Milliman

Los Angeles Fire and Police Pensions

Actuarial Audit of June 30, 2018 Valuation

Prepared by:

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Issued July 18, 2019

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July 18, 2019

Board of Commissioners
Los Angeles Fire and Police Pensions
701 E 3rd Street, #200
Los Angeles, CA 90013

Re: Actuarial Audit of June 30, 2018 Valuation

Dear Board Members:

The enclosed report presents the findings from our review and full replication audit of the June 30, 2018 actuarial valuation and our high-level review of the most recent actuarial experience study performed by Segal for Los Angeles Fire and Police Pensions (LAFPP). An overview of our major findings is included in the Executive Summary section of the report. More detailed commentary on our review process is included in the latter sections.

All calculations are based on LAFPP's plan provisions and the actuarial assumptions adopted by the Board of Commissioners. The plan provisions, assumptions and methods used are the same as those disclosed in Segal's June 30, 2018 valuation report. As discussed in our report, we believe the package of actuarial assumptions and methods is reasonable (taking into account the experience of LAFPP and reasonable expectations). Nevertheless, the emerging costs will vary from those presented in this report to the extent that actual experience differs from that projected by the actuarial assumptions. Future actuarial measurements may differ significantly from the current measurements presented in this report due to factors such as the following:

- Plan experience differing from the actuarial assumptions,
- Future changes in the actuarial assumptions,
- Increases or decreases expected as part of the natural operation of the methodology used for these measurements (such as potential additional contribution requirements due to changes in the Plan's funded status), and
- Changes in the plan provisions or accounting standards.

Due to the scope of this assignment, we did not perform an analysis of the potential range of such measurements.

In preparing this report, we relied, without audit, on information (some oral and some in writing) supplied by LAFPP's staff and by Segal. This information includes, but is not limited to, statutory provisions, employee data, and financial information. In our examination of these data, we have found them to be reasonably consistent and comparable with data used for other purposes. Since the audit results are dependent on the integrity of the data supplied, the results can be expected to differ if the underlying data is incomplete or missing. It should be noted that if any data or other information is inaccurate or incomplete, our calculations may need to be revised.

On the basis of the foregoing, we hereby certify that, to the best of our knowledge and belief, this report is complete and accurate and has been prepared in accordance with generally recognized and accepted actuarial principles and practices which are consistent with the Actuarial Standards of Practice promulgated by the

Actuarial Standards Board and the applicable Code of Professional Conduct, amplifying Opinions, and supporting Recommendations of the American Academy of Actuaries.

Milliman's work product was prepared exclusively for LAFPP for a specific and limited purpose. It is a complex, technical analysis that assumes a high level of knowledge concerning LAFPP's operations, and uses LAFPP's data, which Milliman has not audited. It is not for the use or benefit of any third party for any purpose. Any third party recipient of Milliman's work product who desires professional guidance should not rely upon Milliman's work product, but should engage qualified professionals for advice appropriate to its own specific needs.

The consultants who worked on this assignment are pension actuaries. Milliman's advice is not intended to be a substitute for qualified legal or accounting counsel.

The signing actuaries are independent of the plan sponsors. We are not aware of any relationship that would impair the objectivity of our work.

We would like to express our appreciation to both the Segal and LAFPP staff for their assistance in supplying the data and information on which this report is based.

We are members of the American Academy of Actuaries and meet the Qualification Standards of the American Academy of Actuaries to render the actuarial opinion contained herein.

We respectfully submit the following report, and we look forward to discussing it with you.

Sincerely,

Matt Larrabee, FSA, EA, MAAA
Principal and Consulting Actuary

Robert Schmidt, FSA, EA, MAAA
Principal and Consulting Actuary

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Section 1 Summary of the Findings

Purpose and Scope of the Actuarial Audit

In this actuarial audit, we independently calculate the key results from the June 30, 2018 actuarial valuation of retirement and OPEB benefits and review the actuarial assumptions used in the valuation. The purpose of this audit is to provide an opinion regarding the reasonableness and accuracy of the actuarial assumptions, actuarial cost methods, valuation results and contribution rates. The following tasks were performed in this audit:

- ✓ Evaluation of the data used in the valuation,
- ✓ Full independent replication of the key valuation results,
- ✓ Confirmation that the actuarial assumptions are reasonable and appropriate, and
- ✓ Analysis of valuation results and reconciliation of material differences (if any).

Audit Conclusion

Actuarial Valuation

Based upon our review of the June 30, 2018 actuarial valuation, we found the valuation results were reasonable. The following table shows that our independent calculations are close to those determined by Segal based on the methods and assumptions used in the valuation. Given the myriad of calculations and differences in actuarial software between firms, we would not expect to match Segal's calculations exactly; however, the overall results indicate a high level of consistency.

Note that we have shown the employer contribution rate and funded ratio for all LAFPP tiers in aggregate. For key measurements, we developed comparisons for each tier in Section 4 of this report. The comparison shown below is based on a contribution rate payable biweekly throughout the year.

Pension Contribution Rate and Funded Ratio		
	Segal	Milliman
Employer Contribution Rate	35.49%	35.55%
Funded Ratio	92.86%	92.92%

OPEB Contribution Rate and Funded Ratio		
	Segal	Milliman
Employer Contribution Rate	13.23%	13.26%
Funded Ratio	51.28%	51.24%

Membership Data

We performed tests on both the raw data supplied by LAFPP staff and the processed data used by Segal in the valuation. Based on this review, we feel the individual member data used is appropriate and complete.

Statement of Key Findings

Actuarial Value of Assets

We have reviewed the calculation of the actuarial value of assets used in the June 30, 2018 valuation. We found the calculations to be reasonable and the methodology to be appropriate and in compliance with Actuarial Standards of Practice.

Actuarial Liabilities and Normal Cost

We independently calculated the normal cost and liabilities of LAFPP. We found that all significant benefit provisions were accounted for in an appropriate manner, the actuarial assumptions and methods are being applied correctly, and that our total liabilities matched those calculated by Segal closely.

A summary of the Actuarial Accrued Liability (AAL) and employer normal cost is shown in the tables below. All dollar amounts are in millions.

Pension Actuarial Accrued Liability and Normal Cost	Segal	Milliman	Ratio Segal/Milliman
Actuarial Accrued Liability	$21,364.8	$21,352.5	100.1%
Employer Normal Cost	$290.5	$292.3	99.4%

OPEB Actuarial Accrued Liability and Normal Cost	Segal	Milliman	Ratio Segal/Milliman
Actuarial Accrued Liability	$3,547.8	$3,550.6	99.9%
Employer Normal Cost	$71.3	$71.4	99.9%

Member Contribution Rates

We reviewed the expected member contribution rates used to determine the employer portion of the normal cost and found them to be accurate and consistent with governing plan rules.

Funding

We reviewed the application of the funding method and find it is reasonable and that it meets generally accepted actuarial standards. Based on the system's funding methods and assumptions, we believe the employer contribution rates are appropriately calculated. A comparison of the aggregate employer contribution rate and the funded ratio calculated by Segal and Milliman is shown earlier in this section. Both metrics easily match within a reasonable tolerance.

Actuarial Assumptions (Economic)

We reviewed the economic assumptions used in the June 30, 2018 valuation and found them to be reasonable. The economic assumptions used in the June 30, 2018 actuarial valuation were adopted based on Segal's actuarial experience study completed in May 2017.

We have the following comments regarding the economic assumptions on the pension valuation:

- We strongly support a recommendation to decrease the inflation assumption from 3.00% to 2.75% in future valuations. We would also support a recommendation to further decrease the assumption to 2.60% or lower. Our endorsement of a 2.60% inflation assumption in future valuations is based on relevant forward-looking outlooks for inflation provided by investment market data, investment consultants and the Social Security Administration.

- A decrease in the inflation assumption would also affect the assumptions for investment return, COLA and potentially salary increases for individual members.
- Other than changes in future valuations to inflation and other assumptions associated with it as noted above, the overall package of economic assumptions is in line with what we recommend to our retained clients.

We have the following comments regarding the economic assumptions on the OPEB valuation:

- The LAFPP maximum subsidy trend for 2017, 2018, and 2019 is similar to our data sources. In addition, our medical trend recommendations for the first two years are slightly lower than Segal's. This is illustrated in the tables below.

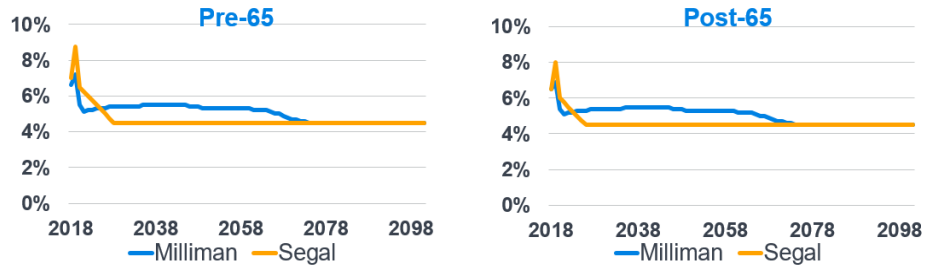
Pre-65		July 2017	July 2018	July 2019	July 2020
Segal	Assumed 6/30/2018 valuation trend			7.0%	8.8%
Milliman	Recommended 6/30/2018 valuation trend			6.6%	7.2%
Actual	LAFPP maximum subsidy	6.0%	6.0%	5.5%	
Actual	Large public LA area	4% - 5%	4% - 6%		
Actual	Milliman LA area active/pre-65	2%	9%		

Post-65		July 2017	July 2018	July 2019	July 2020
Segal	Assumed 6/30/2018 valuation trend			6.5%	8.0%
Milliman	Recommended 6/30/2018 valuation trend			6.5%	6.9%
Actual	LAFPP maximum subsidy	7.2%	0.0%		
Actual	Large public LA area	4% - 5%	4% - 6%		

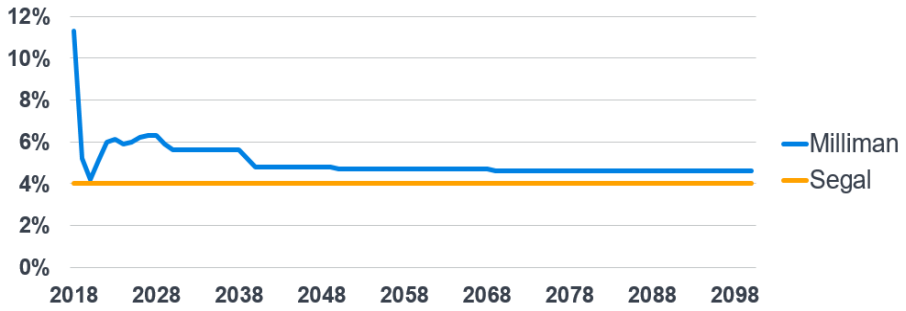
- After the first two years, our standard approach to medical trend is to use the Society of Actuaries long-term trend model[1] as the basis for our estimates. This model uses macroeconomic factors to estimate long-term medical trends based on the percentage of the U.S. GDP that is spent on healthcare. We make adjustments for administrative costs, population aging, and Affordable Care Act (ACA) related fees in the model. The model assumes that U.S. health care spending increases from 2017 levels of 17.9% of GDP to 30.6% of GDP by 2072. After that, U.S. health care spending is assumed to be a constant 30.6% of GDP. Segal's long-term trend assumption reaches the ultimate level much earlier, in 2028, at approximately 22% of GDP.

  The difference between the Segal and Milliman recommended trends are illustrated in the charts below.

[1] See this link: https://www.soa.org/resources/research-reports/2016/research-hlthcare-trends



- For Medicare Part B premium trends, Segal used a flat 4% per year with the 2018 calendar year standard Part B premium of $134 per month. Our recommended Part B premium trends are higher than Segal's, because we take the following three factors into account. First, we note that Medicare Part B premiums change each January 1. Since the valuation date is June 30, 2018, an adjustment for the premium increase halfway through the valuation year should be included in the trend assumption. Second, we note that the Part B premium for LAFPP members was approximately $116 per month as of the June 30, 2018 valuation date, and we assume that all beneficiaries will increase to the standard Part B premium in the second year. Third, we use Part B premium projections in the CMS Trustees' Reports to estimate the long-term trend, with adjustments for LAFPP's 3% inflation assumption. The difference between the Segal and Milliman recommended Part B trends are illustrated in the chart below.



- We estimate the impact of the Milliman recommended medical and Part B trends to be a 5.5% increase in OPEB actuarial accrued liability and a 12.1% increase in the actuarially determined OPEB contribution rate.

- The ACA excise tax (aka "Cadillac Tax") was originally scheduled to be effective in 2018, but has been delayed until 2022. Our understanding of standard practice is to include the ACA excise tax in OPEB accounting and funding liabilities. The excise tax is being included in the GASB accounting results, which we agree with, but is not included in the funding calculations that determine contribution rates. Since the excise tax could apply in the future years under current law and the tax's applicability is beyond LAFPP's control, we recommend at least including a sensitivity analysis of the impact on the funding of the liabilities in future valuation reports.

Actuarial Assumptions (Demographic)

We conducted a high-level review of the analysis and recommendations from the most recent actuarial experience study. Based on this review, we believe the demographic assumptions used in the June 30, 2018 valuation are reasonable. In future valuations, we would recommend adoption of the "Pub-2010" public safety above median mortality tables. Those tables were published in January 2019 by the Society of Actuaries, which was subsequent to the completion of the most recent LAFPP experience study.

Reports

Segal's valuation report meets the applicable Actuarial Standards of Practice. We felt that the amount of disclosure included in the report was generally commensurate with the complexity of LAFPP. We are recommending a few changes be made to subsequent valuations that will provide better disclosure, and we have added some other comments for consideration in future valuation reports.

Recommendations and Other Items to Consider in the Future

Recommended Changes in Future Valuations

- ✓ We recommend that Segal provide more documentation as to the basis for their assumed health cost variation by age (referred to as the "aging assumption") in the OPEB valuation.
- ✓ In Segal's OPEB valuation, for some purposes they apply aging assumption to the maximum subsidy and for other purposes they do not. We recommend more documentation in the valuation of Segal's approach.
- ✓ A clarification in assumption approaches is warranted. The DROP probability is stated as 95% on page 39 of the OPEB funding report, but we understand per discussion with Segal that 100% is being used.
- ✓ We support Segal's recent recommendation to reduce the inflation assumption from 3.00% to 2.75%, and would further recommend that the investment return be reviewed in connection with this change.
- ✓ We suggest adoption of "Pub-2010" mortality tables and generational mortality improvement scales in future valuations, as detailed in Section 7.

Changes to be Considered in Future Valuations

We recommend that Segal and LAFPP consider the following for future OPEB valuations and experience studies:

- ✓ Include child claim cost load in future spouse claims.
- ✓ Change the assumption for beneficiary benefit start date to be based on the date the deceased retiree would have reached 55/65 rather than the beneficiary's age 55/65.
- ✓ Add more specificity in assumption descriptions and subsidy approaches. Periodically monitor the dental subsidy approximation and the approach for beneficiaries of vested terminated members.
- ✓ Review the timing of actual LAFPP salary increases and compare against the current assumed salary increase methodology, as detailed in Section 7.

Section 2 Membership Data

Audit Conclusion

We performed tests on both the raw data supplied by LAFPP staff and the processed data used by Segal in the valuation. Based on this review, we feel the individual member data used is appropriate and complete.

Comments

Overall, the data process appears to be thorough and accurate. We would add the following comments:

- Raw Data: We were provided with the same data that was given by LAFPP staff to Segal for use in the actuarial valuation.

  Completeness: The data contained all the necessary fields to perform the actuarial valuation.

  Quality: Although we did not audit the data at the source, we performed some independent checks to confirm the overall reasonableness of the data. We compared the total retiree, beneficiary, and DROP benefit payment amounts in the LAFPP data with the actual pension benefit payments made, as reported in LAFPP's financial statements. We also compared the total active member contributions in LAFPP's financial statements with estimated contributions based on the LAFPP data. We estimated contributions using the actual compensation rates reported in the data and the applicable contribution rates for each Tier. Based on this analysis, we found the data to be reasonable.

- Parallel Data Processing: We performed independent edits on the raw data and then compared our results with the valuation data used by Segal. We found our results to be very consistent.

  Our results did not match exactly; however, this is understandable since Segal, as the retained actuary, has more extensive data editing procedures. Overall, each key data component matched within an acceptable level, and we believe the individual member data used by Segal was appropriate for valuation purposes.

Section 3 Actuarial Value of Assets

Audit Conclusion

We have reviewed the calculation of the actuarial value of assets used in the June 30, 2018 valuation. We found the calculations to be reasonable and the methodology to be appropriate and in compliance with actuarial standards of practice.

Comments

The method used to determine the actuarial value of assets systematically recognizes single-year investment gains and losses over a seven year period.

As of this valuation, the actuarial value of assets is lower than the market value of assets due to net unrecognized investment gains over the past seven years.

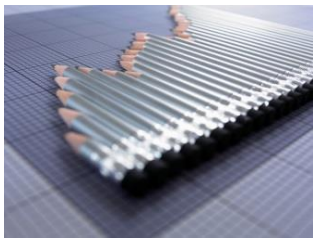
We matched the calculation of the actuarial value of assets and found it to be a reasonable methodology.

A five-year smoothing method is the most commonly used among large public retirement systems. We believe the use of an asset smoothing method is appropriate, and we generally recommend this to our clients, particularly in systems where contribution rates change annually. We believe a seven-year period is reasonable.

The current asset method applies a 60%/140% corridor limiting the actuarial value of assets. The purpose of a corridor is to keep the actuarial value of assets within a reasonable range of the market value. The California Actuarial Advisory Panel (CAAP) has a paper on model actuarial funding policies which include guidelines for asset smoothing. LAFPP's method of seven-year smoothing with a 60%/140% corridor falls in the "Model Practices" category (highest level) under these guidelines.

Section 4 Actuarial Liabilities

Audit Conclusion



We independently calculated the present value of projected benefits, actuarial accrued liability, and normal cost of LAFPP. We found that all significant benefit provisions were accounted for in an accurate manner, the actuarial assumptions and methods are being applied correctly, and that the above-mentioned metrics calculated by Milliman matched those calculated by Segal closely.

Comments

We independently calculated the liabilities for all members based on the following:

Data: We used the same data used by Segal in its valuation. As discussed in Section 2 of this report, we confirmed that this data was consistent with the data provided by LAFPP staff.

Assumptions: We used the assumptions disclosed in the June 30, 2018 actuarial valuation report. This information was provided to us electronically by Segal. We confirmed the assumptions were consistent with those adopted based on the recent experience study report.

Methods: We used the actuarial methods disclosed in the June 30, 2018 actuarial valuation report. This was supplemented by discussions between Segal and Milliman on the technical application of these methods.

Benefits: We obtained this information from the LAFPP website, information provided to us by LAFPP, and the relevant law.

We then performed a full actuarial audit replication of Segal's valuation as of June 30, 2018. Based on this valuation, we completed a detailed comparison of the actuarial accrued liability (AAL) computed in our independent valuation and the amounts reported by Segal.

Exhibit 4-1 shows the present value of projected benefits by tier, and also by employer for the pension program and by tier for the OPEB program. All results were reasonable. Our calculated values match closely with those reported by Segal, and were well inside acceptable tolerances for differences between firms in actuarial calculations.

Exhibit 4-1
Pension Present Value of Projected Benefits by Tier
(Dollar Amounts in Millions)

Pension Present Value of Projected Benefits by Tier and Employer	Segal	Milliman	Ratio Segal/Milliman
Tier 1	$81.5	$81.5	100.0%
Tier 2	$5,047.8	$5,046.1	100.0%
Tier 3	$1,323.5	$1,324.2	99.9%
Tier 4	$636.7	$636.7	100.0%
Tier 5, excluding Harbor and Airport	$17,270.2	$17,274.6	100.0%
Tier 6, excluding Harbor and Airport	$1,394.5	$1,394.7	100.0%
Total, excluding Harbor and Airport	$25,754.2	$25,757.9	100.0%
Harbor Port Police Tier 5	$110.5	$110.6	100.0%
Harbor Port Police Tier 6	$10.3	$10.3	100.0%
Total Harbor Port Police	$120.8	$120.9	100.0%
Airport Police Officers Tier 6	$27.3	$27.3	100.0%
Total Present Value of Benefits	$25,902.4	$25,906.1	100.0%

OPEB Present Value of Projected Benefits by Tier	Segal	Milliman	Ratio Segal/Milliman
Tier 1	$12.0	$11.8	101.4%
Tier 2	$927.0	$940.4	98.6%
Tier 3	$246.5	$243.0	101.4%
Tier 4	$122.4	$120.3	101.8%
Tier 5	$2,665.1	$2,663.9	100.0%
Tier 6	$347.6	$348.9	99.6%
Total Present Value of Benefits	$4,320.6	$4,328.4	99.8%

Exhibit 4-2 shows the actuarial accrued liability by tier. The results for each group were reasonable, and our calculated values match closely with those reported by Segal.

Exhibit 4-2
Actuarial Accrued Liability by Tier
(Dollar Amounts in Millions)

Pension Actuarial Accrued Liability by Tier			
	Segal	Milliman	Ratio Segal/Milliman
Tier 1	$81.5	$81.5	100.0%
Tier 2	$5,047.1	$5,045.4	100.0%
Tier 3	$1,196.6	$1,197.5	99.9%
Tier 4	$586.6	$586.9	99.9%
Tier 5	$14,290.4	$14,286.0	100.0%
Tier 6	$162.6	$156.1	104.2%
Total Actuarial Accrued Liability	**$21,364.8**	**$21,353.4**	**100.1%**

OPEB Actuarial Accrued Liability by Tier			
	Segal	Milliman	Ratio Segal/Milliman
Tier 1	$12.0	$11.8	101.4%
Tier 2	$926.9	$940.4	98.6%
Tier 3	$224.5	$219.9	102.1%
Tier 4	$114.2	$112.0	102.0%
Tier 5	$2,231.3	$2,225.5	100.3%
Tier 6	$38.9	$41.0	94.8%
Total Actuarial Accrued Liability	$3,547.8	$3,550.6	99.9%

Note that there will always be differences in the calculated liabilities when different software is used by different actuaries; however, the results should not deviate significantly.

Our audit provides a high level of assurance that the results of the valuation reasonably reflect the aggregate liabilities of LAFPP based on the assumptions and methods.

In addition to reviewing the liabilities in total, we also received selected results from a number of individuals included in the valuation. We were able to match closely on these individuals.

We also looked at the normal cost (the contribution cost of projected future benefits allocated to the upcoming year of service for each active member). In the many audits we have performed, this is usually the area where we see the greatest differences. Although there were some modest differences, as seen in Exhibit 4-3, the overall match was close, and the observed deviations fell well within acceptable tolerances.

Based on these results, we feel that Segal's calculated normal cost amounts are reasonable.

Exhibit 4-3

Comparison of Normal Cost Calculations
(Dollar Amounts in Millions)

Pension Active Member Normal Cost	Segal	Milliman	Ratio Segal/Milliman
Active members not in DROP	$386.2	$388.4	99.4%
Active members in DROP	$55.3	$55.0	100.6%
Total Normal Cost	$441.6	$443.4	99.6%
Expected member contributions, discounted to beginning of year	$151.1	$151.1	100.0%
Employer Normal Cost	$290.5	$292.3	99.4%

OPEB Active Member Normal Cost	Segal	Milliman	Ratio Segal/Milliman
Employer Normal Cost	$71.3	$71.4	99.9%

Section 5 Funding

Audit Conclusion

We reviewed the application of the funding method and find it is reasonable and that it meets generally accepted actuarial standards. Based on the system's funding methods and assumptions, we believe the employer contribution rates are appropriately calculated.

Comments

We independently calculated the employer contribution rates based on our replication valuation. We found that all rates were reasonable and matched closely to Segal's calculation in total. A summary comparison of our results is shown in Section 1 of this report. We also reviewed contribution by tier.

Contribution Adequacy

The Conference of Consulting Actuaries Public Plans Community (CCA PPC) has published a paper on model actuarial funding policies which includes guidance for pension funding. A method that funds new UAAL layers due for experience gains and losses over closed 20-year periods falls in the Model Practices category in that area.

Actuarial Cost Method

LAFPP uses the Entry Age Actuarial Cost Method. We feel it is appropriate for valuing costs and liabilities and is the cost method that we usually recommend.

Purpose of a Cost Method: The purpose of any cost method is to allocate the cost of future benefits to specific time periods. Most public plans follow one of a group of generally accepted funding methods, which allocate the cost over the members' working years. In this way, benefits are financed during the time in which services are provided if actual future experience matches the actuarial assumptions and actuarially determined contributions are made each year.

Most Common Public Plan Cost Method (Entry Age): The most common cost method used by public plans is the Entry Age Actuarial Cost Method. The focus of the Entry Age Cost Method is the level allocation of costs over the member's working lifetime. For a public plan, this means current taxpayers pay their fair share of the pensions of the public employees who are currently providing services. Current taxpayers are not expected to pay for services received by a past generation, nor are they expected to pay for the services that will be received by a future generation. The cost method does not anticipate increases or decreases in allocated costs.

The Public Fund Survey shows that about 70% of the retirement systems surveyed are using the Entry Age Cost Method.

For GASB Statements Nos. 67, 68, 74, and 75 the Entry Age Actuarial Cost Method is the only permissible cost method for financial reporting purposes.

The Entry Age Actuarial Cost Method with separate normal cost rates calculated for each plan falls in the "Model Practice" category under the Actuarial Funding Policies and Practices for Public Pension Plans guidelines issued by the California Actuarial Advisory Panel.

Section 6 Actuarial Assumptions (Economic)

Audit Conclusion

We reviewed the economic assumptions used in the June 30, 2018 valuation and found them to be reasonable. We do have recommendations for some changes to economic assumptions in future valuations. The economic assumptions used were adopted based on Segal's actuarial experience study completed in 2017.

We have the following comments regarding the economic assumptions in the experience study:

Comments

- We support Segal's recent recommendation to decrease the inflation assumption in future valuations from 3.00% to 2.75%. Additionally, we would support a decrease in the inflation assumption to 2.60% or lower. Our opinion on a 2.60% recommendation is based on relevant forward-looking data produced by the Social Security Administration, TIPS markets, investment consultants, and Milliman.
- We would also support reevaluating the investment return assumption in future valuations in connection with the proposed decrease to the inflation assumption.
- With the exceptions noted above, the overall package of economic assumptions is otherwise in line with what we recommend to our retained clients.

The purpose of the actuarial valuation is to analyze the resources needed to meet the current and future obligations of the system. To provide the best estimate of the long-term funded status of the system, the actuarial valuation should be predicated on methods and assumptions that will estimate the future obligations of the system in a reasonable manner.

An actuarial valuation uses various methods and two different types of assumptions: economic and demographic. Economic assumptions are related to the general economy and its long-term impact on the system, or to the operation of the system itself. Demographic assumptions are based on the emergence of the specific experience of the system's members.

This section of the report will focus on the economic assumptions. The following section will address the demographic assumptions. Our scope for this assignment was to provide a high-level critical review of assumptions. For a large system, the demographic assumptions for retirement, disability incidence, and pre-retirement termination of employment are customarily set via an experience study review of system-specific recent observed experience. A replication review of Segal's experience study calculations was beyond the scope of our engagement, so the technical calculations underlying the demographic assumptions noted above were not reviewed. We did conduct a high-level review to confirm that the demographic assumptions mentioned above are logically structured and appear reasonable upon high-level inspection.

Actuarial Standard of Practice No. 27: Selection of Economic Assumptions

The Actuarial Standards Board has adopted Actuarial Standard of Practice (ASOP) No. 27, *Selection of Economic Assumptions for Measuring Pension Obligations*. This standard provides guidance to actuaries giving advice on selecting economic assumptions for measuring obligations under defined benefit plans, such as LAFPP.

As actual future economic experience cannot be known precisely in advance, the actuary must estimate possible future economic outcomes. These estimates are based on a mixture of past experience, future expectations, and professional judgment. The actuary should consider a number of factors, including the purpose and nature of the measurement, and, if appropriate, recent and long-term historical economic data. ASOP 27 explicitly advises the actuary not to give undue weight to recent experience.

Each economic assumption should individually satisfy this standard. Furthermore, with respect to any particular valuation, each economic assumption should be consistent with every other economic assumption over the measurement period.

After completing the selection process, the actuary should review the set of economic assumptions for consistency. This may entail the actuary using the same inflation component in each of the economic assumptions selected.

An actuary's estimate with respect to a particular measurement of benefit obligations may change from time to time due to changing conditions or emerging plan experience. Even if assumptions are not changed, we believe that the actuary should be satisfied that each of the economic assumptions selected for a particular measurement complies with Actuarial Standard of Practice No. 27, unless that assumption has been prescribed by a governance entity with authority to do so.

Economic Assumptions

Based on the information and economic environment present as of the date of Segal's analysis, we believe the economic assumptions used by Segal in the June 30, 2018 actuarial valuation are reasonable. We understand that a 0.25% reduction in inflation and investment return assumptions has been recommended by Segal for subsequent valuations, and we strongly endorse that recommendation for future valuations.

Of course, measured liabilities and normal cost are directly impacted by these important assumptions. The most critical assumption in determining the present value of benefits is the total investment return assumption.

In our opinion, the package of economic assumptions recommended in the 2018 actuarial experience study was reasonable but we feel that an update to the inflation and investment return assumption should be made in future valuations. The following portion of this report discusses three of the key economic assumptions (inflation, wage growth, and investment rate of return).

Inflation

Use in the Valuation: Inflation, as referred to here, means price inflation. The inflation assumption has an indirect impact on the results of the actuarial valuation through the development of the assumptions for investment return, general wage increases, payroll increase, and the cost-of-living adjustments for current and future retirees and survivors.

There is expected to be a long-term relationship between inflation and the investment return assumption. The basic principle is that the investors demand a "real return" – the excess of actual investment returns over inflation. If inflation

rates are expected to be high, investors will demand expected investment returns that are also expected to be high enough to exceed inflation, while lower inflation rates will result in lower demanded expected investment returns, at least in the long run.

Historical Perspective: The historical data for inflation referenced by Segal in its experience study is the national Consumer Price Index, US City Average, All Urban Consumers (CPI-U) as published by the Bureau of Labor Statistics.

There are numerous ways to review historical data, with significantly differing results. Segal used 15-year and 30-year moving averages for its summary of historical CPI. Using moving averages, in particular for 30-year periods, gives **significantly** more weight to old information than it gives to recent and more relevant current information. For instance, it includes 30-year-old information 30 times, while only considering the past year's information for one of the 30-year periods. We believe this approach overstates the importance of historical data. That said, Segal's recommendation of a 3.00% to 2.75% decrease in future valuations would keep the inflation assumption as reasonable.

Forecasts of Inflation: Since the U.S. Treasury started issuing inflation indexed bonds (TIPS), it is possible to determine the approximate rate of inflation anticipated by the financial markets by comparing the yields on inflation TIPS with traditional Treasury bonds. As of the end of 2018, market prices suggested investors expected inflation to be about 1.8% over the next 30 years.

Most investment consultants and economists' forecasts are in the low-to-mid 2% range, but look at shorter time horizons than is appropriate for an actuarial valuation. To consider a longer time frame, we look at the expected increase in the CPI by the Office of the Chief Actuary for the Social Security Administration. In the most recent Social Security Trustees Report, the projected ultimate average annual CPI increase under intermediate cost assumptions is 2.60%.

Conclusion: For future valuations, we believe that a 2.75% assumption is reasonable for an actuarial valuation. As noted, long-term forecasts are for a somewhat lower levels of inflation, so we feel that the recent recommendation to change from 3.00% to 2.75% is warranted. We would also support a recommendation to further decrease the assumption to 2.60% or lower. This assumption should continue to be monitored in the future.

General Wage Growth

Use in the Valuation: Estimates of future salaries are based on two types of assumptions. Rates of increase in the general wage level of the membership are directly related to inflation, while individual salary increases due to promotion and longevity (referred to as the merit scale) occur even in the absence of inflation. This section will address the general wage growth assumption (price inflation plus productivity increases). The merit scale is discussed in Section 7 of this report (demographic assumptions).

The current wage growth assumption is 0.50% above the price inflation rate. This meant an assumption of 3.50% for the June 30, 2018 actuarial valuation, which would decrease to 3.25% with the recently recommended 0.25% decrease to the inflation assumption. Note that the growth includes increases in wages due to productivity as discussed below.

Historical Perspective: As with inflation, historical measures for general wage growth vary widely depending upon the data source, consideration of mean vs. median, and how far back it is measured. We have used statistics from the Social Security Administration on the National Average Wage. Using this data implies real wage growth of about 0.65% over the past 40 years.

Forecasts for Future Wage Growth: Wage inflation has been projected by the Office of the Chief Actuary of the Social Security Administration. In the most Trustees Report, the long-term ultimate annual increase in the National Average Wage was estimated to be 1.2% higher than the Social Security intermediate ultimate inflation assumption of 2.6% per year.

Conclusion: We believe that the current estimate of 0.50% is a reasonable estimate of future real wage growth.

Payroll Increase Assumption

For most tiers, the UAAL is amortized as a level percentage of payroll in determining contribution rates as a percentage of pay. The current payroll increase assumption is equal to the general wage growth assumption. It is our general recommendation to set these two assumptions equal, unless there is a specific circumstance that would call for an alternative assumption. Therefore, we agree with this approach.

Investment Return (Discount Rate)

Use in the Valuation: The investment return assumption is one of the primary determinants in the calculation of the expected cost of LAFPP's benefits, providing a discount of the estimated future benefit payments to reflect the time value of money. This assumption has a direct impact on the calculations of actuarial accrued liabilities, normal cost, and employer contribution rates.

The discount rate is the rate used to discount future benefit payments into an actuarial present value. The traditional actuarial approach used for public sector funding sets the discount rate equal to the expected investment return. Under current standards set by the GASB, the "discount rate" should reflect the long-term expected rate of return on pension plan investments to the extent that the pension plan's assets are expected to be sufficient to pay benefits.

The current investment return assumption of 7.25% implies a net real rate of return of 4.25% over the current 3.00% inflation assumption. This approach of splitting the net return into separate pieces is called the "building block" method to assumption setting. The recent recommendation to lower the inflation assumption from 3.00% to 2.75% in future valuations should be taken into account when considering future investment return assumptions. If the investment return assumption is not updated in tandem with the inflation assumption, then the implied net real rate of return would increase to 4.50%.

Long-term Expected Investment Return: In the actuarial experience study, Segal uses the average assumed real rate of return from a sample of investment consultants to California public sector plans. That is a reasonable approach and similar to what we often use in our analyses. The average of the investment consultants' assumptions resulted in an average **arithmetic** rate of real (i.e., before inflation) return of 5.11%. After adding the 3.00% for the inflation assumption and subtracting 0.40% for investment expenses and a 0.46% "risk adjustment", Segal calculates an expected return of 7.25%. Segal also calculates a 55% chance (confidence level) of attaining the 7.25% return on an expected value basis over 15 years.

Rather than highlighting arithmetic returns, we recommend focusing boards on median **geometric** returns over a 20 to 30 year period. We find this metric is more understandable and more consistent with how most people would interpret the expected return assumption because there is a 50% probability of annualized returns over the specified time horizon meeting or exceeding the geometric median. By contrast, the probability of annualized returns meeting or exceeding an arithmetic average return drops below 50% after one year, which is why the arithmetic average approach involves a "risk adjustment".

The geometric return is always less than the arithmetic return over a multi-year period. As a simplified example, if the fund doubled in one year (100% return) and then lost half of its value in the next year (-50% return), the arithmetic return would be 25% (average of +100% and -50%); whereas, the geometric return for the period would be 0%, as the fund would be back to where it started at the beginning of the period (multiplying by 2 and then dividing by 2 equals 100%).

Using Milliman's most current capital market outlook assumptions for real returns by asset class in combination with the 3.00% inflation assumption used in the 2018 valuation, we project a median geometric return of between 7.05% and 7.15% over a 20 to 30 year time horizon. The corresponding probability of meeting or exceeding the 7.25% investment return assumption over this time period is between 46% and 48%. Using a 2.75% inflation assumption would reduce the median geometric return by approximately 0.25%, resulting in an estimated range of 6.80% to 6.90% over 20 to 30 years.

We believe the investment return assumption of 7.25% used in the 2018 valuation was reasonable predicated on the 3.00% inflation assumption in that valuation also being reasonable. In other words, we believe the implied 4.25% net real return assumption is reasonable. As noted previously, we strongly support Segal's recommendation to lower the inflation assumption to 2.75% in future valuations. We would support an additional decrease of 0.15% as well in future valuations, for reasons detailed in our discussion of the inflation assumption.

Conclusion: We believe the 2018 valuation's investment return assumption of 7.25% was within a reasonable range based on the 3.00% inflation assumption used in that valuation. Further, we believe the implied 4.25% net real return assumption is reasonable. As noted previously, we support Segal's recommendation to lower the inflation assumption to 2.75%, and as such we would also recommend lowering the expected return assumption in future valuations in light of that proposed update to the outlook for future inflation.

Section 7 Actuarial Assumptions (Demographic and OPEB)

Audit Conclusion

We completed a high-level critical review of the valuation assumptions that were recommended in Segal's most recently completed actuarial experience study. Based on this review, we believe the demographic and OPEB assumptions used in the 2018 valuation are reasonable. However, we believe that the mortality assumptions in future valuations should be updated to reflect new public safety-specific "Pub-2010" mortality tables, which were issued in January 2019. We also recommend adoption of a generational mortality approach in future valuations.

We also suggest considering changes to the OPEB trend and miscellaneous other assumptions elsewhere in this report. We suggest Segal reviews the methodology used to estimate projected payroll based on biweekly pay rates.

Comments

Studies of demographic experience involve a detailed comparison of actual and expected experience. If the actual experience differs significantly from the overall expected results, or if the actual pattern does not follow the expected pattern, new assumptions should be considered. Recommended revisions normally are not an exact representation of the experience during the observation period. Judgment is required to predict future experience from past trends and current evidence, including a determination of the amount of weight to assign to the most recent observed experience.

Independent replication of Segal's detailed calculations of the actual-to-expected ratios was beyond the scope of our requested assignment. We performed a high-level review of the assumptions based on our experience with similar systems, including a review to confirm that the assumptions were comprehensive and logically structured.

Actuarial Standard of Practice No. 35: Selection of Demographic Assumptions

Actuarial Standard of Practice No. 35 (ASOP 35) governs the selection of demographic and other noneconomic assumptions for measuring pension obligations. ASOP 35 states that the actuary should use professional judgment to estimate possible future outcomes based on past experience and future expectations, and select assumptions based upon application of that professional judgment. The actuary should select reasonable demographic assumptions in light of the particular characteristics of the defined benefit plan that is the subject of the measurement. A reasonable assumption is one that is expected to appropriately model the contingency being measured and is not anticipated to produce significant cumulative actuarial gains or losses over the measurement period.

Actuarial Standard of Practice No. 6: Measuring Retiree Group Benefit Obligations

Actuarial Standard of Practice (ASOP) No. 6 *Measuring Retiree Group Benefit Obligations* provides guidance to actuaries giving advice on selecting assumptions for measuring obligations under OPEB plans.

Each individual OPEB assumption should satisfy the criteria of ASOP No. 6. In selecting OPEB assumptions, the actuary should also consider: the internal consistency between the assumptions, materiality, cost effectiveness, and the combined effect of all assumptions. At each measurement date, the actuary should consider whether the selected assumptions continue to be reasonable, but the actuary is not required to do a complete assumption study at each measurement date.

Actual-to-Expected Ratio

In performing an experience study, an actuary will compare the actual results of the study with those the assumptions would have predicted. This comparison is called the Actual-to-Expected (A/E) ratio. If, for example, the A/E ratio for service retirement is 120%, this would indicate that the actual number of service retirements exceeded the number expected by the assumptions by 20%.

As noted previously, we did not independently replicate Segal's technical A/E ratio calculations as that was beyond the scope of our requested assignment.

Mortality

We reviewed the work documenting Segal's development of assumptions for the probability of death, either before or after retirement. We found these assumptions to be reasonable, but would recommend an update to these assumptions in future valuations in two key aspects.

- **Adoption of New "Pub-2010" Mortality Tables:** The current base mortality tables are from the "RP-2014" family of tables. Those tables are based on observed private sector mortality experience centered around 2006. We believe these tables were reasonable at the time of the last experience study, and were also the most current tables available.

  In January 2019, the Society of Actuaries issued the "Pub-2010" base mortality tables. These tables are based on a large amount of recent public sector specific mortality experience centered around 2010. They include tables using only public safety specific experience, which differs from the experience of other public sector employees and retirees at a statistically significant level. Based on our understanding of the compensation and retirement benefits for the LAFPP population, we recommend adoption of the **Pub-2010 safety above median mortality tables** in future valuations.

- **Change from Static to Generational Mortality Table Structure:** The mortality assumptions adopted at the most recent experience study used a **static** table structure, projecting future mortality improvements for 20 years beyond 2016 using the mortality improvement projection Scale "MP-2016". The projected 2036 mortality rates were then applied to all possible years of death in the valuation. This approach was reasonable in our opinion.

  That noted, a best practice approach would be to use a **generational** mortality improvement table structure, which projects continued mortality improvement in all future years, rather than exclusively projecting improvement to a single point in time. Based on our analysis, we believe that the current assumption is likely to accurately match actual future mortality experience for current retirees. However, we believe the structure of the current assumption is likely to lead to a moderate understatement of true actual future life expectancy for current actives. We note that Segal recommended a generational mortality table structure in the most recent experience study, and we support that recommendation.

Longevity and Promotion Salary Increases

We did a high-level review of the individual salary increase assumptions due to merit (longevity and promotion). These increases are in addition to the assumed increases due to general wage inflation. At a high level, the assumptions for merit salary increases appear reasonable, based on the experience study report.

Salary Increase Methodology

Segal annualized biweekly pay rates as of the valuation date (divided by 14 and multiplied by 365) and applied a full year of salary increase assumptions, including general wage inflation and merit scale components, for all members with at least one year of service. This methodology would be most accurate if all salary increases in the prior year and future years were expected to occur on July 1.

For future valuations, we suggest Segal review past and expected future practices regarding the timing of LAFPP member salary increases, and adjusting the assumed timing if appropriate. For example, if salary increases are expected to be spread throughout the year or occur on a weighted average basis on a date different than July 1 due to a mixture of step and calendar year based increases, it may be appropriate to apply a partial-year salary increase assumption to the annualized pay rates at the valuation date when projecting payroll for the first subsequent year, rather than applying a full year of increases.

Rates of Service Retirement

Based on our high-level review of the experience study, the retirement assumptions appear reasonable, including the practice of combining experience of members participating in the DROP with experience of other active members.

Retirement assumptions used for GASB 67 purposes differ from those used for funding purposes due to GASB requirements that liabilities be attributed over the period ending at projected DROP entry. We believe an adjustment to retirement rates for GASB purposes is appropriate. Given the lack of detail on the GASB assumptions in this area in the experience study report, we have not reviewed the adjusted rates shown in the appendix to the GASB 67 report and express no opinion on them. We suggest in future valuation reports and experience studies that Segal provide more detail on the methodology and its development.

DROP Election Rate and Methodology

The DROP election rate is reasonable based on the experience study report.

We were able to replicate the method used to value current and future participants in the DROP, and we believe this method is reasonable for funding valuation purposes. As noted above, we express no opinion on methodology adjustments made for GASB 67 purposes.

Rates of Disability Retirement

Based on our high-level review of the experience study report, the disability retirement rates appear reasonable.

Rates of Pre-Retirement Termination

Based on our high-level review of the experience study report, the rates of pre-retirement termination appear reasonable.

OPEB Election Rates

Based on our high-level review of the experience study report, the spouse/domestic partner, retiree medical coverage, and plan election rates appear reasonable.

OPEB Spouse Age Difference

The valuation uses an assumption that female spouses are 3 years younger than male spouses, even though the experience studies indicate an age difference that is closer to 4 years. We recommend Segal consider changing the assumption from 3 years to 4 years if this trend continues.

Section 8 Segal Reports

Audit Conclusion

In our opinion Segal's reports meet the applicable Actuarial Standards of Practice. We felt that the amount of disclosure included in the report was generally commensurate with the LAFPP's complexity. We are recommending a handful of changes to be considered in future valuations that will provide better disclosure, and are providing some other comments for consideration for possible inclusion in future valuation reports.

Comments

The following discussion mentions a few items that we believe that Segal should consider disclosing (or changing their current disclosure) in the future. These are all changes in disclosure and would not impact the results of the valuation.

Comments for Consideration for Disclosure of Liabilities:

- In the OPEB report, we think it would be good to show both the Actuarial Accrued Liability and Actuarial Present Value of Total Projected Benefits split by benefit type (i.e. medical, dental, Part B). This information would enable the reader to understand the relative magnitude of each benefit type.

Other Comments for Consideration

- We think it would be helpful to include spouse counts in the plan membership summaries on page 33 of the OPEB report.
- We would like Segal to consider adding detailed eligibility requirements for OPEB benefits by tier and decrement to the Summary of Plan in Section 4 of the OPEB report.