STUDY OF OHIO PUBLIC RETIREMENT SYSTEMS

July 29, 1998
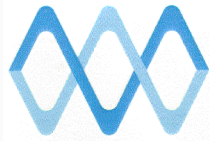
July 29, 1998

Mr. Aristotle L. Hutras, Director
Ohio Retirement Study Council
88 East Broad Street, Suite 1175
Columbus, OH 43215-3580

Dear Aris:

We are pleased to present this report regarding the funding of Ohio's public retirement systems. The report is organized into the following sections:

Summary of Findings/Conclusions;

Recommended Changes in Contribution Rates;

Background regarding the financing of the Systems;

Measurement of the actuarial status of the Systems using consistent assumptions and methods;

Comparison of the Systems' funded status;

Comparison of current contribution rates with contribution rates based on consistent assumptions and methods; and,

Discussion of Pension Obligation Bonds.

The Retirement Systems included in our study are the:
Highway Patrol Retirement System ("HPRS");

Police and Firemen's Disability and Pension Fund, ("PFDPF");

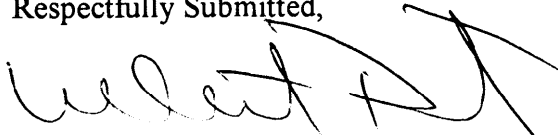Public Employees Retirement System, ("PERS");

School Employees Retirement System, ("SERS"); and,

State Teachers Retirement System, ("STRS").

We would like to thank the staffs and actuaries of the five retirement systems for their cooperation in providing us with requested data and information for this analysis.   Their assistance has been most helpful.

We are pleased to present the results of our study in the following report to the Council. We will be happy to respond to any questions you or other interested parties may have regarding its contents.

Respectfully Submitted,

William A. Reimert, F.S.A., C.F.A.

Katherine A. Warren, F.S.A.

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Summary of Findings/Conclusions

The major conclusions of our analyses are summarized below.

1) The favorable investment returns earned on retirement system assets since 1994 have significantly improved the funded status of all five retirement systems. This is a common occurrence nationwide among retirement systems. After years of working to amortize unfunded liabilities, the extremely favorable returns generated by the capital markets has significantly reduced or eliminated unfunded liabilities for most retirement systems. Many systems are working to develop policies to deal with their significantly improved funded status due to the favorable investment gains. This is not a situation unique to the Ohio systems.

2) It is worth noting that the Legislature enacted S.B. 43, effective 1993, which raised the limit on equity investments from 35% to 50% and S.B. 82, effective 1997, which removed the legal limits and replaced them with the prudent person standard. These Bills allowed the Ohio retirement systems to significantly modify their investment policies to improve long term investment performance to a greater extent than would have been permitted under prior law. The table below summarizes the systems' target asset allocations based on their 1997 Comprehensive Annual Financial Statements.

	HPRS	PERS	PFDPF	SERS	STRS
Cash	0%	6%	0%	1%	2%
Fixed Income	25	51	35	28	23
Equities	65	33	57	61	66
Real Estate	10	10	8	10	9

3) For their annual actuarial reports, the systems use smoothing methods to dampen volatility in reported assets (this is common actuarial practice). During a period of consistently favorable market returns, such as has occurred recently, these techniques tend to make a system's funded status appear to be less favorable than current market conditions indicate (the reverse would be true during prolonged unfavorable investment markets). If current market values represent fair long term valuations rather than the results of a temporary market bubble, the resulting improvement in funded status of the retirement systems should be reflected. For some systems, this may allow consideration to improving benefits and/or reducing contribution rates.

4) The total assets in all five retirement systems exceed $100 Billion. Each system has developed an investment strategy deemed appropriate for its circumstances. Understandably they differ from each other. Several academic studies have concluded that more than 90% of the variability in returns on investment portfolios are attributable to the asset allocation. Accordingly, the long term asset allocations established as policy objectives by the systems will have a very significant effect on investment returns, which in turn will materially affect required contribution rates. For example, increasing investment returns by 0.5% per annum would reduce contribution rates by approximately 2.5% of payroll for PERS. The asset allocations indicated as targets by the systems differ markedly. For example, the target asset allocations reported in the 1997 Comprehensive Annual Financial Reports for PERS and STRS are:

Asset Class	PERS	STRS
Cash	6%	2%
Fixed Income	51	23
Domestic Equities	28	45
International	5	20
Real Estate	10	9
Alternative Investments	0	1

By allocating 65% of its assets to equities, the STRS portfolio can be expected to earn 0.6% more than the PERS portfolio, which reported a long term target allocation of 33% to equities. (This assumes that equity (stock) investments will return 2% more long term than fixed income investments and ignores the additional positive effect of STRS's lower allocation to cash.) Asset allocation has a significant effect on long term returns which in turn will affect member and employer contribution rates. It is not apparent why the State's two largest retirement systems (both with assets in excess of $40 Billion) should adopt such different investment strategies.

We noted that the investment expenses relative to invested assets reported by the two largest systems are significantly lower than the investment expenses reported by the other systems. This was expected due to the economies of scale associated with investing such large investment portfolios. Consideration might be given to allowing the other three systems to share in the lower investment expense levels by commingling some investment functions across all systems.

5) HPRS and PERS have actuarially funded both pension and health insurance benefits for their members which will allow them to continue to provide health insurance benefits to their retirees subject to the constraint that health insurance net premiums (total premiums less retiree contributions) do not increase faster than wages. Since these systems have actuarially funded health insurance benefits in the past, they have accumulated assets to cover expected increases in their total pay-as-you-go costs due to demographic factors.

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6)   PFDPF, SERS and STRS have adopted modified pay-as-you-go funding with a stabilization reserve. For PFDPF and SERS, 1997 contributions approximately equaled current costs. For STRS, 1997 contributions covered only 75% of current costs.   (The 1998 STRS employer contributions allocated to health insurance benefits have been increased by 1.5% of payroll, which will increase 1998 contributions to approximately 120% of current health insurance costs. This is reported to be a change for one year only, so STRS will revert to funding less than current health insurance costs in its 1999 fiscal year without either significant increases in retiree contributions or an increase in the employer contributions allocated to health insurance.)

7)   Since PFDPF, SERS and STRS have not actuarially funded health insurance benefits in the past, they do not have sufficient assets to cover expected increases in their total pay-as-you-go costs due to demographic factors. As a result, these systems will face greater pressure than HPRS or PERS to increase retiree contributions and/or reduce health insurance coverage.   SERS has addressed this issue by requiring members who joined the system after June 30, 1993 to pay 100% of the premium for health insurance coverage prior to Medicare eligibility (generally age 65).

8)   Fully funding the remaining unfunded liabilities in the retirement systems with proceeds from Pension Obligation Bonds does not appear to be an optimal strategy for the State.   The major system covering State employees has a Funded ratio exceeding 100% and the unfunded liabilities in the Highway Patrol System are relatively modest. The systems with remaining unfunded liabilities, PFDPF, SERS and STRS, cover employees of municipalities, townships and school districts. Thus it is not apparent that the State would benefit from such a transaction. Moreover, the continued favorable investment experience since the start of the fiscal year beginning in 1997 should have improved the funded status of the systems beyond the figures shown in this report.   This should have further reduced the unfunded liabilities in those systems.

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Recommended changes in contribution rates

Based on the analysis contained in the report, we believe that consideration should be given to reducing the contribution rates for certain groups within PERS and for health insurance under HPRS. We base this recommendation on the following factors:

• The figures shown in this report for HPRS and PERS are based on market value data as of January 1, 1997. Since then the investment markets have continued to experience very favorable performance. For example, during 1997 HPRS reported a 15.60% return on its total portfolio and PERS reported a 13.31% return on its portfolio. During the first half of 1998, returns should have continued to be quite favorable. Thus basing a decision on asset data from 18 months ago should be conservative.

• In developing the contribution rate reductions shown below, we used figures based on a 7.5% investment return assumption, which should be conservative, and 30-year amortization of any funding surplus.

Rates allocable to pension benefits

We believe that contribution rate reductions of the following magnitude should be adopted applicable to pension benefits.

Group	Current Pension Contribution Rates			Reduction in Rates
	Members	Employers	Total	
PERS				
State	8.50%	9.11%	17.61%	3.9%
Local Government	8.50%	9.35%	17.85%	3.5%
Law Enforcement	9.00%	12.50%	21.50%	3.3%

Rates allocable to health insurance benefits

We believe that contribution rate reductions of the following magnitude should be adopted applicable to health insurance benefits. We would suggest caution in reducing the rates for health insurance as indicated below if there is concern regarding the desirability of increasing retiree contributions and/or reducing coverage to limit the rate of growth in premium rates to the rate of growth in wages.

Group	Current Health Insurance Contribution Rates		Reduction in Rates
	Members	Employers	
HPRS	0.00%	4.13%	0.6%
PERS			
State	0.00%	4.20%	0.9%
Local Government	0.00%	4.20%	0.2%

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Rates applicable to Police and Firemen in PFDPF

We recommended as part of our actuarial review of PFDPF in 1994 that the contribution rates applicable to Police and Firemen be equalized because there was no apparent actuarial justification for the difference between them, The PFDPF's actuary has also made such a recommendation. We continue to recommend that as an appropriate action based on the results of this study.

Background regarding the financing of the Systems

Sources of Income

Each of the five Ohio State Retirement Systems is financed by contributions made by employees, employers and the State. Contributions from employees and employers are generally a percentage of covered payroll. The State contributions are relatively modest and generally cover the costs of ad hoc increases granted in the past. Recent State appropriations are summarized in Appendix B. The contribution rates in effect during 1997 under each of the systems are summarized below.

System	Employee Rate	Employer Rate
Highway Patrol	10.00%	24.00%
Public Employees		
State Employees	**8.50%**	13.31%
Local Governments	8.50%	13.55%
Law Enforcement	9.00%	16.70%
Police and Firemen		
Police	10.00%	19.50%
Firemen	10.00%	24.00%
School Employees*	9.00%	14.00%
Teachers	9.30%	14.00%

 * During fiscal year 1997 an additional $28.0 million was collected from SERS employers as a health care surcharge. This was equivalent to increasing the contribution rate by 1.69% of payroll. Thus the average contribution rate for SERS employers is 15.69%.

These contributions, along with investment income earned on System investments, support the payment of pension and health insurance benefits to covered members and their beneficiaries as well as the administrative costs of operating the System. Recently, investment income has exceeded member and employer contributions combined; this is expected to continue.

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System Assets

The value of assets accumulated by each of the retirement systems is summarized below as of the end of their fiscal year ending in 1997. In total, the combined assets exceed $100 billion.

($ amounts in Millions)

System	End of Fiscal Year	Assets at Fair Market Value
Highway Patrol	12/31	$ 588. 7
Public Employees	12/31	45, 333. 2
Police and Firemen	12/31	7, 663. 7
School Employees	6/30	6, 367. 4
Teachers	6/30	42. 353. 5
Total		102, 306. 5

Actuarial Funding - Pension Benefits

Each of the system's funding is done on an actuarial basis. By this we mean that actuaries determine the contribution rates based on a projection of the benefits ultimately due under the system and the assets accumulated to date. The objective of actuarial funding is to accumulate in an orderly fashion over the working lifetime of employees sufficient assets to ensure that all benefits can be paid when due.

The actuarial cost method utilized by each of the systems for pension benefits is the Entry Age Normal Cost Method. Under this method, a "normal cost" is calculated, which is the rate of annual contribution necessary to fully fund a member's pension benefit by the time the member retires or otherwise terminates employment. Under the Entry Age Normal Cost Method, this normal cost is estimated to remain a fixed percentage of payroll over the employee's career. If future experience is in accord with the assumptions used, the system will have accumulated sufficient assets to fund all pension benefits by the time the member retires.

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Retirement Eligibility

Eligibility for retirement under each of the systems is summarized below.

System	Eligibility for Unreduced Benefits	Eligibility for Reduced Benefits
Highway Patrol	Age 52 with 20 years of service; or, Age 48 with 25 years of service.	Age 48 with 20 years of service.
Public Employees		
State Employees & Local Governments	Age 65 with 5 years of service; or, Any age with 30 years of service.	Age 60 with 5 years of service; or, Age 55 with 25 years of service.
Law Enforcement	Same as above, or, Age 52 with 25 years of law enforcement service.	Same as above; or, Age 48 with 25 years of law enforcement service.
Police and Firemen	Age 62 with 15 years of service; or, Age 48 with 25 years of service.	Age 48 with 15 years of service.
School Employees	Age 65 with 5 years of service; or Any age with 30 years of service.	Age 60 with 5 years of service; or, Age 55 with 25 years of service.
Teachers	Age 65 with 5 years of service; or Any age with 30 years of service.	Age 60 with 5 years of service; or, Age 55 with 25 years of service.

As indicated in the above table, eligibility for unreduced benefits for public safety officers is provided after 25 years of service and age 48 (52 for PERS Law Enforcement) while 30 years of service is required under each of the other systems for unreduced benefits prior to age 65. As a result, public safety employees tend to have significantly earlier retirement ages and hence higher pension costs.

Unfunded Liabilities / Funding Surplus

As noted previously, each of the systems uses the Entry Age Normal Cost Method of actuarial funding for pension benefits. This method is intended to fully fund members' benefits before they retire. Nevertheless, "unfunded liabilities" exist. Some of these unfunded liabilities were created when the systems were established because benefits were provided for service prior to the date when the system was created. Additional unfunded liabilities were created when benefits were improved by legislation. Unfunded liabilities also arise to the extent that system experience differs unfavorably from the actuarial assumptions. Since actuarial assumptions are merely estimates of future experience, both favorable and unfavorable deviations should be expected. Thus unfunded liabilities are not "bad" per se; they arise during the normal operation of a retirement system.

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By the same token, funding surpluses can arise if system experience is more favorable than anticipated. Sources of favorable experience in recent years have included higher investment returns and/or lower wage growth than expected. The presence of a funding surplus does not mean that contributions can cease. It merely indicates that the assets of the system exceed the amount determined under the Entry Age Normal Cost Method as the actuarial reserve that is needed to cover the cost of benefits which were scheduled to be funded to date. The full cost of future service benefits, as measured by the systems' "normal cost", will still have to be paid. It is common under such circumstances to amortize the surplus over the same time period, i.e., 30 years, that would be used if there were an unfunded liability.

For example, consider a system with a surplus of $10 million and a total covered payroll of $100 million. If this amount were amortized over a thirty year period as a level percentage of payroll, the amount applied to reduce current year contribution rates would be 0.57% of payroll or $568,000. Contribution rates could be reduced in each of the next 30 years by 0.57% of payroll before exhausting the surplus. In this way, the system would gradually amortize the surplus in the same way it would fund an unfunded liability if one existed.

The actuarially determined contribution rates include both the "normal cost" and amortization payment to fund any unfunded liabilities (or surpluses). Senate Bill 82, which became effective in 1997, established a maximum 30 year amortization period as the time period to be used for this purpose and provided a 10 year transition period for attaining this objective.

Funding Period

The contribution rates are set by the systems within the statutory guidelines and are changed infrequently. See Appendix C for a historical summary of the contribution rates. Under these circumstances, it is convenient to determine the length of time necessary to amortize any unfunded liabilities assuming that (1) the current contribution rates remain unchanged and (2) the Entry Age Normal Cost remains stable over time (this is typically the case unless significant changes are made in benefits or the actuarial assumptions). The resulting time period is called the "Funding Period". This Funding Period will be one of the key figures we will report.

Funding Health Insurance Benefits

Two of the systems also use the Entry Age Normal Cost Method to fund health insurance benefits: the Highway Patrol and Public Employees Retirement Systems.

The other three systems fund health insurance benefits by paying health insurance benefits as they are due and by use of a supplemental stabilization reserve to provide partial advance funding and/or buffer fluctuations in health insurance costs. By contributing less toward health insurance than the rate required to actuarially support the benefits, these systems are likely to face the need to significantly increase the contribution rate to support

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health insurance benefits over time. Actuarial funding attempts to maintain stable long term contribution rates to support current benefit levels. If the contribution rates are currently lower than the actuarially determined rate, they will have to be raised in the future or benefits will have to be reduced. The Statutes grant the Boards discretionary authority to provide health insurance within the constraints of available resources.

In the table below, we have shown the projected pay-as-you-go costs of health insurance benefits over the next decade assuming that health cost inflation is at the same rate as wage inflation. This is an optimistic projection of the rate of growth in health insurance costs. The figures shown indicate these costs as a percentage of payroll since contribution rates are developed on this basis. The current contribution rate is also shown for comparison purposes.

Year	PFDPF	SERS	STRS
Current Contribution Rate	6.50%	5.90%*	2.00%**
1	6.7	6.6	2.9
2	6.9	6.6	3.0
3	7.1	6.5	3.1
4	7.2	6.5	3.2
5	7.4	6.5	3.3
6	7.6	6.5	3.4
7	7.7	6.4	3.5
8	7.8	6.4	3.7
9	8.0	6.4	3.8
10	8.2	6.3	4.0

* The SERS health insurance contribution rate has been increased to reflect the health care surcharge.

** For fiscal year 1998 only, the allocation to health insurance in STRS has been increased to 3.50% and the pension allocation has been reduced.

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All five systems finance health insurance benefits with a portion of the employer contribution rate and also require contributions from retirees to finance a portion of the cost of their and/or their spouse's coverage. (No employee contributions are allocated to health insurance benefits by law.) The portion of the employer contribution rate allocated to health insurance benefits by each System during its fiscal year ending 1998 is summarized below.

System	Employer Rate	Portion Allocated to Health Insurance	Portion Allocated to Pension Benefits
Highway Patrol	24.00%	4.13%	19.87%
Public Employees			
State Employees	13.31%	4.20%	9.11%
Local Governments	13.55%	4.20%	9.35%
Law Enforcement	16.70%	4.20%	12.50%
Police and Firemen			
Police	19.50%	6.50%	13.00%
Firemen	24.00%	6.50%	17.50%
School Employees*	14.00%	4.21%	9.79%
Teachers**	14.00%	2.00%	12.00%

 * During fiscal year 1997 an additional $28.0 million was collected from employers as a health care surcharge on employers. This was equivalent to increasing the contribution rate by 1.69% of payroll.

 ** For fiscal year 1998 only, the allocation to health insurance in STRS has been increased to 3.50% and the pension allocation has been reduced.

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Measurement of the actuarial status of the Systems using consistent assumptions and methods

Actuarial Assumptions

Each of the five Ohio Retirement Systems annually reports its actuarial status. They do so based on actuarial assumptions and methods adopted by the Boards and deemed appropriate for meeting their responsibilities. Understandably those assumptions and methods vary from system to system.

But in order to compare the systems, it was desirable to use consistent actuarial assumptions and methods to measure the funded status and the contributions required to support each system. Therefore we developed a single set of underlying economic assumptions to be applied to each system along with demographic assumptions which are based on actual experience within that system over the past decade. In this way we have attempted to apply a single, common benchmark for comparing the funded status and contribution rates of the five Retirement Systems.

We have set forth in detail the rationale for the assumptions we have used for this analysis in Appendix D. In summary, we have used two alternative investment return assumptions (8.0% and 7.5%) in order to indicate the sensitivity of the results to this important assumption.   Appendix E contains information regarding the investment return assumptions used by other public employee retirement systems from the 1997 Survey of State and Local Government Employee Retirement Systems. Other key economic assumptions include 4.0% general wage inflation and 3.0% price inflation. Demographic assumptions were set equal to actual experience over the most recent 10 years studied by the system's actuaries without adjustment, except with respect to life expectancy among service retirees for which we used actual experience projected to 2007 to make some provision for continuing mortality improvement.

Member Data and Plan Provisions

In preparing this comparison, we used the member census data utilized for the 1997 actuarial valuations, and the asset values and plan provisions as of the same date (January 1, 1997 for HPRS, PERS and PFDPF; July 1, 1997 for SERS and STRS.) In general, we have not reflected any benefit or other changes which have become effective since those valuations.

In particular, we did not reflect the effect of House Bill 648 that was recently enacted, except with respect to the improvements that applied to HPRS. In addition to the changes applicable to HPRS, significant changes in benefit provisions were made applicable to PFDPF and other less significant changes in provisions applicable to the other systems. PFDPF's actuary has not estimated the effect of the changes in H.B. 648 on PFDPF. We have not done so either. We also did not include the Variable Supplemental Benefit Check paid in December to STRS retirees.

<u>Asset Values</u>

Market values of publicly traded securities are subject to short term fluctuations. Actuaries frequently develop "actuarial values" for assets rather than using fair market values in an attempt to provide stability to the measurement of unfunded liabilities and contributions from year to year. These methods are not intended to consistently over- or understate asset values; they are merely intended to avoid unnecessarily large changes in contribution rates from year to year. Each of the five Ohio Retirement Systems uses such an actuarial asset value in measuring its funded status and determining contribution requirements. The following table compares the market and actuarial values of assets as of January 1, 1997 for HPRS, PERS and PFDPF, and as of July 1, 1997 for SERS and STRS. (The amounts shown are in millions.)

System	Market Value Of Assets	Actuarial Value of Assets	Difference
Highway Patrol	$434.8	$411.3	$23.5
Public Employees			
State Employees	13,342.6	12,563.7	778.9
Local Governments	18,049.8	16,996.1	1,053.7
Law Enforcement	1,034.5	974.1	60.4
Police and Firemen	6,188.9	5,424.7	764.2
School Employees	6,221.0	5,519.7	701.3
Teachers	<u>40,494.0</u>	<u>36,849.5</u>	<u>3,644.5</u>
Total	85,765.6	78,739.1	7,026.5

For purposes of this report, we have chosen to use fair market value of system assets. We did so because our objective is to compare the funded status of the systems on a consistent basis. Fair market value seems to us to be the best measure to use for this purpose.

The US stock market experienced quite favorable returns during the first 6 months of 1997 (the S&P 500 index showed a 20% return over this period) while returns on fixed income securities were modestly unfavorable due to the small increase in interest rates. This has the effect of making the two systems with June 30 fiscal years, SERS and STRS, look somewhat better relative to the other systems which use a December 31 fiscal year solely on account of the different valuation dates.

It is worth noting that the assumed rates of investment returns (8.0% and 7.5%) used for this study are intended to represent long term average return assumptions. Short term favorable and unfavorable fluctuations around this average (such as the 20% return on stocks during the first half of 1997) should be expected.

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Results

The results of our calculations are summarized on the exhibits in Appendix A. As indicated above, these calculations were based on participant census data, asset information and the benefit provisions in effect as of January 1, 1997 for HPRS, PERS, and PFDPF and as of July 1, 1997 for SERS and STRS. (H.B. 648 is reflected for HPRS.)

<u>Funded Status - Pensions</u>

The funded status of each of the systems is shown below with respect to pension benefits. We have not included health insurance benefits in this initial table because the health insurance benefits are discretionary and could be reduced or eliminated by each system's Board based on available resources. (The exception is that the Medicare Part B supplement is included with the pension benefits in SERS is accordance with their valuation procedure.) On the other hand, the pension benefits are established by statute and cannot be changed without legislation. We have indicated the Unfunded Liabilities in dollars (amounts are shown in millions) and also indicated the Funded Ratio (the ratio of assets to actuarial accrued liabilities as a percentage.)

System	@ 8.0%		@ 7.5%	
	Unfunded Liabilities	Funded Ratios	Unfunded Liabilities	Funded Ratios
Highway Patrol	$30.9	93.4%	$63.5	87.3%
Public Employees				
State Employees	**(824.7)**	**106.6**	**(54.6)**	**100.4**
Local Governments	**(704.5)**	**104.1**	338.8	98.2
Law Enforcement	(89.0)	109.4	**(22.5)**	**102.2**
Police and Firemen	990.2	**86.2**	1,403.2	**81.5**
School Employees	612.5	91.0	995.5	**86.2**
Teachers	4,016.6	91.0	**6,537.2**	**86.1**

These figures indicate that all three PERS Divisions are fully funded assuming investment returns average 8.0% compounded annually. The same is true assuming lower investment returns averaging 7.5%, except for the local government group. The other systems have Unfunded Liabilities, but their Funded Ratios are all higher than 80%, even based on a 7.5% investment return assumption. All of these figures assume that the past 10 years demographic experience is representative of future experience.

We have indicated the funding period for the pension benefits provided by each system in the following table based on their current contribution rates for pension benefits. This indicates that each of the systems is already within the 30 year period established by S.B. 82 if future investment returns average 8.0%. HPRS, PFDPF, SERS and STRS would not be able to finance their unfunded liabilities within 30 years without increasing their contribution rates allocated to pension benefits if future investment returns average 7.5%.

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We have also indicated the contribution rates that would be required to achieve 30 year funding of pension benefits. Again, all of these figures assume that the past 10 years demographic experience is representative of future experience.

System	Current Total Contribution Rate - Pension	@8.0%		@ 7.5%	
		Funding Period	30 year Funding Rate	Funding Period	30 year Funding Rate
Highway Patrol	29.87%	10.2 yrs.	26.6%	Infinite	32.0%
Public Employees					
State Employees	17.61		11.1	-	13.7
Local Governments	17.85		12.0	1.9 yrs.	14.4
Law Enforcement	21.50		14.5	-	18.2
Police and Firemen	24.90*	29.2	24.8	Infinite	28.8
School Employees	18.79	15.1	17.5	Infinite	20.3
Teachers	21.30	18.8	20.0	Infinite	23.8

A "-" in the above table indicates that the system has no unfunded liabilities.

* The 24.90% is the combined rate for Police and Firemen as shown in the January 1, 1997 actuarial valuation.

Contributions - Pensions

We have indicated below the increase or (decrease) in current employer contribution rates to fund the pension benefits provided by each retirement system assuming both unfunded liabilities and/or funding surpluses would be amortized over 30 years. We have also indicated the current employer contribution rate.

System	Current Rate	Increase/(decrease) based on 30 year funding rate @ 8.0%	Increase/(decrease) based on 30 year funding rate @ 7.5%
Highway Patrol	19.87%	(3.3%)	2.1%
Public Employees			
State Employees	9.11	(6.5)	(3.9)
Local Governments	9.35	(5.9)	(3.5)
Law Enforcement	12.50	(7.0)	(3.3)
Police and Firemen			
Police	13.00	1.8	5.8
Firemen	17.50	(2.7)	1.3
School Employees	9.79	(1.3)	1.5
Teachers	12.00	(1.3)	2.5

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Based on this analysis, PERS should consider reducing its contribution rates allocated to pensions by 3.9% for the State, 3.5% for local governments, and 3.3% for law enforcement members based on the 7.5% investment return assumption. This seems reasonable because the above calculations ignore the 13.31% earned on PERS investments during 1997 and the favorable market returns to date in 1998.

The other systems should probably not consider reducing their contribution rates allocable to pensions, although continued favorable investment returns might justify such consideration by SERS and STRS upon completion of the 1998 actuarial valuations. Eliminating the difference in contribution rates applicable to police and firemen continues to be an appropriate action as we suggested several years ago and as recommended by PFDPF's actuary.

<u>Funded Status - Health Insurance</u>

The funded status of each of the systems is shown below with respect to health insurance benefits. We have indicated the Unfunded Liabilities both in dollars (amounts are shown in millions) and as a percentage of payroll for all five systems, even though only two of them currently actuarially fund health insurance benefits. We have done this for comparison purposes. As with pension benefits, we have expressed unfunded liabilities in dollars (the amounts are in millions) and indicated the Funded Ratios (ratio of assets to actuarial accrued liabilities).

System	@8.0%		@7.5%	
	Unfunded Liabilities/ (Surplus)	Funded Ratio	Unfunded Liabilities/ (Surplus)	Funded Ratio
Highway Patrol	($6.6)	109.3%	($1.2)	101.6%
Public Employees				
State Employees	110.9	95.9	275.9	90.5
Local Governments	47.3	99.0	319.2	93.4
Law Enforcement	7.6	96.3	20.7	90.6
Police and Firemen	1,170.9	16.2	1,249.9	15.4
School Employees	1,381.8	9.6	1,462.2	9.1
Teachers	2,281.1	44.9	2,522.6	42.4

These figures indicate that HPRS is fully funded based on either an assumed 8.0% or 7.5% investment return. PERS is approximately 98% funded in the aggregate based on an 8.0% investment return and is about 92% funded in the aggregate based on a 7.5% investment return.

The other three systems would have significant unfunded liabilities under either investment return assumption. This is not surprising since they have not been actuarially funding health insurance benefits.

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<u>Contributions - Health Insurance</u>

We have indicated below the contribution rates required to fund the health insurance benefits provided by each retirement system assuming unfunded liabilities or funding surpluses would be amortized over 30 years. We have also indicated the current contribution rate as well as the current pay-as-you-go costs.

System	Current Rate	30 year funding Rate @ 8.0%		30 year funding Rate @7.5%		Current Pay-as-you-go costs	
		Rate	Difference	Rate	Difference	Rate	Difference
Highway Patrol	4.13%	2.5%	(1.6%)	3.5%	(0.6%)	4.4%	0.3
Public Employees							
State Employees	4.20	2.8	(1.4)	3.3	(0.9)	4.3	0.1
Local Governments	4.20	3.3	(0.9)	4.0	(0.2)	5.0	0.8
Law Enforcement	4.20	3.9	(0.3)	4.6	0.4	3.1	(1.1)
Police and Firemen	6.50	9.7	3.2	10.2	3.7	6.7	0.2
School Employees	5.90*	7.2	1.3	7.4	1.5	6.6	0.7
Teachers	2.00	3.7	1.7	4.0	2.0	2.9	0.9

 * Includes health insurance surcharge.

This indicates that the current health insurance contributions are more than adequate to fund health insurance benefits on an actuarial basis for HPRS and PERS, with the exception of law enforcement, which would have a small shortfall based on a 7.5% investment return assumption. Based on these figures, consideration could be given to reducing the contribution rates allocated to health insurance by 0.6% for HPRS and 0.9% and 0.2% for PERS State and local government respectively. (It is possible for the actuarial cost of health insurance to be lower than pay-as-you-go costs due to investment income on the assets accumulated in the past to fund these benefits.) Alternatively, since these calculations assume that costs for health insurance will not increase faster than wages, some lesser reduction may be appropriate if it is desired to provide some margin for higher health insurance cost increases.

It also indicates that the current health insurance contribution rates under the other three systems are not adequate to actuarially fund health insurance or to meet current pay-as-you-go costs. It is possible over the short term for contributions to fall short of current pay-as-you-go costs. The shortfall can be covered by drawing down the health insurance stabilization reserves, to the extent available. For these three systems, this indicates that there is a significant probability that significant increases in retiree contributions and/or reductions in coverage will have to be made in health insurance benefits in the future if the statutory limits on contribution rates are reached. (Technically these statutory limits may not restrict SERS since the health surcharge is not limited.) Such action may produce pressure on the Boards to find additional financial support to maintain health insurance benefits. It is also worth repeating that all of these projections are based on the optimistic

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projection that health insurance costs will not increase by more than the rate of wage inflation.

SERS looks somewhat better than expected on an actuarially funded basis because they will require members who join the system after June 30, 1993 to pay 100% of the premium for health insurance coverage prior to Medicare eligibility (generally age 65). By limiting system financial support to those eligible for Medicare, SERS will restrict the period of time when it subsidizes coverage to the period when Medicare is primary (after the attainment of 65) hence reducing the cost of health insurance coverage. This curtailment in health insurance benefits significantly reduces the long term cost of health insurance benefits to SERS members, but has no immediate effect on current pay-as-you-go costs. But even though this cutback has been communicated, the reduction may be protested when retirees become affected by this change.

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Pension Obligation Bonds

Pension Obligation Bonds are debt instruments for financing pension liabilities that have been used by several state and local governments in recent years. The essential features of POB's if issued by the State of Ohio are:

The State would issue taxable bonds;

The proceeds would be contributed to the Retirement Systems to fund some or all of the Unfunded Actuarial Liabilities;

The State would reduce its future contributions into the Retirement Systems to reflect the reduced need to amortize UAL's;

The State would pay debt service on the POB's; and

The Retirement Systems would invest the proceeds in their diversified portfolios of investments in the expectation of earning higher returns than the rate of interest paid by the State on the POB's.

From the Perspective of the Members and Employers supporting the systems

Whether this transaction provides an economic benefit depends on the Systems actually earning higher returns over time than the interest cost on the POB's. If the Systems succeed, the Members and Employers will benefit; if not, the POB's will produce a net cost.

POB's represent an attempt to reduce long term costs through the use of leverage (which serves to increase risk exposure). When things go as expected, leverage can produce benefits; but it can also generate losses if actual future experience is adverse.

Advantages and Disadvantages of POB's

The potential benefits associated with POB's include:

Provides financing for Unfunded Pension Liabilities through the capital markets at a lower cost than amortization at the actuarial investment return assumption (this can produce (1) immediate accounting savings, (2) reductions in member and/or employer contributions and/or (3) finance benefit improvements);

Provides participants with a sense of increased security in their pension benefits by improving the funded status of actuarial accrued liabilities; and

Provides short term savings through reduced contributions to service debt at a lower interest rate or more rapid amortization if contributions are held constant.

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The potential disadvantages associated with POB's include:

If actual investment returns over time fall short of interest costs on the POB's, there will be a net cost;

Unfunded pension liabilities financed through POB's are a fixed obligation that is difficult to restructure (in contrast to unfunded liabilities within the systems which can be restructured by speeding or slowing amortization);

Fully funded Retirement Systems may create increased pressure for benefit increases from members thereby increasing long term costs; and

POB's use some of the legal debt limit, if a limit exists (this may constrain financing for other potential uses).

From the Retirement Systems' Perspectives

From the perspective of the Retirement Systems, there appears to be little downside risk but significant upside potential. To the extent that the Systems are able to earn investment income on the proceeds of POB's in excess of the actuarially assumed rate, the gains can be utilized by the Boards to provide benefits to members (within the limits of the discretion allowed by statute) and/or reduce member or employer contributions. If actual returns fall short of the actuarially assumed rate, member and employer contributions will have to be maintained higher than otherwise necessary. Of course, this would also be the case if no POB's had been issued; the difference is that the shortfall would be incurred on a larger asset base with POB's than without.

The point is that the Systems are in a position to pass on to the employers any investment losses on the proceeds of POB's; and would reap the upside potential gains if investment experience is more favorable than expected. The Systems stand to lose little but may realize significant gains.

From the State's Perspective

Some of the financing for unfunded pension liabilities currently comes from employers other than the State while the proposed POB's appear to be financed solely by the State (for example, State employees are participants in HPRS and PERS; employees of the counties, school districts, municipalities, etc. are members of PERS, PFDPF, SERS and STRS .).

The overriding issue for the State should be whether the use of POB's can be expected to generate long term benefits worth the costs. Some of those costs are directly measurable (e.g., the interest cost on the bonds) and some represent contingent costs dependent on future experience (e.g., the potential for a shortfall in investment returns).

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To the extent that POB's issued by the State would be used only to fund Unfunded Liabilities being financed by State contributions, POB's do not represent an increased or decreased liability to the State; they shift an existing liability from the Retirement Systems to State debt service.   Since most of the members in the Retirement Systems with Unfunded Liabilities are not State employees, there is a very limited opportunity for the State to finance its obligations using POB's.

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Pension Benefits - Discount Rate of 8.0%
($ Amounts in Millions)

	HPRS	PERS State	PERS Local Government	PERS Law Enforcement	PERS Total	PFDPF	SERS *	STRS
Valuation Date:	01/01/97	01/01/97	01/01/97	01/01/97	01/01/97	01/01/97	07/01/97	07/01/97
EAN Accrued Liability (AL j	$465.7	$12,517.9	$17,345.3	$945.5	$30,808.7	$7,179.1	$6,833.5	$44,510.6
Market Value of Assets (MVA)	434.8	13,342.6	18,049.8	1,034.5	32,426.9	6,188.9	6,221.0	40,494.0
Unfunded Accrued Liability (UAL)	30.9	(824.7)	(704.5)	(89.0)	(1,618.2)	990.2	612.5	4,016.6
Portion of UAL financed by:								
Past Service Liability Payments	0.0	0.0	0.0	0.0	0.0	132.8	0.0	23.5
State Appropriation Payments	0.2		n/a			27.5	2.1	13.0
Regular Contributions	30.7	(824.7)	(704.5)	(89.0)	(1,618.2)	829.9	610.4	3,980.1
Funded Ratio = MVA / AL	93.4%	106.6%	104.1%	109.4%	105.3%	86.2%	91.0%	91.0%
Payroll	59.1	3,318.9	4,792.1	229.1	8,340.1	1,111.4	1,551.4	6,563.6
Statutory Contribution Rates:								
Member	10.00%	8.50%	8.50%	9.00%	n/a	10.00%	9.00%	9.30%
Employer	19.87%	9.11%	9.35%	12.50%	n/a	14.90%	9.79%	12.00%
Employer Surcharge	0.00%	0.00%	0.00%	0.00%	n/a	0.00%	0.00%	0.00%
State	$0.0	n/a	n/a	n/a	$2.1	$3.7	$0.4	$2.2
Normal Cost Rate (Employer & Member)	23.6%	12.5%	12.8%	16.7%	n/a	20.6%	15.3%	16.6%
Funding Period for UAL (in years)	10.2	(4.5)	(2.8)	(7.2)	n/a	29.2	15.1	18.8
Normal Cost plus 30-year amortization of Unfunded Accrued Liabilities/Surpluses	26.6%	11.1%	12.0%	14.5%	n/a	24.8%	17.5%	20.0%
Increase/(Decrease) based on 30-year funding	-3.3%	-6.5%	-5.9%	-7.0%	n/a	-0.1%	-1.3%	-1.3%

* Pension Benefits for SERS includes Medicare Part B Reimbursement

MILLIMAN & ROBERTSON, INC.

Postretirement Health Benefits - Discount Rate of 8.0%
($ Amounts in Millions)

		PERS						
	HPRS	State	Local Government	Law Enforcement	Total	PFDPF	SERS.	STRS
Valuation Date:	01/01/97	01/01/97	01/01/97	01/01/97	01/01/97	01/01/97	07101/97	07/01/97
EAN Accrued Liability (AL)	$70. 7	$2, 737. 8	$4, 551. 6	$207. 5	$7, 496. 9	$1,397.7	$1, 528. 2	$4, 140. 6
Market Value of Assets (MVA)	77. 3	2, 626. 9	4, 504. 3	199. 9	7, 331. l	226. 8	146. 4	1, 859. 5
Unfunded Accrued Liability (UAL)	(6.6)	110. 9	47. 3	7. 6	165. 8	1, 170. 9	1, 381. 8	2, 281. l
Portion of UAL financed by:								
Past Service Liability Payments	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
State Appropriation Payments		n/a	n/a	n/a	n/a	0.0	0.0	0.0
Regular Contributions	(6.6)	110.9	47. 3	7. 6	165. 8	1, 170. 9	!, 381. 8	2, 281. l
Funded Ratio = MVA / AL	109.3%	95. 9%	99. 0%	96. 3%	97. 8%	16. 2%	9. 6%	44. 9%
Payroll	59.1	3, 318. 9	4. 792. 1	229. 1	8, 340. l	1,111.4	1, 551. 4	6, 563. 6
Statutory Contribution Rates:								
Member	0.00%	0.00%	0. 00%	0.00%	n/a	0.00%	0.00%	0.00%
Employer	4.13%	4. 20%	4. 20%	4. 20%	n/a	6. 50%	4. 21%	2. 00%
Employer Surcharge	0.00%	0.00%	0. 00%	0.00%	n/a	0.00%	1.69%	0.00%
State	$0.0	n/a	n/a	n/a	$0.0	$0.0	$0.0	$0.0
Normal Cost Rate (Employer & Member)	3.1%	2. 6%	3. 2%	3. 7%	n/a	3. 7%	2.1%	1. 7%
Funding Period for UAL in years	(9. 4)	2. 2	1. 0	8. 2	n/a	Infinite	61.4	Infinite
Normal Cost plus 30-year amortization of Unfunded Accrued Liabilities/Surpluses	2. 5%	2. 8%	3. 3%	3. 9%	n/a	9. 7%	7. 2%	3. 7%
Increase/(Decrease) based on 30-year funding	- 1. 6%	- 1. 4%	- 0. 9%	- 0. 3%	n/a	3. 2%	1. 3%	1.7%
Pay-As-You-Go (PAYG) - net of retiree contributions if applicable	2. 6	142. 9	241. 8	7. 1	391. 8	74. 2	101. 8	192. 9
PAYG as percent of Payroll	4.4%	4.3%	5. 0%	3.1%	4. 7%	5. 7%	6. 6%	2. 9%

MILLIMAN & ROBERTSON, INC.

Appendix A - Results

Pension and Postretirement Health Benefits - Discount Rate of 8.0%
($ Amounts in Millions)

| | | PERS | | | | | | |
	HPRS	State	Local Government	Law Enforcement	Total	PFDPF	SERS	STRS
Valuation Date:	01/01/97	01/01/97	01/01/97	01/01/97	01/01/97	01/01/97	07/01/97	07/01/97
EAN Accrued Liability (AL)	$536.4	$15,255.7	$21,896.9	$1,153.0	$38,305.6	$8,576.8	$8,361.7	$48,651.2
Market Value of Assets (MVA)	512.1	15,969.5	22,554.1	1,234.4	39,758.0	6,415.7	6,367.4	42,353.5
Unfunded Accrued Liability (UAL)	24.3	(713.8)	(657.2)	(81.4)	(1,452.4)	2,161.1	1,994.3	6,297.7
Portion of UAL financed by:								
Past Service Liability Payments	0.0	0.0	0.0	0.0	0.0	132.8	0.0	23.5
State Appropriation Payments	0.2			n/a	n/a	27.5	2.1	13.0
Regular Contributions	24.1	(713.8)	(657.2)	(81.4)	(1,452.4)	2,000.8	1,992.2	6,261.2
Funded Ratio MVA / AL	95.5%	104.7%	103.0%	107.1%	103.8%	74.8%	76.1%	87.1%
Payroll	59.1	3,318.9	4,792.1	229.1	8,340.1	1,111.4	1,551.4	6,563.6
Statutory Contribution Rates:								
Member	10.00%	8.50%	8.50%	9.00%	n/a	10.00%	9.00%	9.30%
Employer	24.00%	13.31%	13.55%	16.70%	n/a	21.40%	14.00%	14.00%
Employer Surcharge	0.00%	0.00%	0.00%	0.00%	n/a	0.00%	1.69%	0.00%
State	$0.0	n/a	n/a	n/a	$2.1	$3.7	$0.4	$2.2
Normal Cost Rate (Employer & Member)	26.7%	15.1%	16.0%	20.4%	n/a	24.3%	17.4%	18.3%
Funding Period for UAL in years	6.4	(3.1)	(2.2)	(6.1)	n/a	98.9	30.0	35.1
Normal Cost plus 30-year amortization of Unfunded Accrued Liabilities/Surpluses	29.0%	13.9%	15.2%	18.4%	n/a	34.5%	24.7%	23.7%
Increase/(Decrease) based on 30-year funding	-5.0%	-7.9%	-6.9%	-7.3%	n/a	3.1%	0.0%	0.4%

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MILLIMAN & ROBERTSON, INC.

Appendix A - Results

Pension Benefits - Discount Rate of 7.5%

($ Amounts in Millions)

		PERS						
	HPRS	State	Local Government	Law Enforcement	Total	PFDPF	SERS	STRS
Valuation Date:	01/01/97	01/01/97	01/01/97	01/01/97	01/01/97	01/01/97	07/01/97	07/0l/97
EAN Accrued Liability (AL)	$498.3	$13,288.0	$18,388.6	$1,012.0	$32,688.6	$7,592.1	$7,216.5	$47,031.5
Market Value of Assets (MVA)	434.8	13,342.6	18,049.8	1,034.5	32,426.g	6,188.9	6,221.0	40,494.0
Unfunded Accrued Liability (UAL)	63.5	(54.6)	338.8	(22.5)	261.7	1,403.2	995.5	6,537.5
Portion of UAL financed by:								
Past Service Liability Payments	0.0	0.0	0.0	0.0	0.0	140.2	0.0	23.5
State Appropriation Payments	0.2	n/a	n/a			28.7	2.2	13.8
Regular Contributions	63.3	(54.6)	338.8	(22.5)	261.7	1,234.3	993.3	6,500.2
Funded Ratio = MVA / AL	87.3%	100.4%	98.2%	102.2%	99.2%	81.5%	86.2%	86.1%
Payroll	59.1	3,318.9	4,792.1	229.1	8,340.l	1,111.4	1,551.4	6,563.6
Statutory Contribution Rates:								
Member	10.00%	8.50%	8.50%	9.00%	n/a	10.00%	9.00%	9.30%
Employer	19.87%	9.11%	9.35%	12.50%	n/a	i4.90%	9 .79%	12.000%
Employer Surcharge	0.00%	0.00%	0.00%	0.00%	n/a	0.00%	0.00%	0.00%
State	$0.0	n/a	n/a	n/a	$2.1	$3.7	$0.4	$2.2
Normal Cost Rate (Employer & Member)	26.3%	13.8%	14.0%	18.7%	n/a	22.8%	16.9%	18.5%
Funding Period for UAL (in **years)**	Infinite	(0.4)	1.9	(3.4)	n/a	Infinite	Infinite	Infinite
Normal Cost plus 30-year amortization of Unfunded Accrued Liabilities/Surpluses	32.0%	13.7%	14.4%	18.2%	n/a	28.8%	20.3%	23.8%
Increase/(Decrease) based on 30-year funding	2.1%	-3.9%	-3.5%	-3.3%	n/a	3.9%	**1.5%**	2.5%

* Pension Benefits for SERS includes Medicare Part B Reimbursement

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Appendix A - Results

Postretirement Health Benefits - Discount Rate of 7.5%
($ Amounts in Millions)

			PERS					
	HPRS	State	Local Government	Law Enforcement	**Total**	PFDPF	SERS	STRS
Valuation Date:	01/01/97	01/01/97	01/01/97	01/01/97	01/01/97	01/01/97	07/01/97	07/01/97
EAN Accrued Liability (AL)	$76.1	$2,902.8	$4,823.5	$220.6	$7,946.9	$1,476.7	$1,608.6	$4,382.1
Market Value of Assets (MVA)	77.3	2,626.9	4,504.3	199.9	7,331.1	226.8	146.4	1,853.5
Unfunded Accrued Liability (UAL)	(1.2)	275.9	319.2	20.7	615.8	1,249.9	1,462.2	2,522.6
Portion of UAL financed by:								
Past Service Liability Payments	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
State Appropriation Payments	0.0	n/a	n/a	n/a	n/a	0.0	0.0	0.0
Regular Contributions	(1.2)	275.9	319.2	20.7	615.8	1,249.9	1,462.2	2,5226
Funded Ratio = MVA / AL	101.6%	90.5%	93.4%	90.6%	92.3%	15.4%	9.1%	42.4%
Payroll	59.1	3,318.9	4,792.1	229.1	8,340.1	1,111.4	1,551.4	6,563.6
Statutory Contribution Rates:								
Member	0.00%	0.00%	0.00%	0.00%	n/a	0.00%	0.00%	0.00%
Employer	4.13%	4.20%	4.20%	4.20%	n/a	6.50%	4.21%	2.00%
Employer Surcharge	0.00%	0.00%	0.00%	0.00%	n/a	0.00%	1.69%	0.00%
State	$0.0	n/a	n/a	n/a	$0.0	$0.0	$0.0	$0.0
Normal Cost Rate (Employer & Member)	3.6%	2.9%	3.6%	4.1%	**n/a**	4.2%	2.3%	1.9%
Funding Period for UAL in years	(3.8)	7.4	14.2	Infinite	n/a	Infinite	64.8	Infinite
Normal Cost plus 30-year amortization of Unfunded Accrued Liabilities/Surpluses	3.5%	3.3%	4.0%	4.6%	n/a	10.2%	7.4%	4.0%
Incrcasc/(Decrcase) based on 30-year funding	-0.6%	-0.9%	-0.2%	0.4%	n/a	3.7%	1.5%	2.0%
Pay-As-You-Go (PAYG) - net of retiree contributions if applicable	2.6	142.9	241.8	7.1	391.8	74.2	101.8	192.9
PAYG as percent of Payroll	4.4%	4.3%	5.0%	3.1%	4.7%	6.7%	6.6%	2.9%

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MILLIMAN & ROBERTSON, INC.

Pension and Postretirement Health Benefits - Discount Rate of 7.5%
($ Amounts in Millions)

| | HPRS | PERS | | | | PFDPF | SERS | STRS |
		State	Local Government	Law Enforcement	Total			
Valuation Date:	01/01/97	01/01/97	01/01/97	01/01/97	01/01/97	01/01/97	07/01/97	07/01/97
EAN Accrued Liability (AL)	$574.4	$16,190.8	$23,212.1	$1,232.6	$40,635.5	$9,068.8	$8,825.1	$51,413.6
Market Value of Assets (MVA)	512.1	15,969.5	22,554.1	1,234.4	39,758.0	6,415.7	6367.4	42,353.5
Unfunded Accrued Liability (UAL)	62.3	221.3	658.0	(1.8)	877.5	2,653.1	2,457.7	9,060.1
Portion of UAL financed by:								
Past Service Liability Payments	0.0	0.0	0.0	0.0	0.0	140.2	0.0	23.5
State Appropriation Payments	0.2	n/a	n/a	n/a	n/a	28.7	2.2	13.8
Regular Contributions	62.1	221.3	658.0	(1.8)	877.5	2,484.2	2,455.5	9,022.8
Funded Ratio = MVA / AL	89.2%	98.6%	97.2%	100.1%	97.8%	70.7%	72.2%	82.4%
Payroll	59.1	3,318.9	4,792.1	229.1	8,340.1	1,111.4	1,551.4	6,563.6
Statutory Contribution Rates:								
Member	10.00%	8.50%	8.50%	9.00%	n/a	10.00%	9.00%	9.30%
Employer	24.00%	13.31%	13.55%	16.70%	n/a	21.40%	14.00%	14.00%
Employer Surcharge	0.00%	0.00%	0.00%	0.00%	n/a	0.00%	1.69%	0.00%
State	$0.0	n/a	n/a	n/a	$2.1	$3.7	$0.4	$2.2
Normal Cost Rate (Employer & Member)	29.9%	16.7%	17.6%	22.8%	n/a	27.0%	19.2%	20.4%
Funding Period for UAL in years	62.5	1.4	3.3	(0.3)	n/a	Infinite	109.0	Infinite
Normal Cost plus 30-year amortization of Unfunded Accrued Liabilities/Surpluses	35.5%	17.1%	18.3%	22.8%	n/a	39.0%	27.7%	27.8%
Increase/(Decrease) based on 30-year funding	1.5%	4.70%	-3.8%	-2.9%	0.0%	7.6%	3.0%	4.5%

MILLIMAN & ROBERTSON, INC.

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OHIO RETIREMENT SYSTEMS

GENERAL REVENUE FUND - SUBSIDIES

Appropriation Item	Fiscal Year 98	Fiscal Year 99
090-510 PERS Cost of Living	$2,028	$1,633
090-511 STRS Cost of Living	$3,300	$3,000
090-512 SERS Cost of Living	$700	$700

These state subsidies are authorized by RC. §§145.321 (PERS), 3307.401 (STRS) and 3309.371 (SERS), and find the ad hoc increases enacted in H.B. 377 (102nd General Assembly - 1957). Public employees, teachers and school employees who were receiving a pension prior to June 29, 1955 were granted variable increases based on the date of retirement.

Appropriation Item	Fiscal Year 98	Fiscal Year 99
090-520 PERS Pension Benefits	$576,435	$492,982
090-521 STRS Pension Benefits	$485,000	$460,000
090-522 SERS Pension Benefits	$116,000	$95,000
090-523 Highway Patrol Retirement System	$4,776	$4,600
090-524 Police and Fire Disability Pension	$80,000	$75,000

These state subsidies are authorized by RC. §§5145.326 (PERS), 3307.404 (STRS), 3309.376 (SERS), 5505.171 (HPRS) and 742.374 (PFDPF), and the ad hoc increases enacted in H.B. 284 (109th General Assembly - 1971). Persons who were receiving a pension prior to July 1, 1968 were eligible for an additional monthly payment of two dollars for each year between their effective date of retirement and December 31, 1971, or fifty dollars, whichever is less.

Appropriation Item	Fiscal Year 98	Fiscal Year 99
090-530 PERS Ad Hoc Cost of Living	$1,633,500	$1,482,112
090-531 STRS Ad Hoc Cost of Living	$2,300,000	$2,200,000
090-532 SERS Ad Hoc Cost of Living	$303,000	$267,000

Appropriation Item	Fiscal Year 98	Fiscal Year 99
090-533 HPRS Ad Hoc Cost of Living	$27,681	$27,500
090-534 PFDPF Ad Hoc Cost of Living.	$410,000	$395,000

These state subsidies are authorized by R.C. §§145.3210 (PERS), 3307.409 (STRS), 3309.3710 (SERS), 5505.173 (HPRS) and 742.3712 (PFDPF), and fund the ad hoc increases first granted in H.B. 204 (113th General Assembly - 1979) and later codified in H.B. 638 (114th General Assembly - 1981). Persons who were receiving an age and service or disability pension prior to July 1, 1974 were eligible for a supplemental payment of five percent of the first five thousand dollars of their annual pension. Also, persons who were receiving a survivor benefit on or after June 14, 1951 through August 26, 197O from PERS, STRS or SERS were eligible for a five percent increase in their annual benefit. Persons receiving a survivor benefit prior to July 1, 1981 from HPRS or PFDPF were eligible for a supplemental payment of five percent of the first five thousand dollars of their annual benefit.

Appropriation Item	Fiscal Year 98	Fiscal Year 99
090-544 Police and Fire State Contribution	$1,200,000	$1,200,000

This state subsidy is authorized by R.C. §742.36 and is known as the "state contribution". The state contribution had been made annually to the 454 1ocal police and firemen pension funds in existence prior to their consolidation into PFDPF. The annual contribution was continued and paid into PFDPF and has remained unchanged since the consolidation in 1967.

Appropriation Item	Fiscal Year 98	Fiscal Year 99
090-554 Police and Fire Survivor Benefits	$2,130,000	$ 2 , 0 1 0 , 0 0 0

This state subsidy is authorized by R.C. §742.361 and funds the survivor benefit increases enacted in H.B. 215 (108th General Assembly - 1970), S.B. 48 (110th GeneralAssemb1y-1974)andH.B.268 (111th General Assembly - 1976).

This subsidy was limited by H.B. 694 (114th General Assembly - 1981) to persons who first received survivor benefits prior to July 1, 1981. For survivors first receiving benefits on or after July 1, 1981, PFDPF is required to make payment from its own resources.

Appropriation Item	Fiscal Year 98	Fiscal Year 99
090-575 Police and Fire Death Benefits	$l7,500,000	$19,300,000

This state subsidy is authorized by R.C. §742.61 and funds benefits payable under the Firemen and Policemen's Death Benefit Fund to the surviving spouses and dependent children of law enforcement officers and firefighters who die in the line of duty or from injuries sustained in the line of duty. PFDPF administers the Death Benefit Fund; the State of Ohio funds the benefits payable thereunder.

CHANGES IN EMPLOYEE CONTRIBUTION RATES
(AS PER CENT OF SALARY)

NON-UNIFORMED EMPLOYEE SYSTEMS

YEAR CHANGE OCCURRED	PERS STATE	PERS NON-STATE	STRS	SERS	MODIFICATION
1920			4.00		$2,000 earnings limit
1935	4.00				$2,000 earnings limit
1937				4.00	$2,000 earnings limit
1938		4.00			$2,000 earnings limit
1945	5.00	5.00	5.00	5.00	$3,000 earnings limit
1951	6.00	6.00	6.00	6.00	Based on total salary
1959			7.00	7.00	Optional on salary over $18,000*
1960	7.00	7.00			Optional on salary over $18,000*
1965	7.00	7.00	7.00	7.00	Optional on salary over $25,000
1968	7.70	7.70	7.80	7.90	Based on total salary
1974	8.00	8.00	8.00	8.00	
1977	8.50	8.50	8.50	8.00	
1983			8.75		
1984				8.75	
1988			8.77		
1989				9.00	
1990			9.25		
1994			9.30		

*Until 1959-60, members were charged an operational expense fee. initially set by law at one dollar, then $1.50 and finally $3.00. In 1959-60 the systems discontinued the fee charges and charged all expenses to earnings on investments.

CHANGES IN EMPLOYER CONTRIBUTION RATES
(AS PERCENT OF PAYROLL)

NON-UNIFORMED EMPLOYEE SYSTEMS

YEAR CHANGE OCCURRED	PERS STATE	PERS NON-STATE	STRS	SERS
1920			5.57	
1923			4.70	
1924			3.70	
1926			3.60	
1927			3.57	
1930			3.45	
1935	4.80			
1937				5.57
1938			3.82	
1939		4.80	4.44	5.50
1941			4.00	
1942		4.30		5.00
1943	4.30			
1945			5.00	5.50
1946		5.40	4.75	
1947	5.40		5.75	6.50
1948		5.70	7.50	7.00
1949	6.05		7.25	
1950		5.90		
1951	6.95		8.50	8.00
1952		7.00	8.00	7.75
1953	7.10			7.50
1955			9.25	8.00
1956		7.25		
1957	7.35			
1958			9.33	

CHANGES IN EMPLOYEE CONTRIBUTION RATES
(AS PERCENT OF SALARY)

UNIFORMED EMPLOYEE SYSTEMS

YEAR CHANGE OCCURRED	PFDPF	HPRS	PERS LAW ENFORCEMENT	MODIFICATION
1937	2.0[1]			Firefighters - based on total salary; Police officers - $3,000 earnings limit
1941		4.0		Based on total salary
1947	4.02			Based on total salary
1950		5.0		
1967[3]	6.0	7.0		
1968	7.0			
1P7S[4]			8.5	
1977		8.0		
1980	8.5			
1981		9.0		
1982			9.5	
1986	9.5			
1988	10.0			
1989		10.5		
1991			9.0	
1996		10.0		

[1]Until 1967, police officer's and firefighter's pensions were administered locally by 454 independent boards.
[2]Rate set for all locally administered systems receiving a state subsidy.
[3]PFDPF was established in 1967.
[4]The plan for law enforcement persons in PERS was established in 1975.

CHANGES IN EMPLOYER CONTRIBUTION RATES
(AS PER CENT OF PAYROLL)

UNIFORMED EMPLOYEE SYSTEMS

YEAR CHANGE OCCURRED	PFDPF POLICE	PFDPF FIRE	HPRS	PERS LAW ENFORCEMENT
1941			4.00	
1950			5.00	
1966			9.00	
1967	13.55	13.13		
1968	13.66	13.50		
1969	14.68	14.48		
1970	15.52	15.52		
1971	12.81	12.96	10.00	
1972	12.96	13.26		
1973	12.85	13.41		
1974	12.88	13.60		
1975	12.49	13.78	13.00	18.10
1976	14.02	15.57		
1977	15.34	16.77	13.25	
1978	17.53	18.90		
1979	18.40	20.11	18.00	
1980	15.70	19.87		
1981	15.60	20.72	22.00	
1982	16.62	22.39		
1983	18.45	23.57	24.80	
1985	20.03	24.59	24.66	
1986	19.50	24.00		
1989			24.39	
1991			24.53	16.00
1994				16.70
1996			24.00	

Economic Assumptions

A single set of assumptions with respect to inflation and investment returns was selected for this study since:

- each of the retirement systems is an investor in the same capital markets and is subject to the same statutory investment standards;
- the salaries of each system's members will be subject to the same general wage inflation pressures;
- post-retirement cost-of-living increases will. be based on the Consumer Price Index; and,
- the cost of health insurance benefits will be subject to the same health care cost pressures.

In developing a set of economic assumptions, it is common practice to start with the assumption regarding price inflation because this factor affects both the rate of salary increases and the rate of return on investments. We used a 3% price inflation assumption for this study. We chose 3% because it is consistent with long-term inflation during this century (over the last 72 years, inflation has averaged 3.1%) as well as the recent past (inflation over the last 5 years has averaged 2.6%).

Moving on to investment returns, we have summarized in the table below our assumptions regarding the long-term real rates of return (in excess of inflation) and total returns (with inflation). We have also indicated approximate weightings among the various asset classes (based on the policy asset allocations among the five retirement systems as reported in their most recent Comprehensive Annual Financial Statements) which were used to develop the expected return on the overall investment portfolio. We will present results based on two assumed rates of investment returns to illustrate the sensitivity of the results to this important assumption.

Asset Category	Average Current Policy Mix	Assumed Real Return	Assumed Total Return
Cash	3.6%	0.5%	3.52%
Fixed Income	37.0	4.0	7.12
Equities	**50.0**	**6.0**	**9.18**
Real Estate	**9.4**	**5.0**	**8.15**
Composite			**8.12**
Investment Expenses			**0.15**
Net Return			**7.97**

We based the assumed return on fixed income investments on current yields on fixed income investments and based the real return (above inflation) for equity and cash investments on experience over the last 72 years.   With respect to fixed income

investments, we selected 4.0%, which is higher than fixed income real returns over the past 72 years (long term government bonds showed a real return of 2.1% and Corporate Bonds 2.6%). We did so to recognize the significant changes in the fixed income markets over the past 20 years since the Federal Reserve Board has stopped trying to closely manage the level of interest rates and has focused more on inflation and other economic measures in managing the money supply. Over the past 25 years, long term government bonds showed a real return of 3.7% and Corporate Bonds 3.8% with higher returns over more recent periods. In addition, we referenced the yield on Treasury Inflation Indexed securities that are currently yielding returns over inflation of over 3.6% for a 30 year maturity and higher yields for the shorter 5 and 10 year maturities. Expected returns on conventional Treasury Bonds should be higher than this level and expected returns on Corporate Bonds even higher.

For the real return on equities, we adjusted the real rate over the past 72 years of 7.7% downward to reflect the concern that current market levels are high based on historical valuation levels. The real return on real estate was chosen to fall between returns on fixed income and equity investments.

As indicated in the table above, we then reduced the expected return to reflect 15 basis points (0.15%) of investment expenses and rounded the resulting amount. The 15 basis point assumption regarding investment expenses is in line with the level of investment expenses reported for four of the five systems. The actual level of investment expenses for HPRS is significantly greater than this amount due to its small size. We have adjusted for this in the administrative expense provision for HPRS.

To provide an indication of how close the expected return on each of the current Retirement System portfolios is to the 8.0% assumption, we have estimated the expected return of each System's investment portfolio based on their target asset allocation as presented in their 1997 Comprehensive Annual Financial Statements. The results are summarized below.

	HPRS	PERS	PFDPF	SERS	STRS
Cash	0%	6%	0%	1%	2%
Fixed Income	25	51	35	28	23
Equities	65	33	57	61	66
Real Estate	10	10	8	10	9
Gross Expected Returns	8.40%	7.55%	8.22%	8.29%	8.34%

Based on the investment assumptions shown previously, each of the retirement systems has an asset allocation which should produce gross (before investment expenses) expected investment returns of over 8.0% except PERS, whose asset allocation produces a gross expected investment return of 7.55%. In the absence of the adoption of a more aggressive asset allocation, PERS should continue to base its actuarial calculations on an investment

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return assumption 0.5% lower than the higher 8.0% assumption acceptable for use with the other systems"

With respect to general wage inflation, we used the assumed rate of price inflation plus 1% to reflect general wage growth due to productivity. This is consistent with the real growth in wages from 1951 through 1996 based on Social Security data. Using this assumption produced a general wage inflation assumption of 4%.

With respect to the future level of increases in health insurance costs, we used the 4% wage inflation assumption. (This is consistent with the assumption currently used by the HPRS and PERS actuaries.) This does not represent a best estimate of future health insurance cost increases. It represents the assumption that the Boards will take action in the future to control the cost of the health insurance benefits so they do not grow faster than the rate of increase in wages.

Demographic Actuarial Assumptions

An actuarial valuation for a retirement system includes the use of many assumptions regarding demographic factors such as rates of termination, disability, death and retirement among active members as well as the mortality among disability and service retirees. It would not be appropriate to use a single set of demographic assumptions for all five retirement systems because the requirements and stresses of the jobs preformed by members covered by the various retirement systems differ significantly as do the eligibility requirements for benefits under the systems. Therefore we used different demographic assumptions for each of the retirement systems.

The demographic assumptions we used were based on the actual experience under each of the five Retirement Systems as tabulated by the System's actuary over the most recent 10 year period studied. (In the case of STRS, complete data for all 10 years was not available. Therefore we based the demographic assumptions on the experience data available. For HPRS, we relied on the available mortality experience among service retirees that covered only 5 years. For PERS, only 5 years of data was available regarding early retirements. We do not believe that using this data impairs the results of the study.)

We used the actual experience data to develop assumptions regarding the following demographic factors:

> Decrements from active service
>> Death
>> Disability
>> Retirement
>> Termination prior to retirement
> Merit salary increases during active service
> Mortality among Service Retirees and Beneficiaries

There was a situation where we modified this standard approach for developing demographic assumptions listed above for this study. It related to Mortality among service retirees and beneficiaries where we modified the actual 10 year experience data to project for future mortality improvements. Throughout this century (and prior centuries), life expectancies have been continuously improving as sanitation and medical services have improved. Since it is generally expected that life expectancy will continue to increase in the future, we have projected actual past experience to the year 2007 based on the AA projection scale developed by the Society of Actuaries Task Forces formed to develop updated mortality tables.

In addition we developed merit salary scales for PFDPF, SERS and STRS by determining the excess of wage growth within five year age groups over the increase in average wages among members ages 65 and over (55 for PFDPF). We then assumed that merit increases were 0% beyond that age. This was possible because their actuaries reported data in that format. For PERS we used the average merit increase experience as reported for 1986 through 1995. For HPRS we used the merit increase assumption developed by the System's actuary from the more recent study because the basis of tabulating data was changed from the prior experience study.

We used without modification the other non-economic assumptions utilized by the Systems' actuaries.

Expenses

As indicated above, we reflected the level of aggregate investment expenses for all retirement systems in developing the proposed investment return assumption. As we indicated previously, 15 basis points are adequate to cover substantially all of the investment-related expenses for all systems except HPRS. We reflected the administrative expenses on a system-by-system basis as an additional annual cost expressed as a percentage of payroll.

Actuarial Cost Method

We used the Entry Age Normal Cost Method for measuring system liabilities and contributions in this study. This included applying that method to measuring the cost of the health insurance benefits provided by the systems.

All of the five retirement systems use this method. This method is especially useful in determining the adequacy of fixed contribution rates, such as is the case with the five Ohio Retirement Systems. If the fixed contribution rates are adequate to fund the full normal cost for the year plus provide sufficient contributions to fund any Unfunded actuarial liabilities within a reasonable time period, then the contribution rates can be considered to be adequate. Senate Bill 82, which became effective in 1997, established a maximum 30 year amortization period as the time period to be used for this purpose and provided a 10 year transition period for attaining this objective.

In developing Entry Age Normal costs, we utilized the variation of the Entry Age Method, which bases the entry age normal cost on the benefits that apply to new entrants to the system. We chose this approach in order to provide for a stable normal cost over time as current members cease active employment and are replaced by new hires. As a practical matter, this primarily affected the calculation of entry age normal costs for health insurance under SERS since the health insurance plan has been curtailed for members joining SERS after June 30, 1993 by requiring them to pay their full premium for health insurance after retirement until they become eligible for Medicare.

Actuarial Asset Value

Actuaries frequently develop "actuarial values" for assets rather than using fair market value. They do this in an attempt to provide stability to the measurement of unfunded liabilities and contributions from year to year. Market values of publicly traded securities are subject to short term fluctuations. Actuaries have developed "smoothing" techniques to dampen year to year volatility. These methods are not intended to consistently over- or understate asset values; they are merely intended to avoid unnecessarily large changes in contribution rates from year to year. Each of the five Ohio Retirement Systems uses such an actuarial asset value in measuring its funded status and determining contribution requirements.

For purposes of this report, we have chosen to use fair market value of system assets. We did so because our objective is to compare the funded status of the systems on a consistent basis. Fair market value seems to us to be the best measure to use for this purpose.

To allocate the market value of assets between the divisions of PERS (State, local government and law enforcement), we utilized the relationship between the actuarial value of assets for each division for pension and health benefits as indicated in the January 1, 1997 actuarial valuation.

The US stock market experienced quite favorable returns during the first 6 months of 1997 (the S&P index showed a 20% return over this period) while returns on fixed income securities were modestly unfavorable due to the small increase in interest rates during this period. This has the effect of making the two systems with June 30 fiscal years, SERS and STRS, look somewhat better relative to the other systems which use a December 31 fiscal year solely on account of the different valuation dates.

The effect on pension unfunded liabilities of using fair market value instead of actuarial asset value has been isolated from the effect of all of the other assumptions and method changes made below.

System	Unfunded Liabilities reported in valuation	Unfunded Liabilities based on market values	Unfunded Liabilities based on market values and alternative assumptions @ 8.0%
Highway Patrol*	$43.2	$19.7	$22.1
Public Employees			
State Employees	717.3	(61.6)	(824.7)
Local Governments	1,307.4	253.7	(704.5)
Law Enforcement	14.4	(46.0)	(89.0)
Police and Firemen	1,599.g	842.2	990.2
School Employees	984.9	283.6	612.5
Teachers	7,854.7	4,210.2	4,016.6

 * These figures reflect the plan provisions reflected in the January 1, 1997 actuarial valuation of HPRS and do not reflect the effect of H.B. 648.

As indicated in the table below, the major factor in reducing the funding period for all systems was the use of market value of assets. All of the other changes we made in assumptions served to further reduce the funding period for PERS, had little net effect for HPRS and increased the funding period for PFDPF, SERS and STRS.

Specifically, the more significant assumption changes for each system are:

HPRS - The longer life expectancies we assumed for service retirees largely offset the reduction in liabilities due to reducing the wage inflation assumption from 5% to 4% and increasing the investment return assumption from 7.75% to 8.0%;

PERS - The major changes were the reduction in wage inflation from 4.75% to 4% and the increase in the investment return assumption to 8.0% from 7.75%.

PFDPF - The major changes were the increase in the life expectancies among service retirees and the lower investment return assumption (from 8.25% to 8%).

SERS - The major changes were due to lowering the investment return assumption from 8.25% to 8% and lowering the wage inflation assumption from 4.25% to 4%.

STRS - The major changes were increased retirement decrements among members with 30 or more years of service and higher wage inflation (4% vs 3.25%). These were offset by the effect of raising the investment return assumption to 8% from 7.5%.

System	Normal Cost from:		Funding Period based on:		
	Valuation	@ 8.0%	Valuation	Market Value	@ 8.0%
Highway Patrol*	24.45%	23.2%	17.1 yrs.	6.9 yrs.	6.5 yrs.
Public Employees					
State Employees	14.71	12.4	8.9		
Local Governments	14.66	12.8	15.0	2.5	
Law Enforcement	19.50	16.7	9.9		
Police and Firemen	18.35	20.6	42.6	12.6	29.2
School Employees	13.99	15.3	24.7	5.1	15.1
Teachers	15.06	16.6	28.4	12.4	18.8

* These figures reflect the plan provisions in the January 1, 1997 actuarial valuation of HPRS and do not reflect H.B. 648.

The following pages present a summary of the altered demographic assumptions for select ages. A summary of the additional assumptions used to value the post-retirement health insurance benefits also is provided. However, we adjusted the retiree liabilities and payouts to reflect the actual payouts for post-retirement health insurance benefits reported in the 1997 Comprehensive Annual Financial Reports for HPRS, PERS and PFDPF.

Appendix D

Summary of Altered Demographic Assumptions

HPRS

Normal Retirement:

Age	Rate	Age	Rate
48	31.3%	54	37.5%
49	23.2%	55	55.0%
50-51	26.8%	56	100.0%
52-53	33.3%		

Withdrawal:

& s	Rate
20-24	4.1%
25-29	2.1%
3O&Over	1.2%

Pre-Retirement Mortality:

	Rate	
Age	Male	Female
25	0.05%	0.02%
35	0.06%	0.04%
45	0.12%	0.07%
55	0.33%	0.17%

Post-retirement Mortality for Healthy Retirees and Beneficiaries:

	Rate	
Age	Male	Female
55	0.26%	0.22%
65	0.94%	0.87%
75	2.40%	2.20%
85	6.94%	6.74%
95	17.93%	19.51%

Administrative Expenses: 2.00% of payroll (added to normal cost rate)

Appendix D

Summary of Altered Demographic Assumptions

PERS

Normal Retirement:

			Rate		
	State	State	Local Gov't	Local Gov't	Law
Age	Male	Female	Male	Female	Enforcement
55	12.59%	14.02%	17.63%	16.85%	16.10%
60	12.16%	13.89%	13.89%	17.84%	11.47%
62	16.07%	15.17%	19.69%	18.10%	19.17%
65	22.22%	17.18%	24.65%	21.98%	26.32%
70	21.58%	19.19%	17.03%	19.56%	28.57%
80	100.00%	100.00%	100.00%	100.00%	100.00%

Early Retirement:

	Rate	
Age	State	Local Gov't
55	18.17%	7.81%
60	11.04%	8.96%
62	15.55%	13.34%
64	16.98%	11.84%

Withdrawal: With less than 5 Years of Service

			Rate		
Years of	State	State	Local Gov't	Local Gov't	Law
Service	Male	Female	Male	Female	Enforcement
0	32.46%	29.38%	30.77%	29.73%	16.13%
1	15.78%	16.04%	15.13%	17.69%	10.19%
2	12.60%	12.88%	11.88%	14.18%	7.45%
3	9.08%	10.34%	8.98%	10.80%	6.93%
4	5.96%	6.56%	6.57%	7.14%	4.94%

With 5+ Years of Service

			Rate		
	State	State	Local Gov't	Local Gov't	Law
Age	Male	Female	Male	Female	Enforcement
25	6.37%	8.39%	7.66%	10.38%	4.50%
35	3.71%	4.50%	4.02%	5.46%	2.49%
45	2.41%	3.12%	3.12%	3.99%	1.87%
55	2.08%	2.45%	2.70%	3.00%	1.92%

Appendix D

Summary of Altered Demographic Assumptions

PERS (continued)

Disability:

			Rate		
Age	State Male	State Female	Local Gov't Male	Local Gov't Female	Law Enforcement
25	0.04%	0.03%	0.09%	0.07%	0.22%
35	0.18%	0.18%	0.30%	0.17%	0.54%
45	0.5 1%	0.53%	0.67%	0.38%	1.65%
55	1.45%	1.19%	1.66%	0.98%	2.24%
65	1.88%	2.44%	1.40%	1.07%	1.92%

Merit Salary Scale:

		Rate	
Age	State	Local Gov't	Law Enfor,
25	3.30%	4.40%	6.65%
35	2.00%	2.30%	2.05%
45	1.15%	1.55%	1.20%
55	0.55%	0.85%	0.65%
65	0.00%	0.00%	0.00%

Pre-Retirement Mortality:

			Rate			
Age	State Male	State Female	Local Gov't Male	Local Gov't Female	Law Enfor. Male	Law Enfor. Female
25	0.07%	0.03%	0.05%	0.02%	0.06%	0.03%
35	0.09%	0.05%	0.07%	0.03%	0.08%	0.04%
45	0.17%	0.10%	0.13%	0.07%	0.14%	0.09%
55	0.48%	0.22%	0.37%	0.16%	0.39%	0.20%
65	1.56%	0.85%	1.20%	0.59%	1.28%	0.76%
75	4.00%	2.22%	3.08%	1.56%	3.28%	2.00%

Post-retirement Mortality for Healthy Retirees and Beneficiaries:

	Rate	
Age	Male	Female
55	0.47%	0.26%
65	1.68%	1.02%
75	4.29%	2.54%
85	12.56%	7.85%
95	32.70%	23.00%

Administrative Expenses: 0.00% of payroll (added to normal cost rate)

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Summary of Altered Demographic Assumptions

PFDPF

Normal Retirement:

Age	Rate Police	Fire	Age	Rate Police	Fire
48	40.51%	35.85%	62	21.62%	3 1.47%
55	24.39%	24.52%	65	33.71%	37.84%
60	24.39%	31.47%	70	100.00%	100.00%

Withdrawal:

Age	Rate Police	Fire	Age	Rate Police	Fire
25	3.00%	1.23%	45	0.80%	0.37%
35	1.80%	0.90%	55	3.60%	1.18%

Disability:

Age	Rate Police	Fire	Age	Rate Police	Fire
25	0.10%	0.05%	45	2.48%	1.94%
35	0.85%	0.42%	55	4.71%	5.07%

Type of Disablity Retirement	Police	Fire
Permanent & Total Disability (On Duty)	28%	33%
Partial Disability (On Duty)	69%	65%
Ordinary Disability (Off Duty)	3%	2%

Merit Salary Scale:

Age	Rate Police	Fire	Age	Rate Police	Fire
25	2.10%	2.09%	45	0.38%	0.05%
35	0.29%	0.24%	55	0.00%	0.00%

Pre-Retirement Mortality:

Age	Rate Police	Fire	Age	Rate Police	Fire
25	0.05%	0.04%	55	0.30%	0.25%
35	0.06%	0.05%	65	1.00%	0.83%
45	0.11%	0.09%			

Post-retirement Mortality for Healthy Retirees and Beneficiaries:

Age	Rate Healthy Male Ret	Healthy Female Ret.	Male Beneficiary	Female Beneficiary
55	0.44%	0.22%	0.37%	0.29%
65	1.57%	0.87%	1.30%	1.15%
75	4.01%	2.20%	3.33%	2.89%
85	11.66%	6.74%	9.54%	8.89%
95	30.20%	19.51%	24.47%	25.96%

Administrative Expenses: 1.25% of payroll (added to normal cost rate)

MILLIMAN & ROBERTSON, INC.

Appendix D

Summary of Altered Demographic Assumptions

SERS

Retirement:

Age	Rate Male	Female	Age	Rate Male	Female
50	38.15%	31.27%	65	40.03%	28.71%
55	17.39%	22.07%	70	28.45%	29.55%
60	15.33%	22.16%	80	100.00%	100.00%
62	24.53%	21.18%			

Withdrawal:

Age	Rate Male	Female	Age	Rate Male	Female
One or fewer Years of Service					
25	65.32%	60.72%	45	41.41%	36.30%
35	50.98%	40.15%	55	41.41%	41.22%
Between One and Two Years of Service					
25	15.50%	13.94%	45	12.62%	8.99%
35	14.12%	9.73%	55	10.65%	10.26%
Between Two and Three Years of Service					
25	11.37%	11.89%	45	8.72%	6.78%
35	10.61%	7.55%	55	7.71%	8.78%
Between Two and Three Years of Service					
25	6.12%	7.43%	45	3.13%	3.23%
35	4.30%	4.73%	55	3.13%	2.50%

Disability:

Age	Rate Male	Female	Age	Rate Male	Female
25	0.04%	0.01%	45	0.59%	0.28%
35	0.24%	0.07%	55	1.46%	0.88%

Merit Salary Scale:

Age	Rate	Age	Rate
25	8.27%	45	3.00%
35	4.81%	55	1.54%

Pre-Retirement Mortality:

Age	Rate Male	Female	Age	Rate Male	Female
25	0.06%	0.02%	45	0.15%	0.07%
35	0.08%	0.04%	55	0.41%	0.17%

Post-retirement Mortality for Healthy Retirees and Beneficiaries:

Age	Rate Male	Female	Age	Rate Male	Female
55	0.42%	0.22%	85	11.33%	6.75%
65	1.50%	0.87%	95	29.64%	19.86%
75	3.84%	2.18%			

Administrative Expenses: 0.10% of payroll (added to normal cost rate)

MILLIMAN & ROBERTSON, INC.

Summary of Altered Demographic Assumptions

STRS

Retirement:

Age	Rate Male	Female	Age	Rate Male	Female
Under 30 Years of Service					
55	4.44%	9.32%	65	25.26%	28.01%
60	9.96%	15.72%	70	35.44%	25.59%
62	12.80%	15.72%	75	100.00%	100.00%
30 or More Years of Service					
50	38.71%	33.29%	65	48.250%	52.57%
55	30.39%	28.48%	70	54.93%	44.16%
60	33.14%	40.15%	75	100.00%	100.00%
62	38.91%	46.55%			

Withdrawal:

Age	Rate Male	Female	Age	Rate Male	Female
25	7.30%	13.70%	45	1.00%	1.20%
35	2.20%	2.90%	55	1.80%	2.10%

Disability:

Age	Rate Male	Female	Age	Rate Male	Female
25	0.00%	0.02%	45	0.25%	0.24%
35	0.11%	0.13%	55	0.66%	0.61%

Merit Salary Scale:

Age	Rate Male	Female	Age	Rate Male	Female
25	10.27%	8.45%	45	1.05%	1.68%
35	3.87%	3.86%	55	0.68%	0.45%

Pre-Retirement Mortality:

Age	Rate Male	Female	Age	Rate Male	Female
25	0.04%	0.02%	45	0.10%	0.06%
35	0.05%	0.03%	55	0.27%	0.14%

Post-retirement Mortality for Healthy Retirees and Beneficiaries:

Age	Rate Male	Female	Age	Rate Male	Female
55	0.37%	0.24%	85	9.35%	7.29%
65	1.28%	0.94%	95	23.86%	21.03%
75	3.29%	2.38%			

Administrative Expenses: 0.00% of payroll (added to normal cost rate)

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Appendix D

Summary of Health Care Assumptions

HPRS: As indicated in the December 31, 1996 valuation of post-retirement medical benefits

PERS: As indicated in the December 31, 1996 valuation of post-retirement medical benefits

PFDPF:	1997 Benefit Cost (PC-C)	1997 Retiree Contribution	
Benefit Recipient			
Non-Medicare Eligible	3,281	116	
Medicare Eligible	2,143	60	
Spouse			
Non-Medicare Eligible	3,296	521	
Medicare Eligible	1,402	0	
Portion of Retirees electing medical coverage:			91%
Portion of electing Retirees who also elect Spouse coverage:			
Non-Medicare Eligible			86%
Medicare Eligible			66%

SERS:	1997-98 Benefit Cost (PCC)*	1997-98 Retiree Contribution**	
Benefit Recipient			
Non-Medicare Eligible	3,982	4,199	
Medicare Eligible	1,282	732	
Spouse			
Non-Medicare Eligible	3,982	2,865	
Medicare Eligible	1,282	712	

* Benefit costs for current retirees were adjusted to account for differences in data
   from the retiree census data file and information in the 1997 health care report
** Assuming Retiree pays 100%

Portion of Future Retirees electing medical coverage:	
Superannuation Annuitants	
Between 10 and 14 Years of Service	48%
Between 15 and 19 Years of Service	55%
Between 20 and 24 Years of Service	70%
25 or more Years of Service	97%
Survivor Annuitants	86%
Disability Annuitants	99%
Portion of electing Retirees who also elect Spouse coverage:	29%

MILLIMAN & ROBERTSON, INC.

Appendix D

Summary of Health Care Assumptions (continued)

STRS:	1997-98 Benefit Cost (PCC)	1997-98 Retiree Contribution*
Benefit Recipient		
Non-Medicare Eligible	3,854	547
Medicare Eligible	1,924	201
Spouse		
Non-Medicare Eligible	3,255	1,109
Medicare Eligible	1,233	407

* Average for current retirees

1997-98 Retiree contributions for future retirees

| Years of Service | Benefit Recipient | | Spouse | |
	Non-Medicare Eligible	Medicare Eligible	Non-Medicare Eligible	Medicare Eligible
Less than 10	1,874	463	2,933	984
Between 10 and 14	1,419	368	2,417	784
Between 15 and 19	1,075	285	1,961	623
Between 20 and 24	793	214	1,575	475
Between 25 and 29	587	167	1,241	353
30 or more	455	132	989	254

Portion of Future Retirees electing medical coverage:

Less than 10 Years of Service	64%
Between 10 and 14 Years of Service	76%
Between 15 and 19 Years of Service	85%
Between 20 and 24 Years of Service	91%
Between 25 and 29 Years of Service	91%
30 or more Years of Service	91%

Portion of electing Retirees who also elect Spouse coverage: 35%

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