State of Minnesota \ LEGISLATIVE COMMISSION ON PENSIONS AND RETIREMENT

TO: Members of the Legislative Commission on Pensions and Retirement

FROM: Lawrence A. Martin, Executive Director
Ed Burek, Deputy Director

RE: Designated Commission Interim Topic: Potential Actuarial Assumption Changes, Especially Interest Rate Actuarial Assumption Changes (First Consideration) - Revised

DATE: September 15, 2011 *(revised 9/23/2011)*

Introduction

The Commission Chair, Representative Morrie Lanning, has designated as an interim topic for consideration by the Legislative Commission on Pensions and Retirement the subject of potential actuarial assumption changes, especially potential interest rate actuarial assumption changes.

The topic arises out of concerns publicly expressed by several members of the House State Government Finance Committee, which had hearings on the funding impact on Minnesota public pension plans by the 2008-2009 recession and the effect of the 2010 Omnibus Retirement Bill (Laws 2010, Ch. 359, Art. 1), that the interest rate actuarial assumptions used by many Minnesota public pension plans are unduly optimistic. Concerns about the magnitude of the salary increase assumptions used by the various Minnesota public pension plans also have been expressed publicly by members of the Senate Finance Committee and by members of the House of Representatives during House floor debate over recent omnibus retirement bills.

This Commission meeting is the initial consideration by the Commission of the topic and this Commission staff issue memorandum is the initial Commission staff issue memorandum on the topic. The topic is expected to require consideration by the Commission over two or three interim meetings, depending on the course of Commission deliberations and interested party information contributions.

This Commission staff issue memorandum is intended to provide the Commission and interested parties with background information on the topic sufficient to place the topic in the context with the broader topic of actuarial reporting requirements and actuarial reporting results and to allow the Commission members to identify additional informational needs. The Commission staff issue memorandum has seven parts:

1. Part One describes the practice of providing funding for pension plans on an actuarial basis and the role of actuarial assumptions in that actuarial funding process.

2. Part Two summarizes the actuarial assumptions currently in force for the statewide and major local Minnesota public pension plans *(revised 9/23/2011)*.

3. Part Three summarizes the legislative development of the statutory actuarial assumption changes.

4. Part Four summarizes the most recent experience studies available for the various Minnesota public pension plans.

5. Part Five provides a summary of the experience gains and losses reported in the annual actuarial valuations annually for the period 2000-2020 and for the periods 1986-2000, 1991-2000, and 1996-2000.

6. Part Six discusses four specific actuarial assumptions (interest, salary increase, payroll growth, and mortality) and the considerations that may be appropriate to consider and discuss if changes are contemplated.

7. Part Seven discusses how Minnesota's current actuarial funding process, with amortization periods set generally in relation to the average remaining lifetimes of active members, can correct for any actuarial assumption disparities.

Part One
Actuarial Funding of Defined Benefit Retirement Plans, Actuarial Reporting, and the Role of Actuarial Assumptions

a. Purpose of Defined Benefit Retirement Plan Actuarial Funding. With the creation of defined benefit public pension plan liabilities, there arises a need to provide financing to match the liabilities and to create a trust fund for the accumulated assets. Since the obligation undertaken with a defined benefit plan is to provide a benefit of a predetermined amount at and each month after the time of retirement, the financing method will be more complex and will allow more variations than funding a lump sum benefit. There are a number of possible financing budget estimation methods which have been developed by actuaries which can be utilized.

The actual or ultimate cost of a pension plan is the total amount of any monthly retirement annuities, disability benefits and survivor benefits eventually paid plus the total amount of any administrative costs eventually paid. The actual or ultimate cost will result no matter what method of financing is employed to fund pension benefits. The financing or actuarial funding method merely separates out the portion of the actual or ultimate cost that will be paid from investment returns from the portion to be funded from periodic contributions and designates the timing of the financing and the amount of the financing burden which will be borne by the pension plan employer or employers.

b. Minnesota Defined Benefit Retirement Plan Actuarial Reporting Requirement. Virtually every public pension plan is required to make annual financial and actuarial reports under Minnesota Statutes, Sections 356.20, 356.214, 356.215, and 356.216. The Standards for Actuarial Work, issued by the Commission, specify the detailed contents and format requirements for both the actuarial valuation reports and the experience studies. The public pension plans which are included in this requirement are the General State Employees Retirement Plan of the Minnesota State Retirement System (MSRS-General), the Correctional State Employees Retirement Plan of the Minnesota State Retirement System (MSRS-Correctional), the General Employee Retirement Plan of the Public Employees Retirement Association (PERA-General), the Public Employees Police and Fire Retirement Plan (PERA-P&F), the Teachers Retirement Association (TRA), the State Patrol Retirement Plan, the St. Paul Teachers Retirement Fund Association (SPTRFA), the Duluth Teachers Retirement Fund Association (DTRFA), the Minneapolis Employees Retirement Fund (MERF), the University of Minnesota Faculty Retirement Plan and Supplemental Retirement Plan, the Judges Retirement Plan, and the various local police and firefighters relief associations.

The annual actuarial valuation is required to include the determination of normal cost as a percentage of salary and accrued liability of the fund calculated according to the entry age normal cost method, with a prescribed pre- and post-retirement interest assumption, a prescribed salary assumption, and other assumptions as to mortality, disability, retirement, and withdrawal which are appropriate to the experience of the plan. A statement of administrative cost of the fund as a gross amount and as a percent of payroll is required. The actuary must also present an actuarial balance sheet, setting forth the accrued assets, the accrued liabilities (reserves for active members, deferred annuitants, inactive members without vested rights, and annuitants) and the unfunded actuarial accrued liability. The valuation is also to include a calculation of the additional rate of support required to amortize the unfunded accrued liability by the end of the applicable target full funding year. The actuary is required to provide an analysis of the increase or decrease in the unfunded accrued liability from changes in benefits, changes in actuarial assumptions, gains and losses from actual deviations from actuarial assumptions, amortization contribution, and changes in membership. An exhibit setting forth total active membership, additions and separations from active service during the year, total benefit recipients, additions to and separations from the annuity payroll, and a breakdown of benefit recipients into service annuitants, disabilitants, surviving spouses and children, and deferred annuitants is also required.

The quadrennial experience study periodically prepared for MSRS-General, PERA-General, and TRA is required to furnish experience data and an actuarial analysis which substantiates the actuarial assumptions upon which the annual valuations are based. The quadrennial experience study is required to contain an actuarial analysis of the experience of the largest retirement plans and a comparison of that plan experience with the actuarial assumptions in force for the most recent annual actuarial experience.

The purpose of the quadrennial experience studies is to provide the Commission and the retirement plan administrations with a periodic opportunity to review the accuracy of the current actuarial assumptions of the three largest retirement plans, compared to the experience for the most recent period and to revise those actuarial assumptions based on the recommendation of the retained consulting actuary and on input from plan administrators, their actuarial consultants, and others.

Experience studies for retirement plans other than MSRS-General, PERA-General, and TRA are prepared on an ad hoc basis.

The actuarial valuation process, as corrected or refined by the quadrennial or ad hoc experience study process, is intended to provide policymakers and others with an accurate picture of the funded condition and financial requirements of a public pension plan and the process is not aided if it relies on incorrect or inadequate assumptions. If a trend line is established in recent experience, that trend line should be reflected in a plan's actuarial assumptions, even if those assumptions make the financing position of the plan appear worse than it would under different assumptions.

c. Actuarial Funding Methods; Determination of Actuarial Liabilities.

1. Non-Actuarial Pension Plan Funding. Although defined benefit pension benefits for retired employees of an employing entity can be paid from the ongoing revenues of the employing entity, a practice sometimes referred to as the current disbursements pension financing method or the pay-as-you-go financing method, that financing practice is not systematic, creates a cost pattern for the plan that usually becomes increasingly larger in amount over time as the number of retirees amass, disconnects the recognition of pension costs from the workers who obtained the pension benefit entitlements, and foregoes investment income as a potential source of funding for future pension benefit outlays.

   Early Minnesota defined benefit public pension plans were established utilizing the current disbursements financing procedure of retirement benefit entitlements, with changes in that view and process occurring only after the creation of the interim commission predecessors of the Legislative Commission on Pensions and Retirement in the mid-1950s, when the General Employees Retirement Plan of the Public Employees Retirement Association (PERA-General) was on the brink of insolvency.

2. Actuarial Funding and Funding Methods In General. As an alternative to the use of the current disbursements financing procedure to meet defined benefit retirement plan benefit payment obligations, actuarial funding methods have been developed to determine the pension benefit obligation of a cadre of workers while still actively employed, amass assets for investment underlying those pension benefit obligations, and allocate the cost of defined benefit pension coverage between plan members and plan sponsors. There are six actuarial funding methods that are permitted by the Government Accounting Standards Board (GASB) for use in determining public pension plan accounting disclosures, which are 1) the entry age actuarial method, 2) the frozen entry age actuarial method, 3) the attained age actuarial method, 4) the frozen attained age actuarial method, 5) the unit credit actuarial method, and 6) the aggregate actuarial method.

   The choice of the actuarial funding method will not change the ultimate cost of a defined benefit retirement plan, which is the sum of the benefit payment outlays and the administrative expense outlays related to the retirement plan, but will affect the incidence of the recognition of actuarial costs, will affect the allocation of pension costs between plan members and plan sponsors, and will affect the allocation of the funding burden between pension plan contributors and investment performance. All actuarial cost methods will systematically offset a portion of the present value of future benefit payments, but actuarial cost methods will produce a pattern of pension costs that will be either more or less advantageous compared to the ongoing financial resources of the retirement plan, either front-loading the pension liability recognition and actuarial cost incurrence, or leveling the pension liability recognition and actuarial cost incurrence on the basis of service, salary, or absolute dollars.

   Actuarial cost methods are classified based on their characteristics, specifically whether the method allocates the benefit to future years or whether the method allocates the cost to both past and future years, whether the method calculates an annual cost for all participants as a whole or whether the method calculates an annual cost for each retirement plan participant individually before totaling them, whether the method develops a supplemental cost liability (unfunded actuarial accrued liability) or whether the method assigns past service benefits, retroactive benefit grants, or experience to normal cost, and whether any actuarial gain or loss is directly computed and set for amortization or is spread over the future working lifetimes of current plan participants as part of the normal cost calculation.

3. Entry Age Normal Cost Actuarial Method. Since 1965, state law (Minn. Stat. 1965-1974, Sec. 356.21; Minn. Stat. 1976-___, Sec. 356.215), has required Minnesota public pension plan to be valued using the entry age normal cost actuarial method. The actuarial cost method is a cost-based and immediate gain recognition method. The statutory requirement is for actuarial valuations based on a level dollar normal cost computation for volunteer firefighter relief associations, which

provide retirement benefits not related to covered salaries, and on a level percentage of covered pay annual cost computation for all other Minnesota public retirement plans. The entry age normal cost actuarial cost method was chosen by the interim predecessor to the current Legislative Commission on Pensions and Retirement and by the 1965 Legislature in order to provide a level contribution rate over time for the full projected retirement benefits of public employee retirement plan members.

The entry age normal cost actuarial method was mandated in statute after the actuary retained by MSRS-General, A.A. Weinberg, filed MSRS-General actuarial valuations with the interim commission that were based on the unit credit actuarial cost method. The entry age normal cost method was apparently intended in the pre-1965 actuarial reporting law, but was not explicitly mandated. Under the entry age normal cost actuarial method, the benefit of each plan participant is projected from the applicable actuarial assumptions, its present value of future benefits is calculated, the normal cost of active member benefits under the retirement plan is calculated as a level percentage of covered payroll from entry age to retirement age, the present value of future normal costs is calculated and is subtracted from the present value of future benefits to determine the actuarial accrued liability of the plan, is compared to retirement plan assets, and any unfunded actuarial accrued liability is amortized by a supplemental contribution amount over the remaining amortization period duration.

The entry age normal cost actuarial cost method (level percentage of pay) cited strengths and weaknesses are that the method produces a pension cost that is less conservative (i.e., smaller plan accrued liability from the origination of the plan) than the entry age normal cost actuarial cost method (level dollar) and is more conservative than the unit credit method, produces an accrued liability that is greater than the plan termination liability, produces a stable normal cost, and provides some flexibility in the amortization of its unfunded actuarial accrued liability.

4. Unit Credit Actuarial Cost Method. Aside from some early-1960s actuarial valuations of MSRS-General, the unit credit actuarial cost method has not been used in Minnesota and never has been mandated by state statute. Under the unit credit actuarial cost method, the benefit calculated to be funded for each participant is the amount of the expected increase in the person's accumulated plan benefit during the valuation year, with its normal cost calculated as the whole life annuity value for the increase in the accumulated plan benefit and discounted by the interest rate interest assumption. The method generates an unfunded actuarial accrued liability, which is the whole life annuity value for the plan benefit accumulated to date reduced by the retirement plan assets, to be amortized by a supplemental contribution amount over the remaining specified amortization period duration.

   The cited strengths and weaknesses of the unit credit actuarial cost method are the complicated nature of its actuarial calculation for a retirement plan that is not fully funded (i.e., unfunded actuarial accrued liability greater than zero), the general rising normal cost as a dollar amount and a percentage of salary year to year, and the actuarial accrued liability calculated under the method can be less than the present value of accrued retirement benefits in the event of a plan termination.

5. Aggregate Actuarial Cost Method. The aggregate cost method has never been authorized by statute for use by any Minnesota defined benefit plan in meeting statutory reporting requirements. Under the aggregate actuarial cost method, the present value of future benefits for all active and retired plan participants is calculated under the applicable actuarial assumptions and, after subtracting the value of the assets of the retirement plan, is typically expressed as a percentage of the present value of future covered salary, which becomes the annual cost requirement for funding the retirement plan. By definition, the actuarial accrued liability of a retirement plan is equal to the plan's accumulated assets, so a retirement plan under this actuarial cost method is always 100% funded.

   The cited strengths and weaknesses of the aggregate actuarial cost method are that it produces no unfunded actuarial accrued liability, offers more funding security, has considerable flexibility in the annual retirement plan cost developed under the method in periods of significant net actuarial gains or losses, is a very conservative method when net experience gains dominate, is less conservative when net experience losses predominate, produces very large contribution requirements during the early years after the creation of a retirement plan, and can amass retirement plan asset amounts that are unnecessarily large at any time for an ongoing retirement plan.

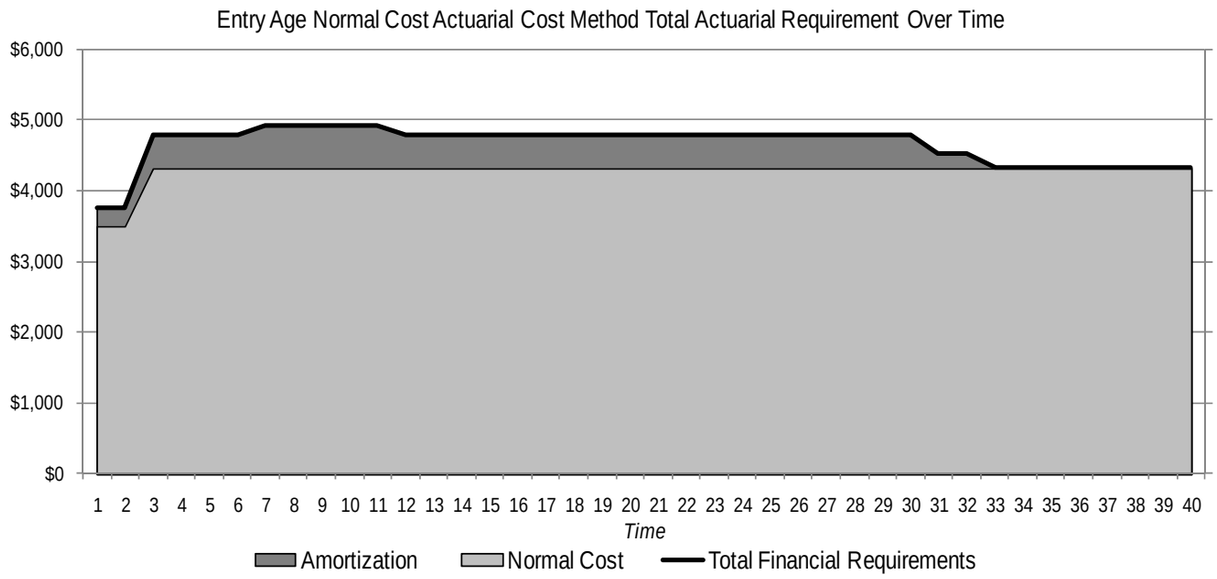
6. Frozen Initial Liability Actuarial Cost Method. While not ever authorized for official actuarial reporting by Minnesota law for any Minnesota defined benefit retirement plan, this amalgamation of two actuarial cost methods (i.e., entry age normal cost actuarial cost method and the aggregate

actuarial cost method) is used by the Wisconsin Retirement System and has led to some confusion when the actuarial reporting results for Minnesota and Wisconsin are compared. Under the frozen initial liability actuarial cost method, the aggregate actuarial cost method is the ongoing actuarial cost method used to determine annual actuarial costs, but another method, usually the entry age normal cost method, is used to assess an amount of unfunded actuarial accrued liability when the cost method is first employed to be used as if it were an asset for subsequent annual cost determinations under the aggregate cost method and that unfunded actuarial accrued liability amount is amortized by use of a supplemental amortization contribution and separately tracked. The frozen initial unfunded actuarial accrued liability is usually not increased or reduced by net experience gains or losses.

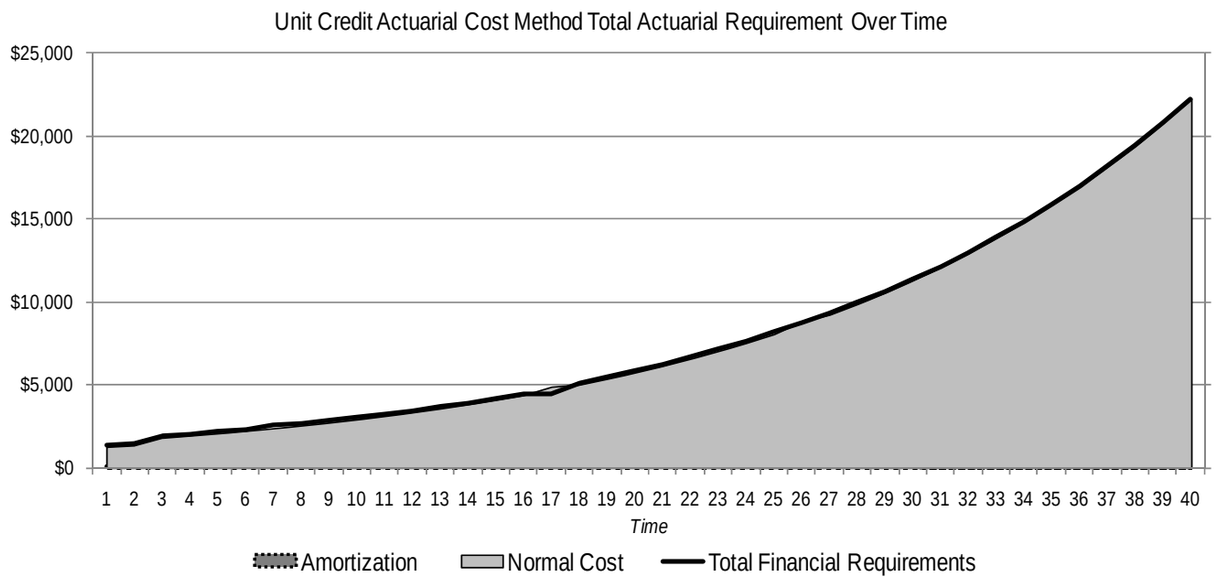
The strengths and weaknesses of the frozen initial liability actuarial cost method are that the actuarial method very easily accommodates total consolidations of other retirement plans with differing funding ratios at consolidation, the annual normal cost results can change significantly year to year based on net experience gains or losses, the results are not directly comparable with most other public employee retirement plan actuarial results which are calculated on an entry age normal cost actuarial cost method basis, and the recognized unfunded actuarial accrued liability becomes increasingly disconnected from the reality that it once measured over time.

7. Graphical Comparison of the Cost Patterns Over Time of Selected Actuarial Cost Methods. The following provides a comparably computed set of defined benefit retirement plans annual total actuarial funding requirements over a 40-year period for the various actuarial cost methods summarized above, with the numeric actuarial requirements set forth in Attachment A:[1]

Graph 1

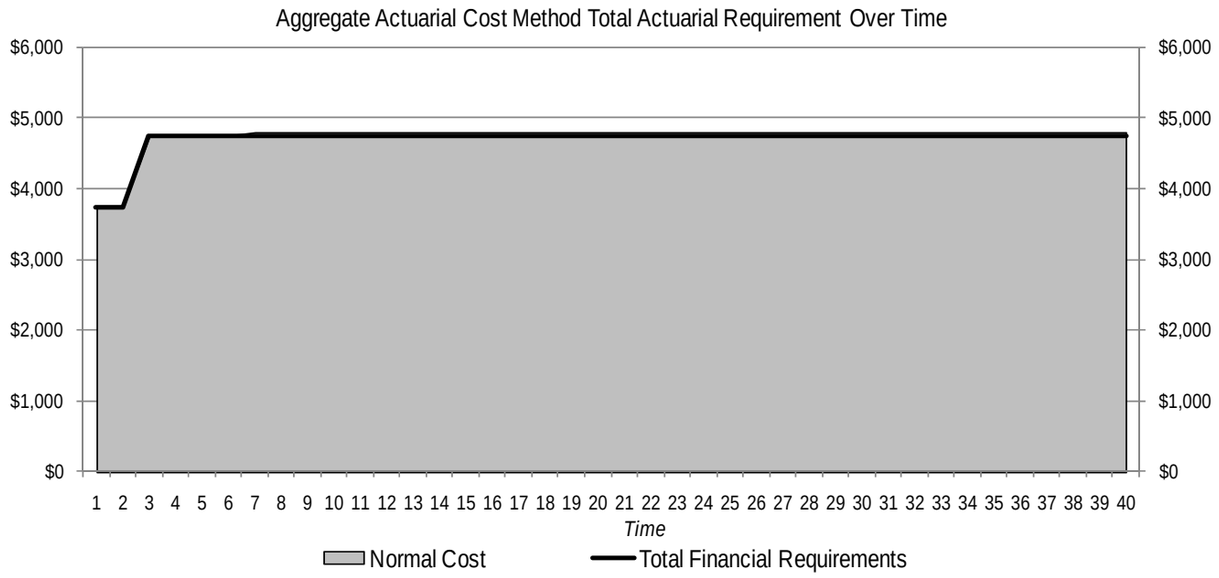


Graph 2

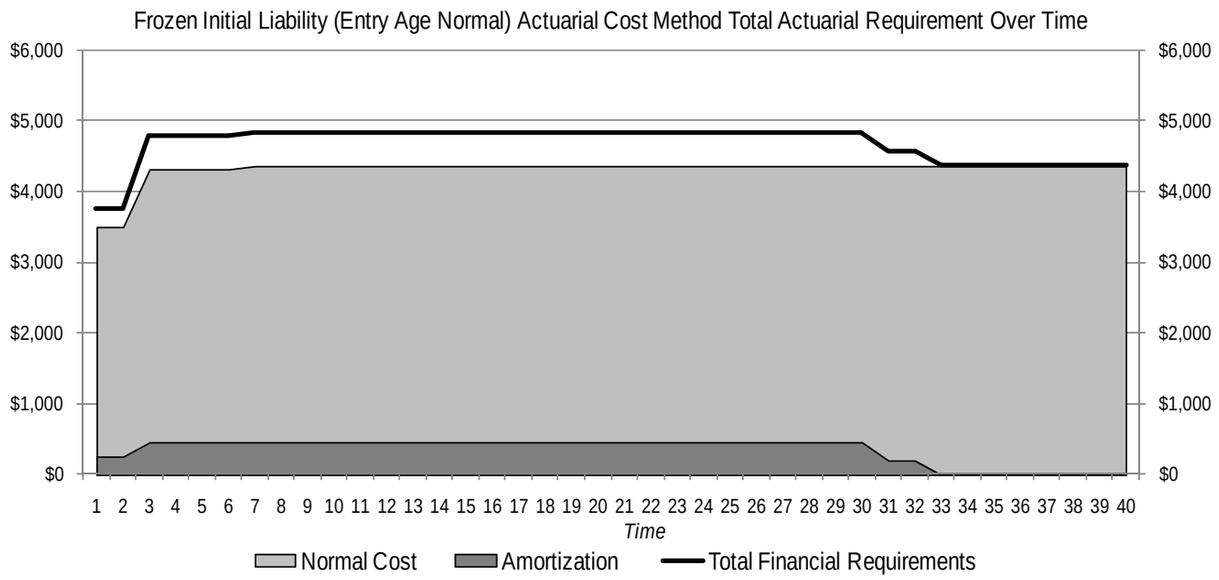


[1] Source: Chen, Irene Wai-Ling, "Actuarial cost methods in pension funding" (1995). *Master's Theses.* Paper 1128. http://scholarworks,sjsu.edu/etd_theses/1128

Graph 3



Graph 4



d. Minnesota Public Retirement Plan Actuarial Assumptions, In General. Minnesota public pension plan actuarial assumptions are specified in part in statute (the economic assumptions of interest/investment return, individual salary increase, and payroll growth) and are determined in part by other parties, with Commission approval (the balance of all actuarial assumptions, generally, the demographic assumptions). Economic assumptions are required to project the amount of benefits that will be payable. Demographic assumptions are required to project when benefits will be payable. Demographic assumptions are used to project the development of the population covered by the pension plan and hence when the benefits to be provided will be paid. The demographic assumptions project when a member is likely to progress between the various categories of membership (active, deferred, or retired) and how long the person stays in each category. The types of economic assumptions used to measure obligations under a defined benefit pension plan include the following:

- inflation;
- investment return (sometimes referred to as the valuation interest rate);
- compensation progression schedule; and
- other economic factors (e.g., Social Security, cost-of-living adjustments, growth of individual account balances, and variable conversion factors).

The types of demographic assumptions used to measure pension obligations include, but are not necessarily limited to, the following:

- retirement;
- mortality;
- termination of employment;

- disability and disability recovery;
- election of optional forms of benefits; and
- other assumptions, such as administrative expenses; household composition; marriage, divorce, and remarriage; open group assumptions; transfers; hours worked; and assumptions regarding missing or incomplete data.

The actuarial assumption selection process should result in actuarial assumptions that are reasonable in light of the particular characteristics of the defined benefit plan that is the subject of the measurement. A reasonable actuarial assumption is one that is expected to appropriately model the contingency being measured and is not anticipated to produce significant cumulative actuarial gains or losses over the measurement period. For any given measurement, two or more reasonable actuarial assumptions may be identified for the same contingency.

e. Economic Assumptions, Generally.

1. Interest/Investment Rate Actuarial Assumption. Because Minnesota public pension plan benefits are paid out over time and are paid from retirement funds that are invested to obtain investment returns, future obligations are discounted for those future interest or investment earnings. In selecting the interest/investment rate actuarial assumption, the appropriate investment data should be reviewed, including the current yields to maturity of fixed income securities such as government securities and corporate bonds; any forecasts of inflation and of total returns for each asset class; historical investment data, including real risk-free returns, the inflation component of the return, and the real return or risk premium for each asset class; and the historical plan performance.

   The interest/investment rate actuarial assumptions can be arrived at using one of two methods, either the building block method or the cash-flow matching method.

   Under the building-block method, the expected future investment return of each asset class is assembled as a combination of the components of investment return. These components are factors such as inflation and the real rate of return for the class. The best-estimate investment return range is determined by identifying a best-estimate range of expected future real returns for each broad asset class applicable to the plan, such as cash and cash equivalents, fixed income securities and equities, an average weighted real-return range reflecting the plan's expected asset class mix is computed and that range is combined with the expected inflation range.

   Under the cash flow matching method, the expected future investment return range is a combination of the internal rate of return on a bond portfolio with interest and principal payment approximately matching the plan's expected disbursements, and a risk adjustment range. The best-estimate investment return range is determined:

   – by projecting the plan's benefit and expense disbursements to be valued in the measurement;
   – by identifying a highly diversified portfolio available as of the measurement date of non-callable, high-quality corporate or U.S. government bonds with interest and principal payments approximately matching the projected disbursements;
   – by computing the bond portfolio's internal rate of return;
   – by establishing a risk adjustment range for the plan that reflects the uncertainties in the projected benefits and expenses, the expected returns on future contributions, the reinvestment of interest and principal payments not fully needed to pay current benefits, any mismatches between the benefit disbursement stream and the high-quality bond portfolio's interest and principal payment stream, and the current and expected future plan investments in equities or other asset classes besides high-quality bonds; and
   – then by combining these figures.

2. Compensation/Salary Scale Actuarial Assumption. Compensation is a factor in determining participants' benefits in Minnesota public pension plans other than volunteer firefighter relief associations. Generally, a participant's compensation will change over the long term in accordance with inflation, productivity growth, and merit scale increases. The assumption used to measure the anticipated year-to-year change in compensation is referred to as the compensation or salary scale. It may be a single rate assumption, or, alternatively, it may be a select and ultimate rate assumption and vary by age and/or service, consistent with the merit scale component; or vary over future years, consistent with the inflation component.

   In selecting the compensation or salary scale assumption, the appropriate compensation data should be reviewed, including the plan sponsor's current compensation practice and any anticipated changes in this practice; the current compensation distributions by age and/or service;

historical compensation increases and the practices of the plan sponsor/sponsors; and historical national wage and productivity increases.

The compensation or salary scale assumption is generally constructed using a building-block method, which combines the best-estimate ranges for the components of compensation scale. These components include inflation, productivity growth, and merit scale.

3. Payroll Increase Assumption. Except for the Legislators Retirement Plan, the Elected State Officers Retirement Plan, and the Minneapolis Employees Retirement Fund Division of the Public Employees Retirement Association, the various statewide and major local retirement plans amortize their unfunded actuarial accrued liabilities on the basis of a level percentage of an increasing covered payroll rather than on the basis of a level dollar amount. The covered payroll increase actuarial assumption specifies the level of the annual increase in the total covered payroll from the valuation date until the amortization target date for the calculation of that level percentage of covered payroll contribution requirement. In selecting the assumption, the inflation assumption is a primary determinant, adjusted for known or expected changes in active plan membership numbers.

f. Demographic Assumptions, Generally.

1. Retirement Age Assumption. With only a few exceptions, where length of service is the determining factor, Minnesota public pension plan members are required to attain a specified minimum age at which retirement benefits are payable if the member also terminates active employment. The retirement age assumptions relate to the specific age at which retirement benefits are likely to begin or the ages with a specific probability of retirement benefit commencement. In selecting the retirement age assumptions, in addition to data on the past experience of the plan membership, consideration should be given to the factors of the plan design, where specific incentives may influence when participants retire; the design of and the date of anticipated payment from Social Security and Medicare; and the availability of other employer-sponsored post-retirement benefit programs.

2. Turnover/Termination of Employment Assumptions. The termination of public employment by a Minnesota public pension plan member determines the amount of the person's accrued service credit. Minnesota public pension plans utilize service credit in determining retirement benefit amounts. The termination/withdrawal/turnover assumption predicts the amount of service credit to be acquired by plan members and also predicts the extent of any gain expected to be accrued from plan members who terminate without vesting. In selecting the termination assumption, in addition to data on the past experience of the plan, consideration should be given to the factors of employer-specific or job-related factors such as occupation, employment policies, work environment, unionization, hazardous conditions, and location of employment; and applicable plan provisions, such as any early retirement benefits, the vesting schedule, or the payout options.

3. Mortality Assumptions. Generally, Minnesota public retirement plan benefits terminate upon the death of the recipient, or if a joint-and-survivor optional annuity form was chosen, upon the death of the survivor. The mortality assumption is the measure of the expected lifetimes of active members, retired members, deferred retirees, disabilitants, and survivors. In addition to data on the past experience of the plan, in selecting the mortality assumptions, consideration should be given to the likelihood and extent of mortality improvement in the future.

4. Disability Assumption. Except for the Legislators Retirement Plan, the Elected State Officers Retirement Plan, and some volunteer firefighter relief associations, Minnesota public pension plans pay disability benefits. The disability assumption is a prediction of the occurrence of disabilities, which constitute a premature commencement of benefits. In selecting the disability assumption, in addition to analyzing the data on the past experience of the plan, consideration should be given to the plan's definition of disability and the potential for recovery.

5. Optional Annuity Form Election Assumption. Most statewide and major local Minnesota public pension plans provide optional annuity forms, whereby the number adjusts the timeframe over which the benefit will be paid in return for a modification in the amount of the benefit. Many of these plans have a subsidized bounce-back joint-and-survivor optional annuity form, the selection of which will increase the liability of the plan. The optional annuity form election assumption implements expectations about the future selections of optional annuity forms. In addition to analyzing the data on the past experience of the plan, in selecting the optional annuity form election assumption, consideration should be given to the benefit forms and benefit commencement dates available under the plan and the degree to which particular benefit forms may be subsidized.

g. Time Horizon for Setting Actuarial Assumptions. The actuarial assumption selection or revision process should result in assumptions that are reasonable in light of the particular characteristics of the defined benefit plan that is the subject of the measurement. A reasonable assumption is one that is expected to appropriately model the contingency being measured and is not anticipated to produce significant cumulative actuarial gains or losses over the measurement period. For any given measurement, two or more reasonable assumptions may be identified for the same contingency. At a minimum, when a revision of an actuarial assumption is considered, the new actuarial assumption should be consistent with the recent experience in that area unless experience is in flux, and then the new actuarial assumption should attempt to reasonably anticipate the progression of any identifiable trend.

In particular with respect to mortality, in addition to data on the past experience of the plan, in selecting the mortality assumptions, consideration should be given to the likelihood and extent of mortality improvement in the future.

Where a retirement plan is closed to new members, such as the Minneapolis Employees Retirement Fund (MERF), the Minneapolis Firefighters Relief Association (MFRA), or the Minneapolis Police Relief Association (MPRA), the consideration of an appropriate mortality table may be different because of that fact. The consideration is shaped by the fact that the total covered population is known, that the population is somewhat less susceptible to developments in longevity compared to plans with open active memberships due to a likely greater average age, and that any mortality losses will be required to be funded relatively quickly due to relatively short remaining amortization periods.

h. Context in Which Actuarial Assumptions are Set; Complications. Changing actuarial assumptions, when the quadrennial experience study indicates a need to do so, is not always an easy proposition. In the 1993-1995 round of experience studies, several assumptions that were identified for modification by the Commission actuary ultimately were not modified because of opposition from pension plan actuaries and administrators and several assumption changes were subject to dispute because of apparent stylistic disagreements among actuaries and because of the actuarial cost impact of the change on the potential for additional future benefit increases.

Frequently in the past, actuarial assumptions have been changed in combination with benefit improvements (principally 1973 and 1989 for the statewide plans) or in combination with contribution restructurings (1984 for the statewide and major local plans; 1991 for the Minneapolis Employees Retirement Fund (MERF)).

i. Historical Development of Minnesota Defined Benefit Retirement Plan Actuarial Reporting Requirements. Since the creation of the Legislative Commission on Pensions and Retirement as an interim commission in 1955, retirement funding and actuarial data has been required to be provided to the state by or relating to the various public pension plans in the state, as follows:

- Laws 1957, Special Session, Chapter 11 was the initial actuarial reporting law enacted by the Minnesota Legislature. The 1957 actuarial reporting law was an uncoded temporary law that was applicable only to actuarial valuations prepared as of January 1, 1958. No prior generally applicable law required specific actuarial reporting to the Legislature or to any other public office or official. The 1957 actuarial reporting law required census tabulations of active members and benefit recipients, an actuarial balance sheet disclosing assets, liabilities and the actuarial full funding deficit, a statement of actuarial assumptions, an indication of the normal support rate for currently accruing liabilities and an indication of the 1997 target date amortization requirement. The 1957 actuarial reporting law was unspecific on the manner in which the actuarial calculation was to be prepared, leading to disputes when some funds prepared valuations on a basis other than the entry age normal actuarial method. The 1957 actuarial reporting law was broadly applicable to all statewide general and public safety pension plans, all local general employee plans, all local police relief associations and all local salaried firefighter relief associations. Problems with the 1957 actuarial reporting law led the Commission to refine the actuarial reporting requirements and procedures and to recommend a general ongoing actuarial reporting law in the years between 1958 and 1965. The actuarial reporting under the 1957 special law was due by January 6, 1959.

- Laws 1965, Chapters 359 and 751. Laws 1965, Chapter 359, was the initial codification of the general employee pension plan actuarial reporting law. Laws 1965, Chapter 751, was an uncoded temporary law applicable to local police and paid firefighters relief association actuarial valuations prepared as of December 31, 1964. The general employee pension plan actuarial reporting law required an indication of the level normal cost, an actuarial balance sheet disclosing assets, accrued liabilities and unfunded accrued liability as well as specific required reserve figures and an indication of the 1997 target date amortization requirement. The general employee pension plan actuarial reporting law required that the actuarial valuation normal cost and accrued liabilities to be prepared using the Entry Age Normal Cost (Level Normal Cost) Method, that the actuarial

method be used to value all aspects of the benefit plan and known future benefit changes, that the actuarial valuation be prepared on the basis of a 3% interest assumption and other appropriate assumptions and that assets not include any present value of future amortization contributions. The general employee pension plan actuarial reporting law required annual actuarial valuations for the State Employees Retirement Fund, the Public Employees Retirement Fund, and the State Police Officers Retirement Fund. The general employee pension plan actuarial reporting law also required the preparation of an experience study validating the actuarial assumptions used in the valuation. The local police and paid fire actuarial reporting law was based on the 1957 actuarial reporting law with the additional clarification of a 3% interest rate assumption, the requirement of normal cost and accrued liabilities calculated on the basis of the entry age normal cost method and the reporting of the amount for the amortization of the unfunded accrued liability by the 1997 target date. The local police and paid fire actuarial reporting law was applicable to all police and paid firefighters relief associations. The actuarial reporting under the 1965 general law was due five months after the close of the fiscal year covered by the valuation. No experience studies were required by the 1965 general law.

- Laws 1967, Chapter 729, was a revision in the 1965 local police and paid fire actuarial reporting law. The 1967 local police and paid fire actuarial reporting law was a coded general statute requiring actuarial valuations as of December 31, 1967, and each four years thereafter. It was also made applicable volunteer firefighters relief associations and very small active membership police and paid firefighters relief associations. A 3% salary rate assumption was added. A 2007 target date amortization requirement replaced the prior 1997 target date amortization requirement for police and paid fire plans, leaving the 1997 requirement for volunteer and smaller active membership police and paid fire relief associations. An addition of a requirement to the calculated normal cost for amortizing net actuarial experience gains or losses was also added.

- Laws 1969, Chapter 289, revised the 1965 general employee pension plan actuarial reporting law by making the requirement applicable to the Minneapolis Employees Retirement Fund (MERF) and to the three first class city teacher retirement fund associations. It also provided for an interest rate assumption to 3.5% as well as 3.0% for comparison purposes and added a salary assumption of 3.5% for funds with a final salary based benefit plan.

- Laws 1973, Chapter 653, Section 45, modified the general employee pension plan actuarial reporting law by increasing the interest assumptions from 3.5% to 5%.

- Laws 1975, Chapter 192, recodified the general employee pension plan actuarial reporting law, previously coded as Minnesota Statutes 1974, Sections 356.21, 356.211, and 356.212, as Minnesota Statutes, Section 356.215. The actuarial valuation reports under the 1975 general law were due five months after the close of the fiscal year covered by the valuation. The experience studies under the 1975 general law were also due five months after the period covered by the experience study.

- Laws 1978, Chapter 563, Sections 9-11, and 31, repealed the separate local police and fire relief association actuarial reporting law, Minnesota Statutes 1976, Sections 69.71 to 69.76, and required the local police and fire relief associations to report under the general employee pension plan actuarial reporting law with specific adaptations, coded as Minnesota Statutes, Section 356.216. It also amended the actuarial reporting law by requiring specific reporting of entry age and retirement age assumptions and the provision of a summary of the benefit plan provisions on which the actuarial valuation is based.

- Laws 1979, Chapter 184, modified the actuarial reporting law by replacing the 1997 amortization target date with a 2009 amortization target date and establishing a procedure for extending that target date in the event of substantial unfunded actuarial accrued liabilities resulting from benefit increases, actuarial cost method changes or actuarial assumption changes.

- Laws 1981, Chapter 224, Sections 169-170. Laws 1981, Chapter 224, Section 169, largely revised the language usage and style of the actuarial reporting law. The 1981 general law also clarified that actuarial valuation reports and experience studies were due on the first day of the sixth month occurring after the end of the previous fiscal year. It also provided that actuarial valuations and experience studies were to be filed with the Legislative Reference Library rather than with the Secretary of the Minnesota Senate and with the Chief Clerk of the Minnesota House of Representatives. Additionally, the 1981 law clarified that amortization contribution requirements were required to be calculated on a level dollar basis.

- Laws 1984, Chapter 564, Section 43, substantially modified the actuarial reporting law. Actuarial valuations are required to comply with the Standards for Actuarial Work adopted by the Commission. The interest rate assumption was modified, with a post-retirement interest rate of

5% and a pre-retirement interest rate of 8% for the major, statewide plans. The actuarial balance sheet requirement was also substantially modified, and was expanded to include reporting of current and expected future benefit obligations, current and expected future assets and current and expected future unfunded liabilities. The amortization contribution requirement was also modified, with a change from a level dollar annual amortization procedure to a level percentage of future covered payroll amortization procedure for the major, statewide and local general employee plans other than MERF.

- Laws 1987, Chapter 259, Section 55, revised the language and style of the actuarial reporting provision, specified the particular interest and salary increase actuarial assumptions for the legislators retirement plan and elected state officers retirement plan, set the amortization target date for MERF at 2017 and exempted MERF from the process for automatically revising the target date upon benefit increases or assumption changes, required approval by the Legislative Commission on Pensions and Retirement for any demographic actuarial assumption changes, and reset the deadline date for experience studies from December 1 to June 1.

- Laws 1989, Chapter 319, Article 13, Sections 90-91, increased the interest rate actuarial assumption from 8.0% to 8.5% for all statewide and major local retirement plans other than MERF and extended the amortization full funding target date from 2009 to 2020 for all statewide and major local retirement plans other than MERF.

- Laws 1991, Chapter 269, Article 3, Sections 3-19, updated the actuarial valuation reporting requirements to accommodate governmental pension plan generally accepted accounting changes, required actuarial valuations or experience studies prepared by an actuary other than the actuary retained by the Legislative Commission on Pensions and Retirement to submit the document to the Commission, and modified some of the services performed by the Commission-retained actuary to reduce the cost of retirement plan-reimbursed actuarial services compensation.

- Laws 1991, Chapter 345, Article 4, Sections 3-4, reset the interest and salary actuarial assumptions for the MERF at 6% and 4% respectively and extended the MERF amortization target date from 2017 to 2020.

- Laws 1993, Chapter 336, Article 4, Section 1, defines administrative expenses for purposes of inclusion of administrative expenses as part of actuarial cost calculations.

- Laws 1993, Chapter 352, Section 7, provided, for the Public Employees Police and Fire Plan (PERA-P&F), for the reverse amortization of the amount of assets in excess of the plan's actuarial accrued liability.

- Laws 1995, Chapter 141, Article 3, Sections 14-15, implemented an age-related salary increase assumption for the General State Employees Retirement Plan of the Minnesota State Retirement System (MSRS-General), the General Employees Retirement Plan of the Public Employees Retirement Association (PERA-General), and the Teachers Retirement Association (TRA), and set fund-specific payroll growth actuarial assumption rates for MSRS-General, PERA-General, and TRA.

- Laws 1997, Chapter 233, Article 1, Sections 2 and 57, required, two years after the quadrennial experience studies, that the actuary retained by the Legislative Commission on Pensions and Retirement conduct quadrennial projection valuations for MSRS-General, PERA-General, TRA, and for any other plans for which the Commission determines a study of this type would be beneficial. These quadrennial projection valuations were required to be conducted in consultation with the Commission's executive director, the retirement fund directors, the state economist, the state demographer, the Commissioner of Finance, and the Commissioner of Employee Relations. The results were required to be reported in the same manner as the quadrennial experience studies. The quadrennial projection valuation cost was required to be paid by retirement plans, with the costs allocated among all plans for which the actuary retained by the Commission performs annual actuarial valuations.

- Laws 1997, Chapter 241, Article 4, Section 1, revised the salary increase assumption for the State Patrol Retirement Plan, the Correctional Employees Retirement Plan of the Minnesota State Retirement System (MSRS-Correctional), PERA-P&F, and the first class city teacher retirement plans, and added a payroll growth assumption to the MSRS-General, MSRS-Correctional, State Patrol, Legislators, Elected State Officers, and Judges Plans; to PERA-General and PERA-P&F; to TRA; and to the first class city teacher retirement plans.

- Laws 1998, Chapter 390, Article 8, Section 2, changed the requirement for a quadrennial projection valuation from the three major statewide retirement plans to one of the statewide or major local retirement plans.

- Laws 1999, Chapter 222, Article 4, Section 14, set the calculated overfunding credit for PERA-P&F if the plan has assets in excess of its actuarial accrued liability at the 30-year level percentage of covered pay amortization requirement applicable if the excess assets were an unfunded liability and reset as a new 30-year period for each valuation year.

- Laws 2000, Chapter 461, Article 1, again substantially modified the actuarial reporting law. Salary assumptions and post-retirement interest rate assumptions were reset, and the actuarial value of assets also was changed to an approach that approaches, but smoothes, market values.

- First Special Session Laws 2001, Chapter 10, Article 11, Section 18, exempted PERA-General from the automatic amortization target date resetting provisions of Minnesota Statutes, Section 356.215, and set a 2031 amortization target date for PERA-General.

- Laws 2003, Chapter 392, Articles 9 and 11, the select and ultimate salary increase assumptions (i.e., rates varying based on both age and length of service) for MSRS-General, PERA-General, TRA, the Duluth Teachers Retirement Fund Association (DTRFA), the Minneapolis Teachers Retirement Fund Association (MTRFA) and the St. Paul Teachers Retirement Fund Association (SPTRFA) were revised based on the 2000 experience studies. The structure of Minnesota Statutes, Section 356.215, also was reorganized and revised as part of a recodification of Minnesota Statutes, Chapter 356.

- Laws 2004, Chapter 223, Section 7, replaced a single contracting consulting actuary retained by the Legislative Commission on Pensions and Retirement to prepare the annual actuarial valuations of the various statewide and major local retirement plans with a single contracting consulting actuary retained jointly by the administrators of the seven retirement systems with Commission ratification.

- First Special Session Laws 2005, Chapter 8, Article 11, Section 2, set the interest and salary actuarial assumptions for the Bloomington Fire Department Relief Association at 6% and 4% respectively.

- Laws 2008, Chapter 349, Article 10, Sections 7-15.
  - The requirement that the pension funds to jointly retain an actuary to provide actuarial reports for the pension plans was revised by removing the requirement of having a joint actuary and the governing board of each pension plan system was authorized to retain its own actuary.
  - The Commission was authorized to contract with an actuarial firm to audit or review the actuarial valuations, experience studies, and actuarial cost analysis prepared by the actuaries retained by the various pension plan governing boards, with a $140,000 initial appropriation provided to cover the cost of the contract.
  - The definition of approved actuary, for purposes of retaining and providing actuarial valuations, was revised by removing authority to be retained if the individual had 15 years of experience serving major public retirement plans in lieu of being a fellow in the Society of Actuaries. Obsolete language in the actuarial value of assets provision was removed.
  - The provision which had required actuarial valuations to be filed with the Legislative Commission on Pensions and Retirement, Commissioner of Finance, and Legislative Reference Library no later than six months after the end of the fiscal year was revised by removing valuation reporting deadlines.
  - The salary assumption and payroll growth assumption for the Elective State Officers Retirement Plan was removed (because the plan is closed and has no active members).
  - The salary growth assumptions for other plans were revised by reducing the MSRS-General select period to five years rather than ten; by revising the select calculation for DTRFA to 8% per year in years one to seven, 7.25% per year for years seven and eight, and 6.5% for years eight and nine; by increasing the percentage rate from 0.3% to 0.6% for MSRS-General and PERA-General; and by reducing the ultimate salary increase assumptions for the plans, at least in some age ranges, except for the State Patrol Retirement Plan, the Local Government Correctional Service Retirement Plan (PERA-Correctional), and SPTRFA.
  - The payroll growth assumptions were decreased from 5.0% to 4.5% for MSRS-General, MSRS-Correctional, the State Patrol Retirement Plan, the Legislators Retirement Plan, TRA, and DTRFA; and from 5.0% to 4.0% for the Judges Retirement Plan; and from 6.0% to 4.5% for PERA-General, PERA-P&F, and PERA-Correctional.
  - After July 1, 2010, the salary and payroll growth assumptions were permitted to be revised by the governing boards of the applicable plan and become effective if the Commission does not take action to overrule the plan proposed change within one year.
  - The full funding dates for MSRS-Correctional, the Judges Retirement Plan, and PERA-P&F were reset to June 30, 2038. The full funding date for SPTRFA was reset as a rolling period

25 years from the year of the valuation, and the annual actuarial valuation was required to contain an exhibit indicating the SPTRFA funding ratio and contribution deficiency/sufficiency based on market value.
  - The MERF actuarial valuation, with respect to its Retirement Benefit Fund, and MSRS, PERA, and TRA plan actuarial valuations with respect to the Minnesota Post Retirement Investment Fund (Post Fund), must include an exhibit indicating the contribution necessary to amortize the unfunded liability of the Retirement Benefit Fund or the Post Fund, as applicable.

- Laws 2009, Chapter 169, Article 1, Sections 70-71.
  - The actuarial value of assets computation provision was revised by redefining the actuarial value of assets to use a consistently applied 8.5% investment earnings assumptions and by incorporating a five-year phase in of market value asset recognition for the dissolved former Minnesota Post Retirement Investment Fund.
  - The provision specifying how amortization contributions are to be determined for most plans was revised by eliminating an obsolete requirement relating to the Minnesota Post Retirement Investment Fund.

- Laws 2010, Chapter 359, Article 1, Sections 68-69, and 82; Article 9, Section 1; Article 11, Sections 19-20; and Article 12, Sections 23-24.
  - A service-related future salary increase assumption replaced the select and ultimate future salary increase assumption for PERA-General.
  - The amortization target date of MSRS-General was reset to 2040 and of the MERF Division of PERA was reset to 2031.
  - The deadline date for the filing actuarial valuation reports was re-imposed as the last day of the sixth month occurring after the end of the previous fiscal year.
  - The modified single rate future salary increase assumption applicable to MERF was eliminated as part of the administrative consolidation of the retirement plan with PERA.
  - MERF was removed from the requirement for filing a separate annual financial report and the PERA-General actuarial valuation was required to include a valuation of the MERF Division.
  - For as long as the applicable plan provides a reduced post-retirement adjustment, the actuary must use a post-retirement interest rate assumption equal to the difference between the pre-retirement interest rate assumption and the stated post-retirement adjustment rate.

- First Special Session Laws 2011, Chapter 8, Article 3, Section 1. The salary increase and payroll growth actuarial assumptions were revised for MSRS-General, PERA-General, PERA-P&F, and TRA, based on recent actuarial experience studies.

j. Provision of Actuarial Services to the Legislature and the Various Retirement Plans. Since the creation of the Legislative Commission on Pensions and Retirement as an interim commission in 1955, the Commission has retained a consulting actuary to provide necessary actuarial consulting services. In 1955, the various retirement plans only had infrequent actuarial valuations or had no previous actuarial valuations at all and the retirement plans had unclear or irregular relationships with consulting actuarial firms.

- For the period 1955-1984, the consulting actuary retained by the Commission functioned chiefly as the actuarial advisor to the Commission, presenting information on actuarial procedures, techniques and principles, recommending improvements in regulation or procedure of an actuarial nature and reviewing actuarial valuations, benefit increase actuarial cost estimates and experience studies for consistency, accuracy and conformance to sound actuarial technique.

- Before 1965, actuarial valuations were irregular or infrequent and were frequently limited to total actuarial accrued liability calculations without actuarial contribution requirement determinations (e.g. Minnesota State Retirement System (MSRS) valuations in 1957, 1958, 1959, 1962, 1963, and 1964; Public Employees Retirement Association (PERA) valuations in 1955, 1958, and 1963; Teachers Retirement Association (TRA) valuations in 1958, 1959, and 1964). The first class city general employee retirement plans have been required by statute to prepare annual actuarial valuations only since 1969, with infrequent and sometimes incomplete actuarial valuations before 1969 (e.g. Minneapolis Employees Retirement Fund (MERF) 1958, 1967 and 1968; Duluth Teachers Retirement Fund Association (DTRFA) valuations in 1952 and 1955; Minneapolis Teachers Retirement Fund Association (MTRFA) valuations in 1957 and 1964; and St. Paul Teachers Retirement Fund Association (SPTRFA) valuations in 1958). The Commission, by a special law it recommended, first required the preparation of actuarial valuations by the various statewide retirement plans and their consulting actuaries in 1957. The 1957 special law was not explicit about the actuarial method or assumptions for the preparation of the actuarial valuations, allowing for considerable latitude in interpretation on the part of the retirement fund and its

consulting actuary and producing results that were not considered fully appropriate by the 1957 Commission. In 1965, the Commission recommended and the Legislature enacted a statutory actuarial reporting law that specified numerous actuarial procedure elements to address the perceived deficiencies in the 1957 special law.

- From 1965 to 1984, the various Minnesota public pension plans were required to have prepared annual actuarial valuations meeting the requirements of Minnesota Statutes, Section 356.215, and they retained consulting actuaries to perform these valuations (the statewide plans in 1965 and the first class city retirement plans in 1969). The consulting actuaries were required to be approved actuaries, meaning that the actuary had minimum credentials (fellowship in the Society of Actuaries) or had a minimum length of experience. The various public pension plans also were required to have prepared experience studies meeting the requirements of Minnesota Statutes, Section 356.215, every four years, covering the prior five year period, which task was also performed by the retained consulting actuaries. The consulting actuaries retained by the various public pension plans each operated under contract with the particular pension plan, with the contract's duration, specific requirements, and compensation unregulated by the Commission or state law.

- In 1984, apparently in reaction to various irreconcilable actuarial cost estimates for the Rule of 85 temporary normal retirement provision proposal supplied by the various actuaries of the various pension plans, and after the Commission apparently considered the possibility of the retention of an actuary as a member of the Commission staff, and with the concurrence of the state Department of Finance, the procedure for the provision of regular actuarial services for the statewide and major local pension plans was changed. Under Minnesota Statutes 1984, Section 3.85, Subdivision 11, the Commission was required to retain a consulting actuarial firm to provide annual actuarial valuations, periodic experience study and periodic benefit increase costing services related to the various statewide and major Minnesota public pension plans. The Commission was also required to establish standards for the preparation of any required actuarial work. The various public pension plans were permitted, but not required, to retain a consulting actuary for the review of the work of the Commission-retained actuary and for other actuarial services.

- Following the 1984 Legislative Session, the Commission held a competitive bidding process to select its consulting actuarial firm. A five member (three House members, two Senate members) Commission subcommittee, chaired by Representative John Sarna, undertook the process. A Request for Proposal was prepared and was provided to 17 actuarial firms on July 30, 1984. Ten actuarial firms submitted proposals to the Commission subcommittee by the September 7, 1984 deadline date. The Commission subcommittee directed the Commission staff and actuary (then James Bordewick) to make the initial evaluation of the written proposals. Four finalists were selected to make in-person presentations to the Commission subcommittee, which occurred on November 8, 9 and 13, 1984. The four finalists were Milliman & Robertson, Inc., Peat, Marwick, Mitchell & Co., Towers, Perrin, Forster & Crosby, and The Wyatt Company. The Commission subcommittee recommended The Wyatt Company to the full Commission following evaluation of the in-person presentations and the Commission selected The Wyatt Company as the Commission retained actuary on a unanimous vote. On December 31, 1984, a contract for the provision of actuarial services between The Wyatt Company and the Commission was executed by Representative John Sarna and Mr. Allen Grosh. The contract provided for the development and updating of standards for actuarial work, the preparation of annual actuarial valuations, the preparation of annual cash flow projections and the provision of other consulting. Karen Dudley, the Commission Executive Director, drafted the initial contract in 1984, with the assistance of Joel Michael of the House Research Department and John Asmussen of the Office of the Legislative Auditor. The contract was potentially effective for a three-year period if the arrangement was reaffirmed by the Commission during each of the second and third option years. The Commission exercised its option to continue the contract with The Wyatt Company for Fiscal Year 1987 and Fiscal Year 1988 respectively.

- In 1987, as part of the State Departments appropriation bill, a portion of the cost of the annual actuarial valuations and periodic experience studies, previously borne almost entirely by the Commission out of its budget, was assessed against the various retirement funds on the basis of proportional membership.

- In 1988, the Commission considered the question of the contract for the provision of actuarial services in light of the expiration of the contract with The Wyatt Company on June 30, 1988 and the Commission approved a recommendation by Representative Wayne Simoneau that the contract with The Wyatt Company, due for expiration on June 30, 1988, be extended to June 30, 1990, with a substantial redrafting of the contract language and a resetting of some actuarial compensation rates as recommended by Representative Simoneau.

- In 1990, after a controversy over the actuarial services fees charged by the Wyatt Company that was raised by James Hacking, the Executive Director of the Public Employees Retirement Association (PERA) and after a request from Representative Wayne Simoneau to the Legislative Audit Commission for an audit of the Wyatt Company's contract with the Legislative Commission on Pensions and Retirement, the Commission rebid the actuarial services contract and the actuarial consulting firm of Milliman & Robertson, Inc., was retained by the Commission, chosen from a group of seven bidders (four finalists). The actuarial services contract with Milliman & Robertson, Inc., was extended for one year in 1993 and in 1994, was renewed for two years after rebidding with one competitor in 1995, was extended for one year in 1997, was renewed for four years after rebidding without any other bidder competing in 1998, and was renewed for two years after rebidding with one competitor in 2002. In 2000 (Laws 2000, Ch. 461, Art. 1, Sec. 1), the method for computing the recoupment amount for the Legislative Commission on Pensions and Retirement from the various retirement plans, eliminating the 1988 formula based on system status, plan status, and relative membership size in favor of an allocation based on the actuarial firm's records on the time spent on each plan's valuation.

- In 2002, an issue arose between Milliman USA, the renamed actuarial firm of Milliman & Robertson, Inc., and the Commission over liability limitations, third-party reliance on actuarial work, and mandatory dispute arbitration. The issue limited the 2002 contract with Milliman USA to the two-year period that Milliman USA was willing to commit to without a positive resolution of the liability limitation and related issues.

- In 2004 (Laws 2004, Ch. 223), the actuarial services issues from 2002 and reductions in appropriations to the Commission resulted in the Executive Committee of the Commission recommending and the Commission approving legislation, subsequently enacted, providing for a replacement of a consulting actuarial firm retained by the Commission by a consulting actuarial firm retained jointly by the seven largest retirement system administrators, acting jointly, with the ratification of the choice by the Commission. The joint retirement administrators retained The Segal Company as the consulting actuarial firm.

- In 2008 (Laws 2008, Ch. 349, Art. 10, Sec. 7-9, 17-18), the requirement that the pension funds jointly retain an actuary to provide actuarial reports for the pension plans was revised by removing the requirement of having a joint actuary and by providing that the governing board of each pension plan system retain its own actuary. The Commission was authorized to contract with an actuarial firm to audit or review the actuarial valuations, experience studies, and actuarial cost analyses prepared by the actuaries retained by the various pension plan governing boards, with an annual $140,000 appropriation provided to cover the cost of the contract.

- In 2009, the Legislative Commission on Pensions and Retirement issued a request for proposal for retention of a consulting actuarial firm as its actuarial advisor, reduced the responders to the request for proposal to four finalists, entertained presentations by those four finalists (Deloitte Consulting LLP; Hay Group, Inc.; Milliman, Inc.; and PriceWaterhouse Coopers LLP), selected Milliman, Inc. as its consultant, and entered into an actuarial services contract with Milliman, Inc. in late 2009. During Fiscal Year 2010, Milliman reviewed all of the actuarial valuations of the statewide and major local retirement plans, reviewed and recommended revisions in the Commission's Standards for Actuarial Work, and reviewed the experience studies and assumption change recommendations for the General State Employees Retirement Plan of the Minnesota State Retirement System (MSRS-General), the General Employees Retirement Plan of the Public Employees Retirement Association (PERA-General), and TRA. During Fiscal Year 2011, Milliman replicated in an actuarial audit the actuarial valuations of the MSRS-General, the PERA-General, and MERF and reviewed the actuarial valuations of the remaining statewide and major local retirement plans.

- On March 30, 2011, because of significant recommended reductions in appropriations for the Commission in the pending House and Senate State Government finance bills, the Commission executive director exercised, on behalf of the Commission, its option to terminate the actuarial services contract for Fiscal Years 2012 and 2013 pending the achievement of greater certainty in likely appropriations and a potential future negotiated revision in actuarial contract duties with Milliman.

Part Two
Summary of Current Actuarial Assumptions

The following tables provide a summary of the actuarial assumptions used for the July 1, 2010, actuarial valuations.

Table 1 is the current actuarial assumption comparison for the General State Employees Retirement Plan of the Minnesota State Retirement System (MSRS-General), the General Employees Retirement Plan of the Public Employees Retirement Association (PERA-General), the Teachers Retirement Association (TRA), and the MERF Division of PERA.

Table 2 is the current actuarial assumption comparison for the Correctional State Employees Retirement Plan of the Minnesota State Retirement System (MSRS-Correctional), the State Patrol Retirement Plan, the Public Employees Police and Fire Retirement Plan (PERA-P&F), and the Local Government Correctional Service Retirement Plan (PERA-Correctional).

Table 3 is the current actuarial assumption comparison for the Legislators Retirement Plan, the Elected State Officers Retirement Plan, and the Judges Retirement Plan.

Table 4 is the current actuarial assumption comparison for the Duluth Teachers Retirement Fund Association (DTRFA), and the St. Paul Teachers Retirement Fund Association (SPTRFA).

Table 1
Current Actuarial Assumptions - Statewide General Employee Retirement Plans

	MSRS-General	PERA-General	TRA	MERF Division
Investment return	8.50% compounded annually pre-retirement. 6.50% compounded annually post-retirement.	8.50% compounded annually pre-retirement. 7.50% compounded annually post-retirement.	8.5% compounded annually pre-retirement. 8.5% compounded annually post-retirement for first 2 years. 6.5% compounded annually post-retirement thereafter.	8.5% compounded annually
Benefit increases after retirement	The post-retirement investment return changed from 6.0% to 6.5% to reflect the change in post-retirement benefit increases from 2.5% to 2.0%.	Payment of 1.00% annual cost-of-living adjustments after retirement accounted for by using a 7.50% post-retirement assumption, as required by statute.	Payment of 2.0% annual benefit increases after retirement are accounted for by using a 6.5% post-retirement assumption, as required by statute.	Payment of 1% annual cost of living adjustments after retirement accounted for explicitly.
Salary increases	Reported salary for prior fiscal year, with hew hires annualized, increased to current fiscal year and annually for each future year according to the ultimate rates in the rate table. During a 5-year select period, 0.6% x (5-T), where T is competed years of service, is added to the ultimate rate.	Reported salary for prior fiscal year, with new hires annualized, increased to current fiscal year and annually for each future year according to the ultimate rates in the rate table based on service.	Reported salary for prior fiscal year, with new hires annualized, increased according to the age-based ultimate table shown in the rate table to current fiscal year and annually for each future year. During a ten-year select period, 0.30 x (10-T), where T is completed years of service is added to the ultimate rate. See table of sample rates.	Total reported pay for prior calendar year increased 1.98% (half year of 4.00%, compounded) to prior fiscal year and 4.00% annually for each future year.

Salary Scale

Baseline Assumption		Alternative Assumption	
Age	Salary Increase	Age	Salary Increase
20	5.75%	1	10.75%
25	5.75	2	8.35
30	5.75	3	7.15
35	5.75	4	6.45
40	5.75	5	5.95
45	5.75	6	5.55
50	5.45	7	5.25
55	4.95	8	4.95
60	4.45	9	4.75
65	4.25	10	4.65
70	4.25	11	4.45
		12	4.35
		13	4.25
		14	4.05
		15	3.95
		16	3.85
		17+	3.75

Salary Scale

Baseline Assumption		Alternative Assumption	
Age	Salary Increase	Age	Salary Increase
1	12.03%	1	12.25%
2	8.90	2	9.15
3	7.46	3	7.75
4	6.58	4	6.85
5	5.97	5	6.25
6	5.52	6	5.75
7	5.16	7	5.45
8	4.87	8	5.15
9	4.63	9	4.85
10	4.42	10	4.65
11	4.24	11	4.45
12	4.08	12	4.35
13	3.94	13	4.15
14	3.82	14	4.05
15	3.70	15	3.95
16	3.60	16	3.85
17	3.51	17	3.75
18+	3.50	18+	3.75

Salary Scale

Baseline Assumption		Alternative Assumption	
Age	Salary Increase	Age	Salary Increase
20	5.50%	1	12.00%
25	5.50	2	9.00
30	5.50	3	8.00
35	5.50	4	7.50
40	5.20	5	7.25
45	4.70	6	7.00
50	4.50	7	6.85
55	4.50	8	6.70
60	4.80	9	6.55
65	5.20	10	6.40
70	5.20	11	6.25
		12	6.00
		13	5.75
		14	5.50
		15	5.25
		16	5.00
		17	4.75
		18	4.50
		19	4.25
		20	4.00
		21	3.90
		22	3.80
		23	3.70
		24	3.60
		25+	3.50

Current Actuarial Assumptions - Statewide General Employee Retirement Plans

MSRS-General

Payroll growth (amortization)

A level percentage of payroll each year to the statutory amortization date of July 1, 2040 (July 1, 2020, last year), assuming payroll increases of 4.50% per annum. If there is a negative Unfunded Actuarial Accrued Liability, the surplus amount shall be amortized over 30 years as a level percentage of payroll.

Alternate actuarial results are prepared assuming payroll increases of 3.75% per annum.

Mortality

Healthy pre-retirement

Healthy Pre-Retirement Mortality

Age	Male	Female
20	0.0255%	0.0176%
25	0.0297%	0.0186%
30	0.0457%	0.0236%
35	0.0722%	0.0393%
40	0.1066%	0.0515%
45	0.1456%	0.0793%
50	0.1960%	0.1220%
55	0.3017%	0.1977%
60	0.4896%	0.3248%
65	0.7404%	0.5179%
70	2.2964%	0.7785%
75	4.2084%	2.1643%

Healthy post-retirement

Healthy Post-Retirement Mortality

Age	Male	Female
20	0.0226%	0.0175%
25	0.0270%	0.0193%
30	0.0336%	0.0257%
35	0.0562%	0.0418%
40	0.0821%	0.5554%
45	0.1178%	0.0865%
50	0.4989%	0.2062%
55	0.4484%	0.3219%
60	0.5622%	0.5343%
65	1.0104%	0.8665%
70	1.6571%	1.4443%
75	2.9211%	2.3732%

Disabled

Disabled Mortality

Age	Male	Female
20	2.2571%	0.7450%
25	2.2571%	0.7450%
30	2.2571%	0.7450%
35	2.2571%	0.7450%
40	2.2571%	0.7450%
45	2.2571%	1.1535%
50	2.8975%	1.6544%
55	3.5442%	2.1839%
60	4.2042%	2.8026%
65	5.0174%	3.7635%
70	6.2583%	5.2230%
75	8.2067%	7.2312%

Retirement

Members retiring from active status are assumed to retire according to the age related rates as shown in rate table. Members who have attained the highest assumed retirement age will retire in one year.

PERA-General

Payroll growth (amortization)

A level percentage of payroll each year to the statutory amortization date of July 1, 2031, assuming payroll increases of 4.00% per annum. If there is a negative Unfunded Actuarial Accrued Liability, the surplus amount shall be amortized over 30 years as a level percentage of payroll.

Alternate actuarial results are prepared assuming payroll increases of 3.75% per annum.

Mortality

Healthy pre-retirement

Healthy Pre-Retirement Mortality

Age	Male	Female
20	0.0270%	0.0172%
25	0.0336%	0.0176%
30	0.0562%	0.0212%
35	0.0821%	0.0335%
40	0.1178%	0.0463%
45	0.1649%	0.0656%
50	0.2268%	0.1025%
55	0.3628%	0.1618%
60	0.5841%	0.2694%
65	0.8445%	0.4318%
70	2.9211%	0.6674%
75	5.3731%	1.7687%

Healthy post-retirement

Healthy Post -Retirement Mortality

Age	Male	Female
20	0.0226%	0.0176%
25	0.0270%	0.0180%
30	0.0336%	0.0224%
35	0.0562%	0.0366%
40	0.0821%	0.0488%
45	0.1178%	0.0719%
50	0.4989%	0.1120%
55	0.4484%	0.2568%
60	0.5622%	0.4456%
65	1.0104%	0.7057%
70	1.6571%	1.1788%
75	2.9211%	1.9485%

Disabled

Disabled Mortality

Age	Male	Female
20	2.2571%	0.7450%
25	2.2571%	0.7450%
30	2.2571%	0.7450%
35	2.2571%	0.7450%
40	2.2571%	0.8959%
45	2.2571%	1.3456%
50	2.3847%	1.8654%
55	3.0268%	2.4080%
60	3.6732%	3.1325%
65	4.3474%	4.2851%
70	5.2213%	5.9545%
75	6.5841%	8.2298%

Retirement

Members retiring from active status are assumed to retire according to the age related rates as shown in rate table. Members who have attained the highest assumed retirement age will retire in one year.

TRA

Payroll growth (amortization)

The unfunded liability is amortized as a level percentage of payroll each year to the statutory amortization date of July 1, 2037, assuming payroll increases of 4.5% per year. If the Unfunded Actuarial Accrued Liability is negative, the surplus amount is amortized over 30 years as a level percentage of payroll. If there is an increase in the unfunded accrued liability due to a change in the actuarial assumptions, plan provisions, or actuarial cost method, a new amortization period is determined. This new amortization period is determined by blending the period needed to amortize the prior unfunded actuarial accrued liability over the prior amortization period and the increase in unfunded actuarial accrued liability amortized over 30 years. if there is a decrease in the unfunded accrued liability, no change is made to the amortization period.

Mortality

Healthy pre-retirement

Healthy Pre-Retirement Mortality

Age	Male	Female
20	0.0177%	0.0156%
25	0.0226%	0.0176%
30	0.0270%	0.0180%
35	0.0336%	0.0224%
40	0.0562%	0.0366%
45	0.0821%	0.0488%
50	0.1178%	0.0719%
55	0.1649%	0.1120%
60	0.2268%	0.1786%
65	0.3628%	0.2955%
70	0.5841%	0.4735%
75	0.8445%	0.0722%

Healthy post-retirement

Healthy Post -Retirement Mortality

Age	Male	Female
20	0.0207%	0.0172%
25	0.0255%	0.0176%
30	0.0297%	0.0212%
35	0.0457%	0.0335%
40	0.0722%	0.0463%
45	0.1006%	0.0656%
50	0.1456%	0.1025%
55	0.4671%	0.2329%
60	0.4841%	0.4045%
65	0.8018%	0.6406%
70	1.3752%	1.0663%
75	2.2964%	1.7687%

Disabled

Disabled Mortality

Age	Male	Female
20	2.2571%	0.7450%
25	2.2571%	0.7450%
30	2.2571%	0.7450%
35	2.2571%	0.7450%
40	2.2571%	0.7450%
45	2.2571%	0.7450%
50	2.8975%	1.1535%
55	3.5442%	1.6544%
60	4.2042%	2.1839%
65	5.0174%	2.8026%
70	6.2583%	3.7635%
75	8.2067%	5.2330%

Retirement

Graded rates beginning at age 55 as shown in rate table. Members who have attained the highest assumed retirement age will retire in one year.

MERF Division

Payroll growth (amortization)

No assumption. Level dollar amortization procedure.

Mortality

Healthy pre-retirement

Pre-Retirement Mortality

Age	Male	Female
20	0.02%	0.02%
25	0.02%	0.02%
30	0.03%	0.02%
35	0.05%	0.04%
40	0.08%	0.05%
45	0.11%	0.08%
50	0.14%	0.12%
55	0.23%	0.22%
60	0.43%	0.44%
65	0.86%	0.80%
70	1.47%	1.40%

Healthy post-retirement

Post -Retirement Mortality

Age	Male	Female
20	0.02%	0.02%
25	0.02%	0.02%
30	0.03%	0.02%
35	0.05%	0.04%
40	0.08%	0.05%
45	0.11%	0.08%
50	0.14%	0.12%
55	0.23%	0.22%
60	0.43%	0.44%
65	0.86%	0.80%
70	1.47%	1.40%

Disabled

Disabled Mortality

Age	Male	Female
20	0.02%	0.02%
25	0.02%	0.02%
30	0.03%	0.02%
35	0.05%	0.04%
40	0.07%	0.05%
45	0.11%	0.08%
50	0.48%	0.20%
55	0.43%	0.28%
60	0.53%	0.45%
65	0.93%	0.73%
70	1.54%	1.21%

Retirement

Active members are assumed to retire at age 61.

Current Actuarial Assumptions - Statewide General Employee Retirement Plans

MSRS-General

Age	Rule of 90 Eligible	All Others
55	20%	5%
56	15%	5%
57	15%	5%
58	15%	5%
59	20%	6%
60	20%	7%
61	22%	12%
62	40%	22%
63	30%	16%
64	30%	18%
65	40%	40%
66	30%	30%
67	25%	25%
68	25%	25%
69	25%	25%
70	30%	30%
71+	100%	100%

Withdrawal

Select and ultimate rates based on actual plan experience. Ultimate rates after the third year are shown in the rate table. Select rates are as follows:

	1st Yr	2nd Yr	3rd Yr
Males	45.00%	14.00%	9.00%
Females	48.00%	15.00%	10.00%

Ultimate Withdrawal

Age	Male	Female
20	6.90%	8.55%
25	5.90%	7.80%
30	4.90%	7.05%
35	3.90%	5.10%
40	3.20%	4.38%
45	2.70%	3.75%
50	2.20%	3.05%
55	0.00%	0.00%
60	0.00%	0.00%
65	0.00%	0.00%
70	0.00%	0.00%

Disability

Age-related rates based on actual experience; see table of sample rates.

Disability

Age	Male	Female
20	0.010%	0.010%
25	0.010%	0.010%
30	0.010%	0.010%
35	0.030%	0.030%
40	0.080%	0.080%
45	0.130%	0.130%
50	0.288%	0.288%
55	0.504%	0.432%
60	0.780%	0.624%
65	0.000%	0.000%
70	0.000%	0.000%

PERA-General

Age	Rule of 90 Eligible	All Others
55	20%	6%
56	20%	6%
57	20%	6%
58	20%	7%
59	20%	8%
60	20%	8%
61	25%	12%
62	35%	20%
63	25%	16%
64	25%	18%
65	35%	35%
66	25%	25%
67	20%	20%
68	20%	20%
69	20%	20%
70	20%	20%
71	100%	100%

Withdrawal

Select and ultimate rates based on actual plan experience. Ultimate rates after the third year are shown in the rate table. Select rates are as follows:

1st Year	2nd Year	3rd Year
40.00%	15.00%	10.00%

Ultimate Withdrawal

Age	Male	Female
20	8.40%	8.40%
25	6.90%	6.90%
30	5.40%	5.40%
35	3.90%	4.20%
40	3.00%	3.50%
45	2.50%	3.00%
50	2.00%	2.50%
55	0.00%	0.00%
60	0.00%	0.00%
65	0.00%	0.00%
70	0.00%	0.00%

Disability

Rates are shown in rate table.

Disability

Age	Male	Female
20	0.01%	0.01%
25	0.01%	0.01%
30	0.02%	0.02%
35	0.05%	0.04%
40	0.09%	0.06%
45	0.14%	0.09%
50	0.23%	0.16%
55	0.49%	0.26%
60	0.82%	0.46%
65	0.00%	0.00%
70	0.00%	0.00%

TRA

Age	Rule of 90 Eligible	Rule of 90 Not Eligible
Coordinated Members:		
55 & Under	50%	7%
56	55%	7%
57	45%	7%
58	45%	8%
59	45%	10%
60	40%	12%
61	45%	16%
62	45%	20%
63	40%	18%
64	45%	20%
65	40%	40%
66	35%	35%
67	30%	30%
68	30%	30%
69	30%	30%
70	35%	35%
71 & Over	100%	100%

Age	30 and Out Eligible	30 and Out Not Eligible
Basic Members:		
55 & Under	40%	6%
56	40%	6%
57	40%	6%
58	40%	6%
59	40%	6%
60	25%	25%
61	25%	25%
62	25%	25%
63	25%	25%
64	25%	25%
65	40%	40%
66	40%	40%
67	40%	40%
68	40%	40%
69	40%	40%
70-74	60%	60%
75-79	60%	100%
80 & Over	100%	100%

Withdrawal

Select and ultimate rates based on actual plan experience. Ultimate rates after the third year are shown in the rate table. Select rates are as follows:

	1st Yr	2nd Yr	3rd Yr
Males	45.00%	12.00%	6.00%
Females	40.00%	10.00%	8.00%

Ultimate Withdrawal

Age	Male	Female
20	3.70%	4.50%
25	3.20%	4.50%
30	2.70%	4.50%
35	2.50%	3.90%
40	2.35%	2.75%
45	2.10%	2.10%
50	1.85%	1.85%
55	0.00%	0.00%
60	0.00%	0.00%
65	0.00%	0.00%
70	0.00%	0.00%

Disability

Age-related rates based on actual experience; see table of sample rates.

Disability

Age	Male	Female
20	0.00%	0.00%
25	0.00%	0.00%
30	0.00%	0.00%
35	0.01%	0.01%
40	0.03%	0.03%
45	0.05%	0.05%
50	0.10%	0.10%
55	0.16%	0.16%
60	0.25%	0.25%
65	0.00%	0.00%
70	0.00%	0.00%
75	0.00%	0.00%

MERF Division

Withdrawal

Rates are shown in rate table.

Withdrawal

Age	Male	Female
20	21.00%	21.00%
25	11.00%	11.00%
30	5.00%	5.00%
35	1.50%	1.50%
40	1.00%	1.00%
45	1.00%	1.00%
50	1.00%	1.00%
55	1.00%	1.00%
60	1.00%	1.00%
65	0.00%	0.00%
70	0.00%	0.00%

Disability

Rates are shown in rate table.

Disability

Age	Male	Female
20	0.21%	0.21%
25	0.21%	0.21%
30	0.23%	0.23%
35	0.30%	0.30%
40	0.41%	0.41%
45	0.61%	0.61%
50	0.93%	0.93%
55	1.60%	1.60%
60	0.00%	0.00%
65	0.00%	0.00%
70	0.00%	0.00%

Current Actuarial Assumptions - Statewide General Employee Retirement Plans

	MSRS-General	PERA-General	TRA	MERF Division
Allowance for combined service annuity	Liabilities for active members are increased by 1.20% and liabilities for former members are increased by 40.00% to account for the effect of some members having eligibility for a Combined Service Annuity.	Liabilities for active members are increased by 0.80% and liabilities for former members are increased by 60.00% to account for the effect of some members having eligibility for a Combined Service Annuity.	Liabilities for active members are increased by 1.40% and liabilities for former members are increased by 4.00% to account for the effect of some members having eligibility for a Combined Service Annuity.	Liabilities for active members are increased by 0.2% and liabilities for former members are increased by 30.0% to account for the effect of some members having eligibility for a Combined Service Annuity.
Administrative expenses	Prior year administrative expenses expressed as percentage of prior year payroll.	Prior year administrative expenses expressed as percentage of prior year payroll.	Prior year administrative expenses expressed as percentage of prior year payroll.	Prior year administrative expenses (excluding investment expenses) increased by 4.00% expressed as a percentage of projected annual payroll. Investment expenses for the fiscal year ending June 30, 1992, are being amortized as follows: Beginning Balance $2,849,000 / Fixed Annual $207,000 / Years Remaining 10
Return of contributions	All employees withdrawing after becoming eligible for a deferred benefit are assumed to take the larger of their contributions with interest or the value of their deferred benefit.	All employees withdrawing after becoming eligible for a deferred benefit are assumed to take the larger of their contributions with interest or the value of their deferred benefit.	All employees withdrawing after becoming eligible for a deferred benefit are assumed to take the larger of their contributions with interest or the value of their deferred benefit.	All employees withdrawing after becoming eligible for a deferred benefit are assumed to take the larger of their contributions with interest or the value of their deferred benefit.
Commence-ment of deferred benefits	Members receiving deferred annuities (including current terminated deferred members) are assumed to begin receiving benefits at age 65.	Members receiving deferred annuities (including current terminated deferred members) are assumed to begin receiving benefits at age 65.	Members receiving deferred annuities (including current terminated deferred members) are assumed to begin receiving benefits at age 65.	Members receiving deferred annuities (including current terminated deferred members) are assumed to begin receiving benefits at age 60.
Percent married	85% of active male members are assumed to be married and 70% of active female members are assumed to be married. Actual marital status is provided for members in payment status.	75% of male members and 70% of female members are assumed to be married.	85% of male members and 65% of female members are assumed to be married.	67% of members are assumed to be married.
Age of spouse	Male members are assumed to have a beneficiary three years younger and female members are assumed to have a beneficiary two years older.	Males are assumed to have a beneficiary 3 years younger, while females are assumed to have a beneficiary 2 years older. For members in payment status, actual spouse date of birth is used if provided.	Females two years younger than males.	Wives are assumed to be three years younger than their husbands. For members in payment status, actual spouse date of birth is used.
Eligible children		Retiring members are assumed to have no dependent children.	Members are assumed to have no children.	
Form of payment	Married members retiring from active status are assumed to elect form of annuity as follows: Males: 25% elect Straight Life 15% elect 50% J&S option 10% elect 75% J&S option 50% elect 100% J&S option Females: 60% elect Straight Life 15% elect 50% J&S option 0% elect 75% J&S option 25% elect 100% J&S option Members receiving deferred annuities (including current terminated deferred members) are assumed to elect a life annuity.	Married members retiring from active status are assumed to elect subsidized joint and survivor form of annuity as follows: Males: 5% elect 25% J&S option 15% elect 50% J&S option 10% elect 75% J&S option 30% elect 100% J&S option Females: 5% elect 25% J&S option 5% elect 50% J&S option 5% elect 75% J&S option 15% elect 100% J&S option Remaining married members and unmarried members are assumed to elect a life annuity Members receiving deferred annuities (including current terminated deferred members) are assumed to elect a life annuity.	Married members are assumed to elect subsidized joint and survivor form of annuity as follows: Males: 10% elect 50% J&S option 15% elect 75% J&S option 70% elect 100% J&S option Females: 20% elect 50% J&S option 10% elect 75% J&S option 50% elect 100% J&S option Members receiving deferred annuities (including current terminated deferred members) are assumed to elect a life annuity.	Members are assumed to elect a life annuity.
Unknown data for members		To prepare this report, Mercer has used and relied on participant data supplied by the Fund. We have reviewed the participant data for internal consistency and general reasonableness, but we have not verified or audited any of the data or information provided.	We used membership data as supplied by the plan sponsor as of July 1, 2010. Customarily, this information would not be verified by a plan's actuary. We have reviewed the information for internal consistency and we have no reason to doubt its substantial	To prepare this report, Mercer has used and relied on participant data supplied by the Fund. We have reviewed the participant data for internal consistency and general reasonableness, but we have not verified or audited any of the data or information provided.

Current Actuarial Assumptions - Statewide General Employee Retirement Plans

	MSRS-General	PERA-General	TRA	MERF Division
		Data for active members: Date of birth: July 1, 1965 Gender: Female Salary: Prior year salary, if available; otherwise high five salary with a 10% load to account for salary increases. Data for terminated members: Date of birth: July 1, 1965 Gender: Female Allowable service: 9 years Salary: $24,000	accuracy. Data for active members: Salary: $49,000 Data for terminated members: Date of birth: July 1, 1965 Average salary: $29,000 Age at termination: Age 40, or current age if younger than 40	Data for vested terminated members (one participant): Annual benefit: $5,085 (equal to the average for vested terminated members)
Future service			Members are assumed to earn future service at full-time rate.	
Interest on member contributions			Members and former members who are eligible for the money purchase annuity are assumed to receive interest credits equal to the Pre-Retirement interest rate. All other members and former members receive the interest crediting rate as specified in statutes.	
Decrement timing		All decrements are assumed to occur on the anniversary of the valuation date. Decrement timing is a fundamental part of the computer programming underlying actuarial calculations. Mercer's valuation systems use beginning of year decrements, a generally accepted actuarial practice. The LCPR approved this modification to the Standards for Actuarial Work prior to the preparation of this report in order to ensure consistency and comparability.	All decrements are assumed to occur on the anniversary of the valuation date. Decrement timing is a fundamental part of the computer programming underlying actuarial calculations. Mercer's valuation systems use beginning of year decrements, a generally accepted actuarial practice. The LCPR approved this modification to the Standards for Actuarial Work prior to the preparation of this report in order to ensure consistency and comparability.	All decrements are assumed to occur on the anniversary of the valuation date. Decrement timing is a fundamental part of the computer programming underlying actuarial calculations. Mercer's valuation systems use beginning of year decrements, a generally accepted actuarial practice. The LCPR approved this modification to the Standards for Actuarial Work prior to the preparation of this report in order to ensure consistency and comparability.

Table 2
Current Actuarial Assumptions - Statewide Public Safety Retirement Plans

	MSRS-Correctional	State Patrol	PERA-P&F	PERA-Correctional
Investment return	8.50% compounded annually pre-retirement. 6.50% compounded annually post-retirement.	8.50% compounded annually pre-retirement. 7.00% compounded annually post-retirement.	8.50% compounded annually pre-retirement. 7.00% compounded annually post-retirement (7.5% for the first two years).	8.50% compounded annually pre-retirement. 6.00% compounded annually post-retirement (7.5% for the first four years).
Benefit increases after retirement	Payment of 2.0% annual benefit increases after retirement are accounted for by using the 6.50% post-retirement assumption, as required by statute.	Payment of 1.5% annual benefit increases after retirement are accounted for by using the 7.00% post-retirement assumption, as required by statute.	Payment of annual cost-of-living adjustments after retirement of 1.0% for two years and CPI up to 1.5% thereafter, accounted for by using a 7.0% post-retirement assumption (7.5% for the first two years), as required by statute.	Payment of annual cost-of-living adjustments after retirement of 1.0% for four years and 2.5% thereafter accounted for by using a 6.0% post-retirement assumption (7.5% for the first four years), as required by statute.
Salary increases	Reported salary at valuation date increased according to the rate table, to current fiscal year and annually for each future year. Prior fiscal year salary is annualized for new members.	Reported salary at valuation date increased according to the rate table, to current fiscal year and annually for each future year. Prior fiscal year salary is annualized for new members.	Reported salary for prior fiscal year, with new hires annualized, increased to current fiscal year and annually for each future year according to the ultimate rate table below.	Reported salary at valuation date increased according to the rate table, to current fiscal year and annually for each future year. Prior fiscal year salary is annualized for new members.

Age	MSRS-Correctional Salary Incr.	Age	State Patrol Salary Incr.	Age	PERA-P&F Salary Incr.	Age	PERA-Correctional Salary Incr.
20	6.75%	20	7.75%	20	11.00%	20	7.75%
25	6.50	25	7.00	25	9.00	25	7.00
30	6.50	30	7.00	30	7.50	30	7.00
35	6.50	35	7.00	35	6.50	35	7.00
40	6.00	40	6.50	40	5.50	40	6.50
45	5.25	45	5.75	45	5.00	45	5.75
50	5.00	50	5.50	50	4.75	50	5.50
55	4.75	55	5.25	55	4.75	55	5.25
60	4.75	60	5.25	60	4.75	60	5.25
65	4.75	65	5.25	65	4.75	65	5.25
70	0.00	70	5.25	70	4.75	70	5.25

Current Actuarial Assumptions - Statewide Public Safety Retirement Plans

MSRS-Correctional

Payroll growth (amortization)

A level percentage of payroll each year to the statutory amortization date of July 1, 2038, assuming payroll increases of 4.50% per annum. If there is a negative Unfunded Actuarial Accrued Liability, the surplus amount is amortized over 30 years as a level percentage of payroll.

Mortality

Healthy pre-retirement

1983 Group Annuity Mortality for males set back five years.
1983 Group Annuity Mortality for females set back two years.

Pre-Retirement Mortality

Age	Male	Female
20	0.03%	0.02%
25	0.04	0.02
30	0.05	0.03
35	0.06	0.04
40	0.09	0.06
45	0.12	0.08
50	0.22	0.14
55	0.39	0.21
60	0.61	0.34
65	0.92	0.58
70	1.56	0.97

Healthy post-retirement

1983 Group Annuity Mortality for males set back two years.
1983 Group Annuity Mortality for females set back one year.

Post-Retirement Mortality

Age	Male	Female
20	0.04%	0.02%
25	0.04	0.02
30	0.05	0.03
35	0.07	0.04
40	0.10	0.06
45	0.17	0.09
50	0.31	0.15
55	0.52	0.23
60	0.77	0.38
65	1.24	0.64
70	2.22	1.09

Disabled

Combined Annuity Mortality up to age 40, grading to health mortality for ages 60 and over.

Disability Mortality

Age	Male	Female
20	0.21%	0.21%
25	0.22	0.22
30	0.24	0.24
35	0.31	0.31
40	0.46	0.46
45	0.58	0.48
50	0.69	0.49
55	0.80	0.51
60	0.92	0.52
65	1.56	0.87
70	2.75	1.62

Retirement

Members retiring from active status are assumed to retire according to the following age-related rates:

Ages:	
50-54	5%
55	60%
56-61	10%
62-64	25%
65 & over	100%

State Patrol

Payroll growth (amortization)

A level percentage of payroll each year to the statutory amortization date of July 1, 2036, assuming payroll increases of 4.50% per annum. If there is a negative Unfunded Actuarial Accrued Liability, the surplus amount is amortized over 30 years as a level percentage of payroll.

Mortality

Healthy pre-retirement

1983 Group Annuity Mortality for males set back five years.
1983 Group Annuity Mortality for females set back two years.

Pre-Retirement Mortality

Age	Male	Female
20	0.03%	0.02%
25	0.04	0.02
30	0.05	0.03
35	0.06	0.04
40	0.09	0.06
45	0.12	0.08
50	0.22	0.14
55	0.39	0.21
60	0.61	0.34
65	0.92	0.58
70	1.56	0.97

Healthy post-retirement

1983 Group Annuity Mortality for males set back two years.
1983 Group Annuity Mortality for females set back one year.

Disabled

Combined Annuity Mortality.

Retirement

Members retiring from active status are assumed to retire according to the following age-related rates:

Ages:	
50-54	7%
55	60%
56	40%
57-59	20%
60 & over	100%

PERA-P&F

Payroll growth (amortization)

A level percentage of payroll each year to the statutory amortization date of July 1, 2038, assuming payroll increases of 4.50% per annum. If there is a negative Unfunded Actuarial Accrued Liability, the surplus amount is amortized over 30 years as a level percentage of payroll.

Mortality

Healthy pre-retirement

1983 Group Annuity Mortality for males set back six years.
1983 Group Annuity Mortality for females set back six years.

Pre-Retirement Mortality

Age	Male	Female
20	0.03%	0.01%
25	0.04	0.02
30	0.04	0.02
35	0.06	0.03
40	0.08	0.04
45	0.11	0.06
50	0.19	0.09
55	0.35	0.15
60	0.57	0.23
65	0.84	0.38
70	1.39	0.64

Healthy post-retirement

1983 Group Annuity Mortality for males set back one year.
1983 Group Annuity Mortality for females set back one year.

Disabled

1965 RRB rates up to age 40. For ages 41 to 59, graded rates between 1965 RRB and the Healthy Post-Retirement Mortality Table. For ages 60 and later, the Healthy Post-Retirement Mortality Table.

Retirement

Members retiring from active status are assumed to retire according to the following age-related rates:

Ages:	
50-54	10%
55	30%
56-59	20%
60-61	25%
62-64	35%
65-69	50%
70 & over	100%

PERA-Correctional

Payroll growth (amortization)

A level percentage of payroll each year to the statutory amortization date of July 1, 2023, assuming payroll increases of 4.50% per annum. If there is a negative Unfunded Actuarial Accrued Liability, the surplus amount is amortized over 30 years as a level percentage of payroll.

Mortality

Healthy pre-retirement

1983 Group Annuity Mortality for males set back one year.
1983 Group Annuity Mortality for females.

Pre-Retirement Mortality

Age	Male	Female
20	0.04%	0.02%
25	0.04	0.03
30	0.06	0.03
35	0.08	0.05
40	0.11	0.07
45	0.19	0.10
50	0.35	0.16
55	0.57	0.25
60	0.84	0.42
65	1.29	0.71
70	2.48	1.24

Healthy post-retirement

1983 Group Annuity Mortality for males set forward two years.
1983 Group Annuity Mortality for females set forward two years.

Disabled

Combined Annuity Mortality.

Retirement

Members retiring from active status are assumed to retire according to the following age-related rates:

Ages:	
50-53	2%
54	5%
55	25%
56-59	10%
60-61	20%
62-64	40%
65-69	50%
70 & over	100%

Current Actuarial Assumptions - Statewide Public Safety Retirement Plans

	MSRS-Correctional	State Patrol	PERA-P&F	PERA-Correctional
Withdrawal	Select and ultimate rates based on actual experience. Rates after the third year are shown in rate table. Select rates in the first three years are 10% each year. Withdrawal Age / Male / Female 20 / 12.00% / 8.00% 25 / 7.35 / 7.00 30 / 4.55 / 6.75 35 / 3.00 / 6.45 40 / 2.20 / 5.20 45 / 1.70 / 3.20 50 / 1.20 / 2.35 55 / 0.70 / 1.65 60 / 0.00 / 0.00 65 / 0.00 / 0.00 70 / 0.00 / 0.00	Select and ultimate rates are based on plan experience. Ultimate rates after the third year are shown in the rate table. Select rates are 2.5% for the first three years of employment. Age / Ultimate Withdrawal 20 / 1.47% 25 / 1.13 30 / 0.80 35 / 0.47 40 / 0.40 45 / 0.40 50 / 0.00 55 / 0.00 60 / 0.00 65 / 0.00 70 / 0.00	Select and ultimate rates are based on plan experience. Ultimate rates after the third year are shown in the rate table. Select rates are 3.5% for the first three years of employment. Age / Ultimate Withdrawal 20 / 6.01% 25 / 3.24 30 / 1.90 35 / 1.46 40 / 1.26 45 / 0.91 50 / 0.50 55 / 0.11 60 / 0.00 65 / 0.00 70 / 0.00	Graded rates based on actual experience of the plan. Rates are shown in the rate table. Age / Male / Female 20 / 24.00% / 16.00% 25 / 14.70 / 14.20 30 / 9.10 / 13.50 35 / 6.00 / 12.90 40 / 4.40 / 10.40 45 / 3.40 / 6.40 50 / 2.40 / 4.70 55 / 1.40 / 3.30 60 / 0.00 / 0.00 65 / 0.00 / 0.00 70 / 0.00 / 0.00
Disability	Age-related rates based on experience; see table of sample rates. Disability Retirement Age / Male / Female 20 / 0.05% / 0.08% 25 / 0.08 / 0.12 30 / 0.11 / 0.16 35 / 0.15 / 0.22 40 / 0.24 / 0.36 45 / 0.39 / 0.58 50 / 0.67 / 1.00 55 / 1.17 / 1.76 60 / 1.88 / 2.82 65 / 0.00 / 0.00 70 / 0.00 / 0.00	Rates adopted by MSRS as shown in rate table. Benefits are calculated assuming all future disabilities are occupational disabilities. Age / Disability 20 / 0.04% 25 / 0.06 30 / 0.08 35 / 0.11 40 / 0.18 45 / 0.29 50 / 0.50 55 / 0.88 60 / 1.41 65 / 0.00 70 / 0.00	Rates are shown in rate table. Benefits are calculated assuming all future disabilities are duty disabilities. Age / Disability 20 / 0.11% 25 / 0.13 30 / 0.16 35 / 0.19 40 / 0.29 45 / 0.54 50 / 1.04 55 / 2.03 60 / 0.00 65 / 0.00 70 / 0.00	Rates are shown in rate table. Age / Disability 20 / 0.04% 25 / 0.06 30 / 0.08 35 / 0.11 40 / 0.18 45 / 0.29 50 / 0.50 55 / 0.88 60 / 1.41 65 / 0.00 70 / 0.00
Allowance for combined service annuity	Liabilities for former members are increased by 30% to account for the effect of some participants having eligibility for a Combined Service Annuity.	Liabilities for former members are increased by 30% to account for the effect of some participants having eligibility for a Combined Service Annuity.	Liabilities for former members are increased by 30% to account for the effect of some participants having eligibility for a Combined Service Annuity due to continued public employment.	Liabilities for former members are increased by 30% to account for the effect of some participants having eligibility for a Combined Service Annuity.
Administrative expenses	Prior year administrative expenses expressed as percentage of prior year projected payroll.	Prior year administrative expenses expressed as percentage of prior year payroll.	Prior year administrative expenses expressed as percentage of prior year payroll.	Prior year administrative expenses expressed as percentage of prior year payroll.
Refund of contributions	All employees withdrawing after becoming eligible for a deferred benefit take the larger of their contributions accumulated with interest or the value of their deferred benefit.	All employees withdrawing after becoming eligible for a deferred benefit are assumed to take the larger of their contributions accumulated with interest or the value of their deferred benefit.	All employees withdrawing after becoming eligible for a deferred benefit are assumed to take the larger of their contributions accumulated with interest or the value of their deferred benefit.	All employees withdrawing after becoming eligible for a deferred benefit take the larger of their contributions accumulated with interest or the value of their deferred benefit.
Commence-ment of deferred benefits	85% of active members are assumed to be married. Actual marital status is provided for members in payment status.	100% of members are assumed to be married.	85% of male members and 65% of female members are assumed to be married.	85% of members are assumed to be married.
Percent married	Females are assumed to be three years younger than their male spouses.	Female members are assumed to be three years younger than males.	Wives are assumed to be four years younger than their husbands. For members in payment status, actual spouse date of birth is used if provided.	Wives are assumed to be three years younger than their husbands. For members in payment status, actual spouse date of birth is used if provided.
Age of spouse		Each member is assumed to have two children whose ages are dependent upon the member's age. First child is assumed to be born at member's age 28 and second child is born at member's age 31.	Retiring members are assumed to have no dependent children.	Retiring members are assumed to have no dependent children.
Eligible children	Members receiving deferred annuities (including current terminated deferred members) are assumed to begin receiving benefits at age 55.	Members receiving deferred annuities (including current terminated deferred members) are assumed to begin receiving benefits at age 55.	Members receiving deferred annuities (including current terminated deferred members) are assumed to begin receiving benefits at age 55.	Members receiving deferred annuities (including current terminated deferred members) are assumed to begin receiving benefits at age 55.

Current Actuarial Assumptions - Statewide Public Safety Retirement Plans

	MSRS-Correctional	State Patrol	PERA-P&F	PERA-Correctional
Form of payment	Married members retiring from active status are assumed to elect subsidized joint and survivor form of annuity as follows: Males: 50% elect Straight Life option 25% elect 50% J&S option 0% elect 75% J&S option 25% elect 100% J&S option Females: 0% elect Straight Life option 5% elect 50% J&S option 0% elect 75% J&S option 5% elect 100% J&S option Members receiving deferred annuities (including current terminated deferred members) are assumed to elect a straight life annuity.	Married members retiring from active status are assumed to elect subsidized joint and survivor form of annuity as follows: Males: 25% elect 50% J&S option 0% elect 75% J&S option 25% elect 100% J&S option Females: 5% elect 50% J&S option 0% elect 75% J&S option 5% elect 100% J&S option Unmarried and remaining married members retiring from active status are assumed to receive life annuities. Members receiving deferred annuities (including current terminated deferred members) are assumed to elect a life annuity. Surviving spouses are assumed to receive a life annuity equal to 50% of pay if death occurred before age 55. If death occurred on or after age 55, surviving spouses are assumed to receive a life annuity equal to the survivor portion of the 100% joint and survivor annuity.	Married members retiring from active status are assumed to elect subsidized joint and survivor form of annuity as follows: Males / Females 50% J&S option 40% 15% 100% J&S option 45% 15% . Unmarried and remaining married members retiring from active status are assumed to receive life annuities. Members receiving deferred annuities (including current terminated deferred members) are assumed to elect a life annuity.	Married members retiring from active status are assumed to elect subsidized joint and survivor form of annuity as follows: Males: 25% elect 50% J&S option 25% elect 100% J&S option Females: 5% elect 50% J&S option 5% elect 100% J&S option Unmarried and remaining married members retiring from active status are assumed to receive life annuities. Members receiving deferred annuities (including current terminated deferred members) are assumed to elect a life annuity.
Unknown data for members			To prepare this report, Mercer has used and relied on participant data supplied by the Fund. We have reviewed the participant data for internal consistency and general reasonableness, but we have not verified or audited any of the data or information provided. In cases where submitted data was missing or incomplete, the following assumptions were applied: Data for active members: Date of birth: July 1, 1965 Gender: Male Salary: Prior year salary, if available; otherwise high five salary with a 10% load to account for salary increases. Data for terminated members: Date of birth: July 1, 1965 Gender: Male Allowable service: 9 years Salary: $24,000	
Decrement timing	All decrements are assumed to occur on the anniversary of the valuation date. Decrement timing is a fundamental part of the computer programming underlying actuarial calculations. Mercer's valuation systems use beginning of year decrements, a generally accepted actuarial practice. The LCPR approved this modification to the Standards for Actuarial Work prior to the preparation of this report in order to ensure consistency and comparability.	All decrements are assumed to occur on the anniversary of the valuation date. Decrement timing is a fundamental part of the computer programming underlying actuarial calculations. Mercer's valuation systems use beginning of year decrements, a generally accepted actuarial practice. The LCPR approved this modification to the Standards for Actuarial Work prior to the preparation of this report in order to ensure consistency and comparability.	All decrements are assumed to occur on the anniversary of the valuation date. Decrement timing is a fundamental part of the computer programming underlying actuarial calculations. Mercer's valuation systems use beginning of year decrements, a generally accepted actuarial practice. The LCPR approved this modification to the Standards for Actuarial Work prior to the preparation of this report in order to ensure consistency and comparability.	All decrements are assumed to occur on the anniversary of the valuation date. Decrement timing is a fundamental part of the computer programming underlying actuarial calculations. Mercer's valuation systems use beginning of year decrements, a generally accepted actuarial practice. The LCPR approved this modification to the Standards for Actuarial Work prior to the preparation of this report in order to ensure consistency and comparability.

Table 3
Current Actuarial Assumptions - Statewide Specialty Retirement Plans

	Legislators	Constitutional Officers	Judges
Investment return	8.50% compounded annually pre-retirement. 6.50% compounded annually post-retirement.	8.50% compounded annually pre-retirement. 6.50% compounded annually post-retirement.	8.50% compounded annually pre-retirement. 6.50% compounded annually post-retirement.
Benefit increases after retirement	Payment of 2.0% annual benefit increases after retirement accounted for by using a 6.5% post-retirement assumption, as required by statute.	Payment of 2.0% annual benefit increases after retirement accounted for by using a 6.5% post-retirement assumption, as required by statute.	Payment of 2.0% annual benefit increases after retirement accounted for by using a 6.5% post-retirement assumption, as required by statute.
Salary increases	5.00% annually.	N/A	4.00% annually.
Payroll growth (amortization)	No assumption. Level dollar amortization procedure.	No assumption. Level dollar amortization procedure.	A level percentage of payroll each year to the statutory amortization date of July 1, 2038, assuming payroll increases of 4.00% per annum. If there is a negative Unfunded Actuarial Accrued Liability, the surplus amount is amortized over 30 years as a level percentage of payroll.
Mortality			
Healthy pre-retirement	1983 Group Annuity Mortality for males set back four years. 1983 Group Annuity Mortality for females set back two years. Healthy Pre-Retirement Mortality Age / Male / Female 20 / 0.03% / 0.02% 25 / 0.04 / 0.02 30 / 0.05 / 0.03 35 / 0.06 / 0.04 40 / 0.09 / 0.06 45 / 0.14 / 0.08 50 / 0.25 / 0.14 55 / 0.43 / 0.21 60 / 0.66 / 0.34 65 / 1.01 / 0.58 70 / 1.76 / 0.97	1983 Group Annuity Mortality for males set back four years. 1983 Group Annuity Mortality for females set back two years. Healthy Pre-Retirement Mortality Age / Male / Female 20 / 0.03% / 0.02% 25 / 0.04 / 0.02 30 / 0.05 / 0.03 35 / 0.06 / 0.04 40 / 0.09 / 0.06 45 / 0.14 / 0.08 50 / 0.25 / 0.14 55 / 0.43 / 0.21 60 / 0.66 / 0.34 65 / 1.01 / 0.58 70 / 1.76 / 0.97	1983 Group Annuity Mortality for males set back four years. 1983 Group Annuity Mortality for females set back two years. Healthy Pre-Retirement Mortality Age / Male / Female 20 / 0.03% / 0.02% 25 / 0.04 / 0.02 30 / 0.05 / 0.03 35 / 0.06 / 0.04 40 / 0.09 / 0.06 45 / 0.14 / 0.08 50 / 0.25 / 0.14 55 / 0.43 / 0.21 60 / 0.66 / 0.34 65 / 1.01 / 0.58 70 / 1.76 / 0.97
Healthy post-retirement	1983 Group Annuity Mortality for males. 1983 Group Annuity Mortality for females.	1983 Group Annuity Mortality for males. 1983 Group Annuity Mortality for females.	RP-2000 Combined Annuity Mortality, projected 8 years, with no collar adjustment. Healthy Post-Retirement Mortality Age / Male / Female 20 / 0.03% / 0.02% 25 / 0.03 / 0.02 30 / 0.04 / 0.02 35 / 0.07 / 0.04 40 / 0.10 / 0.06 45 / 0.14 / 0.10 50 / 0.18 / 0.15 55 / 0.31 / 0.25 60 / 0.59 / 0.49 65 / 1.14 / 0.93 70 / 1.97 / 1.61
Disabled	N/A	N/A	Combined Annuity Mortality.
Retirement	Age 62 or if over age 62, one year from valuation date.	N/A	Members retiring from active service are assumed to retire according to the following age-related rates: Ages: 62-63 10% 64 5% 65-67 20% 68-69 30% 70 100%
Withdrawal	Rates based on years of service. Year / House / Senate 1 / 0% / 0% 2 / 30% / 0% 3 / 0% / 0% 4 / 20% / 25% 5 / 0% / 0% 6 / 10% / 0% 7 / 0% / 0% 8 / 5% / 10% 9+ / 0% / 0%	N/A	None.

Current Actuarial Assumptions - Statewide Specialty Retirement Plans

	Legislators	Constitutional Officers	Judges
Disability	None.	N/A	Rates based on actual experience, as shown in rate table. Disability Age / Male / Female 20 0.00% 0.00% 25 0.00 0.00 30 0.02 0.00 35 0.02 0.01 40 0.02 0.02 45 0.03 0.05 50 0.14 0.10 55 0.34 0.24 60 0.76 0.62 65 0.00 0.00 70 0.00 0.00
Allowance for combined service annuity	Liabilities for former members not in pay status are increased by 30% to account for the effect of some participants having eligibility for a Combined Service Annuity.	Liabilities for former members not in pay status are increased by 30% to account for the effect of some participants having eligibility for a Combined Service Annuity.	Liabilities for former members not in pay status are increased by 30% to account for the effect of some participants having eligibility for a Combined Service Annuity.
Administrative expenses	Prior year administrative expenses expressed as percentage of prior year payroll.	$1,000 per year.	Prior year administrative expenses expressed as percentage of prior year payroll.
Refund of contributions	All employees withdrawing after becoming eligible for a deferred benefit were assumed to take the larger of their contributions accumulated with interest or the value of their deferred benefits.	All employees withdrawing after eight years of service were assumed to leave their contributions on deposit and receive a deferred annuitant benefit.	
Commence-ment of deferred benefits	Members receiving deferred annuities (including current terminated deferred members) are assumed to begin receiving benefits at age 62.	Members receiving deferred annuities (including current terminated deferred members) are assumed to begin receiving benefits at age 62.	Members receiving deferred annuities (including current terminated deferred members) are assumed to begin receiving benefits at age 65.
Percent married	85% of members are assumed to be married.	85% of members are assumed to be married.	Marital status as indicated by data.
Age of spouse	Females are assumed to be three years younger than males.	Females are assumed to be three years younger than males.	Females are assumed to be three years younger than males.
Eligible children	Each member may have two dependent children depending upon member's age. Assumed first child born at member's age 28 and second child is born at member's age 31.	Each member may have two dependent children depending upon member's age. Assumed first child born at member's age 28 and second child is born at member's age 31.	
Form of payment	Active married members are assumed to elect a 50% joint and survivor annuity. Active single members and deferred members are assumed to elect a life annuity.	Members are assumed to elect a life annuity.	Members are assumed to elect a life annuity.
Decrement timing	All decrements are assumed to occur on the anniversary of the valuation date. Decrement timing is a fundamental part of the computer programming underlying actuarial calculations. Mercer's valuation systems use beginning of year decrements, a generally accepted actu-arial practice. The LCPR approved this modifi-cation to the Standards for Actuarial Work prior to the preparation of this report in order to ensure consistency and comparability.	N/A	All decrements are assumed to occur on the anniversary of the valuation date. Decrement timing is a fundamental part of the computer programming underlying actuarial calculations. Mercer's valuation systems use beginning of year decrements, a generally accepted actu-arial practice. The LCPR approved this modifi-cation to the Standards for Actuarial Work prior to the preparation of this report in order to ensure consistency and comparability.

Table 4
Current Actuarial Assumptions - First Class City Teacher Retirement Fund Associations

	DTRFA	SPTRFA
Investment return	8.50% per annum.	Pre-retirement - 8.50% per annum. Post-retirement - 8.50% per annum.
Benefit increases after retirement	Effective July 1, 2010, the law provides for a post-retirement benefit adjustment of CPI-U (up to 5%) when the funding ratio using the actuarial value of assets equals or exceeds 90%. Until that 90% threshold is met, the post-retirement adjustment will operate under a transition schedule, which provides for an adjustment based on the funding ratio using the market value of assets (2% when greater than 90%, 1% when greater than 80%, otherwise 0%). Since projected contributions are not sufficient to cover the long-term cost of the plan, neither threshold is expected to be met (90% funded on an actuarial value basis or 80% funded on a market value basis). Therefore, the valuation results do not reflect any increases to benefits after retirement.	0.00% at January 1, 2011 (actual); 2.00% per annum thereafter.

Current Actuarial Assumptions - First Class City Teacher Retirement Fund Associations

Salary increases

DTRFA

Reported salary for prior fiscal year, with new hires annualized, increased to current fiscal year and annually for each future year according to the ultimate table. This table includes a 10-year select period. For service from hire through 7 completed years, an 8.00% salary increase is assumed. With 8 completed years, a 7.25% increase is assumed. With 9 completed years, a 6.50% increase is assumed.

Age	Ultimate Rate of Salary Increases
20	6.90%
25	6.75
30	6.50
35	6.25
40	6.00
45	5.50
50	5.00
55	4.50
60	4.00
65	3.50
67*	--

* Last retirement

SPTRFA

In addition to the age-based rates shown below, during the first ten years of employment, a service-based component of 0.30% x (10-T), where T is completed years of service, is included in the salary increase used.

Age	Ultimate Rate of Annual Salary Increases	Age	Ultimate Rate of Annual Salary Increases
<22	6.90%	45	5.75%
23	6.85	46	5.70
24	6.80	47	5.65
25	6.75	48	5.60
26	6.70	49	5.55
27	6.65	50	5.50
28	6.60	51	5.45
29	6.55	52	5.40
30	6.50	53	5.35
31	6.45	54	5.30
32	6.40	55	5.25
33	6.35	56	5.20
34	3.30	57	5.15
35	6.25	58	5.10
36	6.20	59	5.05
37	6.15	60 & over	5.00
38	6.10		
39	6.05		
40	6.00		
41	5.95		
42	5.90		
43	5.85		
44	5.80		

Payroll growth (amortization)

DTRFA

A level percentage of payroll each year to the statutory amortization date assuming payroll increases of 4.50% per annum. If the Actuarial Value of Assets exceeds the Actuarial Accrued Liability, the surplus amount is amortized over 30 years as a level percentage of payroll.

SPTRFA

The UAAL is amortized over the statutory period using level percent of payroll assuming payroll increases of 5.00% per annum.

Mortality

DTRFA

1994 Group Annuity Mortality for males set back two years.
1994 Group Annuity Mortality for females set back two years.

Mortality

Age	Male	Female
20	0.05%	0.03%
25	0.06	0.03
30	0.08	0.03
35	0.08	0.04
40	0.09	0.06
45	0.14	0.09
50	0.21	0.12
55	0.36	0.19
60	0.63	0.34
65	1.15	0.67
67*	1.45	0.86

*Last retirement age

SPTRFA

Healthy Pre-Retirement:
1983 Group Annuity Mortality Table for males set back 7 years.
1983 Group Annuity Mortality Table for females set back 5 years

Healthy Pre-Retirement Mortality [2]

Age	Male	Female	Age	Male	Female
20	3	2	45	10	7
21	3	2	46	11	7
22	3	2	47	12	8
23	3	2	48	14	8
24	3	2	49	15	9
25	4	2	50	17	10
26	4	3	51	19	11
27	4	3	52	22	12
28	4	3	53	25	14
29	4	3	54	28	15
30	4	3	55	31	16
31	4	3	56	35	18
32	5	4	57	39	19
33	5	4	58	43	21
34	5	4	59	48	23
35	5	4	60	52	25
36	6	5	61	57	28
37	6	5	62	61	31
38	6	5	63	66	34
39	7	6	64	71	38
40	7	6	65	77	42
41	8	7	66	84	47
42	9	7	67	92	52
43	9	8	68	101	58
44	10	8	69	111	64

Healthy Post-Retirement:
1983 Group Annuity Mortality Table for males set back 4 years.
1983 Group Annuity Mortality Table for females set back 1 year

[2] *Deaths expressed as the number of occurrences per 10,000:*

	DTRFA	SPTRFA
		Healthy Post-Retirement Mortality [2]

Age	Male	Female	Age	Male	Female
20	3	2	45	14	9
21	3	2	46	15	10
22	4	2	47	17	11
23	4	2	48	19	12
24	4	2	49	22	14
25	4	2	50	25	15
26	4	3	51	28	16
27	4	3	52	31	18
28	4	3	53	35	19
29	5	3	54	39	21
30	5	3	55	43	23
31	5	3	56	48	25
32	5	4	57	52	28
33	6	4	58	57	31
34	6	4	59	61	34
35	6	4	60	66	38
36	7	5	61	71	42
37	7	5	62	77	47
38	8	5	63	84	52
39	9	6	64	92	58
40	9	6	65	101	64
41	10	7	66	111	71
42	10	7	67	124	78
43	11	8	68	139	87
44	12	8	69	156	97

Disabled

Male and Female tables apply:

Age	Table
54 and younger	Disabled Eligible for Social Security Disability-ERISA Sec. 4044 for 2006
55-64	Graded from table for ages 54 and younger to table for ages 65 and older
65 and older	1994 Group Annuity Mortality Table set back 2 years

1977 Railroad Retirement Board Mortality Table for Disabled Lives

Post-Disability Mortality [3]

Age	Male	Female	Age	Male	Female
20	57	57	45	275	274
21	60	60	46	275	275
22	63	63	47	276	276
23	66	66	48	279	279
24	69	69	49	283	283
25	72	72	50	289	289
26	75	75	51	297	297
27	79	79	52	310	310
28	82	82	53	327	327
29	87	87	54	348	348
30	91	91	55	371	371
31	95	95	56	395	395
32	99	99	57	417	417
33	103	103	58	439	439
34	107	107	59	455	455
35	273	273	60	473	473
36	273	273	61	494	494
37	273	273	62	516	516
38	273	273	63	541	541
39	273	273	64	569	569
40	273	273	65	598	598
41	273	273	66	628	628
42	273	273	67	658	658
43	274	274	68	687	687
44	274	274	69	716	716

Retirement

Rates are shown for selected ages. In addition, 40% of the members are assumed to retire each year that they are eligible for Rule of 90.

Age	Old	New
20	--	--
25	--	--
30	--	--
35	--	--
40	--	--
45	--	--
50	--	--
55	15%	15%
60	15	15
65	40	40
67*	100	100

*Last retirement age

Rates of Retirement: [3]

	Basic Members		Coordinated Members	
Age	Eligible for Rule of 90	Not Eligible for Rule of 90	Eligible for Rule of 90	Not Eligible for Rule of 90
<55	5,000	0	5,000	0
55	5,000	800	5,000	500
56	5,000	1,300	5,000	500
57	4,000	1,300	4,000	500
58	4,000	1,800	4,000	700
59	3,500	1,800	4,000	700
60	3,500	2,000	4,000	700
61	3,500	2,000	4,500	1,000
62	3,500	4,000	4,500	2,000
63	3,500	4,000	3,000	2,000
64	4,000	4,000	3,000	2,000
65	5,000	5,000	5,000	3,500
66	3,000	5,000	3,000	3,000
67	3,000	5,000	3,000	3,000
68	3,000	5,000	3,000	3,000
69	3,000	5,000	3,000	3,000
70 & over	10,000	10,000	10,000	10,000

[3] *Expressed as the Number of Occurrences per 10,000:*

Current Actuarial Assumptions - First Class City Teacher Retirement Fund Associations

Withdrawal

DTRFA

Select and ultimate rates are based on recent plan experience. Ultimate rates after the third year are shown in the table below.

Select rates are as follows:

First year:	60%
Second year:	20%
Third year:	15%

Ultimate Rates

Age	Withdrawal
20	3.50%
25	3.25
30	3.00

SPTRFA

Number of Terminations per 1,000 Active Members

Years of Service	Male	Female
0	400	400
1	180	160
2	110	100
2	110	100

Disability

DTRFA

Rates of Disability

Age	Disability
20	--
25	--
30	--
35	0.01%
40	0.03
45	0.06
50	0.10
55	0.15
60	0.21
65	--
67*	--

* Last retirement

SPTRFA

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

Age	Disability	Age	Disability
20	1	45	4
21	1	46	4
22	1	47	4
23	1	48	4
24	1	49	4
25	1	50	7
26	1	51	7
27	1	52	7
28	1	53	7
29	1	54	7
30	2	55	14
31	2	56	14
32	2	57	14
33	2	58	14
34	2	59	14
35	2	60	29
36	2	61	29
37	2	62	29
38	2	63	29
39	2	64	29
40	2		
41	2		
42	2		
43	2		
44	2		

Allowance for combined service annuity

DTRFA

10% load on liabilities for active members and 25% load on benefits for deferred vested participants in a Combined Service arrangement as of the valuation date.

SPTRFA

7% load on liabilities for active members and 30% load on liabilities for former members.

Administrative expenses

DTRFA

Prior year administrative expenses expressed as a percentage of prior year projected payroll.

SPTRFA

Prior year administrative expenses (excluding investment expenses) expressed as a percentage of prior year payroll.

Refund of contributions

DTRFA

All employees withdrawing after becoming eligible for a deferred benefit were assumed to take the larger of their contributions accumulated with interest or the value of their deferred benefit.

SPTRFA

N/A

Commencement of deferred benefits

DTRFA

Normal retirement age.

SPTRFA

Basic Plan members who terminate vested are assumed to commence benefits at age 60. Coordinated Plan members are assumed to commence benefits at age 63. If the member is already past the assumed deferral age, the member is assumed to commence benefits one year from the valuation date.

Percent married

DTRFA

80% of members are assumed to be married.

SPTRFA

It is assumed that 85% of male members and 60% of female members have an eligible spouse.

Age of spouse

DTRFA

Females three years younger than males.

SPTRFA

The male spouse is assumed four years older than the female spouse.

Eligible children

DTRFA

SPTRFA

Married members are assumed to have two dependent children.

Form of payment

DTRFA

Married members assumed to elect subsidized joint and survivor form of annuity as follows:

Males: 30% elect 50% J&S option
40% elect 100% J&S option

Females: 15% elect 50% J&S option
15% elect 100% J&S option

SPTRFA

N/A

Current Actuarial Assumptions - First Class City Teacher Retirement Fund Associations

	DTRFA	SPTRFA
Unknown data for members	Same as those exhibited by members with similar known characteristics.	Active members with reported salaries of $100 or less were assumed to have the average non-zero active salary. Deferred vested members without salary information were valued using accumulated contributions. For members on leave of absence at valuation date, the prior year's valuation pay was used. Active members with salaries less than those reported at the prior valuation date are valued using their prior salary amount.
Special Consideration	Members in the Old Plan are assumed to receive their retirement benefits from the New Plan. Members who terminated under the Old Plan are assumed to take refund under the New Plan. Direct State aid payments include a portion attributed to redirected "amortization state aid" under 42A.02, Subdivision 3. For fiscal 2011, the amount is assumed to equal the amount that was paid for the 2010 fiscal year on June 30, 2010.	According to 1996 legislation, the St. Paul School District and the State of Minnesota are scheduled to make a combined annual supplemental contribution of $1,230,000. According to 1997 legislation, annual supplemental contributions of $2,827,000 are scheduled to be paid on October 1.
Accelerated Benefit Option		Retired members who have elected the accelerated benefit option and who have not yet attained the age of 65 are assumed to receive 50% of their pre-1965 benefit after age 65.
Decrement timing		Retirement and Termination: end of valuation year-consistent with retirements and terminations occurring at the end of the school year. Death and Disability: middle of valuation year.

Part Three

Development of Statutory Actuarial Assumptions

a. Regulation of Actuarial Reporting In General. Before 1957, the various Minnesota retirement plans conducted actuarial valuations, if at all, on a schedule of their choosing, and used the actuarial cost method and actuarial assumptions of their (or their actuary's) choice.

- The initial state law relating to Minnesota public pension plan actuarial valuations was enacted in 1957 (Ex. Sess. Laws 1957, Ch. 11), an uncoded provision that required the preparation of actuarial surveys as of January 1, 1958, from the State Employees Retirement Association (SERA, the predecessor of the Minnesota State Retirement System (MSRS)), the Public Employees Retirement Association (PERA), the Teachers Retirement Association (TRA), the Minneapolis Municipal Employees Retirement Plan (MMER, the predecessor of the Minneapolis Employees Retirement Fund (MERF)), the various local police relief associations, the second class city firefighter relief associations, the first class city firefighters relief associations, any other firefighter relief association providing a retirement benefit based on compensation as a firefighter, any first class city teacher retirement fund association, and any other public pension retirement fund, to be reported to the interim pension commission.

- In 1961 (Laws 1961, Ch. 736, Sec. 10), the former State Police Officers Retirement Fund was required to have an actuarial survey made as of January 1, 1962, and reported to the interim pension commission.

- In 1965 (Laws 1965, Ch. 359 and Ch. 751), annual financial reports and annual actuarial valuations and surveys were required, in a coded provision, of SERA, PERA, TRA, the Highway Patrolmen's Retirement Plan, and the State Police Officers Retirement Plan, to be filed with the Secretary of the Senate, the Chief Clerk of the House of Representatives, and the Legislative Retirement Study Commission (a predecessor of the Legislative Commission on Pensions and Retirement) and actuarial surveys were required as of December 31, 1964, in an uncoded provision, from the local police relief associations, the second class city firefighter relief associations, the first class city firefighters relief associations, any other firefighter relief association providing a retirement benefit based on firefighter compensation, to be filed with the Secretary of the Senate, the Chief Clerk of the House of Representatives, and the Legislative Retirement Study Commission.

- In 1967 (Laws 1967, Ch. 249 and Ch. 729), tee general employee retirement plan actuarial reporting law was amended by requiring greater assumption and demographic information to be reported and the local police and fire actuarial reporting law was amended to require valuations as of December 31, 1967, and every four years thereafter and was extended to any local police or fire pension plan.

- In 1969 (Laws 1969, Ch. 249), the general employee retirement plan annual financial and actuarial reporting law was extended to the Minneapolis Teachers Retirement Fund Association (MTRFA), the St. Paul Teachers Retirement Fund Association (SPTRFA), the Duluth Teachers Retirement Fund Association (DTRFA), the St. Paul Bureau of Health Relief Association, and the Minneapolis Municipal Employees Retirement Plan (MMER).

- In 1971 (Laws 1971, Ch. 7 and Ch. 281), the general employee retirement plan annual financial and actuarial reporting law was extended to the Twin City Lines Employees Retirement Plan, the University of Minnesota Police Retirement Plan, and the University of Minnesota Faculty Retirement Plan.

- In 1975 (Laws 1975, Ch. 192, Sec. 3, 7), the general employee retirement plan annual financial and actuarial reporting law was recodified.

- In 1978 (Laws 1978, Ch. 563), the separate local police and fire relief association actuarial reporting law was integrated into the general emp0loyee retirement plan actuarial reporting law, with appropriate adjustments, and the general employee retirement plan annual financial and actuarial reporting law was extended to the Judges Retirement Plan.

- In 1981 (Laws 1981, Ch. 224, Sec. 168), the responsibility for the preparation of the actuarial valuations of the various statewide and major local retirement plans was shifted from the several consulting actuaries retained by the various retirement plans to the consulting actuarial firm retained by the Legislative Commission on Pensions and Retirement.

- In 1999 (Laws 1999, Ch. 222, Art. 2, Sec. 16), the actuarial reporting law coverage was expanded to include the newly created Local Government Correctional Service Retirement Plan of the Public Employees Retirement Association (PERA-Correctional).

- In 2004 (Laws 2004, Ch. 223, Sec. 6), the responsibility for the preparation of annual actuarial valuations shifted from the consulting actuarial firm retained by the Commission to the consulting actuarial firm retained by the seven statewide and major local retirement plans acting jointly.

- In 2008 (Laws 2008, Ch. 349, Art. 10, Sec. 7), the responsibility for the preparation of annual actuarial valuations was placed with the governing boards of the various statewide and major local retirement systems acting separately.

b. Specifications of an Actuarial Cost Method. The initial actuarial reporting law (Ex. Sess. Laws 1957, Ch. 11), required the reporting of a normal support rate for currently accruing liabilities and an additional annual amortization rate, consistent with and likely presuming the use of the entry age normal actuarial cost method, but the enactment did not specify the use of any particular actuarial cost method and, surprisingly, did not require the disclosure of the actuarial cost method used. The 1965 biennial report of the Employee Retirement Systems Interim Commission, a predecessor of the Legislative Commission on Pensions and Retirement, indicated that the sponsors of Extra Session Laws 1957, Chapter 11, intended that its required actuarial valuations would be prepared using the normal level cost or entry age normal actuarial cost method, but the language of the enactment was sufficiently ambiguous to allow at least one retirement plan actuary to use a different actuarial cost method indicating only temporary financing contribution rates. The 1965 biennial report of the Employee Retirement Systems Interim Commission included a recommendation for the 1965 Legislature to specify the entry age normal actuarial cost method in any future required actuarial reporting.

- In 1965 (Laws 1965, Ch. 359), an annual actuarial valuation report was required of SERA, PERA, TRA, the Highway Patrolmen's Retirement Plan, and the State Police Officers Retirement Plan, specifying that the valuation be prepared using the entry age normal actuarial cost method.

- In 1975 (Laws 1975, Ch. 192, Sec. 3), when the actuarial reporting law was recodified in a new statute, in 1984 (Laws 1984, Ch. 564), when the provision of actuarial valuations was centralized with the consulting actuary retained by the Legislative Commission on Pensions and Retirement, in 2004 (Laws 2004, Ch. 223, Sec. 6), when the responsibility to contract with the consulting actuarial providing the official actuarial valuation reports shifted from the consulting actuary firm retained by the Legislative Commission on Pensions and Retirement to the consulting actuarial firm retained jointly by the seven statewide and major local retirement plans, in 1987 (Laws 1987, Ch. 259, Sec. 55), when a definition of the entry age actuarial cost method was added to the actuarial reporting law, and in 2008 (Laws 2008, Ch. 349, Art. 10, Sec. 7), when the actuarial reporting responsibility devolved to the various statewide and major local retirement plan governing boards and their retained consulting actuarial firms, the actuarial reporting law continues to require the use of the entry age normal actuarial cost method.

c. Statutory Interest/Investment Performance Actuarial Assumption Rate Changes. Before 1965, there was no ongoing actuarial reporting law and the interest or investment performance actuarial assumption rate was chosen by the retirement plan governing board or the retained consulting actuary.

The following compares the interest rate assumptions disclosed in the actuarial valuations on file with the Legislative Commission on Pensions and Retirement for the period before the enactment of the 1965 actuarial reporting law:

Table 5
Interest Rate Assumptions, Pre-1965

Retirement Plan	Year	Interest Rate Assumption	Retirement Plan	Year	Interest Rate Assumption
MSRS-General	1954	Undisclosed	PERA-General	1943	3%
	1957	3%		1946	2.5%
	1958	3%		1955	3%
	1959	3%		1957	3%
	1962	3%		1963	3%
	1963	3%/3.5%			
	1964	3%	TRA	1944	4%
				1958	3%
State Patrol	1948	2.5%		1959	3%
	1952	2.5%		1963	3%
	1954	Undisclosed			
	1955	2.75%	DTRFA	1952	3%
	1958	3%		1955	3%
	1963	3%/3.5%			
	1965	3%	SPTRFA	1957	3%

- In 1965 (Laws 1965, Ch. 359), as part of the enactment of a recurring actuarial valuation law applicable to the SERA, PERA, the Highway Patrolmen's Retirement Plan, the State Police Retirement Plan, and TRA, the interest or investment performance actuarial valuation rate was set at 3%.

- In 1969 (Laws 1969, Ch. 289, Sec. 2), for the major statewide retirement plans, two interest rate assumptions were required, 3% and 3.5% for comparison purposes.

- In 1971 (Laws 1971, Ch. 7, Sec. 6), the requirement of preparing an actuarial valuation report using a 3% interest rate assumption for comparison purposes was eliminated.

- In 1973 (Laws 1973, Ch. 653, Sec. 45), as part of the legislation creating the Correctional State Employees Retirement Plan of the Minnesota State Retirement System (MSRS-Correctional) and replacing the career average salary benefit plan of the MSRS-General with a highest five successive years' final average salary benefit plan, the interest or investment performance actuarial assumption rate was increased from 3% to 5% for the eight retirement plans required to report.

- In 1984 (Laws 1984, Ch. 564, Sec. 43), as part of a major revision in the manner in which actuarial valuation reports are prepared and the contents of actuarial valuation reports required, the interest or investment performance actuarial assumption rate was modified, with a pre-retirement interest rate assumption increased from 5% to 8% and retaining a 5% post-retirement interest rate assumption for the retirement plans participating in the Minnesota Post Retirement Investment Fund and retaining a 5% pre-retirement and post-retirement interest rate assumption for all other retirement plans.

- In 1985 (1st Special Session Laws 1985, Ch. 7, Sec. 27), for the first class city teacher retirement fund associations, the post-retirement interest rate assumption was increased from 5% to 8%.

- In 1986 (Laws 1986, Ch. 458, Sec. 20), the variable annuity program of TRA was excluded from the post-retirement and pre-retirement interest assumption rate specification.

- In 1989 (Laws 1989, Ch. 319, Art. 13, Sec. 20), the actuarial reporting law was amended to increase the pre-retirement interest assumption rate of the statewide retirement plans from 8% to 8.5% and the pre-retirement and post-retirement interest assumption rates of the first class city teacher retirement fund associations were increased from 8% to 8.5%.

- In 1991 (Laws 1991, Ch. 345, Art. 4, Sec. 3), for MERF, the pre-retirement interest assumption rate was increased from 5% to 6% and the post- retirement interest rate assumption was continued at 5%.

- In 1997 (Laws 1997, Ch. 233, Art. 1, Sec. 58), the post-retirement interest assumption rate of the various statewide retirement plans covered by the Minnesota Post Retirement Investment Fund was increased from 5% to 6% and the pre-retirement and post-retirement interest assumption rates for each specific retirement plan was specified, including the Minneapolis Police Relief Association, other local police relief associations, the Minneapolis Firefighters Relief Association, other local salaried firefighter relief associations, and local monthly benefit volunteer firefighter relief associations.

d. Statutory Salary Scale Assumption Rate Changes. Akin to the interest or investment performance actuarial assumption rates, before 1965, there was no recurring actuarial reporting law and the salary scale assumption was chosen by the governing board of the particular retirement plan or its contracted consulting actuary. Some of the actuarial valuations and experience studies indicated that the retirement plan had a salary scale assumption, but never disclosed that salary scale assumption. For most of the statewide and major local retirement plans, the retirement plan benefit program was based on a career average salary at that time, where a salary scale assumption was less significant, and, until the mid-1960s, had a maximum covered salary of $4,800 per year or $6,500 per year.

- In 1965 (Laws 1965, Ch. 359), the recurring actuarial reporting law was amended by the addition of a 3.5% salary scale assumption for the 11 retirement plans required to report.

- In 1984 (Laws 1984, Ch. 564, Sec. 43), the prior 3.5% salary scale assumption was replaced with a 6.5% salary scale assumption for the Legislators Retirement Plan, MSRS-General, MSRS-Correctional, the State Patrol Retirement Plan, the Elective State Officers Retirement Plan, PERA-General, PERA-P&F, TRA, the first class city teacher retirement fund associations, and the Judges Retirement Plan.

- In 1987 (Laws 1987, Ch. 259, Sec. 55), the salary assumption for the Legislators Retirement Plan, the Elective State Officers Retirement Plan, and the Judges Retirement Plan, of 6.5% increase annually was specified to be used only if the salary amount of the plan participants is not determinable from statute or compensation council recommendations.

- In 1991 (Laws 1991, Ch. 269, Art. 3, Sec. 9), the language usage and style of the provisions was revised to better reflect then-current conventions and the potential inconsistencies related to the salary assumptions for the Legislators Retirement Plan, the Elective State Officers Retirement Plan, and the Judges Retirement Plan. Also in 1991 (Laws 1991, Ch. 345, Art. 4, Sec. 3), for MERF, the salary scale assumption was revised from 3.5% annually to 4% annually.

- In 1995 (Laws 1995, Ch. 141, Art. 3, Sec. 14), for MSRS-General, PERA-General, and TRA, tables of graded age-related rate salary increase assumptions were implemented, ranging from 7.25% at age 16 to 5.25% at age 70 for MSRS-General and TRA, and from 8.71% at age 16 to 5% at age 70 for PERA-General.

- In 1997 (Laws 1997, Ch. 241, Art. 4, Sec. 1), the salary scale assumptions were totally revised, with:

  1) a single annual increase rate set at:
     a) 5% for the Legislators Retirement Plan, the Elective State Officers Retirement Plan, and the Judges Retirement Plan,
     b) 4% for MERF, the Minneapolis Police Relief Association, and the Minneapolis Firefighters Relief Association, and
     c) 3.5% for other local police and paid firefighter relief associations; and

  2) graded rate future salary increase assumptions added for:
     a) MSRS-Correctional ranging from 7.25% at age 16 to 5.25% at age 70,
     b) PERA-P&F and PERA-Correctional ranging from 11.5% at age 16 to 5.25% at age 70,
     c) DTRFA ranging from 8% at age 16 to 5.25% at age 70,
     d) MTRFA ranging from 7.50 % at age 16 to 5% at age 70, and
     e) SPTRFA ranging from 7.25% at age 16 to 5.25% at age 70.

- In 2000 (Laws 2000, Ch. 461, Art. 1, Sec. 5),

  1) the single rate future salary increase assumption for MERA was modified into a two-part rate, 1.0198% for the initial succeeding year and 4% thereafter; and

  2) the ultimate graded rate future salary increase assumptions were changed for:
     a) MSRS-General and PERA-General, newly ranging from 6.95% at age 16 to 5% at age 71,
     b) MSRS-Correctional, the State Patrol Retirement Plan, and PERA-Correctional, newly ranging from 7.75% at age 16 to 5.25% at age 71, and
     c) TRA, newly ranging from 8.20% at age 16 to 5% at age 71 and a select assumption for the initial ten years of employment.

- In 2002 (Laws 2002, Ch. 461, Art. 1, Sec. 5),

  1) the ultimate graded rate future salary increase assumptions were changed, as follows:
     a) between ages 21 and 71 for MSRS-General,
     b) between ages 19 and 59 for PERA-General,
     c) between ages 20 and 71 for TRA,
     d) between ages 20 and 70 for DTRFA,
     e) between ages 16 and 59 for MTRFA, and
     f) between ages 23 and 71 for SPTRFA; and

  2) different select future salary increase assumptions were specified for the initial ten years of service for MSRS-General, PERA-General, TRA, DTRFA, MTRFA, and SPTRFA.

- In 2005 (1st Spec. Sess. Laws 2005, Ch. 8, Art. 11, Sec. 2), a 4% single rate salary increase actuarial assumption was specified for the Bloomington Fire Department Relief Association.

- In 2008 (Laws 2008, Ch. 349, Art. 10, Sec. 13),

  1) the ultimate graded rate future salary increase assumptions were totally revised, with the rate for:
     a) MSRS-General ranging from 5.95% at age 16 to 4.25% at age 71,
     b) PERA-General ranging from 5.95% at age 16 to 4% at age 71,
     c) PERA-P&F ranging from 11% at age 16 to 4.75% at age 70,
     d) TRA ranging from 7.70% at age 16 to 5.20% at age 71,
     e) DTRFA ranging from 8% at age 16 to 3.5% at age 70,
     f) SPTRFA ranging from 6.90% at age 16 to 5.25% at age 70, and
     g) MSRS-Correctional ranging from 7.25% at age 16 to 4.75% at age 70;

  2) the select salary increase rates were revised as follows:
     a) reduced from the initial ten years of employment to the initial five years of employment and reset to 0.6% for MSRS-General and PERA-General,
     b) reset to 0.3% for TRA, DTRFA, and SPTRFA, and

c) a special select calculation at 8% for service years one to six, 7.25% for service years seven and eight, and 6.5% for service years eight and nine for DTRFA.

- In 2010 (Laws 2010, Ch. 359, Art. 1, Sec. 68), the salary scale assumption for PERA-General was shifted from a select and ultimate future salary increase based on age to a service-related ultimate future salary increase assumption ranging from 12.03% with one year of service to 3.5% with 30 or more years of service.

- In 2011 (1st Spec. Sess. Laws 2011, Ch. 8, Art. 3, Sec. 1),

  1) the 2010 PERA-General service-related ultimate future salary increase assumption was modified to range from 12.25% with one year of service to 3.75% with 30 or more years of service, and

  2) the salary scale assumptions for MSRS-General, TRA, and PERA-P&F were shifted from select and ultimate future salary increase based on age to a service-related ultimate factor salary increase assumption ranging from:
     a) 10.75% with one year of service to 3.75% with 30 or more years of service for MSRS-General,
     b) 12% with one year of service to 3.5% with 30 or more years of service for TRA, and
     c) 13% with one year of service to 4.5% with 30 or more years of service for PERA-P&F.

b. Payroll Growth Assumption. Before 1984, when the required amortization supplemental contribution rate was calculated as a level dollar amount annually until the amortization target date, no aspect of the required actuarial valuation derived from overall covered payroll change.

- In 1984 (Laws 1984, Ch. 564, Sec. 43), for the Legislators Retirement Plan, MSRS-General, MSRS-Correctional, the State Patrol Retirement Plan, PERA-General, PERA-P&F, TRA, the first class city teacher retirement fund associations, and the Judges Retirement Plan, the unfunded actuarial accrued liability amortization contribution requirement was changed to a level percentage of an increasing total covered payroll, with the annual payroll growth assumption set at 6.5%.

- In 1995 (Laws 1995, Ch. 141, Art. 3, Sec. 15), the annual payroll growth assumption was modified for three of the 13 retirement plans required to be amortized on a level percentage of an increasing covered payroll basis, with the payroll growth assumption for MSRS-General and TRA reduced from 6.5% annually to 5% annually and with the payroll growth assumption for PERA-General reduced from 6.5% annually to 6% annually.

- In 1997 (Laws 1997, Ch. 241, Art. 4, Sec. 1), the payroll growth assumptions for ten of the 13 retirement plans amortizing on a level percentage of an increasing covered payroll basis were modified, with the payroll growth assumptions for:

  1) MSRS-Correctional, the State Patrol Retirement Plan, the Legislators Retirement Plan, the Elective State Officers Retirement Plan, the Judges Retirement Plan, and the three first class city teacher retirement fund associations reduced from 6.5% annually to 5% annually, and
  2) PERA-P&F and PERA-Correctional reduced from 6.5% annually to 6% annually.

  The new payroll growth assumptions were newly placed in the subdivision of the actuarial reporting law specifying interest and salary assumptions, but the outdated payroll growth assumptions were not immediately removed from the amortization contribution determination subdivision of the actuarial reporting law.

- In 2008 (Laws 2008, Ch. 349, Art. 10, Sec. 13-14),

  1) the payroll growth assumption was eliminated for the Elective State Officers Retirement Plan, where there are no longer active members,
  2) the payroll growth assumption was reduced from 6% to 4.5% for PERA-General, PERA-P&F, and PERA-Correctional, was reduced from 5% to 4.5% for MSRS-General, MSRS-Correctional, the State Patrol Retirement Plan, the Legislators Retirement Plan, TRA, and DTRFA, leaving only the SPTRFA assumption unchanged at 5%, and
  3) the outdated payroll growth actuarial assumptions were finally eliminated from the amortization contribution determination subdivision.

- In 2010 (Laws 2010, Ch. 359, Art. 1, Sec. 68), the payroll growth assumption of PERA-General was reduced from 4.5% annually to 4% annually.

- In 2011 (1st Spec. Sess. Laws 2011, Ch. 8, Art. 3, Sec. 1), the payroll growth assumption of MSRS-General, PERA-P&F, and TRA was reduced from 4.5% annually to 3.75% annually and the payroll growth assumption of PERA-General was reduced from 4% annually to 3.75% annually.

Part Four
Experience Studies

a. Summaries of the Most Recent Experience Studies

1. Executive Summary of Mercer 2004-2008 MSRS-General Experience Study.

Executive Summary

Actuarial Methods
We recommend no changes to the actuarial methods.

Economic Assumptions

Real Wage Growth

Based on our analysis of actual growth in real National Average Wages over the last 50 years, we are recommending changing the current assumption from 1.50% to 1.00%.

Payroll Growth

Based on our recommended change in the Real Wage Growth assumption, we recommend changing the current assumption from 4.50% to 4.00%.

Salary Increases

We recommend changing the salary increase rates from a five-year select and ultimate basis to a service based table which reflects lower expected salary increases.

Investment Return

Based on our analysis of anticipated returns for asset classes included in the target asset allocation, we are recommending changing the current assumption from 8.50% to 8.00%.

Demographic Assumptions

Healthy Post Retirement Mortality

Mortality rates are used to project the length of time benefits will be paid to current and future retirees and beneficiaries. We recommend a change to a more recent mortality table to better anticipate current and future mortality patterns.

Pre-retirement Mortality

In conjunction with our recommended change for healthy retiree mortality, we recommend a change to a more recent mortality table with adjustments.

Disabled Post Retirement Mortality

In conjunction with our recommended change for healthy retiree mortality, we recommend a change to a more recent disabled mortality table with adjustments.

Retirement from Active Status

Retirement rates are used to predict when active members will elect to begin receiving retirement benefits. We recommend lowering the retirement rates to reflect retirement patterns observed over the last two four-year experience study periods.

Executive Summary

Annuity Form Elections at Retirement

We recommend making minor adjustments to the percentages of retirees who are married, the age difference between retirees and beneficiaries, and the percentages of retirees electing the optional forms of benefit at retirement.

Disability Retirement

We recommend a minor reduction in disability rates for male members.

Termination Rates

We recommend changing the termination rates from a three-year select basis to an age and service based table which reflects higher expected turnover.

2. Executive Summary of Mercer 2004-2008 PERA-General Experience Study.

Executive Summary

Overview of Recommended Changes

Actuarial Methods

We recommend no changes to the actuarial methods.

Economic Assumptions

Real Wage Growth

Based on our analysis of actual growth in real National Average Wages over the last 50 years, we recommend changing the current assumption from 1.50% to 1.00%.

Payroll Growth

Based on our recommended change in the Real Wage Growth assumption, we recommend changing the current assumption from 4.50% to 4.00%.

Salary Increases

We recommend changing the salary increase rates from a five-year select basis to a service based table which reflects lower expected salary increases.

Investment Return

Based on our analysis of anticipated returns for asset classes included in the target asset allocation, we recommend changing the current assumption from 8.50% to 8.00%.

Demographic Assumptions

Healthy Post Retirement Mortality

Mortality rates are used to project the length of time benefits will be paid to current and future retirees and beneficiaries. We recommend a change to a more recent mortality table to better anticipate current and future mortality patterns.

Disabled Post Retirement Mortality

In conjunction with our recommended change for healthy retiree mortality, we recommend a change to a more recent disabled mortality table with adjustments.

Pre-retirement Mortality

In conjunction with our recommended change for healthy retiree mortality, we are recommending a change to a more recent mortality table with adjustments.

Retirement from Active Status

Retirement rates are used to predict when active members will elect to begin receiving retirement benefits. We recommend lowering the retirement rates to reflect retirement patterns observed over the last two four-year experience study periods.

Executive Summary

Annuity Form Elections at Retirement

We recommend making minor adjustments to the percentages of retirees who are married, the age difference between retirees and beneficiaries and the percentages of retirees electing the optional forms of benefit at retirement.

Disability Retirement

We recommend a reduction in disability rates for male and female members.

Termination Rates

We recommend changing the termination rates from a three-year select and ultimate basis to an age and service based table which reflects higher expected turnover.

3. Executive Summary of Mercer 2004-2008 TRA Experience Study.

Executive Summary

Overview of Recommended Changes

Actuarial Methods

We recommend no changes to the actuarial methods.

Economic Assumptions

Real Wage Growth

Based on our analysis of actual growth in real National Average Wages over the last 50 years, we recommend changing the current assumption from 1.50% to 1.00%.

Payroll Growth

Based on our recommended change in the Real Wage Growth assumption, we recommend changing the current assumption from 4.50% to 4.00%.

Salary Increases

We recommend changing the salary increase rates from a ten-year select basis to a service based table which reflects lower expected salary increases at later years of service.

Investment Return

Based on our analysis of anticipated returns for asset classes included in the target asset allocation, we recommend changing the current assumption from 8.50% to 8.00%.

Demographic Assumptions

Post-retirement Mortality for Healthy Lives

Mortality rates are used to project the length of time benefits will be paid to current and future retirees and beneficiaries. We recommend a change to a more recent mortality table to better anticipate current and future mortality patterns.

Post-retirement Mortality for Disabled Lives

In conjunction with our recommended change for healthy retiree mortality, we recommend a change to a more recent disabled mortality table.

Pre-retirement Mortality

In conjunction with our recommended change for healthy retiree mortality, we are recommending a change to a more recent mortality table.

Retirement from Active Status

Retirement rates are used to predict when active members will elect to begin receiving retirement benefits. We recommend lowering the retirement rates to reflect retirement patterns observed over the last four years and anticipated future changes in retirement patterns.

Executive Summary

Annuity Form Elections at Retirement

We recommend making minor adjustments to the assumed percentages of retirees who are married, the assumed age difference between retirees and beneficiaries and the assumed percentages of retirees electing the optional forms of benefit at retirement.

Disability Retirement

We recommend a change from separate disability rates for males and females to a unisex table which has the same rates as the current female disability table. This recommendation is a reduction in disability rates for males.

Termination Rates

We recommend changing the termination rates from a three-year select and ultimate basis to a service based table which reflects higher expected turnover.

4. Executive Summary of Mercer 2004-2009 PERA-P&F Experience Study.

Executive Summary

Overview of Proposed Changes

Actuarial Methods

We propose no changes to the actuarial methods.

Economic Assumptions

Real Wage Growth

Based on our analysis of actual growth in real National Average Wages over the last 50 years, we propose changing the current assumption from 1.50% to 0.75%.

Payroll Growth

Based on our proposed change in the Real Wage Growth assumption, we propose changing the current assumption from 4.50% to 3.75%.

Salary Increases

We propose changing the salary increase rates from an age based table to a service based table.

Investment Return

Based on our analysis of anticipated returns for asset classes included in the target asset allocation, we propose changing the current assumption from 8.50% to 8.00%. Please see our Experience Study for Public Employees Retirement Fund dated August 31, 2009 for the detail behind this proposal.

Demographic Assumptions

Healthy Post Retirement Mortality

Mortality rates are used to project the length of time benefits will be paid to current and future retirees and beneficiaries. We propose a change to a more recent mortality table to better anticipate current and future mortality patterns.

Disabled Post Retirement Mortality

In conjunction with our proposed change for healthy retiree mortality, we propose a change to a more recent disabled mortality table with adjustments.

Pre-retirement Mortality

In conjunction with our proposed change for healthy retiree mortality, we are proposing a change to a more recent mortality table with adjustments.

Executive Summary

Retirement from Active Status

Retirement rates for actives are used to predict when active members will elect to begin receiving retirement benefits. We propose increasing the retirement rates at ages 50 and 54 to reflect retirement patterns observed over the five-year experience study period.

Retirement from Inactive Status

Retirement rates for inactives are used to predict when vested terminated members will elect to begin receiving retirement benefits. We propose no change in the current assumption.

Annuity Form Elections at Retirement

We propose making minor adjustments to the age difference between retirees and beneficiaries for males and the percentages of retirees electing the optional forms of benefit at retirement.

Disability Retirement

We propose no adjustment in disability rates for male and female members.

Termination Rates

We propose changing the termination rates during the three-year select period to reflect higher expected turnover.

b. Review of Experience Studies.

1. Milliman, Inc., Experience Study Review of MSRS, PERA, and TRA for the Minnesota Legislative Commission on Pensions and Retirement.

Milliman Client Report

Milliman

Experience Study Review of MSRS, PERA, and TRA for the Minnesota Legislative Commission on Pensions and Retirement

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Purpose and Scope of the Actuarial Review

In accordance with Minnesota Statues, Section 356.214, Subdivision 4, the Minnesota Legislative Commission on Pensions and Retirement (LCPR) has engaged Milliman, Inc. to perform an actuarial review of the 2004-2008 experience study reports prepared for the Minnesota State Retirement System (MSRS), Minnesota Public Employees Retirement Association (PERA), and the Minnesota Teacher Retirement Association (TRA). The studies were completed and issued in 2009 so we refer to them as the "2009 studies" throughout our report. The prior experience studies were completed by Segal, Inc. as part of their work as the Commission actuary. Those experience study reports were issued in 2005 and are referred to as the "2005 studies" in our report.

The purpose of an actuarial valuation is to provide a timely best estimate of the ultimate costs of a retirement system. The valuation requires the use of certain assumptions with respect to the occurrence of future events, such as rates of death, termination of employment, retirement age and salary changes to estimate the obligations or liabilities of the System. The assumptions are a critical part of the valuation process to allocate the cost of benefits to periods of service. Consequently, an experience study is performed periodically to determine whether the actuarial assumptions currently in use have adequately projected actual emerging experience. This information, along with the professional judgment of System personnel and advisors, is used to evaluate the appropriateness of continued use of the current actuarial assumptions. When analyzing experience and assumptions, it is important to recognize that actual experience is reported short term while assumptions are intended to be long-term estimates of experience. While the actuary's goal is to make the best possible estimate of future experience, it will almost certainly differ from our current best efforts to forecast it. Reviews of the actuarial assumptions are done every four years for MSRS, PERA and TRA to identify where assumptions differ from emerging experience and to adjust the assumptions, if appropriate.

An actuarial valuation uses two different types of assumptions: economic and demographic. Economic assumptions are related to the general economy and its long-term impact on the system, or to the operation of the system itself. These include investment return assumption, price inflation, general wage increase, and payroll growth assumption. Demographic assumptions are based on the emergence of the specific experience of the system's members. These include assumed rates of mortality, disability, retirement, termination of employment and merit salary scale.

In the Mercer experience study reports, we found the methodology to be in accordance with standard actuarial techniques. Mercer reported the actual to expected ratios (A/E) ratios, which are a common way to display the percentage of actual decrements (status changes) to the expected decrements. They are the required form of communication of experience study results set out in the Commission's Standards for Actuarial Work. An A/E ratio greater than one indicates that there were more actual decrements than expected and an A/E ratio less than one indicates there were fewer actual decrements than expected. These ratios were displayed for the current assumptions as well as for the recommended assumption throughout the reports. Detailed A/E ratios for the experience separately in each year were also provided in the appendices, which was very helpful.

Choosing actuarial assumptions is highly subjective. It is unlikely that any two actuaries, given the same set of experience statistics, would arrive at exactly the same set of actuarial assumptions for any system. Even allowing for the minor variations that occur because of the variability of the underlying statistics and possible data anomalies, differences among actuarial approaches will occur in analyzing trends. Some actuaries prefer to match the results of recent experience very closely in setting future assumptions, while other actuaries will use recent experience as a guide, but tend to change existing assumptions gradually over time. Valid arguments can be made for either approach. In many situations, our comments will reflect the fact that our approach in setting assumptions appears to differ from Mercer's. After reviewing the experience study reports, Mercer appears to set the recommended assumption very close to recent experience. Our approach results in more gradual changes, moving only part of the way toward emerging

experience. Throughout this report, there will be discussion on several assumptions for each Fund where this difference in approach led to Milliman making a different recommendation for the new assumption.

It is important to recognize that setting actuarial assumptions is as much art as it is science. There is room for differences in opinion and interpretation of results. Therefore, it is not uncommon for the auditing or reviewing actuary to have a different opinion than the retained actuary on how, or if, the assumptions should be changed. In reading our report, it is important to remember that there is no "correct" answer with respect to actuarial assumptions as the future is unknown. A range of results is acceptable and reasonable so our comments should be viewed in that context.

Statement of Key Findings

In general, we found the recommendations with respect to changes in the actuarial assumptions to be reasonable, justified by observed experience, and consistent with standard actuarial practice. However, the July 1, 2009 actuarial valuation for each Fund indicated that the funded ratios were around 75-85%, actuarial assets were about 30% higher than market value (meaning there are significant deferred investment losses yet to be recognized) and the current, fixed contribution rates were much lower than the actuarial contribution rates. Therefore, at this particular point in time we believe it is prudent to be more conservative in setting assumptions, especially if there is any doubt or concern about the assumption change. If assumptions are set more aggressively, they are more likely to produce experience losses which will only add to the Fund's difficulty in recovering from the recent investment losses. Many of the proposed changes to the demographic assumptions result in lower costs, with the exception of mortality changes. Therefore, we are more uncomfortable when all of the changes are considered together than with any one assumption change by itself. We consider it our responsibility to educate the Commission about the proposed assumptions and provide insight into the possible impact of proposed changes. Ultimately, the Commission will have to evaluate the proposed changes and decide how they wish to proceed. While none of Mercer's recommended changes are unreasonable or unsupported by the experience, there are many changes proposed, some of which are significantly different in approach. Given the long term funding situation, additional effort was expended to be thorough in our review of the experience study findings and recommendations.

In the past, the Commission retained their own actuary who performed the annual valuations and the experience studies for all of the Funds. The current (2009 Study) experience study is the first time in the recent past that each Fund's retained actuary has performed the formal experience study. The last study (2005 Study) was performed by Segal, Inc. as the Commission's actuary. It is our understanding that Segal gave Mercer the TRA data for 2004 and 2005 that was used in the 2009 experience study. A change in actuaries often results in many changes in the actuarial assumptions due to individual preference and the subjective nature of setting assumptions, as discussed above. There were changes recommended to almost all of the assumptions for all three Funds (MSRS, PERA, and TRA). Some of those were significant and others were less dramatic. While we understand the basis for the recommendations, there are certain situations where we don't feel comfortable moving forward with the recommended change. This generally applies to proposed changes to the salary increase assumption, termination of employment assumption, and certain of the post-retirement mortality assumption changes. From our perspective, some modification of the current assumption could be made now and the results from the 2009 experience study could be aggregated with results of the next study to develop an assumption that is based on more data and thus, should produce assumptions that better anticipate future experience.

Data

Data was provided to us from the Fund administrators and the retained actuary (Mercer is the retained actuary for all three funds). We also requested and reviewed additional, more detailed information provided by Mercer for several assumptions. We did not replicate the numerical results presented in the

experience study, i.e. the calculation of decrements and exposure. We reviewed them for general reasonableness, but relied on the accuracy of those calculations as performed and reported by Mercer. We were particularly concerned about the data given the significantly different results in the 2009 Studies compared to the 2005 Studies for several assumptions.

We reviewed the data files in detail for two of the four years for each of the Funds and independently developed the exposure at each age. We then compared our results to the exposure shown in the experience study report for that year. The match was very good so we are comfortable that the exposure in the Mercer report is reasonable. In an attempt to independently verify the decrements in the experience study report, we compared the number of members shown as changing status (retirement, death, disability, termination) in the "Reconciliation of Member Data" exhibit in the valuation reports to the counts shown in the experience study report for each year. The number of status changes shown in the valuation data was not consistent with the decrements reported in the experience study. We would note that the valuations for years before 2008 were performed by Segal rather than Mercer. In addition, we noticed that for some years, the Reconciliation of Member Data exhibit contained significant adjustments from year to year so we are unsure how reliable the valuation data was with respect to changes in member status. For example, in the MSRS valuation reports there were adjustments to the active member count of 446 in the July 1, 2005 report, 1,879 in July 1, 2006 report, 1,644 in the July 1, 2007 report, and 1,550 in the July 1, 2008 report. The active count is around 48,000 members so some of these adjustments represent a significant portion of the active exposure for that year. To illustrate the apparent inconsistency of the valuation data with the experience study data, the following table shows the difference in the number of members retiring and terminating employment for MSRS.

MSRS

	Retirements		Termination of Employment	
	Valuation	Experience Study	Valuation	Experience Study
7/1/04 to 6/30/05	776	877	3,941	3,492
7/1/05 to 6/30/06	871	999	3,907	3,422
7/1/06 to 6/30/07	1099	1,235	4,205	3,701
7/1/07 to 6/30/08	1,050	1,194	3,926	3,482

Based on discussions with Mercer after this draft report was issued, we were told that numbers shown in the reconciliation of member data exhibit in the valuation report were provided by the Fund, i.e. the status reconciliation was not performed by the actuary. This could explain some of the inconsistencies in the counts shown in the experience study report as compared to the valuation exhibit. Mercer has advised us that they will be performing the reconciliation of member status in the future which should address this issue. In addition, if a member was eligible to retire and terminated employment but did not commence benefits, they were classified as a retirement not a termination. This fact could account for some of the difference in the counts of termination and retirement. We believe it is appropriate to treat these members as retirees rather than terminations.

Even with this information, we were unable to attain a high level of comfort with respect to the data. As a result, we believe we should proceed cautiously with any significant changes in the assumptions.

Combined Service Annuity

The valuations for PERA, MSRS, and TRA include a load on active and deferred vested liabilities to reflect the impact of the Combined Service Annuity rules, which can result in a higher retirement benefit for an inactive member than the data in the prior system would indicate (final average salary is used to calculate the benefit in both systems).

Mercer's report states that this assumption is outside the scope of the experience study, but they recommend that the actual Combined Service Annuity data be collected and reviewed in order to determine whether the current assumptions are appropriate. We are not in a position to weigh in on whether or not the Combined Service Annuity assumption is outside the scope of the experience study. The Standards for Actuarial Work state that all assumptions used in the valuation should be included in the experience study. It does not provide for an exception, but to the extent the data is not available it is understandable that Mercer did not include such information. It does not appear the Combined Service Annuity was studied in the 2005 Experience Study either.

It is our understanding that this has been an issue for many years and the data is not readily available. However, we believe it would be worth the effort to gather the data and review the current assumption as it appears it has not been evaluated for some time.

Economic Assumptions

The economic assumptions are the same for all three Funds and include:

(1) investment return assumption,
(2) price inflation,
(3) wage growth assumption, and
(4) payroll growth assumption.

We have two comments related to the economic assumptions:

- The current assumption of 8.5% is within the "best estimate" range that must be developed under actuarial standards issued by the American Academy of Actuaries. However, there is a significant difference in where the 8.5% lies within that range using the capital market assumptions developed by Mercer, Milliman and the State Board of Investment (SBI). The net expected rate of return (50th percentile) using the capital market assumptions developed by Mercer and Milliman is 8.2% and 7.8% respectively. Note that these are based on the current (2010) capital market assumptions, but the results don't vary significantly if we use assumptions in place when the experience study was issued. The expected rate of return using SBI's assumptions was 9.1%. Given the importance of this assumption and the significant difference in results, we recommend there be further discussion on the subject. We are aware that both Mercer and SBI made presentations regarding the rate of return assumption after the experience study was issued and consensus could not be reached. It is clear that there are differing opinions on the subject. Because the 8.5% assumption is in statute, there is no urgency to make a decision immediately as it will not impact the current valuation. However, due to its importance further analysis should not be deferred until the next experience study, but should transpire over the next six to nine months. Given the differences of opinion and the importance of this assumption we believe an unbiased opinion from a totally independent third party with specific investment expertise could be very valuable to the Commission.
- Mercer recommended that the payroll growth assumption be lowered from 4.5% to 4.0%, which is the same rate as the general wage growth assumption. The payroll increase assumption is typically set equal to the wage growth assumption. However, the proposed merit salary scale assumption for all three Funds includes negative merit rates for certain years of service (varies somewhat by Fund). Given the recommended salary increase assumption, we are concerned that the proposed payroll growth assumption is too high. The negative merit scale, which applies to a large number of active members and an even greater portion of total payroll, is likely to result in covered payrolls that do not increase at the general wage growth assumption (4%) even if all other assumptions are met. We suggest Mercer perform further study on this issue before a decision is made if the recommended salary assumptions are adopted.

Demographic Assumptions

Termination of Employment

Mercer recommended changing the termination of employment assumption from a three year select and ultimate rate to an assumption based on service, age and gender for MSRS and PERA and to an assumption based on service and gender for TRA. The proposed assumptions represent a new approach to developing the termination assumption and would require that the rates be set only using the actual experience in the current study period since comparable information from the prior study is not available. Since in most cases, the termination data in this experience study was very different from the prior study and there has been no explanation, we would prefer not to make a material change to the approach used in the termination of employment assumption at this time. When the next study is performed there will be more data upon which to base this assumption and most of the data will be that used by Mercer in the Fund's valuations so the reliability of that data should be higher.

For MSRS and PERA, Mercer's recommended approach "slices and dices" the data into many different groupings. As a result, there are small numbers of members at some of the age groupings (older age with higher service) which can cause volatility in the observed rates and make it more difficult to develop smooth rates that will provide a reasonable estimate of future experience. Rather than moving to a full age and service assumption for all ages and years of service, it may make sense to remain with the select and ultimate assumption and extend the select period. We suggest Mercer revisit their proposed approach and address this issue.

Salary Increase Assumption

Mercer commented that the observed salary increases had a stronger correlation to service than age in general and they recommended moving to a service based table for all three Funds. We agree that the change to a service-based table is reasonable and in line with common actuarial practice for public retirement systems, but we are concerned that the proposed salary scale is based on only four years of experience, which may not be representative of long term salary increases. In addition, the way the salary increase assumption was developed does not directly address the separate components of the assumption, i.e. the total salary assumption includes a merit scale and the general wage growth assumption. Inflation and wage increases, in general, have been below the recommended assumption over the last decade and we believe this overall economic trend could have impacted the salary experience in the study period. In addition, the salary increase assumption contains a negative merit scale at certain service durations, which we have rarely seen in our experience. These factors make us less comfortable with a significant change in the assumption as is being proposed. In our opinion, the salary assumption being proposed does not appear to provide much conservatism. We believe the salary assumption should be studied further to determine the appropriate change, particularly if a new service based assumption is to be implemented.

Comments Specific to Each Fund

MSRS

Post-retirement Mortality: The A/E ratio for postretirement mortality for males dropped from 139% in the prior study to 101% in the current study. This is a dramatic change in a very short period, which is very unusual. There was no discussion of this in the experience study report and we could find no explanation for the observed data. In discussions with Mercer after the initial draft of this report was issued, they indicated that they had questioned Segal's results back when the prior experience study (2005) was issued. The difference was never resolved, but Mercer's results in the 2009 Study are consistent with the 1996-2000 Experience Study which makes the Segal results appear questionable.

- While the overall A/E ratio for males and females using the recommended assumption was 105% and 99%, we are concerned with the fit of the recommended assumptions at certain key ages. The A/E ratio at age 65 to 80 is 92% which means that mortality rates are higher than the actual experience at those ages, resulting in a shorter expected benefit payment period and potential understatement of liabilities. Given that a large portion of the exposure is in this age group, this may be reason for concern. We support the use of generational mortality, as recommended by Mercer, but want to be sure the starting mortality rates are a good fit. We suggest Mercer revisit the mortality assumption in light of the comments in this report and evaluate whether or not it is appropriate to modify the rates in the standard RP 2000 Table.

Retirement Rates: The proposed retirement rates are lower than the current assumption and closely follow the actual experience. Given that the retirement rates for Rule of 90 were lowered in the last study with a resulting A/E ratio of 103%, the experience in this study seems unusually low (A/E ratio of 66%). We would prefer to move only part of the way toward the actual experience and maintain some conservatism in the retirement rates for Rule of 90. We also would suggest that some conservatism be introduced into the non-Rule of 90 retirement rates by moving only part of the way toward the observed experience even though the experience was fairly consistent in both studies.

Disability Rates: Mercer recommended lowering the disability rates for males across the board by 10%. The disability rates were increased in the last experience study with a resulting A/E ratio for males of 101%, indicating a close fit to the actual observed experience in that study. The A/E ratio for males in the current study was 85%. Due to the small number of disabilities, there is a tendency for variability in the A/E ratio. Since the assumption was just increased in the last study and the aggregate results of the combined 2005 and 2009 study period is an A/E ratio of 93%, we would suggest the current assumption for males remain in place.

PERA

Post-retirement Mortality: The A/E ratio for postretirement mortality for males dropped from 102% in the prior study to 90% in the current study. For females, the A/E ratio dropped from 104% to 91% from the 2005 to the 2009 study. This is material and we believe it should have been discussed in the experience study report. While the overall A/E ratio on the proposed assumption was 103% for males and 96% for females, we are concerned with the fit at certain ages. The A/E ratio for females at ages 55 to 64 is 91% and at ages 65 to 80 is 95% which means that mortality rates are higher than the actual experience at those ages (which produces a shorter life expectancy and as potential understatement of liabilities). Because a large portion of the exposure is in these age groups, this may be reason for concern. We support the use of generational mortality, as recommended by Mercer, but want to be sure the starting mortality rates are a good fit. We suggest Mercer revisit the

mortality assumption in light of the comments in this report and evaluate whether or not it is appropriate to modify the rates in the standard RP 2000 Table.

Retirement Rates: The proposed retirement rates are lower than the current assumption and closely follow the actual experience. Given that the rates for Rule of 90 were lowered in the last study, we would prefer to move only part of the way toward the actual experience and maintain some conservatism in the retirement rates for Rule of 90. If the proposed rates are adopted, we suggest some minor adjustments at age 57, 58, 63 and 64. We also suggest that some conservatism be introduced into the non-Rule of 90 retirement rates by moving only part of the way toward the observed experience or at least changing the retirement rates at ages 65 and 66.

TRA

Post-retirement Mortality: The A/E ratio for postretirement mortality for males changed from 94% in the prior study to 114% in the current study. This change is material and we believe that it should have been discussed in the experience study report. While the overall A/E ratio for males and females using the recommended assumption is 104% and 107% respectively, we are concerned about the fit at certain key retirement ages. The A/E ratio for females at ages 55 to 64 is 80% and at ages 65 to 80 is 82% which means that assumed mortality rates are much higher than the actual experience at those ages (which produces a shorter life expectancy and potentially understates liabilities). Because a large portion of the exposure is in these age groups, this may be reason for concern. We support the use of generational mortality, as recommended by Mercer, but want to be sure the starting mortality rates are a good fit. . We suggest Mercer revisit the mortality assumption in light of the comments in this report and evaluate whether or not it is appropriate to modify the rates in the standard RP 2000 Table.

Retirement Rates: In the 2005 Study, the retirement rates were increased for age 56 and 57 with a resulting A/E ratio of 107%, indicating the actual retirements were still greater than the number assumed using the new assumption. The A/E ratio in the current study, using the retirement assumption adopted after the last study, is 72% so the A/E ratio dropped significantly. Because of the significant drop since the last study, we believe some conservatism should be retained in the retirement rates in case the experience in this study period is unusual and not a long-term trend. The recommended rates very closely match the actual experience during the study period as the resulting A/E ratio of 101% indicates. We would suggest moving only part of the way toward the observed experience for Rule of 90 retirements rather than all the way as recommended by Mercer. We also suggest that some conservatism be introduced into the non-Rule of 90 retirement rates by moving only part of the way toward the observed experience.

Actuarial Methods

While we are not recommending any change to the actuarial methods used in the valuation, we do believe that the funded ratio, UAAL, and actuarial contribution rate should be reported on both a market value basis and an actuarial value basis, particularly if there is a significant difference in the two asset values. We would note that this reporting was included in the July 1, 2009 actuarial valuation reports prepared by Mercer.

It may be appropriate to have further discussion on the use of a corridor with the asset valuation method and the layered amortization approach. Input from the retained actuary and Fund Administrators should be solicited as part of any discussion.

2. Commission Staff Review of the 2004-2009 PERA-P&F Experience Study.

   a. Experience Study Requirement. Minnesota Statutes, Section 356.214, Subdivision 1, Paragraph (c), requires the preparation of an experience study for the General State Employees Retirement Plan of the Minnesota State Retirement System (MSRS-General), for the General Employees Retirement Plan of the Public Employees Retirement Association (PERA-General), and for the Teachers Retirement Association (TRA). Minnesota Statutes, Section 356.214, Subdivision 1, Paragraph (e), provides for an experience study for any of the other nine retirement plans when the actuarial valuation gain and loss analysis indicates a persistent pattern of actuarial gains or losses.

   On November 10, 2010, Mercer, a consulting actuarial firm, filed an actuarial experience study of the Public Employees Police and Fire Retirement Plan (PERA-P&F) with the executive director of the Public Employees Retirement Association (PERA), who transmitted a copy of the study to the office of the Legislative Commission on Pensions and Retirement on November 12, 2010.

   b. General Summary of Actuarial Assumptions Proposed for Change. The 2004-2009 PERA-P&F experience study proposes changing four economic actuarial assumptions and seven demographic actuarial assumptions:

Economic Assumptions	Demographic Assumptions
Real Wage Growth	Healthy Post-Retirement Mortality
Payroll Growth	Disabled Post-Retirement Mortality
Salary Increase	Pre-Retirement Mortality
Interest Rate/Investment Return	Retirement Age
	Age Difference Between Retirees and Beneficiaries
	Percentage of Optional Annuity Form Election
	Termination/Withdrawal Rates

   c. Summary of Specific Proposed Actuarial Assumption Changes.

      1) Real Wage Growth. The recommendation is to reduce the current 1.5% annual real wage (productivity) growth assumption to a 0.75% annual real wage growth assumption, based on the 50-year results of the growth in national average wages as compiled by the Social Security Administration and based on undisclosed modeling by Mercer.

      2) Payroll Growth. The recommendation is to reduce the current 4.50% annual payroll growth assumption to a 3.75% annual payroll growth assumption to be consistent with the recommended real wage growth assumption change and the recommendation for no change in the 3% inflation assumption. The experience study presented no information on the past five years of actual payroll growth experience or any other experience period.

      3) Salary Increase. The recommendation is to shift the actuarial assumption from an age-related select and ultimate salary increase assumption to a service-related graded rate future salary increase assumption, which was included in the 2011 Omnibus Retirement Bill (see 1st Spec. Sess. Laws 2011, Ch. 8, Art. 3, Sec. 1). The experience study based the recommendation on a combination of the inflation assumption (3%) and real wage growth (productivity, 0.75%) and merit or promotion increases after reviewing salary increases for approximately 95% of the PERA-P&F active membership (excluding the highest and lowest increase 2.5% and participants with less than one year of service credit), organized based both on age and service.

      4) Interest Rate/Investment Performance. The recommendation is to change the current 8.5% pre-retirement and post-retirement interest rate assumption to an 8.0% pre-retirement and post-retirement interest rate assumption, referencing the 2004-2008 PERA-General experience study report, without producing any PERA-P&F-specific data or analysis.

      5) Healthy Post-Retirement Mortality Table. The recommendation is to replace the current 1983 Group Annuity Mortality Table, set back by one year for males and set back by one year for females, to the RP2000 Annuitant Generational Mortality Table, with white collar adjustment and no set backs or set forwards. The assumption recommendation was based on the summarized recent four-year experience, which overestimated male mortality on average by 9% and which underestimated female mortality on average by 17%. The generational mortality recommended is not a static table, as the 1983 Group Annuity Mortality Table, but incorporates mortality improvements each year into the future.

6) Disabled Retired Mortality. The recommendation is to replace the current composite mortality table (1965 Railroad Retirement Board rates from age 16 to age 40, graded rates between the 1965 RRB rates and the healthy post-retirement mortality table from age 41 to age 59, and the healthy post-retirement mortality table after age 59) with the RP2000 annuitant mortality table with the white collar adjustment, set forward by eight years for males and set forward by eight years for females. The assumption recommendation was based on the summarized recent five-year experience, which overestimated male disabled retired mortality by 39% and overstated female disabled retirement mortality by 65%.

7) Pre-Retirement Mortality Table. The recommendation is to replace the current 1983 Group Annuity Mortality Table, set back six years for males and set back six years for females, with the RP2000 non-annuitant generational mortality table with white collar adjustment, set back two years for males and set back two years for females. The assumption recommendation was based on the summarized five-year experience, which overestimated male mortality by 20% and underestimated female mortality by 19%.

8) Active Status Retirement. The recommendation is to adjust the current retirement table with 3% higher expected retirements at ages 50 and 54. The recommendation is based on this five-year review period and the prior four-year period and would change the current underestimate of retirements of 2% to overestimating retirements by 4%.

9) Age of Beneficiary. The recommendation is to reduce the expected age difference between the retiree and the retiree's beneficiary, if the retiree is male, from four years younger to three years younger. The experience study presented data that the actual average age difference was 68% less than expected average age difference and would be 26% less than the expected average age under the proposal.

10) Annuity Form Selection. The recommendation is to reduce the number of females who are expected to take a straight life annuity, to reduce the number of males who are expected to take a 50% or 100% joint and survivor annuity, and to add expectations for retirees selecting 25% and 75% joint and survivor annuities. The experience study presents whole period only average information indicating that the proposed assumption more closely matches the overall average experience.

11) Terminations. The recommendation is to increase the termination rates during the first two years of the three-year select period and to retain the current termination rates after the three-year select period. The average select period at large data indicates that the current select assumption underestimates withdrawals by 18%, with the greatest underestimation occurring in the first two years of the three-year select period.

d. Observations. The 2004-2009 experience study of PERA-P&F is not required by statute, but is elective on the part of the PERA board of trustees, and hence was not planned for in the contractual duties of the consulting actuary retained by the Legislative Commission on Pensions and Retirement, Milliman, and was not reviewed by Milliman.

The following represents observations by the Commission staff, based on the requirements of the Standards for Actuarial Work promulgated by the Commission and the items contained in the Milliman analysis of the most recent MSRS-General, PERA-General, and TRA experience studies.

1) Overall Scale of Assumption Changes and Extent of Conservatism. In reviewing the MSRS-General, PERA-General, and TRA experience studies in 2010, Milliman was concerned about the aggressiveness of Mercer in setting new assumptions, the overall lack of conservatism of the recommendations, and cautioned that more gradual changes in many assumptions, especially the salary increase assumption, the termination assumption, and the post-retirement mortality assumption changes. The PERA-P&F experience study recommends changes of a similar magnitude as the PERA-General experience study in ten of 11 assumptions (all but disability). Milliman's June 2010 suggestion of more moderation in changes regarding the PERA-General largely appears not to have been heeded in Mercer's November 2010 PERA-P&F experience study.

2) Data Reliability. The Milliman review of the Mercer MSRS-General, PERA-General, and TRA experience studies criticized the deviations between the exposures in the experience studies with the comparable membership data reconciliation information in the corresponding actuarial valuations, especially with respect to retirements and

terminations. The same problem appears to be true for the PERA-P&F experience study, as indicated in the following comparison:

Table 6
PERA-P&F 2004-2009 Experience Study

	Retirement			Terminations		
Year	Experience Study Occurrence	Valuation Reconciliation Data	Valuation Data Corrections	Experience Study Occurrences	Valuation Reconciliation Data	Valuation Data Corrections
2004-2005	189	180	0	159	175	0
2005-2006	177	169	(40)	195	208	0
2006-2007	257	247	(2)	211	227	0
2007-2008	206	193	0	198	214	0
2008-2009	215	241	5	169	183	0
	1,044	1,030		930	1,007	

3) Combined Service Annuity Loading Omission. Milliman noted in the review of the MSRS-General, PERA-General, and TRA 2004-2008 experience studies that all actuarial valuation assumptions are required by the Standards for Actuarial Work to be included in the experience study and criticized Mercer for not including data related to the Combined Service Annuity utilization loading. The 2004-2008 MSRS-General, PERA-General, and TRA Mercer experience studies included an explanation for the Combined Service Annuity loading assumption omission, indicating that the assumption is outside of the scope of the experience study. Mercer did not include Combined Service Annuity loading assumption data or analysis in the 2004-2009 PERA-P&F experiences study and did not include any explanation for its omission.

4) Interest Rate Assumption. Mercer has recommended a reduction of the current 8.5% interest rate actuarial assumption to 8% interest rate actuarial assumption as part of the 2004-2008 MSRS-General, PERA-General, and TRA experience studies and included the same recommendation for the 2004-2009 PERA-P&F experience study without presenting any additional data or analysis. The Mercer recommendation was based on undisclosed proprietary capital market assumptions developed by Mercer Investment Consulting, which reportedly predict a net expected rate of return (50 percentile) of 8.1% annually based on the portfolio composition currently used by the State Board of Investment. The Mercer analysis in the PERA-General experience study lacked assumptions for portions of the State Board of Investment alternative investment portfolio and substituted other assumptions for those components. The Mercer analysis in the PERA-General experience study also assumed a 20 basis point investment expense for passive investments without validating that assumption against State Board of Investment actual past experience with passive investments and assumed that any gain beyond the passive investment strategy expense (the "alpha") for active management would be equal to the additional fees for active management. The State Board of Investment investment portfolio makes use of a significant amount of active investment management. The MSRS, PERA, and TRA boards of trustees did not include this Mercer recommendation in their sets of requested actuarial assumption changes because of a lack of consensus between Mercer and the State Board of Investment on the future expected capital market rates of return.

5) Payroll Growth Assumption. In reviewing the Mercer 2004-2008 MSRS-General, PERA-General, and TRA experience studies, Milliman criticized the recommended change from 4.50% to 4% as being too high, given that Mercer's merit salary scale assumption includes negative merit salary scale rates for certain years of service, and suggested further Mercer study of the issue. Mercer is recommending a lower payroll growth assumption (3.75% rather than 4%) for PERA-P&F compared to PERA-General, based wholly on a lower average real growth assumption for PERA-P&F than for PERA-General, although the experience study analyses of real growth for PERA-P&F and PERA-General are identical except for the recommendation. No evidence of the further study by Mercer advocated by Milliman was presented in the 2004-2009 PERA-P&F experience study, only the presentation of a different recommendation.

6) Salary Increase Assumption. Milliman expressed concern in its review of the 2004-2008 MSRS-General, PERA-General, and TRA experience studies about a shift from an age-related select and ultimate table to a service-related ultimate table and the lack of conservatism in the proposed table, with negative merit scale (assumption less than

assumed inflation plus assumed real wage growth) at various service durations. The Mercer recommended assumption change for PERA-P&F appears not to have any negative merit scale occurrences, but the Milliman criticisms of the PERA-General salary scale assumption of the lack of an extended period of experience and analysis as a basis for the new table, of the potential failure to assemble the assumption from the normal components, and of the potential lack of conservatism in the proposal may still be applicable.

7) Post-Retirement Mortality. Milliman expressed concern about the fit at certain ages of the healthy post-retirement mortality assumption recommended by Mercer in the 2004-2008 PERA-General experience study because of a material drop in the actual-to-expected ratio from the prior PERA-General experience study (replicated for males in the 2004-2009 PERA-P&F experience study) and because of the overestimate of retiree deaths of the proposed mortality table at the ages of greatest exposure. The 2004-2009 PERA-P&F experience study does not provide any information on the actual-to-expected ratio of Mercer's proposed healthy post-retirement mortality table by age categories, so the adequacy of the fit of the proposed mortality table is impossible to ascertain. The Mercer information on the actual-to-expected ratio of its proposed healthy post-retirement mortality table was limited to five single year aggregate results which indicate a strengthening of the assumption for both males (107% for the whole period) and females (102% for the whole period), but that apparent strengthening is attributable largely or wholly to one or two years (2004-2005 for males and 2006-2007 and 2007-2008 for females) and underestimated mortality in the most recent year (2008-2009). The revisiting of the assumption by Mercer that Milliman recommended for the 2004-2008 PERA-General experience study appears to be appropriate for the 2004-2009 PERA-P&F experience study.

8) Retirement Assumption. Milliman found the Mercer-proposed PERA-General retirement age assumption in the 2004-2008 experience study insufficiently conservative. The PERA-P&F retirement age assumption in the 2004-2009 experience study, although unaffected by the Rule of 90 experience attributable to PERA-General, also appears to be potentially insufficiently conservative. While it overestimates retirements at large for the whole study period, the proposed assumption underestimates retirements in two of the five study years, the same years that the current assumption underestimates retirements. The proposed assumption only increases expected retirements for two of the 21 applicable ages (ages 50 and 54) and only increases the rate from 10% to 13% in each of those years.

9) Absence of Compliance Certification. Although not the subject of any comment by Milliman when it reviewed the 2004-2008 MSRS-General, PERA-General, and TRA experience studies, the 2004-2009 PERA-P&F experience study continued the practice of the prior Mercer MSRS-General, PERA-General, and TRA experience studies of failing to include any certification by the approved actuary that it was prepared in a manner that conformed with the requirements of Minnesota Statutes, Section 356.215, the general actuarial reporting law, the Standards For Actuarial Work adopted by the Legislative Commission on Pensions and Retirement, or the requirements of generally accepted actuarial practice and procedures. The same actuaries, one of which is an approved actuary under Minnesota Statutes, prepared the June 30, 2010, PERA-P&F actuarial valuation and did certify compliance with Minnesota Statutes, Section 356.215, and the Standards for Actuarial Work. The prior (1997-2001) PERA-P&F experience also did not include a statement of compliance with Minnesota Statutes, Section 356.215, or the Standards For Actuarial Work and neither preparer was even designated as an actuary.

10) Omission of Any Experience Data. Although the Standards For Actuarial Work provide that no assumption change may be recommended in an experience study without the need for that change being established by that experience study and that the report must present sufficient statistics to allow a pension professional to assess the viability of the actuary's conclusions in the experience study, the 2004-2009 PERA-P&F experience study contained no investment performance data, contained no Combined Service Annuity liability loading assumption experience data, and contained no marital status experience data. Since the inflation assumption is a major component in the experience study for setting the investment performance assumption, the payroll growth assumption, and the salary increase assumption, the failure to review any experience data, which is readily available and which have been under 3% for 15 of the last 35 years (December to December Consumer Price Index results from the Department of Labor, Bureau of Labor Statistics), raises questions about the accuracy of these other derivative assumptions. The absence of investment performance data is addressed specifically below. The absence of

Combined Service Annuity liability experience data is unexplained, since Mercer was the actuary retained by all but two of the statewide and major local retirement plans and consequently has the bulk of the new demographic information needed to assess the assumption's accuracy. The absence of marital status experience data was blamed on the Public Employees Retirement Association (PERA) by Mercer, which indicates that PERA failed to include that information in its supplied data, although the marital status experience was assessed in the 2004-2008 PERA-General experience study.

11) Omitted Investment Performance Experience Data. The Standards for Actuarial Work provide for the reporting of annual investment retirement on assets calculated on a market value basis and on an actuarial value of assets basis using the dollar-weighted technique, with cash flows assumed to occur mid-year. The PERA-P&F 2004-2009 experience study presented no past investment performance data and presented no future capital market performance projections, referring instead to the 2004-2008 PERA-General experience study. The investment return information presented in the 2040-2008 PERA-General experience study appeared to be based on some generic "off the shelf" analysis developed by Mercer Investment Consulting, without any disclosure as to how that information was developed. The Mercer Investment Consulting analysis is indicated as being based on a different inflation assumption (2.8%) than the inflation assumption that the Mercer actuarial services portion of the company are proposing to retain (3%), and the experience study indicates that the performance information was adapted for the different inflation assumption, but the manner in which that adaptation was made was also not disclosed.

12) No Individual Annual Actual-to-Expected Results Presented. Although the Standards For Actuarial Work requires individual year actual and expected occurrence data for actuarial assumptions reviewed, the 2004-2009 Mercer PERA-P&F experience study failed to present individual year occurrence data for the inactive retirement actuarial assumption and for the annuity form selection actuarial assumption.

13) No Detailed Service-Related Salary Increase Data Presented. Mercer proposed a major change in the salary increase actuarial assumption, shifting it from the prior age-based increase assumption to a service-based increase assumption, which was implemented for PERA-General by the Commission as part of the 2010 Omnibus Retirement Bill (Laws 2010, Ch. 359, Art. 1, Sec. 68), modified somewhat in response to Milliman's PERA-General experience study review during the 2010-2011 interim and implemented in the 2011 Omnibus Retirement Bill (1st Spec. Sess. Laws 2011, Ch. 8, Art. 3, Sec. 1) along with service-related salary increases for MSRS-General and TRA derived from the 2004-2008 experience studies, and for PERA-P&F based on the 2004-2009 experience study without Milliman review and without apparent modification based on the Milliman criticisms of the PERA-General 2004-2008 experience study. The salary increase assumption information presented in the 2004-2009 PERA-P&F experience study is particularly difficult to analyze because the experience study does not present a breakdown of the salary increase data by service increments, only by age increments, and the "fit" of the new assumption is impossible to ascertain based on only gross at-large actual-to-expected ratios for the total period.

14) Actual-To-Expected Results Do Not Add Correctly. In the actual-to-expected number and ratio presentations for the current healthy post-retirement mortality table female results, the current disabled retirement mortality table male and female results, the current pre-retirement mortality table female results, the proposed pre-retirement mortality table male and female results, and the retirement assumption results totals do not coincide with the sum of the individual year results. The deviation may be a function of dropping decimals in expected results and are not large differentials, but the occurrence does confuse an experience study reader.

15) Unspecific Mortality Table Recommendation. Mercer is proposing a shift from a static mortality table, the 1983 Group Annuity Mortality Table, to a dynamic mortality table, the RP2000 Mortality Table. The table has two potential adjustments, a white collar adjustment and a blue collar adjustment. Mercer is proposing the use of the white collar adjustment. The RP2000 Mortality Table is a projection of longevity improvements to 2000 from various prior years and can be used in the future by incorporating annual longevity improvement adjustments each year based on a prescribed scale table (Scale AA, developed for the Group Annuity Reserving 1994 Mortality Table) or by projecting longevity improvement adjustments based on Scale AA to a certain future year and

generate a static table to be used for a period of years. Mercer is not clear in its recommendations as to what manner expected longevity improvements are to be incorporated into tables to be approved by the Commission under Minnesota Statutes, Section 356.215, Subdivision 18. As discussed later, optional annuity forms and some early retirement reduction factors in Minnesota public pension plans are required by statute (see Minn. Stat., Sec. 353.01, Subd. 14; Sec. 353.30, Subd. 3, 3b, 5) to be the actuarial equivalent of the single retirement annuity or normal retirement age annuity and using a mortality table that changes annually or periodically will require similar revisions in optional annuity factor tables and early retirement annuity reduction factor tables.

16) Lack of Inactive Retirement Actuarial Assumption Change Recommendation. The 2004-2009 PERA-P&F experience study omits any recommendation by Mercer with respect to the assumed age at which retirements would occur for individuals in inactive status. The presented information did not provide the actual-to-expected ratios used in the balance of the experience study. Mercer declined to recommend an assumption change despite acknowledging that actual experience indicates a significant number of inactive participants retiring at ages other than age 55, where the current assumption specifies 100% retirement. Mercer suggests that 2010 legislation reducing post-retirement adjustments and deferred annuity augmentation and 2007 legislation changing the early retirement reduction factors would produce different results in the future. Mercer also argues that the actuarial accrued liability for deferred retirees is less than 5% of the plan's total and that the added complexity of a more refined assumption may not be justified. The assumption likely relates closely to the unexamined Combined Service Annuity utilization loading assumption, since deferred retirees would be strong utilizers of the Combined Service Annuity, but Mercer made no note of that interaction in its unconvincing dismissal of a need to revise the assumption.

17) Poor Termination Assumption Fit. The 2004-2009 Mercer PERA-P&F experience study recommended a change in the select period portion of the select and ultimate termination assumption, but did not recommend a change in the ultimate period portion of the assumption. The data presented by Mercer indicates that the current select period portion of the assumption greatly underestimated the actual experience and that the current ultimate period portion of the assumption was closer to the actual experience. The proposed select period portion of the assumption still significantly underestimates the terminations over the past five years.

Part Five
Historical Summary of Actuarial Gains and Losses

The following tables show Minnesota Public Pension Plans actuarial experience gains (-) and losses (+) from 1986 to 2000, for the period from 1991 to 2000, for the period 1996 to 2000, and annually after 2000 until 2010.

Table 7
Salary Increase Assumption

Plan	2009-2010	2008-2009	2007-2008	2006-2007	2005-2006	2004-2005	2003-2004	2002-2003	2001-2002	2000-2001	1996-2000	1991-2000	1986-2000
MSRS-General	-158,877,000	-22,704,000	-48,586,000	-83,746,773	-79,496,460	-112,124,775	--	-7,148,000	-100,655,000	108,969,000	-125,831,000	-344,439,000	-417,563,000
PERA-General	-169,777,000	-12,262,000	-26,366,000	-101,197,698	-146,764,055	--	-20,387,679	33,730,000	-221,668,000	-50,387,000	-366,202,000	-725,461,000	-817,982,000
TRA	-297,584,000	-16,554,000	51,254,000	--	--	--	--	-59,162,000	-119,422,000	7,300,000	-442,219,000	-1,188,570,000	-1,326,930,000
Subtotal	-626,238,000	-51,520,000	-23,698,000	-184,944,471	-226,260,515	-112,124,775	-20,387,679	-32,580,000	-441,745,000	65,882,000	-934,252,000	-2,258,470,000	-2,562,475,000
MSRS-Corr.	-15,123,000	-3,631,000	-1,540,000	-170,390	-6,102,666	-7,904,270	--	-3,155,000	-6,690,000	-12,263,000	1,576,000	-5,753,000	-7,241,000
State Patrol	-10,626,000	-4,023,000	-4,294,000	215,396	-2,920,024	-7,197,781	--	10,717,000	-8,953,000	-10,122,000	701,000	-1,138,000	-6,369,000
PERA-P&F	-96,316,000	-1,499,000	-28,253,000	-45,220,100	-29,275,893		17,760	-14,079,000	-64,490,000	-5,139,000	-72,046,000	-141,994,000	-158,834,000
P&F Con. Accts.	--	--	--	--	--	--	--	--	--	--	--	--	--
Loc. Govt. Corr.	-5,638,000	-1,372,000	-341,000	-1,070,392	-1,214,136	--	207,896	468,000	376,000	2,110,000	-926,000	-926,000	-926,000
Subtotal	-127,703,000	-10,525,000	-34,428,000	-46,245,486	-39,512,719	-15,102,051	225,656	-6,049,000	-79,757,000	-25,414,000	-70,695,000	-149,811,000	-173,370,000
Legislators	-413,000	60,000	-1,225,000	--	--	--	--	--	-1,595,000	569,000	-5,343,000	-8,495,000	-9,191,000
Elec. St. Off.	0	0	0	--	--	--	--	--	0	0	-236,000	-480,000	-588,000
Judges	-3,495,000	-40,000	-2,359,000	-1,551,189	-2,387,694	-2,666,186	--	1,007,000	1,965,000	-720,000	-7,034,000	-17,215,000	-19,710,000
Subtotal	-3,908,000	20,000	-3,584,000	-1,551,189	-2,387,694	-2,666,186	--	1,007,000	370,000	-151,000	-12,613,000	-26,190,000	-29,489,000
MERF	-2,000	-442,861	-1,860,940	--	--	--	2,145,308	-7,515,000	7,831,000	-149,000	-6,148,000	-14,885,000	7,377,000
DTRFA	--	--	--	--	--	--	--	1,296,000	-3,998,000	-1,811,000	-12,305,000	-56,155,000	-62,594,000
MTRFA	--	--	--	--	--		--	-15,735,000	-17,097,000	-12,689,000	22,101,000	3,902,000	-20,052,000
SPTRFA	-13,954,000	-5,264,000	-4,868,000	--	--	--	--	-8,245,000	-8,292,000	-2,602,000	-20,063,000	-25,499,000	-32,734,000
Subtotal	-13,954,000	-5,264,000	-4,868,000	--	--	--	--	-22,684,000	-29,387,000	-17,102,000	-10,267,000	-77,752,000	-115,380,000
Total	-771,805,000	-67,731,861	-68,438,940	-232,741,146	-268,160,928	-129,893,012	-18,016,715	-67,821,000	-542,688,000	23,066,00	-1,033,975,000	-2,527,108,000	-2,873,337,000

Table 8
Investment Return Assumption

Plan	2009-2010	2008-2009	2007-2008	2006-2007	2005-2006	2004-2005	2003-2004	2002-2003	2001-2002	2000-2001	1996-2000	1991-2000	1986-2000
MSRS-General	572,503,000	723,093,000	403,575,000	-187,380,854	55,910,692	266,051,668	274,167,788	345,598,000	211,865,000	-29,406,000	-1,170,958,000	-1,339,497,000	-1,554,413,000
PERA-General	848,873,000	1,927,455,000	758,806,000	-205,886,745	84,873,894	280,695,109	449,749,410	380,033,000	235,075,000	-24,896,000	-1,230,517,000	-1,425,328,000	-1,722,945,000
TRA	1,061,858,000	3,078,494,000	1,228,867,000	-378,871,708	146,446,633	477,027,445	594,157,408	580,484,000	351,134,000	-63,301,000	-437,398,000	-885,311,000	-1,371,667,000
Subtotal	2,483,234,000	5,729,042,000	2,391,248,000	-772,139,307	287,231,219	1,023,774,222	1,318,074,606	1,306,115,000	798,074,000	-117,603,000	-2,838,873,000	-3,650,136,000	-4,649,025,000

Investment Return Assumption

Plan	2009-2010	2008-2009	2007-2008	2006-2007	2005-2006	2004-2005	2003-2004	2002-2003	2001-2002	2000-2001	1996-2000	1991-2000	1986-2000
MSRS-Corr.	36,603,000	48,978,000	34,378,000	-10,188,061	5,282,955	-7,648,751	27,646,313	19,710,000	11,694,000	-2,628,000	-62,760,000	-70,850,000	-80,384,000
State Patrol	36,437,000	54,220,000	45,173,000	-5,126,728	10,430,339	24,407,199	17,692,716	20,370,000	12,190,000	-2,005,000	-82,780,000	-94,355,000	-110,094,000
PERA-P&F	341,851,000	777,619,000	249,139,000	-93,809,595	46,176,197	158,886,212	--	212,577,000	130,589,000	-14,635,000	-656,932,000	-728,195,000	-813,031,000
P&F Con. Accts.	--	--	--	--	--	--	--	--	--	--	--	--	--
Loc. Govt. Corr.	14,428,000	14,741,000	311,000	-5,018,484	-727,013	404,733	1,725,461	2,591,000	1,585,000	489,000	258,000	258,000	258,000
Subtotal	429,319,000	895,558,000	329,001,000	-114,142,868	61,162,478	176,049,393	47,064,490	255,248,000	156,058,000	-18,779,000	-802,214,000	-893,142,000	-1,003,251,000
Legislators	-948,000	8,146,000	4,897,000	--	--	--	--	--	623,000	562,000	2,759,000	4,914,000	6,587,000
Elec. St. Off.	19,115	18,957	22,610	--	--	--	--	--	17,000	14,000	158,000	301,000	408,000
Judges	8,864,000	7,685,000	14,568,000	-1,600,642	2,737,363	450,168	3,891,745	2,387,000	15,030,000	-2,000	-6,283,000	-7,195,000	-8,761,000
Subtotal	7,935,115	15,849,957	19,487,610	-1,600,642	2,737,363	450,168	3,891,745	2,387,000	15,670,000	574,000	-3,366,000	-1,980,000	-1,766,000
MERF	47,306,000	270,171,052	115,377,024	4,908,970	11,892,784	19,402,232	17,864,808	15,763,000	7,714,000	-5,538,000	-197,268,000	-161,922,000	-210,927,000
DTRFA	29,239,045	26,140,717	-2,165,878	-9,743,992	5,940,799	18,419,965	12,639,583	14,193,000	6,139,000	-5,482,000	-48,167,000	-56,883,000	-75,172,000
MTRFA	--	--	--	--	--	94,426,526	94,369,236	99,686,000	71,199,000	13,655,000	-51,313,000	-115,300,000	-193,272,000
SPTRFA	77,284,000	60,198,000	-28,702,000	-46,420,607	-1,180,976	31,763,741	43,646,529	48,877,000	21,216,000	-8,279,000	2,469,000	-24,317,000	-72,740,000
Subtotal	106,523,045	86,338,717	-30,867,878	-56,164,599	4,759,823	144,610,232	150,655,348	162,756,000	98,554,000	-106,000	-97,011,000	-196,500,000	-341,184,000
Total	3,074,317,160	6,996,959,726	2,824,245,756	-939,138,446	367,783,667	1,364,286,247	1,537,550,997	1,742,269,000	1,076,070,000	-141,452,00	-3,938,732,000	-4,903,680,000	-6,206,153,000

Table 9
Mortality Assumption

Plan	2009-2010	2008-2009	2007-2008	2006-2007	2005-2006	2004-2005	2003-2004	2002-2003	2001-2002	2000-2001	1996-2000	1991-2000	1986-2000
MSRS-General	523,000	4,163,000	9,563,000	190,567,865	-1,688,293	12,432,898	-53,709,413	-8,282,000	20,843,000	3,788,000	20,780,000	28,867,000	33,554,000
PERA-General	33,391,000	58,995,000	-41,173,000	25,060,644	21,781,524	-12,738,334	87,628,749	38,275,000	-122,987,000	-14,319,000	-88,292,000	-44,209,000	16,751,000
TRA	44,520,000	7,566,000	49,721,000					-23,198,000	-10,365,000	-21,143,000	50,487,000	57,010,000	54,848,000
Subtotal	78,434,000	70,724,000	18,111,000	215,628,509	20,093,231	-305,436	33,919,336	6,795,000	-112,509,000	-31,674,000	-17,025,000	41,668,000	105,153,000
MSRS-Corr.	918,000	-196,000	-3,775,000	2,947,950	24,771,591	-25,227,649	8,751,331	664,000	11,694,000	-2,628,000	214,000	1,219,000	847,000
State Patrol	-3,672,000	2,575,000	-4,236,000	4,080,438	5,423,933	7,008,233	-2,339,717	3,281,000	607,000	3,159,000	11,417,000	12,204,000	13,038,000
PERA-P&F	24,019,000	10,528,000	41,222,000	8,126,208	-4,090,833	-10,213,613	33,445,077	21,520,000	-42,416,000	-25,777,000	10,828,000	15,345,000	23,126,000
P&F Con. Accts.	--	--	--	--	--	--	--	--	--	--	19,772,778	24,391,165	25,019,484
Loc. Govt. Corr.	45,000	-176,000	-381,000	-289,659	173,338	-116,162	94,128	-12,000	142,000	-38,000	-2,000	-2,000	-2,000
Subtotal	21,310,000	12,731,000	32,830,000	14,864,937	26,278,029	-28,549,191	39,950,819	25,453,000	-29,973,000	-25,284,000	42,229,778	53,157,165	62,028,484
Legislators	416,000	722,000	1,065,000	--	--	--	--	--	-5,000	105,000	-1,587,000	1,598,000	2,281,000
Elec. St. Off.	130,927	114,224	104,248	--	--	--	--	--	73,000	65,000	-314,000	-375,000	-445,000
Judges	1,016,000	3,659,000	2,810,000	4,758,864	2,152,334	-1,551,119	1,573,253	-1,595,000	1,459,000	1,604,000	1,445,000	6,680,000	6,844,000
Subtotal	1,562,927	4,495,224	3,979,248	4,758,864	2,152,334	-1,551,119	1,573,253	-1,595,000	1,527,000	1,774,000	-456,000	7,903,000	8,680,000

Mortality Assumption

Plan	2009-2010	2008-2009	2007-2008	2006-2007	2005-2006	2004-2005	2003-2004	2002-2003	2001-2002	2000-2001	1996-2000	1991-2000	1986-2000
MERF	7,297,000	-280,213	2,390,845	--	--	--	--	10,513,000	7,714,000	-5,538,000	10,105,000	9,227,000	7,755,000
DTRFA	--	--	--	--	--	--	--	-1,290,000	-1,207,000	-2,194,000	-1,796,000	-595,000	-24,670,000
MTRFA	--	--	--	--	--			-18,966,000	-5,007,000	848,000	13,761,000	-19,411,000	-16,618,000
SPTRFA	1,666,000	482,000	700,000	--	--	--	--	-1,742,000	-2,106,000	-2,475,000	-29,103,000	-35,268,000	-38,898,000
Subtotal	1,666,000	482,000	700,000	--	--	--	--	-21,998,000	-8,320,000	-3,821,000	-17,138,000	-55,274,000	-80,186,000
Total	110,269,927	88,152,011	58,011,093	235,252,310	48,523,594	-30,405,746	75,443,408	19,168,000	-141,561,000	-64,543,000	17,715,778	56,681,165	103,430,484

Table 10
Other Assumptions

Plan	2009-2010	2008-2009	2007-2008	2006-2007	2005-2006	2004-2005	2003-2004	2002-2003	2001-2002	2000-2001	1996-2000	1991-2000	1986-2000
MSRS-General	-16,607,000	-35,288,000	-19,225,000	178,345,541	-71,210,243	180,135,358	-348,711,687	79,388,000	45,958,000	13,977,000	210,148,000	161,489,000	365,317,000
PERA-General	-5,827,000	34,954,000	-580,869,000	54,745,501	19,258,463	115,912,246	229,441,993	103,118,000	48,659,000	31,733,000	407,022,000	730,865,000	1,134,284,000
TRA	119,882,000	98,169,000	-45,753,000	-6,572,078	-41,724,091	-167,807,618	-15,831,440	451,185,000	11,405,000	4,892,000	616,885,000	1,170,772,000	1,445,631,000
Subtotal	97,448,000	97,835,000	-645,847,000	226,518,964	-93,675,871	128,239,986	-135,101,134	633,691,000	106,022,000	50,602,000	1,234,055,000	2,063,126,000	2,945,232,000
MSRS-Corr.	18,486,000	-2,619,000	2,318,000	4,474,443	2,483,954	40,523,289	-17,743,193	7,053,000	9,225,000	12,702,000	35,948,000	29,639,000	37,672,000
State Patrol	3,266,000	3,673,000	181,000	-2,580,973	-7,438,387	-6,509,045	-10,307,625	632,000	2,794,000	209,000	12,921,000	-8,901,000	-3,126,000
PERA-P&F	-11,201,000	10,343,000	-79,796,000	148,110,726	37,038,388	5,469,190	115,588,518	69,944,000	20,098,000	58,959,000	194,138,000	196,059,000	218,207,000
P&F Con. Accts.	--	--	--	--	--	--	--	--	--	--	-134,063,938	-272,790,818	-290,462,162
Loc. Govt. Corr.	321,000	2,712,000	1,489,000	3,139,126	895,198	2,114,595	1,374,341	2,056,000	-554,000	663,000	463,000	463,000	463,000
Subtotal	10,872,000	14,109,000	-75,808,000	153,143,322	32,979,153	41,598,029	88,912,041	79,685,000	31,563,000	72,533,000	109,406,062	-55,530,818	-37,246,162
Legislators	-439,000	-1,405,000	928,000		-3,456,020	-728,319	4,473,062	--	-455,000	1,027,000	3,452,000	189,000	2,822,000
Elec. St. Off.	-25,695	-10,166	-59,537		-98,344	62,790	-75,779	--	71,000	217,000	65,000	-187,000	158,000
Judges	-678,000	3,377,000	4,742,000	89,335	737,645	-1,448,176	4,070,686	776,000	-3,848,000	156,000	7,912,000	3,185,000	7,555,000
Subtotal	-1,142,695	1,961,834	5,610,463	89,335	-2,816,719	-2,113,705	8,467,969	776,000	-4,232,000	1,400,000	11,429,000	3,187,000	10,535,000
MERF	22,940,000	54,409,944	20,073,971	2,776,635	14,932,144	-6,592,764	16,826,413	8,230,000	15,073,000	25,640,000	62,682,000	70,618,000	114,951,000
DTRFA	1,283,443	-10,572,081	3,615,145	-2,023,843	-525,771	-2,614,704	1,242,805	666,000	3,459,000	1,706,000	10,542,000	17,842,000	25,548,000
MTRFA	--	--	--	--	--	-17,123,151	9,882,415	6,000,000	8,686,000	17,173,000	22,223,000	59,140,000	115,434,000
SPTRFA	-4,047,000	-3,569,000	-2,647,000	-29,685,327	8,402,689	-4,696,564	8,836,764	4,479,000	3,239,000	9,695,000	-17,033,000	-15,000,000	6,235,000
Subtotal	-2,763,557	-14,141,081	968,145	-31,709,170	7,876,918	-24,434,419	19,961,984	11,145,000	15,384,000	28,574,000	15,732,000	61,982,000	147,217,000
Total	127,353,748	154,174,697	-695,002,421	350,819,086	-40,704,375	136,697,127	-932,727	733,527,000	163,810,000	178,749,000	1,433,304,062	2,143,382,182	3,180,688,838

Table 11
Total Experience Gains and Losses

Plan	2009-2010	2008-2009	2007-2008	2006-2007	2005-2006	2004-2005	2003-2004	2002-2003	2001-2002	2000-2001	1996-2000	1991-2000	1986-2000
MSRS-General	397,542,000	669,264,000	345,327,000	97,785,779	-96,484,304	346,495,149	-128,253,312	409,556,000	178,011,000	-128,186,000	-1,065,861,000	-1,493,580,000	-1,573,105,000
PERA-General	706,660,000	2,009,142,000	110,398,000	-227,278,298	-20,850,174	383,869,021	746,432,473	555,156,000	-60,921,000	-57,869,000	-1,277,989,000	-1,464,133,000	-1,389,892,000
TRA	928,676,000	3,167,675,000	1,284,089,000	-385,443,786	104,722,542	309,219,827	578,325,968	949,309,000	232,752,000	-72,252,000	-212,245,000	-846,099,000	-1,198,118,000
Subtotal	2,032,878,000	5,846,081,000	1,739,814,000	-514,936,305	-12,611,936	1,039,583,997	1,196,505,129	1,914,021,000	349,842,000	-258,307,000	-2,556,095,000	-3,803,812,000	-4,161,115,000
MSRS-Corr.	40,884,000	42,532,000	31,381,000	-2,936,058	26,435,834	-257,381	18,654,451	24,272,000	15,300,000	-5,521,000	-25,022,000	-45,745,000	-49,106,000
State Patrol	25,405,000	56,445,000	36,824,000	-3,411,867	5,495,861	17,708,606	5,045,374	35,000,000	6,638,000	-8,759,000	-57,741,000	-92,190,000	-106,551,000
PERA-P&F	258,353,000	796,991,000	182,312,000	17,207,239	49,847,859	154,141,789	149,051,355	289,962,000	43,781,000	13,408,000	-524,012,000	-658,785,000	-730,532,000
P&F Con. Accts.	--	--	--	--	--	--	--	--	--	--	-114,291,160	-248,399,653	-265,442,678
Loc. Govt. Corr.	9,156,000	15,905,000	1,078,000	-3,239,409	-872,613	2,403,166	3,401,826	5,103,000	1,549,000	3,224,000	-207,000	-207,000	-207,000
Subtotal	333,798,000	911,873,000	251,595,000	7,619,905	80,906,941	173,996,180	176,153,006	354,337,000	67,268,000	2,352,000	-721,273,160	-1,045,326,653	-1,151,838,678
Legislators	-1,384,000	7,523,000	5,665,000	0	-3,456,020	-728,319	4,473,062	--	-1,432,000	2,263,000	-719,000	-1,794,000	2,499,000
Elec. St. Off.	124,347	123,015	67,321	0	-98,344	62,790	-75,779	--	161,000	296,000	-327,000	-741,000	-467,000
Judges	5,707,000	14,681,000	19,761,000	1,696,368	3,239,648	-5,215,313	9,535,684	2,575,000	1,079,000	1,038,000	-3,960,000	-14,545,000	-14,072,000
Subtotal	4,447,347	22,327,015	25,493,321	1,696,368	-314,716	-5,880,842	13,932,967	2,575,000	-192,000	3,597,000	-5,006,000	-17,080,000	-12,040,000
MERF	77,541,000	323,857,922	135,980,900	7,685,605	26,824,928	12,809,468	36,836,529	26,991,000	24,437,000	12,767,000	-130,629,000	-96,962,000	-80,844,000
DTRFA	30,522,488	15,568,636	1,449,267	-11,767,835	5,415,028	15,805,261	13,882,388	14,865,000	4,393,000	-7,781,000	-51,726,000	-95,791,000	-136,888,000
MTRFA	--	--	--	--	--	77,303,375	104,251,651	58,985,000	57,781,000	18,987,000	6,772,000	-71,669,000	-114,508,000
SPTRFA	60,949,000	51,847,000	-35,517,000	-76,105,934	7,221,713	27,067,177	52,483,293	43,369,000	14,057,000	-3,660,000	-63,730,000	-100,084,000	-138,137,000
Subtotal	91,471,488	67,415,636	-34,067,733	-87,873,769	12,636,741	120,175,813	170,617,332	117,219,000	76,231,000	7,546,000	-108,684,000	-267,544,000	-389,533,000
Total	2,540,135,835	7,171,554,573	2,118,815,488	-585,808,196	107,441,958	1,340,684,616	1,594,044,963	2,415,143,000	517,586,000	-232,045,000	-3,521,687,160	-5,230,724,653	-5,795,370,678

Part Six
Discussion of Specific Actuarial Assumptions

a. Interest/Investment Performance Assumption. This portion of the memo provides background on the assumed rate of return (also referred to as the interest rate assumption) as used by our pension funds, the role that assumption plays in the annual actuarial reviews, and the relationship of the actuarial return assumption to provisions in pension plan laws, such as refund provisions, service credit purchases, optional annuity forms, and post-retirement adjustments. Also included is a review of actual investment performance by the State Board of Investment (SBI) and other large plans.

The term "interest rate assumption" stems from the very distant past when pension fund investments in equities were not permitted, so all investments were fixed income and income generated for the portfolio was due to interest. Given that permissible investment provisions were revised decades ago to permit equity investments, and that currently equity investments predominate pension fund portfolios, the term "rate of return assumption" makes considerably more sense.

1. Importance of Rate of Return Assumption. The rate of return assumption is a critical assumption in actuarial studies, playing a major role in budgeting for pension liabilities over time, because investment returns are the largest source of pension fund assets. Last session in recent testimony before House committees, the executive director of the State Board of Investment (SBI) and the executive directors of Minnesota State Retirement System (MSRS), the Public Employees Retirement Association (PERA), and the Teachers Retirement Association (TRA) stated that 67% of the assets in the SBI combined fund (the accumulated assets of the MSRS, PERA, and TRA plans) are attributable to investment returns, while 18% represent the accumulated employer contributions and 15% is the accumulated employee contributions. These results are due to investment performance which over very long periods was slightly above the current 8.5% investment return assumption.

   The liabilities computed in actuarial valuations are sensitive to changes in the expected investment returns to be earned by the pension plan over time. If the investment return assumption were revised downward, this will increase the computed liabilities. The amortization requirement will increase considerably because those dollars, after they are added to the fund, are not expected to grow as fast, requiring larger payments to the fund to meet the eventual benefit payouts. Given the contribution rates specified in law, the contribution deficiency will increase, indicating a need to increase employee and employer contribution rates to accept a greater role in funding the plans. These results were indicated in work by Mercer, the actuarial consultant used by MSRS, PERA, and TRA, which last year provided estimates of the impact of moving from an 8.5% assumed investment return to an 8.0% return. To illustrate the effects, the actuary's work on two of the plans is summarized here. The actuary noted the following changes for TRA, based on the TRA July 1, 2009 actuarial valuation, and for MSRS-General, based on that plan's 2010 actuarial valuation. The funding ratio would fall because of the increase in liabilities and the amortization requirement increases considerably. For TRA, the required contributions as computed by the actuary increases by 2.9% of payroll, while the increase in MSRS required contributions is 2.1% of payroll.

Table 12
TRA – Actuarial Value of Assets

	Actuarial Condition as of July 1, 2009		0.5% Decrease in Interest Assumption		Resulting Actuarial Condition	
Membership						
Active Members		77,786		--		77,786
Service Retirees		46,108		--		46,108
Disabilitants		624		--		624
Survivors		3,476		--		3,476
Deferred Retirees		12,490		--		12,490
Nonvested Former Members		23,073		--		23,073
Total Membership		163,557		--		163,557
Funded Status						
Accrued Liability		$23,114,802,000		$1,496,274,000		$24,611,076,000
Current Assets		$17,882,408,000		$0		$17,882,408,000
Unfunded Accrued Liability		$5,232,394,000		$1,496,274,000		$6,728,668,000
Funding Ratio	77.36%		(4.70%)		72.66%	
Financing Requirements						
Covered Payroll		$4,049,217,000		--		$4,049,217,000
Benefits Payable		$1,381,366,000		--		$1,381,366,000
Normal Cost	8.88%	$359,579,000	0.71%	$28,749,000	9.59%	$388,328,000
Administrative Expenses	0.28%	$11,338,000	--	--	0.28%	$11,338,000
Normal Cost & Expense	9.16%	$370,917,000	0.71%	$28,749,000	9.87%	$399,666,000
Normal Cost & Expense	9.16%	$370,917,000	0.71%	$28,749,000	9.87%	$399,666,000
Amortization	7.66%	$310,170,000	2.19%	$88,697,000	9.85%	$398,867,000
Total Requirements	16.82%	$681,087,000	2.90%	$117,446,000	19.72%	$798,533,000

TRA – Actuarial Value of Assets

	Actuarial Condition as of July 1, 2009		0.5% Decrease in Interest Assumption		Resulting Actuarial Condition	
Employee Contributions	5.50%	$222,860,000		--	5.50%	$222,860,000
Employer Contributions	5.69%	$230,325,000		--	5.69%	$230,325,000
Employer Add'l Cont.	0.00%	$0		--	0.00%	$0
Direct State Funding	0.44%	$17,948,000		--	0.44%	$17,948,000
Other Govt. Funding	0.06%	$2,500,000		--	0.06%	$2,500,000
Administrative Assessment	0.00%	$0		--	0.00%	$0
Total Contributions	11.70%	$473,633,000		--	11.70%	$473,633,000
Total Requirements	16.82%	$681,087,000	2.90%	$117,446,000	19.72%	$798,533,000
Total Contributions	11.70%	$473,633,000	--	--	11.70%	$473,633,000
Deficiency (Surplus)	5.12%	$207,454,000	2.90%	$117,446,000	8.02%	$324,900,000

Table 13
MSRS-General – Actuarial Value of Assets

	Actuarial Condition as of July 1, 2010		0.5% Decrease in Interest Assumption		Resulting Actuarial Condition	
Membership						
Active Members		48,494		--		48,494
Service Retirees		23,337		--		23,337
Disabilitants		1,684		--		1,684
Survivors		3,414		--		3,414
Deferred Retirees		15,388		--		15,388
Nonvested Former Members		6,537		--		6,537
Total Membership		98,854		--		98,854
Funded Status						
Accrued Liability		$10,264,071,000		$610,400,000		$10,874,471,000
Current Assets		$8,960,391,000		$0		$8,960,391,000
Unfunded Accrued Liability		$1,303,680,000		$610,400,000		$1,914,080,000
Funding Ratio	87.30%		(4.90%)		82.40%	
Financing Requirements						
Covered Payroll		$2,483,519,000		--		$2,483,519,000
Benefits Payable		$473,447,000		--		$473,447,000
Normal Cost	7.77%	$193,027,000	0.90%	$22,352,000	8.67%	$215,379,000
Administrative Expenses	0.23%	$5,712,000	--	--	0.23%	$5,712,000
Normal Cost & Expense	8.00%	$198,739,000	0.90%	$22,352,000	8.90%	$221,091,000
Normal Cost & Expense	8.00%	$198,739,000	0.90%	$22,352,000	8.90%	$221,091,000
Amortization	2.99%	$74,200,000	1.20%	$29,803,000	4.19%	$104,003,000
Total Requirements	10.99%	$272,939,000	2.10%	$52,155,000	13.09%	$325,094,000
Employee Contributions	5.00%	$124,176,000		--	5.00%	$124,176,000
Employer Contributions	5.00%	$124,176,000		--	5.00%	$124,176,000
Employer Add'l Cont.	0.00%	$0		--	0.00%	$0
Direct State Funding	0.00%	$0		--	0.00%	$0
Other Govt. Funding	0.00%	$0		--	0.00%	$0
Administrative Assessment	0.00%	$0		--	0.00%	$0
Total Contributions	10.00%	$248,352,000		--	10.00%	$248,352,000
Total Requirements	10.99%	$272,939,000	2.10%	$52,155,000	13.09%	$325,094,000
Total Contributions	10.00%	$248,352,000	--	--	10.00%	$248,352,000
Deficiency (Surplus)	0.99%	$24,587,000	2.10%	$52,155,000	3.09%	$76,742,000

Any change in the assumed investment rate of return also will have ripple effects through the plan's benefits. Due to legislation passed in the 2010 and 2011 session, the first class city teacher plans and MSRS, PERA, and TRA plans all have post-retirement adjustment procedures which depend on the computed funding ratio. Post-retirement adjustments are reduced until funding ratios improve, and in the case of the Duluth Teachers Retirement Fund Association (DTRFA), no increase at all is payable until the plan's funding ratio is at least 80% based on market value. A decrease in the assumed investment return assumption lowers the funding ratio, delaying the date at which improved adjustments for retirees can be made. The change will also impact optional annuities. If a retiree takes an optional annuity to provide continuing income to the spouse after the death of the retired public employee, the retiree's monthly annuity is reduced to pay for that coverage. The amount of the reduction is a function of the assumed investment return. Lowering the return assumption will require larger reductions in the monthly annuity. The cost of full actuarial value service credit purchases will automatically increase if the rate of return assumption is lowered. The Legislature may also feel a need to revise refund interest rates, and/or refund repayment interest rates to maintain the relationship of these rates to the revised investment return assumption.

Given the negative impact of a reduction in the investment return assumption, the Legislature may chose to decide that a reduction in the rate of return assumption should not be made unless there is considerable evidence that the current 8.5% rate of return is too optimistic. However, failure to act if a reduction is justified also has negative implications. If actual long-term returns are below the estimate, future taxpayers may need to bear a disproportionate share of the load.

2. Desirable Characteristics of Rate of Return Assumption. Two desirable characteristics of a rate of return assumption are accuracy and consistency. The assumption ought to be the best estimate of the long-term return expected to be earned by the pension fund. Frequent changes in the investment return assumption are not desirable. As suggested above, frequent changes could cause similar individuals to be treated quite differently, depending upon the assumptions in place in the year the individual retires. Frequent changes will also undermine the usefulness of the annual actuarial reports. These reports are intended as a budgeting tool, permitting the employers and the Legislature to determine whether contributions to the fund are adequate to keep the fund on track for full funding by the required full funding date. Frequent changes in the investment return assumption can produce radical differences in the actuarial report results from one year to the next, undermining their usefulness.

   Unfortunately, estimating the long-term investment return is not an easy task. It is an attempt to read the future, but that future is unknowable. In practice, estimates of future long-term returns generally are based on past results, with thought given to how those results may change in the future.

3. Role of Investment Portfolio Composition in Determining Rate of Return. In considering current investment return assumptions and whether to change those assumptions, it is useful to begin with the role that portfolio composition has on the rate of return. The portfolio is composed of various asset classes or asset groups. Once it is decided what asset classes to include, the long-term return earned by a given portfolio is a function of the return earned by the asset classes and the ability of the investment managers to capture that return. This can be illustrated using some information found on internet, with returns for the 1925-2004 period. For this entire period small domestic stock provided a 12.7% annualized return. The return on large domestic stock was 10.4% annualized. The return to bonds was 5.4%, and the T-bill return was 3.7%. These results reflect the risk inherent in these various asset classes. T-bills are very short-term (90 day) and secure. On the other extreme is small stock, with a high return on average but with volatile returns. Large cap stocks provide somewhat less volatile results but with a lesser return.

   Given these asset class or asset group returns, the long-term total portfolio pension fund return depends on the portion of the total portfolio devoted to each asset type, as indicated below, assuming the pension fund succeeds in capturing the market return. Devoting more of the portfolio to equities provides a higher return. Moving away from equities lowers the return. If the pension fund invested in nothing but small stocks, the return would be very high, 12.7%. This is labeled as Scenario 1 below. In practice, however, the volatility of the returns from year to year and resulting fluctuations in annual contribution requirements would be too great. Given consideration of risk tolerance, the plan administrators are far more likely to use a blend of assets classes, providing a lower but more stable annual return. If the pension fund devotes a quarter of its total portfolio to each of these assets classes (Scenario 2), it would earn an 8.1% return. Scenario 3 is closer to standard policy for a modern pension fund. Seventy percent of assets are devoted to equities (10% of the total portfolio is in small stock and 60% in large cap stocks). The pension fund holds little cash (T-bills), only 5% of the total portfolio, while the remainder is in bonds. This result provides a 9.1% total portfolio return. The final situation depicted is an ultra-conservative portfolio, where all assets are kept in cash securities. That would result in a 3.7% return.

Table 14
Range of Total Portfolio Returns Given Asset Class Returns
1925-2004 Period

	Asset Class or	Percentage of Portfolio			
Asset class or group	Group Return	Scenario 1	Scenario 2	Scenario 3	Scenario 4
Small stock	12.7%	100%	25%	10%	0%
Large stock	10.4%	0%	25%	60%	0%
Bonds	5.4%	0%	25%	25%	0%
T-Bills	3.7%	0%	25%	5%	100%
Total Portfolio Return		12.7%	8.1%	9.1%	3.7%

   The above demonstration assumes that the pension fund administration succeeds in capturing the returns offered by these markets. The most straight-forward way to achieve this is to invest through highly efficient index funds (investment vehicles designed to produce a return matching the market being tracked). However, this may not be practical for all assets of large pension funds, and none of our larger pension funds index all their assets. SBI uses a combination of indexing (passive management) and active management for most larger asset classes. Index funds exist for the domestic stock market as a whole, and for virtually every subgroup of that market, for bonds, and for foreign stock markets. Pension funds have had some success beating bond indices and foreign stock market indices.

4. Actual Minnesota Large Plan Asset Mix and Short- and Long-Term Investment Performance. To determine whether rate of return assumptions ought to be changed, information regarding the rates of return our larger pension fund systems have earned is a useful starting point. This portion of the memo reviews the actual total portfolio investment performance of our larger Minnesota public pension plans, along with their recent asset mix. The included pension funds included here are the SBI Combined Fund (the combined MSRS, PERA, and TRA assets), Bloomington Firefighters Relief Association (a quasi-volunteer fire plan and the state's largest volunteer fire plan fund based on assets), the Duluth Teachers Retirement Fund Association (DTRFA), the St. Paul Teachers Retirement fund Association (SPTRFA), the Minneapolis Firefighters Relief Association (MFRA), and the Minneapolis Police Relief Association (MPRA).

   The asset mix of the larger Minnesota public pension funds as of the end of calendar 2009 is shown below. The information on the SBI Combined Fund is from an SBI quarterly report. Information on the remaining funds is from Office of the State Auditor large plan investment performance reports. The break down between domestic equities, international equities, and the miscellaneous "other" category unfortunately is not fully consistent across funds. Some plans, the MPRA is an example, has an allocation to "global equities" that is included in the international equity percentage. Global equity managers generally try to pick what they feel are the best stocks, regardless of where the company is located. Thus, global equity managers have a portion of their portfolio in domestic U.S. companies. That may account for the low percentage of the MPRA portfolio included under the domestic stock category. Some domestic equity holdings instead are showing up under international equities. The MPRA "other" category includes some venture capital. For some other plans, venture capital might be lumped under the domestic equity category.

   All the plans have a significant allocation to international equity. In the last two decades foreign stock has become a standard component of pension fund portfolios, as plan administrators seek to tap additional returns and add more stability to the portfolio by diversifying asset holdings.

   Most assets are in equities of various forms. The cash and bond categories are the only significant sources of debt investments in these portfolios. Of the six pension funds included in the table, only Bloomington Fire and DTRFA had less than 70% of their assets in equities.

   Regarding total assets, the total assets in all these systems added together was $42.7 billion. SBI predominates with over $41 billion in assets, which is over 96% of the total. The other pension systems combined invested less than 4% of combined total pension fund assets.

Table 15
Total Assets and Asset Mix
Calendar Year End 2009

		Percent of the Total Portfolio in:				
Fund	Total Assets	Cash	Bonds	Domestic Stocks	International Stocks	Other
SBI Combined Fund	$41,079,070,000	2.5%	21.4%	46.7%	15.2%	14.2%
Bloomington Fire	99,017,000	7.1	33.8	44.9	14.2	--
DTRFA	201,624,000	2.1	35.6	41	15.2	0.7
SPTRFA	869,991,000	0.7	18.0	44.2	28.5	8.6
Minneapolis Fire	212,357,000	4.3	25.1	50.4	20.1	0.1
Minneapolis Police	281,931,000	1.3	27.4	36.3	35	4.1
	$42,743,990,000					

   The Total Portfolio Returns table below provides information on total portfolio rates of return for these pension funds, both short-run and long-term. The rate of return data covers calendar year 1994 through the end of 2010, a 17-year period. The annual returns come from several sources. The returns from 1994 through 2004 are taken from our last investment performance review, which was provided in 2005, and those returns are as reported to us by the pension fund administrators. The 2005 through 2009 returns for funds other than SBI are as reported by the Office of the State Auditor in that office's large public pension fund investment performance reports. The 2010 returns for the funds other than SBI come from several sources. The Bloomington Fire, MFRA, and MPRA 2010 returns were provided to us by e-mail from the applicable pension plan administrators. The DTRFA and SPTRFA returns were available on their websites. The 2005 through 2010 SBI returns are as reported in SBI quarterly reports.

   Also included in the table are returns to a benchmark portfolio with the same portfolio composition as the benchmark portfolio we used in our 2005 investment performance report. This portfolio has a somewhat more conservative asset mix than most of the larger pension funds now carry. This benchmark portfolio is composed of domestic investment-grade bonds and domestic

stocks, with 40% of the portfolio invested in bonds and 60% in stock. The bonds earn the return offered by the investment-grade bond market, and similarly, the stocks earn the return offered by the domestic stock market. The returns earned on the portfolio's stocks and bonds could be obtained by investing in well managed index funds which track these markets, with rebalancing as necessary to maintain the 40%/60% asset mix. By having a lower portion of the portfolio in equities than many of the pension funds, this portfolio will not gain as much in years when equity returns are strong, but it also does not lose as much in particularly bad years.

The 1994-2010 period included some very difficult investment years. The returns to all pension funds were volatile. There were some good years, but also years with strong negative returns. Most of the funds had negative returns in 1994 but two of the funds, the first class city teacher retirement funds, had positive returns in that year. Those returns were less than 1%. Bloomington Fire reported a very low return 1994 return of negative 9.1%, far worse than the other plans, putting that plan far behind the others. In 2000, 2001, and 2002 all the plans had negative returns, with 2002 being the worst in that three-year period. Again, Bloomington Fire's return was the lowest, with a negative 14.3% 2002 return. In 2008 the funds were hit by the effect of the Great Recession. All the funds lost at least a quarter of their value. The worst performing fund that year, by a sizable margin, was the DTRFA with a negative 35.1% return.

The table also includes multi-year returns to provide some long-term prospective. The three-year return covers the 2008 through 2010 period. Although there was a strong market recovery in 2009 and 2010, with the pension funds posting 2009 returns ranging from 15.6% to 27.2%, and 2010 returns from 11.9% to 16.0%, the extreme negative returns for all the funds in 2008 pulled the three-year returns down considerably. Among the pension funds, SBI, MFRA, and MPRA three-year returns were barely positive (each of these funds had a 0.5% return), while the other three pension funds had negative returns. The lowest was the DTRFA, with a negative 3.5% return, pulled down by that fund's negative 35.1% return in 2008. The best performer by far was the index portfolio, with a 2.6% positive return. The reason primarily lies in the asset mix. Because of the sizable bond component, that portfolio was not harmed as much as the pension funds were in 2008.

The five-year returns, covering 2006 through the end of 2010, were also strongly impacted by the 2008 market. For the pension funds, the best results for that five-year period were provided by SBI and the MFRA. Each had a five-year return of about 5%. The index portfolio did equally well, also providing a 5.0% return, again largely due to outperforming the pension funds in 2008. The DTRFA was worst, with a 1.9% five-year annualized return. Looking at the SBI and DTRFA returns for the individual years in that five-year period is instructive. The DTRFA noticeable lagged SBI in 2007, with a 6.6% return compared to SBI's 9.5% return. The DTRFA 2008 return, negative 35.1%, was nearly nine full percentage points below SBI, and well below the other funds also. The DTRFA again underperformed SBI in 2009. The 2010 DTRFA return, 16.0%, was well above SBI or any other fund in the group, but that one year was not nearly enough to compensate for earlier underperformance.

For the ten-year period (2001through 2010), there were a few years of negative returns at the start of that period in addition to the pounding that the funds took later in 2008, but some other years provided healthy returns. For that period as a whole, the fund with the highest ten-year annualized return was SPTRFA, with a 5.9% annualized return. SBI was next with 4.9%. The reason for this result is that the SPTRFA did very well in the early years of this ten-year period. In 2001 and 2002 all the funds had negative returns, but the SPTRFA managed to lose less than the other plans. The SPTRFA also did well when better investment markets returned. Its 2003 return, 27%, was strong, although the DTRFA did have a higher return that year. In 2004, 2005, and 2006, the SPTRA return in each year was higher than any other fund. For ten-year period the index portfolio did fairly well, helped again by its bond component. The index portfolio's ten-year annualized return was 4.5%. That was a better result than that posted by DTRFA, Bloomington Fire, and MPRA.

For the full 17-year period, the SPTRFA and the MFRA are tied for the highest 17-year annualized return, with 8.2%. SBI is next with an 8.0% return, and the index portfolio did nearly as well with a 7.9% return. The other pension funds (DTRFA, Bloomington Fire, and MPRA) trail by noticeable amounts. The DTRFA's 17-year annualized return, 7.2%, noticeably lags SBI's 8.0% return, and further lags the SPTRFA and MFRA 8.2% annualized returns. The Bloomington Fire 5.4% return and the MPRA 6.2% return are substantially below the long-term results provided by the better performing pension funds, or the simple index fund. These weak performance results noticeably impact the cost of operating the Bloomington Fire and Minneapolis Police plans. More contributions are needed to finance any given level of pension benefits. Consider a dollar invested at the beginning of the period. The annualized return is the return which provides the same growth of that dollar as the variable stream of returns generated by the

fund's investment activities. For example, the Bloomington Fire 5.4% 17-year annualized return provides the same growth as the variable stream of annual returns indicated for that fund in the following table. A dollar earning a 5.4% return for 17 years will grow to $2.44 at the end of the period. If that dollar had instead been invested at SBI's 8.0% return, after 17 years that dollar would have grown to $3.77. At the 8.2% annualized rate computed for the SPTRFA and MFRA, that dollar would have grown to $3.81.

Some additional rate of return information is available for SBI, although it is not shown in the table. The March 2011 SBI quarterly report, which provided SBI returns through the end of calendar year 2010, also includes SBI's 20-year return ending on that date. That 20-year average (annualized) return was 9.0%.

Table 16
Total Portfolio Returns
Calendar Years 1994-2009 and Multiple-Year Annualized Returns

Year	SBI Combined Fund	DTRFA	SPTRFA	Bloomington Fire	Minneapolis Fire	Minneapolis Police	Index Portfolio 40% Bond/ 60% Stock
1994	-0.4%	0.2%	0.3%	-9.1%	-1.8%	-1.3%	-1.3%
1995	25.5	25.5	26.2	26.1	26.6	20.6	29.3
1996	15.3	13.4	12.6	12.5	14.0	12.5	14.1
1997	21.5	15.5	19.6	19.7	23.8	12.7	22.7
1998	16.1	11.1	12.0	13.8	21.9	11.4	17.5
1999	16.5	29.4	13.6	13.2	17.8	11.1	13.9
2000	-2.8	-1.6	-0.2	-3.9	-2.7	-2.0	-1.9
2001	-6.0	-4.7	-1.4	-7.8	-3.3	-4.1	-3.2
2002	-11.6	-12.8	-9.6	-14.3	-10.5	-10.1	-8.4
2003	23.1	28.1	27.0	19.9	19.6	22.3	20.6
2004	12.4	10.6	14.1	9.5	10.1	10.1	9.3
2005	9.9	7.6	9.9	4.7	6.6	6.0	4.8
2006	14.6	14.7	15.6	13.0	12.5	13.8	11.2
2007	9.5	6.6	8.1	6.9	11.5	6.9	6.2
2008	-26.2	-35.1	-28.2	-25.2	-28.7	-29.5	-20.2
2009	20.3	19.2	22.4	15.6	27.2	26.7	19.5
2010	14.4	16.0	13.7	12.8	11.9	13.7	13.1
Annualized Returns							
3-year	0.5%	-3.5%	-0.02%	-0.8%	0.5%	0.5%	2.6%
5-year	5.0	1.9	4.5	3.3	4.9	4.3	5.0
10-year	4.9	3.3	5.9	3.4	4.5	4.3	4.5
17-year	8.0	7.2	8.2	5.4	8.2	6.2	7.9

Further information on SBI ending a few months earlier, June 30, 2010, was provided to the Legislature during the 2011 Legislative Session. During the session, SBI Executive Director Howard Bicker testified before House committees and provided an SBI rate of return summary for periods ending June 30, 2010, based on fiscal years. The SBI five-year return ending June 30, 2010 was 3.4% and the ten-year return was 2.9%. Again, the results reflect the very bad 2008 market. But he also provided information about much longer periods ending June 30, 2010. The SBI 25-year annualized return was 9.0% and its return since 1980 (approximately 30 years) was 9.7%. These are comfortably above the 8.5% rate of return assumption used for SBI.

5. Volatility of Markets: Implication for Rate of Return Assumption. Much of SBI's pension assets and those of any typical pension fund are invested in equities, primarily the domestic stock market or other domestic equity holdings, but also foreign markets. Since stock returns are a key driver in producing the pension fund's total portfolio return, it is useful to review long-term stock market returns to be aware of the volatility of those returns. The review may provide some insight and guidance if the Commission and Legislature considers revising the current rate of return assumption.

   Graph 5 displays the domestic stock market returns from 1950 through 2010. The stock market returns are very variable. The return from year to year is never the same, and rarely close. The current year's return is a very poor predictor of next year's return. Because of that variability, the returns to any pension fund heavily invested in equities will also be very variable, although diversification into other assets classes will help to dampen that variability. Also, in every decade, even those that provided excellent returns for the decade as a whole, there was at least one year and generally more where the stock return was negative.

   Below the graph are ten-year average (annualized) returns, summarizing returns in each decade. Of the last 60 years, the 1950s provided the highest stock returns, equivalent to 19.5% per year. However, even in that exceptional decade, there were two years (1953 and 1957) where the return

was negative. In the 1960s the annualized return is 7.7%, much lower than the 1950s, and in the 1960s there were three years with negative returns. In the 1970s the annualized return was 8.8%, and there were again three years with negative returns. The 1980s were an exceptional decade, with a 17.3% annualized return and only one year with a negative return, 1981. The 1990s was another excellent decade for investing, with an 18.1% annualized return and only one year with a negative return. The last decade is highly unusual, with the worst investment results since the Great Depression. The annualized return for the first decade of this century was negative 1.0%, and there were four years with negative returns.

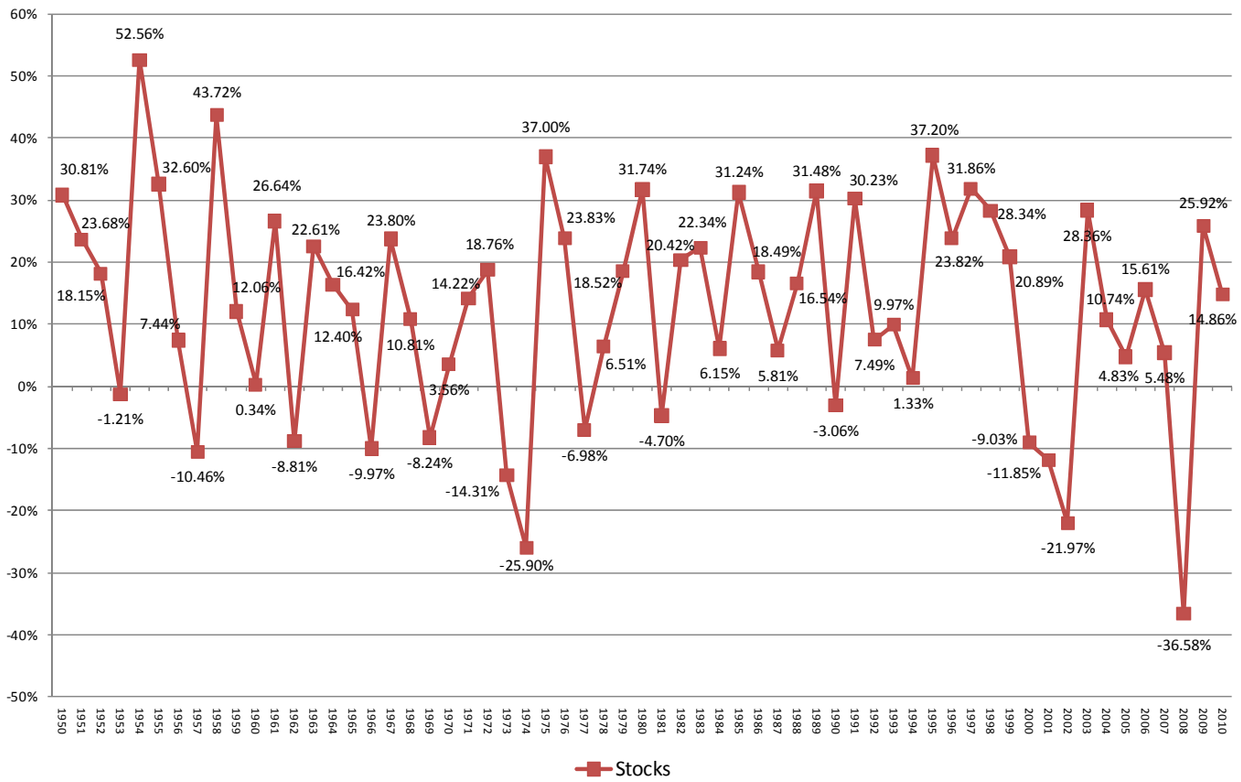
Since each of these annualized returns is summarizing a fairly long period, a full decade, it is surprising that there is so much difference between the decade average (annualized) returns. Just as the return for one year is a bad predictor of the next, the annualized return for any given decade doesn't seem to be a good predictor of performance over the next decade.

The 1980s and 1990s were exceptionally good investment periods, with annualized returns slightly above 17% and 18% respectively, but that is not unprecedented given the returns generated in the 1950s, with its over 19% annualized return. The real outlier is the first decade of this century. It provided results far below any decade in this review.

A decision about whether to revise the rate of return assumption amounts to drawing a conclusion about what to expect from the stock market over the next decade and beyond. Given the annualized returns provided in each decade since 1950, the Legislature will need to decide how much weight, or how much predictive value, it wishes to give to the most recent results. The most recent decade was not typical. If the Commission were to conclude that the markets will move toward a more normal result, then the recent past should not be used to predict future patterns.

Graph 5

Stock Market Returns 1950-2010

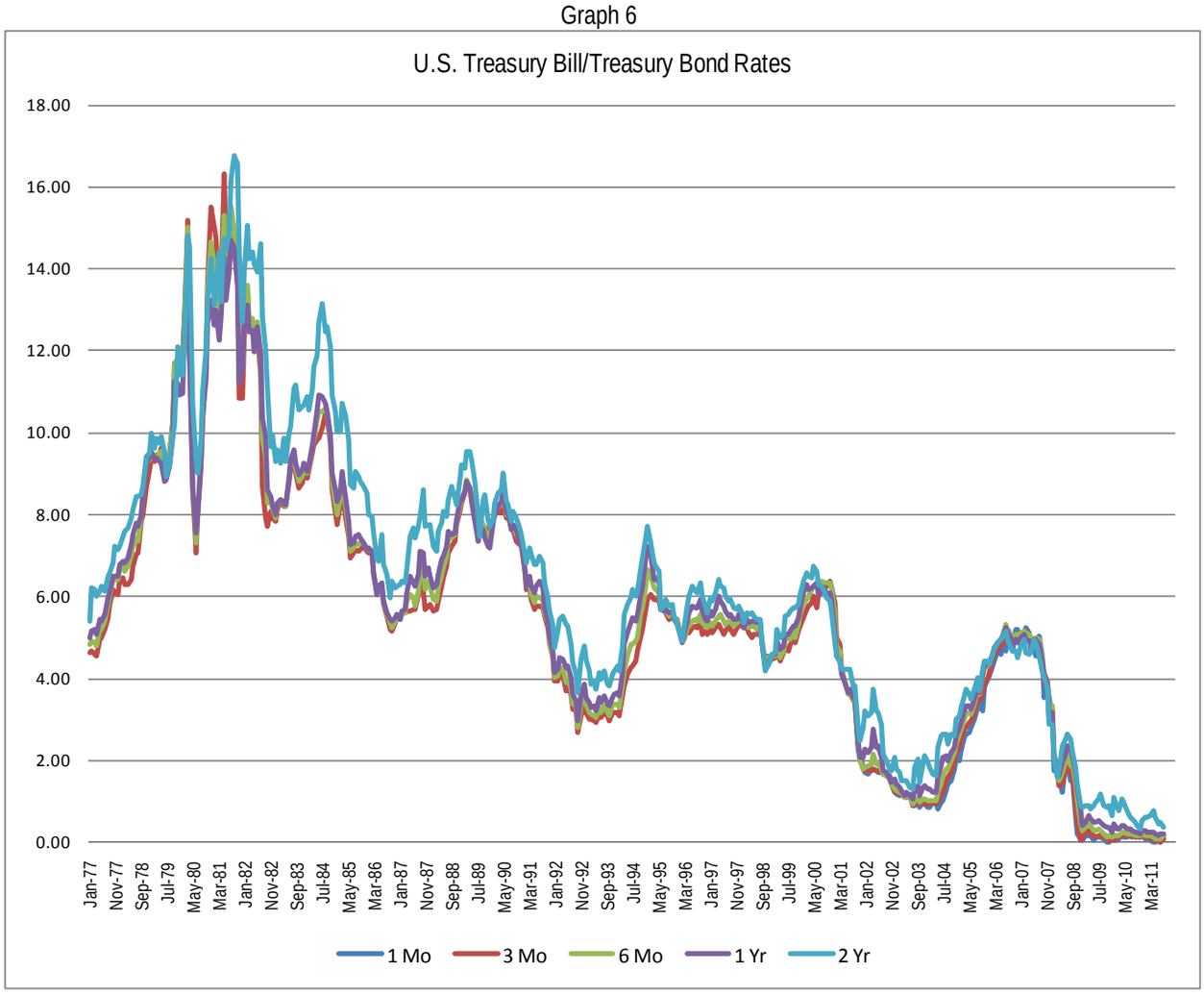


Data source: http://pages.stern.nyu.edu/~adamodar/New_Home_Page/datafile/histret.html

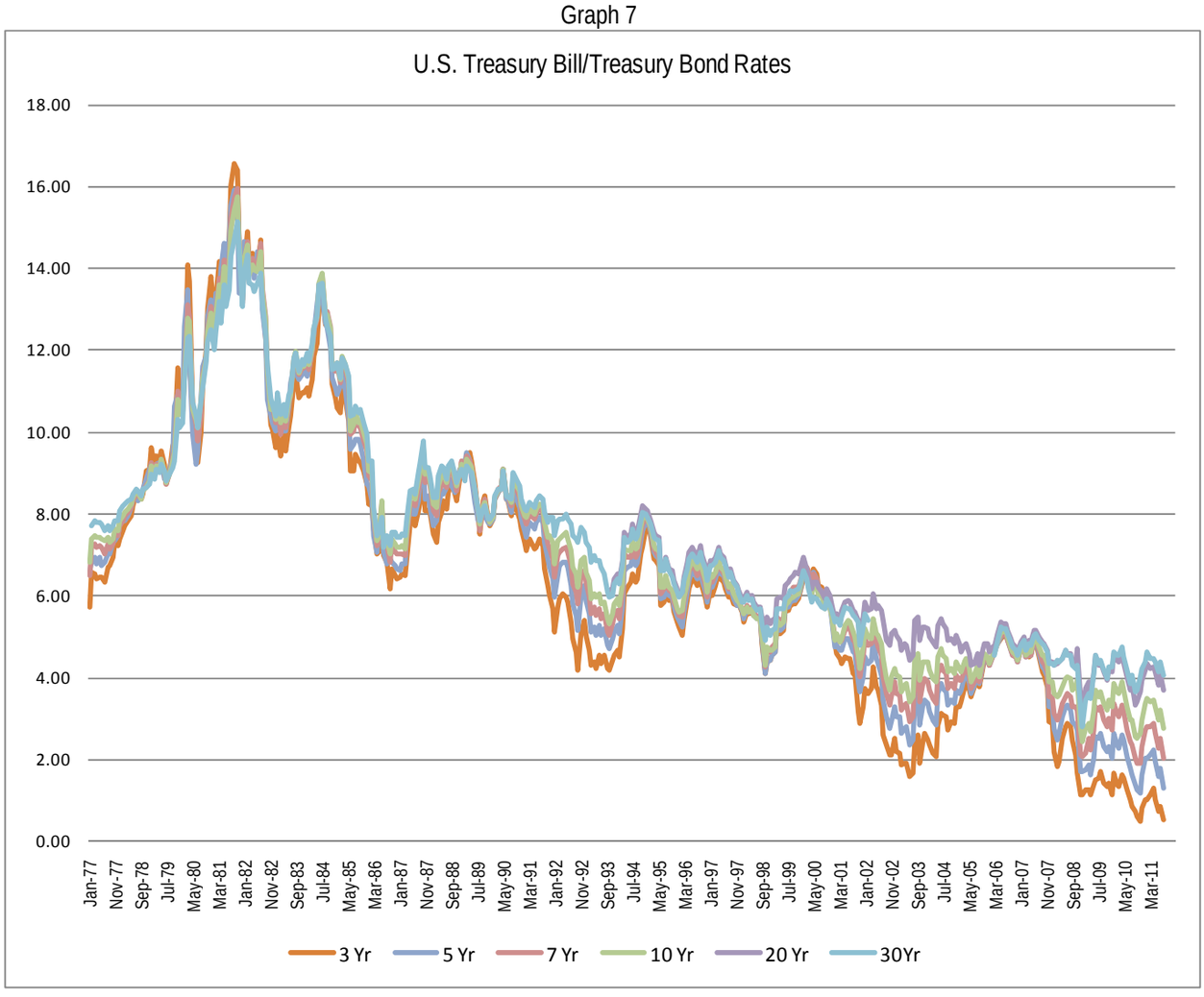
10-Year Annualized Returns

1950-1959	1960-1969	1970-1979	1980-1989	1990-1999	2000-2009
19.5%	7.7%	8.8%	17.3%	18.1%	-1.0%

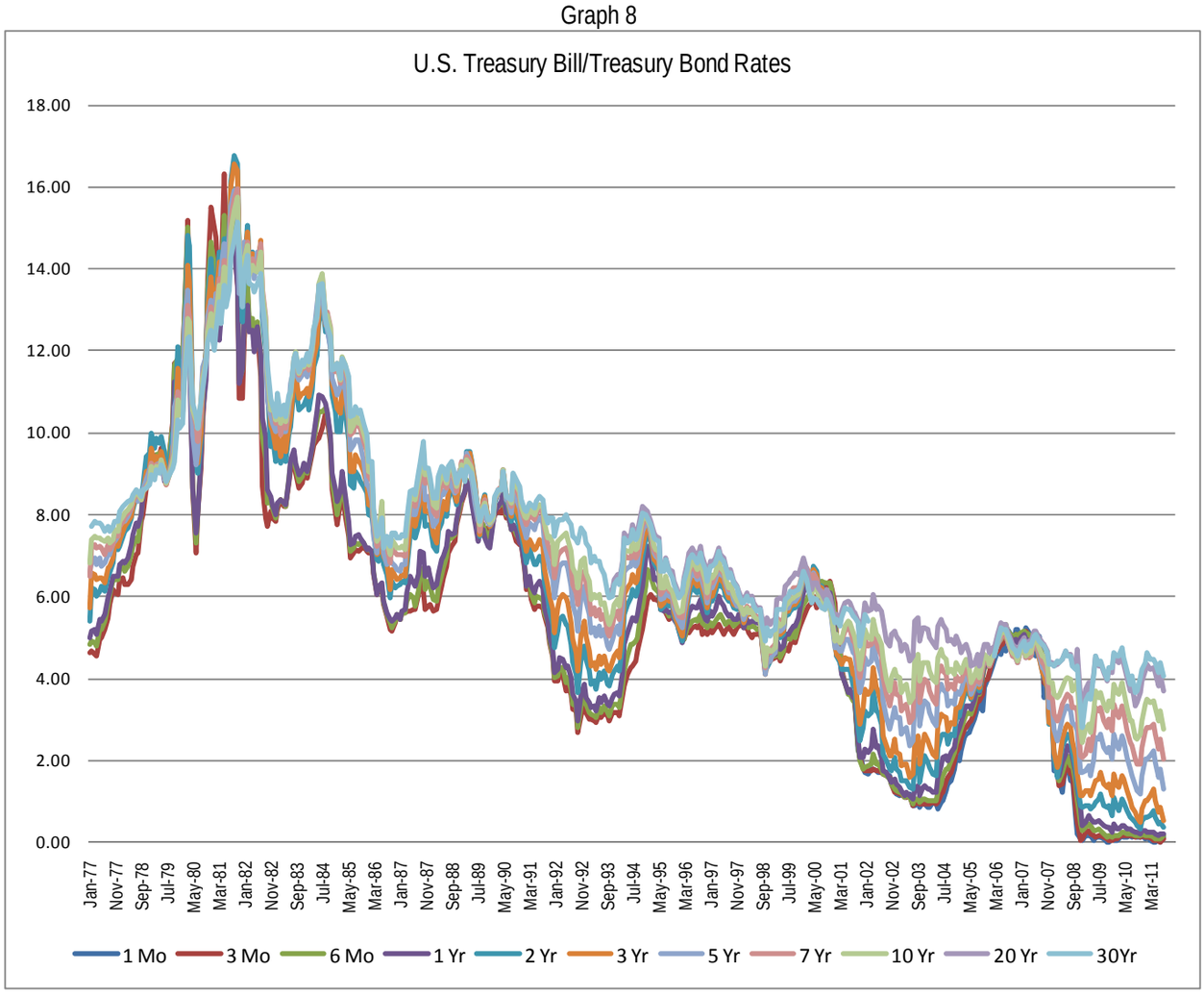
Graph 6



Graph 7



Graph 8



6. Critiques of the 8.5% Rate of Return Assumption. The rate of return assumption in law for SBI invested plans (MSRS, PERA, and TRA), as well as the first class city teacher plans, is 8.5%. Given the recent bad investment markets, some have questioned continued use of that assumption, contending that it should be lower. In this portion of the memo we review some of this criticism of the current rate.

   The recent PERA experience study (PERA Experience Study 2004-2008, by PERA's actuary, Mercer) included a review of the 8.5% investment return assumption. Generally, experience studies review the actual experience of the pension plan, comparing the plan's actual experience with that predicted by the applicable assumption. For example, the assumptions regarding the turnover of employees leaving the plan are compared to the actual turnover that occurred, and the actuary reviews the deviations to decide if there is a need to revise the turnover assumptions to more closely reflect the experience that is occurring. Mortality assumptions and actual mortality is another comparison that is almost always included in an experience study.

   Nothing in the Mercer experience study indicates that Mercer looked at SBI's actual experience, its returns to date and how it has performed in the various asset classes. Rather, the analysis claims to be entirely forward looking. Mercer used long-term return assumptions developed by Mercer Investment Consulting, and attempted to apply these to the asset mix which SBI uses. The approach appears to be based on what actuaries refer to as the "building-block method" (Actuarial Standards Board, Actuarial Standard of Practice, No. 27, page 5). In general, Mercer developed a rate of return assumption for each type of asset SBI holds and applied these to the SBI asset mix. This enables Mercer to compute an expected total portfolio return. The applicable table from the experience study is shown below. The gross return which Mercer computed is 8.2%. After adjusting this upward by 0.1% based on a change in inflation which Mercer expected due federal fiscal policy actions occurring in 2009, and subtracting 0.2% for assumed investment expenses, the net return was 8.1%. Mercer then rounded this to the nearest quarter percent and advised that the investment return assumption be revised from the current 8.5% to 8.0%.

   The Mercer analysis raises several questions. First, the Mercer study claims to be entirely forward looking, not relying on past returns, at least not in any specific way, but provides almost no information about how these expected future return estimates for each asset type were developed. Further information to permit the reader to assess the reliability of these estimates would have been helpful. Second, Mercer did not have expected rates of return for all the asset types in the SBI

portfolio. Mercer therefore had to rely on proxies which may or may not be a good fit. Mercer Investment Consulting had no rate of return assumption for mezzanine debt. It therefore assumed that the returns for those assets would be the same as mezzanine private equity. Similarly, lacking estimates for resource investment returns, Mercer assumed those assets would have the same return as the predicted return which Mercer has developed for commodities. Third, Mercer's adjustment for inflation not captured elsewhere, 0.1%, may be too high or too low. Fourth, the reduction for assumed investment expenses, 0.2%, may be too high. This may be a generic reduction which Mercer uses in performing rate of return studies, rather than one based on actual SBI expenses. Fifth, the analysis is specific to SBI's asset mix at the time the study was performed. Any plan's asset mix will evolve over time as new investment forms become practical and now opportunities arise. The approach Mercer took is specific to the then current SBI portfolio, and does not allow for these inevitable changes which will alter the return expected from SBI's portfolio.

Finally, Mercer appears to be using estimates of future average market returns for each asset type and assumes SBI will match but not beat that return. Perhaps assuming returns in excess of average is not permitted under standards that apply to actuaries. However, this approach fails to recognize areas where SBI and many other pension funds consistently outperform the market. This is an area where an examination of SBI's actual past returns relative to market can provide insight. Areas worthy of mention are domestic fixed income and foreign stock (the developed international equity markets and the emerging markets). While SBI uses as its bond benchmark the Barclays Aggregate Bond Index, the same benchmark upon which Mercer developed its assumption of future bond returns, SBI bond returns typically beat that index for multi-year periods. The Barclays index is an investment-grade bond index, but SBI has beaten that return through modest use of junk bonds, and far more significantly, by making moves between government bonds and investment-grade corporate bonds. The SBI quarterly report which provides calendar year 2010 results indicates that the SBI bond portfolio exceeded the Barclay bond index for one-, three-, and ten-year periods, and the five-year return matched the index. Similarly, SBI and many other pension funds outperform the average foreign market returns through managers able to spot countries were economic or political problems may harm the local market, and using other techniques. SBI's international stock returns (developed and emerging markets) beat the applicable index for one, three, five, and ten-year periods. Thus, for some markets were Mercer is assuming SBI will match an index, SBI has consistently beat that applicable index, but these additional increments are not included in Mercer's development of its long-term rate of return estimate.

It is quite possible that if the Mercer analysis could be fine tuned the results would support continued use of the existing 8.5% rate of return assumption rather than the modest reduction which Mercer proposed. During the 2011 session MSRS, PERA, and TRA backed away from any recommendation to revise the rate of return assumption. Similarly, during that session SBI, through testimony by its Executive Director before various legislative committees, has stated its belief that SBI can continue to meet or beat an 8.5% return. The first decade of this century provided the worst investment markets since the Great Depression. Despite that decade, over long historical periods SBI has exceeded that return.

Table 17
Mercer Best Estimate
Rate of Return Development

Asset Class	Target Allocation	Annual Geometric Return	Standard Deviation
U.S. Equity – Large Cap	42.6%	8.2%	17.9%
U.S. Equity – Small Cap	2.4	8.5	24.0
Private Equity	10.6	9.6	28.4
Mezzanine Debt	4.1	8.5	19.4
International Equity	12.0	8.4	18.4
Emerging Markets Equity	3.0	8.4	26.0
U.S. Fixed Income	18.0	4.7	5.5
Real Estate	3.8	7.4	13.7
Resource	1.5	4.6	18.0
Cash	2.0	3.5	1.3
Portfolio – Gross	100.0%	8.2%	13.3%
Gross Geometric Expected Return		8.2%	
Increase in Expected Return from Net Inflation/ Capital Supply Adjustment Described Above		0.1%	
Assumed Investment Expenses		(0.2%)	
Net Geometric Expected Return – Best Estimate		8.1%	

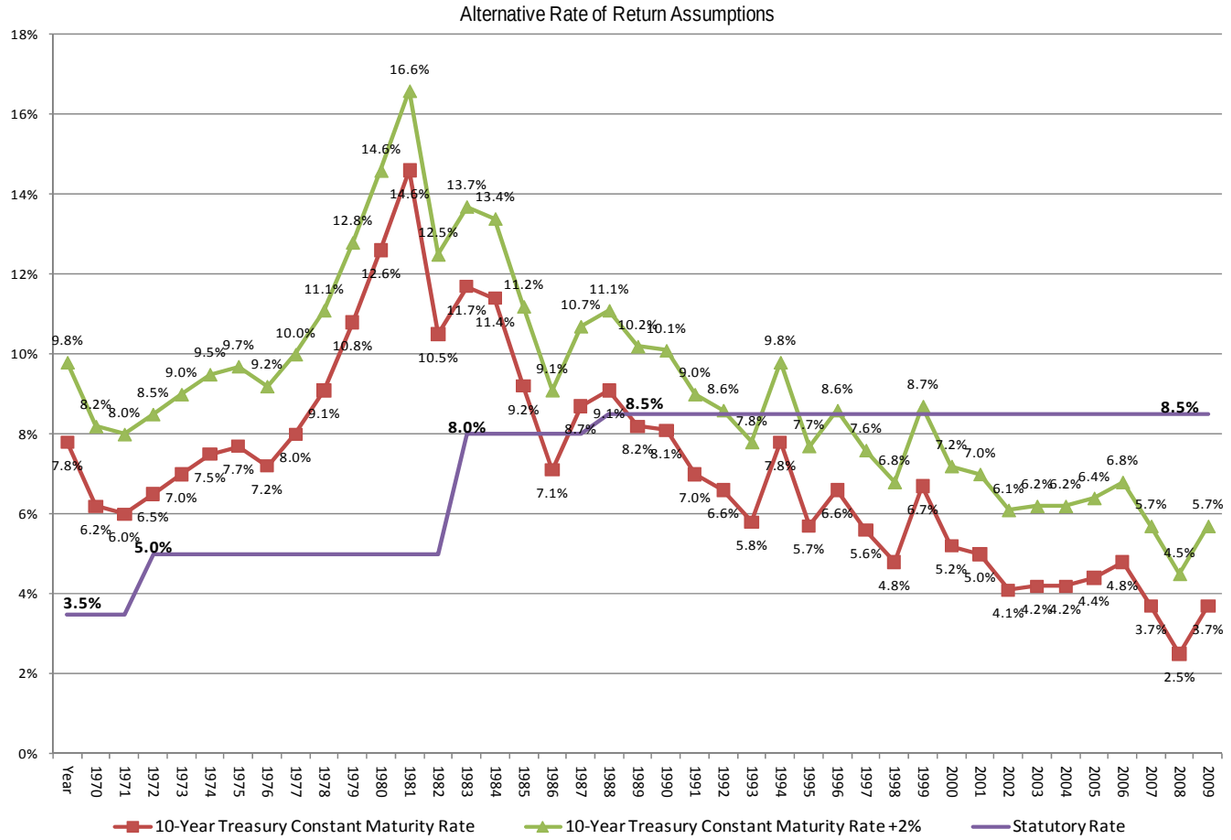
Source: 2004-2008 PERA-P&F Experience Study, pp. 13-16, Mercer, August 13, 2009

Commission staff is aware of another proposal, coming from the Legislature, to revise the 8.5% interest assumption to a variable rate, the ten-year Treasury rate plus 2%. That proposal to revise the investment return assumption is significant in two regards. First, it would replace a constant assumption with a variable rate. The investment return assumption is a long-term assumption and has been very infrequently changed. It is understood that actual experience will provide variation around that assumed rate, but over time, if the rate in current law is a good approximation of long-term tendencies, the financing of the pension plans will proceed in a reasonable fashion. Second, the proposed rate at the present time is considerably below the current assumption. The actuarial calculations would indicate that contribution rates need to be substantially increased to bear a much higher portion of the pension costs.

Graph 9 provides historical information back to 1970 on the statutory investment return assumption for the major plans, and also the ten-year Treasury constant maturity rate, and the ten-year Treasury constant maturity rate plus 2%. The first observation is that neither the ten-year Treasury constant maturity rate nor that rate plus 2% is sufficiently stable to serve as a useful assumption for actuarial work. Our pension plans have very long time horizons, causing a need to project decades into the future. No assumption based on the current ten-year Treasury constant maturity rate provides sufficient stability. Rather than being consistent for long periods, these rates can change considerably from one year to the next. A change of a few tenths of one percent in the assumed investment return rate from one year to the next would have a very large impact on the computed liabilities and contribution requirements, but the yearly variations in these rates often exceed a few tenths. The largest changes were in the early 1980s. In 1980 the ten-year constant maturity rate was 10.8%, an increase of 1.7 percentage points from the prior year. The 1981 rate rose nearly two full percentage points to 12.6%. In 1982 it again rose by two full percentage points to 14.6%. The following year it fell by 4.1 percentage points to 10.5%. Based on the graph, only once in the entire 40-year period under review is the rate unchanged from one year to the next. That is the period 2004-2005. But even in that period change did occur, although it is not evident in the graph. The actual 2004 value of the ten-year Treasury constant maturity rate was 4.15. In the following year it was 4.22. Both round to 4.2, which is the value shown in the graph in those years.

Graph 9

Alternative Rate of Return Assumptions



In contrast, the statutory investment return assumption rate has been consistent for long periods of time, a necessary condition to provide stable actuarial valuations. In general, the statutory rate has been changed when necessary to reflect changes in investment practices and in the investment authority provided under law to our pension plans. Many decades ago, Minnesota public pension plans were prohibited from investing in stocks, and the low rate of return assumptions that applied during those periods reflected that prohibition. Over time, investment practices and the investment authority for our plans have changed to permit extensive investments in domestic and

foreign stocks and other equity investments. The 8.5% investment return assumption in current law reflects the opinion of SBI that an 8.5 long-term return (annualized return) is achievable.

A second observation is that for much of the period reviewed in the chart, the ten-year Treasury constant maturity rate plus 2.0% would have produced a higher assumption than the assumption in statute. Since some have contended that the 8.5% assumption is too optimistic, this may not be desirable. From 1970 through the early 1990s, the proposed assumption is higher than the assumption then in law, and often much higher. In 1982, use of the proposed assumption would have produced a 16.6% assumed return, while the assumption in law was only 5.0%. In recent years the proposed assumption has been below the 8.5% return assumption in existing law, but that may reverse in the future. In fact, it is likely to, the next time the federal government needs to considerably increase interest rates to reign in an overheated economy.

A third observation is that the proposed new investment return assumption procedure can produce results which are beyond the limits of reasonableness given the expected returns to the stock market. Several sources have provided estimates of the long-term (annualized) returns to the stock market, going back decades and in some cases a century or more. These estimates vary a bit due to the differing period under review, but generally suggest a long-term return (annualized) ranging from 8.5% to 11.0% annually. This implies, if we can rely on history for guidance, that a pension fund fully invested in stocks could expect long-term annualized returns in this range. However, under law Minnesota public pension funds must hold at least 15% of their assets in debt investments, which will lower the portfolio's long-term return. Perhaps foreign stocks or private equity holdings might boost returns a bit, offsetting the impact of the bonds, but expecting a long-term total portfolio return above 10.0% does not seem possible. However, the proposal can produce results above that limit. In each year from 1979 through 1991 the proposal would have produced investment return assumptions above 10.0%. Expecting long-term returns of 11%, 12%, or 14%, peaking at 16.6% in 1982, is not reasonable.

An unusual characteristic of the proposal is that it may produce a low assumption when the actual markets are expected to do well, and a high assumption when markets are impaired. In other words, the assumed rate will vary over the business cycle, and that variation may be opposite the direction of the returns actually expected in the market. Economic theory suggests that the value of a stock is equal to the discounted value of the profit stream expected from that ownership share. A given stream of profits will have a higher discounted value when the discount rate (interest rate) is low. Both currently and in the recent past, the federal government and the Federal Reserve have taken actions to lower interest rates in an effort to stimulate the economy. Thus, the discount rate is low, which should provide a boost to stocks. However, because interest rates are low the ten-year Treasury constant maturity rate is low, currently about 3.7%. Adding 2.0% to that would produce a rate of return assumption of 5.7%. This is likely to be a very low long-term estimate of portfolio returns. On the other hand, when the federal government boosts interest rates to reign in an overheated economy, the interest rate on Treasuries will be high, producing a high investment return assumption at a time which may not be at all favorable to equities.

7. Comparison of Minnesota Rate of Return Assumption Compared to Other Public Funds. Some information is available permitting comparison of rate of return assumptions across public pension funds, but any source will have limitations. The National Association of State Retirement Administrators (NASRA) has a Public Fund Survey providing considerable information about the 126 plans included in their survey. Graph 10 (below), derived from the NASRA survey data, shows that 10% of the plan funds (13 plan funds) use an 8.5% assumption. An 8.0% assumption is by far the most common, with over 47% of the plans (59 plan funds) using that assumption. On the low end, one fund (it happens to be the Texas Municipal Fund) is using a 7.0% assumption.

   Although the graph below provides a rough approximation of general tendencies among the included plans, it does not necessarily reflect tendencies in the entire population of public plans in the country, because the sample used in the survey does not appear to be random. Some states have far more plans included in the survey than others, although each state has at least one entry. Thus, the results give far more weight to assumptions used in some states than in others. The states which heavily influence results because of a large number of included plans are Minnesota (five included plans), Washington (seven included plans), Texas (seven included plans), Missouri (six included plans), Colorado (seven included plans), California (six included plans), Illinois (five included plans), and New York (five included plans). These eight states account for 48 included plans, which is 38% of the entire sample.

   The impact of some of the heavily weighted states can be seen by examining the results for plans using an 8.5% rate of return assumption. Although 13 plans use that assumption, five of those are Minnesota plans (MSRS-General, PERA-General, TRA, DTRFA, and SPTRFA), which is at least

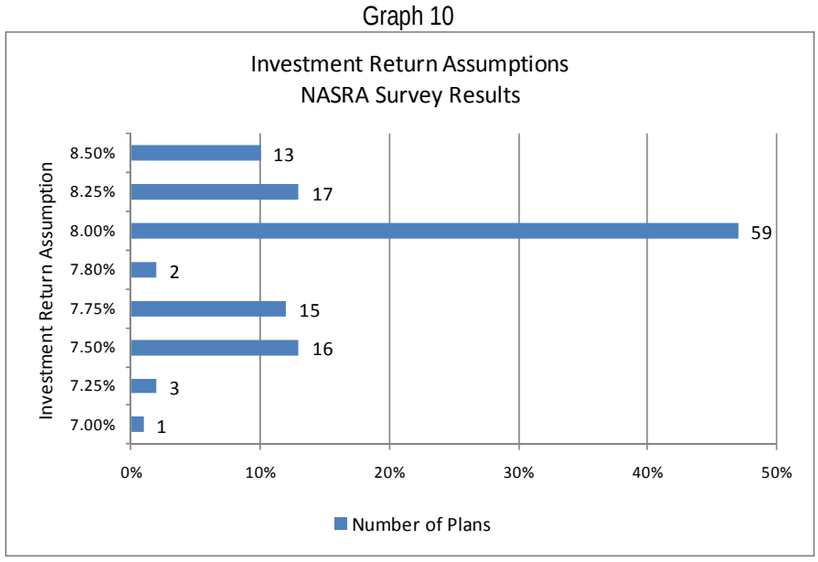
twice the number of Minnesota plans one would expect in the sample if each of the states were to be given equal weight in the survey, and all those Minnesota plans use an 8.5% interest assumption. Therefore, although 10% of the included plans use an 8.5% interest assumption, that does not imply that 10% of the states generally use that as their primary rate of return assumption. On the other hand, the prevalence of the 8.0% assumption (47% of the sample funds) may also be misleading. The state of Washington, with its seven included plans, all use an 8.0% assumption. If fewer Washington plans were included, the 8.0% assumption would be less common than suggested in the graph.

Review of the data also indicates that about 19 of the included plans are not state-level plans, but rather are local or county plans. These may influence results if, as is the case in Minnesota, some of these local plans have a lower rate of return assumption than their state-level counterparts.

Also of interest is that for some states, the included plans from that state do not all use the same rate of return assumption. For example, of the six included Missouri plans, the Missouri Local plan uses a 7.5% assumption; the Missouri PEERS, Missouri Teachers, and St. Louis School Employees Plans use an 8.0% assumption; the Missouri DOT and Highway Patrol uses 8.25%; and the Missouri State Employees plan has an 8.5% assumption. The Missouri plans in the survey include at least one local plan (St. Louis School Employees) which has a lower return assumption than some other Missouri plans. Minnesota also has local plans which have a rate of return assumption below the 8.5% rate used by the Minnesota state level plans, but none of Minnesota's local plans were included in the survey. Texas, with its six included state-level or local plans, have varying rate of return assumptions ranging from 8.5% for Houston Firefighters to 7.0% for Texas Municipal.

A final reservation to mention is that some of the information may be out of date. The dates of the actuarial valuation from which the rate of return assumptions are taken vary. Some of the information is from 2008 valuations, some from 2009, and some from 2010. It is possible that some states or local governments have more recently revised their assumptions.

Graph 10



8. Rate of Return Assumptions Used in Surrounding States. The following chart shows rate of return assumptions used in the states which are close to Minnesota, as indicated by the plans from these states which are included in the NASRA survey. The lowest rate is 7.5%, used by the Iowa PERS plan and the Illinois Municipal plan. At the high end are a few other Illinois plans. The Illinois Teachers plan, Illinois SERS, and Illinois Universities plan all use an 8.5% assumption, the same as the large Minnesota plans.

Table 18
Public Fund Survey Report
Investment Return Assumptions, by State and Plan

Plan Name	Investment Return Assumption	Actuarial Valuation Date
Iowa PERS	7.50%	12/31/2008
Illinois Municipal	7.50%	12/31/2008
Illinois Teachers	8.50%	12/31/2008
Illinois SERS	8.50%	12/31/2008
Illinois Universities	8.50%	12/31/2008
Chicago Teachers	8.00%	12/31/2008

Public Fund Survey Report
Investment Return Assumptions, by State and Plan

Plan Name	Investment Return Assumption	Actuarial Valuation Date
North Dakota PERS	8.00%	6/30/2009
North Dakota Teachers	8.00%	6/30/2009
South Dakota PERS	7.75%	12/31/2009
Wisconsin Retirement System	7.80%	7/1/2010

9. General Comments. Any change in rate of rate of return assumptions, presumably a lowering of that rate, will have far reaching implications which the Legislature may need to take into account. For purposes of discussion, we can divide these into pension plan cost issues, actuarial issues, and benefit issues.

   a. Pension Plan Cost Issues.

      1) Plan Cost. The cost magnitude of a reduction from 8.5% to 8.0% was demonstrated earlier where results for TRA and MSRS-General were presented. The funding ratio would fall because of the increase in liabilities and the amortization requirement increases considerably, because after amounts are contributed to the plan they are not expected to grow as quickly due to the lower assumed rate of return. Actuarial studies will indicate that more money will need to be contributed to the plan to meet any given level of benefits. For TRA, the actuary estimated that required contributions would increase by 2.9% of payroll, while the increase in MSRS-General required contributions was 2.1% of payroll. This serves to illustrate the generally effect. While specific results will vary by plan, any plan covered by the reduction in the rate of return assumption will have lower funding ratios as a result of the change, and greater computed contribution requirements.

      2) Contribution Rate Impact. For MSRS, PERA, TRA, and the first class city teacher plans, the increased contribution requirements computed by the actuary will not translate, at least not immediately, into higher contributions unless the Commission and Legislature revise the employee and employer contribution rates required to be paid under law. However, for MSRS, PERA, and TRA, in recent years the Legislature has enacted provisions (although they may not yet be effective) which permit or mandate revisions in employee and employer contributions following a period of contribution deficiencies lasting for a few years. These are to be implemented by the applicable pension plan board unless overruled by the Legislature. No similar adjustment mechanism exists in law for the first class city teacher plans.

         Any increase in contributions required to be paid under law will trigger reactions by employee and employer groups. Public employers may seek higher appropriations or more aid to assist them in meeting their obligations.

   b. Actuarial Issues.

      1) Scope of Change. The 8.5% rate of return assumption in law applies to all MSRS, PERA, TRA, first class city teacher plans. However, MSRS, PERA, and TRA are invested by SBI, through its Combined Fund, while DTRFA and SPTRFA are free standing entities which invest their own assets. The Mercer analysis of the rate of return assumption, discussed at length earlier in this memo, was very specific to SBI, being based entirely on SBI's detailed asset mix. Whether or not Commission members feel that work adequately justifies a change in the rate of return assumption for SBI, what is clear is that the Mercer analysis said nothing about what is appropriate for the first class city teacher plans. Any change for those non-SBI plans would need to be based on a more general argument. All these plans are all relatively large and professionally managed, investing in the same markets and with essentially identical investment authority. Therefore, logic suggests that we should expect similar long-term investment results from all these plans. If a change is deemed appropriate for SBI-invested plans, the same change presumably is appropriate for the first class city teacher plans.

      2) Question of Extension to Local Plans. The issue is whether a revised rate of return assumption should be applied to the few remaining local police and paid fire plans. The MFRA and MPRA, which will remain freestanding if consolidation legislation into PERA P&F passed last session does not meet all local approval requirements, have a 6.0% rate of return assumption. The Fairmont Police Relief Association and Virginia Fire Department Relief Association have a 5.0% rate of return assumption. These plan

administrations have access to professional management, and they are investing in the same markets as the larger plans. They ought to be able to perform as well as SBI, and logic would suggest that they should have the same rate of return assumption as SBI. Indeed, as demonstrated earlier in the presentation of rate of return results, the MFRA has long been an above average performer, performing at least as well as SBI. If these plans remain free standing, a rate of return assumption above the 6.0% rate, or 5% rate, whichever is applicable, will lower city contribution requirements. The change, however, by altering the schedule of funding may impact the amount distributed under a 13th check provision, for those plans that have them. Reducing the SBI rate of return assumption to something below 8.5% will increase Minneapolis cost under the consolidation.

3) Linkage to Other Assumptions. The issue is that the rate of return assumption has connections to at least one other actuarial assumption, the salary increase assumption. It would seem reasonable, if the rate of return assumption is revised, to ensure that the relationship between these assumptions remains consistent. The link is inflation, or more specifically the inflation rate assumption that underlies the rate of return assumption and the salary increase assumption. Our salary increase and rate of return assumptions are what an economist would call nominal assumptions, as opposed to real assumptions. The salary increase assumption can be decomposed into an adjustment for inflation and a real salary increase (the percentage increase in salary, if any, above the inflation rate). Similarly, the rate of return assumption can be decomposed into a real return (the expected return above inflation) and the expected inflation rate. If the Commission is to consider lowering the rate of return assumption, it may wish to consider the justification for the change. If it is believed that inflation will be lower for a prolonged period, but real returns will remain the same, then that can justify a reduction in the 8.5% interest assumption. But that same expectation of lower inflation also suggests that the salary increase assumption ought to be lowered.

c. Benefit Issues.

1) Impact on Post-Retirement Adjustments. The issue is the impact of any reduction in the rate of return assumption on post-retirement adjustments provided by MSRS, PERA, TRA, and first class city teacher plans. The change will harm retirees of all the major plans. In 2010 and 2011, revised law was enacted for all these plans linking post-retirement adjustments to computed plan funding ratios. Due to the 2010, 2011 legislation, MSRS, PERA, and TRA post-retirement increases were reduced or temporarily eliminated, then will be paid at lesser rates until fund "normalcy" is obtained (when the funding ratio returns to at least 90%). The DTRFA will pay no increase until the funding ratio based on market value is at least 80%, and will pay minimal amounts until a 90% funding ration is achieved. After that, the plan will match inflation up to 5%. Similarly, the SPTRFA will pay minimal amounts until the funding ratio returns to 90%, then match inflation up to 5%. These changes were proposed by the administrators of these plans and were enacted. It is very unlikely that they would have proposed linking these changes to the funding ratios if they had foreseen a change in the rate of return assumption, which will negatively impact those computed ratios.

2) Impact on Optional Annuities. The change will also impact all new optional annuities, and possibly existing ones. All optional annuities in our major plans require that the optional annuity be actuarially equivalent to a single life annuity (except for an adjustment called the "bounce back," which does not need to be addressed for purposes of the present discussion). Therefore, if a public employee retires and takes a joint-and-survivor annuity to provide continuing income to the surviving spouse following the death of the retired public employee, that coverage must be paid for by a reduction in the monthly annuity which the retired employee will receive, in order to pay for the continuing coverage after that retiree's death. The amount of the reduction depends on the sex of the spouse and that spouse's age. Females have a longer life expectancy than males. If a male worker is retiring and has a younger wife, the monthly reduction could be significant because of the expectation that benefits will continue for several years following the death of the primary beneficiary.

The necessary monthly reduction on the optional annuity is also a function of the rate of return assumption. If the rate of return assumption is revised downward, the amount of the monthly reduction applied to the optional annuity must increase. For example, assume an employee retires and life tables predict that the individual will live 20 years in retirement. The individual has a spouse and takes a joint-and survivor annuity. If the rate of return were zero, a one dollar reduction in the current monthly benefit would provide

only one dollar in income to the surviving spouse 20 years from now. With a positive investment return, a one dollar reduction now would provide more than a dollar later. A lesser amount will be required. With an 8.5% rate of return assumption, a one dollar reduction in the current monthly benefit is retained by the pension fund and invested to provide income to the surviving spouse following the death of the retired employee, and at an 8.5% annual rate dollar is expected to grow to $5.11 in 20 years. If, however, the rate of return assumption were 8.0%, the actuary would predict that the current dollar would grow to $4.66 after 20 years, rather than $5.11. Thus, more will need to be set aside now to provide for the continuing spousal coverage.

Therefore, any plan which has its rate of return assumption revised will need to have its actuary recomputed all the factors used by the plan administration to compute reductions applicable to joint-and-survivor annuities. If the rate of return assumption is lowered, a greater reduction in the monthly annuity will be needed to provide the desired coverage.

It is unclear whether pension plan administrations would lower the monthly benefits paid out to all its existing joint-and-survivor annuitants, or just those who retire after the change is enacted. The Commission may wish to seek testimony on that matter. The plan administrations might feel legally constrained to avoid those adjustments for existing retirees because of legal concerns. If these annuities are not revised, it will add to plan unfunded liabilities.

3) Refund Interest Rates. Another area which may require legislative attention is refund interest rates. When an employee terminates service the person may request a refund of employee contributions plus (under current law as revised in 2010 and 2011) 4% interest. This payment is in lieu of an annuity, if applicable. The plans also have death refund provisions applicable if an employee dies. If the rate of return assumption is revised downward, the Commission and Legislature may need to decide if the current law refund interest rates should continue or also be lowered.

   Plans also have provisions in law governing refund repayments. If an individual terminated service and takes a refund, and then later returns to covered employment, the individual is permitted under law to repay any refunds taken, with 8.5% interest, to reestablish all rights previously forfeited. The structure of these provisions suggests an intention that the person compensates the pension fund for the forgone investment earnings, by paying to the fund the expected investment return (8.5% per year) that the pension fund did not receive because the individual had control of the money. Presumably, the Commission and Legislature would want to revise these provisions to be consistent with any new reduced rate of return assumption that is adopted.

4) Leaves of Absence. Also needing review is the issue of payment terms for leaves of absence and other similar purchases of service credit. Numerous leave payment term provisions exist throughout the laws of the various plans. When payment is not received soon after the leave, interest is generally required and this interest is almost always 8.5% compounded annually. Again, these provisions were structured to be consistent with the 8.5% rate of return assumption, and presumably the Legislature would want to retain that connection by revising these rates as needed where they appear. Some thought may need to be given to individuals on leave when the change in general policy occurs, including teachers on extended leaves of absence.

5) Full Actuarial Value Payments. Finally, some comments are appropriate regarding full actuarial value payments to receive service credit. The provision that specifies the procedure for computing full actuarial value (Minn. Stat., Sec. 356.551) refers to an 8.5% rate of return assumption in several places in the law. Those provisions presumably would need revision.

   An issue that arises with the full actuarial value purchases is whether it is practical to seek further payment from at least some individuals who already made payment. The full actuarial value service purchase payment amount is the amount needed to pay for the additional annuity amount created by the purchase, assuming that the payment amount after it is received by the fund grows at an 8.5% rate until the person retires. If the Commission and Legislature were to conclude that, for example, an 8.0% rate is a better estimate of the likely investment return, then at least some individuals who made payments in the past (those who have not yet retired) received a windfall. They should have paid more to compensate the fund.

d. Salary Increase Assumption.

1) Purpose. The salary increase actuarial assumption functions in projecting a retirement plan participant's final average salary figure and a retirement plan participant's initial retirement annuity amount.

2) Factors Included in the Setting of the Assumption. Actuarial Standards of Practice No. 27, published by the Pension Committee of the Actuarial Standards Board and currently being revised, indicates that it is general practice to formulate a salary increase assumption or compensation scale assumption by considering three components, which are inflation, productivity growth, and merit or promotional increases (see Attachment B, excerpt of Proposed Revision of Actuarial Standard of Practice No. 27, Item 3.8).

a) Inflation Component. As disclosed in the actuarial valuation report, Minnesota public pension plans utilize a 3% inflation assumption, which is a rate that has been unchanged for numerous years.

U.S. inflation, based on the federal Consumer Price Index (CPI-U), for the period 1976-2011, averaged 3.9% (July 1976-July 2010). U.S. inflation has exceeded the current 3% inflation assumption in 20 years of that period and has been below 3% in 16 years of that period, as follows:

Table 19
Consumer Price Index (CPI-U)
1976-2011

Year	Annual Inflation Rate	Year	Annual Inflation Rate	Year	Annual Inflation Rate
1976	5.75%	1988	4.08%	2000	3.38%
1977	6.50	1989	4.83	2001	2.83
1978	7.62	1990	5.39	2002	1.59
1979	11.22	1991	4.25	2003	2.27
1980	13.58	1992	3.03	2004	2.68
1981	10.35	1993	2.96	2005	3.39
1982	6.16	1994	2.61	2006	3.24
1983	3.22	1995	2.81	2007	2.85
1984	4.30	1996	2.93	2008	3.85
1985	3.55	1997	2.34	2009	-0.34
1986	1.91	1998	1.55	2010	1.64
1987	3.66	1999	2.19	2011	1.04 (6 mo.)

b) Productivity Growth Component. The Bureau of Labor Statistics of the U.S. Department of Labor does provide information on the rate of productivity change in the non-farm business sector. For the 35-year period (1976-2010), productivity in the non-farm business sector has increased at an annual rate of 1.9% (1.4% for the period 1979-1990, 2.1% for the period 1990-2000, 2.5% for the period 2000-2007, and 2.4% for the period 2007-2010). The following sets forth the individual results from 1976 to 2010:

Minnesota public pension plan actuarial valuations do not report explicit productivity salary increase assumptions. The recent Mercer experience studies indicate the use of productivity salary increase rates as a component in formulating recommendations for the salary increase rate assumption, but contained no explicit information on productivity increase experience or the implicit productivity increase rate assumption.

Table 20
Rate of Productivity Change
Non-Farm Sector, 1976-2010

Year	Annual Productivity Rate	Year	Annual Productivity Rate	Year	Annual Productivity Rate
1976	3.37%	1988	1.65%	2000	3.37
1977	1.55	1989	0.74	2001	2.91
1978	1.35	1990	1.75	2002	4.52
1979	-0.05	1991	1.58	2003	3.68
1980	-0.01	1992	3.97	2004	2.71
1981	1.34	1993	0.54	2005	1.63
1982	-0.10	1994	1.08	2006	0.90
1983	4.36	1995	0.40	2007	1.49
1984	1.92	1996	2.53	2008	0.68
1985	1.73	1997	1.56	2009	3.03
1986	3.10	1998	2.94	2010	4.08
1987	0.30	1999	3.36	2011	N/A

c) Merit or Promotional Increases. Merit salary increases and productivity, the third component suggested by Actuarial Standard of Practice No 27, does not appear to have a body of statistical results to utilize and would presumably be guided by historical practice of the applicable employer or employers. In two of the four most recent experience studies prepared by Mercer, MSRS-General and PERA-General, the recommended salary increase actuarial assumption includes a negative merit or promotional salary increase component, while for the other two, TRA and PERA-P&F, no negative merit or promotional salary increase component apparently was included in the recommendation. The following compares the four salary increase recommendations made by Mercer:

Table 21
Mercer Salary Increase Recommendations

	Negative Merit/Promotional		No Negative Merit/Promotional	
Year	MSRS-General	PERA-General	TRA	PERA-P&F
1	10.52%	12.03%	12.00%	13.00%
2	8.06	8.90	9.00	11.00
3	6.90	7.46	8.00	9.00
4	6.18	6.58	7.50	8.00
5	5.68	5.97	7.25	6.50
6	5.29	5.52	7.00	6.10
7	4.99	5.16	6.85	5.80
8	4.74	4.87	6.70	5.60
9	4.53	4.63	6.55	5.40
10	4.35	4.42	6.40	5.30
11	4.20	4.24	6.25	5.20
12	4.06	4.08	6.00	5.10
13	3.94	3.94	5.75	5.00
14	3.83	3.82	5.50	4.90
15	3.73	3.70	5.25	4.80
16	3.63	3.60	5.00	4.80
17	3.55	3.51	4.75	4.80
18	3.50	3.50	4.50	4.80
19	3.50	3.50	4.25	4.80
20	3.50	3.50	4.00	4.80
21	3.50	3.50	3.90	4.70
22	3.50	3.50	3.80	4.60
23	3.50	3.50	3.70	4.50
24	3.50	3.50	3.60	4.50
25	3.50	3.50	3.50	4.50
26	3.50	3.50	3.50	4.50
27	3.50	3.50	3.50	4.50
28	3.50	3.50	3.50	4.50
29	3.50	3.50	3.50	4.50
30+	3.50	3.50	3.50	4.50

Source: MSRS-General, PERA-General, and TRA Experience Study 2004-2008, pp. 47, 50-51; PERA-P&F Experience Study 2004-2009, p. 36

3) Critiques of the Salary Increase Actuarial Assumptions. Concerns have been raised on the floor of the House of Representatives and in the Senate Finance Committee over omnibus retirement legislation with respect to the magnitude of the assumed salary increase rates in Minnesota Statutes, Section 356.215, Subdivision 8.

In the four most recent quadrennial experience studies (MSRS-General, PERA-General, TRA, and PERA-P&F), information on salary increases (2004-2008 or 2004-2009) was presented. The information presented by Mercer for that period is as follows:

Table 22

Length of Service	MSRS-G Exposures	MSRS-G Observed Average	MSRS-G Current Assumption Expected Average	MSRS-G Proposed Assumption	PERA-General Exposures	PERA-General Observed Average	PERA-General Current Assumption Expected Average	PERA-General Proposed Assumption	TRA Exposures	TRA Observed Average	TRA Current Assumption Expected Average	TRA Proposed Assumption	PERA-P&F Exposures	PERA-P&F Observed Average	PERA-P&F Current Assumption Expected Average	PERA-P&F Proposed Assumption
1	5,376	11.75%	7.84%	10.50%	14,715	14.98%	7.24%	12.00%	13,462	14.75%	7.98%	12.00%	1,083	12.79%	7.76%	13.00%
2	9,300	7.47	7.22	8.10	33,230	9.32	6.58	8.90	16,357	8.97	7.64	9.00	2,366	9.81	7.65	11.00
3	8,134	6.38	6.59	6.90	29,322	7.19	5.93	7.50	13,959	6.93	7.34	8.00	2,363	9.16	7.40	9.00
4	7,886	5.88	5.95	6.20	27,458	6.25	5.30	6.60	13,023	7.15	7.03	7.50	2,318	8.09	7.16	8.00
5	8,055	5.46	5.33	5.70	26,858	5.90	4.66	6.00	12,970	6.99	6.73	7.25	2,433	6.44	6.92	6.50
6	7,926	5.21	5.30	5.30	25,084	5.32	4.64	5.50	12,440	6.86	4.62	7.00	2,552	5.96	6.73	6.10
7	7,206	5.23	5.27	5.00	22,777	4.60	4.61	5.20	12,074	6.95	6.10	6.85	2,676	5.33	6.53	5.80
8	5,875	5.07	5.25	4.70	19,994	4.55	4.58	4.90	11,322	6.74	5.78	6.70	2,622	5.33	6.35	5.60
9	4,960	4.74	5.21	4.50	17,872	4.51	4.56	4.60	10,052	6.88	5.44	6.55	2,521	4.98	6.18	5.40
10	4,305	4.62	5.18	4.40	16,439	4.10	4.53	4.40	9,356	6.64	5.11	6.40	2,266	5.22	6.02	5.30
11	3,945	4.45	5.15	4.20	15,245	4.10	4.50	4.20	9,086	6.37	5.08	6.25	2,112	5.45	5.87	5.20
12	3,880	3.96	5.12	4.10	14,276	3.99	4.48	4.10	8,659	5.77	5.04	6.00	1,796	4.65	5.74	5.10
13	3,664	4.20	5.08	4.00	13,631	3.74	4.45	3.90	8,111	5.78	4.99	5.75	1,618	4.94	5.60	5.00
14	3,931	3.53	5.06	3.80	12,967	3.41	4.42	3.80	7,612	5.47	4.94	5.50	1,456	4.77	5.49	4.90
15	4,057	3.66	5.03	3.70	12,669	3.48	4.41	3.70	6,891	5.00	4.87	5.25	1,389	4.87	5.39	4.80
16	4,255	3.32	5.00	3.60	12,311	3.49	4.39	3.60	6,415	4.61	4.81	5.00	1,359	4.67	5.30	4.80
17	4,422	3.58	4.98	3.50	12,023	3.33	4.38	3.50	6,152	4.08	4.76	4.75	1,378	4.55	5.22	4.80
18	4,096	3.32	4.95	3.50	11,130	3.34	4.36	3.50	5,796	4.31	4.72	4.50	1,381	4.40	5.14	4.80
19	3,929	3.33	4.92	3.50	10,486	3.10	4.35	3.50	5,474	3.97	4.68	4.25	1,312	4.74	5.06	4.80
20	3,772	3.32	4.92	3.50	9,750	3.34	4.33	3.50	5,054	4.34	4.65	4.00	1,187	4.79	5.01	4.80
21	3,487	3.12	4.90	3.50	9,376	3.37	4.32	3.50	4,506	4.10	4.62	3.90	1,061	4.43	4.96	4.70
22	3,126	3.17	4.90	3.50	6,954	3.38	4.31	3.50	4,023	3.76	4.59	3.80	896	4.64	4.91	4.60
23	2,953	3.31	4.87	3.50	6,013	3.11	4.31	3.50	3,685	3.77	4.57	3.70	770	4.29	4.89	4.50
24	2,941	3.30	4.85	3.50	5,736	3.01	4.30	3.50	3,626	3.67	4.55	3.60	786	4.17	4.85	4.50
25	3,178	3.14	4.80	3.50	6,133	3.24	4.29	3.50	3,962	3.41	4.54	3.50	774	4.24	4.82	4.50
26	3,250	2.89	4.75	3.50	6,288	3.03	4.27	3.50	4,247	3.29	4.54	3.50	724	4.44	4.80	4.50
27	3,203	2.81	4.70	3.50	5,938	3.09	4.26	3.50	4,311	3.33	4.54	3.50	645	3.97	4.78	4.50
28	2,901	2.91	4.65	3.50	5,260	3.10	4.25	3.50	4,370	3.25	4.54	3.50	513	4.40	4.76	4.50
29	2,68/1	3.19	4.60	3.50	4,396	3.06	4.23	3.50	4,168	3.28	4.53	3.50	381	3.94	4.75	4.50
30(+)	2,475	2.93	4.57	3.50	3,798	2.95	4.22	3.50	4,025	3.15	4.53	3.50	596	4.16	4.75	4.50
31+	10,711	2.76	4.57	3.50	11,684	3.04	4.22	3.50	13,102	2.93	4.58	3.50				
Total	149,880	4.63	5.36	4.81	428,813	5.16	4.87	5.26	248,290	6.20	5.72	6.21	45,134	5.82	6.04	6.03

While the period 2004-2008 or 2004-2009 covered by the experience studies largely or wholly preceded the impact of the 2008 economic downturn and the generalized limitation that it placed on salary increases, and current rates of salary increase are likely to be modest or nominal, the current short-term experience is unlikely to accurately reflect long-term future salary increase rates.

Unlike the interest rate assumption, where a higher numeric rate represents optimism from the perception of funding costs and the allocation of their burden, the higher the numeric value in the salary increase actuarial assumption represents conservatism in that it produces the recognition of a greater amount of accrued and accruing actuarial liabilities. If the interest rate assumption is correctly viewed as unduly optimistic, the setting of the salary increase assumption can be viewed to balance against that perceived or actual optimism in other economic actuarial assumptions.

4) Importance of the Match of Salary Increase Assumption Rates to Experience Returns. Until 1995 (Laws 1995, Ch. 141, Art. 3, Sec. 14), Minnesota public retirement plans utilized a single salary increase rate for all ages and all years of service, generally 6.5% per year for the statewide and major local Minnesota retirement plans. In 1995, salary increase actuarial assumptions with a variable rate based on age replaced the prior single rate salary increase actuarial assumption for MSRS-General, PERA-General, and TRA, ranging from 7.25% 8.71%, and 7.25% increases respectively for the youngest ages to 5.25%, 5.00%, and 5.25% increases respectively for the oldest ages. Subsequently, age-related variable rate salary increase actuarial assumptions were added for most other statewide and major local Minnesota public pension plans and the age-related variable rate salary increase actuarial assumptions were further refined by the introduction of initial membership period service-related select variable rate salary increase actuarial assumptions as a combination with the ultimate variable rate salary increase actuarial assumptions.

With variable rate salary increase actuarial assumptions, now solely service-based ultimate variable rate salary increase actuarial assumptions for MSRS-General, PERA-General, TRA, and PERA-P&F, and a combination age-based ultimate variable rate salary increase actuarial assumptions and service-based select variable rate salary increase actuarial assumptions for MSRS-Correctional and the State Patrol Retirement Plan, PERA-Correctional, DTRFA, and SPTRFA, the appropriateness of the assumption is the match of the pattern of the assumption to the pattern of long-term and recent experience.

Variable rate salary increase actuarial assumptions tend to be over-weighted to some segment, typically younger ages or earlier service periods, while single rate salary increase actuarial assumptions do not vary over age or service. Since, for any actuarial valuation, most active participants are at that point during their public employment careers short of their final year of service and retirement age, the actuarial valuation will only provide an accurate picture of liabilities and costs if the salary increase actuarial assumption reflects the age and/or service experience pattern of the retirement plan.

5) Problem of the Current Lack of Follow-Up in Setting Salary Increase Assumptions for Smaller Statewide and Major Local Retirement Plans. Currently, one retirement plan (the Elected State Officers Retirement Plan) has no salary increase actuarial assumption because the plan has no active members, two retirement plans (the Legislators Retirement Plan and the Judges Retirement Plan) utilize a single rate salary increase actuarial assumption, five retirement plans (MSRS-Correctional, the State Patrol Retirement Plan, PERA-Correctional, DTRFA, and SPTRFA) have combined service-related select and age-related ultimate salary increase actuarial assumptions, and four retirement plans (MSRS-General, PERA-General, TRA, and PERA-P&F) have service-related ultimate salary increase actuarial assumptions.

The service-related ultimate salary increase actuarial assumption represents Commission ratification of the view and recommendation of the actuarial consultant of the four affected retirement plans, Mercer, that a service-related salary increase actuarial assumption is more consistent with recent experience and more likely to be accurate in the future than a combination service-related select and age-related ultimate salary increase actuarial assumption, but neither Mercer or the Commission have taken any steps to assess whether those combination select and ultimate rate actuarial assumptions need to be replaced for retirement plans other than MSRS-General, PERA-General, TRA, and PERA-P&F and to fashion the appropriate service-related ultimate salary increase actuarial assumption.

Before the 2008 decision (Laws 2008, Ch. 349, Art. 10, Sec. 7), to scrap the post-1984 utilization of a single consulting actuary for the preparation of the actuarial valuations of the statewide and major local retirement plans, the Commission-retained actuary or the actuary retained jointly by the retirement system administrators typically would make recommendations for actuarial assumption change recommendations for the retirement plans other than the three retirement plans required to have periodic experience studies (MSRS-General, PERA-General, and TRA) that were consistent with MSRS-General, PERA-General, and TRA actuarial assumption change recommendations, if appropriate. The 2008 return to the pre-1984 practice of each retirement plan administration retaining its own consulting actuary separately has meant that the smaller retirement plans frequently have been omitted from actuarial assumption changes seemingly as a matter of inertia rather than articulated deliberations leading to sound policy conclusions.

e. Payroll Growth Assumption.

1) Purpose. The payroll growth assumption only has application to those retirement plans that have their unfunded actuarial accrued liability supplemental amortization contribution requirement calculated as a level percentage of an increasing future total covered payroll. Minnesota Statutes, Section 356.215, provides that actuarial valuations are prepared on a closed group basis rather than on an open group basis, so no actuarial assumptions are required regarding new plan members joining after the plan valuation date. However, since amortizing a defined benefit retirement plan unfunded actuarial accrued liability may extend beyond the remaining average working lifetime of the active membership and since many Minnesota public pension plan unfunded actuarial accrued liabilities are amortized as a percentage of the increasing total covered payroll, some assumptions regarding the covered salary growth rate is necessary.

2) Factors Included in the Assumption. Actuarial Standard of Practice No. 27 does not specifically address the setting of a payroll growth actuarial assumption. Mercer, in its recent experience studies, indicates, without providing any specifications of its academic or regulatory source that the assumption is supposed to be the sum of the inflation assumption and the real wage growth assumption. Neither the inflation assumption nor the real wage growth assumption are required by Minnesota Statutes, Section 356.215, and are not required to be approved by the Commission under Minnesota Statutes, Section 356.215, Subdivision 18.

Based on a presentation on the historical real wage growth in national average wages attributed to the Social Security Administration, showing that real wage growth has under-performed the prior assumed rate of 1.5% in 28 of 50 years (1957-2007), and based on undisclosed internal proprietary modeling suggesting a future real wage growth reasonable range of a low of 0.50% and a high of 1.50%, Mercer recommended changing the real wage growth of 1%, down from 1.5%. Combined with Mercer's recommendation for a continuation of the 3.00% inflation rate assumption, Mercer's recommendation for a payroll growth assumption was decreased from 4.50% to 4.00%. In response to critical comments in the experience study review by the Commission's retained actuary, Milliman, the payroll growth assumption ultimately chosen for MSRS-General, PERA-General, TRA, and PERA-P& was 3.75%.

While the Actuarial Standards Board does not specifically address the selection of an actuarial payroll growth assumption for use with a level percentage of covered payroll amortization procedure, the Government Accounting Standards Board (GASB), in guidelines for Government Accounting Standards Board (GASB) Statements 43 and 45, relating to other post-employment benefits (OPEBs), indicates that the acceptable assumption as to the rate of increase over time in covered payroll may only be a result of inflation on general salary levels.

Covered payroll will increase in total, year to year, in a pension plan only if the population covered by the retirement plan remains relatively stable and essentially all salaries increase, or if essentially all salaries remain the same and the population covered by the retirement plan increases, or both possible increases occur.

Since Government Accounting Standards Board (GASB) and generally accepted accounting principles appear to prohibit the use of any expected increase in plan membership and any covered payroll increase factor other than inflation, it would appear to be best practice to limit the covered payroll growth assumption to the inflation assumption.

3) Critiques of the Current Covered Payroll Growth Assumption. While not a specific critique of the current payroll growth assumption, the procedure of a level percentage of increasing covered payroll amortization is problematic, especially if the payroll growth assumption is very large, or if the amortization period is very long, or if the amortization period is reset periodically solely to reduce the calculated total actuarial requirement without the discipline of requiring a small set of extension events.

Unlike level dollar amortization, level percentage of payroll amortization generally produces a supplemental amortization contribution rate that is less in a dollar amount than the full actuarial interest rate assumption amount on the unfunded actuarial accrued liability for a substantial portion of the amortization period, meaning that the retirement plan's unfunded actuarial accrued liability will actually increase during much of the amortization period even if the contribution rates equal the retirement plan's total actuarial requirements.

4) Follow-Up With Other Retirement Plans Problem. Akin to the failure of the current actuarial service arrangement for Minnesota public pension plans set forth for the salary increase assumption, there is no regular and recurring process for updating the payroll growth assumption for those retirement plans that do not have mandated or special experience studies.

f. Mortality Assumption.

1) Purpose. The mortality actuarial assumption functions in projecting the duration of the payment of a retirement annuity or benefit to or on behalf of a participant.

2) Factors Included in the Setting of the Assumption. Actuarial Standard of Practice No. 35, published by the Pension Committee of the Actuarial Standards Board (see Attachment C), indicates that different mortality assumptions should be specified both before and after retirement, that a different mortality assumption should be specified for disabled lives, that different mortality assumptions should be considered for different participant subgroups and their beneficiaries, and that mortality rates should e adjusted for mortality improvements that occurred before the valuation date and for expected mortality improvements after the valuation date.

For decades, mortality tables have been assembled and published for use by pension and life insurance actuaries. Consulting actuaries preparing actuarial valuations of Minnesota public employee retirement plans typically have used published mortality tables, adjusting the national tables for Minnesota's experience by the use of set-backs (using the expected mortality for a person that is some number of years younger than the participant's actual age to account for local longer longevity than the national table) or set-forwards (using the expected mortality for a person that is some number of years older than the participant's actual age to account for local shorter longevity than the national table).

Until recently, most Minnesota public pension plans have utilized the 1983 Group Annuity Mortality Table for pre-retirement mortality and healthy post-retirement mortality, but with different set-backs, and have utilized a combination of the 1965 Railroad Retirement Board mortality rates and the 1983 Group Annuity Mortality Table.

In 2010, based on a recommendation from their retained actuarial consultant, Mercer, the Legislative Commission on Pensions and Retirement approved a shift from the prior mortality tables to the RP2000 annuitant generational table, the RP2000 disability mortality table, and the RP2000 non-annuitant generational mortality table, all three with the white collar adjustment, for three Minnesota plans, MSRS-General, PERA-General, and TRA.

3) Different Approach Represented in Mortality Table Revision. The RP2000 mortality tables were precipitated by the federal Retirement Protection Act of 1994, which established mortality assumptions to be used to calculate actuarial accrued liabilities for private sector pension plans and gave the Secretary of the Treasury authority to promulgate a new mortality table in 2000. The Society of Actuaries collected mortality data from more than 100 uninsured pension plans for the period 1990-1994, with data separated into hourly workers (blue collar), salaried workers (white collar), or mixed and separated based on age, gender, and participant type (active, retired, disabled, and beneficiary). Trends in mortality improvement were developed from Social Security, the Federal Civil Service, the Railroad Retirement Board, and the Society of Actuaries group annuity mortality studies. The RP-2000 longevity reportedly is approximately between 2% and 9% greater for males and approximately between 3% and 5% shorter for females than the 1983 Group Annuity Mortality Table.

   The RP-2000 mortality tables are intended to be generational mortality tables, which attempt to capture expected longevity increases by mathematical adjustments to the static RP-2000 mortality table, either annually or for some longer period.

   The motion approving the mortality table changes for MSRS-General, PERA-General, and TRA adopted by the Legislative Commission on Pensions and Retirement in 2010 specified only the static table RP-2000 with set-backs or set-forwards, and did not set any generational adjustment period. The 2010 actuarial valuations for MSRS-General, PERA-General, and TRA do not describe the RP-2000 mortality table generational adjustment. In testimony over the 2010 mortality table changes in response to a staff question, it was suggested to the Commission that adjustments occur every five years.

4) Role of Mortality Assumptions in Setting Actuarial Equivalent Optional Annuity Forms. Minnesota law (Minn. Stat., Sec. 3A.01, Subd. 1a; 352.01, Subd. 12; 352B.08, Subd. 3; 353.01, Subd. 14; 354.05, Subd. 7; 354A.011, Subd. 3a; 423B.01, Subd. 21; 423.C.01, Subd. 4; and 490.121, Subd. 2a) defines actuarial equivalence and Minnesota law (Minn. Stat., Sec. 3A.02, Subd. 5; 352.116, Subd. 3; 352B.08, Subd. 3; 353.30, Subd. 3; 354.45, Subd. 1; 354A.32, Subd. 1; 423B.09, Subd. 6; 423C.05, Subd. 8; and 490.124, Subd. 11) requires that optional annuity forms be the actuarial equivalent of the single life retirement annuity calculated for the person. In addition to the interest rate actuarial assumption used in calculating actuarial equivalence, the other actuarial assumption that determines actuarial equivalence is the mortality assumption. Although the mortality assumptions for MSRS-General, PERA-General, and TRA were modified in 2010, it is unclear whether or not any of the three retirement plan administrations has modified its optional annuity calculation tables to ensure that optional annuity forms meet the statutory actuarial equivalence requirement.

5) Follow-Up with Other Retirement Plans Problem. Akin to the failure of the current actuarial services arrangement for Minnesota public pension plans outlined for the salary increase actuarial assumption and the payroll growth actuarial assumption, there is no regular and recurring process for updating the payroll growth assumption for those retirement plans that do not have mandated or special experience studies performed.

Part Seven

Accommodation of Actuarial Gains and Losses from Departures from Actuarial Assumptions

a. Departures from Actuarial Assumptions. Because of the number of actuarial assumptions, their basis as an approximation of past experience averages, and the complexity of the underlying experience, departures in actual experience from that expected under the actuarial assumptions are to be expected.

   When departures in experience from actuarial assumptions become too significant and too frequent, actuarial assumptions may need to be changed if there is a discernible trend line. The departures are recognized as gains and losses.

b. Reporting of Actuarial Gains and Losses. From 1975 (Laws 1975, Ch. 192, Sec. 3), until 1987 (Laws 1987, Ch. 259, Sec. 55), actuarial valuations of the statewide and major local Minnesota retirement plans were required to include the actuarial gains and losses related to investment earnings, mortality rates, salary increases, disability rates, withdrawal rates, retirement rates, and other reasons. In 1987 (Laws 1987, Ch. 259, Sec. 55), the explicit gain and loss analysis required to be included in each actuarial valuation was downsized to those related to investment earnings post-retirement mortality, salary increases, and other sources. Since 1987, the Commission's Standards for Actuarial Work have required a designation of the source or sources of actuarial gains or losses that equal or exceed a certain percentage of the retirement plan's unfunded actuarial accrued liability. The 1987 downsizing was pursued by the retirement plan administrators in order to reduce the actuarial compensation of the consulting actuary retained by the Commission, which was payable in part from an assessment charged by the Commission to each statewide or major local retirement plan.

c. Amortization of Net Actuarial Gains and Losses. Under Minnesota Statutes, Section 356.215, Subdivision 11, supplemental amortization contributions for the unfunded actuarial accrued liability of the various Minnesota public pension plans is required to be determined by an amortization target date. While the amortization target date is revised periodically for some retirement plans in the event of an actuarial method change, benefit increase, or actuarial assumption change, no amortization target date revision is automatically implemented in the event of a net experience loss, even one of the size of the 2008-2009 investment performance losses.

   If the amortization target date is set at a date that is not hugely beyond the average remaining expected working lifetime of the active retirement plan members, is not changed with undue frequency, and is substantially matched by the contribution rates of the retirement plan, the amortization procedure will impose a fiscal discipline on the retirement plan and will produce adequate retirement plan advanced funding even if one or more of the actuarial assumptions is significantly inaccurate.

   The recent experience of setting the amortization target date has indicated a trend for demands to lengthen the amortization target date whenever the contribution rate deficiency in comparison to the full actuarial funding requirements becomes very significant, eliminating the amortization procedure as a significant correction to inaccuracies or inadequacies in the actuarial funding procedure in force.

Conclusion

This memorandum was intended to provide sufficient background information to the members of the Commission to place the current interest, salary increase, payroll growth, and mortality assumptions in the broader context of actuarial reporting and funding of Minnesota public retirement plans. If the Commission desires any additional information relating to the topic assembled and explored by the Commission staff in a future Commission staff issue memorandum, the Commission staff stands ready to undertake the task.

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Table A- 1

Entry Age Normal Cost Actuarial Cost Method Total Actuarial Requirement Over Time

Time	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Normal Cost	3506	3506	4324	4324	4324	4324	4324	4324	4324	4324	4324	4324	4324	4324	4324	4324	4324	4324	4324	4324
Amortization	3763	3763	4784	4784	4784	4784	4927	4927	4927	4927	4927	4784	4784	4784	4784	4784	4784	4784	4784	4784
Total Financial Requirements	3763	3763	4784	4784	4784	4784	4927	4927	4927	4927	4927	4784	4784	4784	4784	4784	4784	4784	4784	4784

Time	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40
Normal Cost	4324	4324	4324	4324	4324	4324	4324	4324	4324	4324	4324	4324	4324	4324	4324	4324	4324	4324	4324	4324
Amortization	4784	4784	4784	4784	4784	4784	4784	4784	4784	4784	4527	4527	4324	4324	4324	4324	4324	4324	4324	4324
Total Financial Requirements	4784	4784	4784	4784	4784	4784	4784	4784	4784	4784	4527	4527	4324	4324	4324	4324	4324	4324	4324	4324

Table A- 2

Unit Credit Actuarial Cost Method Total Actuarial Requirement Over Time

Time	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Normal Cost	1272	1361	1820	1947	2083	2229	2385	2552	2731	2922	3127	3345	3580	3830	4098	4385	4892	5021	5372	5748
Amortization	86	86	86	86	86	86	146	146	146	146	146	86	86	86	86	86	86	86	86	86
Total Financial Requirements	1358	1447	1906	2033	2169	2315	2531	2698	2877	3068	3273	3431	3666	3916	4184	4471	4478	5107	5458	5834

Time	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40
Normal Cost	6150	6581	7042	7535	8062	8826	9230	9878	10568	11307	12099	12948	13852	14822	15859	16969	18157	19428	20788	22243
Amortization	86	86	86	86	86	86	86	86	86	86	0	0	0	0	0	0	0	0	0	0
Total Financial Requirements	6236	6667	7128	7621	8148	8712	9316	9962	10654	11393	12099	12916	13852	14822	15859	16969	18157	19428	20788	22243

Table A- 3

Aggregate Actuarial Cost Method Total Actuarial Requirement Over Time

Time	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Normal Cost	3743	3743	4749	4749	4749	4749	4795	4795	4795	4795	4795	4795	4795	4795	4795	4795	4795	4795	4795	4795
Total Financial Requirements	3743	3743	4749	4749	4749	4749	4749	4749	4749	4749	4749	4749	4749	4749	4749	4749	4749	4749	4749	4749

Time	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40
Normal Cost	4795	4795	4795	4795	4795	4795	4795	4795	4795	4795	4795	4795	4795	4795	4795	4795	4795	4795	4795	4795
Total Financial Requirements	4749	4749	4749	4749	4749	4749	4749	4749	4749	4749	4749	4749	4749	4749	4749	4749	4749	4749	4749	4749

Table A- 4

Frozen Initial Liability (Entry Age Normal) Actuarial Cost Method Total Actuarial Requirement Over Time

Time	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Normal Cost	3502	3502	4317	4317	4317	4317	4362	4362	4362	4362	4362	4362	4362	4362	4362	4362	4362	4362	4362	4362
Amortization	259	259	463	463	463	463	463	463	463	463	463	463	463	463	463	463	463	463	463	463
Total Financial Requirements	3761	3761	4780	4780	4780	4780	4825	4825	4825	4825	4825	4825	4825	4825	4825	4825	4825	4825	4825	4825

Time	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40
Normal Cost	4362	4362	4362	4362	4362	4362	4362	4362	4362	4362	4362	4362	4362	4362	4362	4362	4362	4362	4362	4362
Amortization	463	463	463	463	463	463	463	463	463	463	204	204	0	0	0	0	0	0	0	0
Total Financial Requirements	4825	4825	4825	4825	4825	4825	4825	4825	4825	4825	4566	4566	4362	4362	4362	4362	4362	4362	4362	4362

Proposed Revision of Actuarial Standard of Practice No. 27
Selection of Economic Assumptions for Measuring Pension Obligations:
Portion Relating To Selecting a Compensation Scale

3.8 Selecting a Compensation Scale—Compensation is a factor in determining participants' benefits in many pension plans. Also, some actuarial cost methods take into account the present value of future compensation. Generally, a participant's compensation will change over the long term in accordance with inflation, productivity growth, and merit scale. The assumption used to measure the anticipated year-to-year change in compensation is referred to as the compensation scale. It may be a single rate; alternatively, it may vary by age or service, consistent with the merit scale component; or it may vary over future years, consistent with the inflation component.

3.8.1 Data—The actuary should review available compensation data. These data may include the following:

a. the plan sponsor's current compensation practice and any anticipated changes in this practice;
b. current compensation distributions by age or service;
c. historical compensation increases and practices of the plan sponsor and other plan sponsors in the same industry or geographic area; and
d. historical national wage and productivity increases.

The actuary should consider available plan-sponsor–specific compensation data, but the actuary must carefully weigh the credibility of these data when selecting the compensation scale. For small plans or recently formed plan sponsors, industry or national data may provide a more appropriate basis for developing the compensation scale.

3.8.2 Measurement-Specific Factors—The actuary should consider factors specific to each measurement in selecting a specific compensation scale assumption. Examples of such factors are as follows:

a. Compensation Practice—The plan sponsor's current compensation practice and any contemplated changes may affect the compensation scale, at least in the short term. For example, if pension benefits are a function of base compensation and the plan sponsor is changing its compensation practice to put greater emphasis on incentive compensation, future growth in base compensation may differ from historical patterns.
b. Competitive Factors—The level and pattern of future compensation changes may be affected by competitive factors, including competition for employees both within the plan sponsor's industry and within the geographical areas in which the plan sponsor operates, and global price competition. Unless the measurement period is short, the actuary should not give undue weight to short-term patterns.
c. Collective Bargaining—The collective bargaining process impacts the level and pattern of compensation changes. However, it may not be appropriate to assume that future contracts will provide the same level of compensation changes as the current or recent contracts. For example, if the current contract provides for a compensation freeze, it would generally be inappropriate to assume that such a policy would continue indefinitely after the contract expires.
d. Compensation Volatility—If certain elements of compensation, such as bonuses and overtime, tend to vary materially from year to year, or if aberrations exist in recent compensation amounts, then volatility should be taken into account. This may be accomplished by adjusting the base amount from which future compensation elements are projected (for example, the current bonus might be replaced by the average of bonuses over the last 3 years).
e. Expected Plan Termination—In some situations, as stated in section 3.6.3(h), the actuary may expect the plan to be terminated at a determinable date. In these situations, the compensation scale may reflect a shortened measurement period that ends at the expected termination date.

3.8.3 Multiple Compensation Scales—The actuary may use multiple compensation scales in lieu of a single compensation scale. Three examples are as follows:

a. Select and Ultimate Scale—Assumed compensation increases vary by period from the measurement date (for example, 4% increases for the first 5 years following the measurement date, and 5% thereafter) or by age or service.
b. Separate Scales for Different Employee Groups—Different compensation scales are assumed for two or more employee groups that are expected to receive different levels or patterns of compensation increases.
c. Separate Scales for Different Compensation Elements—Different compensation scales are assumed for two or more compensation elements that are expected to change at different rates (for example, 5% bonus increases and 3% increases in other compensation elements).

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3.5.3 Mortality and Mortality Improvement Assumptions—The actuary should consider factors such as the following in the selection of both mortality and mortality improvement assumptions:

a. the possible use of different assumptions before and after retirement (for example, in some small plan cases a reasonable model for mortality may be to assume no mortality before retirement);

b. the use of a different assumption for disabled lives, which in turn may depend on the plan's definition of disability and how it is administered;

c. the use of different assumptions for different participant subgroups and beneficiaries;

and

The actuary should consider the effect of mortality improvement both prior to and subsequent to the measurement date. With regard to mortality improvement, the actuary should do the following:

i. adjust mortality rates to reflect mortality improvement prior to the measurement date. For example, if the actuary starts with a published mortality table, the mortality rates may need to be adjusted to reflect mortality improvement from the effective date of the table to the measurement date. Such an adjustment is not necessary if, in the actuary's professional judgment, the published mortality table reflects expected mortality rates as of the measurement date.

ii. include an assumption as to expected mortality improvement after the measurement date. This assumption should be disclosed in accordance with section 4.1.1, even if the actuary concludes that an assumption of zero future improvement is reasonable as described in section 3.1. Note that the existence of uncertainty about the occurrence or magnitude of future mortality improvement does not by itself mean that an assumption of zero future improvement is a reasonable assumption.