

Report to the  
General Assembly and Governor of the  
Commonwealth of Pennsylvania  
Pursuant to Act 176 of 1986

Study of Method for Setting  
Employer Contribution Rates To  
Optional Alternate Retirement Programs

Prepared by the  
Public Employee Retirement Study Commission  
March, 1987



COMMONWEALTH OF PENNSYLVANIA

**PUBLIC EMPLOYEE RETIREMENT STUDY COMMISSION**

HARRISBURG  
17120

March, 1987

To: Governor Casey and  
Members of the Pennsylvania General Assembly

In compliance with the provisions of Section 2 of Act 176 of 1986, the Public Employee Retirement Study Commission presents the following report recommending a method for setting employer contributions to retirement programs covering Commonwealth employees who are authorized to elect optional retirement coverage in lieu of participating in the State Employees' Retirement System.

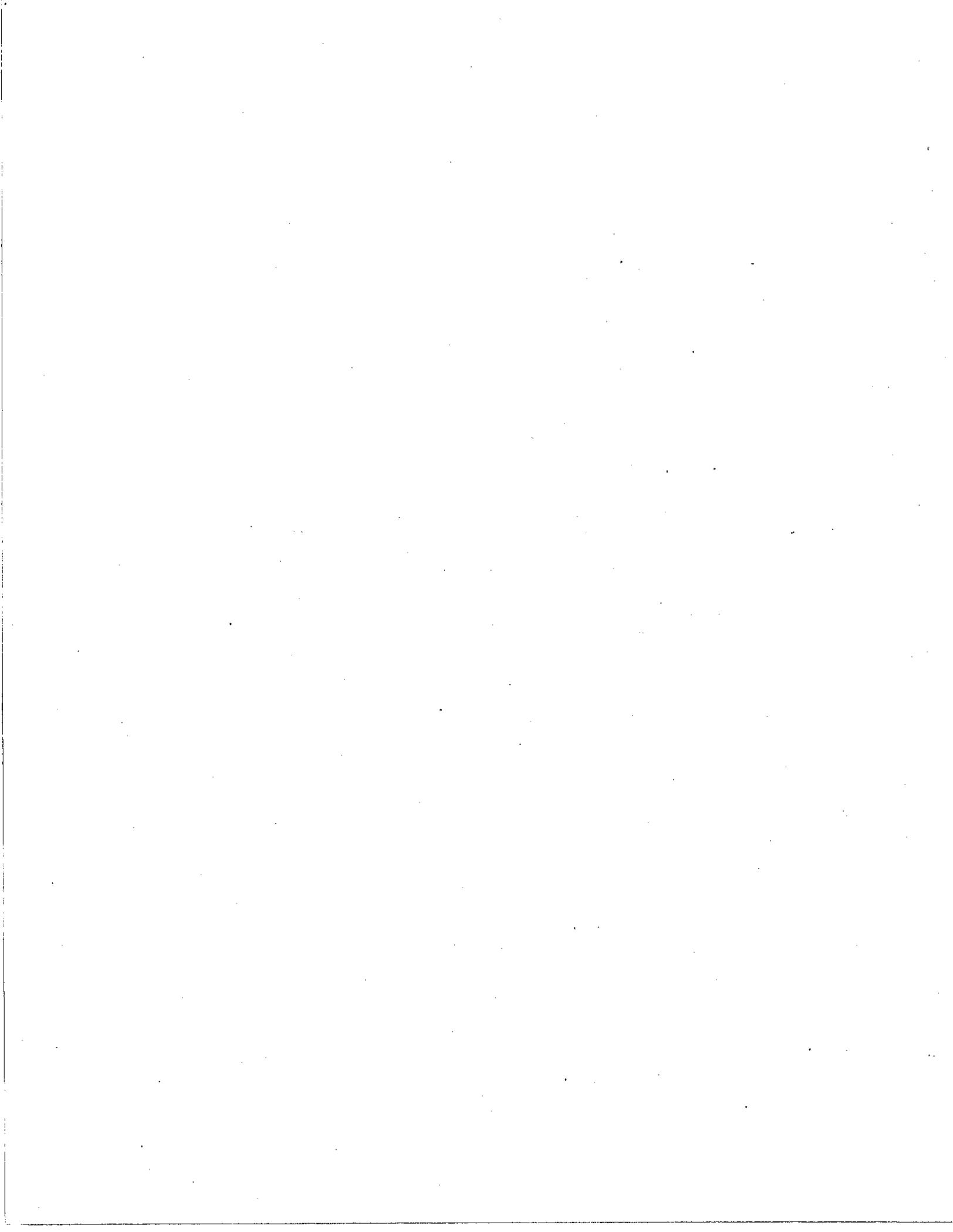
The study analyzes the problems inherent in the present method for setting employer contribution rates to alternative retirement programs and sets forth the Commission's recommendation for a more appropriate method which continues to reflect the current policy of maintaining parity in employer contributions for retirement coverage for all Commonwealth employees.

On behalf of the members of the Commission, I express our hope that this report will be of assistance to you in your future consideration of this issue.

Sincerely,

A handwritten signature in cursive script that reads "Dale D. Stone".

Dale D. Stone  
Chairman



## SUMMARY OF CONCLUSIONS AND RECOMMENDATIONS

### Summary of Conclusions

The following summarizes the main conclusions reached by the Commission in the conduct of the study:

- The current method of determining employer contributions to optional independent retirement programs based on the employer normal rate for the State Employees' Retirement System (SERS) achieves the goal of "parity between employer contribution rates" only if the normal cost is calculated using valid long-term assumptions which produce a stable cost pattern which is likely to fund the benefits of SERS without significant future supplemental contributions.
- The economic actuarial assumptions used in preparing the annual SERS valuations may not produce the desirable stable long-term normal cost pattern which would be appropriate for determining contributions to optional defined contribution pension plans.
- State employees who have elected participation in an optional defined contribution plan should be provided with an employer contribution rate which has a measure of stability and predictability and provides for parity in employer contributions from a long-term rather than short-term perspective.
- In determining contributions on behalf of participants in optional retirement programs, some consideration of the value of periodic ad hoc postretirement adjustments granted to SERS members would be consistent with the goal of providing parity in employer contributions.

### Summary of Recommendations

The Commission's recommendations are based on actuarial calculations designed to approximate the SERS normal cost rate using economic actuarial assumptions considered to be valid long-term assumptions within commonly accepted actuarial practice. The following summarizes the Commission's recommendations:

- That a set rate for employer contributions to approved optional independent retirement programs such as the Teachers Insurance Annuity Association/College Retirement Equities Fund TIAA/CREF be established and continued without modification for a period of five to ten years and that the contribution rate be reviewed at the close of each established period of years to determine whether any modifications are warranted.
- That the initial contribution rate be set in the range of 7% to 9% of payroll, with the 7% rate approximating the value of the regular SERS benefit plan and the 9% rate additionally reflecting the approximate value of postretirement cost-of-living increases likely to be granted to SERS members.



## I. INTRODUCTION

Act 176 of 1986 was signed into law on December 15, 1986. The act addressed the issue of employer contributions for retirement coverage for State employees electing to participate in an employer-approved independent retirement program in lieu of membership in the State Employees' Retirement System (SERS). The affected employees are employees of the State System of Higher Education and the Pennsylvania State University who have chosen the optional retirement coverage. A limited number of employees in the State Department of Education have also elected the optional coverage. The retirement program which has been approved by the employer to provide this alternative coverage is the Teachers Insurance and Annuity Association / College Retirement Equities Fund (TIAA/CREF), a defined contribution pension plan.

Since the alternative retirement coverage was first authorized in 1974, employer contributions on behalf of employees covered by the TIAA defined contribution plan have been limited to the employer normal cost contribution rate for the State Employees' Retirement System, a defined benefit pension plan. During the first thirteen years of the alternative retirement program, employer contributions based on the actuarially determined employer normal rate for SERS have ranged from 6.42% of payroll (1985-86) to 7.9% of payroll (1980-81). The average contribution rate for the period has been 7.08% of payroll.

Based on the results of the December 31, 1985 actuarial valuation of the State Employees' Retirement System, the actuarially calculated employer normal rate decreased from 6.42% in the prior year to 3.6%. This would have resulted in a

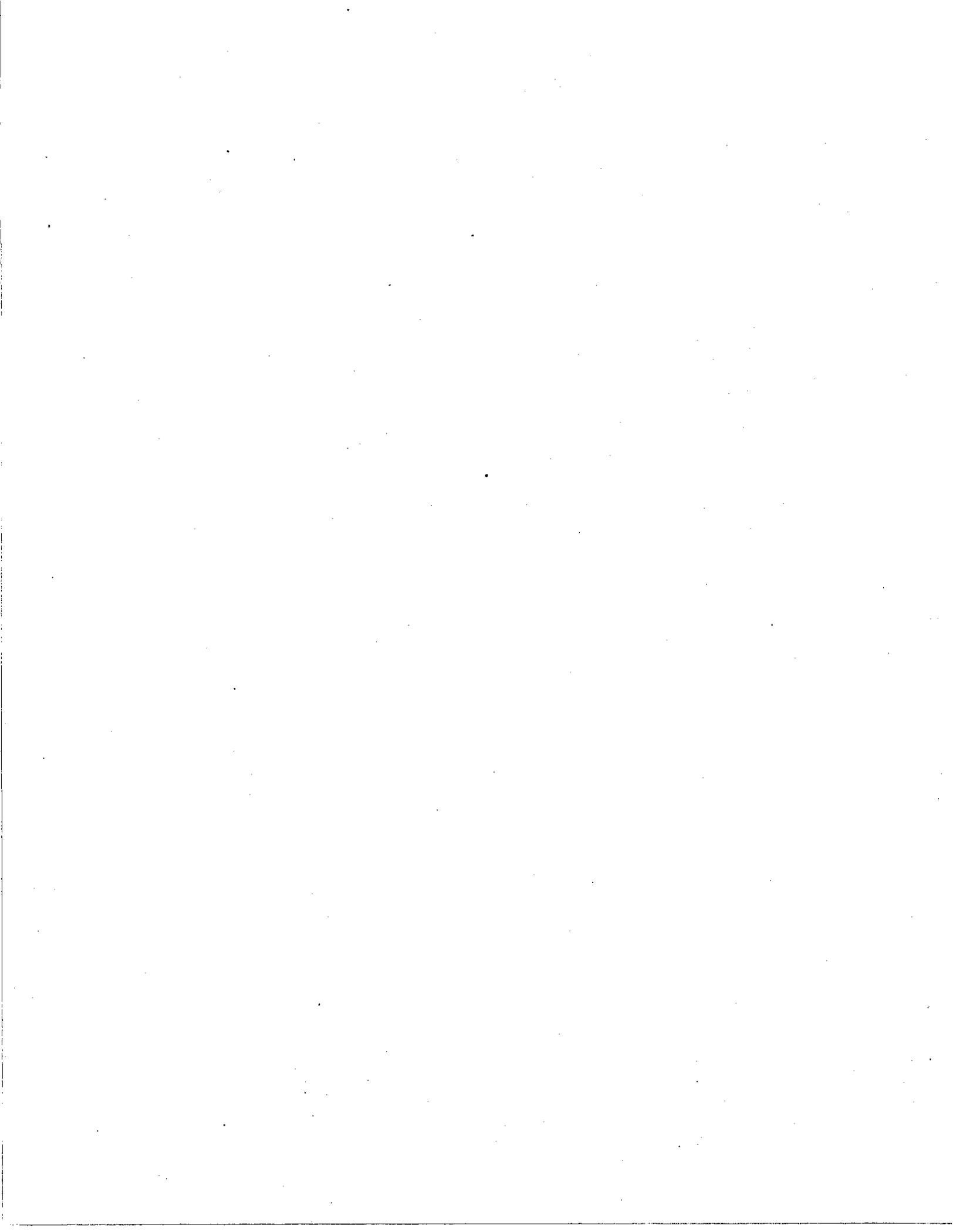
sharp reduction in the employer contribution rate for the 1986-87 fiscal year for employees covered by the TIAA program.

Because the TIAA retirement plan is a defined contribution plan under which the amount of the benefit at retirement will be wholly dependent on the amount of contributions and investment earnings which have accumulated to purchase the benefit, the drastic reduction in the contributions would have had a permanent impact on the ultimate benefit which an employee would receive under the plan. By contrast, the State Employees' Retirement Plan is a defined benefit plan under which an employee is entitled to a set benefit. The amount of contributions to the plan serve as a means of pre-funding the expected benefits, are subject to actuarial adjustment if determined to be too much or too little and do not affect the employee's entitlement to the promised benefit amount.

Act 176 was enacted to prevent the substantial reduction in employer contributions to the alternate retirement plan for the 1986-87 fiscal year which would result from the precipitous drop in the SERS normal cost rate. As an immediate measure of relief for employees affected by the program, the rate for the 1986-87 fiscal year was set at 7% of payroll. The 7% rate approximates the average employer normal contribution rate over the 13-year history of the alternate retirement program.

In enacting Act 176 of 1986, the General Assembly recognized the need to evaluate the current method of setting contribution rates on behalf of employees participating in optional alternate retirement programs. The legislation directed the Public Employee Retirement Study Commission to "undertake a study to ascertain the most appropriate method to set annual employer contribution rates to optional

alternate retirement programs so as to ensure parity between employer contribution rates to the State Employees' Retirement System and alternate employee retirement programs." The legislation specified that the study and the recommendations of the Commission be transmitted to the General Assembly no later than March 31, 1987.



## II. PURPOSE OF STUDY

The purpose of the study, as set forth in Act 176 of 1986, is to determine the most appropriate method to set annual employer contribution rates to optional alternate retirement programs. The sole criterion specified in the legislation is that the method be designed to "ensure parity between employer contribution rates to the State Employees' Retirement System and alternate employee retirement programs."

The charge of the legislation is that a means be found to produce parity between two very dissimilar retirement programs, a state defined benefit plan and an optional alternate defined contribution plan. Specifically the parity which is being sought is between employer contribution rates to the two plans.

It was the apparent policy determination of the General Assembly at the time that optional participation in alternative retirement programs was first authorized (1974) that the Commonwealth should not incur any greater obligation for financing the benefits of an employee electing the alternative coverage than is incurred for financing the benefits of an employee participating in the retirement plan which is generally provided for state employees. The language of Act 176 of 1986, specifying that parity between employer contribution rates to the two plans be maintained, evidences that the state policymakers continue to hold that view.

Since the enactment of Act 176, the Commission has heard various views expressed concerning how the study should be approached. Among the views which have been expressed are the following:

- That the goal of providing parity through a linkage of the employer contribution rates of a defined benefit plan and a defined contribution plan is inappropriate and impossible.
  
- That the parity which is being sought should be parity of benefits. A contribution rate designed to produce benefits under the alternate retirement program which are of comparable value to the SERS benefits should be developed.
  
- That the alternate retirement program must serve a role in the recruitment and retention of qualified faculty in the very competitive field of higher education. The employer contribution rates should be designed to assist Pennsylvania institutions of higher education in maintaining a competitive position in recruiting faculty.

The Commission cannot dispute the difficulty associated with the goal of establishing parity, in either employer contributions or benefits, between two dissimilar retirement systems and is not in a position to argue with those who point out that Pennsylvania's state higher education institutions must be able to offer a retirement program which is competitive with plans being offered by institutions throughout the nation. The legislation which mandated that the study be undertaken, however, specifically cited only the goal of establishing parity in employer contribution rates to the two plans. The focus of the study, therefore, will be to analyze the problems inherent in the present method for setting employer contribution rates to alternative retirement programs and to ascertain a more appropriate method which continues to reflect a policy of maintaining parity in employer contributions.

### III. BACKGROUND

#### Comparison of Defined Contribution and Defined Benefit Plans

The two pension plans with which this study is concerned are representative of the two broad types of benefit plans. The State Employees' Retirement Plan is a defined benefit plan. The plan which certain state higher education employees have been authorized to participate in as an alternative to SERS participation is a defined contribution plan. The distinguishing aspects between the two types of plans are the element which is fixed and the element which is variable. The two elements are the benefit amount and the financing.

In a defined contribution plan, the financing of the pension plan is fixed as a set dollar amount or percentage of pay and the amount of the eventual pension benefit is variable. The amount of the pension benefit is dependent chiefly on the amount of financing, including contributions and investment earnings, available at retirement to fund the benefit.

In a defined benefit plan, the amount of the eventual pension benefit is fixed based on a predetermined benefit formula and the financing of the plan is variable dependent on the actuarial funding method chosen. The actuarial funding method provides a systematic plan for accumulating assets which will be adequate to pay the pension benefits which have been promised.

For a defined contribution plan, the actual financing provided to the plan has a direct impact on the amount of the benefit which will be paid at retirement. For a defined benefit plan, the employee's benefit is not affected by the actual

financing provided to the plan. The financing is actuarially determined based on an actuarial cost method and assumptions concerning expected future economic and demographic occurrences. If the financing which is provided is determined to have been more than adequate or less than adequate due to actual experience differing from experience expected under the assumptions, actuarial adjustments are made through the recognition of actuarial gains or losses. None of these actuarial adjustments impacts on the amount of the ultimate benefit payable to the employee which is pre-established based on the benefit formula.

#### History of Commonwealth Participation in Alternative Retirement Programs

Membership in the State Employees' Retirement System is mandatory for all but a limited number of state employees. Optional membership is available to the Governor, high-level executive branch officials, and members and employees of the General Assembly. These employees are not offered alternative retirement coverage if they opt not to participate in SERS.

In 1972, state higher educational institution employees became eligible to elect coverage under an employer-approved independent retirement program as an alternative to SERS retirement coverage. The provision of law authorizing the alternative coverage specified that contributions to an independent retirement program would be capped at the employer normal contribution rate for SERS which is actuarially determined on an annual basis. An employee electing coverage under the independent retirement program would not have the option of subsequently changing that election in order to become a member of SERS.

The independent retirement program which has been approved by the employer to provide alternative retirement coverage to state higher education employees is the Teachers Insurance and Annuity Association / College Retirement Equities Fund (TIAA/CREF). The TIAA/CREF Retirement Program is the principal retirement system used nationally throughout the higher education community.

The following summarizes, by organization, the estimated number of state employees currently participating in TIAA/CREF and the rate of election of TIAA/CREF by newly entering eligible employees:

<u>Organization</u>	<u>Estimated Number of Employees Participating in TIAA/CREF</u>	<u>Rate of Election of TIAA/CREF by Newly Hired Faculty (1975-1986)</u>
State System of Higher Education	1,460	43.48%
Pennsylvania State University	3,400	72.2%
State Department of Education	30	N/A
Total	<u>4,890</u>	

A history of Commonwealth employer contribution rates to TIAA/CREF since the beginning of Commonwealth participation follows:

<u>Fiscal Year</u>	<u>Rate (% of payroll)</u>
1973-74.....	7.32
1974-75.....	7.30
1975-76.....	6.64
1976-77.....	6.64
1977-78.....	6.64
1978-79.....	7.65
1979-80.....	7.85
1980-81.....	7.90
1981-82.....	6.50
1982-83.....	7.83
1983-84.....	6.54
1984-85.....	6.85
1985-86.....	6.42
1986-87.....	7.00

All of the above employer contribution rates, with the exception of the 1986-87 rate, are based on the SERS employer normal rate. The 1986-87 rate of 7.00% is based on a one-year legislatively established set rate. If the TIAA/CREF contribution rate had continued to be indexed to the SERS employer normal rate, the 1986-87 employer contribution for state employees participating in TIAA/CREF would have been 3.6% of payroll.

Comparison of SERS and TIAA/CREF

The following compares the most significant features of SERS and TIAA/CREF:

<u>Basic Provision</u>	<u>SERS</u>	<u>TIAA/CREF</u>
Type of Annuity.	Fixed based on benefit formula and optional annuity form selected.	Both fixed (TIAA) and variable (CREF). Once a TIAA annuity is determined it remains fixed except for special dividends. CREF invests premiums in common stocks which causes the CREF annuity to vary depending on the performance of the stock portfolio.
Member Contribution Rate.	6.25% if employed on or after 7/22/83; 5% if employed prior to 7/22/83.	5%
Employer Contribution Rate.	Determined annually based on actuarial valuation.	Determined annually; may not exceed SERS employer normal cost rate.
Interested Credited to Member Contributions.	4% annually.	Adjusted annually. 10% in 1986.
Age and Service Requirements.	Full retirement at any age with 35 years of service or age 60 with 3 years of service; reduced retirement at any age with 10 years of service.	Retirement income may commence at any age. No minimum length of membership.
Amount of Benefit.	Full retirement = 2% x years of service x final average salary (highest 3 years); actuarially equivalent optional annuity forms available. Early retirement uses same formula with actuarial reduction for age.	Retirement income depends on age at retirement, the total member and University contributions, and the earnings experience of the TIAA-CREF fund. Single life annuity or option annuity form may be selected.
Postretirement Adjustments.	Ad hoc cost-of-living adjustments may be provided by legislation.	TIAA annuities may be increased by dividends. CREF annuities are adjusted annually (may decrease).
Vesting.	10-year cliff vesting.	Full immediate vesting.
Portability.	Transferability of service credits limited to employment with another Commonwealth agency participating in SERS or through limited nonstate service purchase options.	Transferable if employed by another participating TIAA institution. Direct individual payments to TIAA-CREF also permitted.

For an employee eligible to elect coverage under either system, the most significant factors which would influence the decision in the direction of TIAA/CREF are considered to be:

- (1) Availability of immediate vesting as opposed to a 10-year vesting requirement under SERS.
- (2) Portability of pension coverage among higher education institutions nationwide which offer TIAA/CREF coverage.
- (3) Potential to benefit from superior investment performance, including a variable annuity payout.

The factors which may influence the decision in the direction of SERS participation may be:

- (1) The use of the highest 3-year average salary as the basis for the SERS benefit formula.
- (2) The provision of periodic ad hoc cost-of-living adjustments to retired members of SERS.
- (3) The option IV lump sum payout provision available under SERS.
- (4) The potential that SERS disability and death coverage may be superior.

#### IV. ANALYSIS AND DISCUSSION

##### Purpose of Actuarial Funding

In order for a defined benefit pension plan, such as the State Employees' Retirement System, to operate on a sound actuarial basis, the accumulated assets together with the value of expected future contributions and investment income must be adequate to cover the value of future promised benefit payments. An actuarial cost method is used to determine the annual contributions to be made to the fund. The actuarial cost method used by SERS is the entry age normal cost method. The normal cost as determined under this method is the level percentage of payroll for the average new active member which should be set aside each year in order to fund, together with interest income, the future benefits specified by the system. The employer normal cost is the portion of the normal cost which will not be covered by member contributions and which is required to be contributed by the employer.

##### Role of Actuarial Assumptions

The actuarial assumptions used in the valuation of a pension plan can have a substantial impact on the determination of the financing required for a pension plan and the extent of the recognition of pension liability by a pension plan.

A distinction is frequently drawn between different broad types of actuarial assumptions. The distinction is between economic assumptions and demographic assumptions. Economic assumptions are those variables in the calculation of projected pension benefits which are a function of those forces, chiefly economic,

which apply to society broadly and are beyond the narrow confines of the group of participants and benefit recipients involved in the pension plan. The chief economic assumptions are those relating to investment income and salary increases. Demographic assumptions are those variables in the calculation of projected pension benefits which are a function of those forces which apply specifically to the group of pension plan participants and benefit recipients involved in the pension plan. The demographic assumptions include rates of mortality, termination, disability and retirement.

Actuarial assumptions are used as the basis for projecting the future retirement benefits payable from a pension plan. From those projections, the funded condition and financing requirements for the pension fund are derived. If those projections are not accurate, then the resulting determinations of the funded condition and financing requirements of the pension fund also will not be accurate and eventual unfunded accrued liability in the pension plan will be created for this reason.

Actuarial assumptions are inherently long term assumptions. They are used to project benefits expected to be paid far into the future and to calculate the present value of those eventual benefits. When set or reset, they have application both as a measure of the future experience of the pension plan and as a measure of the past experience of the pension plan. When setting actuarial assumptions, care must be exercised to distinguish the start of long term trends, which should be reflected in the actuarial assumptions, from short term observations, should not be reflected in the actuarial assumptions. For instance, if the recent high rates of interest represented the start of a long term trend which will last for a considerable portion of the expected lifetime of current active

participants, then the actuarial assumption on investment income or interest ought to be set at a rate close to the current market rates. If however, the recent high rates of interest are not indicative of a long term trend and reflect only a short term anomaly, then the actuarial assumption on investment income or interest ought to be set at a lower rate than the current market rates.

#### Validity of Normal Cost as Measurement of Benefit Value

Normal cost calculations are sensitive to the assumptions which underlie them. If actual long-term experience is similar to the expected experience as reflected in the actuarial assumptions, the normal cost of the plan is an accurate measure of the value of the benefit plan to the broad group of employees covered by the plan and the employer normal cost is an accurate measure of the obligation undertaken by the employer to provide retirement benefits for its employees.

Under these circumstances, the current method of determining employer contributions to the TIAA/CREF defined contribution plan by indexing the contributions to the SERS employer normal rate results in broadly equitable treatment for all Commonwealth employees regardless of the retirement coverage selected. On an individual employee basis, the ultimate benefits under the two plans will not be similar due to the dissimilar nature of the two plans. For example, two retirement systems with very different benefit systems may have similar normal cost because one pays a higher proportion of overall benefits to employees who withdraw, while the other focuses its benefits on those who retire. Nevertheless, the overall value of the benefits for the broad group of covered employees should be comparable.

If, on the other hand, the actuarial experience of the plan differs vastly from the experience expected under the actuarial assumptions the normal cost will not have been an accurate measurement of the value of benefits or the employer's funding obligation. If the actuarial assumptions prove to have been too conservative, an actuarial gain will occur and future employer contributions will be reduced by virtue of recognizing the gain. If the assumptions prove to have been too liberal, an actuarial loss will occur and future employer contributions will be increased by virtue of amortizing the unfunded liability created by the actuarial loss. Since the recognition of these actuarial gains or losses occurs independently of the determination of normal cost, the "actuarial adjustments" do not affect the employer contributions made on behalf of employees participating in TIAA/CREF which are indexed only to the SERS employer normal cost.

Thus, the long-term accuracy of the actuarial assumptions becomes extremely significant as to whether the use of the SERS employer normal rate produces a level of employer contributions to an independent defined-contribution pension plan which results in equitable treatment of all employees.

#### Impact of December 31, 1985 Actuarial Valuation for SERS

The December 31, 1985 actuarial valuation of the State Employees' Retirement System resulted in a reduction in the employer normal contribution rate to 3.6% of payroll. The prior year's employer normal cost was 6.42% of payroll.

The sharp reduction in the employer normal cost contribution rate results from the revised actuarial assumptions developed from the Twelfth Investigation of

Actuarial Experience under the State Employees' Retirement System and adopted by the SERS Board. Significant changes were made in many of the assumptions, but two critical assumptions that were changed related to assumed rates of investment return and salary growth. The reasons for the dramatic reduction in the SERS employer normal contribution rate is the expectation by the SERS Board and Actuary of:

- (1) High future rates of investment return.
- (2) Low future salary increases.

The actual approach utilized by the actuary was to make realistic best estimate assumptions regarding both assumptions in order to develop appropriate employer contribution rates for SERS and then to derive a salary increase assumption that would reproduce those contribution rates when the required statutory interest assumption of 5.5% is utilized. The assumption package used for the valuation has a 1995 projection rate of 4% for general salary increase and 9.8% for investment return or a net differential of 5.8%. Working backwards to determine the salary scale assumption that would produce the same contribution rate using the 5.5% valuation interest rate resulted in the use of no general salary increase scale and almost no merit increase scale.

#### Assessment of Revised SERS Actuarial Assumptions

A great deal of concern has been expressed over the economic actuarial assumptions utilized for the most recent SERS valuation. The three consulting actuaries providing consulting services to the Commission have indicated that reservations with the assumptions which were selected appear to be outside the mainstream of common actuarial practice.

The issues raised in connection with the current SERS assumptions focus on both the individual interest rate and salary increase assumptions and particularly on the wide spread between the two assumptions. The following summarizes the main points of concern which have been identified by the Commission's consulting actuaries and which were raised by the Commission in its annual review, conducted on October 8, 1986, of the SERS actuarial valuation:

- Lack of comparability with assumptions used for other contemporary actuarial reports, including the most recent actuarial valuation for the Public School Employees' Retirement System where some consistency in actuarial approach might be expected.
- Absence of the same core of inflation in determining the interest rate and salary increase assumption.
- Lack of consistency with long term historical experience concerning investment return and salary increases.
- Potential that the current assumptions will result in underfunding and that future supplemental contributions will be required to properly fund the SERS benefits.

This final point is particularly significant in relation to the current issue of appropriate employer contributions to alternate independent retirement systems since any supplemental contributions which may be required in the future will be attributable to past service rather than current service and will not therefore become a part of the funding for the alternate plans. This procedure underscores

the need to base the employer's contributions to the alternate plan on a normal cost rate developed using valid long term assumptions which produce stable cost which is likely to fund the benefits of SERS without significant supplemental contributions.

#### Determination of Valid Long-term Actuarial Assumptions

In attempting to develop economic actuarial assumptions which represent the best estimate of long-term future experience concerning investment income and salary increases, the following results are considered desirable:

- Both assumptions reflect the same long-term imbedded inflation rate.
- The assumptions are not inconsistent with a long-term historical perspective.
- The assumptions bear a degree of comparability with economic assumptions used in other contemporary actuarial valuations.

In 1985, the Public Employee Retirement Study Commission, pursuant to the Municipal Pension Plan Funding Standard and Recovery Act (Act 205 of 1984), undertook the specification of standards for municipal pension plan actuarial valuation reports. Act 205 required that the reports be prepared using the entry age normal actuarial cost method and required that the Commission specify economic actuarial assumptions which would be acceptable in preparing the reports. The specification of the actuarial cost method and assumptions for these reports was extremely significant in that the reports formed the basis for a mandated actuarial funding standard for approximately 2,400 municipal pension plans which had

not previously been subject to any actuarial funding requirements. The municipal pension plans which would be subject to the actuarial assumptions ranged in size of active membership from one member to 23,000 active members.

To assist in the development of proposed regulations specifying economic actuarial assumptions for municipal pension plan actuarial valuation reports, the Commission convened a panel of its three consulting actuaries which met with the Commission staff to produce preliminary guidelines on the issue. The portion of the Commission's preliminary guidelines for Act 205 administration developed in 1985 to specify the range of actuarial assumptions considered acceptable for the municipal pension plan valuations without any requirement for justification will be proposed without modification as administrative regulations in the Pennsylvania Code.

The following summarizes the two main economic actuarial assumptions specified by the Commission for use in preparing municipal pension plan actuarial valuations under Act 205:

Interest:	Range of 5% to 9% (Midpoint of 7%)
Salary Increase:	Range of 2% to 9% (Midpoint of 5.5%)
Maximum Spread between Interest and Salary:	3% (Midpoint of 1.5%)

A complete copy of the portion of the Commission's administrative guidelines specifying the actuarial assumptions is included as Appendix A.

The maximum 3% difference between the interest assumption and the salary assumption serves to insure that both assumptions reflect the same core of inflation.

In order to evaluate the Act 205 assumptions from a long-term historical perspective, assumptions based on a 50-year historical average were developed in a study prepared for the Commission by Consulting Actuary William A. Reimert of Milliman and Robertson, Inc. The resulting assumptions are summarized below:

	<u>Historical Average</u>
Investment Return:	
Inflation	4.2%
Real Return:	<u>3.2</u>
Total	7.4%
Salary Growth:	
Inflation	4.2%
General Increase	0.6
Career Increase	<u>0.8-5.5</u>
Total	5.6-10.3

A copy of the study upon which these historical averages are based is included as Appendix B.

The Act 205 assumptions can also be compared to assumptions used in other contemporary actuarial reports. The Wyatt Company's 1985 Survey of Actuarial Assumptions and Funding covering private and public pension plans with 1,000 or more active participants showed the following average assumptions for plans with benefits based on final average pay:

Interest:	7.7%
Salary Increase:	6.0%
Average Spread:	1.7%

The average spread between interest and salary growth assumptions for the plans in the Survey for the 5-year period from 1981 to 1985 is shown below:

<u>Year</u>	<u>Average Spread</u>
1981	1.6%
1982	1.5%
1983	1.5%
1984	1.5%
1985	1.7%

Resulting SERS Cost Using Assumptions within Common Actuarial Practice

In order to determine the approximate SERS normal cost rate using long-term economic actuarial assumptions considered to be within the range of accepted traditional actuarial practice the Commission requested consulting actuary Stanley R. Freilich of Towers, Perrin, Forster and Crosby to prepare a cost estimate based on the administrative guidelines for actuarial valuations of Pennsylvania municipal pension plans. The economic actuarial assumptions, utilizing the midpoints of each of the ranges specified in the guidelines, were:

Investment: 7% / year  
 Salary Increase: 5.5% / year

The demographic assumptions were approximations to the SERS demographic assumptions for the December 31, 1985 actuarial valuation. The SERS demographic assumptions are included as Appendix C.

The resulting normal cost contribution rates were as follows:

Total Normal Cost	13.20%
Member Contributions	<u>6.25%</u>
Net Employer Cost	6.95%

## Consideration of Post Retirement Adjustments

The Commonwealth of Pennsylvania has a history of granting periodic ad hoc cost-of-living adjustments to retired state employees in amounts approximating one-half of the increase in the Consumer Price Index. Since these increases are granted on an ad hoc basis rather than an automatic basis they are funded through supplemental contributions rather than normal cost contributions. The ad hoc post retirement adjustments are totally employer financed.

Since these ad hoc adjustments become part of the value of the benefits ultimately provided by the Commonwealth to state employees who are members of SERS, some consideration may be given to providing contributions equal to the value of this benefit or a portion of the value of this benefit on behalf of employees who have elected coverage under the alternate defined contribution plan. This would be consistent with the goal of providing parity in employer contributions for both groups of state employees.

In order to estimate the cost of prefunding the additional benefit attributable to postretirement cost-of-living increases, the consulting actuary developed an approximate SERS normal contribution rate reflecting future ad hoc increases in SERS benefits equal to one-half of future CPI increases. The economic assumptions were:

Investment:	7% / year
Salary Increase:	5.5% / year
CPI:	3.5% / year

The demographic assumptions, again, were approximations to the SERS demographic assumptions (Appendix C).

The resulting normal cost contribution rates were as follows:

Total Normal Cost	15.20%
Member Contributions	<u>6.25%</u>
Net Employer Cost	8.95%

## V. CONCLUSIONS

Based on the foregoing analysis, the Commission has reached the following conclusions:

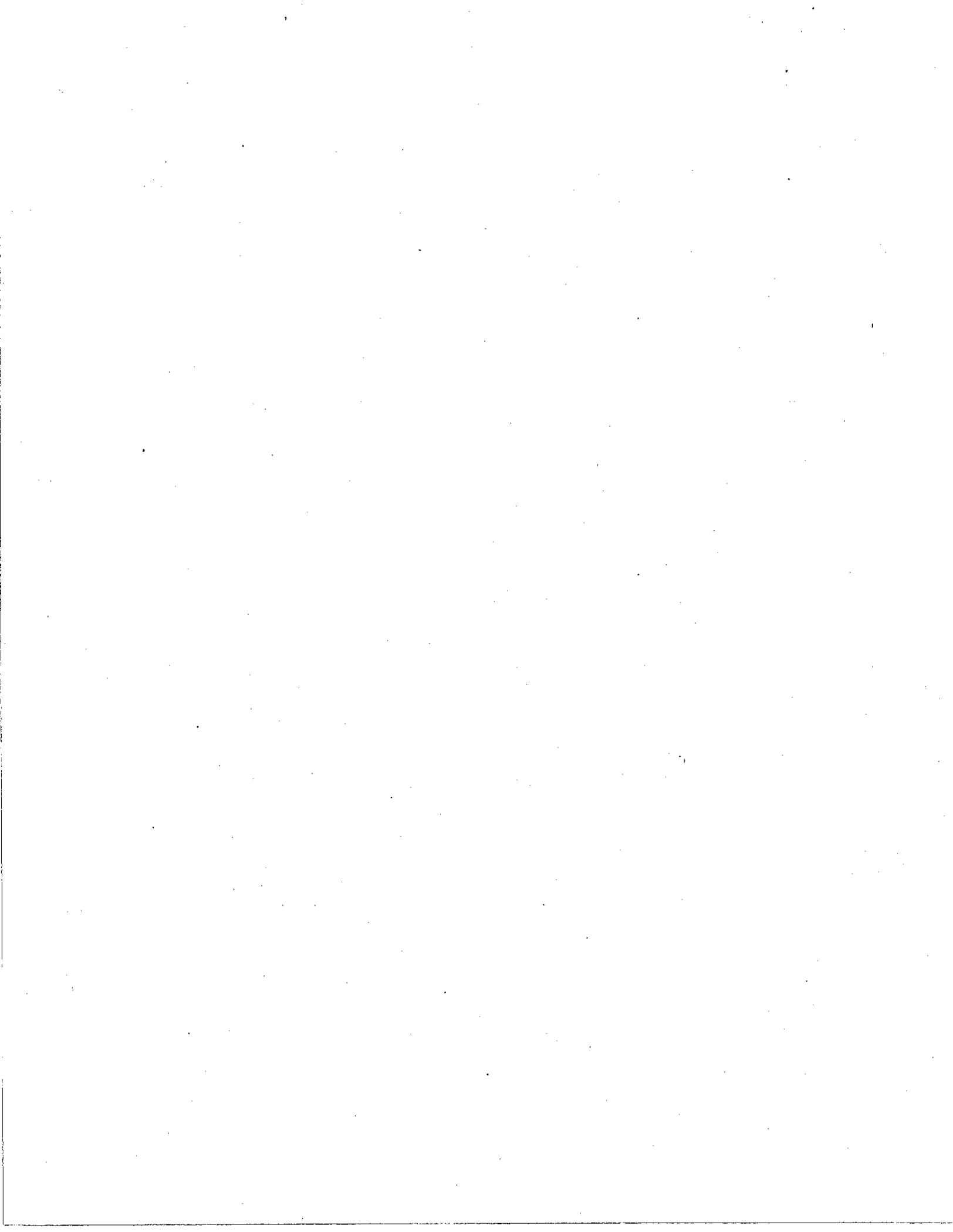
- The normal cost of a benefit plan is a reasonable measure of the value of the plan benefits and the employer normal rate is a reasonable measure of the obligation undertaken by the employer to provide postretirement income for employees provided that the assumptions used to calculate the normal cost represent accurate predictions of long-term future experience.
- If the assumptions used to calculate the normal cost prove to have been more optimistic than actual experience, the normal cost contributions will have to be supplemented by future contributions attributable to past service for which prior normal cost contributions were inadequate. While this self-correcting actuarial process adequately insures proper funding for a defined benefit plan, it may not produce an appropriate funding pattern for a defined contribution plan.
- The current method of determining employer contributions to optional independent retirement programs based on the employer normal rate for SERS achieves the goal of "parity between employer contribution rates" only if the determination of normal cost is made using valid long-term assumptions which produce a stable cost pattern which is likely to fund the benefits of SERS without significant future supplemental contributions.

- The expected validity of economic actuarial assumptions with regard to predicting long-term future economic experience can be judged on a number of factors, including the presence of the same core of inflation in both the interest rate and salary increase assumptions, consistency with a long term historical perspective and the existence of a degree of comparability with assumptions used by other plans.
  
- The December 31, 1985 valuation of the State Employees' Retirement System was prepared using economic actuarial assumptions which may not produce the desirable stable long-term normal cost pattern which would be appropriate for the purpose of determining contributions to optional defined contribution pension plans.
  
- State employees who have elected participation in an optional defined contribution pension plan should be provided with an employer contribution rate which has a measure of stability and predictability and provides for parity in employer contributions from a long-term rather than short-term perspective.
  
- Benefits ultimately provided to SERS members have historically included periodic ad hoc postretirement adjustments which are employer financed. It may be reasonable to consider the value of this benefit in determining appropriate contributions on behalf of participants in optional retirement programs.

## VI. RECOMMENDATIONS

The Public Employee Retirement Study Commission recommends that employer contributions to approved optional independent retirement programs such as TIAA/CREF be established as follows:

- (1) That a set rate be established and continued without modification for a period of years.
- (2) That the period of years for which the set rate would be effective without modification or review be not less than five years and not more than ten years.
- (3) That the contribution rate be reviewed at the close of each established period of years to determine whether any modifications are warranted.
- (4) That, based on the results of actuarial cost estimates prepared for the Commission approximating SERS normal contribution rates calculated using assumptions which meet accepted standards for long-term economic actuarial assumptions, the initial contribution rate be set in the range of 7% to 9% of payroll.
- (5) That the selection of a contribution rate within the 7% to 9% range be based on a determination by the state policymakers concerning the extent to which it is considered appropriate in achieving the goal of parity to include the value or any portion of the value of future ad hoc post-retirement increases which are likely to be granted to SERS members.



PUBLIC EMPLOYEE RETIREMENT STUDY COMMISSION

Administrative Guidelines for Act 205 of 1984

Section 1.3(b), Specifications for Actuarial Valuation Reports,  
Range of Economic Actuarial Assumptions



COMMONWEALTH OF PENNSYLVANIA

## PUBLIC EMPLOYEE RETIREMENT STUDY COMMISSION

## ADMINISTRATIVE GUIDELINES FOR ACT 205 OF 1984

Section 1.3 Specifications for actuarial valuation report.

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(b) Range of economic actuarial assumptions.

(1) Selection of all actuarial assumptions. -- The actuarial exhibits of each actuarial valuation report shall be prepared using actuarial assumptions selected jointly by the actuary of the municipal pension plan and the governing body of the municipal pension plan. The actuarial assumptions shall, in all instances, represent the best available joint estimate of the actuary and the governing body of future occurrences in the case of each actuarial assumption. The economic actuarial assumptions shall additionally be either within the range for economic actuarial assumptions specified in paragraph 2 or shall be accompanied in the actuarial valuation report with the documentation specified in paragraph 3 which explains and justifies the choice of one or more assumptions outside of the range.

(2) Range of economic actuarial assumptions. -- No explanatory or justificatory documentation as specified in paragraph 3 shall be required to accompany the actuarial valuation report if the following conditions are met:

(I) all economic actuarial assumptions reflect annual percentage increase amounts;

(II) the actuarial assumption as to interest or investment earnings is not less than five percent nor more than nine percent;

(III) the actuarial assumption as to salary projection or individual pension plan member salary increase for municipal pension plans with a salary related benefit plan is not greater than the actuarial assumption as to interest or investment earnings and is not less than the amount of the actuarial assumption as to interest or investment earnings reduced by three percent. If the actuarial assumption as to salary projection or individual pension plan member salary increase applicable to the municipal pension plan is in the form of probability rates which differ for various ages, the rate to be used for this comparison shall be calculated by the actuary preparing the report, with appropriate accompanying documentation, and shall be the average rate pursuant to the probability table for the ages 30 through 50, inclusive;

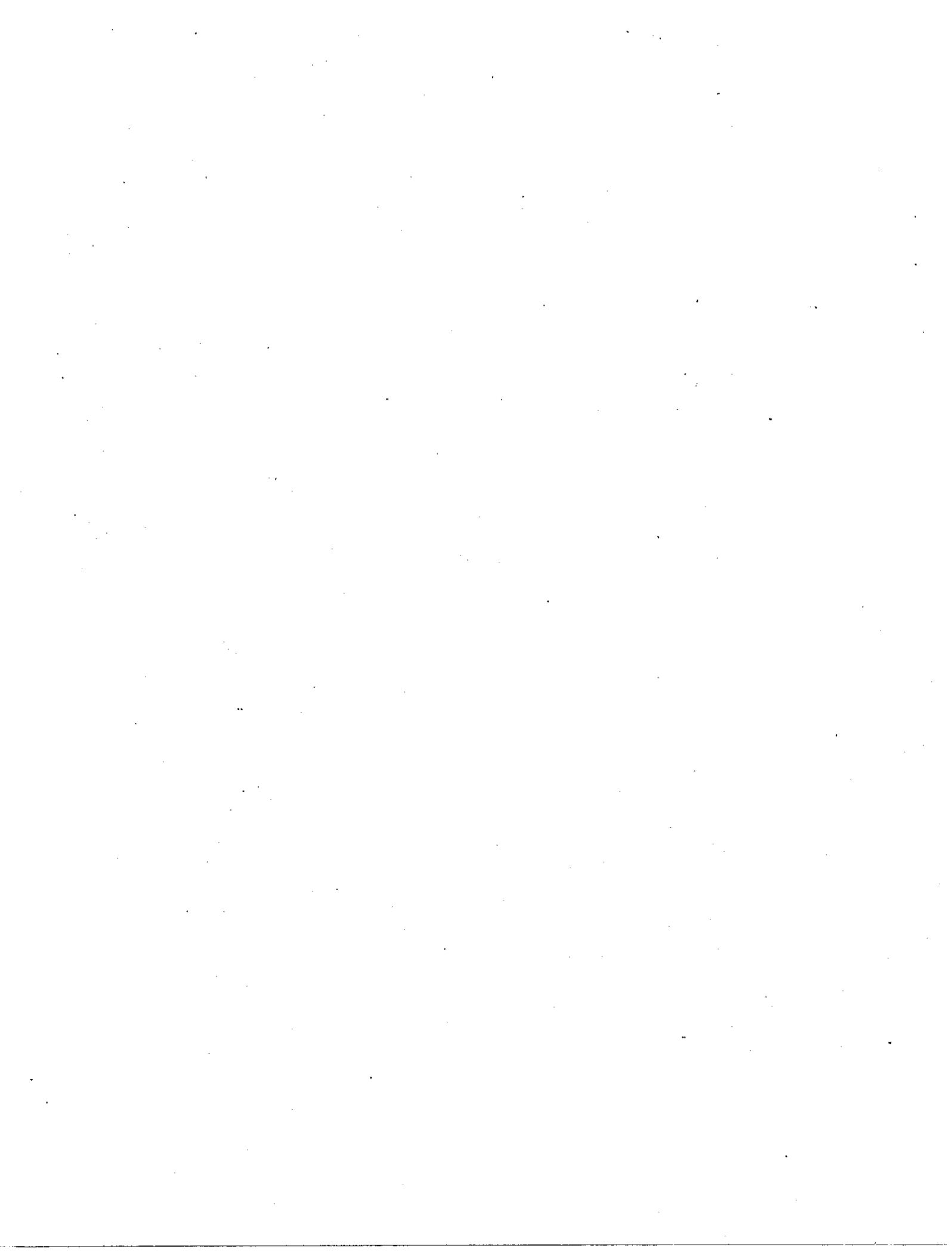
(IV) the actuarial assumption as to total covered payroll increase, for any municipal pension plan of a municipality which has been determined to be financially distressed and to which a remedy of delayed implementation of the funding standard pursuant to section 607(g) or (h) of the act is applicable, is not greater than four percent nor less than zero percent; and

(V) the actuarial assumption as to inflation, for any municipal pension plan which provides for automatic cost-of-living post retirement adjustments based on increases in the federal consumer price index or other recognized measure of inflation, is not greater than the amount of the actuarial assumption as to interest or investment earnings reduced by two percent and is not less than the amount of the actuarial assumption as to interest or investment earnings reduced by five percent.

(3) Documentation required for certain actuarial assumptions. -- If the economic actuarial assumptions used to prepare the actuarial exhibits of an actuarial valuation report are outside the range of economic actuarial assumptions specified in paragraph 2, or if the economic actuarial assumptions utilize annuity rates or differ between pre-retirement experience and post retirement experience the actuary preparing the actuarial exhibits of the actuarial valuation report shall submit documentation which explains the choice of economic actuarial assumptions made by the actuary and the governing body of the municipal pension plan and justifies their use in preparing the actuarial exhibits of the actuarial valuation report. The documentation, at a minimum, shall cite any aspects of the benefit plan of the municipal pension plan in question which affect the choice of the particular economic actuarial assumptions in question and the particular circumstances and specific experience of the municipal pension plan and its investment performance and of the municipality and its salary structure which caused the actuary and the governing body of the municipal pension plan to conclude that a set of actuarial assumptions within the range specified in paragraph 2 is inappropriate and to conclude that the particular economic actuarial assumptions chosen are appropriate.

DEVELOPMENT OF HISTORICAL AVERAGES FOR  
INVESTMENT RETURN AND SALARY GROWTH

William A. Reimert  
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## ANALYSIS AND DISCUSSION

### Actuarial Assumptions - 1985 Changes

The sharp reduction in the employer normal contribution rate for fiscal 1986-87 results from the revised actuarial assumptions developed from the Twelfth Investigation of Actuarial Experience under SERS and adopted by the SERS Board. Significant changes were made in many of the assumptions, but two critical assumptions that were changed related to assumed rates of investment return and salary growth.

The actual approach utilized by the actuary was to make realistic best estimate assumptions regarding both assumptions in order to develop appropriate employer contribution rates for SERS and then to derive a salary increase assumption that would reproduce those contribution rates when the required statutory interest assumption of 5.5% is utilized.

The resulting salary growth rates are misleading when viewed alone. Nevertheless, we have shown them below because the change in the salary growth assumption gives an indication of the extent to which the investment return and salary growth assumptions were modified. (This is true because the investment return assumption must remain at 5.5%.)

<u>Age</u>	<u>Previous Salary Growth Assumptions</u>	<u>New Salary Growth Assumptions</u>	<u>Change</u>
25	7.3%	2.6%	-4.7%
35	5.0	1.3	-3.7
45	3.8	0.0	-3.8
55	3.5	0.0	-3.5
65	3.5	0.0	-3.5

This summary indicates that the Salary Growth assumption was decreased by over 3.5%. Since a 1% higher Salary Growth Rate would increase the Employer Normal Contribution Rate by approximately 1.80% (this information was provided by the SERS actuary), this aspect of the new actuarial assumptions merit some review.

As indicated above, the actuarial projections of SERS were based on best estimate explicit assumptions that differ from the assumptions utilized to develop contributions in compliance with the statute. The balance of this discussion will address those best estimate explicit assumptions.

### Investment Returns

The SERS actuary based the new assumptions on assumed real rates of investment return and inflation as follows:

<u>Period</u>	Real Rate of <u>Return</u>	<u>Inflation</u>	Total Investment <u>Rate</u>
1986-1995	5.6%	4.0%	9.8%
1996-2000	4.8	4.0	9.0
2001-2005	3.8	4.0	8.0
After 2005	2.9	4.0	7.0

It is helpful to review these rates of return in some historical perspective. For comparison we have summarized below (1) real rates of return for several types of investments and (2) rates of inflation for the last 50 years.

<u>Period</u>	<u>S&amp;P 500</u>	Salamon	Shearson	<u>Treasury</u>	<u>Inflation</u>
		Brothers	Lehman		
		Corporate	Government		
		Bonds	Bonds	Bills	
		<u>Index</u>	<u>Index</u>		
1981-85	9.4%	12.5%	11.7%	5.2%	4.8%
1976-80	4.3	-6.2	-6.1	-1.4	9.2
1971-75	-3.5	-0.8	-0.5	-1.0	6.9
1966-70	-1.1	-3.2	-4.3	1.0	4.5
1961-65	11.7	2.5	1.3	1.8	1.3
1956-60	6.7	-0.7	-0.9	0.4	2.1
1951-55	22.2	0.6	-0.1	0.1	1.4
1946-50	3.1	-4.5	-4.9	-5.4	6.6
1941-45	11.2	-1.7	-1.2	-4.7	5.2
1936-40	0.1	4.2	4.6	-0.3	0.4
Average	6.2	0.1	-0.2	-0.5	4.2

This data indicates that a 4.0% assumption for the future rate of inflation is consistent with the economic experience during the last 50 years. It is much more difficult to determine whether the assumed real rates of return are reasonable given the significantly differing levels of return in different types of investments (e.g., common stocks vs. bonds). Therefore we have indicated below the real rate of return that would have been earned in the past based on 3 different mixes of investment types.

The first set of asset mixes is based on the approximate distribution of SERS assets as of December 31, 1986. The second and third reflect the asset mix data for the largest Corporate and Public Pension Funds summarized in the January 26, 1987 issue of Pensions and Investment Age. The table below summarizes the results of this calculation and a more detailed summary of the asset mixes and methodology are attached as Appendix A.

Real Rate of Return Reflecting Alternative Asset Mixes

<u>Period</u>	<u>SERS Mix</u>	<u>Corporate Fund Mix</u>	<u>Public Fund Mix</u>
1936-85	3.2%	3.6%	2.3%

Based on these figures, it appears that the SERS assumptions anticipate real investment returns during the next 20 years significantly higher than the average returns over the last 50 years. Beyond the 20 year point, the investment return assumption is in line with historical returns.

Based on this analysis, it appears that the SERS assumptions anticipate better than average performance by the SERS investment managers. While this may be appropriate for setting performance goals and objectives, it is not clear that the "parity" between SERS and the Optional TIAA-CREF Retirement Program should be based on such performance goals. I would suggest that returns by average investors are more appropriate for this purpose.

Salary Growth

Before reaching any conclusions, though, it is important to also review the other key economic assumption: the rate of salary growth. The approach utilized by the SERS actuary in the Investigation of Actuarial Experience was to split the salary growth analysis into two segments. The first was an analysis of General Salary Increases which reflect general changes in salary levels due to inflation and/or productivity. The second was an analysis of Career Increases which reflects the additional increases to individual employees on account of promotion, training, movement within grade, etc. We will follow the same approach here.

In an attempt to place the general salary increases into some historical perspective, we have shown below the increase in the average total wages of all workers developed by the Social Security Administration.

<u>Period</u>	<u>Increase in Average Total Wages</u>	<u>Inflation</u>	<u>Real Increase in Wages</u>
1981-85	6.1%	4.8%	1.2%
1976-80	7.7	9.2	-1.4
1971-75	6.9	6.9	0.0
1966-70	5.8	4.5	1.2
1961-65	3.1	1.3	1.8
1956-60	4.0	2.1	1.9
1951-55	5.8	1.4	4.3
1946-50	2.3	6.6	-4.0
1941-45	16.2	5.2	10.5
1936-40	3.5	0.4	3.1
Average	6.1	4.2	1.8

Thus real increases in wages have averaged 1.8% over the last 50 years. If the significant increases during World War II are excluded, the average real increase is only 0.6%. (1946-1985). These figures compare with the assumption for SERS which was to anticipate no real increases in salaries over inflation. The above figures indicate that some modest real increases can be reasonably anticipated.

With respect to Career Increases, this factor should reflect actual salary administration practices among State employees and not broad nationwide economic statistics. We were able to develop the average "Career Increase" in excess of the Increase in Average Total Wages for the most recent 15 year period based on data reported in the Eleventh and Twelfth Experience Investigation. The results are summarized below and shown in more detail in Appendix C.

<u>Age</u>	<u>1971-85 Experience Increase</u>	<u>1971-85 Increase in Average Wages</u>	<u>Actual Career Increase</u>	<u>SERS Career Increase Assumption</u>
20	12.8%	6.9%	5.5%	5.7%
25	11.3	6.9	4.1	4.1
30	10.1	6.9	3.0	3.3
35	9.2	6.9	2.2	2.8
40	8.5	6.9	1.5	2.0
45	8.1	6.9	1.1	1.5
50	7.9	6.9	1.0	1.5
55	7.8	6.9	0.9	1.4
60	7.8	6.9	0.8	1.4

Based on this data, it appears that the current SERS Career Increase assumption is approximately 0.5% higher than necessary at ages 30 and over. Since the General Increase assumption was lower than historical data would have indicated by a like amount, the total salary growth assumption would appear to be about where this approach would indicate (this assumes that the World War II Salary Growth experience should be discarded).

#### Summary of Analysis

In summary, the best estimate explicit actuarial assumptions differ from what might be expected based on long term historical averages as indicated below.

	<u>Historical</u> <u>Average</u>	<u>SERS</u> <u>Assumptions</u>	<u>Differences</u>
<b>Investment Return:</b>			
Inflation	4.2%	4.0%	0.2%
<b>Real Return:</b>			
1986-1995	3.2	5.6	+2.4
1996-2000	3.2	4.8	+1.6
2001-2005	3.2	3.8	+0.6
After 2005	3.2	2.9	-0.3
<b>Total:</b>			
1986-1995	7.5	9.8	+2.3
1996-2000	7.5	9.0	+1.5
2001-2005	7.5	8.0	+0.5
After 2005	7.5	7.0	-0.5
<b>Salary Growth:</b>			
Inflation	4.2	4.0	-0.2
General Increase	0.6	0.0	-0.6
<b>Career Increase:</b>			
Age 20	5.5	5.7	+0.2
Age 40	1.5	2.0	+0.5
Age 60	0.8	1.4	+0.6
<b>Total:</b>			
Age 20	10.6	9.9	-0.7
Age 40	6.4	6.1	-0.3
Age 60	5.7	5.5	-0.2

SUMMARY OF ASSET MIX ASSUMPTIONS

	SERS	Corporation	Public
	Fund	Fund	Fund
	<u>Mix</u>	<u>Mix</u>	<u>Mix</u>
Stocks	44%	54%	34%
Government Bonds	20	19	27
Corporate Bonds	13	12	18
Mortgages	12	2	11
Real Estate	6	5	2
Cash Equivalents	5	8	8

SUMMARY OF YIELD ASSUMPTIONS

	<u>Assumptions</u>
Stocks:	S&P 500
Government Bonds:	Shearson Lehman Government Bonds
Corporate Bonds:	Salamon Brothers Corporate Bonds
Mortgages:	100 basis points over Corporate Bonds
Real Estate:	500 basis points over inflation
Cash Equivalents:	Treasury Bills

Appendix A

REAL ESTATE OF RETURN REFLECTING ALTERNATIVE ASSET MIXES

<u>Period</u>	<u>SERS Mix</u>	<u>Corporate Fund Mix</u>	<u>Public Fund Mix</u>
1981-85	10.3%	9.7%	10.6%
1976-80	-0.5	0.4	-1.9
1971-75	-1.5	-1.9	-1.4
1966-70	-1.7	-1.5	-2.2
1961-65	6.6	7.3	5.4
1956-60	3.0	3.6	2.1
1951-55	10.3	12.3	7.9
1946-50	-0.6	-0.1	-1.8
1941-45	4.4	5.5	2.8
1936-40	2.4	1.8	2.7
Average	3.2	3.6	2.3

Appendix B

PENNSYLVANIA STATE EMPLOYEES  
SALARY INCREASE STUDY

Age	1971-75			1976-80			1981-85		
	Experience Increase	Increase in Social Security Average Wages	Career Component of Increase	Experience Increase	Increase in Social Security Average Wages	Career Component of Increase	Experience Increase	Increase in Social Security Average Wages	Career Component of Increase
20	0.158	0.069	0.083	0.116	0.077	0.036	0.111	0.061	0.047
25	0.134	0.069	0.061	0.105	0.077	0.026	0.099	0.061	0.036
30	0.115	0.069	0.043	0.099	0.077	0.020	0.090	0.061	0.027
35	0.103	0.069	0.032	0.090	0.077	0.012	0.084	0.061	0.022
40	0.095	0.069	0.024	0.083	0.077	0.006	0.076	0.061	0.014
45	0.091	0.069	0.021	0.080	0.077	0.003	0.071	0.061	0.009
50	0.089	0.069	0.019	0.078	0.077	0.001	0.071	0.061	0.009
55	0.088	0.069	0.018	0.077	0.077	0.000	0.070	0.061	0.008
60	0.088	0.069	0.018	0.076	0.077	-0.001	0.070	0.061	0.008

Appendix C

Actuarial Assumptions  
State Employes' Retirement System  
1985 Actuarial Report  
Hay/Huggins Company, Inc.



APPENDIX C

STATE EMPLOYES' RETIREMENT SYSTEM

I. ACTUARIAL ASSUMPTIONS

Interest Rate: 5-1/2% per annum, compounded annually.

Service Tables: Service tables for active members based on the experience of the Retirement System in 1981-85, with values at specimen ages in five separate classes as follows:

CLASS*	AGE	Rates of Separation Due To							Salary Scale
		Withdrawal after Years of Service			Death	Dis-ability	Early Retirement**	Super-annuation Retirement**	
		1	5	11					
A (MALE)	25	.125	.038	.003	.0008	.0006	-	-	2.6%
	35	.105	.036	.002	.0009	.0012	.019	-	1.3
	45	.072	.024	.002	.0026	.0025	.015	-	0
	55	.064	.016	.002	.0074	.0081	.022	.143	0
	65	-	-	-	.0131	-	-	.537	0
A (FEMALE)	25	.148	.061	.005	.0003	.0004	-	-	2.6%
	35	.094	.043	.004	.0004	.0014	.029	-	1.3
	45	.067	.030	.003	.0014	.0030	.019	-	0
	55	.051	.024	.003	.0028	.0071	.035	.117	0
	65	-	-	-	.0042	-	-	.481	0
C (MALE and FEMALE)	25	.025	.025	.003			.010	-	2.6%
	35	.025	.025	.003	***	***	.010	-	1.3
	45	.025	.025	.003			.010	-	0
	55	-	-	-			-	.080	0
	65	-	-	-			-	.350	0
D (MALE and FEMALE)	25	.030	.030	.002			.045	-	0
	35	.030	.030	.002	***	***	.045	-	0
	45	.030	.030	.002			.045	-	0
	55	-	-	-			-	.030	0
	65	-	-	-			-	.150	0
E (MALE and FEMALE)	25	.040	.020	.002			.020	-	0
	35	.040	.020	.002	***	***	.020	-	0
	45	.040	.020	.002			.020	-	0
	55	.040	.020	.002			.020	-	0
	65	-	-	-			-	.250	0

Superannuation and Early Retirement Allowances: The mortality table used for those receiving superannuation and early retirement allowance is the 1971 Group Annuity Mortality Table.

Disability Allowances: The mortality tables used for those receiving disability allowances are modifications based on sex of 1965 Railroad Retirement Board Mortality among Totally Disabled Annuitants.

\*As defined in Retirement Law prior to March 1, 1974 amendment (Act 31).

\*\*Retirement Rates are assumed to decrease and withdrawal rates to increase by 20% after 1990.

\*\*\*Same as Class A.

