

Ventura County Employees' Retirement Association

Actuarial Audit of the June 30, 2016 Actuarial Valuation,
the July 1, 2011 through June 30, 2014 Actuarial
Experience Study, and
the June 30, 2015 Economic Actuarial Assumption Review



November 10, 2017

Board of Retirement
Ventura County Employees' Retirement Association
1190 S. Victoria Avenue, Suite 200
Ventura, CA 93003-6572

Attention: Ms. Linda Webb

Re: Actuarial Audit

Dear Board Members:

Gabriel, Roeder, Smith & Company (GRS) is pleased to present this report of an Actuarial Audit of the July 1, 2016 Actuarial Valuation, the July 1, 2011 through June 30, 2014 Experience Study and the June 30, 2015 Economic Actuarial Assumption Review of the Retirement System administered by the Ventura County Employees' Retirement Association (VCERA). We are grateful to VCERA Staff for their cooperation throughout the actuarial audit process. In addition, we wish to thank John Monroe and Paul Monroe of Segal (retained actuary) for their assistance with this project.

The actuarial audit has several related objectives:

- Review of the data used by the retained actuary;
- Review of the benefits modeled in the valuations as they compare to the benefits actually provided by Statute and described in the member handbooks;
- Completion of a parallel actuarial valuation;
- Review of the reasonableness of results of the most recent actuarial valuation;
- Review of the Association's current actuarial funding methods and funding policies;
- Review of assumptions used by the retained actuary and the experience study on which the assumptions were based;
- Review of the presentation of the valuation results (as contained in the valuation report); and
- A statement of the professional qualifications and overall performance of the retained actuary with regard to the practices prescribed by the Actuarial Standard Boards.

The actuarial audit began with a review of the valuation report, experience study, member handbooks, and the County Employees Retirement Law of 1937 (CERL). The actuarial audit also consisted of a parallel June 30, 2016 valuation and a review of the July 1, 2011 through June 30, 2014 experience study and the June 30, 2015 review of economic assumptions. It is possible for critical or material issues that are not apparent in the review of valuation reports to be identified in the parallel valuation process. It is also important to keep in mind that an actuarial audit is not guaranteed to find all existing material issues.

Our review found no critical issues. We have, however, identified several issues for VCERA and the retained actuary to consider.

The results of the audit are subdivided into the following categories:

- Parallel Valuation and Review
 - Member Data
 - Summary of Plan Provisions
 - Parallel Valuation
 - Funding and Asset of Methods
 - Funding Policy
- Review of Experience Study and Actuarial Assumptions
- Review of Reports

In our opinion, the retained actuary's work provides a fair and reasonable assessment of the financial position of VCERA. We are pleased to report that we have found no critical issues in the retained actuary's work in the VCERA parallel valuation and experience study review. The issues that we have identified are believed to collectively have less than a 1% difference in total VCERA liabilities and less than a 2% difference in the total VCERA normal costs.

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

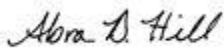
Respectfully submitted,



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SECTION A

EXECUTIVE SUMMARY

Executive Summary

Background

Gabriel, Roeder, Smith & Company (GRS) was asked to perform an actuarial audit of the work performed by Segal (retained actuary) for the Ventura County Employees' Retirement Association (VCERA).

We audited the following VCERA actuarial reports:

- Actuarial Valuation and Review as of June 30, 2016 issued December 20, 2016
- Actuarial Experience Study During the period July 1, 2011 through June 30, 2014 issued April 14, 2015
- Review of Economic Actuarial Assumptions for the June 30, 2015 Actuarial Valuation issued April 14, 2015

We also performed a full replication actuarial valuation for VCERA as of June 30, 2016 using the assumptions, methods and data that Segal Consulting used.

In short, our findings can be classified in the following categories:

- Parallel Valuation and Review
- Review of Experience Studies and Actuarial Assumptions
- Review of Reports

Parallel Valuation and Review Findings

Although it can be very difficult to match another actuary's results precisely in a review, the parallel valuation results were generally within an acceptable range of reasonableness with the current actuary's results.

	<u>GRS</u>	<u>Segal</u>	<u>Difference</u>	<u>% Variation</u>
Actuarial Accrued Liability	\$ 5,363,379,000	\$ 5,398,756,000	\$ (35,377,000)	-0.66%
Total Employer Cost (% Pay)	26.98%	27.52%	-0.54%	-1.96%

In general, we found the actuarial funding, valuation asset methods, and actuarial assumptions to be within generally acceptable ranges of practice and meet the requirements of the Actuarial Standards of Practice (ASOP).

Presented below are the main recommendations/comments that we would like to draw your attention to:

- The retained actuary's numerical results were reproducible within acceptable tolerance ranges.
- The biggest differences are in the development of the Normal Cost and the amortization of the Unfunded Actuarial Accrued Liability (UAAL). Differences in these areas are common due to variances in software and methodologies employed by actuarial firms.

Executive Summary

Review of Experience Study and Actuarial Assumptions Findings

We found the experience study to be understandable and thorough. In general, we agreed with the recommendations of the retained actuary. We recommend review of the following items:

- Expand discussions of rationale;
- Continue to monitor the assumed rate of return;
- Consider updating the mortality and mortality improvement assumptions;
- Continue to monitor the Tier II retirement rates as more experience becomes available;
- Monitor the wage increase assumption for reciprocal transfers;
- Separate commencement age for deferred vested members and transfers.

Review of Reports Findings

We found that the documentation and disclosure in the valuation report was reasonably complete.

Our specific recommendations for the valuation report are detailed in the Review section and include:

- Showing the Normal Cost and the Actuarial Accrued Liabilities by decrement;
- Consider adding a table containing the distribution of forms of payment elected by current retirees;
- Consider adding a description of decrement timing and pay increase timing;
- We recommend a thorough discussion of what the expectation of the contribution basis is for the employer;
- Describe the adjustments made to the member payroll provided by VCERA;
- Projected payrolls consistent with those used to develop plan liabilities should be shown for the rate development for each subcategory (Total Normal Cost, Employer NC, Member Contribution Rate, Unfunded Liability, and Administrative Expense);
- We recommend an aggregate amortization schedule be presented to demonstrate the projected retirement of the debt;
- Include other disclosures as required or soon to be required under Actuarial Standards of Practice and described in Section D.

Executive Summary

Our specific recommendations for the experience study report are detailed in the Review section and include:

- Include more exposure or credibility information in charts or graphs
- More discussion of rationale
- Pursue better data as legacy systems are replaced with newer technologies

Retained Actuary Qualifications

Paul Angelo and John Monroe of Segal Consulting signed or were listed on all of the documents provided to us for the purpose of conducting our actuarial audit.

We consider these reports and documents to be Actuarial Communications and Statements of Actuarial Opinion, as provided under the Qualification Standards and the Actuarial Standards of Practice promulgated by the American Academy of Actuaries.

Segal Consulting is an independent actuarial and consulting firm, with an excellent reputation and a significant actuarial practice in public retirement systems, particularly in California.

Paul Angelo represents being a Fellow of the Society of Actuaries, a Fellow of the Conferences at Consulting Actuaries, a Member of the American Academy of Actuaries and an Enrolled Actuary.

John Monroe represents being an Associate of the Society of Actuaries, a Member of the American Academy of Actuaries and an Enrolled Actuary.

We have validated the Specialists' credentials by reference to the Actuarial Directory as found on the Society of Actuaries' website, and the Roster of Active Enrolled Actuaries as of June 1, 2017, as found on the IRS.gov website.

Paul Angelo and John Monroe acknowledge meeting the Qualification Standards as promulgated by the American Academy of Actuaries to render the actuarial opinions given in the actuarial reports, studies and reviews.

We conclude that Mr. Angelo and Mr. Monroe are appropriately qualified to perform the actuarial retainer services for VCERA.

Conclusion

GRS has made several recommendations throughout the report. These recommendations are summarized in the Executive Summary, but we suggest that VCERA and the retained actuary review the entire report to read expanded discussions and determine what changes should be made for future valuations.

SECTION B

PARALLEL VALUATION AND REVIEW

Member Data

We received the member data directly from Segal Consulting. All relevant data was included in the member data. The data files used by Segal Consulting in the valuation included minor data edits based on routine questions to VCERA during the data collection process. The valuation data as provided does not appear to have any material defects.

Summary of Plan Provisions

The Summary of Plan Provisions in the valuation report appears to be consistent and relatively complete when compared to the handbook and statutes. We recommend consideration be given to the following possible additions:

- A brief description of the various optional forms of payment available to retirees.
- Describe more clearly death benefits for a deferred retirement.

Parallel Valuation Results

In our opinion, given good data and accurate plan provisions, the most important aspect of an actuarial audit is to reproduce the present value of future benefits.

To verify the accuracy of the retained actuary's valuation results, GRS performed an independent July 30, 2016 valuation of the VCERA using the "scrubbed data" of the retained actuary. The replication uses the same methods and procedures that were used by the retained actuary. The results show that the retained actuary's numerical results are reproducible within acceptable tolerance ranges.

Once the present value of future benefits has been fairly reproduced, the next most important aspect of an actuarial audit is to ensure that the retained actuary is following a prudent plan to fund the present value of future benefits. This is accomplished by the determination of the normal cost and the amortization of the unfunded actuarial accrued liability.

A comparison of major results is shown on the following pages.

July 30, 2016 Valuation Results Comparison

Development of Unfunded Liabilities

TOTAL VCERA			
	GRS	Segal	% Variation
Present Value of Future Benefits			
Active Member Benefits	\$ 3,236,560,000	\$ 3,256,058,000	-0.60%
Vested Terminated Benefits	145,485,000	145,994,000	-0.35%
Retiree Benefits	3,072,220,000	3,065,942,000	0.20%
Total Present Value of Future Benefits	\$ 6,454,265,000	\$ 6,467,994,000	-0.21%
Actuarial Accrued Liability			
Total Present Value of Future Benefits	\$ 6,454,265,000	\$ 6,467,994,000	-0.21%
Present Value of Future Normal Cost	\$ 1,090,886,000	\$ 1,069,238,000	2.02%
Actuarial Accrued Liability	\$ 5,363,379,000	\$ 5,398,756,000	-0.66%
Actuarial Value of Assets	\$ 4,585,713,000	\$ 4,585,713,000	0.00%
Net (Surplus)/Unfunded	\$ 777,666,000	\$ 813,043,000	-4.35%

Since we believe matching the present value of future benefits is the most important objective of an actuarial audit, our results are extraordinarily close to Segal, causing us to believe we have met this objective.

Comparison of Normal Cost

	GRS	Segal	Difference	% Variation
Total Normal Cost				
General Tier 1	21.42%	21.47%	-0.05%	-0.23%
General Tier 2	14.43%	14.22%	0.21%	1.48%
General PEPR Tier 2	13.70%	13.92%	-0.22%	-1.58%
General Tier 2C	17.25%	16.93%	0.32%	1.89%
General PEPR Tier 2C	16.23%	16.56%	-0.33%	-1.99%
Safety	30.36%	31.86%	-1.50%	-4.71%
Safety PEPR	28.67%	28.84%	-0.17%	-0.59%
All Categories Combined	19.29%	19.47%	-0.18%	-0.92%

July 30, 2016 Valuation Results Comparison

Development of Amortization Payment

Total VCERA

Segal

Date Established	Source	Initial Amount	Outstanding Balance	Years Remaining	Payment
June 30, 2004	Restart of Amortization	\$ 323,444,000	\$ 128,614,000	3	\$ 46,283,000
June 30, 2005	Actuarial (Gain)/Loss	48,849,000	24,435,000	4	6,718,000
June 30, 2006	Actuarial (Gain)/Loss	1,358,000	800,000	5	179,000
June 30, 2006	Assumption Change	102,790,000	60,545,000	5	13,564,000
June 30, 2006	Plan Provision Change	14,731,000	8,671,000	5	1,943,000
June 30, 2007	Actuarial (Gain)/Loss	(96,898,000)	(64,588,000)	6	(12,281,000)
June 30, 2008	Actuarial (Gain)/Loss	(75,365,000)	(55,262,000)	7	(9,172,000)
June 30, 2009	Actuarial (Gain)/Loss	204,600,000	161,735,000	8	23,917,000
June 30, 2009	Assumption Change	91,252,000	72,119,000	8	10,665,000
June 30, 2010	Actuarial (Gain)/Loss	206,081,000	172,862,000	9	23,134,000
June 30, 2011	Actuarial (Gain)/Loss	38,155,000	33,538,000	10	4,112,000
June 30, 2012	Actuarial (Gain)/Loss	4,258,000	3,895,000	11	442,000
June 30, 2012	Demographic Assumption Change	123,037,000	122,216,000	16	10,397,000
June 30, 2012	Economic Assumption Change	104,278,000	103,589,000	16	8,812,000
June 30, 2013	Actuarial (Gain)/Loss	15,435,000	14,511,000	12	1,537,000
June 30, 2014	Actuarial (Gain)/Loss	(87,484,000)	(84,394,000)	13	(8,391,000)
June 30, 2015	Actuarial (Gain)/Loss	(109,606,000)	(107,733,000)	14	(10,121,000)
June 30, 2015	Assumption Change	218,002,000	217,943,000	19	16,424,000
June 30, 2016	Actuarial (Gain)/Loss	(453,000)	(453,000)	15	(41,000)
			\$ 813,043,000		\$ 128,121,000

GRS

Date Established	Source	Initial Amount	Outstanding Balance	Years Remaining	Payment	% Variation
June 30, 2004	Restart of Amortization	\$ 323,444,000	\$ 128,614,000	3	46,274,000	-0.02%
June 30, 2005	Actuarial (Gain)/Loss	48,849,000	24,435,000	4	6,717,000	-0.01%
June 30, 2006	Actuarial (Gain)/Loss	1,358,000	800,000	5	179,000	0.00%
June 30, 2006	Assumption Change	102,790,000	60,545,000	5	13,563,000	-0.01%
June 30, 2006	Plan Provision Change	14,731,000	8,671,000	5	1,942,000	-0.05%
June 30, 2007	Actuarial (Gain)/Loss	(96,898,000)	(64,588,000)	6	(12,280,000)	-0.01%
June 30, 2008	Actuarial (Gain)/Loss	(75,365,000)	(55,262,000)	7	(9,171,000)	-0.01%
June 30, 2009	Actuarial (Gain)/Loss	204,600,000	161,735,000	8	23,912,000	-0.02%
June 30, 2009	Assumption Change	91,252,000	72,119,000	8	10,663,000	-0.02%
June 30, 2010	Actuarial (Gain)/Loss	206,081,000	172,862,000	9	23,130,000	-0.02%
June 30, 2011	Actuarial (Gain)/Loss	38,155,000	33,538,000	10	4,111,000	-0.02%
June 30, 2012	Actuarial (Gain)/Loss	4,258,000	3,895,000	11	442,000	0.00%
June 30, 2012	Demographic Assumption Change	123,037,000	122,216,000	16	10,395,000	-0.02%
June 30, 2012	Economic Assumption Change	104,278,000	103,589,000	16	8,812,000	0.00%
June 30, 2013	Actuarial (Gain)/Loss	15,435,000	14,511,000	12	1,535,000	-0.13%
June 30, 2014	Actuarial (Gain)/Loss	(87,484,000)	(84,394,000)	13	(8,390,000)	-0.01%
June 30, 2015	Actuarial (Gain)/Loss	(109,606,000)	(107,733,000)	14	(10,119,000)	-0.02%
June 30, 2015	Assumption Change	218,002,000	217,943,000	19	16,421,000	-0.02%
June 30, 2016	Actuarial (Gain)/Loss	(35,830,000)	(35,830,000)	15	(3,196,000)	7695.12%
			\$ 777,666,000		\$ 124,940,000	-2.48%

July 30, 2016 Valuation Results Comparison

Comparison of Employer Contributions

Employer Contribution Rates	GRS		Segal		% Variation
	Rate	Estimated Annual	Rate	Estimated Annual	
		Amount		Amount	
General Tier 1 ⁽¹⁾	23.96%	1,875	24.40%	1,910	-1.80%
General Tier 2	16.35%	35,097	16.54%	35,503	-1.15%
General PEPR Tier 2	16.00%	5,629	16.39%	5,776	-2.38%
General Tier 2C	20.52%	44,362	20.72%	44,794	-0.97%
General PEPR Tier 2C	19.87%	12,740	20.50%	13,149	-3.07%
General Combined	18.53%	99,702	18.79%	101,132	-1.38%
Safety ⁽¹⁾	54.16%	84,172	55.66%	86,496	-2.69%
Safety PEPR	52.66%	6,559	53.49%	6,663	-1.55%
Safety Combined	54.05%	90,731	55.50%	93,159	-2.61%
All Categories Combined	26.98%	190,433	27.52%	194,291	-1.96%
Average Member Contribution Rates					
General Tier 1	10.57%	828	10.60%	830	-0.28%
General Tier 2	7.21%	15,486	7.11%	15,265	1.41%
General PEPR Tier 2	6.85%	2,409	6.96%	2,453	-1.58%
General Tier 2C	9.84%	21,285	9.74%	21,061	1.03%
General PEPR Tier 2C	9.48%	6,078	9.59%	6,152	-1.15%
Safety	14.52%	22,561	15.27%	23,730	-4.91%
Safety PEPR	14.33%	1,786	14.42%	1,796	-0.62%
All Categories Combined	9.98%	70,433	10.10%	71,287	-1.19%

Projected Total Compensation	GRS	-	Segal	% Variation	-
	General Tier 1	7,830	-	7,830	0.00%
General Tier 2	214,683	-	214,696	-0.01%	-
General PEPR Tier 2	35,169	-	35,238	-0.20%	-
General Tier 2C	216,231	-	216,231	0.00%	-
General PEPR Tier 2C	64,125	-	64,147	-0.03%	-
Safety	155,400	-	155,401	0.00%	-
Safety PEPR	12,455	-	12,457	-0.02%	-
All Categories Combined	705,893	-	706,000	-0.02%	-

⁽¹⁾ Employer normal cost rate was adjusted by 0.27% for General Tier 1 Members and 1.32% for Safety Members to account for the cost associated with the cessation of member contributions after 30 years of service. These rates were not audited and we relied on Segal's calculations for our comparison.

The biggest differences are in the development of the Normal Cost and the amortization of the Unfunded Actuarial Accrued Liability (UAAL). This is common in actuarial audits since different firms can take slightly different approaches to splitting the present value of future benefits.

Our calculation of the total dollar amount of the amortization of the UAAL is 2.48% lower than Segal's. The percentage difference in amortization payments is smaller than the percentage difference in total unfunded liabilities due to the tiered amortization used in the valuation report. We relied on Segal's calculation of the Restart of Amortization base established on July 30, 2004, and the subsequent amortization bases resulting from Plan Provision changes, Assumption changes, and Actuarial Gains and Losses, as development of those values were outside the scope of this project. This difference is within an acceptable range.

The Projected Active Member Payroll shown on the previous page is the valuation payroll projected with ½ year of base wage inflation. This is the payroll on which the Amortization of the Unfunded Liability and the Administrative Expense are based as a percent of pay.

We understand that the County contributes on a percent of payroll basis rather than the estimated dollar amounts shown. This is best practice in our opinion due to the variable member contributions rates. Therefore, the percent of payroll contribution is more pertinent than the projected dollar amount. Segal's calculated employer contribution rate is greater than the GRS calculated amount by 54 basis points, a variation of 1.96 %. This difference is within an acceptable range.

Actuarial Methods

Funding Method

We reviewed the funding method in the context of ASOP No. 4, Measuring Pension Obligations and Determining Pension Plan Costs or Contributions. This report was not reviewed for compliance with GASB Nos. 67 and 68.

The funding method is Entry Age Normal Cost (EANC), which is acceptable under the Actuarial Standards of Practice. This is also the most commonly used method in the public sector. This method is consistent with CERL 31453.6.

The Entry Age Normal actuarial cost method is being employed in the valuation of the VCERA.

Under this method, Normal Costs are determined for each individual participant as the level percentage of his or her payroll which will need to be contributed from his or her date of entry into the System until his or her departure from the System. The total Normal Cost for the System is the sum of all of the individual normal costs so determined.

The Actuarial Accrued Liability may be viewed as the accumulation of all prior Normal Cost payments (calculated as if the System always had its current benefit structure), less the prior benefit payments. It is usually calculated, as in your valuation, as the present value of all future benefit payments to current members, annuitants, and beneficiaries, less the present value of future Normal Cost payments for current active members.

Any difference between the Actuarial Accrued Liability and current plan assets is the Unfunded Actuarial Accrued Liability (UAAL). Differences between actual plan experience and experience expected based on the actuarial assumptions creates annual gains or losses which serve to decrease or increase the UAAL. Changes in assumptions, methodologies or benefit provisions also decrease or increase the UAAL but typically not annually. The UAAL created each year by source is amortized as a separate cost item; the UAAL, developed as part of the June 30, 2016 valuation report, is being amortized as a level percentage of payroll over closed periods ranging from 3 years to 19 years.

We believe that this funding method is appropriate for use by VCERA. The Entry Age Normal method is still the most commonly used for public sector defined benefit systems and continues to be our method of choice when we are in a position to influence the decision makers.

Use of the level percent of pay approach to amortize the Unfunded Actuarial Accrued Liability is both common and appropriate. Absent future changes in benefits and/or assumptions, this approach should provide the most stable and most predictable pattern of cost as a percentage of payroll. However, as each separate amortization period is completed, significant swings in year-to-year contribution requirements can result.

This is not a matter of actuarial concern, although it is not always consistent with contribution rate stability; rather it can schedule contribution rate fluctuations.

Full discussion of these issues from time-to-time can help Board members (particularly new ones) to more effectively carry out their responsibilities. These comments are intended to assist the Board in their understanding of this funding method. We strongly believe that the Entry Age Normal cost method, along with level percentage of pay amortization for the UAAL, is appropriate.

We reviewed summary results from Segal Consulting and their presentations in their valuation reports. We conclude that the retained actuary is properly applying the stated actuarial method and producing appropriate contribution rates.

Asset Valuation Method

We reviewed the asset valuation method in the context of ASOP No. 44, Selection and Use of Asset Valuation Methods for Pension Valuations.

The asset smoothing method is a 5.5-year smoothing method with no mention of a corridor around the market value of assets. The Society of Actuaries Blue Ribbon Panel on Public Pension Plan Funding report recommends an asset smoothing period of five years or less. The Conference of Consulting Actuaries Public Plans Community White Paper on Public Pension Funding Policy would categorize a 5-year smoothing method with a 50% corridor as a “model” practice. If there is a corridor, it should be mentioned in Section 2, page 4 or 5.

We recommend using a corridor that forces immediate recognition of gains and losses outside the corridor as they occur. This would be offset in future years by more rapid convergence to the market value of assets resulting in less deferral of contributions needed to replenish the fund.

In our opinion, the current asset valuation method is acceptable under the Actuarial Standards of Practice.

Funding Policy

According to the 2016 CAFR, the CERA funding policy was last reviewed with the Board in 2012. A funding policy establishes and prioritizes funding objectives and strategies.

Some good funding objectives are:

1. *Provide sufficient assets to permit the payment of all benefits under CERL.*
2. *Maintain equity among generations of taxpayers by:*
 - a. *Achieving and maintaining a Funded Ratio between 90% and 110%;*
 - b. *Amortizing the Unfunded Actuarial Accrued Liability over a period approximately equal to the expected average future working lifetime of the active CERA membership; and*
 - c. *Setting Funding Policy so that the Inactive Funded Ratio is expected to remain above 100%.*
3. *Minimize the volatility of the employer's annual contribution rate as a percentage of covered pay by:*
 - a. *Maintaining 3% of total assets as a reserve against contingencies; and*
 - b. *Coordinating Funding and Investment Policies to reduce portfolio risk as the Funded Ratio improves, with the goal of taking opportunities as they present themselves.*
4. *Set a minimum contribution requirement of the normal cost.*

The funded ratio, based on Actuarial Value of Assets, as of June 30, 2016 is 84.94% in Segal's report. It is important to recognize that the contribution rate is designed to achieve 100% funding and return to the target range.

The amortization policy is stated on page 13 of Segal's actuarial valuation report. The policy uses level percent-of-payroll, layered fixed period amortization by source of UAAL. Annual gains and losses and plan amendments (with the exception of retirement incentives) are amortized over 15 years, changes in actuarial assumptions or methods are amortized over 20 years, and changes due to retirement incentives will be amortized over 5 years. This is consistent with the CCA White Paper and sufficient under ASOP No. 4.

SECTION C

REVIEW OF EXPERIENCE STUDY AND ACTUARIAL ASSUMPTIONS

Methodology

An experience study reviews the number of decrements and exposures for each demographic assumption. Segal's methodology follows standard practice methodology and allows for actuarial judgment when exposures are "insufficient" to provide credible analysis and combining groups when independent review is not feasible. These procedures are routine in experience studies, but may result in different actuaries reaching different conclusions.

We discuss each assumption in our review below.

Economic Assumptions

We reviewed the April 14, 2015 Review of Economic Actuarial Assumptions for the June 30, 2015 Actuarial Valuation in the context of ASOP No. 27, Selection of Economic Assumptions for Measuring Pension Obligations. Since ASOP No. 27 now requires assumptions to be reasonable for each valuation, you will notice we are sometimes mentioning information that was unavailable prior to April 14, 2015, but became available by the summer of 2016.

Price Inflation

Over the last 30 years, the average increase in the Consumer Price Index (CPI) was 2.61% with a standard deviation of 1.31%. It is important not to give undue weight to recent experience. We also must consider future expectations as well. One measure is the spread between yields on U.S. Treasuries and U.S. TIPS. This calculation varies depending on the maturity selected. Moreover, there may be other influences on the result such as a risk premium on Treasuries and a liquidity premium on TIPS. Nevertheless, it is a measure easily made. The longest horizon we can use for this basis is 30 years. As of December 30, 2015, the yield on 30-year Treasuries was 3.04% and inflation index TIPS was 1.31% for a raw difference of 1.73%. This is significantly lower than past experience and noticeably below the Federal Reserve's target inflation rate of 2.0%.

Another point of reference is the 2015 and 2016 Social Security Trustees reports, which assumed three scenarios of ultimate annual increases in CPI of 3.4%, 2.7%, and 2.0% for the low-cost, intermediate, and high-cost scenarios for 2015 and 3.2%, 2.6%, and 2.0% for 2016. The Social Security Trustees report uses the ultimate rates for their 75-year projections, much longer than the longest horizon we can discern from Treasuries and TIPS.

In their experience study, Segal made similar observations about future price inflation expectations. Segal also notes that the Board's investment consultant uses 3.25%, which we assume is on a 30-year horizon or is based on global market expectations. Segal recommended the price inflation assumption be reduced from 3.25% to 3.00%.

The Board's assumption of 3.00% should be compared to NEPC's current expectations, since other economic assumptions are impacted if it has been materially lowered (e.g., more than 50%). While the assumption is within Segal's reasonable range, we believe it is on the aggressive end of the range and may need to be lowered in the near future.

Wage Inflation

The average wage inflation experienced from 1990 through 2015 as measured by the Social Security Administration (SSA) was 3.51% per year, 116 basis points higher than price inflation over the same period. However, the SSA also observes that the median increase in compensation from 1990 through 2015 was 3.07% per year, 72 basis points higher than price inflation over the same period. In the public sector, we have generally observed narrowing spreads between price inflation and wage inflation. We believe that the 0.50% assumption set by the Board is reasonable. While the 0.50% spread between wages and prices is reasonable, in combination with the 3.0% price inflation assumption, the 3.50% wage inflation may be high. A high wage inflation assumption has a tendency to understate level percent of payroll amortization rates (ignoring the effect the wage inflation has on the liabilities).

COLA Growth

The COLA provisions grant an increase of CPI up to 3% for General Tier 1 and Safety members, but CPI increases above 3% are “banked” for use of future increases. The Board uses 3.00% and we find this reasonable and slightly conservative.

Generally, all economic assumptions must be consistent under ASOP No. 27, Section 3.12. We acknowledge Segal’s preference for consistency over stochastic modeling.

Discount Rate

Segal’s assumed rate of return is reasonable if it meets the following criteria:

- It is appropriate for the purpose of the measurement;
- It reflects the actuary’s professional judgment;
- It takes into account historical and current economic data that is relevant as of the measurement date;
- It reflects the actuary’s estimate of future experiences, observations of estimates inherent in market data, or a combination thereof; and
- It has no significant bias (i.e., it is not significantly optimistic or pessimistic), except when provisions for adverse deviation or other factors are included.

For purposes of budgeting contributions as a level percentage of payroll, the assumed rate of investment return is used as the discount rate to determine the present value of the system’s pension obligations.

The Board adopted an assumed rate of return of 7.50%. Segal’s report indicates the target asset allocation and their analysis of expected returns using a Segal’s California clients and comparing to the Board’s investment consultant NEPC. For purposes of our analysis, we survey nationally recognized investment consultants’ capital market assumptions and test the System’s target allocation with those assumptions. The eight investment consultants that participated this year are PCA, NEPC, BNY Mellon, JP Morgan Chase, RV Kuhns, Mercer, HEK, and Wilshire.

Segal stated that their expected geometric return was 7.50% with a 54% confidence level. For purposes of this analysis, Segal used 3.00% price inflation and a 5-year average of actual administrative and investment expenses.

We attempt to use the target asset allocation to analyze the assumed rate of return, but different investment consultants often have different asset classes and certain investment strategies (such as risk parity) may be modeled in different ways. In other words, our analysis uses the eight investment consultants and should be considered an approximation only. For consistency, we use the same methodology for all eight consultants.

NEPC is one of the eight investment consultants included in our survey. A good reasonableness check of our analysis would be to compare our results from NEPC to Segal’s. In this case, we match very well. Segal shows NEPC’s real arithmetic return to be 5.13%, and GRS shows 5.24%.

We summarize the arithmetic return assumption development from the eight consultants in the table below.

Investment Consultant	Investment Consultant Expected Nominal Return	Investment Consultant Inflation Assumption	Expected Real Return (2)-(3)	Actuary Inflation Assumption	Expected Nominal Return (4)+(5)	Plan Incurred Administrative Expenses	Expected Nominal Return Net of Expenses (6)-(7)	Standard Deviation of Expected Return (1-Year)
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
1	6.81%	2.50%	4.31%	3.00%	7.31%	0.12%	7.19%	12.82%
2	6.77%	2.20%	4.57%	3.00%	7.57%	0.12%	7.45%	11.46%
3	6.49%	1.56%	4.93%	3.00%	7.93%	0.12%	7.81%	11.60%
4	7.34%	2.26%	5.08%	3.00%	8.08%	0.12%	7.96%	11.31%
5	7.22%	2.00%	5.22%	3.00%	8.22%	0.12%	8.10%	11.81%
6	7.49%	2.25%	5.24%	3.00%	8.24%	0.12%	8.12%	13.08%
7	8.09%	2.25%	5.84%	3.00%	8.84%	0.12%	8.72%	15.07%
8	8.17%	2.20%	5.97%	3.00%	8.97%	0.12%	8.85%	12.96%
Average	7.30%	2.15%	5.15%	3.00%	8.15%	0.12%	8.03%	12.52%

Note that the average arithmetic return for the eight consultants is 8.03% (bottom of column (8)), which is roughly in line with Segal’s analysis under NEPC and Segal’s analysis using other California clients. Similarly, we analyze the median return as a proxy for the geometric return:

Investment Consultant	Distribution of 20-Year Average Geometric Net Nominal Return			Probability of exceeding 7.50%
	40th	50th	60th	
(1)	(2)	(3)	(4)	(5)
1	5.72%	6.43%	7.15%	35.39%
2	6.21%	6.85%	7.49%	39.91%
3	6.54%	7.19%	7.84%	45.17%
4	6.74%	7.37%	8.01%	48.01%
5	6.79%	7.46%	8.12%	49.33%
6	6.61%	7.34%	8.08%	47.79%
7	6.85%	7.69%	8.54%	52.30%
8	7.36%	8.09%	8.82%	58.16%
Average	6.60%	7.30%	8.01%	47.01%

For the geometric return, the average of the 50th percentile of the eight consultants is 7.02% (bottom of column (3)). One final observation we have is that the probability of exceeding 7.50% on a 20-year horizon is 47.01%, as shown at the bottom of column (5).

In general, we concur with Segal that the assumed rate of return is not unreasonable. However, it is critical to understand the impact of price inflation in this analysis. If Segal were to use the current consensus opinion price inflation assumption of 2.25%, estimated rates of return would decrease by roughly 0.75%, which would result in a median return expectation of below 7.00%. We expect that the Board may need to lower the assumed rate of return in the near future.

Demographic Assumptions

We reviewed the demographic assumptions in the context of ASOP No. 35, Selection of Demographic and Other Non-Economic Assumptions for Measuring Pension Obligations. The demographic assumptions analyzed here are based mainly on VCERA experience.

Merit Salary Increases

Segal uses a longitudinal study for the pay longevity and merit analysis using data from both the current and prior study. A longitudinal study uses data over the entire period of study, adjusted for the effects of wage inflation, collective bargaining agreements, and management decisions. The advantage is the use of more data, whereas the disadvantage is that this can result in the appearance of periods of negative merit and seniority. An alternative to consider in future experience studies is a transverse study. A transverse study uses data at a particular point of time and analyzes the increase in pay throughout members' careers by comparing the pay versus service with the active population. Transverse studies have the advantage that inflation uncertainty has less impact on the analysis and the disadvantage that no distinction is made for different job classifications. Transverse studies may minimize the effect of outliers and provide more robust analysis particularly in the early years of members' careers.

The new assumptions appear reasonable and consistent with the data. For the experience study report, we would recommend including a numerical measure of the "goodness of fit" of the assumption to the data, such as a piecewise least squares measure.

Retirement Rates

For Non-PEPRA General retirement rates, Segal recommended assumptions by age. We note the experience ages 69 and 70 appears to understate recent experience, whereas ages 71 and 72 appears to overstate recent experience. We recommend more discussions of the rationale be included in the next experience study.

For Non-PEPRA Safety retirement rates, Segal recommended separate assumptions by age. We note the experience at ages 63 and 64 appears to overstate recent experience, possibly due to limited exposure.

Due to the lack of plan experience, separate rates were not developed for Tier I and Tier II retirees. Tier II members are subject to lower multipliers than Tier I members, and thus have the possibility of having longer average career length than Tier I members. It is reasonable at this early stage, when there is little experience, to use the same rates for both Tiers. It is our recommendation that the Tier II retirement experience be monitored closely to incorporate any deviations between the two actual retirement patterns quickly into the valuation.

For General and Safety PEPRA Tiers, the only anomaly was the new rate at age 64 for General. This is another case where we recommend more discussion on rationale.

Termination Rates

Termination rates, including vested terminations, terminations with refund, and reciprocal terminations, are split between General and Safety and were analyzed on a service basis and an age and service basis. We recommend liability weighting be considered in the next experience study.

For General, we agree with Segal's recommendation.

For Safety termination rates the observed rate at 20 years of service or more seems implausible.

The termination rates appear reasonable. We recommend a little more discussion in the report to aid in the understanding of all the assumptions being made. In particular, it may be helpful to define termination, refund, and transfer in more depth.

Reciprocal terminations must have an assumption for pay increases between the time of terminating VCERA and retiring. Segal chose to use the total pay growth assumption plus 1% for this. This is a reasonable assumption; however, we recommend checking with reciprocal employers to see if newer systems are being brought online to allow better information sharing.

The ages at which vested terminated members decide to retire were not analyzed and for General was recommended to stay at age 58, which could have been written in the text on page 29 of the experience study report. Safety was recommended to stay at age 54, which could have been mentioned on page 30. These are both reasonable assumptions.

The same commencement age assumption is used for vested terminations and members who have transferred to a reciprocating employer. It is possible that members who transfer to reciprocal employers who defer retirement longer may receive a higher benefit from VCERA since the benefit reflects their final average compensation from their reciprocating employer. We recommend that future experience studies review the commencement age for deferred vested members and transfers separately.

Disability Rates

The recommended rates and the assumed incidence of duty related cases were reasonable.

Mortality

Segal's mortality rate recommendation is based on mortality tables and projection scales, which were not the most current available in April 2015. While these mortality rates and mortality improvement factors are somewhat reasonable (due to the significant period of projection using scale BB to year 2035), we recommend some version of the Society of Actuaries 2014 tables be proposed in the next experience study and a change to fully generational projections from static. This is a particular area of concern where we think further discussion of the rationale would have been helpful.

The current assumption for disabled mortality is a set forward of the tables used for healthy retirees. A set forward of tables for disability mortality distorts the mortality rates at older ages. We recommend an

alternative approach for reflecting increased mortality rates for disabled retirees. It is worth noting that the RP-2014 mortality tables include rates specific to disabled retirement.

Other Demographic Assumptions

Terminal Pay

Does not appear to have been analyzed.

Family Composition

The recommendations for family composition and age differences appear reasonable.

In-Service Redemptions

Although Segal's recommendation of 7.25% for non-PEPRA active members is reasonable, no rationale was given why it was not set between 7.38% and 7.50%.

Conclusion

We believe that the actuarial assumptions are reasonable and meet the Actuarial Standards of Practice.

We recommend review of the following items:

- Expand discussions of rationale;
- Continue to monitor the assumed rate of return;
- Consider updating the mortality and mortality improvement assumptions;
- Continue to monitor the Tier II retirement rates as more experience becomes available;
- Monitor the wage increase assumption for reciprocal transfers;
- Separate commencement age for deferred vested members and transfers.

SECTION D

REVIEW OF ACTUARIAL VALUATION

We reviewed the valuation and report of Segal in the context of ASOP No. 41, Actuarial Communications promulgated by the American Academy of Actuaries.

Valuation Report

Overall, we felt the report was reasonably well organized and communicated the most pertinent results clearly and concisely.

Actuarial Certification

In our opinion, the Actuarial Certification in the valuation report could benefit from explicitly adding the following:

- A mention that the unfunded actuarial accrued liability should not be used as a settlement liability.

Report

We recommend a projection of contribution results and resulting contribution rates be included at least in the aggregate. This is not a trivial addition. Segal would have to provide a fee quote for such a change. We also note that ASOP 51, Assessment and Disclosure of Risk Associated with Measuring Pension Obligations and Determining Pension Plan Contributions, has been adopted. We recommend early compliance for the June 30, 2018 actuarial valuation.

Membership Information

- Consider adding a table containing the distribution of forms of payment elected by current retirees.
- Consider adding a table containing the distribution of active member statistics by type of COLA cost-sharing.

Statement of Current Actuarial Assumptions and Methods

- Consider adding a description of decrement timing and pay increase timing.
- Describe the adjustments made to the member payroll provided by VCERA.