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Introduction: In its annual reviews of the Fairfax County budgets, the Fairfax Federation has asked that the County determine the effect of rates of return other than the 7.5% used in the actuarial computations and to estimate the actuarial liability out to 30 years from now¹. Projections of the actuarial liability out to 2026 have been made for other County pension funds by Cheiron, under a County contract. For example, the projections for the Uniformed Retirement System from 2011 to 2020 amount to increases of 5.1% per year, of which 3.0% is attributed to cost-of-living increases. The Fairfax County Public School (FCPS) system has not made such projections for its pensions.

In the absence of projected costs for the ERFC (Educational Employees Retirement System), we have undertaken the work reported herein to estimate the amount that must be paid to FCPS retirees in the future. Because we do not have data on the salaries, years of service, etc., of the employees, we developed a model based on having the number of employees constant over future years. We have included the effect of employees leaving employment with the school system and the number who choose to take their pension as a lumped sum upon leaving the system.

The purpose of this report is to present the results of our computations of the future actuarial liabilities of the ERFC.

Summary: Our long-term projections give results that are reasonably close to those in the report by the FCPS' consultant². If all employees worked for 30 years, then retired, the actuarial liability would double from its present value. The present funding budget is relying on attrition. At present, only approximately 8% of those hired remain with the FCPS for 30 years until retirement.

Of the income to the pension fund, 72% is from investments (Exhibit 8); therefore, the adequacy of the County and employee contributions depends strongly on the return on investment, especially the asset appreciation. The return on investment (ROI), including income and appreciation, was 11.2% in 2010³, as corrected for inflation. The actuarial computations are based on 3.61%. At a steady 11.2% ROI, the unfunded actuarial liability (\$562M) would be quickly overcome; however, if the ROI were as low as 5.5%, the unfunded actuarial liability would double. The Board of Supervisors and the Education Board need to know the actuarial situation for ROI's other than the 3.61% so they can assess the risks.

Because the number of employees today is twice what it was 30 years ago, the actuarial liability will grow substantially in future years as the present employees retire. Eventually, each household will be paying \$359 in property taxes, or approximately 7.1% of the property tax, to pay for the teacher pensions.

The current unfunded actuarial liability can be more than overcome if the age of retirement is changed from the current 56 to the private-sector retirement age of 65.

¹ <http://www.fcps.edu/erfc/docs/publications/CAFR.pdf>, Pg 21

² See Gabriel Roeder Smith & Company (GRS) report to Fairfax County: Educational Employees' Supplementary Retirement System of Fairfax County (ERFC), 31ST Annual Actuarial Valuation (December 31, 2010)

³ The County reports an ROI based on the valuation at the beginning of the time period. Such a basis always gives an ROI that is higher than more properly computed. See Appendix A, below.

Discussion:

Parameters of the Model

In the absence of demographic data for the FCPS employees, we computed the actuarial liability for the long-term equilibrium situation in which the number of employees is constant over many years. Over the past 40 years, the number of employees has increased by a factor of two (Exhibit 1); therefore, the number of people now receiving a pension is approximately 50% of the number of current employees. In the long term, because the County is almost entirely developed, we can reasonably expect the number of employees

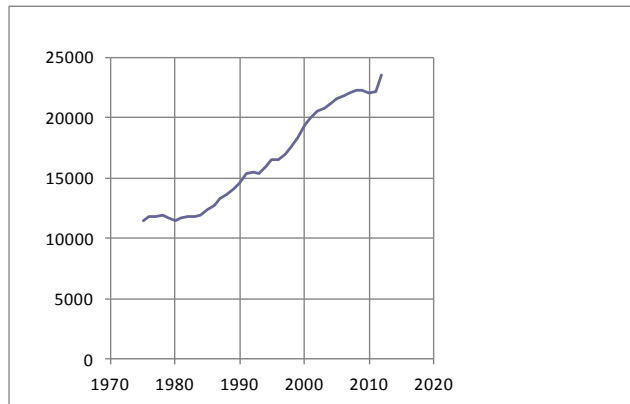


Exhibit 1: Number of Employees in the FCPS System

to stabilize so that the number receiving a pension will also stabilize. Our analysis is based on 22,000 employees because the GRS report is based on 2010 employment, when the FCPS had 22,075 employees.

The amount of the pension has also changed over the years. The benefits were increased in 1988 and again in 2001. The second change was accompanied by a change of name to ERFC2001, with the former plan being called ERFC Legacy⁴. Because new enrollments in ERFC Legacy are no longer allowed, the number on the more beneficial ERFC2001 continues to increase (Exhibit 2); however, few of the current retirees

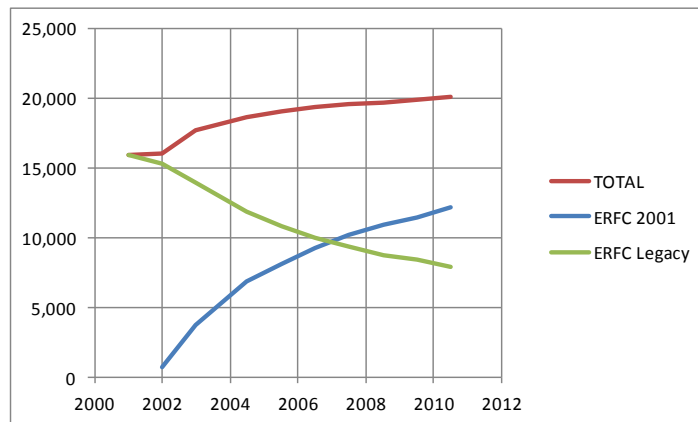


Exhibit 2: Number of Employees in the ERFC Legacy and ERFC2001 Plans

⁴ <http://www.fcps.edu/erfc/docs/publications/CAFR.pdf>, Pp 65 and 66.

are retired under the new plan. Our analysis is based on the benefits according to ERFC2001. We used Option A for the ERFC2001 plan.

Many employees do not complete the full 30 years of service. The GRS report shows in two places, Pp E-5 and G-7, the number leaving service as a function of the age of the employee. Although the two sets of numbers do not seem to be consistent, the results of our computation of the equilibrium actuarial liability

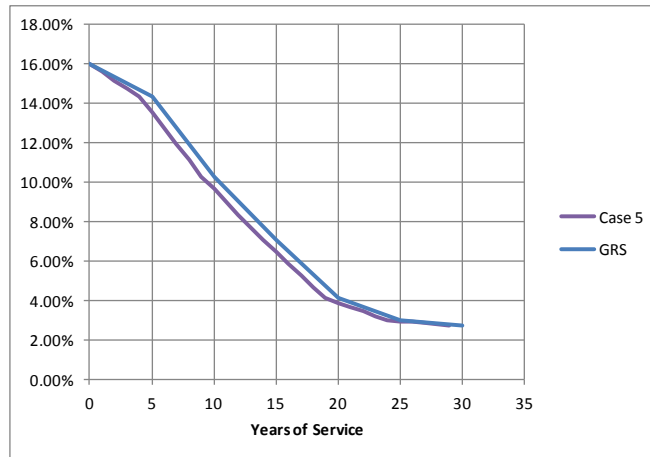


Exhibit 3: Percent of Employees that Leave Active Service

shows them to be the nearly same. We chose to use the data on Pg G-7, to generate what we call Case 5. We used a single curve for both men and women (Exhibit 3), based on the data in the GRS report, Pp E-1 and E-2, which show that approximately 75% of the employees are women.

We used the 2010 salary scale for teachers with a Master’s degree for all years and all employees⁵. The average wage for teachers and non-teachers are within a few percent of each other; therefore, applying the teacher scale to all employees should give reasonable results. Despite the recent two-year freeze, we assumed that every employee moved up one step each year. The Market Rate Adjustment (MRA) by which the salary scale is changed from year to year is only 0.26% per year greater⁶ than the CPI-U increase of 2.34% per year from 2000 to 2010; therefore, we made no correction for the scale increases. Because all of our analyses are in constant dollars (2010 dollars), little error is introduced by the difference between the MRA and the CPI-U.

CDC data gives the expected age of death at 79.1 for those who live until age 54.1 and 83.6 for those who live until age 65, the expected age of death is 83.6⁷. In our computations, we used the expected age of death as 83 in all cases. Because the GRS data show that less than 1% die or become disabled during working years (Pg G-7), we ignored these losses of employees. We also did not allow for employees dying before the age of 83. Because 83 is the average, some die before and some die after this age.

Not all who leave FCPS service remain in the pension system. Those leaving before five years of service are not vested; therefore, they cannot remain in the pension system. After being vested, the employees have a choice of remaining in the system or taking a lump-sum payment. The GRS report (Pg G-9) gives

⁵ <http://www.fcps.edu/fs/budget/docs/ApprovedBudget10.pdf>, Pg 368

⁶ http://nces.ed.gov/programs/digest/d10/tables/dt10_082.asp for national data; <http://www.fcps.edu/fs/budget/budgetdocuments.shtml> for Fairfax County data.

⁷ http://www.cdc.gov/nchs/data/nvsr/nvsr59/nvsr59_09.pdf

the percentage that remains in the system (Exhibit 4). Data on Page E-5 of the GRS report implies that the hiring age is close to 35 years of age; however, we assumed that every employee was hired at the age of 26, retiring 30 years later at the age of 56.

We computed the pension amount (in 2010\$) based on the formula: Pension = 0.008*1.03*Years of Service*Average salary over the last five years. The sample computation in the GRS report (Pg C-8) does not include the additional 3% that is in the County plan.

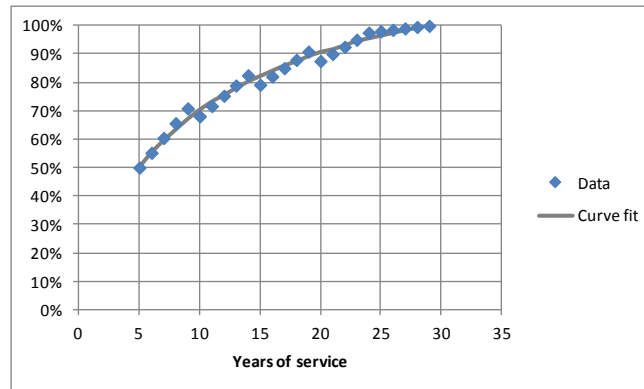


Exhibit 4: Percent Choosing to Vest

Model Predictions for Actuarial Liability

The actuarial liability consists of four parts: (1) those who are retired after completing 30 years of service, (2) those who retired before reaching 30 years of service but are currently collecting a pension, (3) those who are retiring this year with less than 30 years of service, and (4) those who are currently employed. The liability associated with this last group arises if the pension plan were terminated. It covers the pension they would eventually receive. The FCPS combines groups (1) and (2) into a single group.

The actuarial liability would be a maximum if all employees served for 30 years. We call this Case 1. The liability would be a minimum, zero, if all worked for only four years – never to be vested. Case 5 falls between these two cases. Case 5 uses the historical rates of attrition (Exhibit 3) and vesting (Exhibit 4).

The actuarial liability for “Present inactive vested members” in our Case 5 is in good agreement with the actuarial liabilities from the GRS report, which is for 2010 (Exhibit 5). These are the employees who are retiring early this year and will be starting to collect a pension (group 3, above). Also as we would expect, the actuarial liability for those currently working, but who must be covered if the pension plan is terminated, is in good agreement (group 4, above). The “Present Retirees and Beneficiaries”, combining groups 1 and 2 above, are not in good agreement. The difference is due to the small number of current retirees relative to the number of current employees. Currently, this group consists of approximately 11,000 retirees, whereas it would consist of 19,800 retirees under equilibrium with an employment of 22,000. There are currently only 11,000 retirees because when these retirees were working, the FCPS employment was approximately 11,000.

Case 5 yields a turnover rate of 12.5%, including retirements, and a retirement rate of 4.0%, including early retirements. We were told verbally that the actual turnover is closer to 8% and the retirement, to 3%; however, we have not seen data to verify these two numbers.

We can also compare our predicted long-term (equilibrium) liability with the historical values. The historical values are a complicated mixture of ERFC Legacy and ERFC2001. Our predictions are based on ERFC2001, Option A. Exhibit 6 does show a trend of the historical data toward Case 5. Notice also that the actuarial liability of the pension would more than double if every employee worked 30 years before retiring (the top line in Exhibit 6). If the value in the GRS column for the TOTAL of “Present Retirees and Beneficiaries” were doubled, because the number of retirees would eventually be twice what it is today, the GRS “TOTAL if terminated” would be approximately equal to that of Case 5. So Case 5 is a good approximation to the eventual actuarial liability.

	GRS, Pg B-4	Case 5
Present Retirees and Beneficiaries		
Worked 30 years		\$1,484,566,201
Worked less than 30 years		\$753,569,362
TOTAL	\$1,355,093,284	\$2,238,135,563
Present inactive vested members	\$46,528,264	\$44,173,494
TOTAL if not terminated		\$2,282,309,057
Present active members	\$982,439,374	\$1,093,640,103
TOTAL if terminated	\$2,384,060,922	\$3,375,949,160

Exhibit 5: Comparison between Actual 2010 Liability and Case 5 Liability

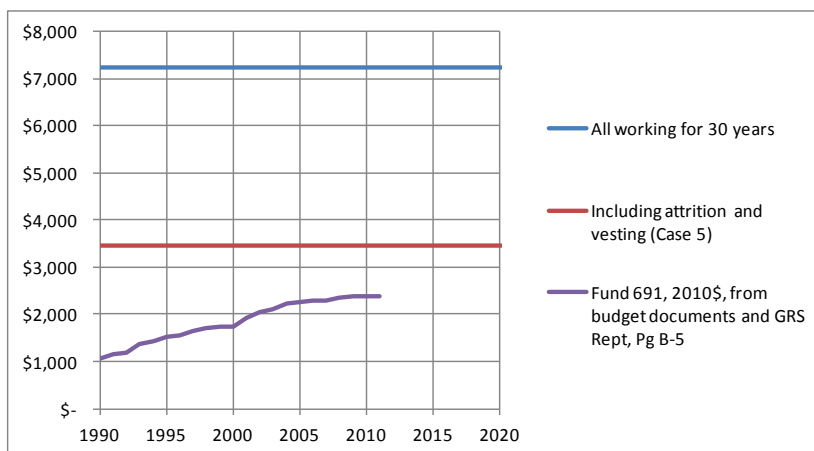


Exhibit 6: Long-Term Actuarial Liability, in millions of 2010\$

Effect of the Return on Investment

The assumed return on investment (ROI) of the pension fund, the nominal as used above and by GRS being 7.5%, with an inflation rate (CPI-U) of 3.75%, has a major impact on the actuarial liability. The inflation-corrected ROI for the nominal case is 3.61% (=1.075/1.0375-1). We consider two other inflation-corrected ROI's: 1.69% and 5.54%. These correspond to an ROI of 5.5% and 9.5%, respectively, with an inflation rate of 3.75%. On average over this range, the Case 5 long-term liability decreases almost \$900M per percent increase in ROI (Exhibit 7).

The ROI is affected more by changes in the asset value than by the interest and dividends received. The GRS reports the 2010 income to the pension fund to offset the liability (Page F-3). The ROI, the ratio of increase in value to the average value of the assets, was 11.3%, the trust ending the year holding \$1,823M in assets. With inflation at 2.0%, the inflation-corrected ROI was 9.2%, well above the 3.61% used in the

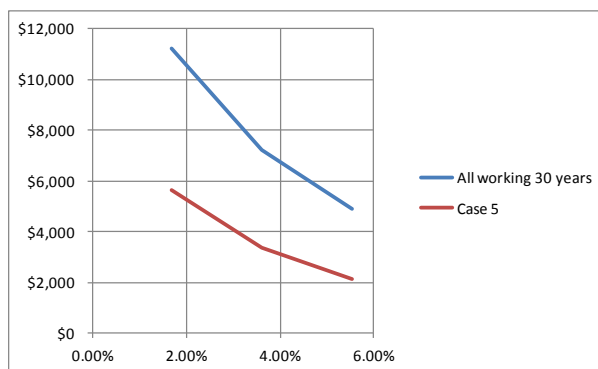


Exhibit 7: Effect of Inflation-Corrected Return on Investment (millions of 2010\$)

Employer	\$41,626,695
Member	\$47,569,052
CONTRIBUTIONS	\$89,195,747
Investment income	\$36,175,279
Asset Appreciation	\$197,040,058
TOTAL	\$322,411,084
Expenses	\$154,308,111
Net increase in trust	\$168,102,973

Exhibit 8: 2010 Income to the Pension Fund

Employer	\$35,146,816
Member	\$47,569,052
CONTRIBUTIONS	\$82,715,868
Investment income	\$37,924,264
Asset Appreciation	\$206,566,458
TOTAL	\$327,206,591
Expenses	\$154,308,111
To reduce unfunded liability	\$32,217,154
Net increase in trust	\$140,681,326

Exhibit 9: Projected 2011 Income to the Pension Fund

GRS actuarial computations; however, 84% of the investment “income” was paper profit (appreciation) (Exhibit 8).

GRS recommended that the FCPS contribute \$35,146,816 in 2010 (Pg F-6). GRS does not present the projected 2011 version of Exhibit 8 as might appear in a budget. Exhibit 9 is our approximation. The reduction of the unfunded liability is based on an ROI of 7.5%, with inflation at 3.75%, over the 28 years remaining to cover the unfunded liability (2 years have already elapsed). We have assumed the income and rate of asset appreciation are the same as in Exhibit 8.

Under equilibrium (long-term) conditions, the amount that must be put into the pension fund equals the net present value of the pensions of the newly retired (\$133,786,711) plus overhead (\$6,000,000)² plus what is paid in lumped sum to those new retirees so choosing (\$3,743,400 in 2010)². The total, \$143,530,111, is less than the current contributions of \$82,715,868, primarily because the current number of retirees is slightly more than 50% of those who will be retired under equilibrium conditions. The annual contribution

amounts to \$6,524 per working employee (8.8% of salary), or \$359 for each of the 400,000 households in the County.

Effect of Retirement Age

If the retirement age is increased to 65 for Case 5, the actuarial liability at equilibrium decreases to \$2,184,262,185, as compared to \$3,375,949,160 with retirement at age 56 for Case 5. The saving will be less under current non-equilibrium conditions, but would surely be more than the current unfunded liability of \$561,523,559.

Conclusions

1. The actuarial liability is strongly dependent on the ROI. The actuarial liability and actuarial assets for several ROI's should be reported to the Board of Supervisors so its members can assess the risks. One of the ROI's should be the long-term average that the fund has realized (e.g., 30-year average).
2. The ROI should be computed using either the average balance or the continuously compounding formula (see Appendix A), not the beginning balance as currently done.
3. The actuarial consultant should use the same time period as the CAFR. The CAFR uses the fiscal year, whereas the consultant uses the calendar year. The CAFR period is more in conformance with the school year. The difference adds work to those generating the CAFR and to people like the author who review the data. The change to calendar year was made in 2004.
4. Switching from the present defined-benefit pension to a defined-contribution pension would avoid the risks associated with the uncertain ROI. The switch would put the risks on the employee, but the employee can more easily recover, for example, by working more years and changing his life style.
5. The actuarial liability will increase substantially from the present value because the number of employees has increased substantially (by a factor of 2) over the past 30 years.
6. The actuarial liability would decrease substantially if retirement age were raised from the current age of 56 to the age of 65 – the usual age of retirement in the private sector.

Appendix A: Computation of the Return on Investment

There are various ways of computing the Return on Investment (ROI). We have chosen the divisor to be the average of the balance at the beginning and end of the year. The divisor is divided into the income. The following shows the implications of using other methods.

Suppose there is an investment of \$10,000 that drops in value to \$9,000 after one year but recovers to \$10,000 the following year. The two-year net is clearly zero ROI.

Divisor	Formula for first year	Year 1 ROI	Year 2 ROI	Average Percent
Avg of beginning and ending balance	$-1000/(0.5*(9000+10000))$	-10.5%	+10.5%	0.0%
Beginning balance	$-1000/10000$	-10.0%	+11.1%	+1.1%
Ending balance	$-1000/9000$	-11.1%	+10.0%	-1.1%
Continuous compounding	$\text{Ln}(9000/10000)$	-10.5%	+10.5%	0.0%

Only the first and last of these methods gives the correct value. Using the beginning balance will always yield a high ROI. Using the ending balance will always yield a low ROI.

The CAFR uses the beginning balance (<http://www.fcps.edu/erfc/docs/publications/CAFR.pdf>, Pg 14); therefore, the reported ROI is always more positive than if the average balance had been used. The average of the ROI's in the CAFR from the end of 2007 to the end of 2011 is -0.3%. If the ROI's had been computed based on the average balances for each year, the four-year average would have been -1.63%. With continuous compounding, the average would be -1.65%.