July 2010

Quadrennial Actuarial Audit of the Virginia Retirement System

Prepared for the Joint Legislative Audit and Review Commission in Compliance with Section 30-81 of the *Code of Virginia*

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Philip A. Leone
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July 12, 2010

Subject: Quadrennial Actuarial Audit of VRS

Dear Mr. Leone:

Our findings and comments resulting from a detailed review of the June 30, 2009 actuarial valuation of the Virginia Retirement System performed by Cavanaugh Macdonald are presented in the enclosed report.

We are pleased to report that we found Cavanaugh Macdonald's work to be reasonable and performed according to generally accepted actuarial standards and principles.

This report includes a detailed discussion of all the elements of our review. These issues are summarized in the Executive Summary. More detailed commentary on our review process and suggested considerations for refinements in actuarial procedures or presentations are included in subsequent sections of this report.

We wish to express our appreciation for the cooperation provided to us during the course of our work by the actuaries at Cavanaugh Macdonald as well as by the staff of the Virginia Retirement System.

Sincerely,

Rory J. Badura, ASA, EA
Senior Associate

Bruce A. Richards, FSA, MAAA, FCA
Partner

Enclosure

The information contained in this document (including any attachments) is not intended by Mercer to be used, and it cannot be used, for the purpose of avoiding penalties under the Internal Revenue Code that may be imposed on the taxpayer.

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Executive summary

Purpose and scope of the actuarial audit

Mercer (US) Inc. was engaged by the Joint Legislative Audit and Review Commission (JLARC) to conduct an actuarial audit of the June 30, 2009, actuarial valuation of the Virginia Retirement System (VRS) prepared by Cavanaugh Macdonald Consulting, LLC, consulting actuary to VRS. The quadrennial audit is required by §30-81 of the *Code of Virginia*. This is the third quadrennial actuarial audit of VRS, but the first since Cavanaugh MacDonald was retained as the VRS actuary.

The audit also includes a review of the valuations for the Health Insurance Credit Program, the Group Life Insurance Program, and the Virginia Sickness and Disability Program.

The primary purpose of the audit was to perform an independent verification and analysis of the assumptions, procedures, and methods used by Cavanaugh Macdonald in preparing the various actuarial valuations. For VRS pension benefits, the report reviewed was the report to VRS covering State Employees, Teachers, State Police, Judicial and Law Officers as well as separate reports for a sample group of local government employers. The local government employers included were:

- Fluvanna County
- James City County
- City of Alexandria
- Town of Remington
- Town of Leesburg
- Hampton Roads Sanitation District
- Appomatox County School Board
- Piedmont Regional Jail

Statement of key findings

Based upon a thorough review of the June 30, 2009 actuarial valuation reports, we believe that the work regarding the VRS Pension Trust Funds, Health Insurance Credit Program, Group Life Insurance Program, and Virginia Sickness and Disability Program are reasonable and performed in accordance with generally accepted actuarial principles and practices using reasonable actuarial assumptions and methods.

All of the work was performed by fully qualified actuaries meeting the Qualification Standards of the American Academy of Actuaries.

Audit exceptions

It is important to understand that in selecting and recommending actuarial methods and assumptions, there is a great deal of professional judgment involved. The review is not a full replication of the actuarial valuation results, but is a review of the key components in the valuation process that encompass the derivation of the liabilities and costs for the system. This audit report has been created for a limited purpose and should not be viewed as a prediction of the plan's future financial condition, but is intended to provide assurance that the liabilities and costs of the system are reasonable. In making the above Statement of Key Findings, we have not attempted to substitute our judgment for that of the consulting actuary to the Fund. However, as a part of our review, we have identified a number of areas where VRS and its consulting actuary should undertake further investigation or study. These areas are described under the "Comments" within each of the sections that follow this Executive Summary and are summarized below.

Actuarial cost method: All plans reviewed are using actuarial cost methods that meet applicable professional guidelines and requirements of state law if applicable.

Actuarial asset valuation method: The actuarial asset valuation methods for all plans meet applicable professional guidelines.

Actuarial assumptions:

Virginia Retirement System

Sufficient detail was not provided regarding the change in methodology regarding the salary scale assumption review for State employees and Teachers.

Service-related death assumption is not indicated in assumptions section, but appears to be used in valuation.

Group Life Insurance Program

Best actuarial practice would be to perform a separate valuation study of the Accidental Death & Dismemberment (AD&D), life insurance and Waiver of Premium (WOP) experience periodically to assure that experience patterns and unique valuation issues are appropriately identified and addressed.

Virginia Sickness & Disability Program

The periodic actuarial valuation should also be performed on the disability program due to unique benefit features which are not part of the retirement studies.

Actual VRS claims terminations experience should be used to modify the base claims termination rates for the valuation if the 87CGDT is to be utilized. Adjustments to the table should be age, gender and duration specific. A policy should be established for periodically updating the termination rates experienced by VRS claimants and making the changes in the valuation table.

There is no specific identified assumption in the valuation for expenses of program administration for open claims. The expense for claims adjudication and administration for open claims should be included in the valuation and explicitly identified.

The liability for those members in the waiting period is not a standard actuarial calculation used by LTD insurers and is highly dependent upon the prior 12 months experience. This methodology should be periodically reviewed to determine the consistency of results produced with that of more typical LTD valuation techniques employed by group LTD insurers.

There is a table that determines "offsets for active members". The valuation report does not derive the table or explain where the adjustments originate. Results should also be periodically compared to emerging experience. The table is a major assumption that needs periodic reconciliation and studies of experience to justify its long-term use.

Actuarial reports: In the local government reports there are a few modifications to the assumptions that are omitted in the summaries of actuarial assumptions.

The report on the actuarial experience study is not presented in sufficient detail for us to be able to form an opinion on all of its conclusions. Specifically, no detail is shown on analysis for State Police, Law Officers, Judicial, or Political subdivisions.

Data review: A few inconsistencies in data counts and compensation were observed, fairly minor in nature, and not materially affecting the actuarial valuation results.

Actuarial computations: The summary of actuarial assumptions in the valuation reports does not mention the service related death assumption of 14% for service related deaths or the 86% applied to non-service related deaths, but these factors are applied to the death decrements. This should be added to actuarial assumptions.

A few discrepancies with Teacher withdrawal and retirement rates on rates used versus those shown in assumptions.

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Actuarial cost methods

Audit conclusion

VRS: The actuarial cost method meets applicable professional guidelines and requirements of state law.

Health Insurance Credit Program: The Entry Age Normal Method meets applicable professional guidelines.

Group Life Insurance Program: The Entry Age Normal method meets applicable professional guidelines.

Virginia Sickness and Disability Program: The Projected Unit Credit method meets applicable professional guidelines.

Comments

The actuarial cost method used by VRS is the Entry Age Normal Cost Method. The Code of Virginia §51.1-145 specifies the following:

> The total annual contribution for each employer, expressed as a percentage of the annual membership payroll, shall be determined in a manner so as to remain relatively level from year to year.

We agree that the Entry Age Normal method complies with this requirement of state law, although it is not the only method that has this characteristic. However, use of the Entry Age Normal Method is very common for public employee retirement systems.

Effective July 1, 2006, the Other Post-Employment Benefit (OPEB) plans became subject to the requirements of the Governmental Accounting Standards Board Statement No. 43 (GASB 43) which required disclosures of the unfunded liability and annual required contribution using a recognized actuarial funding method. The OPEB plans reviewed as part of this audit all have complied by moving to a method that is appropriate for this purpose.

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Actuarial asset valuation method

Audit conclusion

The actuarial asset valuation methods for all plans meet applicable professional guidelines.

Comments

The actuarial asset valuation method calculates the actuarial value of assets (AVA) equal to the market value of assets (MVA) less a five year phase in of the excess (shortfall) between expected investment return and actual income (both based on market value) with the resulting value not being less than 80% or more than 120% of the market value of assets. For the June 30, 2009 valuation, Cavanaugh Macdonald recommended that the AVA corridor be suspended. This change was adopted by the Board of Trustees. This change increased the actuarial value of assets to approximately 133% of market value.

The Actuarial Standards Board adopted Actuarial Standard of Practice (ASOP) No. 44. The standard requires that the actuary should select an asset valuation method that is designed to produce actuarial values of assets that bear a reasonable relationship to the corresponding market values.

In particular, the ASOP goes on to say that the qualities of an asset valuation method should include the following:

“3.3(b) The asset valuation method is likely to produce actuarial values of assets that, in the actuary’s professional judgment, satisfy the following:

1. The asset values fall within a reasonable range around the corresponding market values. For example, there might be a corridor centered at market value, outside of which the actuarial value of assets may not fall, in order to assure that the difference from market value is not greater than the actuary deems reasonable.
2. Any differences between the actuarial value of assets and the market value are recognized within a reasonable period of time. For example, the actuary might use a method where the actuarial value of assets converges toward market value at a pace

the actuary deems reasonable, if the investment return assumption is realized in the future periods.

In lieu of satisfying both 1 and 2 above, an asset valuation method could satisfy section 3.3(b) if, in the actuary's professional judgment, the asset valuation method either (i) produces values within a sufficiently narrow range around market value or (ii) recognizes differences from market value in a sufficiently short period."

Application of this standard in relation to recent market events is still under review and discussion within the actuarial profession. What is clear is that any discussion of asset smoothing methods must include consideration of both how long it takes for the AVA to return to the MVA and how close that AVA stays to the MVA during that time.

In our opinion, an asset smoothing period of five years is a "sufficiently short period" within the meaning of ASOP No. 44. This means that, subject to those conditions, associations using five-year smoothing have considerable latitude when considering the use of market value corridors. However, for smoothing periods longer than five years the situation is less clear.

It is worth noting that during volatile economic times like these, asset smoothing methods will determine how losses are transitioned and ultimately the pattern of contributions. The transition has two time frames that correspond to the two elements of the asset smoothing:

1. The smoothing period determines how long it will take for contribution rates to transition to the new, higher level.
2. The MVA corridor determines whether the transition will occur in a relatively straight line or will increase more sharply in the years immediately after a market downturn.

Because the asset smoothing method is a matter of funding policy and not an actuarial assumption, there is no "right" answer. Instead, the choice depends on what policy objectives the Board wants to accomplish.

Even if removing the market value corridor will reduce contribution rate volatility for the next few years, a change in the asset smoothing method (or any other funding change) will not have a long-term impact on Plan costs (except for the time value of money). The Plan's ultimate costs are determined by the benefits and expenses paid less actual investment income. Since an asset smoothing method affects neither benefits nor expenses, it will not reduce the Plan's true costs. Any short-term current contribution savings that will result from the change in the smoothing method will have to be made up in the future, plus interest.

The use of a smoothing method to remove volatility in investment experience is very common for public retirement systems. The *2010 Wilshire Report on State Retirement Systems* showed more than 90% of state retirement systems used an asset valuation method other than market value. The particular method used by VRS is very common for both public and private retirement plans.

Using a smoothing method mitigates the effect of short-term changes (market fluctuations) in the fair market value of plan assets. This produces a smoothing effect on the value of plan assets and thereby reduces the volatility of annual funding contribution requirements, thus making it easier to budget contributions and expense.

The calculation is done separately for State Employees, Teachers, State Police, Judges and Law Officers based upon the separate accounting for their share of fund assets. For local government plans, the calculation is done on a pooled basis and then the resulting ratio of actuarial value of assets to market value is applied to each employer's share of the market value.

The actuary has properly disclosed the change in method as well as the effect of the change in method. We consider this approach to be reasonable.

Health Insurance Credit Program

The asset valuation method for the Health Insurance Credit Program is the same as the Retirement Plan, including the suspension of the corridor for the June 30, 2009 valuation. This method is acceptable under actuarial standards of practice.

Group Life Insurance Program

The asset valuation method for the Group Life Insurance Program is the same as the Retirement Plan, including the suspension of the corridor for the June 30, 2009 valuation. This method is acceptable under actuarial standards of practice.

Virginia Sickness and Disability Plan

The asset valuation method for the Sickness and Disability Plan is market value. This method is acceptable under actuarial standards of practice. At some point VRS may want to consider adoption of an asset smoothing method that would better meet annual budgeting requirements, but we have no objection to the continued use of market value.

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Actuarial assumptions

Audit conclusion

The actuarial assumptions are reasonable on both an individual and aggregate basis.

Comments

The current actuarial assumptions were adopted for the June 30, 2009 actuarial valuation based upon the results of an experience study performed by Cavanaugh Macdonald for the period 2004-2008 and presented to VRS in August, 2009. It must be recognized in the setting of actuarial assumptions that there is not one answer that reflects the best estimate of future experience. Rather there is a best-estimate range, within which reasonable assumptions lie. We believe that all of the actuarial assumptions lie within this range. However, there are a number of areas in the analysis of actuarial assumptions where we have different opinions concerning the interpretation of the underlying experience data or different preferences with regard to the assumption selected. Some of the comments below reflect these differing opinions or preferences.

Economic assumptions

Investment return rate: The assumed investment return rate is 7.5%, which is unchanged from the previous valuation, as recommended by Cavanaugh Macdonald in the 2008 Experience Study.

In order to assess the reasonableness of this assumption, we have used Mercer's proprietary Portfolio Return Calculator (PRC). The PRC uses as inputs the following information:

- Asset allocation of the pension fund
- Annual investment and administrative expenses expressed as a percentage of plan assets
- Capital market returns for each asset class as developed by Mercer Investment Consulting (MIC), generally referred to as "forward looking assumptions". These returns are expressed in nominal terms and also include measures of standard deviations from the expected value and correlations among asset classes. Alternative capital market return assumptions can also be used in the PRC.

The output from PRC is a probability distribution of expected asset returns based upon the forward looking assumptions and average returns based upon historical assumptions.

The following table shows the current VRS asset allocation weightings, the assumed nominal rates of return for each asset class as developed by MIC, and the assumed nominal rates of return used internally by VRS:

Asset class	Allocation	MIC return	VRS return
Domestic equity	22.0%	8.36%	7.50%
Non-US equity	14.7%	8.16%	7.50%
Emerging Equity	2.9%	8.38%	10.50%
Fixed income	26.8%	4.86%	5.50%
Credit strategies	9.0%	6.00%	7.50%
Convertibles	3.9%	6.80%	7.50%
Real estate	10.0%	7.34%	8.00% (public) 7.00% (private)
Private equity	10.7%	9.59%	10.00%

For annual expense, we assumed 25 basis points, which is based upon 5 basis points for administrative expenses and 20 basis points for investment expenses. The administrative expense assumption is derived from VRS's own experience. The investment expense assumption is consistent with expenses associated with index returns. The implicit assumption is that any additional return from active management (alpha) is exactly offset by the additional expense for active management. To the extent that returns from active management exceed the additional cost, then such additional return should be added to the returns derived from the PRC. Using the above allocation and the assumptions as noted, the PRC produced the following expected investment returns over a 20 year investment horizon:

Percentile	MIC assumptions	VRS assumptions
25%	5.99%	5.60%
40%	6.98%	6.53%
50%	7.58%	7.09%
60%	8.18%	7.64%
75%	9.17%	8.57%

Using MIC's assumptions, the median expected return would be 7.58%. The current assumption of 7.50% falls just below the 50th percentile, meaning that we would conclude that there is at least a 50% probability that the assumed rate of return could be achieved. The VRS results are slightly lower than MIC's.

Generally, Mercer considers that results between the 25th to 75th percentiles are within a reasonable range for the investment return assumption. The current assumption of 7.5% falls well within this range whether we use the MIC or VRS assumptions.

Most surveys of large public retirement systems indicate an average investment return assumption of about 8.0%. In fact, the *2010 Wilshire Report on State Retirement Systems* showed a median assumed investment rate of 8.0%. Therefore, VRS's 7.50% assumption is somewhat more conservative than the average rate.

We therefore conclude that the 7.50% assumption is reasonable for use in the VRS actuarial valuation.

Salary increases: The current salary increase assumptions are based upon the results of the 2004-2008 experience study. As a result of this study, the salary assumptions were adjusted from the prior assumptions as follows:

- For State Employees, no changes were made to the salary increase assumption despite the fact that recent experience shows that actual increases were more than expected. Cavanaugh Macdonald relied on experience from 2002-2008 which showed that actual increases were less than expected.
- For Teachers, no changes were made to the salary increase assumption.
- For Judges, the flat salary scale of at all ages and service was increased from 3.5% to 4.5%.
- For State Police and Law Officers, no changes were made in the step rates or the productivity component.

Sufficient detail was not provided on why the decision was made to expand the number of years over which the State Employees experience was reviewed. This methodology was not used for any other group, and we would expect to see more in depth explanation within the study supporting change. Similarly, the teacher's data used a different methodology of extracting the effects of inflation to justify the assumption; again this methodology was not used for any other group and requires further explanation to support change.

The experience study results were not presented in sufficient detail that we could verify that changes for Judges are consistent with the experience. Yet, the assumptions appear reasonable and the changes made are generally consistent with the overall pattern of experience.

Inflation assumption: The underlying inflation assumption for the actuarial interest rate, for salary increases and for the cost of living adjustments for retirees is 2.5%. We believe that this assumption is reasonable.

Payroll growth assumption: A payroll growth assumption of 3% is used based upon zero growth in the active covered population. This assumption is used in determining the current year amortization amount of the unfunded actuarial accrued liability which is amortized as a level percentage of future payroll. This assumption is unchanged from the prior valuation. We understand that this assumption is set at 0.5% in excess of the actual inflation rate. We agree that this assumption is reasonable.

Demographic assumptions

Death after retirement:

The following assumptions are used for post-retirement mortality:

Non-disabled retirement:

State employees:	1994 Group Annuity Mortality Tables for males and females with a one year set back in age for males and females
Teachers:	1994 Group Annuity Mortality Tables for males and females with a three year set back in age post-retirement for males and females
State Police:	1994 Group Annuity Mortality Tables for males and females with a four year set back in age post-retirement for males and females
Judicial:	Same as state employees
Law Officers:	Same as state police

Disabled retirement:

All classes:	70% of PBGC Disabled Mortality Table 5a for males
	90% of PBGC Disabled Mortality Table 6a for females

The 2004-2008 Experience Study showed that the actual mortality experience for all groups was close to the assumed rates reflecting improvements that have occurred generally in mortality. Therefore, it was recommended to leave the mortality rates unchanged. We believe that these mortality assumptions are reasonable. However, it is not clear from the experience study report whether sufficient margin has been included in the mortality rates for future improvements in mortality. Any additional margin for future improvements would cause an increase in actuarial liabilities.

The disabled mortality assumption is unchanged from prior valuations. The 2004-2008 experience study appeared to show actual mortality close to the assumed mortality, similar to the experience for non-disabled retirees.

Pre-retirement death: The 2004-2008 experience study report showed that mortality rates pre-retirement were either about equal to the assumed rates or slightly below. Cavanaugh Macdonald recommended no changes to the pre-retirement death assumption. While the experience may justify a reduction in rates, this assumption does not have a significant effect upon valuation results. Nevertheless, consideration should be made to reduce the rates further to be more reasonably related to the actual experience.

VRS provides a special death benefit of 50% of average final compensation (33 1/3% if the beneficiary qualifies for Social Security survivor benefits) and offset by Worker's Compensation when death is service related. Cavanaugh Macdonald assumes that zero percent of deaths of active workers will be service related. It would seem that some deaths would be service related and that an assumption should be made accordingly.

Even if it is determined that the assumption should remain at zero, this should be disclosed in the summary of actuarial assumptions.

Termination rates (non-vested and vested): The current termination assumptions are based upon the results of the 2004-2008 experience study. As a result of this study, the termination assumptions were adjusted from the prior assumptions as follows:

- For State employees, termination rates were generally higher than expected for all age and service groups except for female State employees with 3 to 9 years of service. Rates were changed to mirror actual experience.
- For Teachers, actual experience fluctuated between being greater than and less than expected for employees with less than 3 years of service, actual experience was greater than expected for 3 to 9 years of service, and actual experience was close to expected for those with at least 10 years of service. Rates were adjusted to align with actual experience.
- For Law Officers, it appears that termination rates were increased from the prior valuation. The experience study does not provide the necessary confirmation for this change.
- Judges have no assumed termination rates.

We are not able to determine whether the new assumptions for State Police or Law Officers are completely consistent with plan experience. However, we agree that the changes in the termination rates are reasonable.

The methodology for setting new rates was not explained in detail, but appeared to be inconsistent between gender and divisions, sometimes mirroring actual experience and other times splitting the difference between expected and actual.

Disability incidence: Based upon the results of the 2004-2008 experience study, Cavanaugh Macdonald recommended changes to disability incidence assumptions for all groups except State Police and Judicial. The resulting rates generally seem to be consistent with the experience.

A greater disability benefit is provided for service-related disabilities. For each of the groups, an assumption is made regarding the percentage of disabilities that will be service-related. No changes were made in the service-related percentages and no data was shown within the experience study for us to determine whether continuation of these assumptions is reasonable.

VRS provides lower disability benefits to disabled members who qualify for Social Security disability benefits. Cavanaugh Macdonald assumes that zero percent of disabled members qualify for Social Security, thus conservatively valuing the higher benefit, but no experience study data has been presented for us to determine whether this assumption is reasonable.

Retirement rates (reduced benefits): The current reduced retirement assumptions are based upon the results of the 2004-2008 experience study. As a result of this study, the reduced retirement assumptions were adjusted from the prior assumptions as follows.

- For State males, actual experience was close to expected for ages up through 64, and then actual experience was a great deal less. The rates for ages 65 to 69 were lowered to 40%.
- For State females, actual experience fluctuated between being more or less than expected. Rates for ages 50, 51, 54, 58, and 59 were increased while rates for ages 60 and 64-69 were decreased.
- For Teachers, actual experience fluctuated between being more or less than expected up through age 64 for both males and females. These rates were adjusted to be closer to the actual experience. Rates for ages 65-69 were decreased in accordance with experience.
- The experience study summary states that State Police rates were decreased and Law Officers' rates were changed; however, no experience study data has been presented for us to determine whether these changes were warranted.

We believe the revised reduced retirement assumptions for all groups are reasonable.

Retirement rates (unreduced benefits): The current unreduced retirement assumptions are based upon the results of the 2004-2008 experience study. As a result of this study, the unreduced retirement assumptions were adjusted from the prior assumptions as follows.

- Unreduced rates were lowered for ages 60-67 for State males and for ages 63 and 65-67 for State females.
- For Teachers, experience was generally close to expected or less than expected, except for age 61 where it was more than expected. Rates were lowered for males ages 50-54, 62, and 66-69 and for females ages 50-60, 64,66, and 68-69. Rates were increased for age 61 for both males and females.
- The experience study summary states that State Police rates were decreased and Law Officers rates were changed; however, no experience study data has been presented for us to determine whether these changes were warranted.

In response to these results, Cavanaugh Macdonald recommended changes affecting all groups, some increased rates and some decreased rates. We believe the assumptions as revised are reasonable compared to the experience.

Percent electing a deferred retirement benefit: Terminating members may elect a deferred retirement benefit or a return of their contributions. The valuation assumes that all such members will elect the most valuable of these benefits. This assumption is conservative and we believe it to be reasonable.

Beneficiary age: An assumption is made that beneficiaries are the same age as plan participants. This assumption is necessary for the valuation of certain survivor benefits. We believe that the assumption is reasonable, although since most beneficiaries are spouses, a more typical assumption would be to assume that female spouses are two to three years younger than male spouses.

Actuarial assumptions for Health Insurance Credit Program

The Health Insurance Credit Program uses the same assumptions as those for the valuation of retirement income benefits. Any comments above regarding these assumptions would also apply for purposes of the Health Insurance Credit Program.

We also recommend that a separate experience study be periodically performed to determine how the actual Health Insurance Credit Program results compare to these assumptions.

Actuarial assumptions for Group Life Insurance Program

The post-retirement Group Life Insurance Program uses the same assumptions as those for the valuation of retirement income benefits. Any comments above regarding these assumptions would also apply for purposes of the Group Life Insurance Program.

We also recommend that a separate experience study be periodically performed to determine how the actual results from the Group Life Insurance Program compare to these assumptions.

Other assumptions/considerations

It is unclear how those currently on Waiver of Premium (WOP) are handled in the core valuation document. The individuals on WOP should be explicitly identified and valued according to their status and not aggregated with active employees. Wherever possible, references should be made to explicit assumptions contained in other reports or valuations.

Best actuarial practice would be to perform a separate valuation study of the Accidental Death & Dismemberment (AD&D), life insurance and Waiver of Premium (WOP) experience periodically to assure that experience patterns and unique valuation issues are appropriately identified and addressed. The periodic actuarial valuation should also be performed on the disability program due to unique benefit features which are not part of the retirement studies.

It is unclear whether insurer fees and expenses have been factored into the valuation. The actual cost to the program is the death benefit plus costs charged by the insurer.

Actuarial assumptions for Virginia Sickness and Disability Program (VSDP)

Disability termination rates: 1987 Commissioner's Group Disability Table.

The table selected for the valuation is generally considered to be flawed with respect to several critical elements, including but not limited to, accounting for behavioral health claims, the lack of incorporating Social Security awards, and early duration claims termination rates. All significant insurers with material amounts of business have significantly modified the 87CGDT table to make the valuation results more realistic. Leading disability insurers use more recent valuation tables with modifications and the use of this table without explicit comparison to VRS results can produce misleading results. Actual VRS claims terminations experience should be used to modify the base claims termination rates for the valuation if the 87CGDT is to be utilized. Adjustments to the table should be age, gender and duration specific. A policy should be established for periodically updating the termination rates experienced by VRS claimants and making the changes in the valuation table.

As noted above, a periodic study of just the disability program is a best practice especially given that the results of the long-term disability (LTD) valuation rely heavily upon claims continuance rates, potential claims offsets, and mortality of those that are disabled. These three elements are generally not a part of the assumptions reviewed for retirement benefits and the assumptions for these items have a significant impact on disability liabilities.

Rates of withdrawal

Long-term disability claims experience is known to fluctuate significantly depending upon economic conditions and unemployment rates. Modifications to withdrawal rates were proposed based upon favorable observed experience for a study period. The study period, however, is short in nature and therefore is greatly influenced by economic conditions. The exact impact of just the change in withdrawal assumptions (holding all other assumption and variable changes constant) is not disclosed within the report. The magnitude of the change due to terminations should be understood and reviewed for reasonableness especially given the impact of the economy on disability rates. Given the modifications and the study period, it is likely that future adjustments in the rate of withdrawal might be necessary as economic conditions change. In addition, as noted above, best practices on disability programs do require periodic monitoring and tabulation of how disability recovery rates and benefit offsets are changing over time.

Plan expenses

There is no specific identified assumption in the LTD valuation for expenses of program administration for open claims. The expense for claims adjudication and administration for open claims should be included in the valuation with an explicit disclosure of the assumption.

Other assumptions/considerations

The liability for those members in the waiting period is not a standard actuarial calculation used by LTD insurers and is highly dependent upon the prior 12 months experience. This methodology should be periodically reviewed to determine the consistency of results produced with that of more typical LTD valuation techniques employed by group LTD insurers.

There is a table that determines "offsets for active members". The valuation report does not derive the table or explain where the adjustments originate. Results should also be periodically compared to emerging experience. The table is a major assumption that needs periodic reconciliation and studies of experience to justify its long-term use.

The report is silent on how medical benefits for LTD claimants are valued. If these benefits are separately valued under another program and not part of the liabilities being valued, that should be disclosed.

Pre-retirement mortality is assumed to follow the 1994 Group Annuity Mortality with an age setback. Given the credibility associated with VRS, the actual mortality rate for active employees should be contrasted with the valuation assumption for validation purposes periodically.

There is a table which highlights disability rates for selected ages (page 15 of report). How do these percentages compare to actual VRS experience? Again, given the credibility of VRS experience, actual data over a full economic cycle should be used in lieu of assumptions.

Where the LTD has a cost of living adjustment (COLA) benefit, the calculation methodology should be disclosed and the COLA adjustment highlighted.

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Review of actuarial reports

Audit conclusion

All valuation reports meet professional standards and fairly represent the actuarial condition of the various plans.

Comments

The communication of actuarial valuation results is covered in the Actuarial Standards Board (ASB) Standard of Practice No. 41, *Actuarial Communications* (ASOP 41). Generally, sufficient information should be presented such that:

- It would be properly interpreted and applied by the person or persons to whom the communication is directed, and
- Another actuary in pension practice could form an opinion about the reasonableness of the conclusion.

Standard of Practice No. 4, *Measuring Pension Obligations* (ASOP 4), also indicates specific requirements for content of pension actuarial reports including:

- The name of the person or firm retaining the actuary and the purpose of the report
- An outline of the benefits being valued
- The effective date of the calculation
- A summary of participant data
- A summary of asset information
- A description of the actuarial methods and assumptions
- A statement of the findings, conclusions, or recommendations necessary to satisfy the purpose of the communication

Cavanaugh Macdonald prepares a “primary” actuarial report for VRS that contains the results for State Employees, Teachers, State Police, Judges, and Law Officers. Cavanaugh Macdonald also prepares a separate actuarial report for each local government employer participating in VRS. The results of the local governments are not included in the primary report either individually or in aggregate.

Both the primary report and the reports for the local participating employers meet the requirements of ASOPs 4 and 41. However, it should be noted that the local reports contained a few discrepancies within the summary of actuarial assumptions and methods when compared to the tables provided by Cavanaugh Macdonald. These include:

- Removal of the corridor for actuarial asset value was mentioned in the introduction, but not shown in the assumption and methods section
- Change in assumptions was mentioned in the introduction, but specific changes were not disclosed in the assumption and methods section
- Statement of independence was not included on all local reports

Review of funding levels

The table below shows the calculation of the funded ratios of VRS for the last six years (excluding local plans) compared to the funded ratios for all state retirement systems as shown in the *2010 Wilshire Report on State Retirement Systems*:

Year	(billions) Actuarial value of assets	(billions) Actuarial accrued liability	Funded ratio VRS	Funded ratio all State systems
2004	32.6	36.8	89%	88%
2005	33.0	41.3	80%	85%
2006	34.8	44.6	78%	86%
2007	38.8	48.4	80%	87%
2008	42.4	51.7	82%	84%
2009	42.8	54.6	78%	75%

It is difficult to make direct comparisons to other systems due to the wide variation of actuarial assumptions and methods. However, we would consider the current funded status of VRS to be somewhat “in the middle” when compared to other comparable systems, that is, not significantly better or worse funded than the average system.

Report for Health Insurance Credit Program

The report for the Health Insurance Credit Program incorporates either directly or by reference all of the information required to meet requirements of ASOP 41.

Report for Group Life Insurance Program

The report for the Group Life Insurance Program meets or exceeds all of the requirements of ASOP 41.

Report for Virginia Sickness and Disability Program (VSDP)

The report for the VSDP incorporates either directly or by reference the information required to meet requirements of ASOP 41.

Report of Actuarial Experience

We do not believe that the report of the actuarial experience study is presented in enough detail that permits another actuary to assess the reasonableness of the conclusions. For example:

- Commentary in the report that reflects the actuary's interpretation of the results could be expanded to include more insight on experience and further explanation of recommended changes.
- There were a number of assumptions not covered by the experience study where a measurement of experience could have been useful. These assumptions include:
  - Percent married assumption
  - Spousal age difference
  - Percentage of disabilities that are service-related
  - Percentage of deaths that are service-related
  - Optional form of payment elected upon retirement
  - "Offsets for active members" in sickness and disability plan

6

Data review

Virginia Retirement System

Audit conclusion

The membership data used by Cavanaugh Macdonald for the June 30, 2009, actuarial valuation is consistent with the data provided by VRS.

Comments

Mercer requested and received the data file that VRS provided to Cavanaugh Macdonald for the 2009 valuation as well as Cavanaugh Macdonald's actual valuation files.

We compared the data exhibits within the valuation reports to the raw VRS data file without adjusting for any potential data questions. While counts of active participants may differ slightly between the file and the report for some groups, differences were not material enough to affect the average service, pay, or age of the population. In our opinion the differences are deminimus and therefore we believe the valuation data is consistent with the data provided by VRS.

Health Insurance Credit Program

Membership data for the Health Insurance Credit Program is the same as used for VRS retirement system valuation. The same comments from above would apply.

Group Life Insurance Program

Membership data for the Group Life Insurance Program is same as used for VRS retirement system valuation, plus 20,692 life insurance only participants from five political subdivisions that do not participate in VRS.

Virginia Sickness and Disability Program (VSDP)

The membership data used by Cavanaugh Macdonald for the June 30, 2009 valuation of the VSDP was consistent with the data provided by VRS indicating 73,002 individuals enrolled in VSDP as of June 30, 2009.

7

Review of actuarial computations

Audit conclusion

Our review of the actuarial computations included the following:

- Review of the calculations presented in the actuarial report for consistency and accuracy. We found no issues to report on this review.
- Checking of test cases to determine whether plan provisions and actuarial assumptions were programmed properly.

Comments

Virginia Retirement System (VRS)

Review of the calculations presented in the actuarial report for consistency and accuracy

For this review, we mathematically checked a number of report exhibits for consistency within the exhibit and for consistency with other exhibits. Amortization amounts were checked, as were calculations of actuarial asset value. We found the report accurate in all respects based on this review.

Checking test cases to determine whether plan provisions and assumptions were programmed properly

We requested from Cavanaugh Macdonald test cases of inactive plan members, and test cases of active plan members selected from among various age and service combinations. Test cases were received from all groups (i.e., State Employees, Teachers, State Police, Judges and Law Officers). It is important to realize that test cases are carefully selected to check all of the plan provisions rather than being selected randomly. For the test cases of active plan members, our review included checking closely the projected benefits for each member (known as “benefit arrays”) as well as a review of the actuarial present values computed from such benefit arrays.

From our review we found the following issues to report:

Virginia Retirement System

- Death Benefit: The summary of actuarial assumptions in the valuation reports does not mention the service related death assumption of 14% for service related deaths or the 86% applied to non-service related deaths, but these factors are applied to the death decrements. This should be added to actuarial assumptions.
- Teacher Withdrawal Rates: The valuation report states that greater than or equal to age 65 rates are the same as those assumed at age 60; however, the experience study report suggested that these rates equal 0 for all service groups.
- Teachers Retirement Rates: The valuation report differs from the suggested table in the experience study for a few ages. The experience study recommended 30% for males ages 67-69 and for females age 68-69. The valuation report uses 20% for males ages 67-69, 25% for females age 68, and 20% for females age 69. The test cases match the valuation report.

Health Insurance Credit Program

Review of the calculations presented in the actuarial report for consistency and accuracy

For this review, we mathematically checked a number of report exhibits for consistency within the exhibit and for consistency with other exhibits. We found the report accurate in all respects based on this review and the results looked consistent with prior year results.

Checking test cases to determine whether plan provisions and assumptions were programmed properly

Individual calculations were consistent with provisions of plan and incorporated the current assumptions of the plan. No issues to report.

Group Life Insurance Program

Review of the calculations presented in the actuarial report for consistency and accuracy

For this review, we mathematically checked a number of report exhibits for consistency within the exhibit and for consistency with other exhibits. We found the report accurate in all respects based on this review. Results looked consistent with prior year results.

Checking test cases to determine whether plan provisions and assumptions were programmed properly

In the previous audit, the method of reducing the value of the death benefit from the initial level down to the 25% level was inconsistent with provision. This has been fixed.

All other calculations were consistent with provisions of plan and incorporated the current assumptions of the plan.

Virginia Sickness and Disability Program

For this review, there were not many computations within the report to review, rather exhibits which appeared to be consistent with prior year exhibits.

8

Agency responses

As a part of the extensive validation process, State agencies and other entities involved in a JLARC assessment are given the opportunity to comment on an exposure draft of the report. Appropriate technical corrections resulting from comments provided by these entities have been made in this version of the report. This appendix includes written responses from the Virginia Retirement System and Cavanaugh Macdonald Consulting, LLC.

Virginia Retirement System

1200 East Main Street, P.O. Box 2500, Richmond, Virginia 23218-2500
Telephone: (804) 344-3120 Fax: (804) 786-1541

Robert P. Schultze
Director

June 25, 2010

Mr. Philip A. Leone
Director
Joint Legislative Audit and Review Commission
General Assembly Building, Suite 1100
Richmond, VA 23219

Dear Mr. Leone:

Thank you for the opportunity to review the exposure draft of the *Quadrennial Actuarial Audit of the Virginia Retirement System.* We also appreciated the chance to discuss the report's findings in the meeting between our respective actuaries on June 9, 2010, during which the actuaries reached substantial agreement on the report's major findings.

We are pleased that Mercer found Cavanaugh Macdonald's work to be performed according to generally accepted actuarial standards and principles using reasonable actuarial assumptions and methods. While we generally concur with the report's findings and recommendations, two findings by Mercer warrant additional clarification and context.

First, regarding VRS' assumptions on future salary increases, Mercer opined that sufficient detail was not provided to justify deviating from the 4-year average of salary increases found for teachers and state employees. VRS believes that the 4-year look-back period (2004-2008) used in the experience study produced an anomalous result that was not predictive of future salary increases for the two groups.

The look-back period followed a period of slow economic growth and minimal state and local salary increases. However, as the economy rebounded during the 2004-2008 period of the study, state and local governments tried to catch-up by awarding higher than expected salary increases. VRS judged these increases to be anomalous and therefore unsuitable for estimating future salaries. Accordingly, VRS and its actuary expanded the salary analysis by using a wider period and by consulting with state and local officials on forthcoming salary increases. Our collective judgment was to avoid increasing the salary assumptions used for state employees and teachers.

Recent budget actions by state and by local governments validate this decision. Had the actuary increased his salary assumptions a seesaw effect would have been produced followed by an offsetting correction in the next study.

We will agree that the experience study may not provide enough detail about the analysis performed to arrive at the salary assumptions. Nonetheless, VRS thoroughly explored these issues with the actuary and with other organizations before making an informed judgment.

Second, Mercer recommended that VRS conduct additional separate experience studies for the Virginia Sickness and Disability Program (VSDP), Group Life Insurance, and the Retiree Health Insurance Credit programs. Since participants in these ancillary OPEB programs generally consist of the same individuals covered by our pension plans, VRS does not believe that the demographics of these programs would differ materially from the demographics found in the pension studies. Hence, VRS could not justify the added expense of three additional experience studies. Going forward, however, VRS will consider conducting limited studies of the OPEB programs, focusing the analyses only on factors unique and specific to each program.

We have attached a separate letter from Cavanaugh Macdonald which provides more detailed comments on each of the issues raised by the Mercer report.

We would again like to express our appreciation to the actuaries at Mercer and the JLARC staff for the professional, courteous and cooperative manner in which they conducted their work during the course of their review.

Finally, VRS and its actuaries from Cavanaugh Macdonald concur with the report's major findings. We find that the Quadrennial Audit conducted by JLARC and its actuary to be an important tool for validating and fine tuning VRS' valuation and rate setting processes.

Sincerely,

Robert P. Schultze
Director

cc: Glen Tittermary, JLARC
Rory J. Badura, Mercer

Attachment

Cavanaugh Macdonald
CONSULTING, LLC
The experience and dedication you deserve

June 23, 2010

Ms. Patricia Bishop
Policy Planning and Compliance Director
Virginia Retirement System
1200 E. Main Street
Richmond, VA 23219

RE: ACTUARIAL REVIEW RESULTS

Dear Ms. Bishop:

We have received a copy of the Exposure Draft of the Quadrennial Actuarial Audit of the Virginia Retirement System dated June 2010 which was produced by Mercer to detail their findings of the review of our June 30, 2009 valuation reports, as well as our latest experience study report.

We are, of course, pleased that Mercer's overall findings conclude that our results are reasonable and performed in accordance with generally accepted actuarial principles and practices.

Mercer has detailed a number of issues that will allow us to fine-tune future valuations and experience studies. We have reviewed each issue and, as appropriate, provided our comments below.

We want to thank Mercer for the professional and courteous manner in which they conducted their review.

Sincerely,

Jose I Fernandez

Jose I. Fernandez, ASA, FCA, EA, MAAA
Principal and Consulting Actuary

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Economic assumptions

Salary Increases
Mercer comment: Sufficient detail was not provided on why the decision was made to expand the number of years over which the State Employees experience was reviewed. This methodology was not used for any other group, and we would expect to see more in depth explanation within the study supporting change. Similarly, the teacher's data used a different methodology of extracting the effects of inflation to justify the assumption; again this methodology was not used for any other group and requires further explanation to support change.

Cavanaugh Macdonald comment: Generally, if the actual experience differs significantly from the overall expected results, or if the pattern of actual salary increases does not follow the expected pattern, new assumptions are recommended. Recommended changes do not follow the exact actual experience during the observation period. Judgment is required to extrapolate future experience from past trends and current member behavior. In addition, non-recurring events, such as pay freezes or higher than expected inflation in the experience study period, need to be taken into account in determining the weight to give to recent experience.

In the cases of the State employees and Teachers plans, the experience period salary data indicated greater than expected pay increases. Cavanaugh Macdonald and VRS believed these results required further investigation to confirm whether the higher pay increases were a result of an ongoing trend requiring a change in the pay increase assumption or due to unusual events during the experience period. To avoid a seesaw in assumptions (for example as has happened with the Judges plan for which the decrease in the pay increase assumption from the prior experience study was reversed with the current experience study when pay increases returned to previous levels) it is important to not overly rely on the data from the current experience period to forecast future events.

For State employees, VRS staff discussed salary increases with the Virginia Department of Human Resources Management (DHRM). The DHRM staff indicated that State employees did not receive pay increases in 2001 and 2002 (before the experience study period). As a result, in the following years there was an apparent attempt to make-up for the foregone salary increases by awarding additional pay increases. VRS provided Cavanaugh Macdonald with additional salary data prior to fiscal year 2004 to review the overall trend. Upon further analysis, we found the longer term pay increase trend from 2002 through 2008 for State employees was less than expected. Therefore, we recommended keeping the current salary increase assumption.

For the Teachers plan, the actual rates of salary increase were consistently above the assumed rates. After further review of the components of the pay increases, we found that actual price inflation greater than the assumed 2.5% per year during the experience study period was the primary factor for actual rates of pay greater than expected. When the inflationary effects were accounted for, actual rates of pay increase due to productivity and merit were generally lower than expected. Therefore, we did not recommend changing the current salary increase assumption for the Teachers plan.

We did not feel it was necessary to use similar approaches with the other plans since it did not appear the aberrations observed with the State and Teachers plans had a significant impact on those plans. We agree that this detail should have been included in the experience study report to allow a report user to understand the different approaches.

Demographic assumptions

Death after retirement
Mercer comment: It is not clear from the experience study report whether sufficient margin has been included in the mortality rates for future improvements in mortality. Any additional margin for future improvements would cause an increase in actuarial liabilities.

Cavanaugh Macdonald comment: Generally, the actual number of deaths was greater than expected. We believe a sufficient margin exists between actual and expected deaths to accommodate future mortality improvements.

Pre-retirement death
Mercer comment: Cavanaugh Macdonald assumes that zero percent of deaths of active workers will be service related. It would seem that some deaths would be service related and that an assumption should be made accordingly. Even if it is determined that the assumption should remain at zero, this should be disclosed in the summary of actuarial assumptions.

Cavanaugh Macdonald comment: Our service-related death assumptions are 14% for State and Locals (non-LEO), 5% for Teachers and Judicial, and 60% for State Police, Law Officers, and Local LEOs. We agree that these assumptions should be disclosed in the valuation reports.

Termination rates (non-vested and vested)
Mercer comment: The methodology for setting new rates was not explained in detail, but appeared to be inconsistent between gender and divisions, sometimes mirroring actual experience and other times splitting the difference between expected and actual.

Cavanaugh Macdonald comment: Where actual and expected experience differed significantly our approach generally was not to go all the way to the actual experience but to recommend rates between actual and expected.

Actuarial assumptions for Health Insurance Credit Program

Mercer comment: We also recommend that a separate experience study be performed to determine how the actual Health Insurance Credit Program results compare to these assumptions.

Cavanaugh Macdonald comment: Given the high level of assumed participation (95%, as defined on page 20 of the Health Insurance Credit Program valuation report), Cavanaugh Macdonald Consulting (CMC) believes the experience of this group does not differ greatly in terms of the economic and demographic assumptions shared with the pension plans.

Actuarial assumptions for Group Life Insurance Program

Mercer comment: We also recommend that a separate experience study be performed to determine how the actual results from the Group Life Insurance Program compare to these assumptions.

Cavanaugh Macdonald comment: Given the high level of assumed participation (100%), CMC believes the experience of this group does not differ greatly in terms of the economic and demographic assumptions shared with the pension plan.

Other assumptions/considerations

Mercer comment: It is unclear how those currently on Waiver of Premium (WOP) are handled in the core valuation document. The individuals on WOP should be explicitly identified and valued according to their status and not aggregated with active employees. Wherever possible, references should be made to explicit assumptions contained in other reports or valuations.

Cavanaugh Macdonald comment: CMC assumes the waiver of premium amount to which Mercer refers is for the life insurance benefit (the AD&D component is addressed below) provided to members while in long-term disability (LTD) status. Here, all individuals (active and inactive, including LTD beneficiaries) decrementing due to disability are valued in accordance with the disability retirement provisions of the plan. A comment to this effect, regarding the treatment of members who are currently receiving benefits from VSDP, is made on page 4 of the June 30, 2009 Group Life Insurance Program valuation report. For completeness, in future valuation reports we will include applicable cross references between different actuarial valuation reports.

Alternatively, the WOP benefit could be valued in a manner similar to the LTD benefit, requiring additional liability components for LTD participants who leave LTD status for another (e.g., active service, disability retirement, normal retirement). In CMC's opinion, the current approach provides reasonable results using a simple approach.

CMC has assumed the life insurance coverage for those members in LTD status is not insured through Minnesota Life in exchange for a premium (like actives), but instead, the life insurance benefit is self-insured and paid from the trust (as it is with retirees). VRS has verified that this assumption is correct.

Mercer comment: Best actuarial practice would be to perform a separate valuation study of the Accidental Death & Dismemberment (AD&D), life insurance and Waiver of Premium (WOP) experience periodically to assure that experience patterns and unique valuation issues are appropriately identified and addressed. The periodic actuarial valuation should also be performed on the disability program due to unique benefit features which are not part of the retirement studies.

Cavanaugh Macdonald comment: Based upon CMC's understanding of the AD&D plan, with two exceptions, AD&D is not an OPEB benefit (Code of Virginia Section 51.1-505.E).

> *All accidental death and dismemberment insurance on an employee shall cease upon the earliest of (i) his separation from service, (ii) his failure to pay, in the manner prescribed by the Board, the contribution required for the first 24 months of leave without pay, (iii) if the employee has not returned to pay status, the expiration of 24 months of leave without pay, or (iv) his retirement.*

Exception One
For those employees participating in VSDP, AD&D coverage continues at the commencement of disabled status. A liability for this benefit is not currently being valued by CMC. To properly value this benefit, an assumption regarding the excess AD&D payment would need to be developed and applied to the life insurance benefit currently valued, as the AD&D benefit is paid directly from the trust (as it is with retirees). Recent history indicates a very small number of AD&D payments and the benefit's impact on the liability is viewed to be de minimus.

Exception Two
An OPEB liability may exist for the AD&D benefit provided by those employers who choose to provide the benefit at no cost during the 24-month period an employee is in Leave Without Pay (LWOP) status. To properly value this benefit, an assumption regarding the excess AD&D payment would need to be developed and applied to the life insurance benefit, as the AD&D benefit is paid directly from the trust (as it is with retirees). Additionally, the valuation of this liability would require additional information from the System in the form of those employer/LWOP status code combinations for which the employer pays the cost of coverage. Recent history indicates a very small number of AD&D payments and the benefit's impact on the liability is viewed to be de minimus.

Mercer comment: The actual cost to the program is the death benefit plus costs charged by the insurer. It is unclear whether insurer fees and expenses have been factored into the valuation.

Cavanaugh Macdonald comment: CMC agrees and suggests these fees be included in the normal cost in the same manner as expenses for the LTD program.

Actuarial assumptions for Virginia Sickness and Disability Program (VSDP)

Disability termination rates and Rates of withdrawal
Mercer comment: Mercer's comments generally recommend that actual VSDP experience be explicitly used in the actuarial valuation.

Cavanaugh Macdonald comment: With respect to the VSDP actuarial assumptions, CMC has used experience data, if it is applicable and available (e.g., rates of disability based upon the System's retirement experience). For assumptions specific to VSDP, there was a discussion with the System regarding conducting an experience study. Given what was felt to be a lack of credible experience, as the VSDP program is fairly new, the approach taken was to perform an experience study in the future, once credible experience data was available.

Plan expenses
Mercer comment: There is no specific identified assumption in the LTD valuation for expenses of program administration for open claims. The expense for claims adjudication and administration for open claims should be included in the valuation with an explicit disclosure of the assumption.

Cavanaugh Macdonald comment: TPA and System administrative expenses totaling $9,080,856.94 were included in the normal cost. The inclusion of administrative fees in the normal cost rate is consistent with the methodology used in past valuations. CMC agrees the disclosure of this approach should be included in the report's language.

Other assumptions/considerations

Mercer comment: The liability for those members in the waiting period is not a standard actuarial calculation used by LTD insurers and is highly dependent upon the prior 12 months experience. This methodology should be periodically reviewed to determine the consistency of results produced with that of more typical LTD valuation technique employed by group LTD insurers.

Cavanaugh Macdonald comment: Under GASB 43/45, the liability for current actives needs to be accrued as well. The traditional method of determining the IBNR liability is not explicitly used because the employees to whom the IBNR applies are classified as active employees in the valuation. The active component of the liability would be for any potential disability in the future. As a result, the traditional IBNR would be included, implicitly, within the current active employee liability. The use of the prior twelve months experience is included as additional margin and is consistent with past practice.

Mercer comment: There is a table that determines "offsets for active members". The valuation report does not derive the table or explain where the adjustments originate. Results should also be compared to emerging experience. The table is a major assumption that needs periodic reconciliation and studies of experience to justify its long term use.

Cavanaugh Macdonald comment: The offsets used are consistent with the rates used in past valuations. These rates were reviewed by CMC against recent plan experience for reasonableness. CMC agrees the disclosure of their basis should be included in future reports.

Mercer comment: The report is silent on how medical benefits for LTD claimants are valued. If these benefits are separately valued under another program and not part of the liabilities being valued, that should be disclosed.

Cavanaugh Macdonald comment: CMC agrees language should be added to the report disclosing the fact Health Insurance Credits and Life Insurance benefits are valued separately under those programs. While not specifically addressed by Mercer's report, CMC believes the work-related disability benefit under 51.1-1132.C should be addressed. Under this provision, the

Commonwealth continues to pay the employer's share of the health care premium until coverage is provided under the Line of Duty Act.

Mercer comment: Pre-retirement mortality is assumed to follow the 1994 Group Annuity Mortality with an age setback. Given the credibility associated with VRS, the actual mortality rate for active employees should be contrasted with the valuation assumption for validation purposes periodically.

Cavanaugh Macdonald comment: CMC believes the experience of this group does not differ greatly in terms of the economic and demographic assumptions shared with the pension plan.

Mercer comment: There is a table which highlights disability rates for selected ages (page 15 of report). How do these percentages compare to actual VRS experience? Again, given the credibility of VRS experience, actual data over a full economic cycle should be used in lieu of assumptions.

Cavanaugh Macdonald comment: CMC believes the experience of this group does not differ greatly in terms of the economic and demographic assumptions shared with the pension plan.

Mercer comment: Where the LTD has a cost of living adjustment (COLA) benefit, the calculation methodology should be disclosed and the COLA adjustment highlighted.

Cavanaugh Macdonald comment: The COLA assumption is 2.5% per year, and CMC agrees this assumption should be added to the report.

Review of actuarial reports

Mercer comment: It should be noted that the local reports contained a few discrepancies within the summary of actuarial assumptions and methods when compared to the tables provided by Cavanaugh Macdonald.

Cavanaugh Macdonald comment: We agree that the items mentioned should be disclosed in the assumptions section of the reports.

Report of Actuarial Experience

Mercer comment: We do not believe that the report of the actuarial experience study is presented in enough detail that permits another actuary to assess the reasonableness of the conclusions. For example:

- Commentary in the report that reflects the actuary's interpretation of the results could be expanded to include more insight on experience and further explanation of recommended changes.
- There were a number of assumptions not covered by the experience study where a measurement of experience could have been useful. These assumptions include:
  - Percent married assumption
  - Spousal age difference
  - Percentage of disabilities that are service-related
  - Percentage of deaths that are service-related
  - Optional form of payment elected upon retirement
  - "Offsets for active members" in sickness and disability plan

Cavanaugh Macdonald comment: CMC will consider these comments for future experience studies and will work with VRS to collect the data to analyze other assumptions not covered by the most recent experience study.

Review of actuarial computations—Virginia Retirement System

Mercer comment: Death Benefit: The summary of actuarial assumptions in the valuation reports does not mention the service related death assumption of 14% for service related deaths or the 86% applied to non-service related deaths, but these factors are applied to the death decrements. This should be added to actuarial assumptions.

Cavanaugh Macdonald comment: Complete assumptions are provided in previous comment above on page 3. We agree the assumptions should be disclosed in the valuation reports.

Mercer comment: Teacher Withdrawal Rates: The valuation report states that greater than or equal to age 65 rates are the same as those assumed at age 60; however, the experience study report suggested that these rates equal 0 for all service groups.

Cavanaugh Macdonald comment: In the experience study report we made a typographical mistake by showing withdrawal rates equal to 0 for ages 65 and above. We corrected the rates for the actuarial valuation.

Mercer comment: Teachers Retirement Rates: The valuation report differs from the suggested table in the experience study for a few ages. The experience study recommended 30% for males ages 67-69 and for females age 68-69. The valuation report uses 20% for males ages 67-69, 25% for females age 68, and 20% for females age 69. The test cases match the valuation report.

Cavanaugh Macdonald comment: The rates in question are those for service greater than 30 years. The rates used in the valuation and shown in the valuation report match the proposed rates shown on page 60 of the experience study report. Looking at page 82 of the experience study report, it appears there was a typographical error in that the previous rates of 30% were inserted for ages 67-69 instead of the proposed rates shown on page 60.

MERCER

MARSH MERCER KROLL
GUY CARPENTER OLIVER WYMAN

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