MUNICIPAL EMPLOYEES' RETIREMENT SYSTEM OF MICHIGAN

Experience Study Report

For the Period

January 1, 2009 – December 31, 2013

Prepared by

CBIZ Retirement Plan Services

July 6, 2015

CBIZ Retirement Plan Services
17187 N. Laurel Park Dr., Ste. 250
Livonia, MI 48152
http://retirement.cbiz.com

July 6, 2015

The Retirement Board
Municipal Employees' Retirement System of Michigan
Lansing, Michigan

Ladies and Gentlemen:

This report presents the results of the 5-year ***actuarial experience study*** of the Municipal Employees' Retirement System of Michigan (MERS), covering the period from January 1, 2009 through December 31, 2013, and was carried out using generally accepted actuarial principles and techniques. The analysis was conducted for the purpose of updating the funding policy and the actuarial assumptions used in valuing the actuarial liabilities of MERS plans.

Performing an experience study is a best practice that compares actual experience with the current actuarial assumptions, and reviews the funding policy used for the actuarial valuations. MERS is an agent multiple employer plan where each employer's retirement plan is maintained separately. The analysis was based upon the statistical data furnished for annual active member and retired life actuarial valuations concerning members who died, withdrew, became disabled or retired during the 5 year period.

We believe the recommended funding policy will assist in attaining MERS' goal of accumulating adequate assets to pay for plan benefits.

We believe that the actuarial assumptions recommended in this experience study report represent individually and in the aggregate reasonable estimates of future experience of MERS.

The actuaries submitting this statement are Members of the American Academy of Actuaries (MAAA), and meet the Qualification Standards of the American Academy of Actuaries to render the actuarial opinions contained herein.

Respectfully submitted,

Alan Sonnanstine, ASA, MAAA

Cathy Nagy, FSA, EA, MAAA

James Koss, ASA, EA, MAAA

TABLE OF CONTENTS

Section A

Executive Summary

EXECUTIVE SUMMARY

Background

The MERS Retirement Board has established a policy of requesting the actuary to periodically review the MERS funding policy and the actuarial assumptions used to calculate liabilities and employer contributions to MERS. The assumptions are reviewed every five years. The last review was prepared for the period from January 1, 2004 through December 31, 2008. The last change in funding policy was adopted in November, 2014.

Periodic review and selection of the actuarial assumptions is one very important component of managing the financial aspects of MERS. Use of outdated assumptions can lead to:

- Understated costs resulting in either (i) sharp increases in required contributions at some point in the future, or (ii) in the extreme situation, an inability to pay benefits when due;
- Overstated costs resulting in either (i) benefit levels that are kept below the level that could be supported by the contribution income, or (ii) an unnecessarily large burden on the current generation of employees and employers.

A single set of assumptions is typically not expected to be suitable forever. As the actual experience of MERS changes, the assumptions should be reviewed and adjusted accordingly.

In this report, we reviewed the current MERS funding policy and reviewed the current actuarial assumptions, and compared them to the actual experience of MERS for the years 2009-2013. Changes in funding policy and certain assumptions are recommended based upon this comparison and upon our general experience with public employee retirement systems.

The following page lists areas of funding policy and each of the actuarial assumptions that we reviewed, including our recommendations for each item, and the financial impact of any recommended changes (effect on computed contribution requirements for fiscal years beginning in 2017).

Funding Policy Goals

Every funding policy will address the goals of adequacy, equity, contribution stability, transparency and governance in different measures (see Section H for more details). Determining the relative weight of MERS' desire to attain each of these goals aided in producing a specific funding policy.

MERS determined that its priorities are:

1. Adequacy
2. Inter-Period Equity (in particular intergenerational equity), and Transparency
3. Contribution Stability, and Governance

Sections C-G include specific recommendations about both funding policy and actuarial assumptions. MERS determined that some funding policy issues could be deferred to gather input from employers. These issues are discussed in detail in Section H, and are also listed on page A-4.

SUMMARY OF RECOMMENDATIONS AND FINANCIAL IMPACT

Funding Policy or Assumption	Recommendation	Financial Impact
Asset valuation method	5-year smoothing	Prospective[1]
Actuarial method	No change	N/A
Open division amortization policy	Several changes	Prospective[1]
Closed division amortization policy	Several changes	Prospective[1]
Closed municipality funding policy	No change	N/A
Investment return	Decrease	Increase
Wage inflation – long term Wage inflation – 2016	Decrease 3% =>3.75%	Varies[2] Immaterial Impact
Normal retirement rates	New rates[3]	Varies[3]
Early retirement rates	Increase rates	Slight decrease
Withdrawal rates – Base rates – Scaling factor	Decrease rates Scale by Municipality	Increase Varies
Disability rates	New rates[4]	Slight increase
Pre and post-retirement mortality rates – Healthy lives – Disabled lives	 Longer lifetimes Longer lifetimes	 Increase Increase
Pay increases due to merit/longevity	Decrease at younger ages	Decrease
Increases in FAC at retirement	Adjusted loading factors	Varies
Service accruals for active employees	No change	N/A
Assumptions for optional forms of payment	No change	N/A

[1] Would affect contribution requirements for fiscal years beginning in 2018 and later.
[2] Decreases active member liabilities, but some contributions will increase (less back-loaded amortization payments).
[3] Increase at lower replacement indexes, but decrease at higher replacement indexes. Results will vary by division.
[4] Increase at younger ages, but decrease at older ages.

Summary

1. Actuarial Assumptions

Overall experience in the five-year review period was less favorable than projected by the present actuarial assumptions. We are recommending adjustments to some of the assumptions. Most of the adjustments are in the direction of higher computed liabilities and employer contributions.

We are recommending significant changes in the economic assumptions:

- Lower rate of investment return.
- Lower rate of wage inflation.

We are recommending significant changes in the following assumptions:

- Longer projected lifetimes.

We are recommending minor changes in the following assumptions:

- Slightly lower rates of age and service normal retirement for members whose accrued retirement benefits are higher than average, when compared to their annual pay, and slightly higher rates of retirement for members with lower than average benefits.
- Higher rates of early retirement.
- Somewhat lower rates of employment termination before becoming eligible to retire.
- Slightly higher rates of disability at the younger ages, and slightly lower rates of disability at the older ages.
- Lower rates of merit and longevity pay increase at the younger ages.

2. Funding Policy

We are recommending changes in amortization policy, consistent with the policy changes adopted in November, 2014 that eliminated rolling amortization periods:

- Layered amortization periods: different closed periods for increases in unfunded accrued liabilities (UAL) arising from different causes.

We are recommending changing the asset valuation method to use 5-year smoothed market value, instead of the current 10-year smoothed market value.

3. Impacts and Additional Recommendations

The largest impacts will result from the changes in the rate of investment return and longevity after retirement.

Because of the significant increases in employer contribution requirements that result from the combination of all of the recommended assumption changes, we recommend that implementation of the layered amortization policy be deferred to calendar year 2016 or later; and that the impact of assumption changes on the December 31, 2015 annual actuarial valuations (affecting contributions for fiscal years beginning in 2017) be phased-in over a 5 year period.

In Section K we report the estimated impact of changing the assumptions, based on the December 31, 2013 annual actuarial valuations. Results are displayed for each municipality. The full impact of the recommendations is reported, along with the minimum required contribution based on a 5-year phase-in of the required contributions.

4. Funding Policy Issues and Assumptions for Future Review

We discussed several potential future changes in funding policy, consistent with the established funding policy goals:

1. Set the funding target at 130%.
2. Require payment of normal cost even after 100% funding status is reached.
3. Not allow for reductions in contribution rates until 100% funded.
4. Reduce the back-loading built into the scheduled amortization payments.
5. Phase-out the current Option A and Option B amortization schedules for closed divisions, as the amortization period for open divisions decreases in future years.
6. Use market value of assets combined with direct contribution smoothing, instead of smoothed market value.
7. Review generational mortality tables and their appropriateness for MERS.

These issues are discussed in Section H and on page E-23. MERS determined that some or all of these issues could be deferred in order to gather input from employers.

Section B

Introduction

INTRODUCTION

Each year as of December 31, the actuary computes the liabilities and employer contribution requirements of MERS plans. We provide each employer with an individual actuarial valuation report, and we provide the Retirement Board with a Summary Report covering all of the individual employer reports. All of these valuation reports are based on MERS' current funding policy and current actuarial assumptions regarding the future experience in the risk areas listed on the following page.

In the process, funding policy must be selected, and assumptions must be made regarding the future experience in the various risk areas listed on page A-2.

The funding policy will have a major impact on how rapidly the benefits are funded over future years.

Assumptions should be carefully chosen and continually monitored to avoid:

- Understated costs, resulting in sharp increases in required contributions at some point in the future;
- Overstated costs, resulting in either (i) benefit levels that are kept below the level that could be supported by the contribution income, or (ii) an unnecessarily large burden on the current generation of employees and employers.

A single set of assumptions should not be expected to be suitable forever. Things change, and our understanding of things also change (whether or not the things themselves are changing). For that reason the Retirement Board directs the actuary to review the funding policy and actuarial assumptions every 5 years (the experience study). In addition, every 10 years the Retirement Board has hired a different actuarial firm to review the funding policy, the actuarial assumptions, and the actuarial valuation results. The next actuarial peer review is scheduled for late 2015.

In this experience study report, the funding policy and actuarial assumptions are reviewed and the assumptions are compared with the standard of actual experience for the years 2009-2013. Changes in certain assumptions are suggested based upon this comparison and upon our general experience with public employee retirement systems. Changes in funding policy are suggested, based on MERS' funding policy goals and emerging thought among public employee retirement systems and their advisors.

No single 5-year experience period should be given full credibility in the actuarial valuation assumptions. With some exceptions, in proposing new actuarial assumptions, we suggest an assumption that is about half-way between the current assumption and the actual experience. In that way, with each experience study the actuarial assumptions become better and better representations of actual experience. The adjustments made as a result of each study will better fine tune the assumptions. Temporary conditions that might influence a particular 5-year period will not unduly influence the choice of long-term assumptions.

RELATIONSHIP BETWEEN THE CLIENT AND THE ACTUARY

The actuary should have the primary responsibility for choosing the ***non-economic*** assumptions used in the actuarial valuation, making use of his/her specialized training and experience.

The actuary, however, has no special knowledge concerning the choice of suitable ***economic*** assumptions. The basis of the economic assumptions is the assumed rate of ***inflation***, a quantity which defies accurate prediction by anyone. Given an assumed rate of future inflation, however, it is very important that this rate be applied in a consistent manner in deriving both the assumed rate of investment return and the base portion of the pay increase assumptions (wage inflation).

A sound procedure is that the actuary suggests reasonable economic assumptions, considering input from various expert sources. This is followed by discussion between the actuary and the Client, and the Client then makes the final choice.

Both the actuary and the Client will have input into a choice of funding policy, from among a range of reasonable choices. The Client's funding goals will help shape the choice of funding policy.

EXPERIENCE STUDY PROCESS

The experience study was composed of two parts: Funding Policy, and Actuarial Assumptions.

The *funding policy study* consisted of:

1. Reviewing MERS' funding policy goals.
2. Reviewing the various components of the funding policy (amortization policy, asset smoothing, contribution smoothing, closed divisions, closed municipalities, etc.), with the objective of narrowing down the list of possible candidate policies for recommendation.
3. Extensive discussions between MERS and CBIZ, resulting in final policy recommendations.

The *actuarial assumption study* consisted of the following steps:

1. Historical data from December 31, 2008 to December 31, 2013, supplied by MERS for use in the actuarial valuations, was loaded into database tables. CBIZ analyzed the data and created algorithms for tracking a member through each file for all years. Each member's historical data was then loaded into a database table.
2. Adjustments were made to the data to account for the following:
   - If a retiree or beneficiary disappeared from the pension payroll without a termination code, it was assumed they had died.
   - For retirees and beneficiaries who received benefits from more than one employer, division or employment history, their multiple records were combined into a single record per person, for each valuation year.
   - Data was adjusted so that members who transfer from one division to another within the same municipality are not treated as withdrawals.
   - For active members, "holes" in their employment history were filled in, so that a temporary departure from active member status (later returning to active status) was not treated as a withdrawal.
3. Once the data adjustments were complete, the data was processed through our valuation system. Each member's exposure to each appropriate decrement type was measured and stored.
4. Experience study reports were generated for various years and data groupings. These were then examined by CBIZ actuaries and, if applicable, new probabilities were proposed.

Section C

Amortization Policies

OPEN DIVISION AMORTIZATION POLICY

Background

An open division is defined as one which includes new hires, and currently has active members. Under current funding policy, divisions which are "closed-linked", where new hires enter a different MERS Defined Benefit or Hybrid Plan division, also follow the open division amortization policy discussed in the section.

An amortization policy determines the period of time and pattern of contributions required to fund any unfunded accrued liability (UAL) or surplus. Changes in UAL from valuation year to year are common, and arise from:

i. Asset or liability gains or losses occurring due to actual experience being different than assumed,
ii. Changes in plan provisions, or
iii. Changes in assumptions or methods.

Beginning with the December 31, 2005 annual actuarial valuation, the Retirement Board decided to gradually reduce the amortization period for open divisions, from a rolling 30 years down to a rolling 20 year period. As a result of the 2008 financial crisis the Board decided to fix the amortization period at 28 years for the December 31, 2008, 2009 and 2010 valuation years, before continuing to decline to a rolling 20 years. In November 2014 the Board adopted a change to the open division amortization periods to continue reducing the period by one year each year after the 20 year amortization period is reached (i.e. the rolling amortization has been eliminated, so that the amortization is more like a home mortgage and the UAL is fully funded by the end of the fiscal year beginning in 2039).

Current thinking on funding policy in the actuarial community is to move toward shorter amortization periods, and to explicitly amortize each source of UAL over a fixed period of years. This is often referred to as "layered amortization" or "multiple base amortization". Shorter periods avoid "negative amortization" (when the amortization policy by design allows the nominal UAL dollar amount to increase, by contributing less than nominal interest on the UAL or the increase in UAL). Setting up a new amortization for each new source of UAL prevents the very high volatility that may occur when amortizing the total UAL over a single period – as that period shrinks below 10 years. Layered amortization also increases transparency, in that each source of UAL is identified (e.g. gain/loss, benefit provision change, assumption change).

The following discussion will focus on amortizing future changes in UAL; dealing with the current UAL will be discussed in subsection E.

A. One Amortization Base or Many?

The advantage to having separate amortizations of the items that change the UAL is one of transparency and accountability. By separately amortizing each change in UAL (or "base"), one can readily track the historical sources of the cause of the UAL change, as well as identify when each base is scheduled to be fully amortized. A schedule of historical bases is also useful in determining the relative impact of various changes (e.g. was the impact of the last assumption change greater or less than last year's liability gain or loss).

Not unexpectedly, the major disadvantage of tracking separate amortization bases is that it adds complexity. MERS would be developing a table of bases for each division, rather than publishing a single amortization amount. Separate amortization bases may also increase contribution volatility as amortization bases "drop off" from the calculation at the end of their respective amortization periods.

A rough idea of an amortization table is shown below for the December 31, 2017 annual valuation (something similar will be included in the annual actuarial valuation report for each division). This sample table is based on 15 year amortization of gains/losses and 15 year amortization of assumption/method changes:

Valuation Date December 31,	Base Type	Remaining Amortization Period	Outstanding UAL Balance as of July 1, 2019	Amortization Payment as of July 1, 2019
2014	Initial UAL	21	2,100,140	141,612
2015	(Gain)/Loss	13	452,123	43,699
2016	(Gain)/Loss	14	(357,852)	(32,610)
2016	Assumption Change	14	147,369	13,429
2017	(Gain)/Loss	15	(99,000)	(8,549)
Total			2,242,780	157,581

B. Amortization Period Length?

Generally speaking determining the length of an amortization period requires balancing contribution volatility against intergenerational equity and funding adequacy concerns. Shorter periods increase volatility but promote demographic matching and adequacy; the outcomes are reversed with longer amortization periods.

B.1. Gains/Losses

Year to year changes in UAL arising from differences between actual and expected experience are referred to as gains or losses in this subsection. Gains and losses are expected to offset each other over time, if the underlying assumptions are an accurate predictor of future experience. Further, gains or losses are normally outside the control of either the plan sponsor or the Retirement Board.

The public plan actuarial community has invested considerable resources in developing recommendations for funding policies for public plans (see: *Actuarial Funding Policies and Practices for Public Pension Plans*, by the Conference of Consulting Actuaries Public Plans Community; CCA-PPC). The CCA-PPC White Paper model practice recommendation is for a gain/loss amortization period of between 15 and 20 years. That paper opines that a period "…less than 15 years gives too little 'volatility control', especially for gains". However, if other aspects of the funding policy manage the use of funding surplus, a period as short as 10 years may be considered, in our opinion.

B.2. Changes in Plan Provisions

The MERS Plan Document requires that a division be 100% funded in order to be eligible to adopt an increased benefit provision, and must be 100% funded after adoption of an increased benefit provision. Exceptions to this policy are:

1. The one-time benefit increase for current retirees may be adopted if the employer contributes in a lump sum 100% of the increased liability associated with the benefit increase.
2. Purchases of service credit may be adopted if the employer and employee contribute in a lump sum 100% of the estimated actuarial cost of the purchase.
3. A division that is 80% or more funded may adopt an increased benefit provision if the employer contributes in a lump sum 100% of the increased liability associated with the benefit increase.

Therefore for most benefit provision increases, the employer will either fully fund the increased liability immediately (i.e. 1 year amortization), or the employer will remain 100% funded after the adoption of the increased benefit provision.

However, in the latter case (over 100% funded both before and after the benefit change), we suggest that the employer contribute additional amounts to fully fund the increased benefit over a period of years, instead of simply using assets in excess of liabilities to fund the increased liability. Therefore, we need an amortization policy for benefit provision changes.

Changes in plan provisions are in the plan sponsor's control, so that volatility management is not an issue. The current thinking in the actuarial community is that changes in benefits which increase liability should be amortized over the remaining working lifetime of the affected active members or the remaining lifetime of the affected inactive members (i.e. retirees and vested former members), depending on which group is impacted by the benefit change.

While fixing the amortization period to average future lifetime targets has theoretical appeal, it is impractical to implement for 2,400 MERS divisions. We suggest determining a constant fixed period that is a reasonable proxy for the average future lifetime target and can be used for all benefit change amortizations (with the exception of early retirement incentives, discussed below).

The CCA-PPC White Paper model practice recommendations suggest amortization periods of the lesser of the average working lifetime or 15 years for active member plan amendments, and the lesser of average lifetime and 10 years for inactive member plan amendments. Given that the policy only affects plans that are already 100% funded, we suggest MERS use the same amortization period for both active member and inactive member plan changes: 10 years.

B.3. Early Retirement Incentive Programs

Early Retirement Incentive programs should be amortized over approximately the same period the employer is expected to benefit from the program, typically no more than 5 years.

B.4. Changes in Actuarial Assumptions and Methods

Finally, changes in actuarial assumptions or methods are outside the employer's control, so some consideration should be given to managing contribution volatility. The CCA-PPC White Paper model practice sets a range between 15 to 25 years for amortizing changes in UAL resulting from assumption of method changes. We suggest using 15 year amortization, in order to avoid "negative amortization"

(when the amortization policy by design allows the nominal UAL dollar amount to increase, by contributing less than nominal interest on the UAL or the increase in UAL).

C. Limiting Tail Volatility?

Contributions can become volatile as amortization bases are fully accounted for, when payments "drop off" the amortization payment schedule (known as "tail volatility"). This is a consequence of scheduling separate amortization bases. The sample table on page C-2 illustrates this well. In this example the Initial UAL and its $141,612 amortization payment is the largest component of the total required payments. If future gains, losses, and assumption change impacts approximately balance each other out (the expected condition), the Initial UAL amortization payment will remain the largest component of the total payment. In 21 years, that large payment will drop off, resulting in a material decrease that year in the total required amortization payment.

The impact of dropping off bases will be clearly reported in the 5 year contribution projections, included beginning in the 2014 annual valuation reports, so it should not come as a surprise to the plan sponsor. Alternatively, the concept of combining gain and loss bases into a single base with a rolling amortization period could be explored. This method would limit tail volatility, but at the expense of transparency, and we do not recommend it.

The idea of allowing outstanding gain and loss bases to be combined for purposes of limiting tail volatility is discussed in the CCA-PPC White Paper, via actively reviewing the amortization table each year and combining bases when necessary. This is not a viable alternative given the number of MERS divisions.

D. What Happens when UAL Becomes Negative?

A successful funding policy will eventually see municipalities whittling down their UAL to zero, or less (a funding surplus; i.e. over 100% funded). At the time the UAL moves from a positive to a negative position, it would be common to have a combination of both positive and negative remaining amortization bases. Consider the following example, where the net outstanding UAL becomes negative due to a liability gain:

Valuation Date December 31,	Base Type	Remaining Amortization Period	Outstanding UAL Balance as of July 1, 2028	Amortization Payment as of July 1, 2028
…	…	…	…	…
2022	Early Ret. Window	1	45,000	45,000
2026	(Gain)/Loss	15	(99,000)	(8,549)
Total			(54,000)	36,451

The division is overfunded by $54,000 as of the beginning of the fiscal year, yet strict application of the amortization schedule would require an amortization payment of $36,451. To avoid this nonsensical result, the amortization table could be reset to wipe out the prior bases. In the example above, the revised table would show a single row with a gain/loss base of ($54,000) and an amortization payment of ($4,663). Resetting the amortization table when the UAL flips from positive to negative is a CCA-PPC White Paper model practice recommendation.

E. Transition from Current Amortization Method

Up until now this subsection has considered how future changes in UAL would be amortized. But how should the current UAL be amortized?

We suggest the current UAL be amortized under the current amortization policy, adopted in November 2014. This would fully pay off the current UAL for all open divisions by 2040. There would be some tail volatility in the final year as the last of the current UAL payments drops off, but this would be volatility which would be welcomed by most sponsors.

F. Poorly Funded Divisions

Poorly funded divisions will need a shorter amortization period for their current UAL (shorter than 24 years). Otherwise, their funded condition will likely decline for several years, before starting to head towards full funding. We suggest that the actuary and MERS' CEO have the discretion to propose a shorter amortization period for such divisions, on a case-by-case basis.

G. New MERS Employers

The Plan Document provides that employers that are newly joining MERS will amortize their current UAL over a period of 25 years. Using a 25 year period will result in the paying less than nominal interest on the UAL for the first 9 years of MERS participation ("negative amortization"). However, as long as this issue is understood by the potential client before they join MERS, and as long as the actuary and MERS' CEO have the discretion to use a shorter period if deemed necessary for adequate funding, the current 25 year period can continue.

Summary of Current Amortization Policy for Open Divisions

The current MERS funding policy has worked well for many years and in different economic cycles. However, like everything else, it does have its advantages and disadvantages as shown below:

Advantages of Current Policy:

- Easy to understand because one amortization period is used to amortize the entire UAL.
- Did a good job dampening volatility in the contributions from one year to the next because of the length of the amortization period.

Disadvantages of Current Policy:

- Contribution volatility increases as the closed amortization period declines to 1 year.
- For employers with mature populations the amortization period may be too long.
- Back-loaded because contribution is expressed as a percentage of projected payroll.
- Lack of transparency as to the sources of the total UAL.

Recommendations

Given i) the events of 2008, ii) the changes in the demographics of the MERS population and general changes in the economic environment, and iii) the current thinking in the actuarial community, *we recommend the following amortization policy for open divisions (and closed-linked divisions):*

1. Fixed period layered amortization based on the following schedule:

Source	Period
Current 12/31/2014 UAL before any changes	24 years
UAL for new MERS employers	25 years [1]
Future Active and Inactive Plan Amendments	10 years [2]
Future Liability and Asset Gain or Loss	15 years
Future Assumption or Method Changes	15 years
Future Early Retirement Incentives	5 years [2]

[1] A shorter amortization period may be suggested for poorly funded divisions (subject to MERS CEO and actuary discussion).
[2] Only applies to divisions that are over 100% funded before and after the benefit provision change.

2. Reset amortization bases when the UAL changes from underfunded to overfunded.
3. Actuary's and CEO's Discretion - We recommend allowing the actuary and MERS' CEO flexibility in deviating from the blanket amortization policies described above in cases where a particular employer needs to have more accelerated funding as a result of the financial condition of the particular plan. There are some very poorly funded employers within MERS that will need this flexibility in order to accumulate enough assets to pay the promised benefits. For these plans a one size fits all approach will not work and each one will have to be analyzed on a case by case basis.
4. Require a minimum contribution equal to the excess (if any) of three times the annual retiree benefit payments over the current total market value of assets. This minimum is currently in place for closed-not-linked divisions, for the employer overall (all divisions combined), and for closed municipalities. Expanding this to all divisions will ensure that all MERS divisions will have adequate assets to pay the promised benefits. This is rarely triggered (it is only triggered for a handful of employers within MERS at this time), but is serves as a failsafe so the division does not run out of money.

Advantages and disadvantages of the recommended amortization policy include:

a. Advantage: Transparency – easy to track historical changes in UAL.
b. Advantage: Accountability – one can see the relative impact of a given change.
c. Advantage: Using different amortization periods for different types of changes in the UAL promotes demographic matching and adequacy.

d. Advantage: Shorter amortization periods promote adequacy, inter-period equity, and avoid so-called "negative amortization" (when the amortization policy by design allows the nominal UAL dollar amount to increase).
e. Disadvantage: Added complexity.
f. Disadvantage: Possible increase in contribution volatility.

CLOSED DIVISION AMORTIZATION POLICY

Background

A closed division is defined as one which excludes new hires, or which does not have active members. Under current funding policy, closed divisions which are "closed-linked", where new hires enter a different MERS Defined Benefit or Hybrid Plan division, follow the open division amortization policy and are not a subject of this subsection.

For closed divisions that are not linked to an open division, the amortization period is shortened in order to ensure adequate funding. The employer has two amortization options:

> Under Amortization Option A, the amortization period for positive unfunded liabilities is decreased annually by 2 years until the period reaches 5 or 6 years. Each year thereafter the amortization period decreases one year each valuation year.
>
> Under Amortization Option B, the amortization period is decreased annually by 2 years until the period reaches 15 or 16 years. Thereafter, the amortization period decreases one year each valuation year.

Although closed division amortization payments are calculated using the same amortization method used for open divisions (scheduled payments increase each year), the contributions are invoiced as a dollar amount rather than a percentage of pay. This is done to avoid issues involved with applying a percent of pay contribution to a declining (or non-existent) payroll.

Under both options, the total minimum contribution requirement for closed (not-linked) divisions is equal to the excess (if any) of three times the annual retiree benefit payments over the current total market value of assets. This ensures funding adequacy, with the minimum usually operating only in later years as the closed plan becomes extremely mature. By that time, the contributions to the closed plan are expected to be small in relation to the employer's total operating budget.

Closed Divisions

We believe the current policy will adequately fund the closed divisions for the outstanding UAL in place as of the date of the funding policy change, a few unusual divisions excepted. Similar to the discussion of amortization periods for open divisions, we recommend that new unfunded liability be amortized over a layered fixed period schedule.

We recommend the layered amortization periods for newly emerging UAL in closed divisions be shorter than similar periods for open divisions, to avoid the likelihood the amortization period will extend beyond the life expectancy of the members in the closed division. We recommend 10 year amortization for gain/loss and assumptions/method changes, and a 5 year period for benefit changes and early retirement incentives (as with open divisions, this currently only impacts divisions that are over 100% funded).

As the number of retirees in a closed division winds down, it is possible that the proposed periods will exceed the remaining life expectancy of the group. However, the current minimum contribution requirement will ensure there will be sufficient funds available to pay benefits in the short term (that is, the minimum contribution requirement acts as a safeguard ensuring that the funding policy does not push contributions beyond the period benefits are payable).

We have previously advocated that any funding policy allow for the actuary to recommend deviating from blanket amortization policies in cases where a particular employer needs accelerated funding. We continue that recommendation.

Recommendations

We recommend the following amortization policy for closed divisions within open employers:

1. Fixed period layered amortization based on the following schedule:

Source	Period
Current 12/31/2014 UAL before any changes	Option A or B
Future Active and Inactive Plan Amendments	5 years [1]
Future Liability and Asset Gain or Loss	10 years
Future Assumption or Method Changes	10 years
Future Early Retirement Incentives	5 years [1]

[1] Only applies to divisions that are over 100% funded before and after the benefit provision change.

2. Reset amortization bases when the UAL changes from underfunded to overfunded.
3. Actuary's and CEO's Discretion - We recommend allowing the actuary and MERS' CEO flexibility in deviating from the blanket amortization policies described above in cases where a particular employer needs to have more accelerated funding as a result of the financial condition of the particular plan. There are some very poorly funded employers within MERS that will need this flexibility in order to accumulate enough assets to pay the promised benefits. For these plans a one size fits all approach will not work and each one will have to be analyzed on a case by case basis.
4. Continue to require a minimum contribution equal to the excess (if any) of three times the annual retiree benefit payments over the current total market value of assets. This is not triggered often, but it serves as a failsafe so the division does not run out of money.

Advantages and disadvantages of the recommended amortization policy include:

a. Advantage: Transparency – easy to track historical changes in UAL.
b. Advantage: Accountability – one can see the relative impact of a given change.
c. Advantage: Using different amortization periods for different types of changes in the UAL promotes demographic matching and adequacy.
d. Disadvantage: Added complexity.
e. Disadvantage: Possible increase in contribution volatility.

CLOSED MUNICIPALITY FUNDING POLICY

Current Policy for Closed Municipalities

Participating municipalities or courts, which withdraw from MERS (either due to privatization, dissolution, or election to terminate participation), are referred to as closed municipalities. These entities may leave MERS with liabilities for future benefit payments, so current policy requires a funding level which includes a margin for future adverse experience.

The MERS Plan Document give the Retirement Board latitude concerning how much assets the former municipality or court leaves with MERS to cover its MERS liabilities. The Board also determines how the former municipality or court must fund any unfunded MERS liabilities. The Board's policy is expressed in its Restated Policy for Closed Municipalities (November 13, 2014). Under this policy, on the date of termination of MERS participation a closed group must have MERS assets, at market value, equal to at least 120% of the actuarial accrued liability of the participants left in MERS. Assets in excess of 130% of liabilities may be refunded to the former municipality or court at the time of termination.

Each December 31 thereafter, the annual actuarial valuation determines the current funded condition, at market value, for each closed municipality (16 closed municipalities were included in the 2013 valuations). The current policy aims to keep the funded percentage of closed groups at 120% or more. If the funded percentage is over 130%, the former municipality or court may request a refund of the excess. If the funded percentage is under 120%, the former municipality or court must make a contribution to MERS as follows:

- If between 115% and 120% funded, contribute enough to become 120% funded.
- If between 110% and 115% funded, contribute enough to become 115% funded.
- If between 105% and 110% funded, contribute enough to become 110% funded.
- If between 100% and 105% funded, contribute enough to become 105% funded.
- If under 100% funded, contribute the lesser of: enough to become 100% funded, or 5% of actuarial accrued liability.

In all cases the required payment shall not be less than the excess, if any, of three years of annual benefit payments over the current total market value of assets.

The "three years of annual benefit payments" minimum contribution was introduced in order to avoid running out of assets when the remaining retirees are very old and the computed actuarial liability is not much more than a year of benefit payout. A municipality that is 110% funded one year could quickly become well under 100% funded the next, just because projected deaths did not occur. Add a poor market investment year and the municipality could run out of money.

Comments

We believe the current funding policy for closed municipalities provides for adequate funding.

The current policy phases in contributions when the market value of assets is less than 120% of the closed municipality's liabilities in increments of the lesser of 5% of the termination liability or the amount needed to reach the next "step" in funding (intermediate funding target ratios of 100%, 105%, 110%, 115% or 120%). This was done to limit the contribution volatility resulting from market

volatility, because the closed municipalities use actual market value in the contribution calculation (instead of a smoothed asset value). We believe the "steps" are still reasonable.

In addition, the minimum contribution requirement for closed municipalities is equal to the excess (if any) of three times the annual retiree benefit payments over the current total market value of assets. This ensures funding adequacy, with the minimum usually operating only in later years as the closed plan becomes extremely mature. By that time, the contributions to the closed plan are expected to be small in relation to the employer's total operating budget.

Allowing refunds only when the funded percentage exceeds 130% should prevent employers that elected refunds from dropping below 100% funding during any reasonably-expected market downturn. We suggest maintaining the 130% threshold.

Recommendation

We recommend continuation of the current funding policy for closed municipalities.

ACTUARIAL METHOD

Actuarial Funding Method

An actuarial funding method is a set of techniques for conversion of the actuarial present values of benefits into contribution information. Per the MERS Plan Document: "Contribution requirements shall be actuarially determined using experience assumptions and level percent of payroll actuarial cost methods adopted by the Retirement Board." Effective for 1993 and later actuarial valuations, the Board directed that the actuary use the "entry age actuarial cost method," characterized by:

1. Normal Cost – the level percent of payroll contribution, paid from each member's date of plan entry to date of retirement, which will accumulate enough assets at retirement to fund the member's projected benefits from retirement to death.
2. Actuarial Accrued Liability – the assets which would have accumulated to date had contributions been made at the level of the normal cost since the date of the first benefit accrual, all actuarial assumptions had been exactly realized, and there had been no benefit changes.

The total contribution produced by an actuarial method is the total of the normal cost and an amount to amortize any unfunded actuarial accrued liability.

The entry age actuarial method is the most prevalent funding method in the public sector. It is appropriate for the public sector because it produces costs that remain stable as a percentage of payroll over time, if all the actuarial assumptions are met. Most public retirement plans use the entry age actuarial method. Governmental Accounting Standards Board Statements Nos. 67 and 68 require the use of the entry age actuarial method for reporting and disclosure purposes. The MERS method for calculating the contributions and liabilities are certainly in line with national trends.

We believe the current actuarial funding method has worked well for MERS.

Recommendation

We recommend continued use of the entry age actuarial cost method for all divisions.

Section D

Economic Assumptions

INVESTMENT RETURN AND INFLATION ASSUMPTIONS

Background

In a defined benefit retirement system such as MERS there are three major sources of funding: employer contributions, member contributions, and investment income. As part of the valuation process the actuary makes assumptions regarding the timing, amounts, and duration of benefits which will be paid out of the system. Once the assumptions are set, the liability associated with the benefits expected to be paid is allocated among the various sources of funding.

Member contributions are generally fixed as a percentage of payroll. Therefore, any benefits to be paid in excess of what can be financed solely out of member contributions must come from either employer contributions or investment income. The larger the share of benefits that can be provided from investment income the smaller the required employer contribution. The assumed return on investments determines the portion of benefits that is assumed to be provided by investment income and hence has a major impact on the computed employer contribution.

The demographic experience examined in this report covers the period from 2009 through 2013. We do not believe, however, that a review limited solely to the past five year period would be sufficient to determine long-term economic assumptions. When developing economic assumptions it is instructive to consider:

i. A longer historical perspective,
ii. Whether recent history fundamentally changed the future economic outlook,
iii. Analysis and forecasts from experts and governmental sources, and
iv. Evaluation of economic assumptions against comparably sized public retirement systems.

The actuary has no special skill in forecasting future economic conditions (the actuary does have special skill in forecasting demographic assumptions). The views and analysis of expert sources may be incorporated in the analysis of relevant economic data, but the actuary's recommendation on economic assumptions is ultimately based on professional judgement.

Current Economic Assumptions

The current economic assumptions include an 8.0% annual investment return (net of both investment and administrative expenses) and an expected 4.5% annual wage inflation rate, used to project across-the-board annual pay increases (merit and longevity pay increases are in addition to this amount, and are covered in the section on demographic assumptions). Note that, for calendar years 2015 and 2016 only, the current wage inflation assumption is 2% and 3%, respectively (not 4.5%).

Although price inflation is not explicitly assumed for valuation purposes (it is not needed as benefits are not based on price inflation), the current 4.5% annual wage inflation rate would correspond to a price inflation rate of between 3.0% and 4.0%. This is our current implicit assumption for price inflation.

Actuarial Standards and Methodology

The selection of an appropriate investment return rate and pay increase assumption is based on guidance prescribed in Actuarial Standards of Practice No. 27 (ASOP 27) *Selection of Economic Assumptions for Measuring Pension Obligations*, adopted September 2013. Significantly, the 2013 version of ASOP 27 changes the guidance determining the reasonability of an economic assumption from a "best-estimate" range to one where the assumption must not be significantly biased (either

optimistic or pessimistic). The standard still recognizes that there may be a range of reasonable assumptions, given the inherently uncertain nature of the assumptions themselves.

ASOP 27 lists the following characteristics of a reasonable assumption:

- It is appropriate for the purpose of the measurement;
- It reflects the actuary's professional judgment;
- It takes into account historical and current relevant economic data;
- It reflects the actuary's estimate of future experience, the actuary's observations of the estimates inherent in market data, or some combination thereof; and
- It has no significant bias (i.e. it is not significantly optimistic or pessimistic).

One of the methods for determining an appropriate investment return rate assumption is the so-called building block approach. Under this method the investment return rate is considered to be comprised of an inflation assumption and a real rate of return assumption. The real rate of return assumption is calculated separately for each asset class, such as fixed-income investments or equity, then a weighted average real return range is calculated based on the asset allocation of the fund. Adjustments are made to reflect factors such as reinvestment risk, manager performance, investment expenses and administrative expenses.

Previous Experience Studies have reviewed both inflation rates and investment return rates under the building block methodology, using historical data to determine the inflation and real return components, and applying these to the then-current MERS asset allocation. The 2004 – 2008 Study used both the building block approach, as well as a forward looking approach using the Monte Carlo method. The Monte Carlo method projects a large number of future return scenarios, based on expectation of the return and risk of various asset classes making up the investment portfolio, and determines the probability of attaining a specified target return over various future time periods.

Current thinking about setting economic assumptions in the actuarial community has shifted away from building block approaches and toward the use of projection simulation techniques. In this experience study we used the building block approach in our analysis of the wage inflation rate (combined with several published forecasts), but used the forward looking Monte Carlo approach in developing a recommended rate of investment return. This Monte Carlo approach allowed us to use assumptions about future investment returns that are consistent with those used by the MERS Office of Investments.

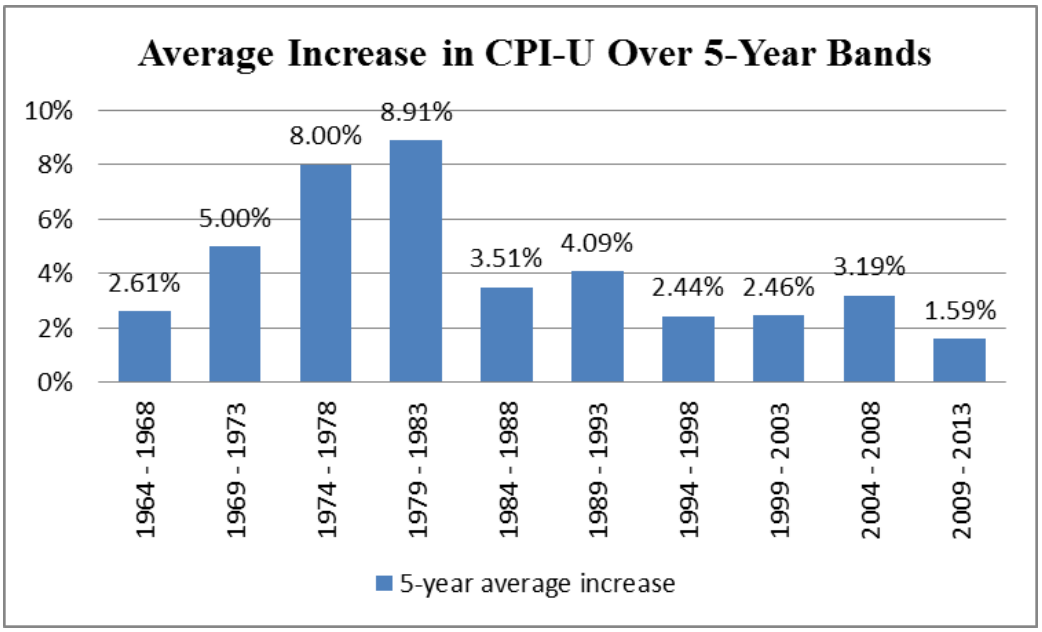
It is also useful to review the economic assumptions of peer Public Retirement Systems when setting the economic assumptions.

Price Inflation

Price inflation is the progressive increase in the price of goods or services over a period of time. The standard measure of price inflation in the US is the annual increase in the Consumer Price Index (CPI). CPI-U is the CPI for "All Urban Consumers". CPI-W is the CPI for "Urban Wage Earners and Clerical Workers". Price inflation is often referred to as simply "inflation".

The general level of price inflation underlies many of the economic assumptions used in the actuarial valuation, from base wage inflation to the investment return assumption.

Historically, the annual increase in CPI over the past fifty years is shown in the following chart:



It is also interesting to look at inflation over wider cumulative periods, seen in the following table:

Period Ending December 31, 2013	Average Annual Increase in CPI-U
Last 5 years	1.59%
Last 10 years	2.39%
Last 20 years	2.42%
Last 30 years	2.88%
Last 40 years	4.27%
Last 50 years	4.18%

While the average annual inflation increase is in the 3% - 4% range when longer time periods are considered, it is difficult to ignore the low inflation environment prevalent during the past 20 years.

As inflation is a key component of economic activity, forecasts of annual inflation are developed by numerous sources. We have reviewed several sources of price inflation forecasts in the course of determining a reasonable price inflation assumption.

The Office of the Chief Actuary of the Social Security Administration (SSA) develops long-range economic assumptions for use in the annual Trustees report, including an assumption of future price inflation. In the 2014 OASDI Trustees Report, published in July 2014, the assumed ultimate annual increase in CPI-W for the 75-year projection period under the intermediate assumption set is 2.8%.

The Office of Management and Budget (OMB) Mid-Session Review of the 2015 fiscal year budget, published in July 2014, projected the long term CPI to be 2.3% per year over their 75-year long term budget outlook, with lower expected inflation in the initial years of the projection period.

There are also a number of groups that prepare inflation forecasts for periods shorter than the SSA and OMB. The Federal Reserve Bank of Cleveland publishes a 10-year inflation forecast monthly. As of March 24, 2015, the Cleveland Fed estimates the expected 10-year inflation rate to be 1.70%. The Federal Reserve Bank of Philadelphia publishes a quarterly Survey of Professional Forecasters. The Philadelphia Fed's first quarter 2015 survey showed the forecasters projecting an average annual inflation increase of 2.2% over the next 10 years. In the 2013 Asset Allocation Analysis report prepared by the MERS Office of Investments, price inflation is assumed to be 2.0% annually over the next 10 years.

As indicated on page D-1, our recommendation for the price inflation assumption is based on professional judgment, after reviewing the views and analysis of expert sources and recent (10-20 year) inflation trends. The recommendation below replaces the current 3%-4% per year price inflation assumption. The proposed 2.5% price inflation assumption is an important component in the development of the proposed wage inflation and investment return assumptions on the following pages.

Recommendation

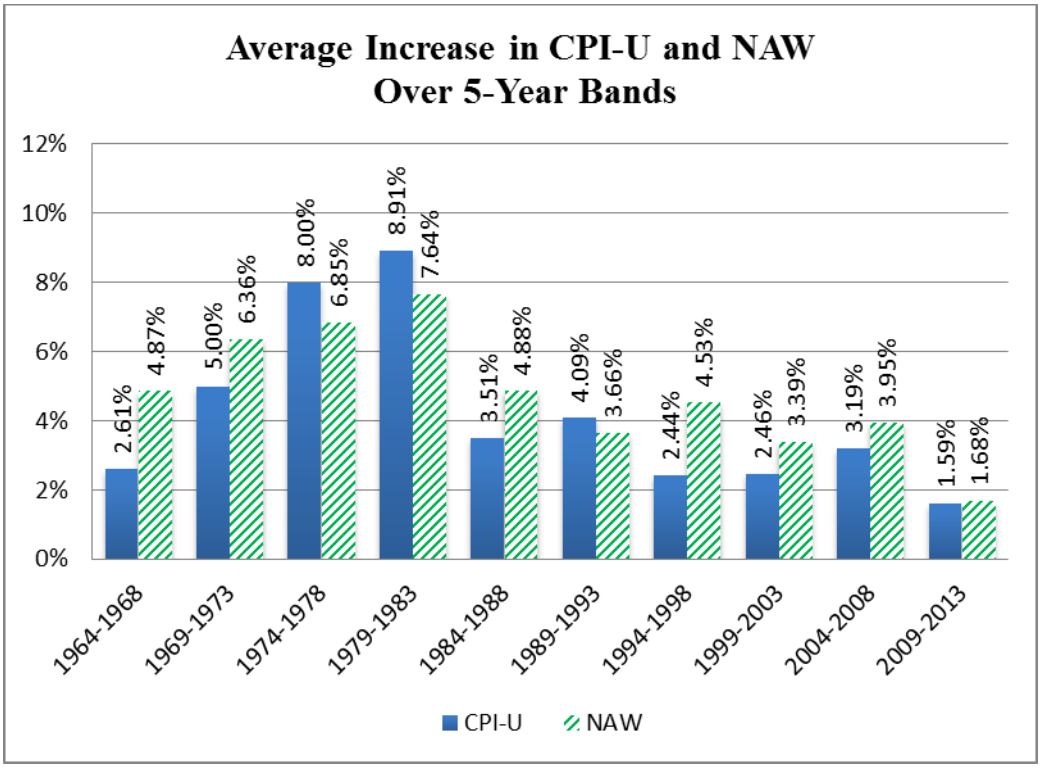
Based on a review of several long-term forecasts, and historical data over the past 20 years, we recommend an assumed long-term annual rate of price inflation of 2.5%.

Wage Inflation

The pay growth assumption consists of three components, price inflation, real wage growth, and increases due to merit and longevity. Merit and longevity increases are discussed in the demographic assumptions section of this report. The combination of price inflation and real wage growth is called the wage inflation assumption, and is discussed below.

The current wage inflation assumption is 4.5% per year (2% and 3% for 2015 and 2016, respectively).

Wages in the US have historically grown at a faster pace than price inflation, in theory due to productivity gains being passed on via pay increases. A comparison of average 5-year increases in price inflation against increases in National Average Wages (NAW: a wage measure used by the Social Security Administration) is shown in the chart below:



In its 2014 Trustees Report, the SSA commented on the slower growth in average earnings relative to price inflation in the period from the mid-1970's through the mid-1980's. In that report they note that this effect was likely due to the baby boom generation reaching employment age along with a large increase in the number of women entering the workforce. As a result of this large number of relatively inexperienced and young employees in the workforce, real wage growth was depressed during this period.

Conversely, the relatively large increases in real wage growth that can be seen in the chart from the mid-1990's through the middle of the 2000's may be due to the baby boomers and influx of women in the workforce reaching their prime earning years, thereby boosting real wage growth. The SSA concludes that this type of demographic movement is unlikely to be repeated in the future, so that it would be beneficial not to look at any short historical period when determining future assumptions but rather look at a longer historical period in order to average out these effects.

The 2014 Trustees Report sets a long range projection of real wage growth of 1.1% per year, under their intermediate assumption set. The Office of Management and Budget projects the average real growth rate of 1.3%, and the Congressional Budget Office estimates a real growth rate of 1.4%, during the same time periods.

As indicated on page D-1, our recommendation for the price inflation and wage inflation assumptions is based on professional judgment, after reviewing the views and analysis of expert sources and recent (10-20 year) price inflation and real wage growth trends. The recommendation below replaces the current annual wage inflation assumption of 2% for 2015, 3% for 2016, and 4.5% thereafter.

Recommendation

Given that the long-range projections of estimated of real wage growth from these sources range from 1.1% to 1.4%, coupled with our recommended price inflation assumption of 2.5%, we recommend a wage inflation assumption of 3.75% per year.

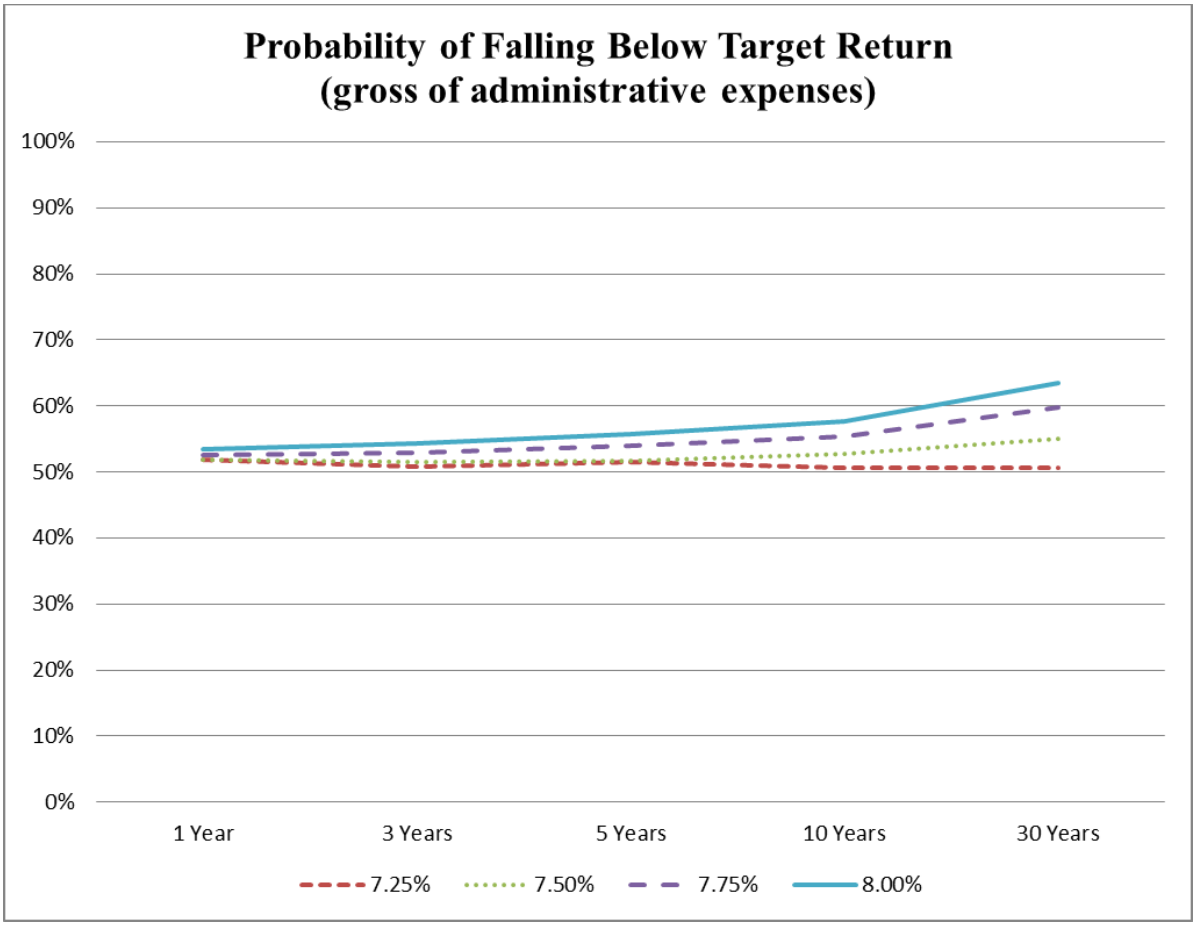
Investment Return / Discount Rate

Our review of the investment return and discount rate assumptions relied heavily on the 2013 Asset Allocation Analysis report prepared by the MERS Office of Investments. The Asset Allocation Analysis forecasted an average annual investment return of 8.01%, based on capital market forecasts developed using a ten-year investment horizon. The forecast investment return was net of investment fees, but gross of administrative expenses.

The investment return assumption used in calculating the contribution rate for funding System benefits is net of both investment and administrative expenses. The discount rate used to determine liabilities and expense for accounting (GASB 68) purposes is net of investment fees but gross of administrative expenses.

The 2013 Asset Allocation study describes the expected return, expected standard deviation and correlation coefficient variables underlying the capital market forecasts used to develop the 8.01% investment return (see page D-10). Utilizing this data as inputs we used software from Sungard WealthStation to prepare Monte Carlo projection forecasts of possible returns over various time periods.

Each Monte Carlo simulation consisted of 1,000 trials of projected asset growth over 30 years. The simulation software calculated the probability of falling below a selected target return over the projection period. Multiple simulations were developed, and the results averaged to produce the chart below, which shows the probability of falling below target returns of 7.25%, 7.5%, 7.75% and 8.0%. Note that the target rates of return are gross of administrative expenses.



Throughout the 30-year projection period, for all target returns other than 7.25% (gross of administrative expenses), the projected likelihood of falling below the target return was greater than 50%. In other words, given the input parameters and asset allocation, there is a slightly less than even chance of meeting (or exceeding) the target returns during the projection period.

We understand the 2013 Asset Allocation Analysis capital market forecast included an implied 2.0% price inflation assumption for the 10 year period studied. We believe it is reasonable to assume that if the Asset Allocation Analysis had instead used our 2.5% recommended long-term price inflation rate and if the analysis had been extended to cover a period of several decades:

- The expected return, expected standard deviation and correlation coefficient variables underlying the capital market forecasts used to develop the 8.01% expected investment return would be different, and would likely resulting in an expected return higher than 8.01%, and
- The resultant probability of falling below the target returns in the above chart would be lower than shown. For example, the probability of achieving a target return of 7.75% (gross of administrative expenses) over 30 years would be much closer to 50%.

Recall that the analysis described above was gross of administrative expenses, and that the investment return rate assumption in the actuarial valuation is net of administrative expenses. We must next develop an assumption of long-term administrative expense.

Over the 10-year period ending in 2013 the average administrative expense, expressed as a percentage of Retirement System assets, was 0.30%. This time period, however, included the large 2008 market loss as well as higher-than-normal administrative expenses for actuarial valuation system software, both of which tended to inflate the expense statistic. Excluding the time period from 2008 – 2012 the average administrative expense is 0.25% of assets. The expense for 2014 was 0.23%. We recommend an assumed rate of administrative expense of 0.25% of assets.

It is also useful to compare the investment return rate assumption to the broader public retirement plan community. The 2015 Public Fund Survey, sponsored by the National Association of State Retirement Administrators, covers about 85% of the US public retirement system universe, and looked at the assumptions used by these systems in fiscal 2013. The Survey notes that "Since 2009, a majority of plans have reduced their investment return assumption, resulting in a reduction to the median to 7.75 percent." For comparison, the median investment return assumption from the 2010 Survey was 8.0%.

Given our recommended 2.5% price inflation assumption and the MERS 2013 Asset Allocation Study, we infer that the probability of achieving a target return of 7.75% (gross of administrative expenses) over 30 years would be around 50%. Subtracting our recommended administrative expense assumption of 0.25% of assets, we think that the probability of achieving a target return of 7.50% (net of administrative expenses) over 30 years would be around 50%. This leads us to favor a 7.50% investment return assumption for the actuarial valuations, instead of the current 8.0% assumption.

However, there is no certainty that the economic conditions since 2008 will prevail over the long term (30+ years). MERS investments have on average earned in excess of the currently assumed 8% net return, since that assumption was adopted over 30 years ago. Thus the actuarial team is proposing to reduce the investment return assumption at this time by 0.25%, instead of 0.50%.

Recommendation

We recommend the investment return rate assumption (net of administrative expenses and investment expenses), used to determine funding liabilities and required contributions, be lowered from the current 8.0% assumption to 7.75%. This recommendation reflects our view that it is still too soon to conclude that recent economic conditions have permanently changed future long-term financial markets. Selecting an investment rate of return assumption lower than 7.75% would increase the likelihood of meeting or exceeding the assumed return over the 30 year projection period.

We further recommend an assumed rate of administrative expense of 0.25% of assets.

We further recommend that the discount rate used to determine accounting liabilities and expense be 0.25% higher than the investment rate return assumption (i.e. the discount rate is gross of administrative expenses).

CAPITAL MARKET ASSUMPTIONS

Assumed Portfolio Composition

Asset Class	Allocation
Global Equity	57.50%
Global Fixed Income	20.00
Real Assets	12.50
Diversifying Strategies	10.00
Expected Return	8.01%
Forecasted Risk	13.30%

Scenario Assumptions

Asset Class	Return	Risk
Global Equity	8.52%	20.20%
Global Fixed Income	5.68	6.65
Real Assets	7.73	11.50
Diversifying Strategies	10.06	7.30
Inflation	2.00	

Scenario Correlation Matrix

Asset Class	(1)	(2)	(3)	(4)
(1) Global Equity	1.00	0.25	0.65	0.30
(2) Global Fixed Income	0.25	1.00	0.30	0.10
(3) Real Assets	0.65	0.30	1.00	0.30
(4) Diversifying Strategies	0.30	0.10	0.30	1.00

Section E

Non-Economic Assumptions

AGE AND SERVICE NORMAL RETIREMENT

Findings

The benefit provisions of the Retirement System establish the minimum age and service requirements for retirement with full benefits. However, the actual cost of retirement is determined by when members actually retire. The assumption about timing of retirements is a major ingredient in cost calculations. Note that higher rates of retirement with full benefits generally results in higher computed contributions, and vice-versa.

Each employer division has a normal retirement provision setting the age and service conditions for retiring with full benefits. Each employer division also has a benefit formula indicating how a retiring employee's benefit is computed (based on service credit and final average compensation). The experience study takes into account the exact provisions in place for each of the 2,400+ employee divisions.

Consistent with the current approach, we have used the "Replacement Index" method. Instead of tabulating members by their age (for age-based retirement conditions) or by their service (for service-based retirement conditions), we tabulate members by their Replacement Index. For any given year, the Replacement Index for a member is equal to the member's accrued benefit in that year divided by the member's annual pay in that year (reduced by member contributions).

Replacement Index = Accrued Benefit divided by [Pay less Member Contributions]

The Replacement Index is a crude estimate of how well the member's retirement benefit will preserve the member's pre-retirement standard of living. We use the word "crude" here because standard of living comparisons are affected by many other factors, such as social security contributions while working, work-related expenses, income taxes, availability and cost of health insurance, other sources of income, etc.

Note that we excluded from the study all new retirees who were reported to have retired under an Early Retirement Window and those who were age 70 and older.

Our analysis of retirement experience based on Replacement Index is shown on pages E-3 – E-5. The table and chart show the actual experience and the current and proposed assumptions. The vertical bars surrounding the actual data points represent two standard deviations around the data point, representing the theoretical 95% confidence interval.

Looking at the chart on page E-5, one is immediately struck by its simplicity. Ignoring the last few data points (at 90% Replacement Index and over there was very little data), the actual experience (boxes) shows a very clear relationship. These results reinforce a very simple hypothesis:

> *Members are more likely to retire as they become more able to maintain their standard of living after retirement, compared with before retirement.*

The proposed retirement assumption (green line) projects slightly more retirements at the lower Replacement Index values, compared to the present assumptions, but slightly fewer retirements at the higher Replacement Index values. Overall, the proposed assumption projects more retirements (5,439) than the present assumptions (5,385), about halfway between the present assumptions and the actual number experienced (5,504 – see Totals at the bottom of page E-4).

Note that using the Replacement Index concept allows us to have a single table of retirement probabilities that cover all members, whether the members are covered by age-based or service-based retirement provisions. In addition, we eliminate the need for special retirement assumptions for divisions with high benefit multipliers or high member contribution rates. Those divisions will automatically have higher Replacement Indexes than other divisions, and consequently higher projected retirement rates.

Note also that when a division adopts or proposes to adopt a higher benefit formula or a higher member contribution rate, the supplemental actuarial valuation will automatically reflect somewhat higher probabilities of retirement (a reasonable assumption). The opposite would hold if the division adopts a lower benefit formula or a lower member contribution rate.

The Replacement Index method of measuring rates of retirement was designed specifically for MERS, because of the large variation of benefit formula and member contribution rates within MERS. We do not know of any other retirement plans that use this method. Most plans have uniform benefit and member contribution provisions, or a small number of different sets of these provisions. Such plans will often have a separate retirement rate assumption for each of their benefit provision groups, and members do not move among groups via the adoption of higher or lower benefit provisions for their employee division. The Replacement Index method works very well for a plan like MERS which includes a large number of benefit provision choices and member contribution rate choices, and which does not limit an employer's ability to change benefit provisions and member contribution rates from time to time.

The proposed assumption will generally result in slightly higher computed liabilities and contributions.

Recommendation

We recommend adoption of the proposed retirement rates, based on the Replacement Index, shown on the following three pages.

Note: The Exposure is the number of persons who were eligible to retire in a one-year period after a December 31 annual actuarial valuation, whether they did retire or not during that period. For example, there were 344 active members with a Replacement Index of 50 who were eligible to retire during a coming year. 74 of those members actually did retire during that coming year. The Crude Rate of retirement is 74 divided by 344, or .2151 . Under the present assumptions, the retirement rate is 0.20, so that 68.8 (0.20 times 344) members were projected to retire. The proposed retirement rate is 0.21, so that 72.24 (0.21 times 344) members would be projected to retire. The Actual/Expected ratio shows how well the present or proposed assumptions compare to the actual retirements. A 1.00 ratio would represent a perfect match between the assumptions and the actual retirements. Note also that a person may be represented one to five times in the table, depending on how many times during the five year study period that person was an active member in a December 31 annual valuation and eligible to retire.

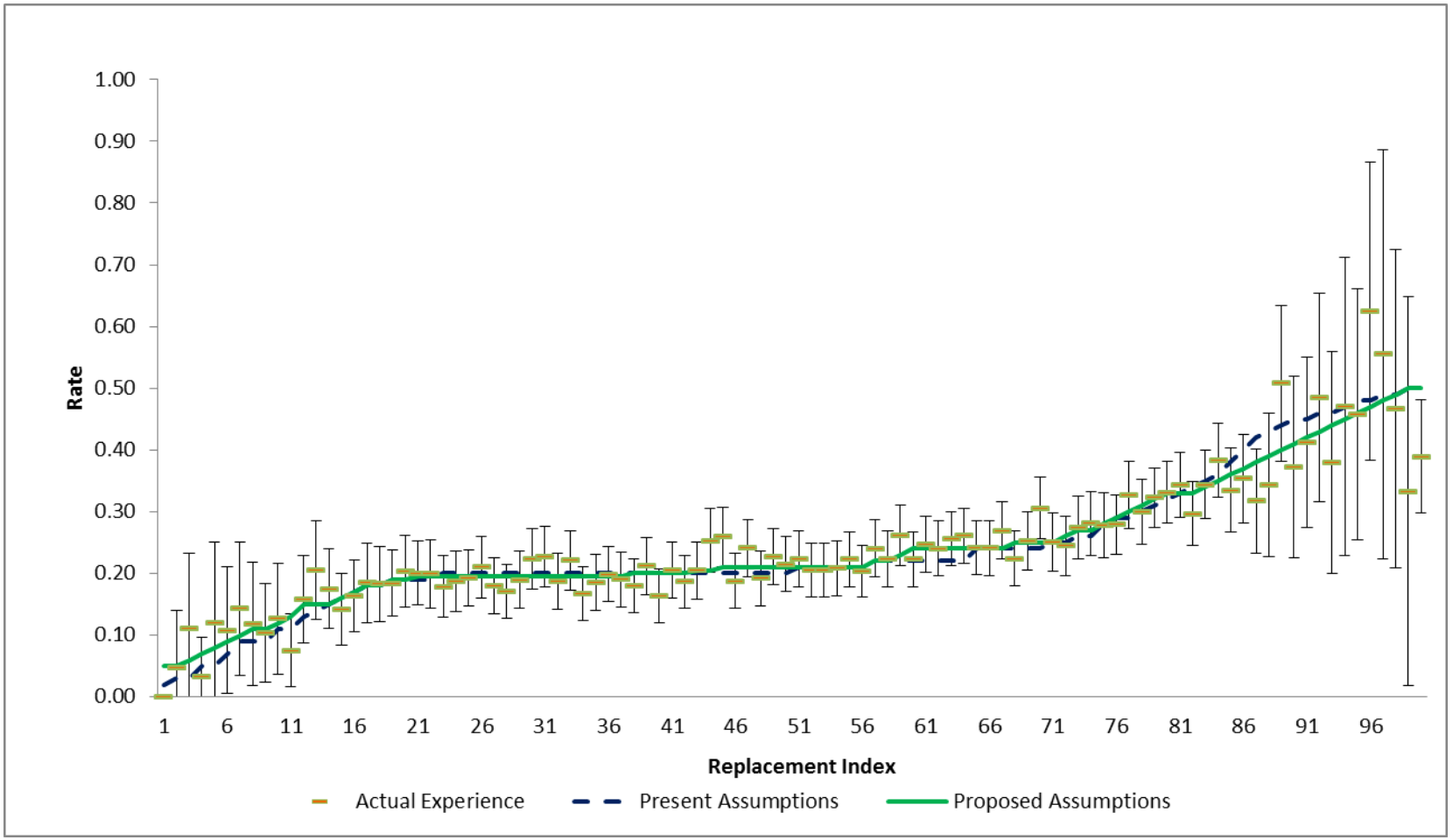
MERS
AGE & SERVICE RETIREMENT EXPERIENCE

Replacement Index	Retirements	Exposure	Crude Rates	Rates		Expected Retirements		Actual / Expected	
				Present	Proposed	Present	Proposed	Present	Proposed
1	0	8	0.0000	0.02	0.050	0.16	0.40	0.00	0.00
2	1	21	0.0476	0.03	0.050	0.63	1.05	1.59	0.95
3	3	27	0.1111	0.03	0.060	0.81	1.62	3.70	1.85
4	1	31	0.0323	0.05	0.070	1.55	2.17	0.65	0.46
5	3	25	0.1200	0.05	0.080	1.25	2.00	2.40	1.50
6	4	37	0.1081	0.07	0.090	2.59	3.33	1.54	1.20
7	6	42	0.1429	0.09	0.100	3.78	4.20	1.59	1.43
8	5	42	0.1190	0.09	0.110	3.78	4.62	1.32	1.08
9	6	58	0.1034	0.09	0.110	5.22	6.38	1.15	0.94
10	7	55	0.1273	0.11	0.120	6.05	6.60	1.16	1.06
11	6	80	0.0750	0.11	0.130	8.80	10.40	0.68	0.58
12	17	107	0.1589	0.13	0.150	13.91	16.05	1.22	1.06
13	21	102	0.2059	0.14	0.150	14.28	15.30	1.47	1.37
14	24	137	0.1752	0.15	0.150	20.55	20.55	1.17	1.17
15	20	141	0.1418	0.16	0.160	22.56	22.56	0.89	0.89
16	26	159	0.1635	0.17	0.170	27.03	27.03	0.96	0.96
17	27	146	0.1849	0.18	0.180	26.28	26.28	1.03	1.03
18	30	164	0.1829	0.18	0.180	29.52	29.52	1.02	1.02
19	38	206	0.1845	0.19	0.190	39.14	39.14	0.97	0.97
20	39	192	0.2031	0.19	0.190	36.48	36.48	1.07	1.07
21	48	239	0.2008	0.19	0.195	45.41	46.61	1.06	1.03
22	41	206	0.1990	0.19	0.195	39.14	40.17	1.05	1.02
23	42	235	0.1787	0.20	0.195	47.00	45.83	0.89	0.92
24	48	257	0.1868	0.20	0.195	51.40	50.12	0.93	0.96
25	57	296	0.1926	0.20	0.195	59.20	57.72	0.96	0.99
26	56	266	0.2105	0.20	0.195	53.20	51.87	1.05	1.08
27	53	294	0.1803	0.20	0.195	58.80	57.33	0.90	0.92
28	51	299	0.1706	0.20	0.195	59.80	58.31	0.85	0.87
29	56	295	0.1898	0.20	0.195	59.00	57.53	0.95	0.97
30	64	286	0.2238	0.20	0.195	57.20	55.77	1.12	1.15
31	67	294	0.2279	0.20	0.195	58.80	57.33	1.14	1.17
32	55	295	0.1864	0.20	0.195	59.00	57.53	0.93	0.96
33	65	294	0.2211	0.20	0.195	58.80	57.33	1.11	1.13
34	50	299	0.1672	0.20	0.195	59.80	58.31	0.84	0.86
35	55	296	0.1858	0.20	0.195	59.20	57.72	0.93	0.95
36	65	327	0.1988	0.20	0.195	65.40	63.77	0.99	1.02
37	60	315	0.1905	0.20	0.195	63.00	61.43	0.95	0.98
38	56	310	0.1806	0.20	0.200	62.00	62.00	0.90	0.90
39	66	311	0.2122	0.20	0.200	62.20	62.20	1.06	1.06
40	47	287	0.1638	0.20	0.200	57.40	57.40	0.82	0.82
41	63	307	0.2052	0.20	0.200	61.40	61.40	1.03	1.03
42	60	322	0.1863	0.20	0.200	64.40	64.40	0.93	0.93
43	62	303	0.2046	0.20	0.205	60.60	62.12	1.02	1.00
44	74	292	0.2534	0.20	0.205	58.40	59.86	1.27	1.24
45	85	328	0.2591	0.20	0.210	65.60	68.88	1.30	1.23
46	60	319	0.1881	0.20	0.210	63.80	66.99	0.94	0.90
47	80	332	0.2410	0.20	0.210	66.40	69.72	1.20	1.15
48	62	323	0.1920	0.20	0.210	64.60	67.83	0.96	0.91
49	77	339	0.2271	0.20	0.210	67.80	71.19	1.14	1.08
50	74	344	0.2151	0.20	0.210	68.80	72.24	1.08	1.02
51	76	339	0.2242	0.21	0.210	71.19	71.19	1.07	1.07

MERS
AGE & SERVICE RETIREMENT EXPERIENCE (CONT.)

Replacement Index	Retirements	Exposure	Crude Rates	Rates		Expected Retirements		Actual / Expected	
				Present	Proposed	Present	Proposed	Present	Proposed
52	70	340	0.2059	0.21	0.210	71.40	71.40	0.98	0.98
53	72	351	0.2051	0.21	0.210	73.71	73.71	0.98	0.98
54	71	341	0.2082	0.21	0.210	71.61	71.61	0.99	0.99
55	79	354	0.2232	0.21	0.210	74.34	74.34	1.06	1.06
56	75	370	0.2027	0.21	0.210	77.70	77.70	0.97	0.97
57	84	349	0.2407	0.22	0.220	76.78	76.78	1.09	1.09
58	78	349	0.2235	0.22	0.220	76.78	76.78	1.02	1.02
59	85	325	0.2615	0.22	0.230	71.50	74.75	1.19	1.14
60	76	341	0.2229	0.22	0.240	75.02	81.84	1.01	0.93
61	88	356	0.2472	0.22	0.240	78.32	85.44	1.12	1.03
62	88	366	0.2404	0.22	0.240	80.52	87.84	1.09	1.00
63	103	401	0.2569	0.22	0.240	88.22	96.24	1.17	1.07
64	103	395	0.2608	0.22	0.240	86.90	94.80	1.19	1.09
65	92	380	0.2421	0.24	0.240	91.20	91.20	1.01	1.01
66	89	369	0.2412	0.24	0.240	88.56	88.56	1.00	1.00
67	99	368	0.2690	0.24	0.240	88.32	88.32	1.12	1.12
68	78	348	0.2241	0.24	0.250	83.52	87.00	0.93	0.90
69	88	348	0.2529	0.24	0.250	83.52	87.00	1.05	1.01
70	105	343	0.3061	0.24	0.250	82.32	85.75	1.28	1.22
71	85	339	0.2507	0.25	0.250	84.75	84.75	1.00	1.00
72	77	315	0.2444	0.25	0.260	78.75	81.90	0.98	0.94
73	85	310	0.2742	0.26	0.270	80.60	83.70	1.05	1.02
74	84	299	0.2809	0.26	0.270	77.74	80.73	1.08	1.04
75	81	291	0.2784	0.28	0.280	81.48	81.48	0.99	0.99
76	96	344	0.2791	0.29	0.290	99.76	99.76	0.96	0.96
77	99	303	0.3267	0.29	0.300	87.87	90.90	1.13	1.09
78	90	300	0.3000	0.30	0.310	90.00	93.00	1.00	0.97
79	124	384	0.3229	0.31	0.320	119.04	122.88	1.04	1.01
80	119	359	0.3315	0.32	0.330	114.88	118.47	1.04	1.00
81	112	326	0.3436	0.33	0.330	107.58	107.58	1.04	1.04
82	92	310	0.2968	0.34	0.330	105.40	102.30	0.87	0.90
83	101	294	0.3435	0.35	0.340	102.90	99.96	0.98	1.01
84	101	264	0.3826	0.36	0.350	95.04	92.40	1.06	1.09
85	65	194	0.3351	0.38	0.360	73.72	69.84	0.88	0.93
86	64	181	0.3536	0.40	0.370	72.40	66.97	0.88	0.96
87	39	123	0.3171	0.42	0.380	51.66	46.74	0.75	0.83
88	23	67	0.3433	0.43	0.390	28.81	26.13	0.80	0.88
89	32	63	0.5079	0.44	0.400	27.72	25.20	1.15	1.27
90	16	43	0.3721	0.45	0.410	19.35	17.63	0.83	0.91
91	21	51	0.4118	0.45	0.420	22.95	21.42	0.92	0.98
92	17	35	0.4857	0.46	0.430	16.10	15.05	1.06	1.13
93	11	29	0.3793	0.46	0.440	13.34	12.76	0.82	0.86
94	8	17	0.4706	0.47	0.450	7.99	7.65	1.00	1.05
95	11	24	0.4583	0.48	0.460	11.52	11.04	0.95	1.00
96	10	16	0.6250	0.48	0.470	7.68	7.52	1.30	1.33
97	5	9	0.5556	0.49	0.480	4.41	4.32	1.13	1.16
98	7	15	0.4667	0.49	0.490	7.35	7.35	0.95	0.95
99	3	9	0.3333	0.50	0.500	4.50	4.50	0.67	0.67
100+	44	113	0.3894	0.50	0.500	56.50	56.50	0.78	0.78
Totals	5,504	23,250	0.2367			5385.14	5439.22	1.02	1.01

MERS
AGE & SERVICE RETIREMENT EXPERIENCE



EARLY (REDUCED) RETIREMENT

Findings

MERS members who do not meet the age and service conditions for normal retirement (with full benefits) may be eligible for reduced early retirement benefits. MERS' standard eligibility requirement for reduced early retirement benefits is age 50 with 25 years of service, or at age 55 with 15 years of service. We refer to these cases as early retirements, and the retiring members receive smaller benefits than if they had waited until age 60 to retire.

Many employers have adopted full, unreduced benefits at age 50 with 25 years of service and/or at age 55 with 15 years of service, thereby eliminating one or both of the standard early (reduced) retirement provisions. The experience study takes into account the exact provisions in place for each of the 2,400+ employee divisions.

Generally, because of the early retirement reduction, these members' benefits have about the same value as the deferred benefit to which they would be eligible if they did not request early commencement of the benefit. Higher rates of early retirement generally result in lower computed contributions, and vice-versa.

Note that we excluded from the study all new retirees who were reported to have retired under an Early Retirement Window.

We reviewed the experience during the last 5 years. The results are shown on the following two pages. The table and chart show the actual experience and the current and proposed assumptions. The vertical bars surrounding the actual data points represent two standard deviations around the data point, representing the theoretical 95% confidence interval.

Overall the plan experienced more early (reduced) retirements (698) than projected by the present assumptions (490 – see Totals at the bottom of page E-7). The chart on page E-8 shows a shape similar to the present assumptions, but higher. The proposed assumption (green line) moves around half way from the present assumption to the actual experience.

The proposed assumption will result in slightly lower computed liabilities and contributions.

Recommendation

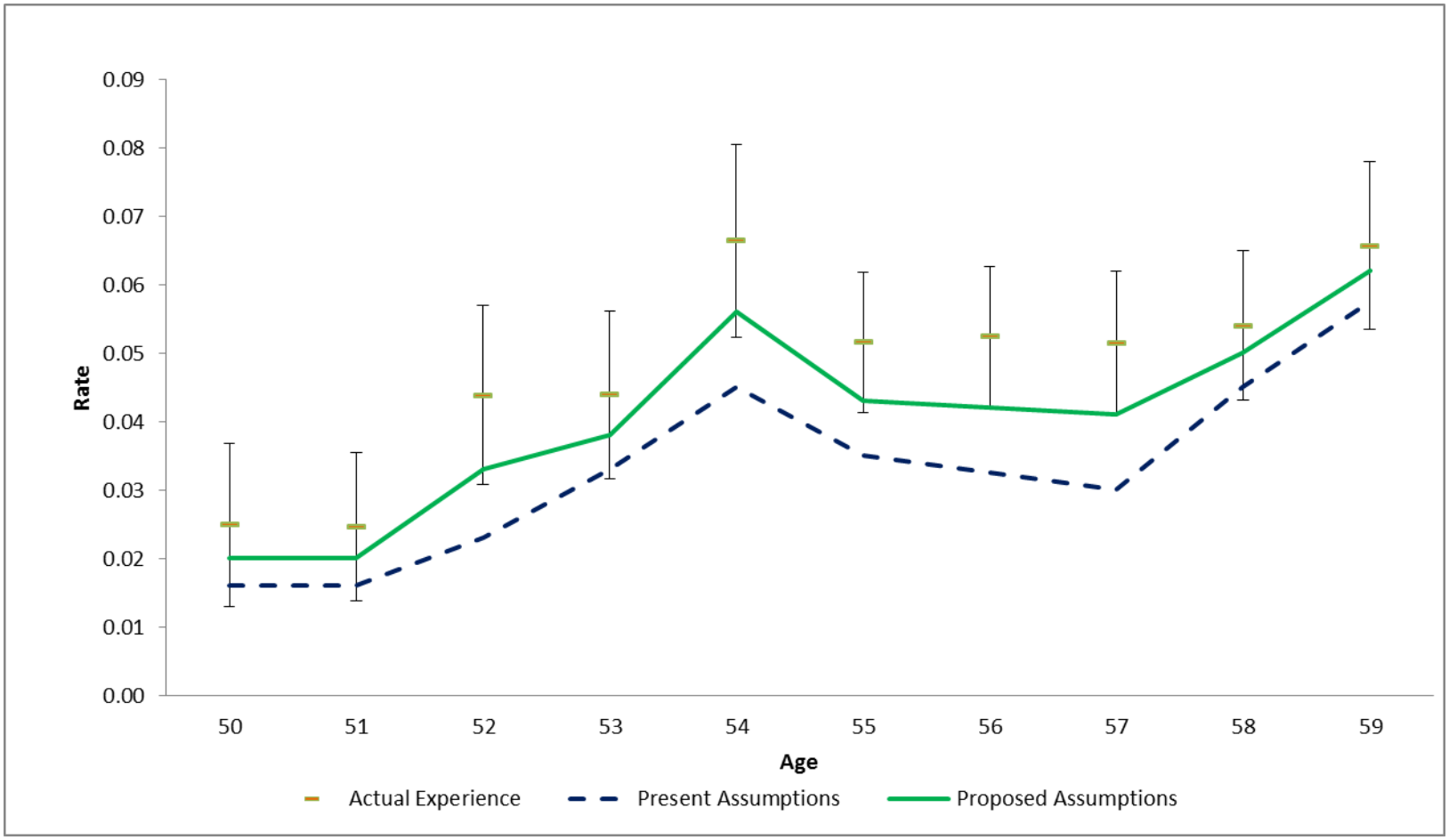
We recommend adoption of the proposed early retirement rates shown on the following two pages.

Note: The Exposure is the number of persons who were eligible to retire with reduced benefits in a one-year period after a December 31 annual actuarial valuation, whether they did retire or not during that period. For example, there were 1,842 active members age 55 who were eligible to retire during a coming year. 95 of those members actually did retire during that coming year. The Crude Rate of retirement is 95 divided by 1,842, or 0.0516 . Under the present assumptions, the retirement rate is 0.035, so that 64.47 (0.035 times 1,842) members were projected to retire. The proposed retirement rate is 0.043, so that 79.21 (0.043 times 1,842) members would be projected to retire. The Actual/Expected ratio shows how well the present or proposed assumptions compare to the actual retirements. A 1.00 ratio would represent a perfect match between the assumptions and the actual retirements. Note also that a person may be represented one to five times in the table, depending on how many times during the five year study period that person was an active member in a December 31 annual valuation and eligible to retire with early (reduced) benefits.

MERS
EARLY RETIREMENT EXPERIENCE

Age	Retirements	Exposure	Crude Rates	Rates		Expected Retirements		Actual / Expected	
				Present	Proposed	Present	Proposed	Present	Proposed
50	17	682	0.0249	0.0160	0.0200	10.91	13.64	1.56	1.25
51	20	814	0.0246	0.0160	0.0200	13.02	16.28	1.54	1.23
52	43	981	0.0438	0.0230	0.0330	22.56	32.37	1.91	1.33
53	49	1,116	0.0439	0.0330	0.0380	36.83	42.41	1.33	1.16
54	83	1,249	0.0665	0.0450	0.0560	56.21	69.94	1.48	1.19
55	95	1,842	0.0516	0.0350	0.0430	64.47	79.21	1.47	1.20
56	98	1,870	0.0524	0.0325	0.0420	60.78	78.54	1.61	1.25
57	93	1,804	0.0516	0.0300	0.0410	54.12	73.96	1.72	1.26
58	92	1,703	0.0540	0.0450	0.0500	76.64	85.15	1.20	1.08
59	108	1,644	0.0657	0.0575	0.0620	94.53	101.93	1.14	1.06
Totals	698	13,705	0.0509			490.06	593.43	1.42	1.18

MERS
EARLY RETIREMENT EXPERIENCE



WITHDRAWAL FROM ACTIVE EMPLOYMENT

Findings

Members who leave active employment, for reasons other than retirement or death, before becoming eligible for an immediate retirement benefit are eligible for either:

- No retirement benefit, if they are not vested.
- A deferred retirement benefit, if they are vested.

A deferred retirement benefit is based on the pay and service credit at the time of withdrawal. The benefit is frozen, and not payable until sometime in the future (typically age 60). Consequently, members who withdraw receive much less (if anything) from the plan compared to members who stay in employment until retirement eligibility. Higher rates of withdrawal result in lower computed contributions, and vice-versa.

The present assumption includes a base withdrawal table, based on the experience of all MERS members, and for some employers a "scaling factor" (see discussion on the next page). The first step in the analysis is to determine the appropriate base withdrawal table. Then scaling factors are developed for some municipalities.

We reviewed the experience during the last 5 years. The results are shown on pages E-12 and E-13. The table and chart show the actual experience and the current and proposed assumptions. The vertical bars surrounding the actual data points represent two standard deviations around the data point, representing the theoretical 95% confidence interval.

Overall, the plan experienced fewer actual withdrawals (8,649) compared to the number projected by the present assumptions (10,045 – see Totals at the bottom of page E-12). The chart on page E-13 indicates that the general shape of the actual experience is similar to the present assumptions, but a little lower. The proposed assumption (green line) moves around one-third of the way from the present assumption to the actual experience. Moving less than half-way reflects our judgement that future employee turnover rates will be more like those experienced in the 1999-2008 period than those experienced in the 2009-2013 period, given the poor employment opportunities during 2009-2013.

The proposed assumption will result in somewhat higher computed liabilities and contributions for those municipalities whose scaling factor did not change.

Note: The Exposure is the number of persons who were *not* eligible to retire (normal or early retirement) during a one-year period after a December 31 annual actuarial valuation, so that they were exposed to the possibility of withdrawing, whether they did withdraw or not during that period. Members who are eligible to retire (normal or early) are excluded from the withdrawal probability study. For example, there were 6,874 active members with 12 years of service who were not eligible to retire during a coming year. These 6,874 active members could withdraw (terminate employment) during the year. 254 of those members actually did withdraw during that coming year. The Crude Rate of withdrawal is 254 divided by 6,874, or 0.0370 . Under the present assumptions, the withdrawal rate is 0.045, so that 309.33 (0.045 times 6,874) members were projected to withdraw. The proposed withdrawal rate is 0.040, so that 274.96 (0.040 times 6,874) members would be projected to withdraw. The Actual/Expected ratio shows how well the present or proposed assumptions compare to the actual withdrawals. A 1.00 ratio would represent a perfect match between the assumptions and the actual withdrawals. Note also that a person may be represented one to five times in the table, depending on how many times during the five year study period that person was an active member in a December 31 annual valuation and not eligible for normal or early retirement.

Variation by Employer

We reviewed the withdrawal data in detail by employer. We found that there is significant variation among the employers in the rates of withdrawal. Equally important, we believe that for the larger employers the amount of data on withdrawals is of sufficient size to be statistically significant. For each employer with 500 or more life years of exposure to the possibility of withdrawal during the 5-year study period (which generally means 100 or more active members not yet eligible to retire each year) we again propose that the employer's actual withdrawal experience be considered when setting the new withdrawal assumption for that employer.

The table on pages E-14 and E-15 lists the employers with at least 500 life years of exposure. For each employer the table shows the ratio of actual withdrawals to expected withdrawals, based on the proposed base withdrawal rates and the displayed current scaling factor (these factors are based on the 2004-2008 experience). The final column in the table shows the proposed scaling factor. As done in deriving the proposed base withdrawal rates, the proposed scaling factor moves around one-third of the way from the current scaling factor to the actual experience. The factor was then rounded to the nearest .01 (1%). In the 2004-2008 study, we proposed that the range of scaling factors be limited to .80 – 1.20. We now suggest that the range of scaling factors be expanded to .60 – 1.40. In the next 5-year experience study, we expect to propose a wider range. We also propose that the scaling factor not change by more than 0.20 for any employer.

For an employer listed on pages E-14 and E-15, the proposed withdrawal rates will be the proposed standard MERS base withdrawal rates (see pages E-12 – E-13) multiplied by the employer's proposed scaling factor. For employers that were formerly assigned scaling factors different from 1.0, but that no longer have 500 life years of exposure, the scaling factor will remain unchanged. For other employers that are not listed on pages E-14 and E-15, the proposed withdrawal rates are the unadjusted proposed standard MERS base withdrawal rates (i.e. the scaling factor is 1.0; see below for exceptions). Note that the scaling factors are applied by employer, not division, because there are very few divisions with sufficient data to derive statistically valid division scaling factors.

As noted above, we included all employers in the development of the proposed base withdrawal rates, and then developed scaling factors for the larger employers. In order to verify that this procedure did not skew the proposed withdrawal rates, we recalculated the expected withdrawals (at each year of service) based on the combination of the proposed base withdrawal rates and the proposed scaling factors. This resulted in expected withdrawals and effective withdrawal rates that were not materially different from the proposed base withdrawal rates. This was the expected result since the weighted average proposed scaling factors for the larger employers was very close to 1.0 .

Increasing the scaling factor for an employer will generally result in somewhat lower computed liabilities and contributions, and vice-versa.

New Employers

This scaling factor issue also has important implications in the area of Initial Actuarial Valuations. MERS is providing initial valuations to a number of non-MERS defined benefit plans. Many (or most) of the non-MERS plans have completed actuarial experience studies, and the plans' withdrawal rates have been reasonably well determined based on past experience. Applying the MERS average withdrawal rates to such a plan can lead to apples to oranges comparisons of computed employer contribution requirements. Applying a scaling factor to the average MERS withdrawal rates results in a better comparison.

A review of Initial Actuarial Valuations of potential new employers that have existing non-MERS defined benefit plans shows that the variation of assumed withdrawal rates is large enough to warrant adoption of different withdrawal rates for different employers and divisions. In fact, the biggest difference between a non-MERS plan's assumptions and the standard MERS assumptions is often the withdrawal rates. It seems obvious that if a non-MERS plan transfers to MERS administration and adopts the same (or nearly the same) benefit structure under MERS as the non-MERS plan provided, the change of plan administration is not going to affect when members withdraw from employment. To use the MERS standard withdrawal assumption and ignore the non-MERS plan's withdrawal assumptions (developed over the years to fit the particular plan's experience) will skew the computed employer contribution rates up or down. For example, the initial MERS contribution rate might be computed to be lower than the non-MERS plan's rate, because of the different assumptions. However, if the members continue to withdraw as in the past (pre-MERS), the computed contribution rate will have to increase over time – eventually becoming higher than the non-MERS plan contribution rate.

As a result of this review, we are recommending *continuation* of the policy that, for future Initial Actuarial Valuations of potential new employers that have existing non-MERS defined benefit plans, the standard MERS withdrawal rates be scaled up or down to closely match the withdrawal rates developed historically for the non-MERS defined benefit plan. We propose to scale each division's withdrawal rate to closely match that division's previous withdrawal assumption. We suggest continuation of the use of scaling factors that vary from 0.1 to 2.0, in units of 0.1 (10%). This will reduce the likelihood that a new employer will face increasing or decreasing contribution rates after joining MERS. Future 5-year experience studies will include a review of the scaling factors assigned to each new municipality.

The different treatment given to small potential new employers compared to existing small MERS municipalities seems justified. It is important to avoid understatement or overstatement of long range costs under MERS when a potential MERS employer is making comparisons between MERS and the pre-existing non-MERS plan.

We propose to continue to use the scaling factors shown on pages E-16 and E-17, for recent new MERS employers, until enough experience is available to test their validity.

Recommendation

We recommend adoption of the proposed base withdrawal rates shown on pages E-12 – E-13.

We further recommend adoption of the proposed withdrawal scaling factors (multipliers) shown on pages E-14 and E-15.

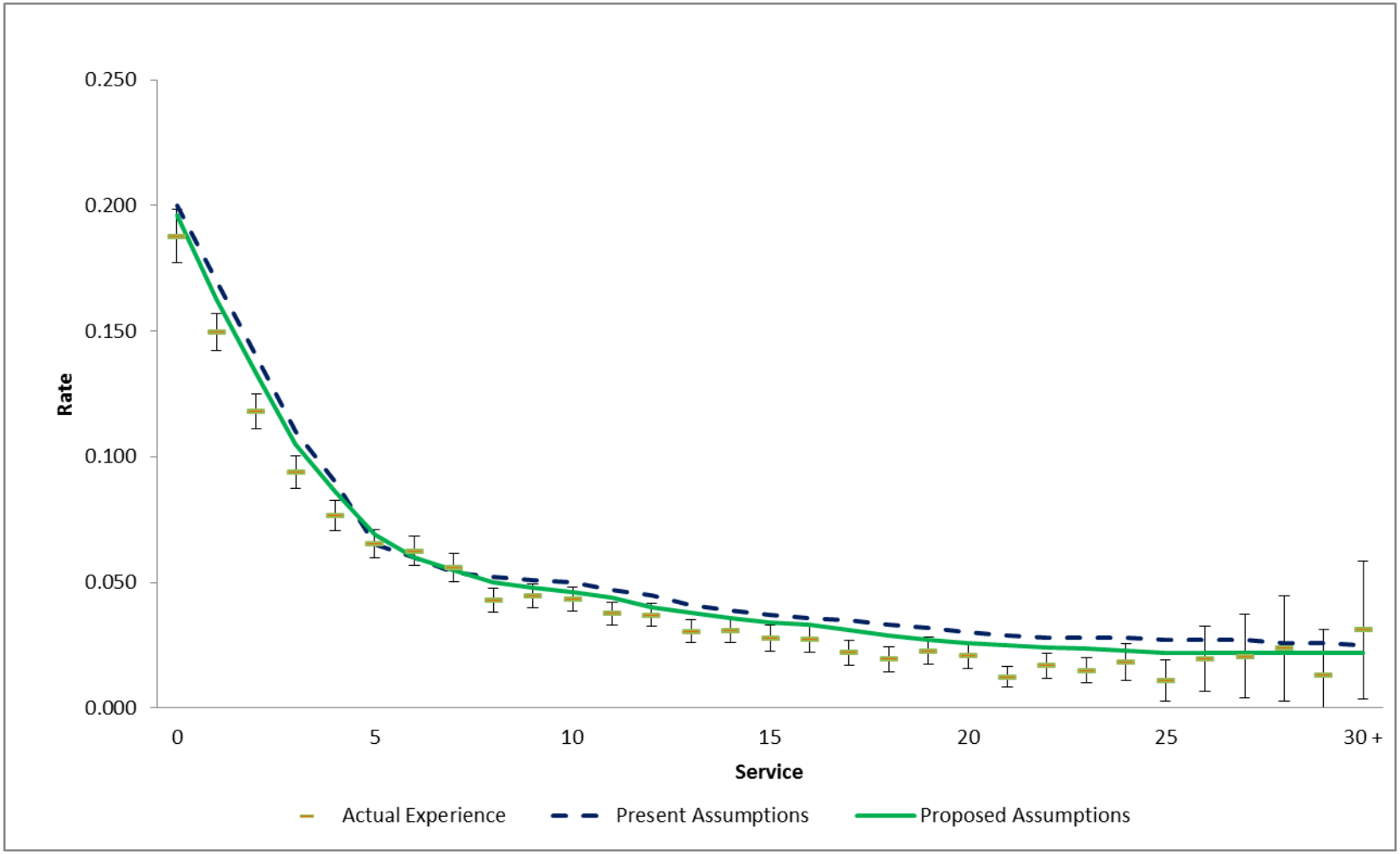
We further recommend continued use of the scaling factors (multipliers) shown on pages E-16 and E-17 for recent new employers.

We further recommend that scaling factors (multipliers) ranging from 0.1 to 2.0, in increments of 0.1, continue to be used to best match the pre-existing withdrawal assumptions for Initial Actuarial Valuations for non-MERS defined benefit plans who are considering joining MERS.

MERS
WITHDRAWAL EXPERIENCE

						Expected			
			Crude	Rates		Withdrawals		Actual / Expected	
Service	Withdrawals	Exposure	Rates	Present	Proposed	Present	Proposed	Present	Proposed
0	1,000	5,325	0.1878	0.2000	0.1960	1,065.00	1,043.70	0.94	0.96
1	1,480	9,889	0.1497	0.1700	0.1630	1,681.13	1,611.91	0.88	0.92
2	1,020	8,630	0.1182	0.1400	0.1330	1,208.20	1,147.79	0.84	0.89
3	750	7,978	0.0940	0.1100	0.1050	877.58	837.69	0.85	0.90
4	598	7,786	0.0768	0.0900	0.0860	700.74	669.60	0.85	0.89
5	483	7,391	0.0653	0.0650	0.0690	480.42	509.98	1.01	0.95
6	443	7,083	0.0625	0.0600	0.0600	424.98	424.98	1.04	1.04
7	390	6,981	0.0559	0.0540	0.0550	376.97	383.96	1.03	1.02
8	312	7,302	0.0427	0.0520	0.0500	379.70	365.10	0.82	0.85
9	323	7,225	0.0447	0.0510	0.0480	368.48	346.80	0.88	0.93
10	307	7,096	0.0433	0.0500	0.0460	354.80	326.42	0.87	0.94
11	265	7,049	0.0376	0.0470	0.0440	331.30	310.16	0.80	0.85
12	254	6,874	0.0370	0.0450	0.0400	309.33	274.96	0.82	0.92
13	193	6,310	0.0306	0.0410	0.0380	258.71	239.78	0.75	0.80
14	165	5,349	0.0308	0.0390	0.0360	208.61	192.56	0.79	0.86
15	120	4,321	0.0278	0.0370	0.0340	159.88	146.91	0.75	0.82
16	106	3,891	0.0272	0.0360	0.0330	140.08	128.40	0.76	0.83
17	77	3,490	0.0221	0.0350	0.0310	122.15	108.19	0.63	0.71
18	62	3,195	0.0194	0.0330	0.0290	105.44	92.66	0.59	0.67
19	69	3,044	0.0227	0.0320	0.0270	97.41	82.19	0.71	0.84
20	60	2,885	0.0208	0.0300	0.0260	86.55	75.01	0.69	0.80
21	34	2,732	0.0124	0.0290	0.0250	79.23	68.30	0.43	0.50
22	44	2,614	0.0168	0.0280	0.0240	73.19	62.74	0.60	0.70
23	35	2,342	0.0149	0.0280	0.0235	65.58	55.04	0.53	0.64
24	25	1,366	0.0183	0.0280	0.0230	38.25	31.42	0.65	0.80
25	7	640	0.0109	0.0270	0.0220	17.28	14.08	0.41	0.50
26	9	461	0.0195	0.0270	0.0220	12.45	10.14	0.72	0.89
27	6	292	0.0205	0.0270	0.0220	7.88	6.42	0.76	0.93
28	5	210	0.0238	0.0260	0.0220	5.46	4.62	0.92	1.08
29	2	153	0.0131	0.0260	0.0220	3.98	3.37	0.50	0.59
30 +	5	161	0.0311	0.0250	0.0220	4.03	3.54	1.24	1.41
Totals	8,649	140,065	0.0617			10,044.77	9,578.40	0.86	0.90

MERS
WITHDRAWAL EXPERIENCE



WITHDRAWAL RESULTS FOR LARGE MUNICIPALITIES

Employer Name	Employer Number	5-Year Exposure	Actual/Expected Proposed	Current Scaling Factor	Proposed Scaling Factor
Adrian, City of	4601	523	0.801	0.85	0.83
Alpena Rgnl Med Ctr	0405	1,146	1.180	0.85	0.96
Antrim Co	0502	1,288	1.016	1.20	1.14
Barry Co	0802	1,726	1.085	1.10	1.10
Battle Creek, City of	1302	1,296	0.500	0.80	0.70
Canton, Chtr Twp of	8233	1,101	0.230	0.90	0.70
Cass Co	1402	600	0.633	1.00	0.88
Charlevoix Co	1503	1,609	1.216	1.20	1.21
Cheboygan Co	1603	549	0.718	1.00	0.91
Chesterfield Twp	5009	599	0.599	1.00	0.87
Chippewa Co	1703	565	1.032	1.00	1.01
Clare Co	1802	600	1.106	1.20	1.17
Clinton Co	1903	629	0.659	0.80	0.75
Clinton Twp	5002	598	0.688	0.80	0.76
Clinton-Eaton-Ingham CMH	3308	2,839	0.819	0.95	0.91
CMH for Central Mich	3708	1,265	0.637	1.00	0.88
Detroit HC	8241	540	1.306	1.00	1.10
East Lansing, City of	3301	995	0.812	0.80	0.80
Eaton Co	2302	1,583	1.013	0.95	0.97
Eaton Co Hlth & Rehab Serv	2305	821	1.603	1.10	1.27
Grand Haven, City of	7010	745	0.544	0.80	0.71
Grand Traverse Pavilions	2809	1,539	1.203	1.10	1.13
Hlth Source of Saginaw	7311	886	1.303	1.20	1.23
Holland, City of	7001	915	0.464	0.80	0.69
Huron Co	3204	1,475	0.699	1.00	0.90
Ingham Co	3303	5,409	1.036	1.00	1.01
Iosco Co	3501	946	1.317	1.20	1.24
Iron Co	3606	1,303	1.258	1.20	1.22
Isabella Co	3703	729	1.182	1.00	1.06
Lake Co	4301	529	0.879	1.10	1.03

WITHDRAWAL RESULTS FOR LARGE MUNICIPALITIES (CONT.)

Employer Name	Employer Number	5-Year Exposure	Actual/Expected Proposed	Current Scaling Factor	Proposed Scaling Factor
Lapeer Co	4403	3,003	1.281	1.20	1.23
Livingston Co	4703	1,812	0.822	1.05	0.97
Mackinac Straits Hosp&Hlth Ctr	4902	875	1.081	1.10	1.09
Manistee Co	5101	1,146	1.189	1.10	1.13
Marquette Co	5202	1,345	1.388	1.20	1.26
Mason Co	5301	560	0.692	1.10	0.96
MERS	2308	567	0.875	1.00	0.96
Midland, City of	5601	721	0.456	0.80	0.69
Muskegon Co	6103	3,779	0.849	0.90	0.88
Muskegon, City of	6116	811	0.771	1.00	0.92
Network180	4109	414	1.016	0.90	0.94
Newaygo MCF	6204	803	1.459	1.20	1.29
Novi, City of	6320	878	0.807	0.80	0.80
Oceana Co	6402	1,264	1.286	1.20	1.23
Ottawa Co	7003	3,640	0.835	0.85	0.85
Pittsfield Chtr Twp	8110	542	0.810	1.00	0.94
Port Huron, City of	7702	1,022	0.435	0.80	0.68
Roscommon Co	7201	525	0.822	1.00	0.94
Schoolcraft Co	7503	752	1.584	1.00	1.19
Shiawassee Co	7602	1,837	1.342	1.20	1.25
SMART	8216	3,489	0.540	0.85	0.75
St Joseph Co	7803	646	0.785	1.00	0.93
Tuscola Co	7902	609	0.940	1.00	0.98
Tuscola Co CMH	7907	576	1.089	1.20	1.16
Tuscola Co MCF	7906	1,365	1.494	1.20	1.30
Van Buren Co	8006	804	0.883	1.00	0.96
Washtenaw Co	8113	1,367	0.571	0.80	0.72
Washtenaw CRC	8102	501	0.528	0.80	0.71
Westland,City of	8211	700	0.707	0.80	0.77

WITHDRAWAL SCALING FACTORS FOR RECENT NEW EMPLOYERS

Employer Name	Employer Number	Division Name	Division Number	Current/Proposed Scaling Factor
Beverly Hills, Vlg of	6321	General	01	1.00
Beverly Hills, Vlg of	6321	Cmmd Off & Pub Sfty & Ret w/1%	02	0.50
Beverly Hills, Vlg of	6321	NonUnion&AFSME	10	1.00
Beverly Hills, Vlg of	6321	Cmmd Off & Pub Sfty Ret w/2%	20	1.00
Beverly Hills, Vlg of	6321	Cmmd Off & Pub Sfty Def&Ret no	21	1.00
Calhoun Co	1311	DB Plan Excl. Exec Mgmt	01	0.40
Calhoun Co	1311	Sheriff's Dpt Sup & Elect/Appt	02	0.80
Calhoun Co	1311	Altern. Div. Excl Management	03	0.40
Calhoun Co	1311	UAW	10	1.00
Calhoun Co	1311	Non Union CRC	11	1.00
Calhoun Co	1311	Management CRC	12	1.00
Calhoun Co	1311	Teamsters CRC	13	1.00
Calhoun Co	1311	Sheriff's Non-Sup & Electe/App	20	0.80
Dearborn, City of	8251	Police hired after 7/1/05	02	0.20
Dearborn, City of	8251	Fire Hired on or after 5/1/09	05	0.10
Farmington, City of	6343	Non-union	01	0.60
Farmington, City of	6343	Command	02	0.50
Farmington, City of	6343	Department of Public Works	10	0.60
Farmington, City of	6343	Department Heads	11	0.60
Farmington, City of	6343	Public Safety	20	0.50
Farmington, City of	6343	Dispatch	21	1.00
Ironwood, City of	2706	General hired prior to 7/1/94	01	1.00
Ironwood, City of	2706	Police and Fire (prior 4/1/95)	02	0.60
Ironwood, City of	2706	Library Employees	07	1.00
Ironwood, City of	2706	General hired 7/1/94 - 6/30/06	10	1.00
Ironwood, City of	2706	General hired after 7/1/06	11	1.00
Ironwood, City of	2706	General after 7/1/12	12	1.00
Ironwood, City of	2706	Police and Fire (Post 4/1/95)	20	0.60
Ironwood, City of	2706	Police/Fire after 4/1/12	21	1.00

WITHDRAWAL SCALING FACTORS FOR RECENT NEW EMPLOYERS (CONT.)

Employer Name	Employer Number	Division Name	Division Number	Current/Proposed Scaling Factor
New Baltimore, City of	5016	AFSCME before 11/1/2006	01	1.00
New Baltimore, City of	5016	Command	02	0.60
New Baltimore, City of	5016	Non-union on or before 11/1/06	10	1.00
New Baltimore, City of	5016	Non-union after 11/1/06	11	1.00
New Baltimore, City of	5016	All af 10/1/10 excp Pub Safety	12	0.90
New Baltimore, City of	5016	Police NU on or before 11/1/06	20	0.60
New Baltimore, City of	5016	POAM	21	0.60
New Baltimore, City of	5016	Pub Safety NH after 10/1/10	22	1.00
Wayne, City of	8242	General	01	0.70
Wayne, City of	8242	Dispatchers	02	1.00
Wayne, City of	8242	Fire	05	1.00
Wayne, City of	8242	Retiree-2% Comp/COLA& Deferred	09	1.00
Wayne, City of	8242	Gen af 2/19/08	10	1.00
Wayne, City of	8242	Dept Heads	11	0.70
Wayne, City of	8242	Dpt Hd af 11/20/07	12	0.70
Wayne, City of	8242	Supervisors	13	0.70
Wayne, City of	8242	Supvr af 11/20/07	14	1.00
Wayne, City of	8242	Court	15	0.70
Wayne, City of	8242	Court af 12/18/07	16	0.70
Wayne, City of	8242	TPOAM	17	0.70
Wayne, City of	8242	TPOAM af 6/5/07	18	1.00
Wayne, City of	8242	Disp af 12/20/07	20	1.00
Wayne, City of	8242	POAM after 5/5/08	21	0.60
Wayne, City of	8242	POAM	22	0.60
Wayne, City of	8242	COAM	23	0.60
Wayne, City of	8242	COAM after 5/5/08	24	1.00
Wayne, City of	8242	Fire 3/16/09	51	1.00
Wayne, City of	8242	Fire after 11/1/2011	52	1.00
Wayne, City of	8242	Retirees - 2% Non-Comp COLA	90	1.00
Wayne, City of	8242	Retirees no COLA	91	1.00
Wayne, City of	8242	Retirees - 2% Comp or ROI	92	1.00

DISABILITY

Findings

The assumed rates of disability (leaving active service due to injury while not entitled to age and service benefits) are a minor ingredient in cost calculations, because the incidence of disability is low. Higher rates of disability generally result in somewhat higher computed contributions, and vice-versa.

We reviewed the experience during the last 5 years. The results are shown on pages E-19 and E-20. The table and chart show the actual experience and the current and proposed assumptions. We use 5-year age groupings because the numbers of actual disabilities is small. The vertical bars surrounding the actual data points represent two standard deviations around the data point, representing the theoretical 95% confidence interval.

Overall, the plan experienced fewer actual disabilities (243) compared to the number projected by the present assumptions (269 – see Totals at the bottom of page E-19). There were more disabilities than expected from age 35-49, but fewer at age 50 and older. The proposed assumption (green line) moves about half way from the present assumption to the actual experience.

If a disability is due to duty-connected causes, the minimum benefit is 25% of the member's final average compensation (FAC). Adoption of optional Benefit Program D-2 provides a retirement allowance for a duty-connected disability that is the greater of: (i) 25% of the member's FAC or (ii) a benefit based on 10 years of credited service in addition to the member's actual period of service, provided the total years of service do not exceed the greater of 30 years or the member's actual period of service.

For members not covered by Benefit Program D-2, about 21% of all disability retirements were duty-related, compared to the current 15% assumption. We suggest increasing the assumption for duty disability to 20%.

For members covered by Benefit Program D-2, about 82% of all disability retirements were duty-related, compared to the current 45% assumption. Although this was based on very few actual disabilities (22 total, of which 18 were duty related), we suggest increasing the assumption for duty disability to 60%.

The proposed assumptions will result in slightly higher computed liabilities and contributions.

Recommendations

We recommend adoption of the proposed disability retirement rates shown on pages E-19 and E-20.

We further recommend adoption of the proposed assumption that if Benefit D-2 is not in effect, 20% of all disabilities will be duty-related, replacing the current 15% assumption.

We further recommend adoption of the proposed assumption that under Benefit D-2, 60% of all disabilities will be duty-related, replacing the current 45% assumption.

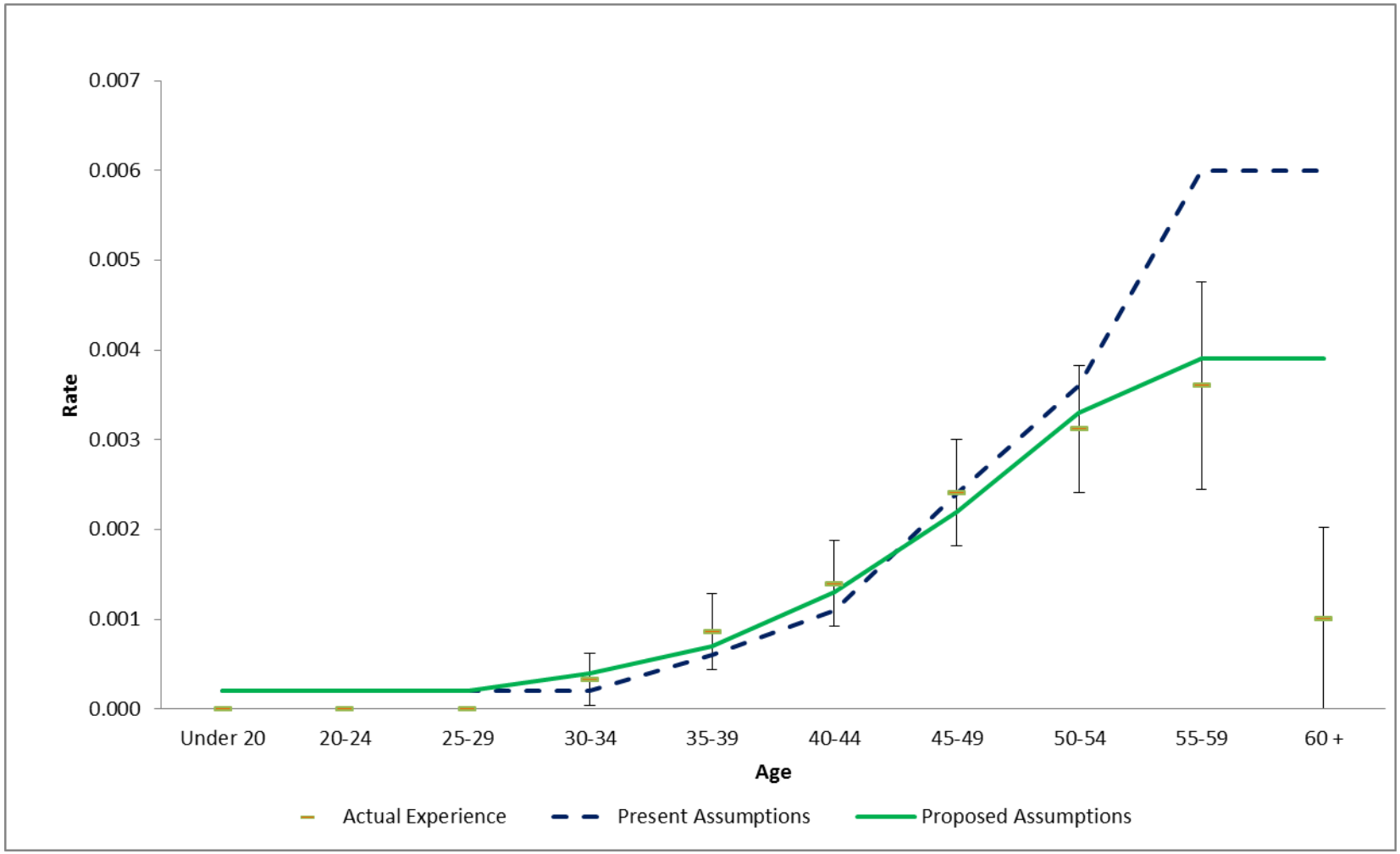
MERS
DISABILITY EXPERIENCE

Age	Disabilities	Exposure	Crude Rates	Sample Rates *		Expected Disabilities		Actual / Expected	
				Present	Proposed	Present	Proposed	Present	Proposed
Under 20	0	102	0.0000	0.0002	0.0002	0.02	0.02	0.00	0.00
20-24	0	3,179	0.0000	0.0002	0.0002	0.64	0.64	0.00	0.00
25-29	0	9,996	0.0000	0.0002	0.0002	2.00	2.00	0.00	0.00
30-34	5	15,313	0.0003	0.0002	0.0004	5.73	5.30	0.87	0.94
35-39	17	19,662	0.0009	0.0006	0.0007	11.80	13.55	1.44	1.25
40-44	35	24,989	0.0014	0.0011	0.0013	22.65	32.72	1.55	1.07
45-49	66	27,367	0.0024	0.0024	0.0022	52.10	63.24	1.27	1.04
50-54	77	24,679	0.0031	0.0036	0.0033	85.17	81.79	0.90	0.94
55-59	39	10,822	0.0036	0.0060	0.0039	64.93	41.96	0.60	0.93
60 +	4	3,956	0.0010	0.0060	0.0039	23.74	15.43	0.17	0.26
Totals	243	140,065	0.0017			268.77	256.64	0.90	0.95

* Sample rates are taken from the midpoint of the age group.

Note: The Exposure is the number of persons who were *not* eligible to retire (normal or early retirement) during a one-year period after a December 31 annual actuarial valuation, so that they were exposed to the possibility of disability, whether they did become disabled or not during that period. Members who are eligible to retire (normal or early) are excluded from the disability probability study. For example, there were 24,989 active members age 40-44 who were not eligible to retire during a coming year. These 24,989 active members could become disabled during the year. 35 of those members actually did become disabled during that coming year. The Crude Rate of disability is 35 divided by 24,989, or 0.0014 . Under the present assumptions 22.65 members were projected to become disabled. Under the proposed assumptions 32.72 members would be projected to become disabled. The Actual/Expected ratio shows how well the present or proposed assumptions compare to the actual disabilities. A 1.00 ratio would represent a perfect match between the assumptions and the actual disabilities. Note also that a person may be represented one to five times in the table, depending on how many times during the five year study period that person was an active member in a December 31 annual valuation and not eligible for normal or early retirement.

MERS
DISABILITY EXPERIENCE



PRE AND POST-RETIREMENT MORTALITY

Findings

Post-retirement mortality is an important, but usually relatively stable ingredient in cost calculations. This assumption should be updated from time to time to reflect measured or projected longevity improvements.

We analyzed the mortality experience separately for:

- Healthy retirees and beneficiaries (excludes disability retirees)
- Disability retirees

Pre-retirement mortality is a relatively minor ingredient in the cost calculations. The frequency of such deaths is so low that mortality assumptions based on experience can only be produced for very large retirement systems. As a result, for pre-retirement mortality we suggest using the same table as used for healthy retirees and beneficiaries.

Healthy Retirees and Beneficiaries

We reviewed the experience during the last 5 years. The results are shown on pages E-24 and E-25. The table and chart show the actual experience and the current and proposed assumptions. We use 5-year age groupings because the numbers of lives is small at the older ages. The vertical bars surrounding the actual data points represent two standard deviations around the data point, representing the theoretical 95% confidence interval.

Healthy retirees and beneficiaries are living longer than projected by the current mortality table. Overall the plan experienced fewer deaths (3,566) than projected by the present assumptions (3663 – see Totals at the bottom of page E-24).

It is not a surprise that retirees are living longer than projected. Both of the last two 5-year experience studies showed that MERS retirees were living shorter lifetimes than projected by the present mortality assumption. National trends showed otherwise. The new study confirms that MERS retirees are now experiencing longer lifetimes. There has been sufficient increase in the longevity of retirees to warrant a new mortality table that projects longer lifetimes.

We analyzed the retiree mortality data two ways:

1. A traditional analysis that assigns the same weighting to each retiree and beneficiary.
2. An analysis that weights the results by the amount of each person's pension benefit. If longevity is affected by pension income, this will produce mortality rates that differ somewhat from the traditionally determined rates. Common belief is that higher incomes will result in longer lifetimes. With pension income as a proxy for total income, this analysis does result in slightly lower mortality rates, supporting this common notion.

Under both methods, healthy retiree and beneficiary actual mortality rates were lower than the current mortality rates. However, the two methods did not produce materially different results (the pension weighted rates were overall about 98% of the equal weighted rates). As a result, we abandoned the pension benefit weighting, in favor of the traditional, less complex method.

The desired qualities of a new MERS mortality table are:

1. Better match to the actual experience of the plan.
2. Inclusion of safety margin for future improvements in retiree longevity.
3. Based on an industry standard table, or simple adjustments to a standard table.
4. Merged-gender based table, so that the table may be used for many purposes without risk of violating any discrimination policies/rules/laws.
5. A single table that can be applied to both healthy retirees and beneficiaries and to active employees.

We propose that the new table be based on a combination of:

a. The RP-2014 Healthy Annuitant Mortality Tables, published by the Society of Actuaries, and
b. The RP-2014 Employee Mortality Tables, extended below age 18 using the RP-2014 Juvenile Mortality Tables.

We considered numerous combinations of the above tables, including: i) various unisex mixes of the male and female tables; ii) adjustments up or down to the tabular ages; iii) multiplicative factors applied to the mortality rates; and iv) linear combinations of the Employee tables and the Annuitant tables for the overlap at ages 50-70.

The proposed mortality table is constructed as follows:

1. Create a 50% Male – 50% Female Blend of the RP-2014 Healthy Annuitant Mortality Tables for males and females. Multiply each of the mortality rates by 1.05 (105%).
2. Create a 50% Male – 50% Female Blend of the RP-2014 Employee Mortality Tables for males and females.
3. Create a 50% Male – 50% Female Blend of the RP-2014 Juvenile Mortality Tables for males and females.
4. For ages 0-17, use Table 3.
5. For ages 18-49, use Table 2.
6. For ages 50-69, blend Table 2 and Table 1 as follows:
    a. Age 50, use 60% of Table 2 and 40% of Table 1.
    b. Age 51, use 57% of Table 2 and 43% of Table 1.
    c. etc. …
    d. Age 69, use 3% of Table 2 and 97% of Table 1.
7. For ages 70 and older, use Table 1.

Based on the proposed table, the expected number of deaths during the 2009-2013 period would be 3,229, compared to the actual 3,566 deaths during that period. The 110% ratio of actual to expected deaths under the proposed table is a measure of the safety margin for future longevity improvement.

Life expectancies under the current and proposed mortality tables are shown on page E-26.

There was not enough data to provide meaningful comparisons of duty and non-duty deaths before retirement. We therefore propose to continue the current assumption that 10% of active employee deaths are duty-related.

The proposed mortality assumptions will result in increased computed liabilities and contributions.

Future Considerations

There is a movement in the actuarial community toward the use of "generational mortality tables". A generational table includes a projection of ongoing future longevity improvements. The underlying feature is that the assumed mortality rates depend not only on a person's age, but also the person's year of birth. A retiree who is age 70 in 2040 (born in 1970) would have an assumed mortality rate that is lower than a retiree who is age 70 in 2020 (born in 1950). In this manner an adopted mortality assumption will be automatically updated in each future year.

Adoption of a generational mortality table will, in theory, eliminate the need to periodically update mortality tables as longevity improves. The reality is that the future cannot be predicted with a high degree of accuracy, so that even generational tables will have to be updated from time to time, as the projections of future longevity improvement change. There is no "permanent assumption" that will not require periodic review and updates.

Only a small proportion of public pension plans have begun to use generational tables. We are recommending a non-generational ("static") table that includes some safety margin for future longevity improvement. MERS staff and the actuaries plan to study the issue of generational mortality tables, with the intention of deciding if that is a good approach for MERS at some future date.

Recommendations

We recommend adoption of the proposed healthy retiree, beneficiary, and active employee mortality rates shown on pages E-24 and E-25.

We further recommend continuation of the current assumption that 10% of all active employee deaths will be duty-related.

The proposed mortality table is constructed as follows:

1. *Create a 50% Male – 50% Female Blend of the RP-2014 Healthy Annuitant Mortality Tables for males and females. Multiply each of the mortality rates by 1.05 (105%).*
2. *Create a 50% Male – 50% Female Blend of the RP-2014 Employee Mortality Tables for males and females.*
3. *Create a 50% Male – 50% Female Blend of the RP-2014 Juvenile Mortality Tables for males and females.*
4. *For ages 0-17, use Table 3.*
5. *For ages 18-49, use Table 2.*
6. *For ages 50-69, blend Table 2 and Table 1 as follows:*
    a. *Age 50, use 60% of Table 2 and 40% of Table 1.*
    b. *Age 51, use 57% of Table 2 and 43% of Table 1.*
    c. *etc.…*
    d. *Age 69, use 3% of Table 2 and 97% of Table 1.*
7. *For ages 70 and older, use Table 1.*

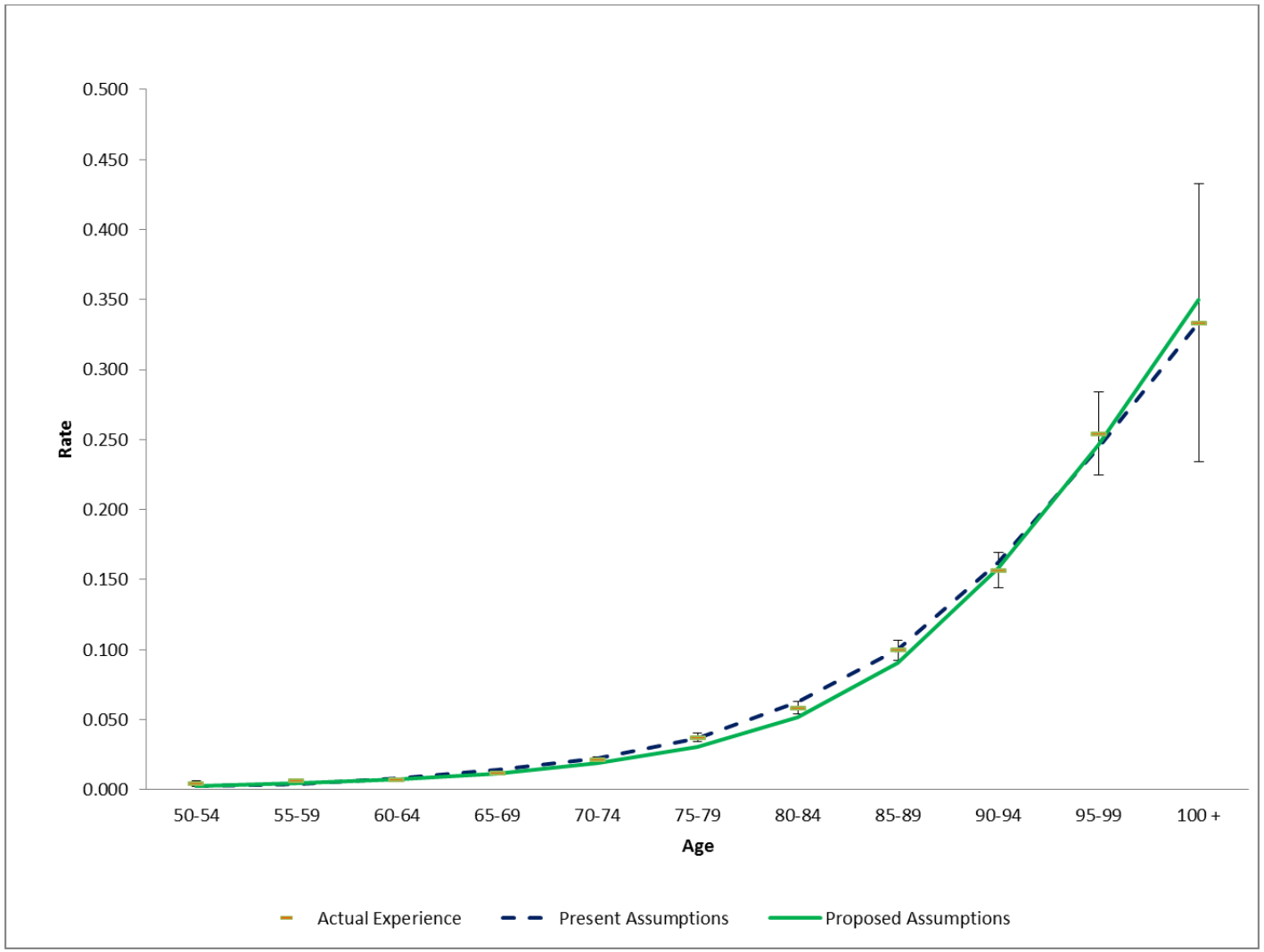
MERS
HEALTHY RETIREE AND BENEFICIARY MORTALITY EXPERIENCE

						Expected			
			Crude	Sample Rates *		Deaths		Actual / Expected	
Age	Deaths	Exposure	Rates	Present	Proposed	Present	Proposed	Present	Proposed
50-54	14	3,423	0.0041	0.002474	0.002790	8.98	10.08	1.56	1.39
55-59	81	12,893	0.0063	0.004250	0.004441	57.88	59.26	1.40	1.37
60-64	172	25,259	0.0068	0.007990	0.007037	208.05	181.55	0.83	0.95
65-69	275	23,358	0.0118	0.014399	0.011465	333.16	268.25	0.83	1.03
70-74	387	18,112	0.0214	0.022494	0.018772	407.40	339.77	0.95	1.14
75-79	523	14,026	0.0373	0.036769	0.030602	517.41	430.00	1.01	1.22
80-84	634	10,885	0.0582	0.062343	0.051855	674.81	565.30	0.94	1.12
85-89	723	7,264	0.0995	0.099847	0.090851	716.19	649.68	1.01	1.11
90-94	505	3,224	0.1566	0.162127	0.157879	507.19	491.41	1.00	1.03
95-99	222	873	0.2543	0.244235	0.246028	202.24	203.05	1.10	1.09
100 +	30	90	0.3333	0.333712	0.349673	29.18	30.39	1.03	0.99
Totals	3,566	119,407	0.0299			3,662.50	3,228.74	0.97	1.10

* Sample rates are taken from the midpoint of the age group.

Note: The Exposure is the number of retirees and beneficiaries who were alive at the beginning of a one-year period after a December 31 annual actuarial valuation, so that they were exposed to the possibility of death, whether they died or not during that period. For example, there were 23,358 retirees and beneficiaries age 65-69 who were alive at the beginning of a year. 275 of those persons actually did die during that coming year. The Crude Rate of death is 275 divided by 23,358, or 0.0118 . Under the present assumptions 333.16 retirees and beneficiaries were projected to die. Under the proposed assumptions 268.25 persons would be projected die. The Actual/Expected ratio shows how well the present or proposed assumptions compare to the actual deaths. A 1.00 ratio would represent a perfect match between the assumptions and the actual deaths. Note also that a person may be represented one to five times in the table, depending on how many times during the five year study period that person was a retiree or beneficiary in a December 31 annual valuation.

MERS
HEALTHY RETIREE AND BENEFICIARY MORTALITY EXPERIENCE



LIFE EXPECTANCIES
BASED ON CURRENT AND PROPOSED MORTALITY ASSUMPTIONS

Age	Expected Years of Life Remaining	
	Current Assumptions	Proposed Assumptions
50	32.60	33.74
55	27.98	29.18
60	23.53	24.79
65	19.40	20.59
70	15.66	16.66
75	12.24	13.07
80	9.25	9.85

Disabled Retirees

We reviewed the experience during the last 5 years. The results are shown on pages E-28 and E-29. The table and chart show the actual experience and the current and proposed assumptions. We use 5-year age groupings because the numbers of actual disabilities is small. The vertical bars surrounding the actual data points represent two standard deviations around the data point, representing the theoretical 95% confidence interval.

Disabled are living longer than projected by the current mortality table. At ages 40-60 actual mortality rates are higher than the current assumed rates. However, at the later ages, the actual mortality rates are much lower than the current assumed rates. Overall the plan experienced fewer deaths (203) than projected by the present assumptions (232 – see Totals at the bottom of page E-28). The proposed assumption (green line) includes a 10% margin for future improvements in longevity.

The desired qualities of a new MERS mortality table for disabled retirees are:

1. Better match to the actual experience of the plan.
2. Inclusion of safety margin for future improvements in disabled retiree longevity.
3. Based on an industry standard table, or simple adjustments to a standard table.
4. Merged-gender based table, so that the table may be used for many purposes without risk of violating any discrimination policies/rules/laws.

We propose that the new table be based on the RP-2014 Disabled Retiree Mortality Tables, published by the Society of Actuaries.

We considered: i) various unisex mixes of the male and female tables; ii) adjustments up or down to the tabular ages; and iii) multiplicative factors applied to the mortality rates.

The proposed mortality table is a 50% Male – 50% Female Blend of the RP-2014 Disabled Retiree Mortality Tables for males and females.

Based on the proposed table, the expected number of deaths during the 2009-2013 period would be 185, compared to the actual 203 deaths during that period. The 110% ratio of actual to expected deaths under the proposed table is a measure of the safety margin for future longevity improvement.

The proposed mortality assumptions will result in increased computed liabilities and contributions.

Recommendations

We recommend adoption of the proposed disabled retiree mortality rates shown on pages E-28 and E-29.

The proposed mortality table is a 50% Male – 50% Female Blend of the RP-2014 Disabled Retiree Mortality Tables for males and females.

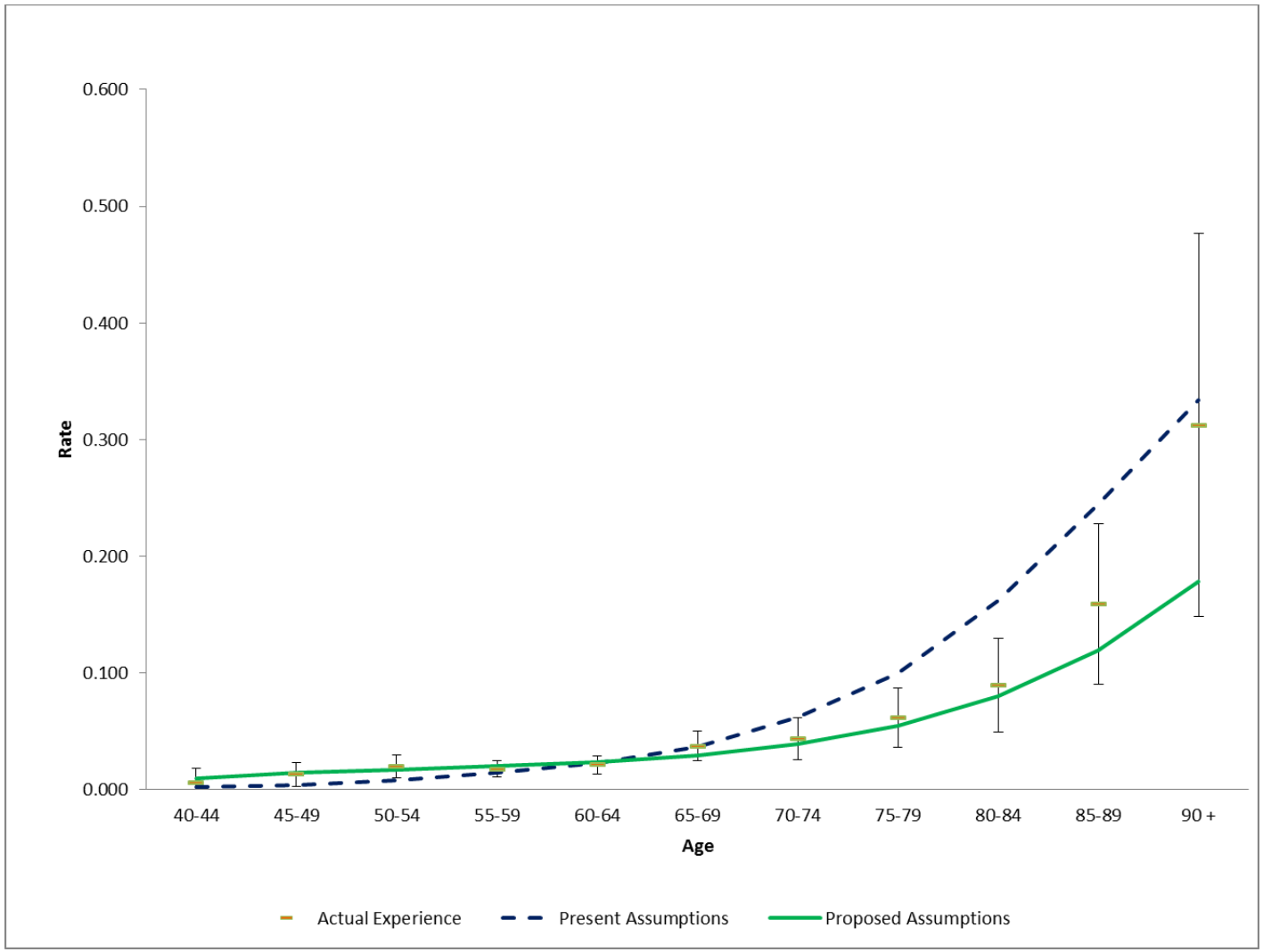
MERS
DISABLED RETIREE MORTALITY EXPERIENCE

						Expected			
			Crude	Sample Rates *		Deaths		Actual / Expected	
Age	Deaths	Exposure	Rates	Present	Proposed	Present	Proposed	Present	Proposed
40-44	1	165	0.0061	0.002474	0.009633	0.43	1.69	2.31	0.59
45-49	6	465	0.0129	0.004250	0.014322	2.08	6.73	2.89	0.89
50-54	17	848	0.0200	0.007990	0.017300	7.13	14.79	2.39	1.15
55-59	24	1,358	0.0177	0.014399	0.019998	19.74	27.26	1.22	0.88
60-64	31	1,459	0.0212	0.022494	0.023293	32.97	34.04	0.94	0.91
65-69	33	883	0.0374	0.036769	0.028942	31.88	25.31	1.04	1.30
70-74	23	524	0.0439	0.062343	0.038881	32.30	20.28	0.71	1.13
75-79	22	357	0.0616	0.099847	0.055012	35.30	19.45	0.62	1.13
80-84	18	201	0.0896	0.162127	0.080321	32.81	16.27	0.55	1.11
85-89	18	113	0.1593	0.244235	0.119680	26.61	13.05	0.68	1.38
90 +	10	32	0.3125	0.333712	0.178643	10.76	5.79	0.93	1.73
Totals	203	6,405	0.0317			231.99	184.67	0.88	1.10

* Sample rates are taken from the midpoint of the age group.

Note: The Exposure is the number of disabled retirees who were alive at the beginning of a one-year period after a December 31 annual actuarial valuation, so that they were exposed to the possibility of death, whether they died or not during that period. For example, there were 524 disabled retirees age 70-74 who were alive at the beginning of a year. 23 of those persons actually did die during that coming year. The Crude Rate of death is 23 divided by 524, or 0.0439 . Under the present assumptions 32.30 retirees were projected to die. Under the proposed assumptions 20.28 persons would be projected die. The Actual/Expected ratio shows how well the present or proposed assumptions compare to the actual deaths. A 1.00 ratio would represent a perfect match between the assumptions and the actual deaths. Note also that a person may be represented one to five times in the table, depending on how many times during the five year study period that person was a disabled retiree in a December 31 annual valuation.

MERS
DISABLED RETIREE MORTALITY EXPERIENCE



PAY INCREASES DUE TO MERIT AND LONGEVITY

Findings

Pay increases granted to active members typically consist of two pieces:

- An across-the-board, economic type of increase granted to most or all members of the group. This increase is typically tied to inflation or cost of living changes.
- An increase as a result of merit and longevity. This increase is typically related to the performance of an individual and includes promotions and increased years of experience.

The assumption for across-the-board increases is the wage inflation assumption discussed in Section D. The merit and longevity portion of pay increases is discussed on this page.

We reviewed the merit and longevity pay increases during the last 5 years. We estimated that during the 5 years of the study, the average wage inflation component of pay increases was 2.0% per year. This 2.0% economic increase was subtracted from the actual pay increases to obtain the merit/longevity portion of the pay increases. It should be noted that the results of the analysis are sensitive to the estimated wage inflation component.

The results of the analysis are shown on the following two pages. Below age 23 the actual increases in pay are lower than projected by the present assumptions. The proposed assumption (green line) moves about half way from the current assumption to the actual experience. At age 23 and older the current and proposed assumptions are the same or only slightly different.

The proposed assumption will result in a slight decrease in computed liabilities and contributions.

Recommendation

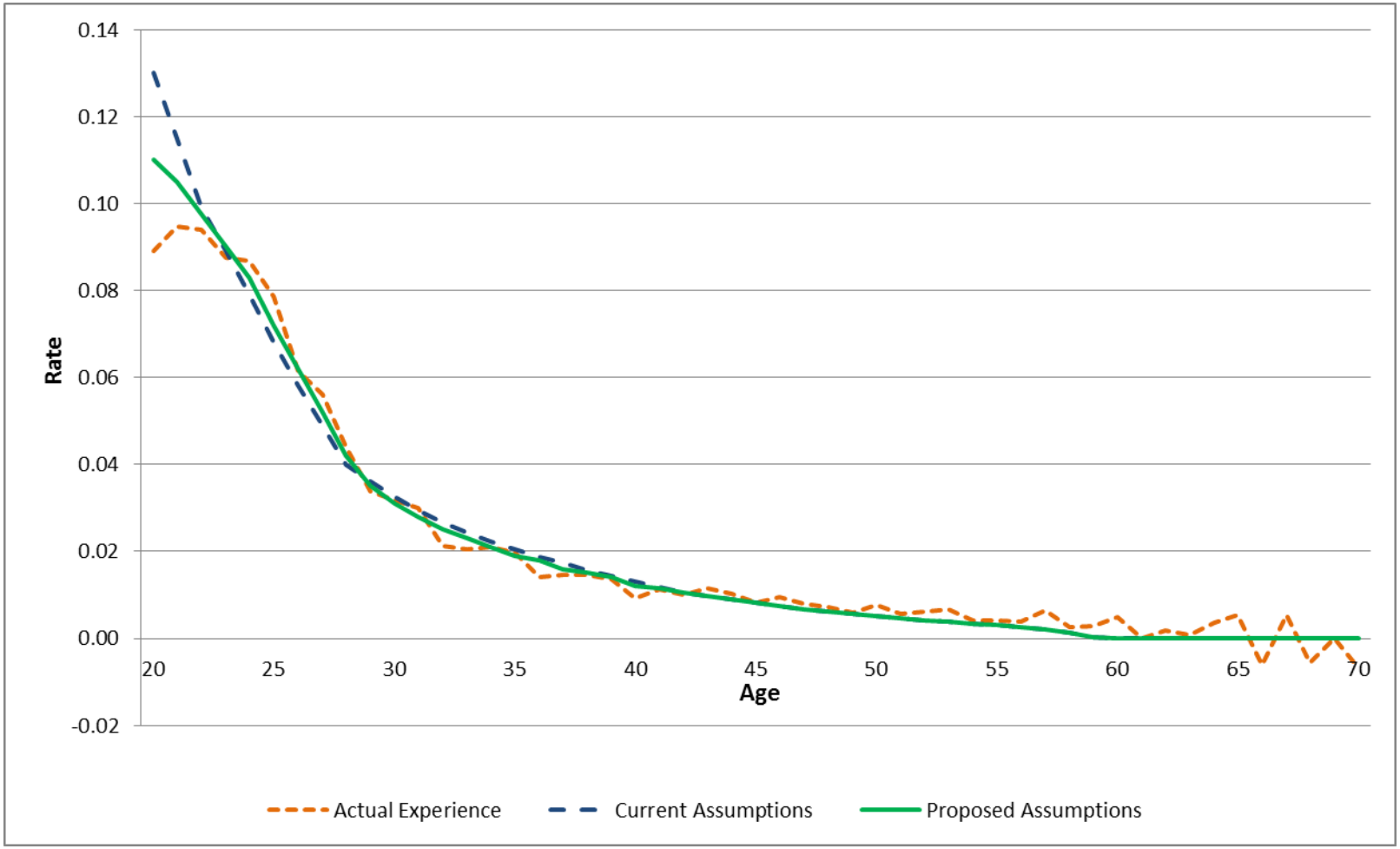
We recommend adoption of the proposed rates of pay increase due to merit and longevity shown on pages E-31 and E-32.

MERS
MERIT & LONGEVITY PAY INCREASES

Age	Sample Rates of Merit/Longevity Pay Increase *		
	Actual	Current Assumption	Proposed Assumption
Under 20	12.7%	13.00%	11.00%
20-24	9.4%	9.90%	9.75%
25-29	5.6%	4.90%	5.20%
30-34	2.1%	2.66%	2.50%
35-39	1.5%	1.73%	1.60%
40-44	1.0%	1.06%	1.06%
45-49	0.8%	0.67%	0.67%
50-54	0.6%	0.41%	0.41%
55-59	0.7%	0.20%	0.20%
60-64	0.2%	0.00%	0.00%
65 +	Varies	0.00%	0.00%

* Sample rates are taken from the midpoint of the age group.

MERS
MERIT & LONGEVITY PAY INCREASES



INCREASES IN FINAL AVERAGE COMPENSATION AT RETIREMENT

Background

The 1999-2003 experience study first confirmed that the final average compensations (FAC) of new retirees were often higher than expected, compared to the reported annual pays from previous years. The Retirement Board adopted new FAC Load assumptions to be first used for the December 31, 2010 annual actuarial valuations. These assumptions reflected an FAC Load of 0% to 4% for each municipality. The 2004-2008 experience study expanded the FAC Load assumption to 0% to 8% for each municipality (see Section K for the current FAC Load).

MERS staff provides FAC amounts for all new retirees, as part of the data for the annual valuations. For each new retiree in the 5-year experience period (2009-2013), we compared the actual FAC at retirement, upon which benefits were based, with the FAC projected from the previous year-end valuation's reported annual pays combined with the assumption for pay increases and the reported year-end FAC.

Note that we do not include in this analysis divisions that have adopted Benefit SLIF (Sick Leave in FAC), since those loads are developed individually for each division.

On average, the actual FAC's were about 3% higher than expected. The chart on page E-35 illustrates the distribution of the results. In the chart, 1.00 includes 1.000-1.025, 1.50 includes 1.025-1.075, etc.

Clearly, the actual FAC's are on average higher than projected by the actuarial assumptions. Some possible sources for this difference are:

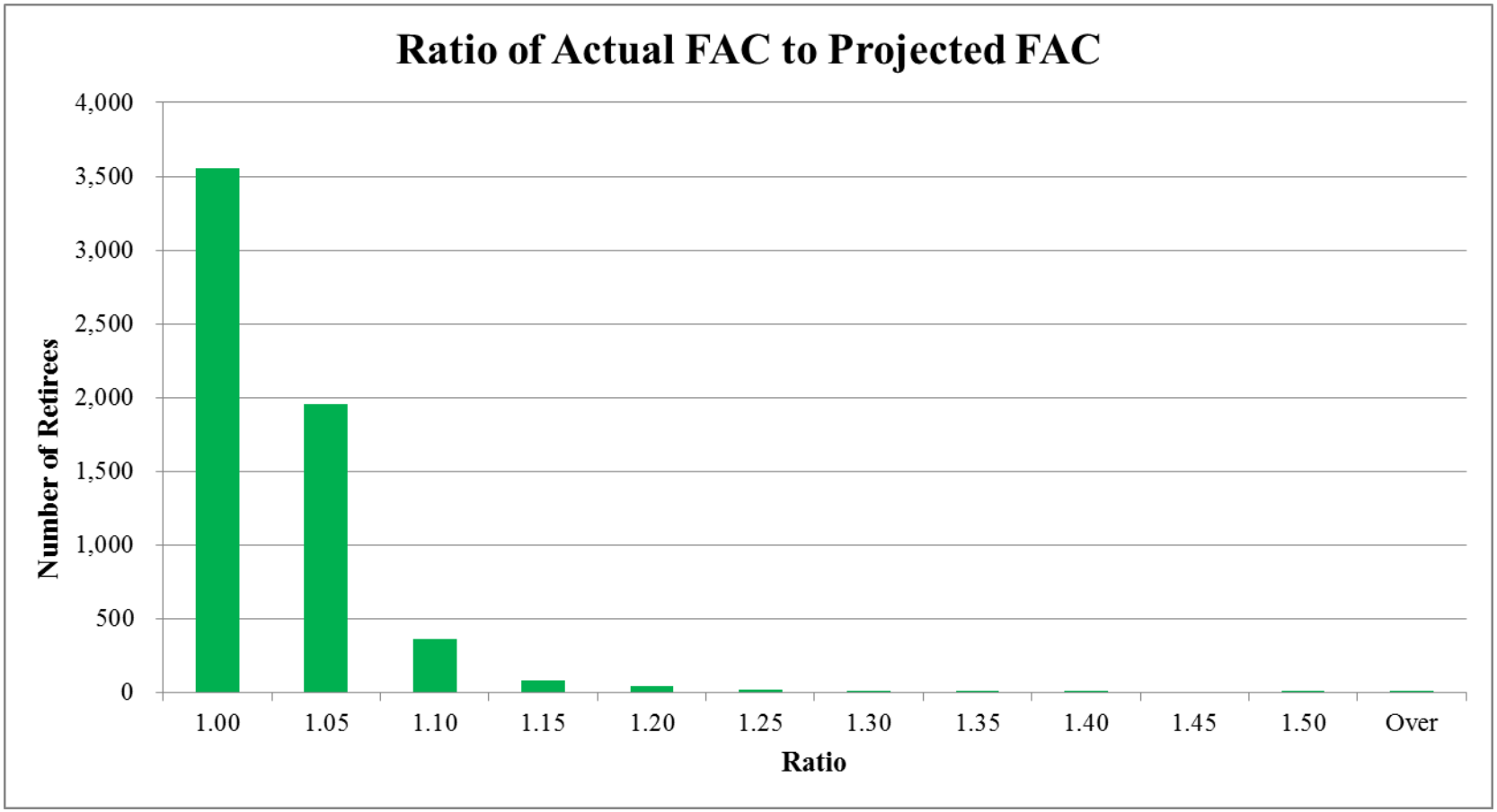
- Lump sum payments for unused paid time off. Unused sick leave payouts have been excluded from FAC since the mid-1970s. However, since that time it has become popular to combine sick and vacation time into paid time off, which is included in the FAC. Consequently, the lump sums that are includible in FAC have grown over the years.
- Extra overtime pay during the final year of employment. Our study only reflects any increase in overtime during the final year, not any increase that occurs during the full 3 to 5 year averaging period.

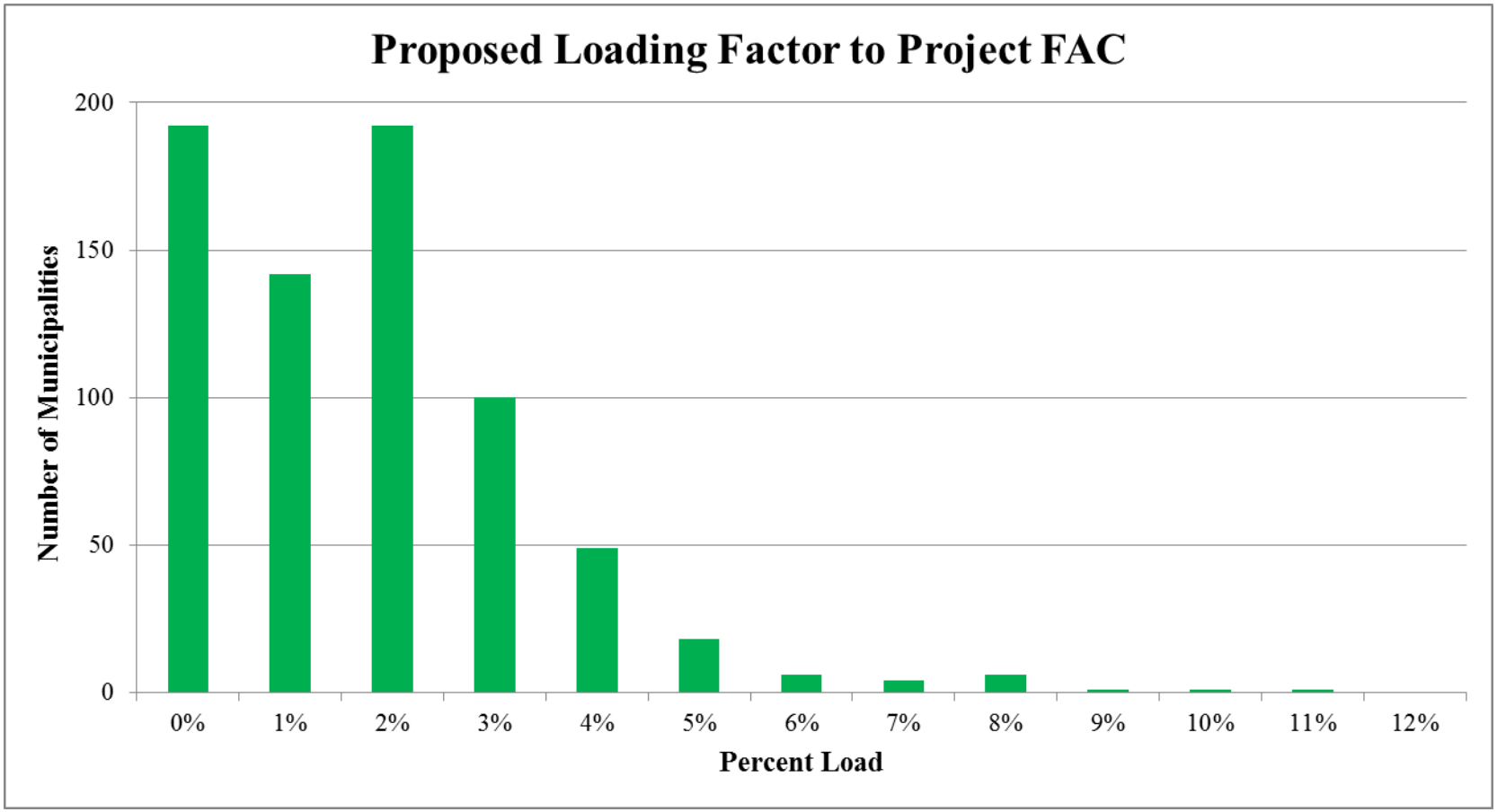
We analyzed the variation among municipalities. The amount of unexpected FAC increase continues to vary quite a bit between municipalities. Some municipalities show no sign of FAC Loading, while other municipalities show increases above the average increase. This is presumably the result of different personnel policies among municipalities. We suggest the continued use of an assumption that recognizes variations between municipalities. Note that a few municipalities include more than one distinct FAC Load factor among its divisions. This resulted from the transfer of divisions from one municipality to another.

For each municipality, we derived a preliminary proposed FAC Loading factor. Then we moved half-way from the current FAC Loading factor to the preliminary FAC Loading factor (in keeping with the usual approach of suggesting an assumption that is about half-way between the current assumption and the actual experience). Next, we limited the increase in the factor to 4% (2% if there was only one retiree during the 5-year period). This limited the factor to 12% at this time. We suggest that MERS staff further review municipalities identified with high FAC Loading. The distribution among municipalities of the proposed FAC Loading factor is displayed on page E-36.

Recommendation

We recommend that future actuarial valuations reflect a 0% to 12% increase in the final average compensation of future retirees, compared to the increases projected based on the pay increase assumption. The recommended FAC Loading factor for each municipality is listed in Section K.


Ratio of Actual FAC to Projected FAC
Number of Retirees
4,000
3,500
3,000
2,500
2,000
1,500
1,000
500
0
1.00
1.05
1.10
1.15
1.20
1.25
1.30
1.35
1.40
1.45
1.50
Over
Ratio


Proposed Loading Factor to Project FAC
Number of Municipalities
200
150
100
50
0
0%
1%
2%
3%
4%
5%
6%
7%
8%
9%
10%
11%
12%
Percent Load

FUTURE SERVICE ACCRUALS FOR ACTIVE EMPLOYEES

Background

Most, but not all, MERS active members work enough in a calendar year to earn a full year of credited service. The actuarial valuation is based on the assumption that every active member earns a full year of credited service each calendar year.

It is important to check periodically whether the current assumption accurately reflects the credited service actually being earned each year. If, for example, a large number of members earned less than a year of credited service on a regular basis, the actuarial assumption should be revised to reflect this.

Note that for a permanent part-time employee, the employee generally earns a full year of credited service each year, but has a lower final average compensation. For example a half-time employee normally consistently earns the same credited service as a full-time employee, but ends up with a final average compensation (FAC) that is half the FAC of the full-time employee --- and consequently a MERS benefit that is half as large. Also note that if a part-time employee converts to full-time employment, the current MERS policy allows the member's total credited service to be converted (to avoid an increase in past service benefits).

Persons earning less than a full year of credited service are likely to be seasonal or casual employees.

For each of the 5 years of the experience period, and for each person who was an active member at both the beginning and end of a given year, we tabulated the credited service earned during the year. If service increased by more than 1 year, we assumed it was a data correction or service purchase and used 1.0 years. If service decreased or did not increase, we assumed it was a data correction and excluded the person from the tabulations. Over the 5 years we found a total of 161,028 life years of experience.

The average amount of credited service earned in a calendar year was .988 years. As expected, there are very few active members (8,467 out of 161,028) earning under a year of credited service during a calendar year. Further, among those persons who do earn under a year of credited service, the average annualized MERS pay was lower than the average pay of all MERS active members during the period.

The current assumption assumes full year future service accruals for the casual employees earning under a year of credited service per year. However, annualized pays are projected for them (under the assumption they will become full time before retirement). This results in a conservative projection of their eventual retirement benefits. However, because of their very low numbers and lower pays, they contribute very little to overall liabilities.

Therefore, we believe that the current assumption does not result in a material overstatement of liabilities and employer contributions.

Recommendation

We recommend continuation of the current assumption that each active member earns a full year of credited service during each calendar year.

ASSUMPTIONS USED IN CALCULATING OPTIONAL FORMS OF PAYMENT

Background

As required by federal and state law, the calculation of retirement benefits must not reflect the gender (male or female) of the retiring member or the member's named beneficiary. Straight life benefits under MERS (Form of Payment SL) satisfy this requirement since the benefit amount is based only on the retiring member's final average compensation, credited service, and benefit program.

When a retiring member elects an optional form of payment (Forms of Payment II, IIA, III, or IV), the amount of the annual benefit is reduced during the retiree's lifetime, in order to pay for the potential benefits payable after the retiree's death. The benefit amount is computed actuarially, based on assumptions as to future investment income and future longevity (mortality) of the retiree and beneficiary. Thus, in order to comply with federal and state law, the mortality table used to compute optional forms of payment must not reflect the gender of the retiree or beneficiary.

MERS achieves this by using a unisex mortality table in the computation of optional forms of payment. In order to maintain overall cost neutrality, the unisex mortality table is designed to reflect the gender mix of the population of retirees electing the optional forms of payment.

The current gender mix was adopted effective January 1, 2011, based on the proportion of retirees who elected optional forms of payment during the 2004-2008 period. At that time around 70% of the retirees electing optional forms of payment were males. Consequently, MERS bases the optional benefit factors on a 70% male/30% female mix of the underlying male and female mortality tables. This assumption should be reviewed periodically.

We reviewed the actual elections of Optional Forms of Payment II, IIA, and III during the 5 years of the experience study (2009-2013). The results are shown below:

Form of Payment	Males	Females	Totals
II (100% Survivor)	1,553	552	2,105
IIA (75% Survivor)	442	200	642
III (50% Survivor)	464	394	858
	2,459	1,146	3,605

During the experience period the population of new retirees who elected joint and survivor payment forms was about 68% male and 32% female. A slightly larger percentage of this group was female, compared with 5 years ago. This continues the trend seen in the last experience study. However, since the change is small, and given the discussion that follows, we make no recommendation concerning changing the gender mix of the underlying tables at this time.

New Actuarial Assumptions

In this experience study report we recommend the adoption of a new mortality table for the actuarial valuations, one that projects longer future lifetimes. We also recommend the adoption of a lower investment return assumption for the actuarial valuations.

MERS has a history of usually using the same underlying mortality table and investment return assumptions for computing optional forms of benefit payment as the assumptions used for actuarial

valuations. However, this is not a requirement. Other public pension plans may or may not use consistent assumptions between the optional benefit calculations and the actuarial valuations. Some reasons to not maintain consistency include:

1. The mortality and interest assumptions used to compute optional forms of benefit payment are included in statute and are not easily changed. This does not apply to MERS.
2. The plan prefers to maintain stable optional benefit factors, even while the assumptions used for actuarial valuations change from time to time.
3. The longevity of new retirees who elect survivor benefit options may be different from the longevity of new retirees who elect life-only benefit payments.

At this time we suggest that the mortality and investment return assumptions used to compute optional forms of benefit payment at retirement remain unchanged. Using a new mortality table that projects longer lifetimes would slightly increase calculated benefit amounts under the optional forms of payment, compared to using the current mortality table. Using a lower investment return assumption would slightly decrease calculated benefit amounts under the optional forms of payment, compared to using the current investment return assumption. Combining both assumption changes would result in very little change to the calculated optional benefit amounts.

If MERS would prefer to update the optional benefit payment assumptions to be consistent with the actuarial valuation assumptions, we suggest first determining if the longevity of new retirees who elect survivor benefit options is substantially the same as the longevity of new retirees who elect life-only benefit payments.

Recommendation

We recommend that the investment return assumption and mortality assumption (including the gender mix) used to calculate actuarially equivalent benefits under optional forms of payment remain unchanged from the present assumptions.

MISCELLANEOUS AND TECHNICAL ASSUMPTIONS

Background

A number of miscellaneous and technical assumptions are used in the actuarial valuation. The proposed assumptions are listed on the following two pages. Five of the assumptions are discussed below, each involving proposed changes.

Loads for the Annuity Withdrawal Program

Annuity Withdrawal is now available to most MERS municipalities. Past practice has been to load the liabilities and normal costs by 3% when the Treasury Bill rate of interest is elected. This load was based on the assumption that the Treasury Bill rate would average around 4%, consistent with a present 3%-4% price inflation assumption. The recent unprecedented near-zero Treasury Bill rates have resulted in actuarial losses for employers that elected the Treasury Bill rate to calculate the benefits payable under the annuity withdrawal provision. Using a near-zero interest rate to compute the actuarial reduction for a retiree electing annuity withdrawal results in higher remaining lifetime benefits, compared to the actuarial reduction being based on the assumed 4% Treasury Bill rate. We will continue to review this issue, and expect to suggest an improved treatment of these cases in time for the December 31, 2015 annual actuarial valuation.

Maximum Compensation under Section 401(a)(17)

The maximum compensation will be projected to increase 3.75% annually, instead of the present 4.5% projected annual increase (to be consistent with the proposed wage inflation assumption).

Maximum Benefits under Section 415

The benefit maximums will be projected to increase 3.75% annually, instead of the present 4.5% projected annual increase (to be consistent with the proposed wage inflation assumption).

Member Contribution Interest

Interest credits on member contributions will be projected to be 3% annually, instead of the present 4% projected annual credit (to be consistent with the proposed price inflation assumption).

DROP+ Assumption

The current assumptions are based on similar benefit provisions in other retirement plans. Only 2 MERS divisions have adopted the DROP+ provision, so there is not enough experience within MERS to develop an assumption. We believe the current assumptions are reasonable.

Recommendation

We recommend use of the Miscellaneous and Technical Assumptions listed on pages E-41 and E-42.

MISCELLANEOUS AND TECHNICAL ASSUMPTIONS

Loads	- Vesting liabilities are increased by 2% to reflect the value of the potential survivor benefit payable in case of death during the benefit deferral period. For divisions with the Annuity Withdrawal provision, if the Treasury Bill rate of interest is used, the normal retirement and early retirement liabilities and normal costs are increased by 3%.
Marriage Assumptions	- 70% of males and 70% of females are assumed to be married for purposes of death-in-service benefits. Male spouses are assumed to be three years older than female spouses.
Pay Increase Timing	- Beginning of valuation year. This is equivalent to assuming that reported pays represent amounts paid to members during the year ended on the valuation date.
Pay Adjustment	- None.
Decrement Timing	- Decrements of all types are assumed to occur mid-year.
Eligibility Testing	- Eligibility for benefits is determined based upon the age nearest birthday and service nearest whole year on the date the decrement is assumed to occur.
Benefit Service	- Exact fractional service is used to determine the amount of benefit payable. Benefit service is the service used in the benefit formula.
Eligibility Service	- The larger of reported Eligibility Service and reported Vesting Service was used as eligibility service in the valuation. Eligibility service is the service used to meet the conditions for retirement, and is generally equal to or larger than benefit service.
Decrement Relativity	- Decrement rates are used directly from the experience study, without adjustment for multiple decrement table effects.
Decrement Operation	- Disability and withdrawal do not operate during retirement eligibility.
Normal Form of Payment	- Future retiring members are assumed to elect the Straight Life form of payment.
Incidence of Contributions	- Contributions are assumed to be received continuously throughout the year based upon the computed percent-of-payroll shown in this report, and the actual payroll payable at the time contributions are made. New entrant normal cost contributions are applied to the funding of new entrant benefits.

MISCELLANEOUS AND TECHNICAL ASSUMPTIONS (CONCLUDED)

Maximum Compensation	- The dollar compensation limits under Section 401(a)(17) of the Internal Revenue Code are projected to increase 3.75% annually. No member or employer contributions are projected to be made on the portion of any member's annual compensation in excess of the IRC Section 401(a)(17) limit for the year.
Maximum Benefit	- The dollar benefit limitations under Section 415 of the Internal Revenue Code are projected to increase 3.75% annually. Employee divisions 02, 20-29 (Police), 05 and 50-59 (Fire) are presumed eligible for the public safety benefit limits. No benefits in excess of the IRC Section 415 limits are projected to be paid, except as provided under the Qualified Excess Benefit Arrangement.
Member Contribution Interest	- The interest rate credited on member contributions is the one-year Treasury Bill rate as of December 1, determined annually. The long-term rate assumed in the valuation is 3%, which is consistent with the proposed 2.5% price inflation assumption.
DROP + Assumptions	- Each eligible member is assumed to make the DROP+ election with the most valuable combination of lump sum and reduced monthly benefit. The standard retirement probabilities are used for members who are not covered by Benefit Program DROP+. For members covered by Benefit Program DROP+, it is assumed that retirement will be delayed long enough to become eligible for at least 4 years' worth of DROP+ lump sum.

Section F

Asset Valuation Method

ASSET VALUATION METHOD

Background

Public employee retirement systems have historically used asset smoothing as a means of limiting contribution volatility by phasing in investment gains and losses over a fixed period of years. The asset smoothing used by MERS aids in developing a contribution rate calculated to remain level as a percent of future payroll.

The 10-year smoothed asset value currently in use was adopted by MERS for the December 31, 2005 valuation. Prior to that date, a 5-year smoothing period was used. Below is a short history of MERS' asset valuation method:

1. MERS traditionally used 5-year asset smoothing with no corridor (a corridor is a lower and upper limit to the ratio of the smoothed assets divided by the market value of assets).
2. After the market volatility of 2000-2002, MERS wanted:
   a. To increase the stability of the employer contribution rates.
   b. To hold back the recognition of anticipated future gains. The intent was to avoid large reductions in employer contribution requirements (like happened during the 1990's, leading to large numbers of collectively bargained benefit increases), and to build up some reserve that could later be used to strengthen the actuarial assumption for investment return (8%, adopted in 1981 and still in effect).
3. Effective December 31, 2005, MERS adopted 10-year asset smoothing, again with no corridor. MERS had seen what a (commonly used) 20% corridor would have done to the employer contribution requirements during the 2000-2002 down markets. MERS' ratio of smoothed value to market value had peaked at 1.26 as of December 31, 2002 and dropped quickly to 1.02 as of December 31, 2004. A 20% corridor would have significantly increased employer contribution requirements in the December 31, 2002 valuation, even though the contributions would have recovered within the next two years. MERS did not want that kind of volatility. The "no corridor" method had worked well in every market cycle to date.
4. It turned out that the anticipated future market gains were short-lived. After the market collapse in 2008, the 10 year smoothing substantially reduced the employer contribution requirement volatility. The market performance in 2009 and later years was very positive and reduced the asset ratio quickly from 1.39 to 1.25 as of December 31, 2009, and down to 1.06 as of December 31, 2013.
5. Of course, the actuarial reports all include comments about the financial markets. In particular, the funded ratio and computed employer contribution requirement based on the market value of assets is also reported, with the statement that if all of the 2008 losses are not made up, the employer contribution rates will have to increase.
6. Looking back to the market crisis, certainly there was no guarantee that the market drop would not continue downward, instead of recovering as had occurred with every other market cycle in recent history. MERS would likely have taken additional steps (to increase employer contributions and/or reduce benefits) if the asset ratio had increased beyond 1.39, or leveled out, instead of rapidly decreasing as it did. On the other hand, if that type of market had

occurred, MERS and the entire country would certainly have more important things to worry about than asset smoothing methods.

More recently, public pension plans have been criticized for the use of a smoothed value of assets, instead of using market value for all purposes. This criticism has often shown up in mainstream publications. MERS' use of 10-year asset smoothing with no corridor is not common among other public plans. In its white paper "Actuarial Funding Policies and Practices for Public Pension Plans" (October, 2014) the Conference of Consulting Actuaries Public Plans Community (CCA-PPC) suggests that this method is "Non-Recommended". CCA-PPC suggests that a 10-year asset smoothing method include a maximum 30% corridor (a 30% corridor requires the smoothed asset value to be 70% - 130% of market value). "No corridor" methods would be recommended only with smoothing periods of 5 years of less.

The essence of the discussion of asset smoothing methods is: How rapidly should employer contributions be increased (or decreased) as a result of lower (or higher) than projected market returns?

The Actuarial Standards Board's standard on asset valuation methods requires that the asset valuation method:

1. Bear a reasonable relationship to market value.
2. Be unbiased in relation to market value
3. Recognize gains and losses consistently and over a reasonable period.

Discussion Items

A. Change the Smoothing Period?

The longer the asset smoothing period, the greater the ability to limit contribution volatility. The current 10-year smoothing period did a good job of limiting the size of contribution increases due to the market losses that occurred in 2008. Anecdotal evidence, however, indicates some employers are dissatisfied with the perception that they are still "paying for" the 2008 market losses years later.

Should the length of the smoothing period correspond to the length of an average market cycle? If so, what is the expected future market cycle period?

Current actuarial practice is moving to shorter smoothing periods. The Model Practices for asset smoothing in the CCA-PPC white paper are; (i) a 3 to 5 year smoothing period with a 50%/150% of market value corridor, or (ii) a 7 year smoothing period with a 60%/140% market value corridor (comments on corridors follow below). The white paper defines Acceptable Practice in this area as either: (iii) 10 year smoothing with a 70%/130% corridor, or (iv) 5 year (or shorter) smoothing with no corridor.

B. Add a Corridor?

Actuarial standards require that a smoothed asset valuation method: "bear a reasonable relationship to the corresponding market value(s)". To satisfy this requirement many smoothed asset valuation methods provide for a corridor around the market value within which the smoothed value must lie.

While a corridor seems reasonable in theory, it tends to cause practical issues. The effect of "hitting the corridor" means immediate recognition of asset gains or losses outside of the corridor. This effectively cancels the contribution volatility dampening the asset smoothing method was designed to produce.

After the 2008 market meltdown we saw that many public plans with corridors simply widened them, to avoid the contribution increases that would otherwise be required. This gave rise to the phrase "A corridor is a corridor…until it isn't".

Our preference is to *not* include a corridor in the asset smoothing method.

C. Replace Smoothed Asset Value with Market Value?

Use of market value is discussed in Section H.

Recommendation

We recommend that beginning December 31, 2015 MERS use a 5-year (fixed period) smoothed asset value for the actuarial valuation's calculation of the required employer contributions, without a corridor.

We further recommend that the asset value as of December 31, 2015 be set equal to the asset value based on the prior 10-year asset smoothing method, with the then-existing difference between market value and smoothed asset value being spread over the following four years.

Advantages and disadvantages include:

1. Advantage: Acceptable Practice in the CCA-PPC white paper.
2. Advantage: 5-year asset smoothing has been commonly used by public plans.
3. Disadvantage compared to present policy: More volatile employer contribution requirements compared to 10-year smoothing.
4. Disadvantage compared to using market value: Less transparent. It is still "asset smoothing".

Other policies are **not** being recommended due to various reasons:

A. Asset smoothing periods in excess of 5 years are only Acceptable Practice in the CCA-PPC white paper if used in conjunction with a corridor. We are not in favor of corridors, as explained above.
B. Methods that use rolling smoothing periods, instead of fixed periods, never fully recognize past market gains or losses (similarly to rolling UAL amortization periods).
C. Asset smoothing periods in excess of 5 years are not commonly in use, and the current 10-year smoothing is rare.
D. Elimination of asset smoothing (using market value) is discussed in Section H.

Section G

Implementation Issues

IMPLEMENTATION ISSUES

Impacts of Recommended Assumption and Method Changes

Sections C, D, E, and F outline numerous recommended changes in:

1. Amortization periods.
2. Economic assumptions.
3. Non-Economic assumptions.
4. Asset valuation method.

The recommended assumption changes will result in higher computed employer contribution requirements for nearly all employers in the December 31, 2015 annual actuarial valuations (affecting fiscal years beginning in 2017). The two recommended changes with the largest impact on computed employer contribution requirements are the proposed 7.75% assumed rate of investment return and the proposed mortality table. Section K of this report shows the impact of the recommended assumption changes if the changes had been reflected in the December 31, 2013 annual actuarial valuations.

The changes in amortization periods (layered amortization periods) can first be effective for changes in unfunded accrued liabilities (UAL) in the December 31, 2015 annual valuations, or can be postponed to the December 31, 2016 or later valuations. As noted in Section F, the proposed change from 10-year to 5-year asset smoothing will only impact the December 31, 2016 and later annual actuarial valuations, as investments gains or losses occur.

Although we recommend that all of the proposed assumption changes in Sections D and E be adopted for the December 31, 2015 valuation, we also suggest that the impacts of the changes (on required contributions) could be phased in over a period of up to 5 years.

In order to determine the optimal combination of effective dates (for layered amortization) and a phase-in method, we chose sample employer divisions. For each sample division we estimated the employer contribution requirements that would appear in the December 31, 2015 through December 31, 2020 annual actuarial valuations – under various scenarios:

0. Present assumptions and methods, before recommended changes. Estimated contributions increase due to: a) continued recognition of the 2008 asset losses, b) the built-in 4.5% annual increase in amortization payments, and c) for closed divisions the impact of Option A or B amortization policy.
1. Proposed assumptions and methods, with layered amortization periods first applied to the December 31, 2015 annual valuation. The UAL resulting from the assumption changes would be amortized over 15 years (open divisions) or 10 years (closed divisions).
2. Proposed assumptions and methods, with layered amortization periods first applied to the December 31, 2016 annual valuation. The UAL resulting from the assumption changes would be amortized over 23 years (open divisions) or the current Option A/B period (closed divisions).
3. Proposed assumptions and methods, with layered amortization periods first applied on the later of: i) when the amortization period for pre-existing UAL declines to the layered amortization period, or ii) the December 31, 2016 annual valuation. The UAL resulting from the assumption changes would be amortized over 23 years (open divisions) or the current Option A/B period (closed divisions). The impact of layered amortization will be phased in over time.

After reviewing a variety of sample employer divisions, we recommend that Scenario 3 be chosen for the implementation of the assumption changes. For open divisions this spreads the new UAL over a 23-year period, instead of 15-years. For closed divisions this spreads the new UAL over the current Option A or B period, instead of 10 years. Although many of the Option A employers will be using a 4-year period in the December 31, 2015 valuation, an Option A employer may elect to change to Option B. By doing so, the 4-year amortization period would increase to 9 years.

The table below shows the estimated annual percentage increases in computed employer contributions for 7 sample divisions (A-G) based on present assumptions, and the estimated annual increases if the assumption changes are reflected (i.e. the estimated annual increases starting with the December 31, 2015 present assumption results).

			Estimated Increase in Employer Contribution Requirement					
		2013	**Starting with 12/31/2015 Present Assumptions Results**					**5-Year**
Division		**% Funded**	**12/31/2015**	**12/31/2016**	**12/31/2017**	**12/31/2018**	**12/31/2019**	**Increase [2]**
A	Present Assumptions	75%	0%	6%	6%	5%	5%	**24%**
	Proposed Assumptions							
	- Without 5-Year Phase-In	72%	7%	5%	5%	5%	5%	**29%**
	- With 5-Year Phase-In	72%	2%	7%	6%	6%	6%	**30%**
B	Present Assumptions	70%	0%	7%	7%	5%	5%	**26%**
	Proposed Assumptions [1]	67%	3%	8%	8%	8%	7%	**39%**
C	Present Assumptions	72%	0%	10%	11%	8%	10%	**45%**
	Proposed Assumptions [1]	69%	4%	11%	12%	13%	14%	**66%**
D	Present Assumptions	102%	0%	7%	7%	5%	5%	**24%**
	Proposed Assumptions [1]	96%	3%	8%	8%	7%	7%	**37%**
E	Present Assumptions	43%	0%	5%	6%	4%	4%	**20%**
	Proposed Assumptions [1]	41%	2%	7%	6%	6%	6%	**30%**
F	Present Assumptions	30%	0%	13%	15%	18%	23%	**89%**
	Proposed Assumptions [1]	29%	2%	14%	16%	18%	24%	**95%**
G	Present Assumptions	39%	0%	5%	5%	5%	5%	**21%**
	Proposed Assumptions [1]	37%	2%	6%	6%	6%	6%	**29%**

[1] With 5-year phase-in.

[2] Cumulative 5-year increase (4-year increase for present assumptions); Not the sum of the annual increases.

The sample employer divisions are described below:

A. Open division; Less than average impact of assumption changes.
B. Open division; More typical impact of assumption changes.
C. Newly closed division – Option A.
D. Open division; Overfunded in 2013, but not in 2015.
E. Closed division – Option B – Less well funded.
F. Closed division –Option A – Less well funded.
G. Open division – Less well funded.

For these sample employer divisions, the 5-year impact of the assumption changes varies from around a 6% increase to a 21% increase in contribution requirements, compared to the present assumptions. The 5-year phase-in substantially reduces the first year impact. However, as shown for division A, paying less up front results in having to pay a little more overall (about 1% more in this case).

Recommendation

We recommend that the layered amortization periods be first implemented on the later of: i) when the amortization period for pre-existing UAL declines to the layered amortization period, or ii) the December 31, 2016 annual valuation. The December 31, 2015 increases in UAL resulting from the assumption changes will then be amortized over the same period as the pre-existing UAL.

We further recommend that the impact of the assumption changes be phased-in over a five year period.

Section H

Funding Policy Issues For Future Consideration

Introduction

The first step in the preparation of this experience study was for MERS staff and the actuarial team to decide what the goals of MERS' funding policy should be. This led to in depth discussions about priorities, targets and other funding policy issues. As the study progressed, it became clear that MERS should discuss many of the issues with its sponsoring employers. This led to our partitioning the experience study into: i) traditional funding issues (e.g. amortization periods, assets smoothing), ii) actuarial assumptions, and iii) less traditional funding approaches.

This section starts out with the discussions that led to MERS' choice of funding policy goals. We then discuss several potential future changes in funding policy, consistent with the established funding policy goals:

1. Set the funding target at 130%.
2. Require payment of normal cost even after 100% funding status is reached.
3. Not allow for reductions in contribution rates until 100% funded.
4. Reduce the back-loading built into the scheduled amortization payments.
5. Phase-out the current Option A and Option B amortization schedules for closed divisions, as the amortization period for open divisions decreases in future years.
6. Use market value of assets combined with direct contribution smoothing, instead of smoothed market value.
7. Review generational mortality tables and their appropriateness for MERS (see page E-23).

MERS plans to continue the discussion of these items, and to gather input from employers.

The traditional funding policy issues, actuarial assumptions, and recommendations are discussed in Sections C, D, E, F, and G of this report.

FUNDING POLICY GOALS

Background

Traditionally, the primary goal of a public pension plan sponsor has been to fund retirement benefits with contributions that are stable as a percentage of payroll of the active members in the plan (level percent of payroll financing). The plan's time horizon was long, sources of funding (e.g. tax revenue) were assumed to be stable and the plan was in the accumulation phase; contributions to the plan exceeded benefit payout and the assets grew steadily.

As the plan matured, the plan sponsor successfully maintained this funding goal and, with the help of steady investment income, increased its funded condition (ratio of assets to accrued liability) year after year; with only temporary setbacks from short-term investment downturns.

This situation changed in the first decade of this century. First there was the asset decline of 2001-2002. Then, just as the markets were recovering (as they had in the past), the 2008 financial crisis hit the plan. The financial crisis was like none that most/all plans had experienced: a steep drop in assets at the same time the plan sponsor's revenues declined significantly (and stayed lower for a prolonged time) and this all happened just when the plan had begun paying out much more in benefits than it was receiving in contributions (i.e. maturity).

The strong equity markets have helped many plans strengthen their financial condition since 2008, but not all plans. Particularly hard-hit were the very mature plans with many more retirees than employees, and the resultant "negative cash flow" (benefit payout exceeding contribution income).

The public plan actuarial community has invested considerable resources in developing recommendations for funding policies for public pension plans (see: *Actuarial Funding Policies and Practices for Public Pension Plans*, by the Conference of Consulting Actuaries Public Plans Community; CCA-PPC). The Society of Actuaries commissioned the *Report of the Blue Ribbon Panel on Public Pension Plan Funding*. The Government Finance Officers Association (GFOA) published *Core Elements of a Funding Policy*, a best practices guide. Each of these recent publications are useful as a guide to the plan sponsor and actuary in selecting a funding policy.

There has been a decline in the financial condition of some public plans in recent years. This decline has caused interest among stakeholders in policies for strengthening plans. Many of the funding policy issues discussed in this report can help improve funding policy and the financial condition of public pension plans.

Funding Policy Goals

Michigan municipalities who have a Defined Benefit and/or Hybrid Plan are required by law to prefund the pension benefits. The Annual Actuarial Valuation determines the contributions necessary to prefund the benefits. The required contributions are calculated based on certain actuarial assumptions and methods recommended by the actuary and adopted by the Retirement Board. The assumptions and methods are necessary because the employer is setting aside money now to pay for benefits in the future. The duration of the benefit payouts, and for current active employees the benefit amounts, is unknown; thus the need for assumptions about these future events.

It is important to remember that the ultimate cost of the benefits will depend on what actually happens in the future (e.g. actual asset returns, actual retirement ages, actual participant lifetimes, etc.), *not* what is assumed to happen. Changing assumptions may make the present value of expected benefits

higher or lower than the liabilities calculated using the current assumption set, but this *will not change* the ultimate cost of the benefits.

A *funding policy* provides the framework for determining a series of contributions to the fund benefits. The funding policy includes a number of features, most notably:

- A funding method (e.g. Entry Age Normal), which allocates the value of the benefits between past service and future service
- A funding target (typically 100% funding of past service liabilities)
- An amortization policy, specifying how to pay off any unfunded past service liabilities (unfunded accrued liability, or UAL), and including specific amortization period(s) and payment amounts
- An asset smoothing method, intended to reduce contribution volatility arising from financial market volatility
- Other methods intended to reduce contribution volatility

Similar to changes in assumptions, changes in the funding policy cannot make the ultimate cost of the benefits "cheaper" or "more expensive". Changes in funding policy impact the pattern of contributions, not the ultimate cost of the benefits.

MERS' current funding policy developed over time and, as such, is found in both the plan document and various Board resolutions. A project to draft a comprehensive funding policy is scheduled in the near future.

Specific Goals

The principal goal of any rational funding policy is to develop a pattern of contributions that, when combined with current assets, is sufficient to pay benefits. Development of a funding policy should take into consideration the following goals (see the following page for additional discussion):

1. **Adequacy** – The funding policy should produce contributions that are expected to be sufficient to pay for benefits under a broad range of possible future events.
2. **Inter-Period Equity** – This covers both intergenerational equity and period-to-period equity:
    a. *Intergenerational equity* is the idea that the cost of the benefits earned by the current workforce should be paid by the current generation of taxpayers.
    b. *Period-to-period equity* is the concept of a consistent cost of benefits between generations of taxpayers.
3. **Contribution Stability** – Plan sponsors tend to prefer stable contribution requirements.
4. **Transparency/Accountability** – Ideally the funding policy should be easy to understand by all stakeholders.
5. **Governance** – Take into account the nature of public pension plans and their governance.

Several of these goals can be in conflict with each other. For example, contribution stability may not be possible if a plan amortizes financial gains and losses over the remaining working lifetime of its employees in order to achieve strict intergenerational equity. Asset value volatility may be smoothed over several years to achieve more contribution stability, but transparency is increased if market value is used instead of a smoothed value of assets.

Such conflicts notwithstanding, it was helpful to reach a consensus ranking the five goals before diving too deeply into the details of any funding policy. This provided a context when deciding on funding policy specifics.

Next, a few comments on each of the numbered goals:

Adequacy is difficult to measure prospectively. In theory, any funding policy is self-correcting: if it turns out that past contributions were too low (or too high), future contributions must be increased (or decreased). However, it may be impractical to require future contributions to be significantly higher than prior contributions, although it would be much easier to lower future contributions.

Inter-period equity is *currently* most often thought of as *intergenerational equity*: ensuring that the cost of the benefits earned by the current workforce is paid by the current generation of taxpayers. The goal of allocating the cost of benefits to the period during which the benefits are earned is generally well served by the current Entry Age Normal (EAN), level percent of pay funding method. The EAN method is designed to allocate the benefit over the working lifetime of the active member. However, intergenerational equity requires that the periods used to amortize unfunded accrued liabilities (UAL) be relatively short, comparable to the remaining working lifetime of today's active members, periods typically not exceeding 15 years. The use of long, rolling amortization periods is not consistent with intergenerational equity. Those amortization policies allow the UAL to grow, so that the next generation of taxpayers is still paying for the cost of pensions for the previous (now-retired) workforce. Note that in the past, public employee retirement plans commonly used long (and often rolling) amortization periods, which better serve the cause of *period-to-period equity*: ensuring a consistent contribution rate between generations of taxpayers.

Contribution stability: Asset volatility is one of the largest reasons that required contributions fluctuate from one year to the next. Somewhat paradoxically, the more mature or well-funded a plan is the greater the impact that asset swings will have on contribution requirements. In the wake of the 2008 financial crisis we saw plan sponsors being asked to make increasing contributions at exactly the time their revenues were decreasing. However, the desire for contribution stability should not drive policy to defer any necessary contribution increases to future generations.

Transparency means that ideally the funding policy should be easily understandable. Asset smoothing, the technique used by nearly all public plans to limit contribution volatility due to market swings, can be confusing to those unfamiliar with the concept. Public plans are often criticized for using smoothed asset values and other options are being discussed to make the funding policy more transparent. The elimination of asset smoothing would be aligned with the new GASB reporting requirements which use market value of assets.

Governance: The funding policy should ensure there is a continuing commitment from plan sponsors to properly fund the plan. The funding policy should also attempt to avoid the possibility that interested parties may attempt to use the funding policy to further their own interests or agendas.

MERS' Priorities

Every funding policy will address the goals of adequacy, equity, contribution stability, transparency and governance in different measures. Determining the relative weight of MERS' desire to attain each of these (sometimes conflicting) goals aided in producing a specific policy.

MERS determined that its priorities are:

1. Adequacy
2. Inter-Period Equity (in particular intergenerational equity), and Transparency
3. Contribution Stability, and Governance

As a future funding strategy, MERS and the actuarial team discussed how its funding policy should be amended so that employers will contribute enough to improve their funding levels over a shorter period of time, compared to the current funding policy.

MERS and the actuarial team also considered an additional funding goal: Can MERS design a funding policy that will result in improved funding levels over 3-5 year periods *under most circumstances* (the vagaries of the financial markets may prevent such improvement over every 3-5 year period)?

FUNDING TARGET

Background

MERS, like all retirement systems in our experience, has historically set a long term full funding target of 100% of actuarial accrued liabilities (AAL). Having assets equal to (or greater than) 100% of AAL means that past service liability is fully funded, and so there is no Unfunded Accrued Liability (UAL). Note – Being 100% funded does not mean that there are no employer contributions. As long as there are active members in the plan, and those active members accrue benefits, there is a Normal Cost that needs to be contributed (or offset by assets in excess of 100% funding – as described below).

When a municipality or division exceeds the 100% target, current funding policy amortizes the negative UAL (or "asset surplus") over a 10 year period, reducing the Normal Cost contribution otherwise payable. In certain situations, like the extended bull market in the late 1990's, negative UAL reached levels that allowed some municipalities to fully offset the Normal Cost contribution – resulting in no contribution requirements (aka "a contribution holiday"). (Note the phrase "asset surplus" is a misnomer. There are only "surplus" assets if money remains in the fund after all liabilities have been discharged).

Funding Targets

Looking back on recent history, the asset boom of the late 1990's, which caused many plans to become overfunded, was followed by significant market downturns in 2001-2002 and 2008. Hindsight suggests that allowing the normal cost to be reduced by overfunding credits may not have been the best strategy. Many employers who were contributing less than Normal Cost saw their contribution requirements quickly become Normal Cost plus a UAL amortization payment as assets were reduced by the bear markets. The contribution increases could be severe (doubling or more) in years where funded levels flipped from over 100% to below 100%.

Funded status is a measure of assets to liabilities *at a point in time*, and depends on market conditions on the measurement date. The better funded the plan, the more the plan's funded status is subject to market variance. For example, consider two plans, A and B, each with AAL of $100 at the end of a given year. Plan A has assets of $100 and Plan B has assets of $50, on December 30. On December 31 the market experiences a 3% asset loss. Plan A was 100% funded on December 30 and is 97% funded on December 31 (a 3% reduction). Plan B was 50% funded on December 30 and is 48.5% at the end of the year (only a 1.5% reduction). The well-funded plan experienced a 3% decrease in its funded percentage, while the poorly funded plan experienced only a 1.5% decrease in its funded percentage. The better funded the plan, the larger the change in funded percentage for a given percent asset gain or loss.

This example shows that reaching the 100% funding target may actually be the trigger for setting a new goal. Even if the plan reaches the 100% funding target, there is no guarantee the funded level will remain there. In fact, the funded level will vary from one year to the next, and it can vary quite a lot from one year to the next for a well-funded plan. There should be two objectives here: First let's get to 100% funding, next let's work to stay there. The balance of this subsection will focus on what happens once a plan attains a 100% funded ratio.

Funding Targets in Excess of 100%

The concept of funding adequacy has to be balanced against the realization that employers and employees do not have unlimited sources of revenue. In theory, a funding target of 100% would be

sufficient to pay all expected benefits, if the assumptions underlying the contribution calculations are realized. We suggest that contributions based on a funding target of 100% be considered a minimum amount for adequate funding, as is the case with current policy.

To the extent that a funding target greater than 100% improves the likelihood that full funding can be maintained during a market downturn, it can be considered to improve funding adequacy. What should such a target be? MERS' assets lost slightly more than 25% of their value during 2008. Should MERS' target be high enough to remain fully funded after another loss of this magnitude (e.g. 130%?) or should MERS' target be something less than that (120%? 125%?). The recommended target would be MERS-wide, not selected by each employer; however, each employer would decide the amount, if any, to contribute in excess of the minimum required contribution.

If a recommended funding target greater than 100% is the goal, we suggest it be included in the annual valuation reports in addition to the minimum contribution calculated using a funding target of 100%. We suggest making any higher target a goal, not a mandatory funding target.

If, for example, the recommended target is 130%, we would report the additional annual contribution (the amount above the calculated minimum) necessary to reach 130% funding in, say, 20 years.

Additional Contributions

MERS strongly recommends that employers contribute more than the required contributions. If an employer makes additional contributions, this immediately improves the funded status of the plan. But what does it do to future contributions?

Under current funding policy any additional contributions are treated as assets in the next annual actuarial valuation, reducing the UAL. This has the effect of lowering the future contributions otherwise payable by the amortized amount of the additional contribution (over 15 years under the proposed amortization policy, since "contribution gains" are generally treated the same as asset and demographic gains and losses). The additional contributions do not shorten the period of time until full funding is reached. Put another way, additional contributions do not make the plan fully funded any quicker (unless the additional amount is equal to or greater than the outstanding UAL). Instead they lower future contributions during the remaining years in the amortization period.

An alternate method of handling the additional contributions would be to set them aside in a notional reserve (some systems have called it the reserve for contingent events). The additional contributions would be included for purposes of determining the funded ratio, but would be excluded from the assets when determining contribution rates. In this way, future contributions otherwise payable would not be reduced, and the plan would reach full funding sooner, assuming the reserve was not used. The downside to this alternative is that separate tracking of this reserve is required.

Minimum Contributions Once 100% Funded

As noted above, current policy amortizes any assets in excess of AAL over 10 years, and uses the resulting payment to offset the Normal Cost contribution. This reduces the assets in excess of AAL, lowering the probability the plan will remain fully funded in an economic downturn or other unfavorable event.

The historical 10 year amortization period was likely chosen out of expediency, as well as then-effective accounting principles. Stakeholders saw that the plan was in "surplus" and wanted access to those funds via reduced contribution requirements. Thus, the period for amortizing excess assets ended up shorter than the period to amortize underfunded liabilities.

One possibility would be to lengthen the current 10 year amortization period. The CCA-PPC White Paper Model Practice recommends 30 year amortization of assets in excess of liabilities.

We suggest consideration of a simpler policy: Require employers to contribute at least the full Normal Cost annually until the recommended funding target (e.g. 130%) is reached. Once the funded ratio is in excess of the recommended target, the required contribution would be the Normal Cost less an amortization of the "surplus", and the minimum contribution level would be zero. In the December 31, 2013 annual valuations, 9 employers with active members are 130% or more funded and have no contribution requirement. Another 7 employers with active members are under 130% funded but have no contribution requirement. Another 78 employers with active members are over 100% funded, and have a non-zero contribution requirement that is less than Normal Cost.

A Word about Assumptions

One way to add conservativism into the funding policy would be to use assumptions that are expected to be met more likely than not (here, conservativism is defined as anything that would reduce the likelihood of increases in future scheduled contributions). For example, if we feel that the investment rate of return is likely to average 8% in the long run, we could assume a 7% investment rate of return for purposes of the contribution calculation.

We do not suggest this approach. We strongly suggest that liabilities be calculated using assumptions that reflect the Retirement Board's best estimate of future experience. This approach would provide an unbiased view of the funding requirements of the System. If conservative assumptions are used, Actuarial Standards of Practice require we disclose any assumptions which include a provision for adverse experience (i.e. conservatism).

If the goal is to build some conservatism into the funding of the MERS plan, it should be done through shorter amortization periods for positive UAL or quicker recognition of asset losses, not through the actuarial assumptions.

Possible Future Recommendations:

1. Minimum contributions will be based on a funding target of 100% of accrued liabilities.
2. The actuarial valuation will also indicate that MERS recommends a higher contribution, one that targets 130% funding over a 20 year period. This would be in addition to the alternate contribution amounts that will take the employer to 100% funding in 10 and 20 years, that are already shown in the annual valuation report.
3. For plans that are between 100% and 130% funded, the minimum contribution will be equal to the normal cost.
4. Until the employer reaches 100% funding, the minimum contribution requirement will not decrease from one valuation to the next, unless the employer has adopted less expensive benefit provisions.

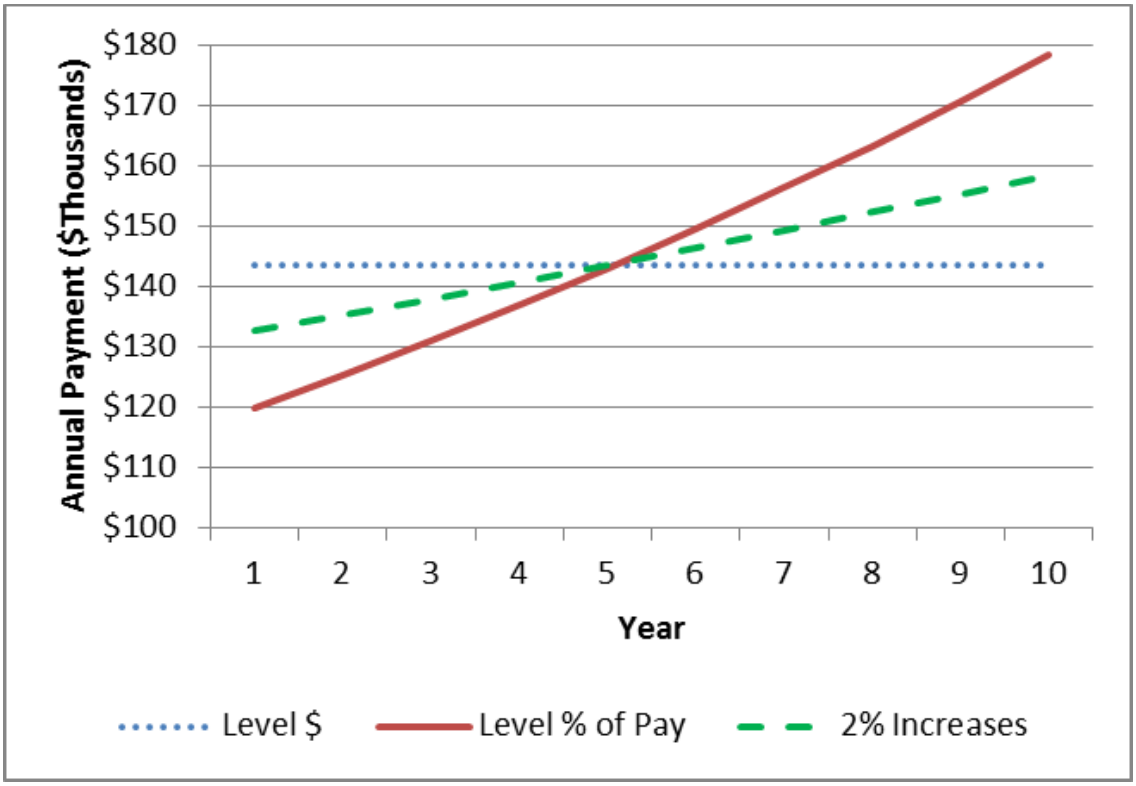
Rationale:

1. MERS would recommend that employers make contributions based on a funding target over 100%, but at this time it would only be a recommendation, not a requirement.
2. The optional 130% funding target would (if followed) eventually place the employer in an advantageous position – immune from normal financial market downturns. Lower targets would increase the chance of dropping from the target level to under 100% funded, resulting in substantial contribution requirement volatility.
3. Requiring a normal cost payment once the plan is 100% funded, until reaching 130% funding, helps attain the 130% target, although additional contributions or experience gains will be needed to attain the higher target. It also results in no change in required contributions if (for example) an employer that is 130% funded drops to 100% funded due to a financial market downturn. The employer would continue to pay normal cost, just as before the financial market downturn.
4. Not allowing the employer contribution to decrease until 100% funding is attained will accelerate the progress towards reaching 100% funding. Note that if the employer contributes more than the minimum contribution, this "no decrease until 100% funded" suggestion will *not* result in a lower contribution requirement the following year (see earlier discussion).

AMORTIZATION PAYMENT GROWTH

Like most public retirement systems, MERS has historically computed amortization payments to remain level as a percentage of (projected increasing) payroll. Historically this was done to align the cost of the retirement benefit with compensation, as an aid to the plan sponsor in budgeting. An alternative amortization procedure would be to calculate a constant, or level dollar, payment over the amortization period.

To illustrate the differences in payments, we prepared a chart of a 10 year amortization of $1,000,000 under both methods (using a 4.5% projected payroll growth rate and an 8% discount rate):



As seen above the level percent payments are "back-loaded", that is, they increase in nominal dollars over the period, but remain constant when adjusted for 4.5% projected wage inflation.

Level dollar amortization may be considered too conservative, but level percent of payroll amortization may be considered too back-loaded. A compromise between these two could be achieved by using increasing payments, but using an increase rate lower than the projected payroll growth rate (e.g. 2% per year as shown on the above chart).

The level dollar payments may be easier for stakeholders to relate to, as level dollar payments are the norm in most commercial transactions (e.g. home mortgage, car loan, etc.). However, the level dollar payments are larger than corresponding level percent payments early in the payoff period (almost 20% higher to start in the example above). Also, the goal of inter-period equity is better satisfied by level percent payments. For these reasons we would suggest an increasing payment amortization method.

Should the level percent payment be tied to projected wage growth, or something else (e.g. 2% per year increases)? Note that the Normal Cost rate under the current actuarial funding method is designed to increase at the rate of wage growth, so using a level percent payment rate other than the wage rate will result in the scheduled amortization payments growing at a different rate than normal cost.

Possible Future Recommendation

Use scheduled amortization payments that increase 2% annually, instead of the current method of level percent of pay amortization payments, (4.5% annually under current assumptions; 3.75% annually under proposed assumptions).

AMORTIZATION OPTIONS A AND B - SUNSET

Background

For closed divisions that are not linked to an open division, the amortization period is shortened in order to ensure adequate funding. The employer has two amortization options:

> Under Amortization Option A, the amortization period for positive unfunded liabilities is decreased annually by 2 years until the period reaches 5 or 6 years. Each year thereafter the amortization period decreases one year each valuation year.
>
> Under Amortization Option B, the amortization period is decreased annually by 2 years until the period reaches 15 or 16 years. Thereafter, the amortization period decreases one year each valuation year.

Possible Sunset

Keep in mind that the current Option A closed division amortization policy was adopted when the open division amortization policy was a rolling 30-year amortization period. That open division policy would not adequately fund a closed division. As the current amortization period for open divisions declines from 24 years to 15 years or less, there may no longer be a need for Option A or Option B closed division amortization policies. MERS could build that phase-out into the new proposed funding policy, or wait and later amend that policy to phase out the closed division funding policy.

Possible Future Recommendations

1. For newly closed divisions, eliminate the Option A amortization schedule. Now that the amortization period for open divisions is a closed 24-year period (not rolling at 20 years), the Option B amortization schedule will prove adequate for most closed divisions. Existing closed divisions using Option A currently have the alternative to change to Option B amortization. For example, a closed division with a 5-year amortization period under Option A (the shortest Option A period in the December, 31, 2014 annual actuarial valuations) could elect Option B, and immediately change to a 10-year amortization under Option B.
2. Effective for the December 31, 2018 and later annual valuations, for newly closed divisions eliminate the Option B amortization schedule. Once the amortization period for open divisions is a closed 20-year period (or shorter), there will no longer be a need for a more rapid amortization schedule for most closed divisions.

ASSET VALUATION METHOD

Background

As discussed in Section F, public employee retirement systems have historically used asset smoothing as a means of limiting contribution volatility by phasing in investment gains and losses over a fixed period of years. The asset smoothing used by MERS aids in developing a contribution rate calculated to remain level as a percent of future payroll.

In Section F we recommended that MERS change from the current 10-year asset smoothing method to a 5-year asset smoothing method.

More recently, public pension plans have been criticized for the use of a smoothed value of assets, instead of using market value for all purposes. This criticism has often shown up in mainstream publications.

The essence of the discussion of asset smoothing methods is: How rapidly should employer contributions be increased (or decreased) as a result of lower (or higher) than projected market returns?

The Actuarial Standards Board's standard on asset valuation methods requires that the asset valuation method:

1. Bear a reasonable relationship to market value.
2. Be unbiased in relation to market value
3. Recognize gains and losses consistently and over a reasonable period.

Discussion Items

A. Replace Smoothed Asset Value with Market Value?

Using the Market Value of assets in the actuarial valuation calculations would have the major advantage of increasing the transparency of the funding policy. This would align the assets used in the valuation with the assets disclosed in the sponsor's financial statements. It would, however, remove an important tool in limiting contribution volatility.

Using only Market Value will result in both the contribution requirement and the funded status fluctuating with market movements. For mature plans, like most of MERS, contribution volatility under this method would increase in relation to the funded status (i.e. the better funded the plan, the greater the impact of market changes on contribution requirements). Because of this, alternate procedures to dampen contribution volatility would need to be developed. For example, volatility could be controlled by setting limits on the rate of change in the contribution requirements from one year to the next (known as "direct contribution smoothing").

Few public plans currently employ the use of Market Value only. The Public Employee Retirement System of Idaho (PERSI) does use the Market Value of assets in their actuarial calculations. However, the contribution rates are set in advance by the Board (in consultation with their actuary) and annual valuations "back into" the amortization period required to reach full funding, based on the contribution rate in effect. CalPERS uses the Market Value of assets in their actuarial calculations, and builds a version of contribution smoothing into their amortization policy.

B. Use Direct Contribution Smoothing?

Direct contribution rate smoothing is a means of limiting contribution volatility, generally in lieu of using asset smoothing. GASB Statement No. 68 decouples funding policy from reporting/disclosure requirements. Employers will disclose their full unfunded accrued liability on their balance sheets, instead of the prior GASB 27 requirement to only disclose on the balance sheet the accumulated (over past years) difference between the full ARC (annual required contribution) and what the plan sponsor actually contributed. One effect of GASB 68 is that it opens up the possibility of replacing asset smoothing with direct contribution rate smoothing for funding purposes. Use market value of assets for determining unfunded accrued liabilities and employer contribution requirements. The resulting employer contribution rate is smoothed over a period of years in some manner, to reduce volatility. Transparency is likely improved because the same asset value (market value of assets) is used for both funding and accounting purposes. Direct rate smoothing may also require an additional calculation of a minimum required contribution, in order to meet the requirements of current Michigan law.

Methods of direct contribution smoothing include:

1. Compute the required employer contribution requirement, generally based on the market value of assets. Report this to the employer, but also provide a phased-in series of contributions over (for example) 5 years. The phase-in moves the contribution level gradually from the previously required contribution amount to the new valuation's computed contribution requirement. If contribution requirements are increasing, the final phased-in contribution amount will be somewhat higher than the new valuation's computed requirement (to make up for the phase-in). The opposite would be true if contribution requirements are decreasing.
2. Allow the employer, or the pension plan's governing board, to specify ahead of time the level of the required contribution. The actuarial valuation (based on any asset valuation method) would determine an amortization period (for unfunded accrued liability, UAL) that would result in the pre-specified contribution requirement. A number of large public plans used this method in the past, and sometimes ran into the situation of an infinite amortization period (in other words the specified employer contribution would result in insolvency). We would not be surprised if this contribution smoothing method eventually falls out of favor, if for no other reason than GASB 68 (blended discount rate issues).
3. Compute the required employer contribution requirement, based on any asset valuation method. Report this to the employer, but also limit the contribution change to a fixed amount. For example, allow the required contribution rate to increase or decrease no more than 2% of payroll in a single year, or allow the required contribution dollars to increase or decrease no more than 15%.

Under any of these contribution smoothing methods, it is important to treat increasing contribution patterns and decreasing contribution patterns in the same manner.

Possible Future Recommendations

Use market value of assets for the actuarial valuation's calculation of the required employer contributions. Use direct contribution smoothing to reduce contribution rate volatility. Advantages and disadvantages include:

1. Advantage: Acceptable Practice in the CCA-PPC white paper.
2. Advantage: High level of transparency.
3. Disadvantage: Direct contribution smoothing is not common at this time.
4. Disadvantage compared to present policy: Possibly more volatile employer contribution requirements.
5. Disadvantage: Higher administrative costs (due to required software changes, and generally more complexity).

Using market value combined with direct contribution smoothing can be designed to have similar (but not identical) contribution volatility as our recommendation to adopt 5-year asset smoothing (see Section F).

The table below shows the estimated annual percentage increases in computed employer contributions for 7 sample divisions (A-G) based on present assumptions, and the estimated annual increases if the assumption changes and market value are reflected (i.e. the estimated annual increases starting with the December 31, 2015 present assumption results). Comparing this table with the table on page G-2 illustrates the differences and similarities between 1) 5-year asset smoothing (page G-2) and 2) market value with 5-year direct contribution smoothing. Because no future gains/losses are projected, the 5-year cumulative increases are about the same, compared to the table on page G-2.

			Estimated Increase in Employer Contribution Requirement					
		2013	Starting with 12/31/2015 Present Assumptions Results					5-Year
Division		**% Funded**	**12/31/2015**	**12/31/2016**	**12/31/2017**	**12/31/2018**	**12/31/2019**	**Increase [2]**
A	Present Assumptions	75%	0%	6%	6%	5%	5%	**24%**
	Proposed Assum. / MV [1]	68%	3%	7%	6%	6%	6%	**31%**
B	Present Assumptions	70%	0%	7%	7%	5%	5%	**26%**
	Proposed Assum. / MV [1]	63%	4%	8%	8%	7%	7%	**40%**
C	Present Assumptions	72%	0%	10%	11%	8%	10%	**45%**
	Proposed Assum. / MV [1]	65%	5%	12%	12%	12%	13%	**66%**
D	Present Assumptions	102%	0%	7%	7%	5%	5%	**24%**
	Proposed Assum. / MV [1]	91%	4%	8%	8%	7%	7%	**38%**
E	Present Assumptions	43%	0%	5%	6%	4%	4%	**20%**
	Proposed Assum. / MV [1]	38%	3%	6%	6%	6%	6%	**31%**
F	Present Assumptions	30%	0%	13%	15%	18%	23%	**89%**
	Proposed Assum. / MV [1]	27%	2%	14%	16%	18%	24%	**96%**
G	Present Assumptions	39%	0%	5%	5%	5%	5%	**21%**
	Proposed Assum. / MV [1]	35%	3%	6%	6%	6%	6%	**30%**

[1] With 5-year phase-in (direct contribution smoothing).

[2] Cumulative 5-year increase (4-year increase for present assumptions); Not the sum of the annual increases.

DIRECT CONTRIBUTION SMOOTHING

Background

Public pension plans traditionally have relied on two features of their funding policy to reduce required contribution volatility from year to year:

1. Asset smoothing, so that large fluctuations in market value would be reflected in the actuarial valuations over a period of years (commonly 5 years, but other periods from 3-15 years have been used). This is the first level of volatility dampening.
2. The unfunded accrued liability (UAL) is then computed as the accrued liability less the smoothed value of assets, and the UAL is then amortized over a number of years, typically 20-30 years. This is the second level of volatility dampening.

In addition to these two volatility dampening measures, a few plans added a third feature:

3. "Contribution Collar": Provide that the required employer contribution rate (as a percentage of payroll) would not increase or decrease by more X%, or the required contribution dollars would not increase by more than Y%. Typically X% was 1% or 2% of payroll. Sometimes the percentage was not symmetrical for increases and decreases. For example the contribution rate would not increase by more than 2% nor decrease by more than 1%.

Or a fourth feature:

4. "Contribution Phase-In": Phase-in changes in the required employer contribution over a short period of years (preferably no longer than 5 years).

Both the Contribution Collar and the Contribution Phase-In are referred to as Direct Rate Smoothing or more generally Direct Contribution Smoothing.

Some plans have eliminated, or are considering eliminating, asset smoothing. The primary reason to do so is likely to significantly increase the transparency of the actuarial valuation process.

Many plans have shortened, or are considering shortening, the amortization periods for paying off their UAL. The primary reasons to do so are likely: i) to improve funded levels and adequacy, ii) eliminate "negative amortization" under which the UAL is allowed to increase in nominal dollars even while it is projected to decrease in value, and iii) emerging public plan actuarial practice.

If a plan eliminates asset smoothing, and also shortens its UAL amortization periods, the required employer contribution will become much more volatile, possibly too volatile for the employer. Some plans might consider a Contribution Collar or a Contribution Phase-In to limit the volatility.

Direct Contribution Smoothing

If MERS chooses to eliminate asset smoothing (i.e. set valuation assets equal market value of assets), MERS' actuarial team has suggested using direct contribution smoothing. This would still result in two levels of volatility reduction: amortization of the UAL and contribution smoothing.

We believe that the combination of the UAL amortization and direct contribution smoothing can have an impact on volatility reduction similar to the more common combination of asset smoothing and UAL amortization.

If MERS chooses to eliminate asset smoothing, we suggest consideration of the following approach:

1. Compute the total employer contribution requirement (normal cost, plus amortization payment) based on the market value of assets, and the proposed (shorter) layered amortization schedules (see previous subsections for more details on the amortization schedules).
2. The resulting total employer contribution is MERS' recommended employer contribution.
3. Either:
    a. Allow the employer to elect to Phase-In to the recommended employer contribution level over a period of 5 years. The Phase-In contribution will become the minimum required contribution for the coming fiscal year. Because of the phase-in, the ultimate contribution level will be somewhat higher than the recommended employer contribution (if required contributions are increasing; and vice-versa).
    b. Implement a Contribution Collar, so that the minimum required employer contribution for the coming fiscal year will be the previously established contribution for that year (from the previous annual valuation) plus the maximum increase under the Contribution Collar (e.g. 2% of payroll maximum increase). If the collar limits the contribution, the ultimate contribution level will be somewhat higher than the recommended employer contribution (if required contributions are increasing; and vice-versa).
4. Note that in no case may the employer contribution be smaller than normal cost, plus a 30-year level-percent-of-payroll amortization of the UAL (State law: 38.1140m).
5. Do not allowing employer contribution reductions unless the employer is fully funded (unless benefit provisions are reduced).
6. The direct contribution smoothing should apply to the total employer contribution (normal cost plus amortization payment).

Changes in normal cost or UAL associated with benefit provision changes would not be eligible for direct contribution smoothing. However, changes in normal cost and UAL associated with assumption/method changes and actuarial gains/losses (both investment and demographic gains/losses) would be eligible for direct contribution smoothing.

Note: The CCA-PPC white paper briefly discusses direct contribution smoothing (both the contribution collar and the contribution phase-in approaches), but only when used in conjunction with asset smoothing. The CCA-PPC may publish a separate white paper to fully explore the subject. Thus there is currently no widely accepted practice established for the use of direct contribution smoothing. However, we believe both of the two above approaches are reasonable.

A Hypothetical Example

The following charts illustrate how this would work in the December 31, 2015 annual actuarial valuation for a hypothetical division. Assume that the December 31, *2014* valuation *projects* the employer contribution requirement for the fiscal year beginning July 1, 2017 to be $1,000,000:

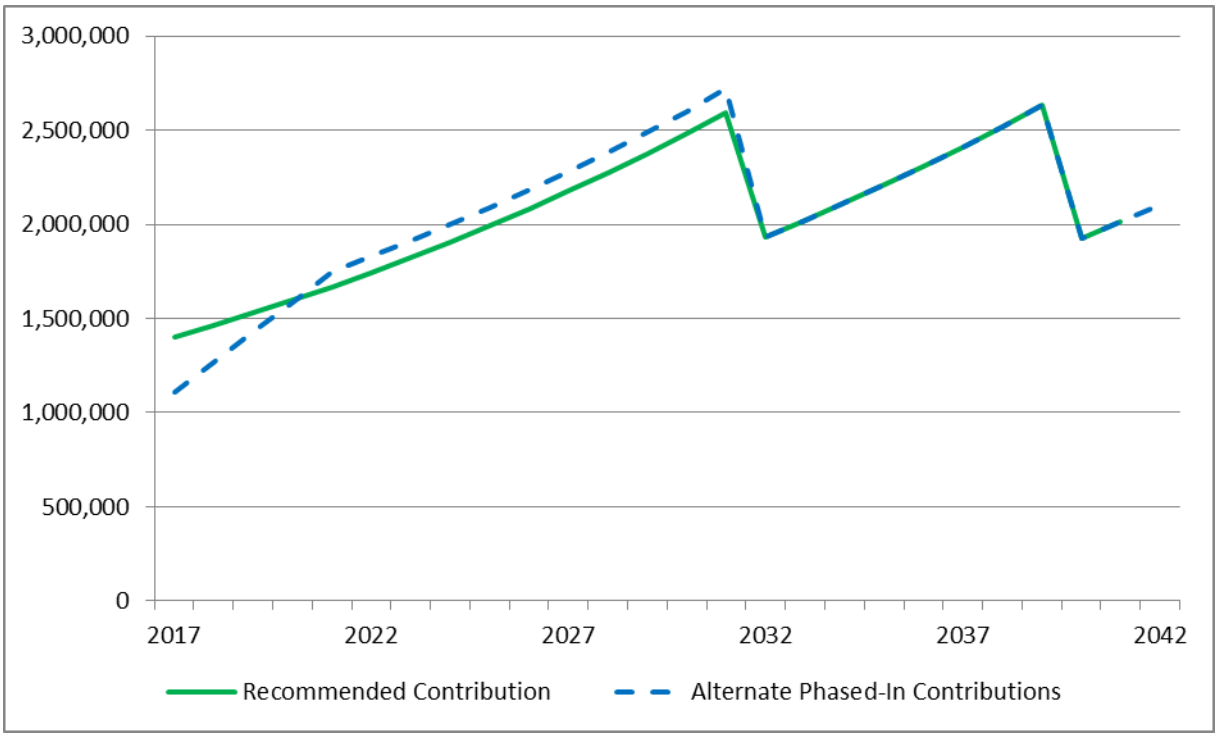
Normal Cost:	$700,000
Amortization Payment (23 Years)	$300,000
Total	$1,000,000

Payment amounts are scheduled to increase 4.5% annually. There were no benefit provision changes affecting the 2015 annual valuation. There were no assumption changes, but there were actuarial losses (amortized over 15 years). The 2015 valuation's computed contribution for the fiscal year beginning July 1, 2017 turned out to be $1,400,000 (instead of the earlier projection of $1,000,000 from the 2014 valuation):

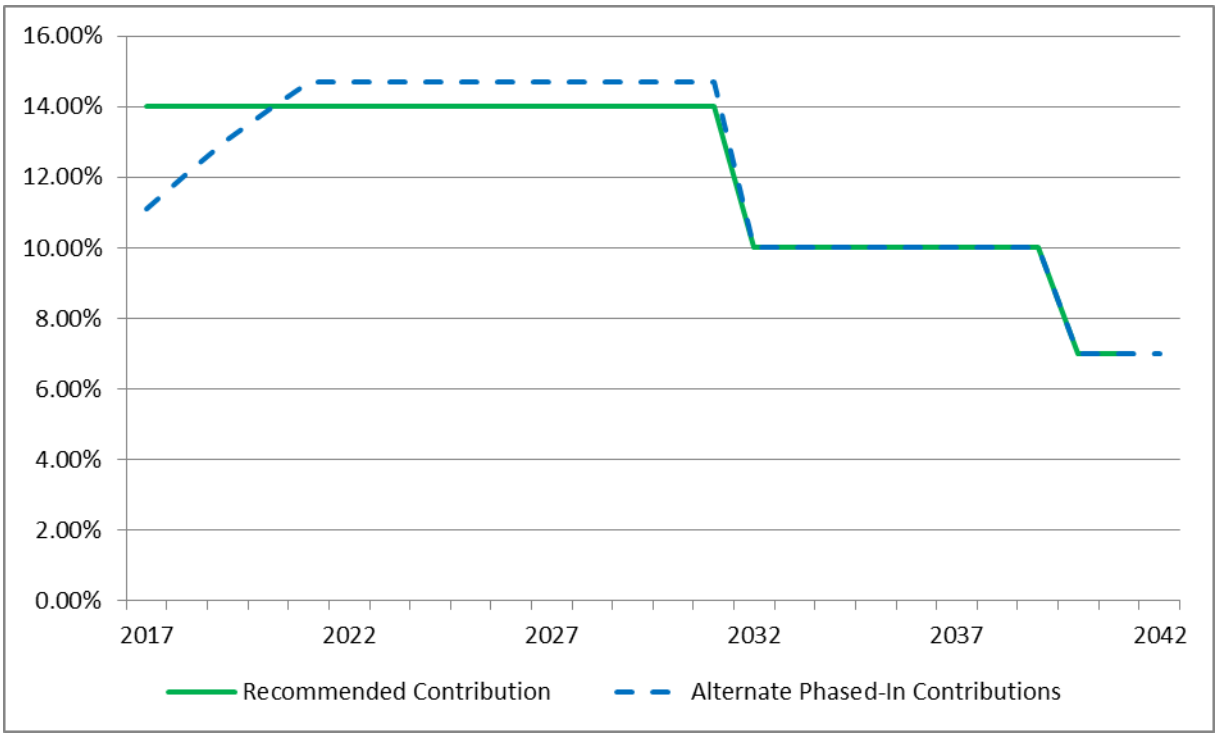
Normal Cost:	$700,000
Amortization Payment (23 Years)	$300,000
Amortization Payment (15 Years)	$400,000
Total	$1,400,000

MERS would recommend that the employer contribute $1,400,000 for the fiscal year beginning July 1, 2017. However, the employer would have the option of gradually increasing their contributions to that higher contribution level using Direct Contribution Smoothing (either the Phase-In or Collar approach), with the understanding that the ultimate contribution requirement would be somewhat higher. Pay less now, pay more later.

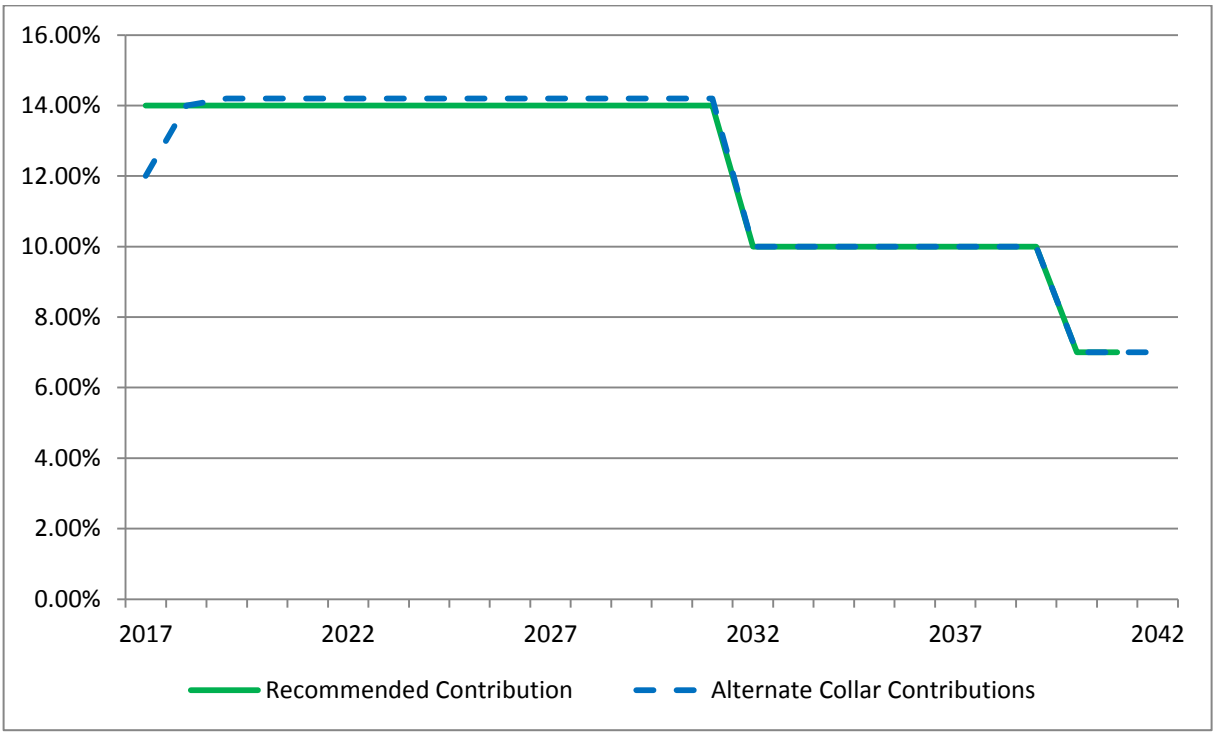
The following chart compares the recommended contribution pattern (in dollars), with the **5-year Phase-In** contribution pattern.



The chart below expresses the same **5-year Phase-In** results as a percentage of projected active member payroll.



The chart below shows the same example, but using a 2% of payroll **Contribution Collar**.



Comment

One issue for discussion is whether there should be complete symmetry between the treatment of contribution increases and contribution decreases. Generally, such symmetry is recommended (the CCA-PPC white paper recommends this symmetry).

If MERS allows employers *the option* to either: i) Phase-In (or Collar) contribution requirement increases, or ii) pay the full computed employer contribution requirement increase, what should MERS do about required contribution decreases? Some employers will choose to Phase-In (or Collar) increases and immediately take advantage of decreases.

One solution would be to require employers to elect: a) Phase-In (or Collar) for all future increases and decreases, or b) no Phase-In (or Collar). Another solution would be to automatically implement Phase-In (or Collar) for all employers. Then employers may choose to contribute more via the existing Additional Employer Contributions policy. Another solution would be to ignore symmetry and allow the Direct Contribution Smoothing to apply only to contribution increases. That is, do not allow the contribution to decrease until full funding is attained.

Possible Future Recommendations

Recommend the following for open and closed divisions within open employers:

1. **If MERS chooses to continue to use asset smoothing**, direct contribution smoothing is not needed.
2. **If MERS chooses to eliminate asset smoothing**, implement direct contribution smoothing of the total required employer contribution, either:
    a. Phase-In to the recommended employer contribution level over a period of 5 years, or
    b. Implement a Contribution Collar, so that the minimum required employer contribution for the coming fiscal year will be the previously established contribution for that year (from the previous annual valuation) plus the maximum increase under the Contribution Collar.
    c. In either case, the employer contribution would not decrease until 100% funding is reached, unless benefit provisions are reduced.

Section I

New Assumption Listing

ACTUARIAL ASSUMPTIONS
BASED ON 2009-2013 EXPERIENCE STUDY

NORMAL RETIREMENT PATTERN

Replacement Index	% Retiring	Replacement Index	% Retiring
0	5.0%	51	21.0%
1	5.0%	52	21.0%
2	5.0%	53	21.0%
3	6.0%	54	21.0%
4	7.0%	55	21.0%
5	8.0%	56	21.0%
6	9.0%	57	22.0%
7	10.0%	58	22.0%
8	11.0%	59	23.0%
9	11.0%	60	24.0%
10	12.0%	61	24.0%
11	13.0%	62	24.0%
12	15.0%	63	24.0%
13	15.0%	64	24.0%
14	15.0%	65	24.0%
15	16.0%	66	24.0%
16	17.0%	67	24.0%
17	18.0%	68	25.0%
18	18.0%	69	25.0%
19	19.0%	70	25.0%
20	19.0%	71	25.0%
21	19.5%	72	26.0%
22	19.5%	73	27.0%
23	19.5%	74	27.0%
24	19.5%	75	28.0%
25	19.5%	76	29.0%
26	19.5%	77	30.0%
27	19.5%	78	31.0%
28	19.5%	79	32.0%
29	19.5%	80	33.0%
30	19.5%	81	33.0%
31	19.5%	82	33.0%
32	19.5%	83	34.0%
33	19.5%	84	35.0%
34	19.5%	85	36.0%
35	19.5%	86	37.0%
36	19.5%	87	38.0%
37	19.5%	88	39.0%
38	20.0%	89	40.0%
39	20.0%	90	41.0%
40	20.0%	91	42.0%
41	20.0%	92	43.0%
42	20.0%	93	44.0%
43	20.5%	94	45.0%
44	20.5%	95	46.0%
45	21.0%	96	47.0%
46	21.0%	97	48.0%
47	21.0%	98	49.0%
48	21.0%	99	50.0%
49	21.0%	100+	50.0%
50	21.0%		

ACTUARIAL ASSUMPTIONS
BASED ON 2009-2013 EXPERIENCE STUDY

EARLY RETIREMENT PATTERN

Age	% Retiring
50	2.00%
51	2.00%
52	3.30%
53	3.80%
54	5.60%
55	4.30%
56	4.20%
57	4.10%
58	5.00%
59	6.20%

ACTUARIAL ASSUMPTIONS
BASED ON 2009-2013 EXPERIENCE STUDY

WITHDRAWAL RATES

Service	Rate
0	0.1960
1	0.1630
2	0.1330
3	0.1050
4	0.0860
5	0.0690
6	0.0600
7	0.0550
8	0.0500
9	0.0480
10	0.0460
11	0.0440
12	0.0400
13	0.0380
14	0.0360
15	0.0340
16	0.0330
17	0.0310
18	0.0290
19	0.0270
20	0.0260
21	0.0250
22	0.0240
23	0.0235
24	0.0230
25	0.0220
26	0.0220
27	0.0220
28	0.0220
29	0.0220
30	0.0220
31	0.0220
32	0.0220
33	0.0220
34	0.0220
35+	0.0220

ACTUARIAL ASSUMPTIONS
BASED ON 2009-2013 EXPERIENCE STUDY

DISABILITY RATES

Age	Rate
20	0.0002
21	0.0002
22	0.0002
23	0.0002
24	0.0002
25	0.0002
26	0.0002
27	0.0002
28	0.0002
29	0.0002
30	0.0002
31	0.0003
32	0.0004
33	0.0004
34	0.0004
35	0.0005
36	0.0006
37	0.0007
38	0.0008
39	0.0008
40	0.0008
41	0.0010
42	0.0013
43	0.0016
44	0.0018
45	0.0020
46	0.0021
47	0.0022
48	0.0025
49	0.0027
50	0.0029
51	0.0031
52	0.0033
53	0.0036
54	0.0037
55	0.0038
56	0.0039
57	0.0039
58	0.0039
59	0.0039
60	0.0039

ACTUARIAL ASSUMPTIONS
BASED ON 2009-2013 EXPERIENCE STUDY

HEALTHY POST RETIREMENT MORTALITY RATES

Age	Rate	Age	Rate	Age	Rate
20	0.000284	54	0.003380	88	0.101757
21	0.000306	55	0.003706	89	0.113958
22	0.000325	56	0.004058	90	0.127593
23	0.000338	57	0.004441	91	0.142310
24	0.000343	58	0.004859	92	0.157879
25	0.000329	59	0.005321	93	0.174169
26	0.000321	60	0.005833	94	0.191124
27	0.000318	61	0.006403	95	0.208737
28	0.000320	62	0.007037	96	0.227030
29	0.000326	63	0.007743	97	0.246028
30	0.000335	64	0.008529	98	0.265735
31	0.000347	65	0.009405	99	0.286110
32	0.000361	66	0.010378	100	0.307044
33	0.000375	67	0.011465	101	0.328338
34	0.000390	68	0.012681	102	0.349673
35	0.000405	69	0.014040	103	0.370873
36	0.000418	70	0.015560	104	0.391762
37	0.000435	71	0.017080	105	0.412180
38	0.000455	72	0.018772	106	0.431973
39	0.000480	73	0.020652	107	0.451015
40	0.000512	74	0.022744	108	0.469195
41	0.000552	75	0.025076	109	0.486429
42	0.000601	76	0.027681	110	0.502655
43	0.000661	77	0.030602	111	0.513767
44	0.000733	78	0.033887	112	0.521397
45	0.000815	79	0.037589	113	0.525000
46	0.000910	80	0.041772	114	0.525000
47	0.001016	81	0.046503	115	0.525000
48	0.001132	82	0.051855	116	0.525000
49	0.001258	83	0.057909	117	0.525000
50	0.002271	84	0.064744	118	0.525000
51	0.002523	85	0.072451	119	0.525000
52	0.002790	86	0.081120	120	1.000000
53	0.003075	87	0.090851		

ACTUARIAL ASSUMPTIONS
BASED ON 2009-2013 EXPERIENCE STUDY

DISABLED POST RETIREMENT MORTALITY RATES

Age	Rate	Age	Rate	Age	Rate
20	0.004671	54	0.018392	88	0.129803
21	0.005047	55	0.018924	89	0.140827
22	0.005389	56	0.019456	90	0.152829
23	0.005600	57	0.019998	91	0.165442
24	0.005682	58	0.020561	92	0.178643
25	0.005430	59	0.021158	93	0.192407
26	0.005278	60	0.021802	94	0.206709
27	0.005220	61	0.022509	95	0.221525
28	0.005238	62	0.023293	96	0.236830
29	0.005324	63	0.024171	97	0.252600
30	0.005459	64	0.025159	98	0.268810
31	0.005645	65	0.026273	99	0.285436
32	0.005857	66	0.027529	100	0.302453
33	0.006085	67	0.028942	101	0.319837
34	0.006321	68	0.030528	102	0.337564
35	0.006549	69	0.032301	103	0.355608
36	0.006759	70	0.034275	104	0.373946
37	0.007015	71	0.036464	105	0.392552
38	0.007326	72	0.038881	106	0.411403
39	0.007724	73	0.041542	107	0.429538
40	0.008226	74	0.044464	108	0.446852
41	0.008857	75	0.047666	109	0.463266
42	0.009633	76	0.051174	110	0.478719
43	0.010587	77	0.055012	111	0.489302
44	0.011726	78	0.059211	112	0.496569
45	0.013044	79	0.063804	113	0.500000
46	0.013688	80	0.068826	114	0.500000
47	0.014322	81	0.074318	115	0.500000
48	0.014944	82	0.080321	116	0.500000
49	0.015555	83	0.086881	117	0.500000
50	0.016151	84	0.094044	118	0.500000
51	0.016733	85	0.101862	119	0.500000
52	0.017300	86	0.110388	120	1.000000
53	0.017852	87	0.119680		

ACTUARIAL ASSUMPTIONS
BASED ON 2009-2013 EXPERIENCE STUDY

AGE-BASED MERIT/LONGEVITY PAY INCREASES

Age	% Increase
20	11.00%
21	10.50%
22	9.75%
23	9.00%
24	8.30%
25	7.20%
26	6.20%
27	5.20%
28	4.20%
29	3.50%
30	3.10%
31	2.80%
32	2.50%
33	2.30%
34	2.10%
35	1.90%
36	1.80%
37	1.60%
38	1.50%
39	1.40%
40	1.20%
41	1.15%
42	1.06%
43	0.97%
44	0.89%
45	0.81%
46	0.74%
47	0.67%
48	0.62%
49	0.57%
50	0.52%
51	0.47%
52	0.41%
53	0.38%
54	0.34%
55	0.30%
56	0.26%
57	0.20%
58	0.12%
59	0.03%
60+	0.00%

Section J

Glossary

GLOSSARY

The following glossary is intended to provide definitions of a number of terms which are used throughout this report and which are somewhat unique to the discussion of an Experience Study.

Actual Decrement. The actual number of decrements which occurred during the study. This number is a straight tabulation of the actual number of occurrences of the particular decrement in question. Normally, the actual number of decrements will be subdivided by age and/or service.

Crude Rate of Decrement. The rate of decrement determined by dividing the actual number of the respective decrement for that age (or service) by the corresponding exposure for that age (and service). The rate is described as a crude rate because no smoothing or elimination of statistical fluctuations has been made. It is indicative of the underlying true rate of the decrement and is the basis used in graduation to obtain the graduated or tabular rate.

Decrements. The decrements are the means by which a member ceases to be a member. For active members, the decrements are death, withdrawal, service retirement, and disability retirement. For retired members, the only decrement is death. The purpose of the Experience Study is to determine the underlying rates of each decrement.

Expected Decrement. This is the number of occurrences of a given decrement expected to occur for a given age (or service) based on the number of lives exposed to the risk of the particular decrement and the current assumed rate for that decrement. It may also be referred to as the tabular number of decrements. It is the number of deaths, withdrawals, retirements, or disabilities (whichever is applicable) that would have actually occurred had the actuarial assumptions been exactly realized.

Exposure. The number of lives exposed to a given risk of decrement for a particular age (or service). It represents the number of members who could have potentially died, retired, become disabled, or withdrawn at that particular age (or service). This term will also be described as "the number exposed to a given risk."

Graduated Rates. Graduation is the process by which a set of crude rates of a particular type is translated into final rates. The graduation process attempts to smooth out statistical fluctuations and to arrive at a set of rates that adequately fit the underlying actual experience of the crude rates that are being smoothed. The graduation process involves smoothing the results, but at the same time trying to fit the results to be consistent with the original data. It requires that the actuary exercise his or her judgment in what the underlying shape of the risk curve should look like.

Merit and Longevity Pay Increase Rate. The portion of the total pay scale which varies by age and/or service. It reflects the impact of moving up the pay grid in a given year, rather than the increase in the overall grid. It includes the pay increase associated with promotions during the year.

Final (Tabular) Rates. The tabular rate of decrement or salary increase is the rate determined by the graduation process. It is the expected rate of change as opposed to the crude rate of change. It is deemed to be the underlying rate applicable to the decrement or to the rate of pay increase. In the first phase of the study, the actual results are compared to the expected results based on the tabular rates developed by the previous study. The second phase of the study determines the new tabular rates based on the crude rates. The final phase of the study compares the actual decrement to the expected decrement based on the new tabular rates.

Wage Inflation. The general rate of increase in pays during a year. It is the component of the total salary scale which is independent of age or service. It consists of two components: inflation and productivity increases. It may be viewed as the ultimate rate of increase if there are no more step-rate/promotional increases applicable.