

Sacramento County Employees' Retirement System

**Actuarial Review of June 30,
2016 Actuarial Valuation and
Actuarial Experience Study**

Produced by Cheiron

October 2017

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Via Electronic Mail

October 11, 2017

Board of Trustees
Sacramento County Employees' Retirement System
980 9th Street, Suite 1900
Sacramento, CA 95814

Members of the Board:

Cheiron is pleased to present the results of our actuarial audit of the June 30, 2016 actuarial valuation of the Sacramento County Employees' Retirement System (SCERS) and Actuarial Experience Study covering the period from July 1, 2013 to June 30, 2016, performed by Segal Consulting (Segal). We would like to thank Segal for providing us with information and explanations that facilitated the actuarial audit process and ensured that our findings are accurate and benefit SCERS.

We direct your attention to the executive summary section of our report which highlights the key findings of our review. The balance of the report provides details in support of these findings along with supplemental data, background information, and discussion of the process used in the evaluation of the work performed by Segal.

In preparing our report, we relied on information (some oral and some written) supplied by SCERS and Segal. This information includes, but is not limited to, actuarial assumptions and methods adopted by SCERS, the plan provisions, employee data, and financial information. We performed an informal examination of the obvious characteristics of the data for reasonableness in accordance with Actuarial Standard of Practice No. 23. A detailed description of all information provided for this review is provided in the body of our report.

We hereby certify that, to the best of our knowledge, this report and its contents have been prepared in accordance with generally recognized and accepted actuarial principles and practices which are consistent with the Code of Professional Conduct and applicable Actuarial Standards of Practice set out by the Actuarial Standards Board. Furthermore, as credentialed actuaries, we meet the Qualification Standards of the American Academy of Actuaries to render the opinion contained in this report. This report does not address any contractual or legal issues. We are not attorneys and our firm does not provide any legal services or advice.



Board of Trustees
Sacramento County Employees' Retirement System
October 11, 2017

This report was prepared exclusively for the Sacramento County Employees' Retirement System for the purpose described herein. This report is not intended to benefit any third party, and Cheiron assumes no duty or liability to any such party.

Sincerely,
Cheiron



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**ACTUARIAL AUDIT REPORT OF THE
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SECTION I - EXECUTIVE SUMMARY

Key Findings and Recommendations

The main findings of our review are as follows:

1. As a result of our efforts, we are able to confirm that the liabilities and costs computed in the valuation as of June 30, 2016 are reasonably accurate and were computed in accordance with generally accepted actuarial principles.
2. We have reviewed the economic and demographic assumptions recommended in the most recent Actuarial Experience Study presented by Segal. In general, we have found them to be reasonable and in accordance with generally accepted actuarial principles. However, we recommend that Segal review the recommendations in two areas – rates of retirement and mortality – and determine whether additional analysis is merited.

Our primary recommendations are related to the assumptions, and are summarized as follows:

- Cheiron determined the non-economic actuarial assumptions proposed in Segal's Experience Study to be generally reasonable and in compliance with acceptable standards of actuarial practice. In particular, we support their recommendation of a change to use generational mortality assumptions. However, as noted above, we believe Segal should review the methodology used to analyze the mortality and retirement assumptions:
 - In addition to examining the mortality experience based on the number of members who lived and died, we recommend analyzing the experience by the *benefit amounts*. Actuaries - ourselves included - have found that members with higher benefit amounts tend to live longer, on average. As a result, mortality assumptions based only on the number of deaths potentially understate SCERS liabilities.
 - As a related issue, since Segal recommends the use of base mortality tables derived from the most recent Society of Actuaries pension study (the RP-2014 Mortality Tables Report), we recommend they consider the use of the standard (benefit-weighted) RP-2014 tables, rather than the RP-2014 Headcount-Weighted versions.
 - We recommend that Segal consider how much credibility to assign to the mortality experience of the last six years in developing proposed adjustments to the standard base tables, in particular for Safety service-retired members.
 - We recommend that Segal review the service retirement rates by both the age **and** service of the members in relation to the probability of leaving employment. The last experience study only showed the analysis using age-related rates. Based on our review of additional data provided by Segal, the number of years of service a member has earned affects the probabilities of retirement, which is consistent with our experience at other systems.

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- Overall, the economic assumptions proposed in Segal's review represent a reasonable set of assumptions. However, we recommend that Segal clarify the meaning of their "risk adjustment" in developing the investment return assumption. The table in the report showing the "confidence level" over 15 years may be misleading because it overstates the probability of achieving the return on a compound basis.

Scope of Assignment

Cheiron performed a complete independent replication of SCERS June 30, 2016 actuarial valuation and reviewed the actuarial methods underlying that valuation. We reviewed the census data provided by SCERS staff, and compared to the information used by Segal in their valuation. We then performed a full parallel valuation, including the calculation of the projected benefits, accrued liability, and normal cost for all SCERS members, and compared the results to those shown in Segal's actuarial valuation report.

Additionally, Cheiron performed a review of the assumptions recommended by Segal for the June 30, 2017 valuation, as reflected in the actuarial experience study covering the period from July 1, 2013 through June 30, 2016. This review did not constitute a full replication of the experience study; it was focused on a review of the recommendations and communications from Segal, based on the information provided within the study.

This audit provides SCERS confirmation that:

- The results reported by Segal can be relied upon,
- Segal's actuarial valuation report, assumptions, and methods comply with Actuarial Standards of Practice (ASOPs),
- The communication of the actuarial valuation results is complete and reasonable, and
- The Board and Segal have considered recommendations and communications that may improve the valuation and experience study.

In a few areas, alternative assumptions should be considered based on review of trends that would be effective in anticipating future experience and could have a material impact on the liabilities and cost of the Plan going forward.

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SECTION II - SUMMARY OF REVIEW AND RECOMMENDATIONS

This section summarizes our review of the actuarial valuation and experience study and our recommendations.

Valuation Procedures

Overall, we find that the June 30, 2016 actuarial valuation procedures applied in the reporting of the funded status and the determination of the funding requirements based on the current funding policies and adopted assumptions are technically reasonable and conform to the ASOPs. This is based on our review of: the valuation report, the census data used in the valuation and our parallel valuation using the information described above.

Valuation Results

Our independent replication of the June 30, 2016 actuarial valuation found no material difference in calculations of plan liabilities, actuarial value of assets, and overall contribution rates from the amounts calculated by Segal based on the adopted assumptions and methods. For the scope of this audit, materiality means the results in the aggregate were within industry standards of plus or minus 5%. Consequently, we conclude that the valuation prepared by Segal for SCERS as of June 30, 2016 is reasonable and can be relied on by the Board for its intended purpose. Our replication of the measures of plan liabilities and costs is summarized in Table II-1 below.

Table II-1			
Summary of Valuation Results as of June 30, 2016			
(\$ in millions)			
	Segal	Cheiron	Ratio
Present Value of Future Benefits	\$ 10,887	\$ 10,787	99%
Actuarial Accrued Liability	\$ 9,436	\$ 9,348	99%
Actuarial Value of Assets	<u>8,236</u>	<u>8,231</u>	100%
Unfunded Actuarial Accrued Liability (UAAL)	\$ 1,200	\$ 1,117	93%
Funded Percentage	87.3%	88.1%	101%
Contribution Rate by Component			
Employer Normal Cost Rate	11.31%	11.10%	98%
UAAL Rate	<u>9.82%</u>	<u>9.19%</u>	94%
Total Employer Contribution	21.13%	20.29%	96%

Although the difference in the unfunded liability estimate is larger than 5%, we note that differences in the unfunded liability amounts are leveraged by the assets. Imagine a plan which is

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measured as 100% funded (assets exactly equal to actuarial liabilities) by the Plan's actuary. If the auditing actuary were to determine an actuarial liability 0.1% greater than the Plan's actuary, the differences would clearly be minor. However, the relative size of the unfunded liability measures would be infinitely different, as the Plan's actuary's estimate of the UAL would be \$0 while the auditing actuary's estimate would be a positive number.

Our replication of the employer contribution rates by Tier is shown below in Table II-2. We note that the total contribution rate and most of the contribution rates by Tier are within the 5% threshold.

Table II-2 Comparison of Employer Contribution Rates			
	Segal	Cheiron	Ratio
Employer Contribution Rates			
Miscellaneous Tier 1	16.33%	15.48%	95%
Miscellaneous Tier 2	14.45%	13.27%	92%
Miscellaneous Tier 3	16.69%	15.85%	95%
Miscellaneous Tier 4	15.01%	14.33%	95%
Miscellaneous Tier 5	14.44%	13.38%	93%
Safety Tier 1	41.30%	40.01%	97%
Safety Tier 2	37.44%	36.70%	98%
Safety Tier 3	36.51%	37.22%	102%
Safety Tier 4	34.11%	33.36%	98%
All Employers Combined	21.13%	20.29%	96%

Several figures fall outside of the normal 5% industry standard; however, none of these raise material concerns with respect to the reasonableness of Segal's results. The difference in the Miscellaneous Tier 2 cost is driven by the difference in the normal cost rate for a small group (62 actives) with high levels of service (over 25 years on average). It is not unusual to see differences in the normal cost rates between valuation systems for members nearing retirement, as they sometimes treat the pay expected to be received in the final year of service differently. We note that our estimate of the total present value of benefits for Tier 2 is within 2% of Segal's.

For Miscellaneous Tier 5, the current active members have very low levels of service on average (1.4 years), which can lead to larger differences in the actuarial liability and normal cost. As with the issue related to members nearing retirement, it is not unusual to see larger differences in accrued liability and normal cost for newer groups, as a result of minor differences in how valuation systems apply various elements used in the allocation of costs between past and future service, such as the rounding of entry ages. As with Tier 2, our estimate of the total present value

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of benefits for the members in Miscellaneous Tier 5 is within 2% of Segal's. As the size of the PEPRA population grows, and as these members accumulate more service, the percentage differences between different valuation systems should decline significantly.

In determining the unfunded actuarial liability, Segal relies on reserve balances provided by SCERS, as well as information related to the liabilities associated with the withdrawal calculations for individual employers provided outside of the actuarial valuation report. Our review did not include an audit of these additional sources of information.

Employee Contribution Rates

As part of the audit, we replicated the calculations of the individual employee contribution rates based on the applicable provisions of the County Employees Retirement Law (the CERL) and our understanding of additional cost-sharing as described in the valuation report. For the Non-PEPRA (Legacy) tiers, we understand the employee contribution rates to be made up of the following components:

- A Basic rate providing for an annuity equal to
 - 1/240th (Miscellaneous Tiers 1, 2, and 3) Final Average Compensation at a retirement age of 55, or
 - 1/120th (Miscellaneous Tier 4) Final Average Compensation at a retirement age of 60, or
 - 1/100th (Safety Tiers 1, 2, and 3) Final Average Compensation at a retirement age of 50.
- A COLA rate providing for one-half of the cost of the COLA for Miscellaneous Tiers 1, 3 and 4 and Safety Tiers 1, 2, and 3.

For the PEPRA members, the employee contribution rates are equal to 50% of the total normal cost rates for each group. In addition, many of the Legacy members are also now paying 50% of the total normal cost.

We have verified the calculations of the individual employee contribution rates based on the applicable provisions of the CERL and generally have found these rates to be correct. Our Basic (non-COLA) rates were within 0.01% of Segal's rates for all Legacy tiers. The total normal cost rates computed for the new tiers (Miscellaneous Tier 5 and Safety Tier 4) match within a 5% margin, as do the total normal cost rates for the other tiers, used as the basis for computing the additional cost-sharing amounts for these tiers reflected in the current valuation.

The only group where the total normal cost difference is slightly greater than 5% is Miscellaneous Tier 2, for whom we have a total normal cost rate approximately 6% greater than Segal's and there are fewer than 40 members subject to the additional cost sharing provisions. We do not believe this represents a significant discrepancy.

We also reviewed the average entry ages used to determine the contribution rates for members not in Tier 1 hired on or after January 1, 1975, who contribute based on a single rate for each tier. SCERS has adopted several sections of the CERL – 31621.11 and 31639.26 – that allow for

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the use of single member contribution rates for Miscellaneous and Safety members, respectively. Segal applies these sections by calculating a contribution rate using the standard entry-age based methodology, and then using the rate determined for the average entry-age for each group: currently age 35 for Miscellaneous members and age 29 for Safety members. Segal reviewed the demographics of the current population to confirm these average entry-ages as part of their recent experience study, and we have confirmed that these estimates appear accurate based on the data we received.

We also reviewed the methodology used by Segal to determine the employee COLA contribution rates – i.e. adding a tier-based load to the Basic rates – and found it to be reasonable and accurately applied. Our calculation of the load for one group – Safety Tier 1 – was more than 5% different than the results presented by Segal. However, the number of affected members is small, and all members of this group are currently subject to the additional cost-sharing contributions. Therefore, their actual contribution is not dependent on the load factor.

The Segal methodology is commonly used by '37 Act systems, and appears to meet the requirement that “*Any increases in contribution shall be shared equally between the county or district and the contributing members*” (CERL 31873). However, we have previously shared with Segal’s consultants an alternative methodology for determining employee COLA contribution rates, which involves calculating a distinct COLA rate for each individual entry-age, rather than applying a certain percentage load to the Basic rates. This methodology has the advantage of avoiding annual changes to the COLA contribution rates; the COLA rates will only change if there is a modification to the benefit provisions or actuarial assumptions.

Census Data

Both the SCERS Staff and Segal provided us with the data that was used in the June 30, 2016 actuarial valuations. We reviewed the information in both files, and reviewed the data questions provided to SCERS by Segal and the SCERS responses.

We find that the data used in the valuation is valid, complete and contains the necessary data elements for purposes of performing the actuarial valuation of SCERS. In Table II-3 on the next page we include an exhibit comparing the raw June 30, 2016 data file - as modified appropriately based on the SCERS responses to Segal’s questions, as noted in Segal’s report and in follow-up communications for issues such as annualization of pay - to Segal’s processed file. Any discrepancies between these files are minor and are not expected to have a significant impact on the valuation results. We also find that the methods and requirements provided in the Actuarial Standard of Practice #23 *Data Quality* have been adhered to, to the extent applicable for the valuation of pension plan obligations.

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**Table II-3
Summary of Counts, Benefits and Pay as of July 1, 2016**

	Segal		Cheiron		Ratio	
	Count	Monthly Benefit/ Annual Pay	Count	Monthly Benefit/ Annual Pay	Count	Monthly Benefit/ Annual Pay
Total Vested Terminated	3,301	N/A	3,301	N/A	100%	N/A
In Receipt						
Retired	8,710	\$ 29,884,232	8,710	\$ 29,886,035	100%	100%
Disabled	717	1,931,428	717	1,931,215	100%	100%
Beneficiaries	1,533	2,774,717	1,534	2,776,630	100%	100%
Total In Receipt	10,960	\$ 34,590,377	10,961	\$ 34,593,880	100%	100%
Actives						
Miscellaneous Tier 1	83	\$ 6,591,339	83	\$ 6,591,330	100%	100%
Miscellaneous Tier 2	62	4,375,098	62	4,375,094	100%	100%
Miscellaneous Tier 3	7,746	578,615,519	7,746	577,589,675	100%	100%
Miscellaneous Tier 4	328	23,965,104	328	23,911,966	100%	100%
Miscellaneous Tier 5	2,144	109,881,536	2,144	110,438,687	100%	101%
Safety Tier 1	218	28,634,501	218	28,643,672	100%	100%
Safety Tier 2	1,337	149,123,940	1,337	148,968,971	100%	100%
Safety Tier 3	102	9,767,462	102	9,767,463	100%	100%
Safety Tier 4	373	27,600,372	373	27,555,041	100%	100%
Total Actives	12,393	\$ 938,554,871	12,393	\$ 937,841,898	100%	100%
Total	23,353		23,354		100%	

Plan Provisions

We compared the summary of plan provisions shown in Section 4, Exhibit IV of Segal's June 30, 2016 valuation report to the benefits as summarized in the member handbooks shown on the SCERS website. In general, the plan provisions shown in the exhibit match what is in the handbooks, and based on our close match of the Segal liabilities as part of our parallel valuation, we conclude that Segal has appropriately reflected these provisions in the actuarial valuation.

Actuarial Assumptions

The June 30, 2017 actuarial valuation will be based on the assumptions ultimately adopted by the SCERS Board, based on recommendations made by Segal in the Actuarial Experience Study covering the three-year period ending June 30, 2016. As part of our actuarial audit review we

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have performed a peer review of this study and have the following comments and recommendations:

Mortality

Segal recommended that SCERS adopt a new approach for developing mortality assumptions based on the generational projection of mortality improvements. Segal suggested the following steps, which are consistent with those used by other actuaries:

1. Select a standard mortality table based on experience most closely matching the anticipated experience of the System.
2. Compare the actual experience of the System to that predicted by the selected standard table for the period of the experience study.
3. Adjust the standard table, either fully or partially, depending on the level of credibility for the System's experience. This adjusted table is called the base table.
4. Select an appropriate standard mortality improvement projection scale and apply it to the base table.

We strongly support the recommended change to the generational mortality approach. However, we have issues with the application of steps #1-3 in Segal's experience study.

Benefit vs. Headcount-Weighted

Our issues with steps #1 and #2 are related, and have to do with the fact that mortality studies in the U.S. have consistently shown that higher income individuals have longer life expectancies than lower income individuals. Because higher income individuals also typically have higher pension benefit amounts, it is important for a pension plan to use assumptions that are weighted to reflect the impact on liability. Otherwise, the mortality assumptions could accurately predict the number of deaths at each age, but still underestimate the liabilities, if the higher-benefit members are outliving the lower-benefit members.

Segal briefly mentioned the benefit-weighted approach in their experience study report, but then stated that the "head-count basis is the more common practice currently and is the approach used by Segal in the past for its California public system clients (including SCERS) and by other public sector actuaries in California." Segal included no other justification in their report for using the Headcount-Weighted RP-2014 Tables as the standard mortality table upon which to base their recommendations (step #1 above), as opposed to the standard RP-2014 Tables, which are benefit-weighted.

However, the report published by the Retirement Plans Experience Committee (RPEC) that accompanied the release of the RP-2014 tables clearly states, "*For the measurement of most pension obligations, tables weighted by benefit amount generally produce the most appropriate results.*" The report also describes a number of applications in which headcount-weighted tables may produce more accurate results, including estimates of average age at death, projections of retirement populations, and the measurement of OPEB plan obligations; the list of exceptions did not include the measurement of liabilities in traditional pay-related defined benefit plans.

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One reason that RPEC recommends the use of the benefit-weighted tables for pension applications is that the behavior of the two tables are quite different: the mortality rates for the headcount-weighted tables are considerably higher at earlier ages, but gradually converge with the benefit-weighted rates at the highest ages. Using a headcount-weighted table will tend to overstate mortality rates in the early years of retirement, and understate it in later years, assuming the overall actual-to-expected ratio is close to 100% based on the number of deaths. Unless Segal has sufficient evidence to indicate that the pattern of mortality for SCERS looks closer to the headcount-weighted tables (measured on a liability-weighted basis), we believe the default should be to use a benefit-weighted table when a choice between such tables is available.

In addition to selecting the headcount-weighted RP-2014 tables as the standard table, Segal only reviewed the SCERS actual mortality experience on a headcount basis (step #2). When asked in a follow-up email to clarify which public sector actuaries in California were using a headcount-weighted approach to review mortality experience, Segal responded that they were referring to the CalPERS actuaries and, that based on informal discussions with the CalPERS actuaries, CalPERS had concluded that the CalPERS actuaries “have not found enough evidence to convince them to use the benefit-weighted basis.”

While it is true that the most recent mortality tables adopted by CalPERS were developed on a headcount-weighted basis, our own informal discussions with the CalPERS actuaries indicated that this approach was not selected because of a lack of evidence to support a benefit-weighted approach, but rather because their systems are not currently set up to review mortality experience on a benefit-weighted basis.

We at Cheiron have made it a standard practice to at least review the mortality experience by both benefit amount and headcount in our studies for SACRS systems, and it is our understanding that the other actuarial consulting firm providing actuarial valuation services to non-Segal clients in the '37 Act systems (Milliman) has also been reviewing the experience on both bases in their recent experience studies.

In our experience with most (but not all) of the SACRS plans and other public plans we work with in California, we have found a significant difference in the actual-to-expected ratios calculated on a headcount-weighted basis compared to a benefits-weighted basis, though the amount of the difference does vary between plans and employee populations. We note that in the experience study that Milliman recently completed for the Oregon Public Employee Retirement System (<http://www.oregon.gov/pers/Documents/2016-Exp-Study.pdf>), the difference between the benefit- and headcount-weighted actual-to-expected ratios averaged about 10% for both males/females and Miscellaneous/Safety members, which is consistent with the level we have found in some systems and represents a material difference.

Credibility

Very few pension plans have sufficient experience to develop their own mortality tables. Most plans instead adjust a standard table (step #3). However, with approximately 1000 deaths necessary for full credibility (defined by a 90% probability that the observed rate is within 5% of the true rate) and actual mortality rates quite low at most ages, many plans lack sufficient data to

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perform even a full adjustment to a standard table (i.e. adjust the tables so the actual-to-expected ratio based on the plan's data is close or equal to 100%).

Segal's experience study report includes a table (page 33) that indicates the number of deaths included in the six-year extended study period. The number of actual Miscellaneous deaths is over 1000, so it is reasonable to consider this experience fully credible and appropriate to propose an adjustment to the standard tables that results in an active-to-expected ratio close to 100%. However, the amount of Safety mortality experience is much smaller, with less than 100 deaths reported over the six-year period. This amount of data should not be considered to be fully credible, and caution should be used in applying significant adjustments to the standard tables, which Segal has done in their recommendation to apply a four-year setback to the ages for Safety members.

In particular, caution should be used when the experience has been different in prior years (as Segal indicated had been the case in their report) and when the proposed assumptions represent an unusual difference in assumptions from other groups. In this case, Segal has proposed mortality assumptions for the SCERS Safety members that are significantly more conservative (i.e. expecting longer lifespans, for members of the same gender) than those for the Miscellaneous members.

Historically, public pension plans have generally assumed shorter lifespans for Safety members, and though that practice has been changing recently in some places, we have not seen a significant amount of experience that demonstrates the tables have completely turned. For example, in the Oregon PERS study referenced above, Milliman indicated that there was still a margin of somewhere between 5-9% between the actual-to-expected ratios for the Miscellaneous and Safety male experience, with the Safety members continuing to exhibit higher rates of mortality.

Similarly, we question whether a 50% adjustment to the Headcount-Weighted RP-2014 Employee table is appropriate for the active members. The Segal report does not include any information related to the number of active deaths, but we feel comfortable in assuming it was well under 1000 during the study period. Finally, we recommend that Segal consider whether the RP-2014 Disabled Mortality tables are more appropriate than the significantly-adjusted Headcount-Weighted RP-2014 Healthy Annuity Table recommended in the report, based on the limited amount of disability mortality experience.

In summary, we recommend that Segal:

- Reconsider whether the RP-2014 Headcount-Weighted tables are the most appropriate to use as the basis of the SCERS-specific assumptions,
- Review whether an analysis of the SCERS actual experience on a benefit-weighted basis would have an impact on their recommended assumptions, and
- Review whether the level of credibility assigned to the actual mortality experience of the subpopulations of SCERS - in particular the populations of Safety service retirees, and all

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disabled and active members – is appropriate, given the numbers of exposures and deaths in these populations, as well as prior behavioral differences.

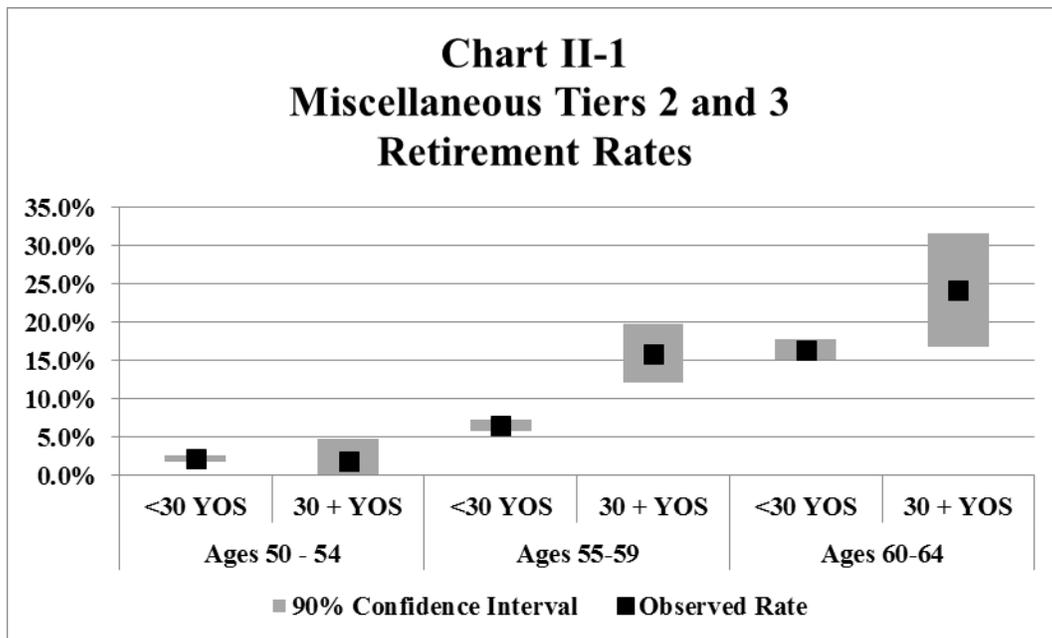
We note that the mortality assumptions are of particular importance in the measurement of Plan liabilities, since they are used to determine both the member and employer rates, for both Legacy and PEPRA members.

Retirement

Segal proposed rates that vary by age and Tier. We focused our analysis on Segal's recommendations related to the Miscellaneous Tiers 2 and 3 and Safety Tiers 1 and 2, because those were the groups with the most observed experience.

The rates recommended by Segal appear reasonable based on the experience presented in their report, if the comparison of the actual and expected number of retirements *looks only at the member's age at retirement*. However, the appropriateness of the assumptions appears quite different when reviewing the experience by looking at both the age and service of the members in relation to the probability of retirement.

We requested – and Segal provided – a summary of the service retirement decrements and exposures by five-year age *and* service bands. In Chart II-1 below, we summarize this information for Miscellaneous Tiers 2 and 3, based on grouping the experience into separate categories for those with less than or greater than 30 years of service. The black squares represent the actual percentage of members within each band who retired during the study period. The gray bars represent the 90% confidence interval for the decrement rate (i.e. there is a 90% likelihood that the underlying rate lies within the band).

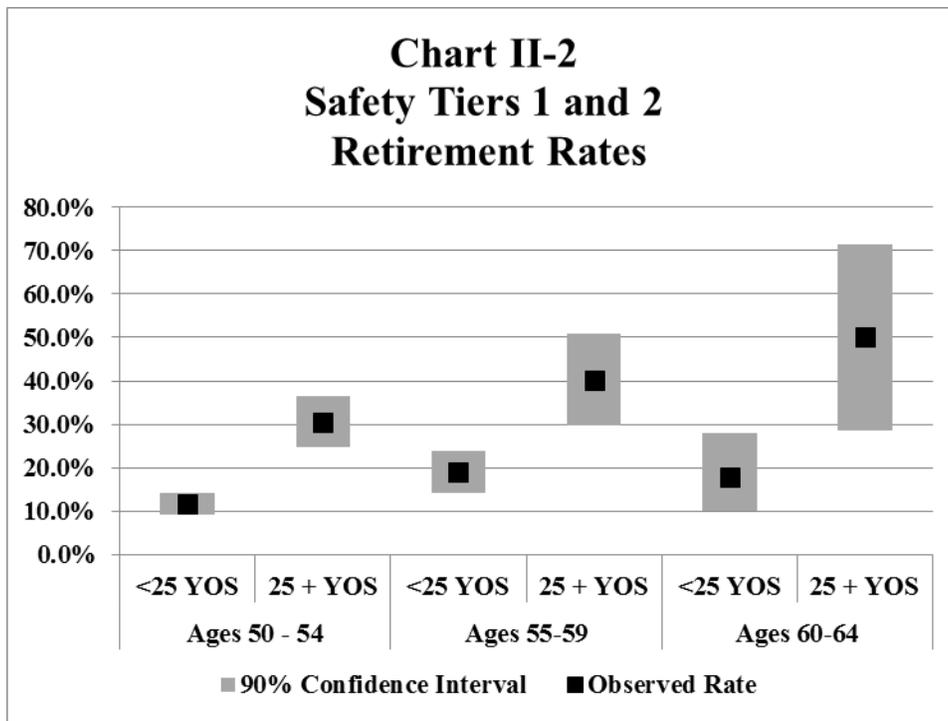


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As seen in this graph, a large difference exists between both the observed rates and the 90% confidence intervals at the selected service levels, at least from ages 55-64 (there are relatively few individuals younger than age 55 with at least 30 years of service). This discrepancy in the rates matters, because all other things being equal, the liabilities will be more heavily weighted towards those with higher levels of service (and thus higher benefits). If the retirement rates accurately predict the number of retirements by age, but overestimate the number of retirements for those with low levels of service and underestimate the number of retirements for those with high levels of service, it is likely that the assumptions will underestimate – potentially significantly – the future liabilities of the Plan.

In the following graph, we show a similar breakdown in the Safety retirement experience for Tiers 1 and 2, for those with less than or greater than 25 years of service.



These differences in behavior make sense on an intuitive level as it is reasonable to assume that, for two members of the same age, the one with the higher level of service will be more likely to retire, if for no other reason than the higher-service member is more likely to have achieved their desired level of post-retirement replacement income.

In response to a follow up question on this issue, Segal responded that they did not look at retirement experience by age and service in their study for SCERS, but they had done so recently for another (larger) '37 Act system, and concluded that they did not have enough reliable experience to develop credible assumptions by age and service.

While it is true that the amount of experience may make it difficult to generate reliable assumptions at *each* age and service combination, it is certainly possible to develop reasonable assumptions that distinguish between higher and lower service levels. Segal has used this approach themselves for other clients: for the University of California Retirement System Staff members, they have recommended that their base retirement rates be multiplied by 70% for those

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with less than 10 years of service and by 160% for those with more than 20 years of service. A similar adjustment could certainly be developed for SCERS, especially given that the level of experience necessary to develop credible retirement assumptions is much less than that needed to develop fully-credible mortality assumptions (since the frequency of retirement is much higher than that of death).

In Segal's response, they also accurately noted that CalPERS produces and utilizes retirement rates that vary by age and service. As an alternative to developing a set of broad service-based adjustment factors based on SCERS experience, Segal could review whether the relative differences in retirement rates at various service levels used by CalPERS for similar benefit formulas provide a reasonable fit to the SCERS data, and then adjust those rates as necessary to bring the overall level of expected retirements into closer alignment with the SCERS experience at each age.

For example, if the CalPERS rate of retirement for a 2% @ 55 Miscellaneous member (similar to the 31676.14 CERL formula for the SCERS members) at age 55 with 30 years of service is approximately double that of an individual of the same age but with only 10 years of service, Segal could develop a set of retirement rates for SCERS that reflect the same relationship between these service levels, but provide a more accurate fit to the overall number of members expected to retire at each age (based on the SCERS data). This table could then be reviewed to determine whether it provides a better fit (measured by age and service) to the actual SCERS experience than the current age-only based rates.

Regardless of the approach taken, we recommend that Segal review the retirement experience for SCERS by age and service, and determine whether their recommended age-based retirement rates could be expected to materially underestimate the liabilities if the recent patterns of behavior by age and service continue to present themselves.

Economic Assumptions

Overall, the economic assumptions proposed in Segal's review represent a reasonable set of assumptions. In particular, we agree with Segal's recommendation to reduce the assumed rate of price inflation from 3.25% to 3.00%, and to reduce the investment return assumption from 7.50% to 7.00%, reflecting a 0.25% reduction in both the inflation rate and the real return.

We have comments, however, on the "risk adjustment" that Segal used in developing their return recommendation, as well as several other aspects of the economic assumptions.

Risk Adjustment

In their experience study report, Segal spends a significant amount of time discussing the concept of a "risk adjustment" – also referred to as a margin for adverse deviation. The following language is from their experience study report (page 12):

In our model, the confidence level associated with a particular risk adjustment represents the likelihood that the actual average return would equal or exceed the assumed value over a 15-year period. For example, if we set our real rate of return assumption using a risk adjustment that produces a confidence level of 60%, then there would be a 60%

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chance (6 out of 10) that the average return over 15 years will be equal to or greater than the assumed value.

Later in their report, they note that they anticipate a 0.50% offset to the investment return assumption to be a sufficient “risk adjustment” to provide a confidence level of 57%. However, this does **not** mean that there is a 57% chance of achieving the return assumption, **when compounded over a 15-year period**. Average annual returns and average compound returns are different concepts, and the Board should focus on achieving an average compound return equal to or greater than the assumed rate of return.

To illustrate the difference between these concepts, consider an extreme example: if your return is 100% one year (i.e. you doubled your money) and -100% the following (i.e. you lost all your money), then the arithmetic average annual return is 0%, but the average compound return is -100% (i.e. you still don't have any money!). At the end of the day, most investors care about the geometric or compound rate. In the extreme example above, an investor would gladly agree to hide their money under a mattress and earn nothing for two years, versus double their money and then lose it all the next year (but still earn the same arithmetic return!).

As stated above, Segal's “confidence level” model provided SCERS with the likelihood that the arithmetic average investment return will exceed the assumption over a 15-year period. However, the likelihood that the geometric or compound average return will exceed the assumption is considerably less. In fact, rather than a 57% chance, there is roughly a 50% chance that the compound return will equal or exceed 7.00%. The expected return would need to be lowered to around 6.50% to obtain a 57% confidence level on a compound basis.

Investment Expenses

A frequent assumption used in setting return assumptions is that the additional returns earned due to active management will offset the higher level of expenses associated with active management. Instead of this approach, Segal assumes that additional expenses for active management simply reduce the return, which is a more conservative assumption but implies that - all other things being equal - Segal's model would result in a higher recommended return assumption if the Board were invested passively instead of using active managers. While there is much debate about this question among investment professionals, we prefer to remain neutral, assuming no advantage or disadvantage to active management.

We appreciate that Segal has explicitly spelled out the impact of active versus passive management on the historical returns and expenses of the Plan, and identified the issue for further study with Staff. We also note that the conservatism included in this approach may enhance the likelihood that the investment return assumption could be achieved on a compound basis, thus offsetting a portion of the impact from the risk adjustment issue identified above.

Inflation

We support Segal's recommendation to reduce the inflation assumption from 3.25% to 3.00%. We note that the average inflation assumption for the investment consultants cited by Segal

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(2.3%), as well as the inflation forecasts used by Social Security (2.6%) and derived from 30-year Treasury bonds (2.10%) are all still significantly below the recommended rate.

While we understand that large and sudden changes in long-term assumptions can be disruptive to the employers and members, and we acknowledge that a 3% inflation assumption still represents a reasonable long-term expectation given historical rates, we recommend that Segal and the Board continue to monitor this assumption and consider further reductions if market-based inflation expectations remain low.

Actuarial Methods

Actuarial methods relate to the application of actuarial assumptions in the determination of Plan liabilities and contributions. These methods include the actuarial cost method, amortization policy, actuarial asset smoothing, and cost-sharing methodologies. The questions guiding our review of the actuarial methods were the following:

- Are the methods acceptable and appropriate for the intended purpose?
- Do the methods comply with relevant accounting and actuarial standards?

Actuarial Cost Method

The individual Entry Age actuarial cost method is used in the June 30, 2016 actuarial valuation. Under this method, the expected cost of benefits for each individual member is allocated over that member's career as a level percentage of that member's expected salary. The normal cost for the plan is the sum of the individual normal costs calculated for each member. We concur with this methodology and note that it is a "Model Practice" based on the guidance issued by the California Actuarial Advisory Panel (CAAP), and a "Best Practice" based on guidance issued by the Government Finance Officers Association. Segal has also applied this method in a manner which complies with the disclosure requirements under GASB Statements 67 and 68.

Asset Smoothing Method

The actuarial (or smoothed) value of assets is determined using a seven-year period for gains and losses. The Board has adopted a corridor around the market value of assets of 30%. We have confirmed that the Segal report applies the actuarial smoothing method as described.

In our opinion, this method satisfies the Actuarial Standard of Practice which governs asset valuation methods (ASOP #44), which requires that the actuarial asset value should fall within a "reasonable range around the corresponding market value" and that differences between the actuarial and the market value should be "recognized within a reasonable period of time."

We commend Segal for including the funded ratio and unfunded liability using both the market value and smoothed value of assets in their report. These disclosures are included in the "Model Disclosure Elements for Actuarial Valuation Reports" adopted by the CAAP.

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Amortization Policy

The current Amortization Policy for SCERS is a layered amortization policy, with the balance of the unfunded liability as of June 30, 2012 amortized as a level percentage of payroll over a closed 23-year period (19 years remaining as of June 30, 2016), with the exception of the UAAL established as a result of an early retirement incentive for LEMA members, which is being amortized over a 10 year declining period beginning June 30, 2010. Each subsequent year's unfunded liability attributable to experience gains or losses, assumption changes, and cost method changes is amortized as a level percentage of payroll over a new closed 20-year period. Plan amendments are amortized over closed 15-year periods and early retirement incentive programs will be amortized over 5 years.

We have confirmed that the Segal report applies the amortization method as described. This amortization method is in accordance with the recent funding policy guidance issued by the CAAP, GFOA, and the Conference of Consulting Actuaries Public Plans Community. This amortization policy also meets the minimum standards of the '37 Act.

Cost-Sharing Methods

SCERS is a cost-sharing plan, wherein the assets of the Plan are available to fund the benefits of all members. This is different from an approach in which specific asset pools are tracked and held separately for each employer. As a result, methods and assumptions must be used to assign portions of the unfunded accrued liability to the different employment groups (i.e. County vs. District, Miscellaneous vs. Safety), including adjustments made to various groups' cost calculations as a result of specific circumstances or policies.

Segal has included some limited information to describe a number of these adjustments. For example, the description of the UAAL amortization method on page 13 of the report briefly mentions an addition to the Miscellaneous UAAL rate for the County to reflect a payment to cover a portion of the net withdrawal liability for the Library Authority and Air Quality Districts, and this line item is shown in the calculation of the overall UAAL schedule as shown on page 82 of the report.

However, Segal's report does not mention or describe the largest adjustment to an individual group's contribution rates: the application of an additional amortization base to the District's UAAL payments, in order to assign sole credit to the County for the previously issued Pension Obligation Bond (POB). We requested additional information from Segal on this adjustment, and we were thereby able to verify the differences between the County versus District UAAL payments as shown in their report.

However, as this is a sizable adjustment – an adjustment of over 8% of payroll for the District's cost – it deserves mention in the valuation report. In general, it would be helpful to include a thorough description – either within the valuation report itself or by reference – to how the POB and other credits or special reserves are determined and maintained (such as the member COLA offset and the reserves for withdrawn employers), including a description of the origin and basis for the credits, and how they are to be allocated among different employment groups.

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Contents of the Reports

We find the actuarial valuation and experience study reports to be in compliance with Actuarial Standards of Practice. We have already mentioned several areas in which we believe each of the reports could be enhanced – such as clarifying the risk adjustment factor in the experience study report, and adding a description of the UAAL adjustment related to the POB in the valuation report.

We also encourage Segal to consider whether a demonstration of future expected funding progress and contribution rates and/or additional statements regarding risk should be contained within the actuarial valuation report. This report represents to the public the current financial condition of SCERS, and as such, we recommend it include a prospective view.

We note that Segal provided SCERS with projections of the employer contribution rate for the next several years, in a separate document, to assist the Board in understanding the impact of a decision to phase-in the cost impact of changes to the assumptions for the employers. We believe that a longer projection can also be helpful to the Board, and we typically include such projections as part of our actuarial valuation reports. For example, such a projection could show the Board how the costs are expected to be affected by the interplay of the assumptions changes *and* the deferred losses currently reflected in the smoothed value of assets.

With respect to risk, although Segal does briefly describe some common volatility ratios in the Section 2 of their report, there is no mention of these ratios or any other discussion of volatility in the Executive Summary. Also, there is no discussion regarding positive or negative cash flow and the risks associated with these situations. We note that the Actuarial Standards Board is currently reviewing a potential new Standard of Practice related to the disclosure of risk for pension plans, the content of which may be useful to Segal and the Board in assessing whether additional risk disclosures could add value to the valuation report.

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APPENDIX A - GLOSSARY OF TERMS

1. Actuarial Assumptions

Estimates of future experience with respect to rates of mortality, disability, turnover, retirement, investment income, and salary increases. Demographic assumptions (rates of mortality, disability, turnover, and retirement) are generally based on past experience, often modified for projected changes in conditions. Economic assumptions (salary increases and investment income) consist of an underlying rate in an inflation-free environment plus a provision for a long-term average rate of inflation.

2. Actuarial Gain (Loss)

The difference between actual experience and actuarial assumption anticipated experience during the period between two actuarial valuation dates, as determined in accordance with a particular actuarial funding method.

3. Actuarial Liability

The Actuarial Liability is the present value of all benefits accrued as of the valuation date using the methods and assumptions of the valuation. It is also referred to by some actuaries as the “accrued liability” or “actuarial accrued liability.”

4. Actuarial Present Value

The amount of funds currently required to provide a payment or series of payments in the future. It is determined by discounting future payments at predetermined rates of interest, and by probabilities of payment.

5. Actuarial Value of Assets

The Actuarial Value of Assets equals the Market Value of Assets adjusted according to the smoothing method. The smoothing method is intended to smooth out the short-term volatility of investment returns in order to stabilize contribution rates and the funded status.

6. Actuarial Cost Method

A mathematical budgeting procedure for allocating the dollar amount of the “actuarial present value of future plan benefits” between the actuarial present value of future normal costs and the actuarial liability. It is sometimes referred to as the “actuarial funding method.”

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7. Funded Status

The Actuarial Value of Assets divided by the Actuarial Liability. The Funded Status can also be calculated using the Market Value of Assets.

8. Governmental Accounting Standards Board

The Governmental Accounting Standards Board (GASB) defines the accounting and financial reporting requirements for governmental entities. GASB Statement No. 67 defines the plan accounting and financial reporting for governmental pension plans, and GASB Statement No. 68 defines the employer accounting and financial reporting for participating in a governmental pension plan.

9. Market Value of Assets

The fair value of the Plan's assets assuming that all holdings are liquidated on the measurement date.

10. Normal Cost

The annual cost assigned, under the actuarial funding method, to current and subsequent plan years. It is sometimes referred to as "current service cost." Any payment toward the unfunded actuarial liability is not part of the normal cost.

11. Present Value of Future Benefits

The estimated amount of assets needed today to pay for all benefits promised in the future to current members of the Plan, assuming all Actuarial Assumptions are met.

12. Present Value of Future Normal Costs

The Actuarial Present Value of retirement system benefits allocated to future years of service.

13. Unfunded Actuarial Liability (UAL)

The difference between the Actuarial Liability and the Actuarial Value of Assets. This is sometimes referred to as the "unfunded accrued liability."



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