	0.1119	0.0952	0.0806	0.0790	0.0774	0.0352
30	0.1373	0.1334	0.1321	0.1295	0.1107	0.0964	0.0836	0.0738	0.0723	0.0708	0.0312
35	0.1143	0.1110	0.1100	0.1078	0.0926	0.0820	0.0732	0.0672	0.0658	0.0645	0.0275
40	0.0978	0.0951	0.0941	0.0923	0.0779	0.0695	0.0637	0.0607	0.0595	0.0583	0.0242
45	0.0910	0.0885	0.0876	0.0859	0.0686	0.0593	0.0553	0.0545	0.0535	0.0524	0.0220
50	0.0967	0.0940	0.0931	0.0912	0.0670	0.0519	0.0480	0.0484	0.0475	0.0465	0.0227
55	0.1455	0.1414	0.1400	0.1373	0.0742	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
60	0.1885	0.1831	0.1814	0.1778	0.0907	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
65	0.2498	0.2428	0.2404	0.2357	0.1167	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

Recommended Multiply all rates above by 80%.

6. Salary Increase Rates

Current: Inflation rate of 3.00% plus productivity increase rate of 1.00%, plus step-rate/promotional increase as shown below. (Adopted July 1, 2000.)

Recommended: Inflation rate of 3.00%, plus productivity rate of 1.50%, plus step-rate/promotional increase as shown below.

Years of Service	Current		Recommended	
	Annual Step-Rate/ Promotional Component	Annual Total Salary Increase	Annual Step-Rate/ Promotional Component	Annual Total Salary Increase
0	9.00%	13.00%	9.50%	14.00%
1	4.00%	8.00%	3.50%	8.00%
2	3.50%	7.50%	3.25%	7.75%
3	3.00%	7.00%	3.00%	7.50%
4	2.75%	6.75%	2.75%	7.25%
5	2.50%	6.50%	2.50%	7.00%
6	2.25%	6.25%	2.25%	6.75%
7	2.25%	6.25%	2.00%	6.50%
8	2.00%	6.00%	1.75%	6.25%
9	1.75%	5.75%	1.50%	6.00%
10	1.50%	5.50%	1.25%	5.75%
11	1.25%	5.25%	1.00%	5.50%
12	1.00%	5.00%	1.00%	5.50%
13	0.75%	4.75%	1.00%	5.50%
14	0.50%	4.50%	0.75%	5.25%
15 or more	0.00%	4.00%	0.00%	4.50%

7. Percent Married

Current: For valuation purposes 75% of members are assumed to be married. Male members are assumed to be three years older than their spouses, and female members are assumed to be three years younger than their spouses. (Adopted July 1, 1992.)

Recommended: No Change

8. Percent Electing a Deferred Termination Benefit

Terminating members are assumed to elect the most valuable benefit at the time of termination. Termination benefits are assumed to commence at the first age at which unreduced benefits are available. (Adopted July 1, 1990)
Recommended: No Change

9. Provision for Expense

Current: The assumed investment return rate represents the anticipated net rate of return after payment of all administrative and investment expenses. (Adopted July 1, 1992.)

Recommended: No Change

ASSET VALUATION METHOD

Current: The actuarial value of assets is based on the market value of assets with a five-year phase-in of actual investment return in excess of (less than) expected investment income. Expected investment income is determined using the assumed investment return rate and the market value of assets (adjusted for receipts and disbursements during the year). The actual investment return for this purpose is determined net of all investment and administrative expenses.

Recommended: No Change

ACTUARIAL COST METHOD

Current: The funding period required to amortize the unfunded actuarial accrued liability (UAAL) is determined using the Entry Age Normal actuarial cost method. This method assigns the plan's total actuarial present value of future benefits to various periods. The actuarial accrued liability is assigned to years prior to the valuation, and the normal cost is assigned to the year following the valuation. The remaining costs are assigned to future years.

The normal cost is determined for a hypothetical group of new entrants, based on actual new entrants in the June 30, 1999 valuation. The actuarial accrued liability is the difference between the total present value of future benefits and the actuarial present value of future normal costs. The unfunded actuarial accrued liability (UAAL) is the excess of the actuarial accrued liability over the actuarial value of assets.

Recommended: Update hypothetical group of new entrants to one based on new members joining TFFR during FY 2000 through FY 2004. No other changes recommended.