Contra Costa County
Employees' Retirement Association

Actuarial Audit of December 31, 2012 Actuarial Valuation

and

2010-2012 Experience Study

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April 10, 2014

Mr. Kurt Schneider
Deputy Chief Executive Officer
Contra Costa County Employees' Retirement Association
1355 Willow Way, Suite 221
Concord, CA 94520-5728

Re: Actuarial Audit Report

Dear Mr. Schneider:

The enclosed report presents the findings and comments resulting from a detailed review of the December 31, 2012 actuarial valuation and 2012 Experience Study performed by Segal Consulting (Segal) for the Contra Costa County Employees' Retirement Association (CCCERA). 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 CCCERA's plan provisions and the actuarial assumptions adopted by the Retirement Board. The plan provisions, assumptions and methods used are the same as those disclosed in Section 4 of Segal's December 31, 2012 actuarial valuation report. As discussed in our report, we believe the package of actuarial assumptions and methods is reasonable (taking into account the experience of CCCERA 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 CCCERA's staff. 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

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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 Guides to Professional Conduct, amplifying Opinions, and supporting Recommendations of the American Academy of Actuaries.

Milliman's work product was prepared exclusively for CCCERA for a specific and limited purpose. It is a complex, technical analysis that assumes a high level of knowledge concerning CCCERA's operations, and uses CCCERA'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.

We would like to express our appreciation to both the Segal and CCCERA 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,

Nick J. Collier, ASA, EA, MAAA
Consulting Actuary

Daniel R. Wade, FSA, EA, MAAA
Consulting Actuary

NJC/DRW/nlo

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Contra Costa County Employees' Retirement Association
Actuarial Audit of 2012 Valuation and Experience Study

Section 1 Summary of the Findings

Purpose and Scope of the Actuarial Audit

This actuarial audit reviews the December 31, 2012 actuarial valuation and the Experience Study for the period January 1, 2010 to December 31, 2012 performed by CCCERA's retained actuary, Segal. The purpose of this audit is to verify that the results of the valuation are accurate and that the assumptions the valuation is based upon are reasonable. The following tasks were performed in this audit:

- ✓ Evaluation of the data used in the valuation and Experience Study;
- ✓ Full independent replication of the Experience Study;
- ✓ Full independent replication of the key valuation results;
- ✓ Evaluation of assumptions used in the valuation; and
- ✓ Analysis of valuation results and reconciliation of material differences

Audit Conclusion

Overall

From an actuarial perspective, the results of this audit are very positive. We found no material concerns. Specifically, we want to highlight the following:

- **Strong Contributions toward Funding**. CCCERA funds its Unfunded Actuarial Accrued Liability (UAAL) over a shorter period than most public sector retirement plans.
- **Reasonable Assumptions**: CCCERA's investment return assumption of 7.25% is lower than about 90% of large public sector retirement systems. Given the continued decline in expectations of future returns, we believe that CCCERA is ahead of the curve in having a lower assumption.
- **Accurate Calculations**: Our independent calculations matched Segal's closely in all material aspects of the valuation.

Experience Study

Based upon our review of the Experience Study for the period ended December 31, 2012, we found the package of recommended assumptions is reasonable and appropriate. We have some comments for Segal and CCCERA to consider in the future; however, these changes are based on minor differences of opinions, rather than differences of facts, and we are not proposing any changes be reflected in the 2012 valuation.

Actuarial Valuation

Based upon our review of the December 31, 2012 actuarial valuation, we found the actuarial work performed by Segal was reasonable, appropriate, and accurate. The following table shows that our independent calculations are very close to those determined by Segal and should give the Board a high level of confidence that the results of the valuation are accurate based on the current assumptions.

	Segal	Milliman
Aggregate Employer Contribution Rate	49.82%	49.53%
Funded Percentage	70.6%	71.0%

We have made a few recommendations regarding the valuation; however, we do not consider any of these potential changes to be material to the overall results of the valuation.

Changes Since Last Actuarial Audit

We previously performed an actuarial audit of CCCERA as of December 31, 2007. There have been significant changes since that time. We have included analysis of these changes in this report:

- **Depooling**: CCCERA, with Segal's assistance, depooled the assets and liabilities effective with the contribution rates calculated in the December 31, 2008 valuation. We have reviewed the new structure as of the December 31, 2012 valuation, but we have not gone back to assess the original depooling.
- **New Plans**: New plans were added effective January 1, 2013. Although there were no active members in the plans as of December 31, 2012, we have confirmed the calculated contribution rates are reasonable based on the same hypothetical population used by Segal.
- **Terminal Pay**: The treatment of terminal pay for valuation purposes was revised for members entering the system after December 31, 2010. Additionally, new terminal pay assumptions were adopted with the most recent experience study. We reviewed these assumptions for reasonableness.
- **Amortization Method**: CCCERA changed from a closed to a layered amortization method since our last audit. This addressed our concerns that we had at that time about potential significant contribution rate volatility. We believe the new method strikes an appropriate balance between strong funding and contribution rate stability.
- **CAAP**: The California Actuary Advisory Panel (CAAP) has published papers on both model actuarial funding policies and model disclosure elements for actuarial valuation reports. These are just guidelines for actuarial work for California plans and not requirements. In our analysis, we found a high level of consistency between these guidelines and Segal's valuation report and CCCERA's funding policy.

Statement of Key Findings

Membership Data

We performed tests on both the raw data supplied by CCCERA staff and the processed data used by Segal in the valuation and the Experience Study. Based on this review, we feel the individual member data used in both projects is appropriate and complete. Note that this included analysis by cost group. A summary is shown in the chart below:

	Segal	Milliman	Ratio Segal/Milliman
Active Members			
Total Number	8,640	8,619	100.2%
Average Service	10.2	10.1	100.6%
Average Compensation	$ 75,499	$ 75,411	100.1%
Retirees and Survivors			
Total Number	8,517	8,482	100.4%
Average Monthly Pension	$ 3,518	$ 3,521	99.9%

Actuarial Value of Assets

We have reviewed the calculation of the actuarial value of assets used in the December 31, 2012 valuation. We also reviewed the allocation of the valuation value of assets into the various cost groups. 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 rates and liabilities of CCCERA. 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 our total liabilities matched those calculated by Segal closely. This was true both in aggregate and by cost group.

A summary of the results for the system in aggregate is shown in the chart below. Further breakdowns by cost group, as well as employer contribution rates for the new plans, are shown in Section 4. The Actuarial Accrued Liability is shown in millions.

	Segal	Milliman	Ratio Segal/Milliman
Actuarial Accrued Liablity	$ 7,761.3	$ 7,723.2	100.5%
Employer Normal Cost	19.20%	19.21%	99.9%

Statement of Key Findings
(continued)

Member Contribution Rates

We reviewed the current member contribution rates. We found that both the basic and COLA rates were determined in an appropriate manner.

The following chart compares the member contribution rates determined by Milliman with those calculated by Segal for a member entering at age 35 who entered prior to 2011. Member rates for all plans at selected entry ages are shown in Section 5, including those for post-2010 hires.

	Entry Age 35 Member Contribution Rate[1]		
Group	**Segal**	**Milliman**	**Segal / Milliman**
General Members (Pre-2011)			
Tier 1	12.26%	12.05%	101.8%
Tier 1 Enhanced	11.42%	11.42%	100.0%
Tier 3 Enhanced	10.79%	10.85%	99.4%
Safety Members (Pre-2011)			
Tier A	17.89%	17.63%	101.5%
Tier A Enhanced	19.31%	19.37%	99.7%
Tier C Enhanced	15.31%	15.21%	100.6%

[1] *Rates shown are for monthly pay greater than $350 and exclude subvention.*

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 for each cost group are appropriately calculated.

There are a number of adjustments to account for prior pension obligation bonds that add to the complexity of the employer rate calculations. We feel that making these adjustments is a reasonable approach to allocating costs by employer.

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Statement of Key Findings
(continued)

Funding (continued)

A summary of the average employer rate for each cost group is shown in the following chart.

Cost Group	Segal	Milliman	Ratio Segal/Milliman
Cost Group #1	41.59%	41.29%	100.7%
Cost Group #2	37.08%	36.73%	101.0%
Cost Group #3	73.93%	72.43%	102.1%
Cost Group #4	47.04%	45.88%	102.5%
Cost Group #5	42.81%	43.10%	99.3%
Cost Group #6	32.16%	32.01%	100.5%
Cost Group #7	89.83%	89.99%	99.8%
Cost Group #8	89.79%	90.76%	98.9%
Cost Group #9	81.53%	79.96%	102.0%
Cost Group #10	80.03%	79.72%	100.4%
Cost Group #11	95.39%	96.95%	98.4%
Cost Group #12	110.02%	110.56%	99.5%
Total Employer Rate	**49.82%**	**49.53%**	**100.6%**

Actuarial Assumptions (Economic)

We reviewed the economic assumptions used in the valuation and found them to be reasonable. The economic assumptions used were adopted based on Segal's Review of Economic Actuarial Assumptions completed in February 2013.

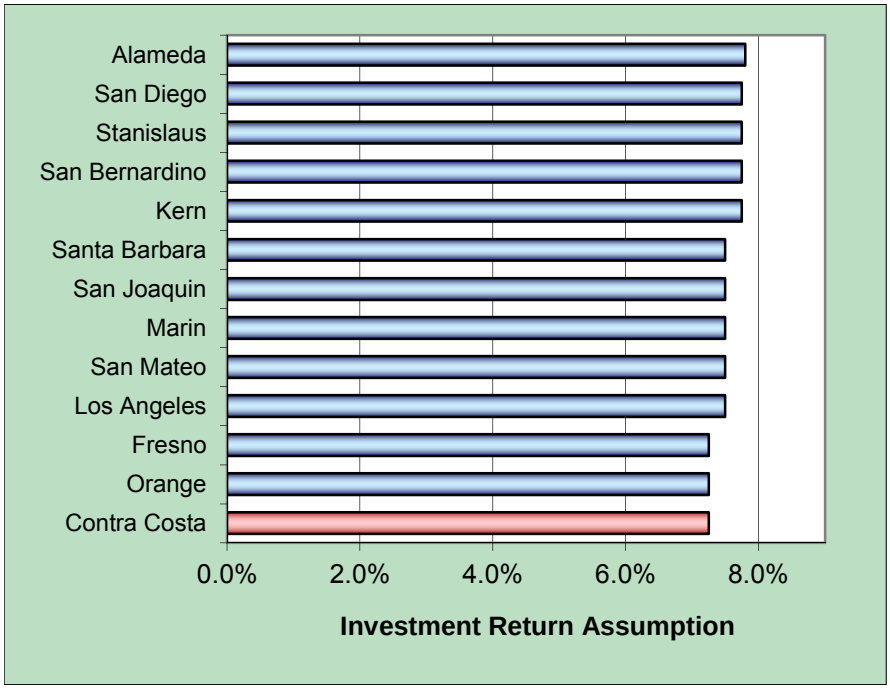
We have the following comments regarding the economic assumption:

- Our analysis supports the expected rate of return of 7.25%, given the building block approach and CCCERA's assumptions for inflation and expenses. The 7.25% is in line with recommendations we have made to our retained clients.
- The inflation assumption of 3.25% is reasonable, but it is toward the higher end of our best-estimate range.
- It should be noted that a recent change in the actuarial standards of practice pertaining to economic assumptions provides a more restrictive definition of what is "reasonable." The new standard will first be applicable for CCCERA with the December 31, 2014 valuation. This could impact the selection of the economic assumptions; however, based on the economic environment when the new assumptions were adopted, we believe they would satisfy the new actuarial standards of practice (if they had applied at that time).

Statement of Key Findings
(continued)

Actuarial Assumptions (Economic) (continued)

Although assumptions should not be set based on what other systems are doing, it is informative to see how CCCERA compares. Looking at other selected '37 Act systems, CCCERA's current assumption is below average, with the return assumptions for most systems being either 7.50% or 7.75%. Similar to statewide systems throughout the country, the trend among '37 Act Systems has been toward lower investment return assumptions.



Actuarial Assumptions (Demographic)

We performed a full replication of the Experience Study. Based on this analysis, we reviewed the demographic assumptions used in the valuation and found them to be reasonable. We are making a few comments to consider for the next Experience Study. A more detailed summary of our analysis is shown in Section 8.

Valuation & Experience Study Reports

Overall, we found Segal's reports to be clear and complete. We have made a few comments for consideration where additional information could be included to enhance the understanding of an outside reader.

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Recommendations and Other Considerations

We are not recommending any changes be reflected in the December 31, 2012 valuation. There are a few changes that we are recommending CCCERA and Segal consider in the future.

Recommended Changes with a Material Impact

We are not recommending any changes that would have a material impact on the valuation.

Other Recommended Changes

We recommend that Segal implement the following change:

- ✓ **Refundability Factor [page 22]:** Revise the method used in the calculation of the refundability factors. (Section 5)

Considerations for the Future

We recommend that Segal consider the following actions for future valuations or experience studies:

- ✓ **Payroll used in Amortization [page 23]:** Revising the method used to determine the valuation year payroll in the amortization of the Unfunded Actuarial Accrued Liability (UAAL).
- ✓ **Mortality Table [page 42]:** Increasing the margin in the post-retirement mortality assumption. The current assumption has some margin for future increases in life expectancies; however, a recent study by the Society of Actuaries indicates that an increased margin may be appropriate.
- ✓ **Termination Rates at More than 20 Years of Service [pages 46-47]:** Reducing the rates of termination for years of service at 20 years and later.
- ✓ **Assumed Deferred Safety Member Retirement [page 47]:** Lowering the age at which deferred Safety members are assumed to retire from age 54 to age 50.

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Section 2 Membership Data

Audit Conclusion

We performed tests on both the raw data supplied by CCCERA staff and the processed data used by Segal in the valuation and the Experience Study. Based on this review, we feel the individual member data used in both projects is appropriate and complete. In particular, Segal has a detailed process to allocate the members correctly by cost group which we believe is reasonable.

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 CCCERA staff to Segal for use in the actuarial valuation (and the preceding actuarial valuations for the Experience Study).
  - ✓ **Completeness:** The data contained all the necessary fields to perform both the actuarial valuation and the Experience Study.
  - ✓ **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 and beneficiary benefit amounts on the CCCERA data with the actual benefit payments made, as reported in CCCERA's asset statements. We also compared the total active member compensation on the CCCERA data with the estimated active payroll for the prior year. The estimated payroll was based on the actual employer and member contribution amounts divided the applicable rates for the prior year. Based on this analysis, we found the data to be reasonable.

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Comments (continued)

- 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 consistent.

  Our results do not match exactly. 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.

  One area we did note some small differences in CCCERA's data and the processed data used by Segal in the valuation was the allocation by cost group. Segal informed us that these differences were primarily due to a detailed check they do each year to make sure the cost group allocations for individuals are consistent with the original "depooling" of assets. We identified a number of individuals and sent them to CCCERA staff, who confirmed that Segal was assigning these individuals appropriately. We adjusted our data process to reflect this.

  A summary of the data in aggregate is shown in Exhibit 2-1. In all cases, we matched Segal's valuation data at a reasonable level. The "Milliman" column reflects the CCCERA data after adjustments by Milliman. The "Segal" column reflects the actual data used in Segal's valuation.

Exhibit 2-1
Member Statistics as of December 31, 2012

	Segal	Milliman	Ratio Segal/Milliman
Active Members			
Total Number	8,640	8,619	100.2%
Average Age	45.9	45.9	100.0%
Average Service	10.2	10.1	100.6%
Average Projected Compensation	$ 75,499	$ 75,411	100.1%
Retirees and Survivors			
Total Number	8,517	8,482	100.4%
Average Age	69.0	69.1	99.9%
Average Monthly Pension[1]	$ 3,518	$ 3,521	99.9%
Vested Terminated Members			
Total Number	2,288	2,304	99.3%
Average Age	46.8	46.9	99.8%

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Section 3 Actuarial Value of Assets

Audit Conclusion

We have reviewed the calculation of the actuarial value of assets used in the December 31, 2012 valuation. We also reviewed the allocation of the valuation value of assets into the various cost groups. 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 gross actuarial value of assets smoothes investment gains and losses by reflecting 10% of the difference between the market-related value and the expected market value for every six months over a five-year period. This value is then adjusted to remove any non-valuation reserves (currently equal to the Post-Retirement Death Benefit reserve), which results in the valuation assets used in the funding calculations.

We reviewed the calculation of the actuarial value of assets and found it to be reasonable, and all adjustments were appropriate. This calculation is performed by CCCERA. Because the calculation is done on a six-month basis and full financial statements are not created on a six-month basis, we were not able to verify the results in full.

We were able to verify that the total contributions for the past year matched the financial statements and that the benefit payments matched within 0.1%. We also verified that the formulas used matched our understanding of what the formulas should be, and thus the calculations are correct as long as the correct June 30 market values of assets are used between valuations.

The valuation assets are allocated to each cost group as part of the valuation process. Segal adjusts the beginning of year balance by the cash flow for the year and then allocates the total earnings for the fund on a proportional basis. We believe this is an appropriate method.

In order to calculate cash flow for the year, the total member contributions, employer contributions, and benefit payments were determined by cost group. Segal also made adjustments based on the extra UAAL payments made by the City of Pittsburg during 2012.

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Comments
(continued)

For contribution amounts, CCCERA provided spreadsheets with both the member and employer contribution rates by employer and additional breakdowns necessary to assign contributions to cost groups. After these contributions were allocated to each cost group, an adjustment was necessary because the total contributions in the spreadsheets differed from the total contributions in the financial statements by approximately 0.5%. We were able to match Segal's calculations for the contributions precisely.

For benefit payments, CCCERA provided a large file with benefit payments by member for each month. We then assigned each payment to the appropriate cost group based on the valuation data. Again, an adjustment was necessary because the total benefit payments did not precisely match the total benefit payments from the financial statements. Segal's calculations appeared reasonable.

Based on the stated methodology, we were within 0.5% of Segal's calculations for each cost group.

As discussed above, CCCERA uses an asset smoothing method to reduce volatility. The 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 also believe a five-year period is reasonable.

When a smoothing method is applied, the actuarial value of assets will deviate from the market value of assets. Many public retirement systems apply a corridor; that is, the actuarial value of assets is not allowed to deviate from the market value by more than a certain percentage. The purpose of a corridor is to keep the actuarial value of assets within a reasonable range of the market value.

The current asset method does not have a corridor limiting the actuarial valuation of assets to be within a certain percentage of the market value (e.g., between 80% and 120% of market value). The downside of using a corridor is that it can cause significant contribution rate volatility when the assets are outside the corridor, which is likely to occur with many systems as the current market decline is reflected in the future. We believe a five-year smoothing period is short enough that a corridor is not necessary for compliance with ASOP No. 44, the actuarial standard of practice for the selection and use of asset valuation methods for pension valuations.

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Comments
(continued)

The California Actuary Advisory Panel (CAAP) has published a paper on model actuarial funding policies which includes guidelines for asset smoothing. CCCERA's method of five-year smoothing without a corridor falls in the "Acceptable Practices" category under these guidelines (categories described below for reference). The only difference between CCCERA's method and the method described in the "Model Practices" is that the model practice method includes a corridor of no greater than 50% to 150%, and CCCERA has no corridor for five-year smoothing.

Categories Under CAAP Guidelines	
Model Practices	Those practices most consistent with the Level Cost Allocation Model (LCAM) developed by CAAP.
Acceptable Practices	Generally those which, while not consistent with the LCAM, are well established in practice and typically do not require additional analysis.
Acceptable Practices with Conditions	May be acceptable in some circumstances either to reflect different policy objectives or on the basis of additional analysis.
Non-Recommended Practices	Systems using these practices should acknowledge the policy concerns identified in the CAAP Guidelines.
Unacceptable Practices	No description provided by CAAP, but implication appears to be clear.

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Section 4 Actuarial Liabilities

Audit Conclusion

We independently calculated the normal cost rates and liabilities of CCCERA. 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 our total liabilities matched those calculated by Segal closely. This was true both in aggregate and by cost group.

Comments

We incorporated the following information into our valuation system:

- ✓ **Data** – We used the data provided by CCCERA. As discussed in Section 2, we confirmed that this data was consistent with the valuation data used by Segal.
- ✓ **Assumptions** – We used the assumptions disclosed in the December 31, 2012 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 December 31, 2012 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 CCCERA website and the relevant law.

We then performed a parallel valuation as of December 31, 2012. Based on this valuation, we completed a detailed comparison of the actuarial accrued liability (AAL) computed in our independent valuation and the amount reported by Segal. Exhibit 4-1 shows a summary of this analysis for each member type. The results for each member group were reasonable, and our calculated AAL values match very closely with those reported in the valuation.

Exhibit 4-1
Actuarial Accrued Liability by Member Type
(Dollar Amounts in Millions)

	Segal	Milliman	Ratio Segal/Milliman
Retirees & Beneficiaries	$ 4,990.8	$ 4,983.7	100.1%
Inactive Members	206.7	197.7	104.6%
Active Members	2,563.8	2,541.8	100.9%
Total AAL	**$ 7,761.3**	**$ 7,723.2**	**100.5%**

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Comments
(continued)

Exhibit 4-2 shows the total (accrued and future) present value of benefits (PVB) for active members by benefit type. Similar to the AAL, our calculated PVB was close to Segal's in total. A summary of the total present value of benefits for active members is shown in the following chart:

Exhibit 4-2
Active Present Value of Benefits by Benefit Type
(Dollar Amounts in Millions)

	Segal	Milliman	Ratio Segal/Milliman
Service Retirement	$ 3,590.6	$ 3,608.4	99.5%
Vested Term & Refund	191.4	181.5	105.5%
Disability	298.3	304.6	97.9%
Death from Active Status	63.0	62.2	101.3%
Total Active PVB	**$ 4,143.3**	**$ 4,156.7**	**99.7%**

Exhibit 4-3 shows the PVB for all members by cost group. Our calculated PVB was within normal actuarial tolerances in all cases. A summary is shown in the following chart:

Exhibit 4-3
Present Value of Benefits by Cost Group
(Dollar Amounts in Millions)

	Segal	Milliman	Ratio Segal/Milliman
Cost Group #1	$ 1,635.3	$ 1,631.3	100.2%
Cost Group #2	3,603.0	3,602.3	100.0%
Cost Group #3	380.0	376.3	101.0%
Cost Group #4	60.6	60.0	101.0%
Cost Group #5	55.1	55.2	99.8%
Cost Group #6	7.1	7.1	100.0%
Cost Group #7	1,872.8	1,874.7	99.9%
Cost Group #8	1,029.4	1,031.1	99.8%
Cost Group #9	74.0	75.6	97.9%
Cost Group #10	195.2	195.1	100.1%
Cost Group #11	386.0	387.0	99.7%
Cost Group #12	42.3	42.6	99.3%
Total PVB	**$ 9,340.8**	**$ 9,338.3**	**100.0%**

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. The level of consistency we found in this audit provides a high level of assurance that the results of the valuation accurately reflect the liabilities of CCCERA based on the plan provisions, assumptions and methods.

Comments
(continued)

There is a relatively minor technical issue with the timing of the benefit payments for future retirees. In a valuation, the actuary first projects the future benefit payments based on the data and assumptions. The actuary then places a value on each future benefit expected to be paid based on the investment return assumption. A dollar paid in the future is worth less than a dollar paid today due to the time value of money.

Segal is effectively treating benefit payments for a given month as being paid on the first of that month in its calculations. CCCERA's benefit payments are actually made at the beginning of the following month for new retirees. For example, a member's payment for October is made in early November. Segal is treating the payment as being made on the retirement date.

We adjusted our valuation to be consistent with Segal's approach so this did not cause any differences. If we had not made this adjustment our numbers for the current active population would have been slightly lower (about ½%). Although we think that using our usual method (payments at the end of the month) better reflects CCCERA's processes, we believe Segal's method is reasonable. Note that currently retired members do receive the first payment after the valuation date at the beginning of January, so Segal's methodology for current retirees is not an issue.

We also looked at the normal cost rate (the allocated cost of benefits earned during the year). Exhibit 4-4 shows the aggregate results. In the many audits we have performed, this is usually the area where we see the greatest differences. Although there were some differences, the overall match was close and deviation by cost group fell within an acceptable level in all cases.

Exhibit 4-4
Comparison of Employer Normal Cost Rate
(Expressed as a Percent of Payroll)

	Segal	Milliman	Ratio Segal/Milliman
Employer NC Rate (Total)			
Basic	14.70%	14.92%	98.5%
COLA	4.50%	4.29%	105.0%
Total	19.20%	19.21%	99.9%

Although there were no members subject to PEPRA included in the valuation, there will be when the contribution rates take effect. Therefore, Segal determined Normal Cost rates for the new tiers that are used in determining the employer and member rate.

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Comments
(continued)

Exhibit 4-5 shows the results for the new tiers. Note that this exhibit shows the gross Normal Cost rate; whereas, the previous exhibit showed the employer Normal Cost rate. The net employer Normal Cost rate would be approximately one-half of the gross Normal Cost rate, since members pay for approximately half of the cost.

Exhibit 4-5
Comparison of Gross Normal Cost Rate (PEPRA)
(Expressed as a Percent of Payroll)

	Segal	Milliman	Ratio Segal/Milliman
Total NC Rate (New Tiers)			
General 4 (Maximum 2% COLA)	19.60%	19.82%	98.9%
General 5 (Maximum 2% COLA)	18.66%	19.18%	97.3%
General 4 (Maximum 3% COLA)	21.92%	22.03%	99.5%
General 5 (Maximum 3% COLA)	20.80%	21.02%	99.0%
Safety D (Maximum 3% COLA)	34.34%	34.92%	98.3%
Safety E (Maximum 2% COLA)	29.34%	29.46%	99.6%

Based on these results, we feel that Segal is valuing all significant plan provisions in an accurate manner.

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Section 5 Member Contribution Rates

Audit Conclusion

We reviewed the current member contribution rates. We found that both the basic and COLA rates were determined in an appropriate manner.

Comments

Member contributions are of two types: Basic contributions and cost-of-living contributions. Basic contributions for each tier are defined in the County Employees Retirement Law as follows:

Tier	Formula
General 1 Non-Enhanced	1/120th of 1-Year FAC at age 55
General 1 Enhanced	1/120th of 1-Year FAC at age 60
General 3 Enhanced	1/120th of 1-Year FAC at age 60
Safety A Non-Enhanced	1/100th of 1-Year FAC at age 50
Safety A Enhanced	1/100th of 1-Year FAC at age 50
Safety C Enhanced	1/100th of 3-Year FAC at age 50

FAC = Final Average Compensation

Basic member contributions are determined using the Entry Age Normal Actuarial Cost Method and the following actuarial assumptions:

1. Expected rate of return on assets
2. Individual salary increase rate (wage growth + merit)
3. Mortality for members after service retirement

The determination of the member cost-of-living contributions is based on Section 31873 of the County Employees Retirement Law. This section requires that the cost of this benefit be shared equally between members and the employer.

For both the basic and COLA portions, we found our results to be consistent with Segal's. Member contribution rates for sample ages are shown in the following exhibit.

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Exhibit 5-1
Sample Member Contribution Rates
Pre-2011 Hires

Group	Member Contribution Rate[1] Segal	Milliman	Segal / Milliman
General Tier 1 Non-enhanced Members			
Entry Age 25	10.68%	10.51%	101.6%
Entry Age 35	12.26%	12.05%	101.8%
Entry Age 45	14.24%	14.00%	101.7%
General Tier 1 Enhanced Members			
Entry Age 25	9.96%	9.97%	99.9%
Entry Age 35	11.42%	11.42%	100.0%
Entry Age 45	13.15%	13.13%	100.1%
General Tier 3 Enhanced Members			
Entry Age 25	9.41%	9.47%	99.3%
Entry Age 35	10.79%	10.85%	99.4%
Entry Age 45	12.42%	12.48%	99.5%
Safety Tier A Non-enhanced Members			
Entry Age 25	15.56%	15.35%	101.4%
Entry Age 35	17.89%	17.63%	101.5%
Entry Age 45	21.28%	20.95%	101.6%
Safety Tier A Enhanced Members			
Entry Age 25	16.79%	16.86%	99.6%
Entry Age 35	19.31%	19.37%	99.7%
Entry Age 45	22.97%	23.02%	99.8%
Safety Tier C Enhanced Members			
Entry Age 25	13.31%	13.25%	100.5%
Entry Age 35	15.31%	15.21%	100.6%
Entry Age 45	17.63%	17.49%	100.8%

[1] *Rates shown are before any employer subvention and are on a refundable basis.*

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Exhibit 5-2
Sample Member Contribution Rates
Hires in 2011 and 2012

Group	Member Contribution Rate[1] Segal	Milliman	Segal / Milliman
General Tier 1 Non-enhanced Members			
Entry Age 25	10.25%	10.21%	100.4%
Entry Age 35	11.76%	11.70%	100.5%
Entry Age 45	13.66%	13.60%	100.5%
General Tier 1 Enhanced Members			
Entry Age 25	9.75%	9.70%	100.5%
Entry Age 35	11.19%	11.12%	100.7%
Entry Age 45	12.88%	12.78%	100.7%
General Tier 3 Enhanced Members			
Entry Age 25	9.12%	9.17%	99.5%
Entry Age 35	10.46%	10.50%	99.6%
Entry Age 45	12.04%	12.08%	99.7%
Safety Tier A Non-enhanced Members [2]			
Entry Age 25	15.06%	15.05%	100.1%
Entry Age 35	17.32%	17.29%	100.2%
Entry Age 45	20.61%	20.55%	100.3%
Safety Tier A Enhanced Members			
Entry Age 25	16.30%	16.23%	100.4%
Entry Age 35	18.74%	18.65%	100.5%
Entry Age 45	22.30%	22.16%	100.7%
Safety Tier C Enhanced Members			
Entry Age 25	13.13%	13.06%	100.5%
Entry Age 35	15.11%	15.00%	100.8%
Entry Age 45	17.39%	17.24%	100.9%

[1] Rates shown are before any employer subvention and are on a refundable basis.
[2] Used Segal's COLA load.

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New Plans Subject to PEPRA

Member contribution rates for members first hired after December 31, 2012 are subject to the California Public Employees' Pension Reform Act (PEPRA) and are equal to one-half of the total Normal Cost Rate. The rates do not vary based on entry age. Further, for the December 31, 2012 actuarial valuation, these rates are rounded to the nearest ¼%. We verified that Segal's calculations were reasonable.

	Segal	Milliman	Ratio Segal/Milliman
Total NC Rate (New Tiers)			
General 4 (Maximum 2% COLA)	9.75%	10.00%	97.5%
General 5 (Maximum 2% COLA)	9.25%	9.50%	97.4%
General 4 (Maximum 3% COLA)	11.00%	11.00%	100.0%
General 5 (Maximum 3% COLA)	10.50%	10.50%	100.0%
Safety D (Maximum 3% COLA)	17.25%	17.50%	98.6%
Safety E (Maximum 2% COLA)	14.75%	14.75%	100.0%

It is our understanding that after the valuation was completed CCCERA elected to no longer apply the ¼% rounding. Recent changes in the law made this an option instead of a requirement. We believe that this change is reasonable and is consistent with the trend among our clients and other '37 Act systems.

Refundability Factors

Segal calculates refundability factors. These factors are based on the portion of annual member contributions that are expected to be refunded. Note that these could also be referred to as "non-refundability" factors, since, for example, a factor of 0.9800 indicates that there is a 98% probability that the contributions will not be refunded and a 2% probability the factors will be refunded at some point in the future.

The refundability factors are used to adjust both the member and employer subvention contributions. Additionally, they are used by Segal in the determination of the COLA load portion of the member contribution rates.

We observed some differences in our calculations in certain cost groups. We discussed these differences with Segal and they felt that a modification in their calculation method would be appropriate. The overall impact of this change is expected to be small.

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Section 6 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 for each cost group are appropriately calculated.

There are a number of adjustments to account for prior pension obligation bonds that adds to the complexity of the employer rate calculations. We have reviewed these adjustments and feel they are a reasonable approach to allocating cost by employer.

Comments

Total Employer Contribution Rates

We independently calculated the aggregate employer contribution rates based on our parallel valuation. We found that all rates were reasonable and matched Segal's calculations very closely in total. A summary comparison of our results is shown below.

Exhibit 6-1
Comparison of Combined Employer Contribution Rate
(as a Percentage of Payroll)

Cost Group	Segal	Milliman	Ratio Segal/Milliman
Employer NC Rate	19.20%	19.21%	99.9%
UAAL Rate	30.62%	30.31%	101.0%
Total Employer Rate	**49.82%**	**49.53%**	**100.6%**

Segal uses a slightly different method in determining the UAAL contribution rate than we do. Specifically, Segal projects the payroll used in the first year of the amortization calculation assuming no change in the active population (i.e., no terminations, retirements, new hires, etc.). This effectively assumes that the payroll will increase by the wage growth and the merit assumptions which results in an increase of about 5.3%. In each succeeding year, they assume the payroll increases by the actuarial assumption of 4.0%. We start with the prior year's annualized pay for the current active population and assume the payroll will increase by 4.0% in each succeeding year. Using our method would result in a slightly lower future payroll and therefore a slightly higher UAAL rate, as the UAAL is paid as a percentage of payroll. We have used Segal's method in our analysis for consistency.

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Individual Employer Contribution Rates

Additionally, we reviewed the employer contribution rates for each individual cost group and found them to be reasonable. A complete list of all employer groups within each cost group is shown in Exhibit A-1 in Appendix 1.

Exhibit 6-2
Comparison of Employer Contribution Rates
(as a Percentage of Payroll)

Cost Group	Segal	Milliman	Ratio Segal/Milliman
Cost Group #1	41.59%	41.29%	100.7%
Cost Group #2	37.08%	36.73%	101.0%
Cost Group #3	73.93%	72.43%	102.1%
Cost Group #4	47.04%	45.88%	102.5%
Cost Group #5	42.81%	43.10%	99.3%
Cost Group #6	32.16%	32.01%	100.5%
Cost Group #7	89.83%	89.99%	99.8%
Cost Group #8	89.79%	90.76%	98.9%
Cost Group #9	81.53%	79.96%	102.0%
Cost Group #10	80.03%	79.72%	100.4%
Cost Group #11	95.39%	96.95%	98.4%
Cost Group #12	110.02%	110.56%	99.5%
Total Employer Rate	**49.82%**	**49.53%**	**100.6%**

Contribution Adequacy

The Government Accounting Standards Board (GASB) provides general guidelines on the appropriate annual pension cost for financial reporting purposes. The Annual Required Contribution (ARC) of the employer is based on certain minimum requirements and is measured on the basis of an actuarially sound funding methodology. These requirements for determining a system's ARC are generally the same as those used for funding purposes. Thus, the GASB requirements are often used as a benchmark for determining funding adequacy for a retirement system.

In general, the guidelines expect each system to receive contributions equal to the normal cost plus a payment to amortize either the UAAL or any surplus amount. Under GASB, the payment on a positive UAAL amount should be at least equal to a 30-year amortization payment. We generally recommend a shorter period, consistent with CCCERA's current practice.

Contribution Adequacy (continued)

It should be noted that GASB recently adopted Statements No. 67 and No. 68 dealing with accounting disclosure for public retirement systems; however, these new statements are not effective for the December 31, 2012 valuation and associated reporting. Under the new standards, accounting and funding are explicitly separated. Therefore, it is unlikely that the funding of CCCERA, nor virtually any retirement system, will match the expense calculation in its accounting disclosures in the future.

CCCERA is funding the UAAL over closed (i.e., declining) 18-year periods (referred to as bases or layers). This approach is in line with what we have recommended to a number of our clients. It will almost always exceed the generally accepted minimum requirements for the ARC, and we believe it is appropriate for use by CCCERA.

We would note that it is possible, albeit unlikely, for a calculated contribution rate under this method to be less than the contribution rate under a 30-year amortization of the aggregate UAAL, which is the minimum required under the '37 Act. This comparison should be done every year to make sure that the contribution rate meets this requirement.

CCCERA's funding policy 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.

Actuarial Cost Method

CCCERA uses the Entry Age Actuarial Cost Method. We agree that it is appropriate for valuing the costs and liabilities of CCCERA, and it 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.

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.

Actuarial Cost Method (continued)

The 2012 Public Fund Survey shows that about 70% of the retirement systems surveyed are using the Entry Age Cost Method. We believe that the use of this cost method satisfies the requirements of CERL 31453.5.

Note that when GASB Statements No. 67 and No. 68 become effective, the Entry Age Actuarial Cost Method will be the only permissible cost method for financial reporting purposes.

The Entry Age Actuarial Cost Method with separate Normal Cost rates calculated for each tier 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.

GASB Reporting

We reviewed the items shown in Exhibits I, II, & III of Section 4 in the December 31, 2012 valuation report. Based on our review of the valuation, we believe the valuation performed for funding purposes meets the guidelines for financial reporting specified by GASB applicable at the time of the valuation.

Section 7 Actuarial Assumptions (Economic)

Audit Conclusion

We reviewed the economic assumptions used in the valuation and found them to be reasonable. The economic assumptions used were adopted based on Segal's Review of Economic Actuarial Assumptions completed in February 2013.

We have the following comments regarding the economic assumption:

- Our analysis supports the expected rate of return of 7.25%, given the building block approach and CCCERA's assumptions for inflation and expenses. The 7.25% is in line with recommendations we have made to our retained clients.
- The inflation assumption of 3.25% is reasonable, but it is toward the higher end of our best-estimate range.
- It should be noted that a recent change in the actuarial standards of practice pertaining to economic assumptions provides a more restrictive definition of what is "reasonable." The new standard will first be applicable for CCCERA with the December 31, 2014 valuation. This could impact the selection of the economic assumptions; however, based on the economic environment when the new assumptions were adopted, we believe they would satisfy the new actuarial standards of practice (if they had applied at that time).

Comments

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 must be predicated on methods and assumptions that will estimate the future obligations of the system in a reasonably accurate 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.

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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 CCCERA.

A revision to ASOP 27 was adopted in September 2013. Since this Standard will first be effective for any actuarial work product with a measurement date on or after September 30, 2014, the focus of our analysis will be on the Standard that is currently in effect. The first scheduled valuation for the new Standard will be December 31, 2014 and the new Standard should be considered at the time of the 2015 Review of Economic Actuarial Assumptions.

As no one knows what the future holds, the best an actuary can do is to use professional judgment to 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 appropriate recent and long-term historical economic data. Both the current and the new Standard explicitly advise the actuary not to give undue weight to recent experience.

Recognizing that there is not one “right answer,” the current Standard calls for the actuary to develop a best-estimate range for each economic assumption, and then recommend a specific point within that range. Each economic assumption should individually satisfy this Standard.

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

An actuary’s best-estimate range with respect to a particular measurement of pension obligations may change from time to time due to changing conditions or emerging plan experiences. 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 someone with the 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 December 31, 2012 actuarial valuation are reasonable. In our opinion, the inflation assumption is toward the top of the best-estimate range, and the investment return assumption is reasonable and in line with what we have been recommending to our other clients.

The current economic assumptions are as follows:

Assumption	Rate
Price Inflation	3.25%
Real Investment Return	4.00%
Total Investment Return	7.25%
Price Inflation	3.25%
Real Wage Growth	0.75%
Total Wage Growth	4.00%
Payroll Growth	4.00%

The Board should be aware that the 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 current package of economic assumptions is reasonable. The following portion of this report discusses four of the key economic assumptions (inflation, wage growth, investment return, and COLA).

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 retirees and survivors. Please see the end of Section 7 for further discussion of the COLA assumption.

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 data for inflation shown below is based on the national Consumer Price Index, US City Average, All Urban Consumers (CPI-U) as published by the Bureau of Labor Statistics.

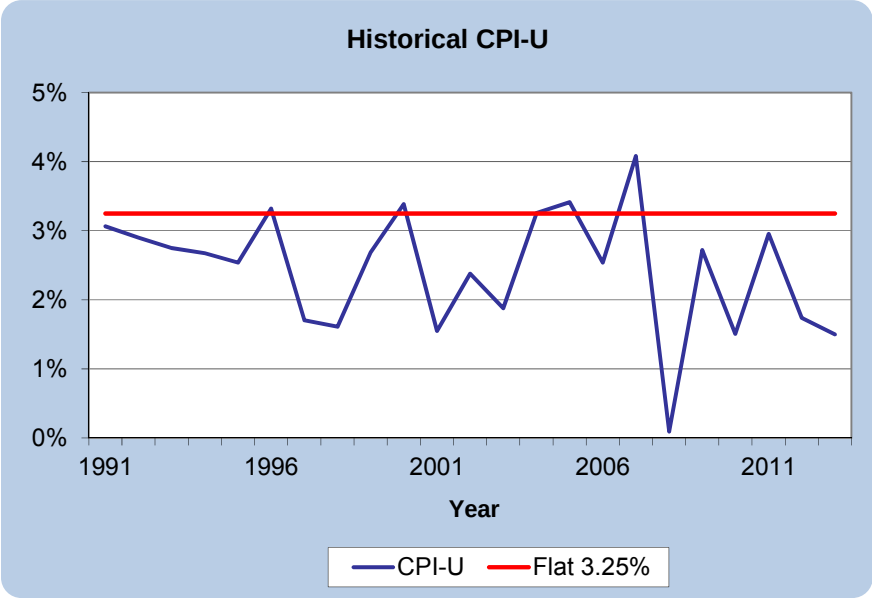
There are numerous ways to review historical data, with significantly differing results. Segal used 15-year and 30-year moving averages for its summary of historical CPI. Using moving averages, in particular 30-year periods, gives significantly more weight to old information than it gives to recent information. 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.

The table below shows the compounded annual inflation rate for the last five 10-year periods, and for the 75-year period ended in December 2012.

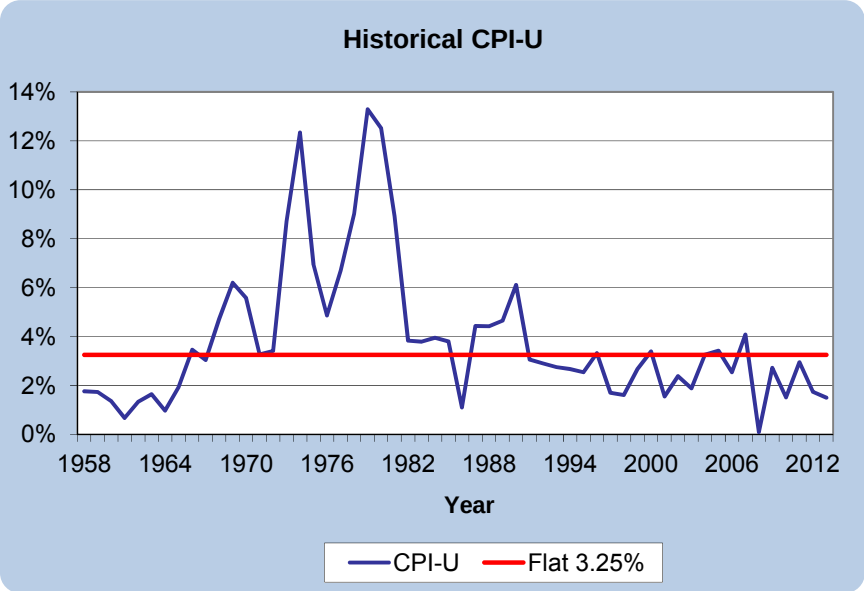
Decade	CPI Increase
2003-2012	2.4%
1993-2002	2.5%
1983-1992	3.8%
1973-1982	8.7%
1963-1972	3.4%
Prior 75 Years	
1938-2012	3.8%

Inflation (continued)

The following graphs show historical national CPI increases after 1990. Note that the actual CPI increases have been less than 3.25% for all but four of the past 22 years.



Before that time, high inflation was more common and inflation exceeded the current assumption 39 times in the past century.



Inflation (continued)

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 indexed bonds with traditional fixed government bonds. As of February 2014, market prices suggested investors expected inflation to be about 2.25% over the next thirty years. As Segal noted, TIPS yields provided an estimate of 2.55% for inflation at the time of the Review of Economic Actuarial Assumptions for the December 31, 2012 Actuarial Valuation.

Although most investment consultants and economists forecast lower inflation, they are generally looking at a shorter time horizon than is appropriate for a pension valuation. To consider a longer, similar time frame, we looked at the expected increase in the CPI by the Office of the Chief Actuary for the Social Security Administration. In the 2013 Trustees Report, the projected average annual increase in the CPI over the next 75 years under the intermediate cost assumptions was 2.80%. The low-cost, high-cost range was stated as 1.80% to 3.80%.

Peer System Comparison: Although assumptions should not be set based on what other systems are doing, it is informative to see how CCCERA compares.

According to the 2013 *Public Fund Survey* (a survey of approximately 100 statewide systems), the average inflation assumption for statewide systems has been steadily declining. As of the most recent study, the average rate is 3.17%, the median was 3.00%, and 3.00% was the most common.

Reasonable (Best Estimate) Range: We believe that a range for inflation between 2.00% and 3.50% is reasonable for an actuarial valuation of a retirement system. It should be noted that the current inflation assumption is lower than what had been used for the actuarial valuations from 2009 through 2011. We believe that the change in 2012 was a step in the right direction, but that the Board should consider further reductions.

Consumer Price Inflation	
Current Assumption	3.25%
Best-Estimate Range	2.00% - 3.50%

Investment Return

Use in the Valuation: The investment return assumption is one of the primary determinants in the calculation of the expected cost of CCCERA'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 member 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 in the public sector sets the discount rate equal to the expected investment return. Under current standards set by the GASB, the terms "discount rate" and "investment return assumption" are used interchangeably and that rate "should be based on an estimated long-term investment yield on the investments that are expected to be used to finance the payment of benefits, with consideration given to the nature and mix of current and expected plan investments."[1]

It should be noted that GASB has recently revised the accounting and financial reporting for pension plans. While GASB has made many fundamental changes, the discount rate will still be based on the "long-term expected rate of return," provided that the plan is not expected to be depleted of assets. Further, GASB's provisions only apply to accounting and are not intended to impact a system's funding.

The current net investment return assumption of 7.25% per year includes two components: (1) inflation of 3.25%, and (2) a net real rate of return equal to 4.00%. This approach of dividing the net return into separate pieces is called the "building block" method.

Method to Determine Best-Estimate Range for Investment Return: The following chart sets out CCCERA's target asset allocation as of December 31, 2012.

Asset Class	December 31, 2012 Target Asset Allocation
US Equity	19.4%
International Equity	23.2%
US Core Bonds	16.1%
International Bonds	3.3%
High Yield Bonds	5.0%
Long Duration Fixed Incom	5.0%
Real Estate	12.5%
Private Equity	10.0%
Other Investments	5.0%
Cash & Equivalents	0.5%
Total	100%

[1] Governmental Accounting Standards Board (GASB) Statement No. 27, paragraph 10.c, and GASB Statement No. 45, paragraph 13.c.

Investment Return (continued)

We used a model to project future returns based on Milliman's capital market assumptions as of December 31, 2012, the asset allocation, and assumed annual rebalancing. The result was a median real return of about 4.53% over the next 30 years, net of investment expenses. After adding the 3.25% assumption for inflation and subtracting 0.12% based on recent administrative expenses, the median expected rate of return was 7.66%, which is higher than the 7.25% assumed. However, as mentioned above, we feel that the 3.25% assumption for inflation is toward the top of the reasonable range.

Note that we also considered capital market assumptions as of December 31, 2013. Those show slightly lower expectations for equity returns, but this would not impact our conclusion that the 7.25% investment return assumption is reasonable.

We agree with Segal's approach of not including any additional returns for alpha from active management.

Using properties of the lognormal distribution, we calculated the 25th and 75th percentiles of the long-term total return distribution. This becomes our best-estimate range because 50% of the outcomes are expected to fall within this range and it is the narrowest symmetric range with 50% of the probable outcomes.

The results are summarized below:

Expected Return with 3.25% Inflation and Milliman's Expected Rate of Return
(net of investment and administrative expenses)

Horizon	Percentile Results for Nominal Rate of Return				
In Years	5th	25th	50th	75th	95th
1	-10.1%	0.0%	7.66%	15.9%	29.0%
5	-0.7%	4.1%	7.66%	11.3%	16.7%
10	1.7%	5.2%	7.66%	10.2%	14.0%
20	3.4%	5.9%	7.66%	9.5%	12.1%
30	**4.2%**	**6.2%**	**7.66%**	**9.1%**	**11.3%**

Over a 30-year time horizon, we estimate there is a 25% chance the nominal rate of return will be less than 6.2% and a 25% chance the return will be greater than 9.1% (bold numbers on the bottom line in the table above). Therefore, we can say the return is just as likely to be within the range from 6.2% to 9.1% as not.

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Investment Return (continued)

Excess Earnings: Section 31592.2 of the 1937 Act provides the Retirement Board with the authority to set aside earnings of the retirement fund during any year in excess of the total interest credited to contributions when such surplus exceeds one percent of the total assets of the retirement system. Based on the law, the excess earnings are considered on a year-by-year basis, so excess earnings are not based upon overall funded status. This means that the Board can choose to distribute excess earnings at a time when actuarial accrued liabilities exceed assets.

Also, if earnings are diverted from funding the base pension benefits when returns exceed the assumption, these earnings will not be available to make up the difference when earnings are less than assumed. Ultimately, this will result in a decrease in the long-term investment return.

CCCERA has addressed these issues with the Board's Interest Crediting and Excess Earnings Policy.

One of our main concerns about excess earnings is that money may be diverted from funding the pension liability, even if the system is poorly funded. By requiring earnings in excess of the targeted return to be first used to make up for prior shortfalls through the Contra Tracking Account, CCCERA has mostly alleviated this concern. As of December 31, 2012, the Contra Tracking Account was approximately $1.7 billion.

Even with this policy, it is still possible that there will be some impact on the long-term investment return due to excess earnings; however, this depends on the future investment returns of CCCERA and the Board's discretion. We have not made any adjustments in our analysis of the investment return assumption due to the potential impact of excess earnings.

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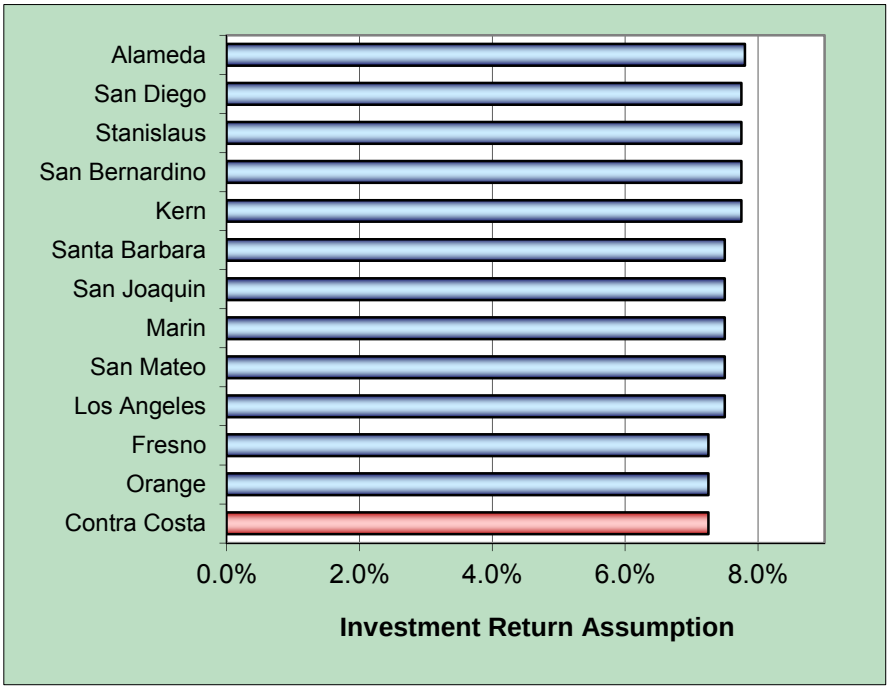
Investment Return (continued)

Peer System Comparison: Looking at other selected ’37 Act systems, CCCERA’s current assumption is below average, with the return assumptions for most systems being either 7.50% or 7.75%. Similar to statewide systems throughout the country, the trend among ’37 Act Systems has been toward lower investment return assumptions.



The investment return assumptions shown above are based on the latest available valuation reports as of December 2013.

Conclusion: We find Segal’s recommendation for a 7.25% investment return assumption to be reasonable.

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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 8 of this report (demographic assumptions).

The current wage growth assumption is 0.75% above the price inflation rate, or 4.00% per year. Note that the 4.00% includes increases in wages due to productivity as discussed below.

Historical Perspective: We have used statistics from the Social Security Administration on the National Average Wage back to 1951. For years prior to 1951, we studied the Total Private Nonagricultural Wages as published in *Historical Statistics of the U.S., Colonial Times to 1970*.

There are numerous ways to review this data. For consistency with our observations of other indices, the table below shows the compounded annual rates of wage growth for various 10-year periods, and for the 75-year period ended in 2012.

Decade	Wage Growth	CPI Increase	Real Wage Inflation
2003-2012	2.8%	2.4%	0.4%
1993-2002	3.8%	2.5%	1.3%
1983-1992	4.7%	3.8%	0.9%
1973-1982	7.4%	8.7%	-1.3%
1963-1972	5.2%	3.4%	1.8%
Prior 75 Years			
1938-2012	5.1%	3.8%	1.3%

The excess of wage growth over price inflation represents the increase in the standard of living, also called the real wage inflation rate.

Forecasts for Future Wage Growth: Wage inflation has been projected by the Office of the Chief Actuary of the Social Security Administration. In the 2013 Trustees Report, the long-term annual increase in the National Average Wage is estimated to be 1.1% higher than the Social Security intermediate inflation assumption of 2.8% per year. The range of the assumed real wage growth in the 2013 Trustees Report was from 0.5% to 1.7% per year.

General Wage Growth (continued)

Best-Estimate Range: We believe that a range between 0.00% and 1.25% is reasonable for the actuarial valuation. We believe that the current estimate of 0.75% is a reasonable estimate. Note that over the last 50 years, real wage inflation has averaged 0.60% per year.

Real Wage Inflation	
Current Assumption	0.75%
Reasonable Range	0.00% - 1.25%

Payroll Increase Assumption

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 of 4.00%. 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 assumption. Note, however, that we do feel that the inflation assumption upon which it is based is at the top of the reasonable range. If the inflation assumption is lowered, both the general wage growth and payroll increase assumptions could be lowered.

Post-Retirement Cost-of-Living Adjustments (COLA)

The current assumption is that retiree COLAs will be equal to the maximum COLA level provided by the Association when the maximum is under the inflation assumption, and COLAs equal to the inflation assumption if that is less than the maximum COLA level. In other words, the valuation effectively assumes that the COLA will be the minimum of the inflation assumption or the maximum COLA allowable.

It is expected that actual inflation in the future will sometimes be greater than the assumption and sometimes less. The result is that there is some probability that the actual COLA paid will average less than the maximum amount, even when considering the COLA bank provision.

As Segal states in its Review of Economic Assumptions, there is some indication (based on stochastic modeling) that a lower assumption could be considered for those with a 3% maximum COLA. The current assumption will result in some actuarial gains for years in which the maximum COLA is not granted. However, in years where the assumption is met there would be an actuarial loss if a lower COLA was assumed. For this reason, we generally recommend using the lower of the maximum COLA and the inflation assumption, consistent with Segal's approach. If there is a further decrease in the inflation assumption, this assumption should be reviewed.

Post-Retirement Cost-of-Living Adjustments (continued)

Because the current inflation assumption is higher than the maximum COLA applied to almost all members and given the CCCERA has a COLA bank, we feel it is appropriate to use an assumption that the COLA will equal the 2% or 3% maximum each year for members with that maximum. In addition, those with a 4% maximum and a COLA bank should see average increases close to inflation. Therefore, we agree with Segal's approach.

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Section 8 Actuarial Assumptions (Demographic)

Audit Conclusion

We performed a full replication of the Experience Study. Based on this analysis, we reviewed the demographic assumptions used in the valuation and found them to be reasonable. We are making a few comments to consider for the next Experience Study.

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 are 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 experience.

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.

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%. For purposes of our analysis, we have used the assumptions from the December 31, 2012 valuation as the expected amounts.

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Post-Retirement Mortality – Healthy Retirement

We studied the probability of death at each age for healthy retired members (service retirements). Overall our results are similar to Segal's. Based on these results, we believe that the current assumptions are reasonable; however, consideration should be given to changing the assumption to reflect increased life expectancies with the next triennial experience study.

The overall actual-to-expected ratio is 110% in Segal's study, so there were fractionally more deaths than the assumptions predicted (i.e., retirees did not live quite as long as expected). However, we generally like to see a higher actual-to-expected ratio. The two main reasons for this are:

- **Margin for Anticipated Improvements in Mortality:** It is generally accepted that life expectancies will continue to increase, and it is prudent to either have a "margin" in the rates used (i.e., predict fewer deaths in the future than actually occurred in the past) or project future mortality improvements directly. Segal mentions that "general actuarial practice is to include some margin for improvements in mortality in the future"; however, we generally like to see a margin greater than 9% (the A/E ratio reported by Segal for healthy retirees was 109%). We normally look to have a margin above 10%, although a 10% margin is in the mainstream of actuarial practice. A recent study from the Society of Actuaries has indicated greater increases in life expectancies than previously predicted. This also argues for an increased margin.

- **Differences by Benefit Amount:** Our analysis has shown that retirees with above-average benefit amounts tend to live longer than those with below-average benefit amounts. This means that although the current assumptions may be accurately predicting the number of deaths, they are overstating the release of liability expected when retirees die, which is what impacts the valuation. Based on our analysis with other systems, an additional adjustment of 5% to 10% in the actual-to-expected ratio is needed to account for this.

The following table shows a comparison of the results of our study of mortality on a count basis with the results reported by Segal.

Group	Healthy (Milliman)			Healthy (Segal)		
	Actual	Expected	Act/Exp	Actual	Expected	Act/Exp
General	373	336	111%	373	339	110%
Safety	40	40	100%	39	39	100%
Total	**413**	**376**	**110%**	**412**	**378**	**109%**

Post-Retirement Mortality – Disabled Retirement

We performed a similar study of mortality for disabled retirements. The results of our study were consistent with those reported by Segal. Segal's actual-to-expected ratio was 115% which indicates there is some margin for future increases in life expectancies. We believe the current mortality assumptions for disabled retirees are reasonable.

The following table shows a comparison of the results of our study of mortality on a count basis with the results reported by Segal.

Group	Disabled (Milliman)			Disabled (Segal)		
	Actual	Expected	Act/Exp	Actual	Expected	Act/Exp
General	58	51	114%	57	50	114%
Safety	28	21	133%	26	22	118%
Total	**86**	**72**	**119%**	**83**	**72**	**115%**

Merit and Longevity Salary Increases

We studied the individual salary increases due to promotion and longevity – the merit component of salaries. These increases are in addition to the assumed increases due to general wage inflation (price inflation plus real "across the board" increases). We believe the current assumption is reasonable.

The method varies merit increases based on service. Members earlier in their career (i.e., low levels of service) are expected to receive larger increases than those later in their career. We agree that service is the most significant factor in expected future merit increases, and this is the approach we generally recommend.

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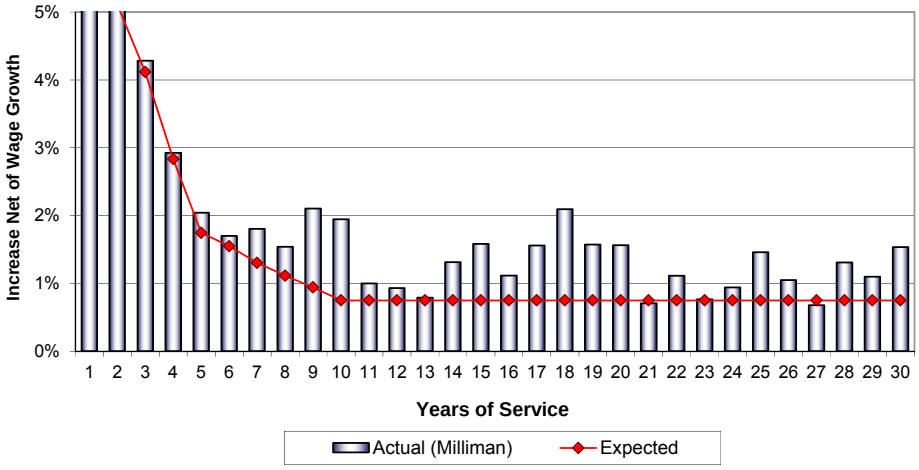
Merit and Longevity Salary Increases **(continued)**

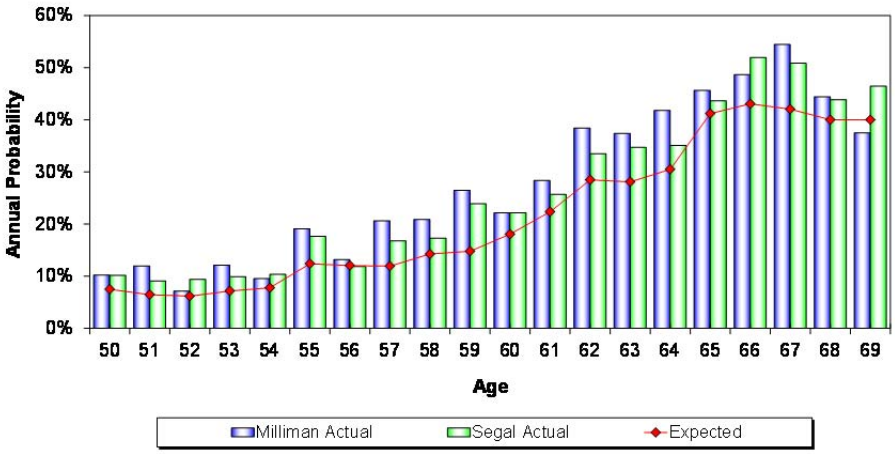
The following graph shows how CCCERA's actual merit increases (blue bars), as calculated by Milliman, are somewhat higher than the assumption, but consistent with the results of Segal's study. Segal only gave partial recognition to the recent experience, so the assumption is less than the experience. We agree with this approach, particularly in light of the somewhat anomalous period where across-the-board increases (salary increase exclusive of merit) were slightly negative.



Rates of Service Retirement

We studied service retirement rates for both General and Safety members. We found our results to be generally consistent with Segal's and believe the current assumptions are reasonable.

The following chart shows the results of our analysis for all retirements from active service. Note how the blue (Milliman) and green (Segal) bars tend to be close in height. This indicates that the observed rates of Milliman and Segal are consistent. Both clearly indicate that the experience during the period exceeded the assumption. This may be a short-term fluctuation or a long-term trend. Our understanding is that flat-to-declining pay during the period may have prompted more people to retire. In any case, we believe that Segal's approach of only partially recognizing this experience in their recommendation was appropriate.



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Rates of Disability Retirement

We studied rates of disability retirement for both General and Safety members. We found our results to be reasonably consistent with Segal's and believe the current assumptions are reasonable. Results of our study are shown by group below.

Group	All Disability Retirements by Group			
	Expected	Actual (Milliman)	Actual (Segal)	S/M Ratio
General Tier 1	11	9	*	*
General Tier 3	26	16	*	*
Safety	52	42	*	*
Total	**89**	**67**	**66**	**102%**

Additionally, we reviewed the split between service-connected and nonservice-connected disabilities and found that to be reasonable also.

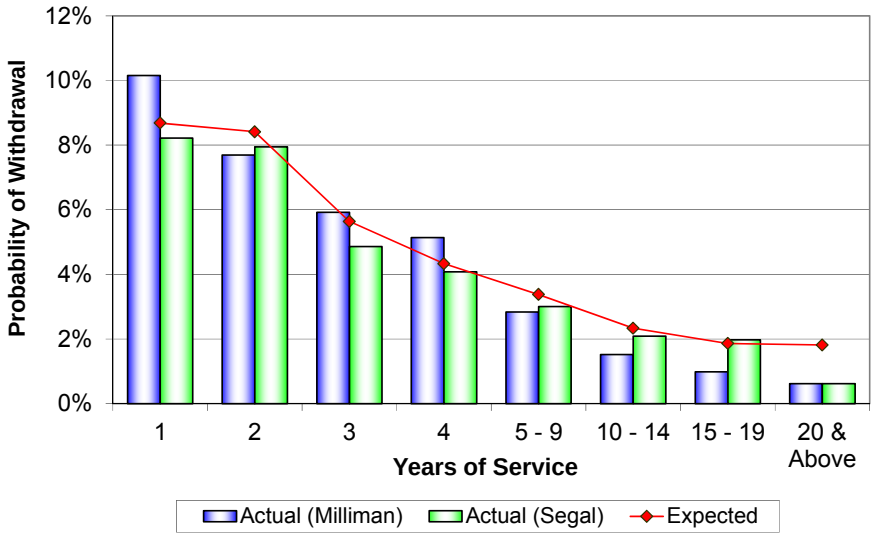
Type	All Disability Retirements by Type			
	Duty	Non-Duty	% Duty	Assumption
General Tier 1	6	3	67%	70%
General Tier 3	7	9	44%	35%
Safety	39	3	93%	100%

Rates of Termination (Withdrawal and Vested Termination)

We studied rates of termination for both General and Safety members. We found our results to be generally consistent with Segal's and believe the current assumptions are reasonable.

The following graph shows a comparison of the rates of termination for all active members by years of service.

Termination Rates for All Active Members



Rates of Termination (continued)

Our one comment for future consideration would be to reflect gradual decreases in rates of termination for members with service at 20 years and above. It has been our experience with other systems that these rates continue to decline later in a member's career, and this appears to be consistent with CCCERA's data.

Other Assumptions

We reviewed the remaining assumptions and have the following comments:

- ✓ **Commencement Age for Deferred Vested Members:** For current and future Safety members who terminate with a deferred vested benefit, it is assumed that they will retire at age 54. Given that Safety Enhanced members can get their full retirement benefit with a COLA starting at age 50, it seems unlikely that many would wait until age 54, with the possible exception of reciprocal members. Based on our analysis, we found this was the case.

  Given that this assumption has a very small impact on the valuation, some simplification may be appropriate. As the overall retirement age for the Safety group averaged age 52.7 based on our analysis, we recommend that consideration be given to lowering this assumption with the next triennial experience study.

  For current General members the actual experience was in line with the assumption.

Class	Milliman Results	Assumption
General	Age 59.3	Age 59
Safety	Age 52.7	Age 54

- ✓ **Percent Married (or with an Eligible Domestic Partner):** Segal studied the percentage of recent retirees who had an eligible survivor. They found that the actual percent was somewhat lower. Based on their results Segal recommended the current assumption be retained, males set at 75% and females at 50%. This is in line with the results of our study and studies we have done for other California counties, and we believe it is a reasonable assumption.

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Other Assumptions (continued)

- ✓ **Terminal Pay:** Segal studied the amount of terminal pay that is included in the final compensation at retirement. We did not have complete data isolating the terminal pay component, but we estimated the amount of terminal pay at retirement by analyzing the expected benefit without terminal pay based on the valuation the year before retirement and the actual benefit for each member who retired during that period. For some cost groups, the data was not sufficiently significant to be included in our study. For those with at least 20 retirements during the period, the results were as follows. These results indicate the current assumptions are reasonable.

Cost Group	Assumption	Actual
Cost Group #1	12.50%	11.15%
Cost Group #2	8.00%	9.86%
Cost Group #3	24.00%	21.39%
Cost Group #7	12.00%	12.05%
Cost Group #8	10.50%	8.71%

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Section 9 Valuation and Experience Study Reports

Audit Conclusion

Overall, we found Segal's reports to be clear and complete. We have made a few comments for consideration where additional information could be included to enhance the understanding of an outside reader.

Comments

In our opinion, Segal's valuation report includes all the necessary information for a valuation report. In particular, we believe it satisfies Actuarial Standard of Practice No. 41 dealing with actuarial communication. Further, the report includes all the basic disclosures included in the model disclosure elements published by the California Actuarial Advisory Panel.

We also believe that Segal's reports reviewing the economic assumptions and studying the actuarial experience satisfy the relevant actuarial standards. We offer the following comment on the Actuarial Experience Study report. This comment pertains to additional disclosure and does not impact the valuation results.

- On page 24 of the experience study report, results for the study of Post-Retirement Mortality are shown for males and females combined and split out by year of death. In our opinion, it would be informative to the reader to show the results separately for males and females, as they have different mortality and consequently different assumptions. To avoid a proliferation of numbers, a breakdown by gender could replace the current subtotals by each year of the study.

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Appendix A Supporting Exhibits

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Exhibit A-1
Employer Contribution Rate Detail

Cost Group	Employer	Hire Date	Segal	Milliman	Ratio Segal/Milliman
Cost Group #1	County	Pre-2011	38.15%	37.99%	100.4%
		2011-12	39.16%	38.22%	102.5%
	(3% COLA)	Post-2012	32.17%	31.92%	100.8%
	(2% COLA)	Post-2012	31.10%	30.82%	100.9%
	Districts w/out POB	Pre-2011	48.36%	48.20%	100.3%
		2011-12	49.37%	48.43%	101.9%
		Post-2012	42.38%	42.14%	100.6%
	Districts w/POB	Pre-2011	34.48%	34.32%	100.5%
		2011-12	35.49%	34.56%	102.7%
		Post-2012	28.50%	28.26%	100.9%
Cost Group #2	County	Pre-2011	37.10%	36.77%	100.9%
		2011-12	36.44%	35.83%	101.7%
	(3% COLA)	Post-2012	31.55%	31.42%	100.4%
	(2% COLA)	Post-2012	30.66%	30.50%	100.5%
	Districts w/out POB	Pre-2011	47.31%	46.98%	100.7%
	Districts w/out POB	2011-12	46.65%	46.04%	101.3%
	Districts w/out POB	Post-2012	41.76%	41.63%	100.3%
Cost Group #3	CCCSD	Pre-2011	74.25%	72.79%	102.0%
		2011-12	71.81%	70.03%	102.5%
		Post-2012	63.94%	62.75%	101.9%
Cost Group #4	CC Housing Authority	Pre-2011	47.06%	45.93%	102.5%
		2011-12	46.22%	44.20%	104.6%
		Post-2012	41.76%	40.50%	103.1%
Cost Group #5	CCCFPD	Pre-2011	42.71%	43.05%	99.2%
		2011-12	44.04%	43.69%	100.8%
		Post-2012	37.17%	37.39%	99.4%
Cost Group #6	Districts w/out POB	Pre-2011	32.48%	31.98%	101.6%
		2011-12	30.80%	32.15%	95.8%
		Post-2012	25.00%	25.90%	96.5%

Milliman

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Exhibit A-1 (Continued)
Employer Contribution Rate Detail

Cost Group	Employer	Hire Date	Segal	Milliman	Ratio Segal/Milliman
Cost Group #7	County Tier A / D	Pre-2011	89.77%	89.95%	99.8%
		2011-12	92.45%	91.49%	101.1%
		Post-2012	74.55%	74.84%	99.6%
Cost Group #8	CCCFPD	Pre-2011	86.52%	87.88%	98.5%
		2011-12	83.33%	82.59%	100.9%
		Post-2012	72.81%	73.60%	98.9%
	East CCCFPD	Pre-2011	131.27%	132.63%	99.0%
		2011-12	128.08%	127.34%	100.6%
		Post-2012	117.56%	118.35%	99.3%
Cost Group #9	County Tier C / E	Pre-2011	82.51%	80.91%	102.0%
		2011-12	80.28%	78.73%	102.0%
		Post-2012	72.05%	72.11%	99.9%
Cost Group #10	Moraga-Orinda Fire	Pre-2011	80.03%	79.72%	100.4%
		2011-12	75.59%	75.05%	100.7%
		Post-2012	65.83%	65.77%	100.1%
Cost Group #11	San Ramon Valley FD	Pre-2011	95.58%	97.25%	98.3%
		2011-12	92.98%	93.27%	99.7%
		Post-2012	81.62%	82.87%	98.5%
Cost Group #12	Rodeo-Hercules FD	Pre-2011	110.02%	110.56%	99.5%
		2011-12	107.08%	107.16%	99.9%
		Post-2012	100.32%	101.91%	98.4%
Total Employer Rate			**49.82%**	**49.53%**	**100.6%**

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