CITY OF FRESNO
RETIREMENT SYSTEMS

Review of Economic Actuarial Assumptions for the June 30, 2016 Actuarial Valuation

Segal Consulting

MAY 2016

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May 17, 2016

Boards of Retirement
City of Fresno Retirement Systems
2828 Fresno Street, Suite 201
Fresno, CA 93721-1357

Re: Review of Economic Actuarial Assumptions for the June 30, 2016 Actuarial Valuation

Dear Members of the Boards:

We are pleased to submit this report of our review of the economic actuarial assumptions for use in the City of Fresno Retirement Systems' June 30, 2016 actuarial valuations. This report includes our recommendations and the analysis supporting their development.

Please note that we have also reviewed the non-economic actuarial experience for the three-year period from July 1, 2012 to June 30, 2015 for use in the June 30, 2016 actuarial valuation. The non-economic actuarial assumption recommendations will be provided in a separate report.

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

We look forward to reviewing this report with you and answering any questions you may have.

Sincerely,

Paul Angelo, FSA, EA, MAAA, FCA
Senior Vice President & Actuary

Andy Yeung, ASA, EA, MAAA, FCA
Vice President & Actuary

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I. INTRODUCTION, SUMMARY, AND RECOMMENDATIONS

To project the cost and liabilities of the Pension Fund, assumptions are made about all future events that could affect the amount and timing of the benefits to be paid and the assets to be accumulated. Each year actual experience is compared against the projected experience, and to the extent there are differences, the future contribution requirement is adjusted.

If assumptions are changed, contribution requirements are adjusted to take into account a change in the projected experience in all future years. There is a great difference in both philosophy and cost impact between recognizing the actuarial deviations as they occur annually and changing the actuarial assumptions. Taking into account one year's gains or losses without making a change in the assumptions in effect assumes that experience was temporary and that, over the long run, experience will return to what was originally assumed. Changing assumptions reflects a basic change in thinking about the future, and it has a much greater effect on the current contribution requirements than recognizing gains or losses as they occur.

The use of realistic actuarial assumptions is important to maintain adequate funding, while fulfilling benefit commitments to participants already retired and to those near retirement. The actuarial assumptions do not determine the "actual cost" of the plan. The actual cost is determined solely by the benefits and administrative expenses paid out, offset by investment income received. However, it is desirable to estimate as closely as possible what the actual cost will be so as to permit an orderly method for setting aside contributions today to provide benefits in the future, and to maintain equity among generations of participants and taxpayers.

This study was undertaken in order to review the economic actuarial assumptions. The study was performed in accordance with Actuarial Standard of Practice (ASOP) No. 27, "Selection of Economic Assumptions for Measuring Pension Obligations." This Standard of Practice puts forth guidelines for the selection of the economic actuarial assumptions utilized in a pension plan actuarial valuation.

The last full review of the economic assumptions was as of June 30, 2013.

We are recommending changes in the investment return and "across the board" salary increase assumptions. Our recommendations for the economic actuarial assumptions for the June 30, 2016 Actuarial Valuations are as follows:

Ref. Pg. 4 **Inflation** – Future increases in the Consumer Price Index (CPI) which drive investment returns and active member salary increases, as well as COLA increases to retired members.

Recommendation: Reduce the inflation assumption from 3.25% to 3.00% per annum.

Ref. Pg. 5 **Retiree Cost-of-Living Increases** – The annual increases to retirees' retirement allowances for inflation.

Recommendation: Reduce the current assumption from 3.25% to 3.00% for the Employees System. Reduce the current assumption from 3.75% to 3.50% for the Fire and Police Tier 1 plan and maintain the current 3.00% assumption for the Fire and Police Tier 2 plan.

Ref. Pg. 7 **Investment Return –** The estimated average future rate of return, net of investment expenses, on current and future assets of the Systems as of the valuation date. This rate is used to discount liabilities.

Recommendation: Reduce the current investment return assumption from 7.50% per annum to 7.25% per annum based on the reduced inflation assumption component and the updated market return expectations for different asset classes and on the Systems' latest asset allocation. The 7.25% recommendation is consistent with the Boards' past practice of having a margin for adverse deviation under the risk adjusted model used by Segal.

Ref. Pg. 18 **Individual Salary Increases** – Increases in the salary of a member between the date of the valuation and the date of separation from active service. This assumption has three components:

- Inflationary salary increases,
- Real "across the board" salary increases, and
- Merit and promotional increases.

Recommendation: Reduce the inflationary salary increase from 3.25% to 3.00% and maintain the current real "across the board" salary increase assumption of 0.50%. This means that the combined inflationary and real "across the board" salary increases will decrease from 3.75% to 3.50% per annum. The review of the merit and promotional increase component of the salary increase assumption will be provided as part of our triennial experience study of non-economic assumptions, along with the other recommended non-economic assumptions for the June 30, 2016 valuation.

Section II provides some background on the basic principles and methodology used for the review of the economic actuarial assumptions. A detailed discussion of each of the economic assumptions and reasons behind the recommendations is found in Section III.

The cost impact of these recommended economic assumptions will be included in our separate analysis of the "non-economic" assumptions for the June 30, 2016 valuation.

II. BACKGROUND AND METHODOLOGY

For this study, we analyzed the "economic" assumptions only. Our analysis of the "non-economic" assumptions for the June 30, 2016 valuation is provided in a separate report. The primary economic assumptions are inflation, investment return and salary increases.

Economic Assumptions

Economic assumptions consist of:

Inflation - Increases in the price of goods and services. The inflation assumption reflects the basic return that investors expect from securities markets. It also reflects the expected basic salary increase for active members and drives increases in the allowances of retired members.

Investment Return – Expected long term rate of return on the Systems' investments after expenses. This assumption has a significant impact on contribution rates.

Salary Increases – In addition to inflationary increases, it is assumed that salaries will also grow by "across the board" real pay increases in excess of price inflation. It is also assumed that members will receive raises above these average increases as they advance in their careers. These are commonly referred to as merit and promotional increases. Payments to amortize any Unfunded Actuarial Accrued Liability (UAAL) are assumed to increase each year by the price inflation rate plus any "across the board" pay increases that are assumed.

The setting of these assumptions is described in Section III.

III. ECONOMIC ASSUMPTIONS

A. INFLATION

Unless an investment grows at least as fast as prices increase, investors will experience a reduction in the inflation-adjusted value of their investment. There may be times when "riskless" investments return more or less than inflation, but over the long term, investment market forces will generally require an issuer of fixed income securities to maintain a minimum return which protects investors from inflation.

The inflation assumption is long term in nature, so it is set using primarily historical information. Following is an analysis of 15-year and 30-year moving averages of historical inflation rates:

Historical Consumer Price Index – 1930 to 2015

(U.S. City Average - All Urban Consumers)

	25th Percentile	Median	75th Percentile
15-year moving averages	2.5%	3.4%	4.6%
30-year moving averages	3.1%	4.1%	4.9%

The average inflation rates have continued to decline gradually over the last several years due to the relatively low inflationary period over the past two decades. Also, the more recent 15-year averages are lower as they do not include the high inflation years of the mid-1970s and early 1980s.

For 2015, the public fund survey published by the National Association of State Retirement Administrators (NASRA) no longer contains the distribution of the inflation assumptions used by the responding retirement systems included in their survey. We contacted the NASRA staff and we were able to obtain the inflation assumptions used by 76 large public retirement funds in their 2014 valuations. The median value of those inflation assumption is 3.00%. In California, CalPERS, Marin County and Contra Costa County use an inflation assumption of 2.75% while CalSTRS, LACERA, OCERS and eight other 1937 Act CERL systems use an inflation assumption of 3.00%.

The Systems' investment consultant, NEPC, anticipates an annual inflation rate of 3.25%. Note that, in general, investment consultants use a time horizon for this assumption that is shorter than the time horizon we use for the actuarial valuation. The average inflation rate used by a sample of eight investment advisory firms is 2.44%.

To find a forecast of inflation based on a longer time horizon, we referred to the 2015 report on the financial status of the Social Security program. The projected average increase in the Consumer Price Index (CPI) over the next 75 years under the intermediate cost assumptions used in that report was 2.70%. We also compared the yields on the thirty-year inflation indexed U. S. Treasury bonds to comparable traditional U. S. Treasury bonds. As of March 2016, the difference in yields is about 1.69%, which provides a current measure of market expectations of inflation.

Based on all of the above information, we recommend reducing the current 3.25% annual inflation assumption to 3.00% for the June 30, 2016 actuarial valuations.

Retiree Cost-of-Living Increases

The retiree cost-of-living adjustments assumed in the prior valuations were 3.25% for the Employees System; and 3.50% and 3.00% for Tier 1 and Tier 2 employees, respectively, in the Fire and Police System. Consistent with our 3.00% inflation assumption, we recommend a 3.00% COLA assumption for the Employees System. As the Tier 1 Fire and Police System has a "pay" based COLA, we recommend a 3.50% COLA assumption consistent with the total of price inflation plus the "across the board" pay increase assumption of 0.50% detailed later in this report. For the Tier 2 Fire and Police System, we recommend maintaining the 3.00% COLA assumption, which is the annual maximum payable to members of the Tier 2 Fire and Police System.

In developing the COLA assumption, we also considered the results of a stochastic approach that would attempt to account for the possible impact of low inflation that could occur before COLA banks are able to be established for the member. Although the results of this type of analysis might justify the use of a lower COLA assumption, we are not recommending that at this time. The reasons for this conclusion include the following:

- The results of the stochastic modeling are significantly dependent on assuming that lower levels of inflation will persist in the early years of the projections. If this is not assumed, then the stochastic modeling will produce results similar to our proposed COLA assumption.

- Using a lower long-term COLA assumption based on a stochastic analysis would mean that an actuarial loss would occur even when the inflation assumption of 3.00% is met in a year. We question the reasonableness of this result.

We do not see the stochastic possibility of COLAs averaging less than those predicted by the assumed rate of inflation as a reliable source of cost savings that should be anticipated in our COLA assumption. Therefore,

we continue to recommend setting the COLA assumption based on the long-term annual inflation assumption, as we have in prior years.

B. INVESTMENT RETURN

The investment return assumption is comprised of two primary components, inflation and real rate of investment return, with adjustments for expenses and risk.

Real Rate of Investment Return

This component represents the portfolio's incremental investment market returns over inflation. Theory has it that as an investor takes a greater investment risk, the return on the investment is expected to also be greater, at least in the long run. This additional return is expected to vary by asset class and empirical data supports that expectation. For that reason, the real rate of return assumptions are developed by asset class. Therefore, the real rate of return assumption for a retirement system's portfolio will vary with the Boards' asset allocation among asset classes.

Following is the Systems' current target asset allocation and the assumed real rate of return assumptions by asset class. The first column of real rate of return assumptions are determined by reducing NEPC's total or "nominal" 2016 return assumptions by their assumed 3.25% inflation rate. The second column of returns represents the average of a sample of real rate of return assumptions, where each firm's assumed nominal returns have been reduced by that firm's assumed inflation rate. The sample includes the expected annual real rates of return provided to us by NEPC and by seven other investment advisory firms retained by Segal's California public sector retirement clients. We believe these averages are a reasonable consensus forecast of long term future market returns in excess of inflation.[1]

[1] Note that, just as for the inflation assumption, in general the time horizon used by the investment consultants in determining the real rate of return assumptions is shorter than the time horizon we use for the actuarial valuation.

The Systems' Target Asset Allocation and Assumed Arithmetic Real Rate of Return Assumptions by Asset Class and for the Portfolio

Asset Class	Percentage of Portfolio	NEPC's Assumed Real Rate of Return[(1)]	Average Real Rate of Return from a Sample of Consultants to Segal's California Public Sector Clients[(2)]
Large Cap U.S. Equity	22.5%	5.58%	5.80%
Small Cap U.S. Equity	7.5%	6.39%	6.47%
Developed International Equity	22.0%	6.64%	6.98%
Emerging Markets Equity	8.0%	9.25%	8.99%
U.S. Core Bonds[(3)]	15.0%	0.85%	0.83%
High Yield Bonds	6.0%	3.26%	3.44%
Real Estate	15.0%	4.25%	4.45%
Private Debt/Direct Lending	4.0%	5.73%	5.73%
Total Portfolio	100.0%	5.13%	5.27%

(1) *Derived by reducing NEPC's nominal return assumptions by their 3.25% inflation assumption.*

(2) *These are based on the projected arithmetic real returns provided by the investment advisory firms serving the City of Fresno Retirement Systems, the county retirement associations of San Diego, Sonoma, Alameda, Mendocino, the LA City Employees' Retirement System, the East Bay Municipal Utility District Retirement Plan and the LA Fire & Police Pensions. These return assumptions are gross of any applicable investment expenses.*

(3) *The allocation of 15% U.S. Core Bonds includes 11% Domestic Core Bonds and 4% Absolute Return Fixed Income.*

The above are representative of "indexed" returns and do not include any additional returns ("alpha") from active management. This is consistent with the Actuarial Standard of Practice (ASOP) No. 27, Section 3.8.3.d, which states:

> "Investment Manager Performance - Anticipating superior (or inferior) investment manager performance may be unduly optimistic (pessimistic). The actuary should not assume that superior or inferior returns will be achieved, net of investment expenses, from an active investment management strategy compared to a passive investment management strategy unless the actuary believe, based on relevant supporting data, that such superior or inferior returns represent a reasonable expectation over the measurement period."

The following are some observations and our conclusions from the above analysis:

1. The investment consultants to our California public sector clients have each provided us with their expected real rates of return for each asset class, over various future periods of time. However, in

general, the returns available from investment consultants are projected over time periods shorter than the duration of a retirement plan's liabilities.

2. Using a sample average of expected real rates of return allows the Systems' investment return assumption to reflect a broader range of capital market information and should help reduce year to year volatility in the Systems' investment return assumption.

3. Therefore, we recommend that the 5.27% portfolio real rate of return be used to determine the Systems' investment return assumption. This is 0.30% higher than the return that was used three years ago to develop the recommended investment return assumption for the June 30, 2013 valuation. The difference is due to changes in the Systems' target asset allocation (+0.30%), changes in the real rate of return assumptions provided to us by the investment advisory firms (+0.01%) and the effect of the interaction between those two changes[2] (-0.01%).

[2] This includes the joint effect of the changes in the Systems' target asset allocation and the changes in the average real rate of return assumptions for each asset category as provided to us by the investment advisory firms.

Systems' Expenses

For funding purposes (and for financial reporting), the real rate of return assumption for the portfolio needs to be adjusted for investment expenses to be paid from investment income. As further discussed later in this report, current practice for the Systems also adjusts for expected administrative expenses. The following table provides these expenses in relation to the actuarial value of assets for the five years ending June 30, 2015.

City of Fresno Employees Retirement System
Administrative and Investment Expenses as a Percentage of Actuarial Value of Assets
(All dollars in 000's)

Year Ending June 30	Actuarial Value of Assets*	Administrative Expenses	Investment Expenses**	Administrative %	Investment %	Total %
2011	$926,370	$1,029	$4,898	0.11%	0.53%	0.64%
2012	920,217	1,087	4,441	0.12%	0.48%	0.60%
2013	891,366	1,138	4,828	0.13%	0.54%	0.67%
2014	933,722	1,086	5,203	0.12%	0.56%	0.68%
2015	993,540	1,071	5,442	0.11%	0.55%	0.66%
Average				0.12%	0.53%	0.65%

* *As of beginning of plan year.*

** *Net of securities lending expenses and interest paid to prepaid employer contributions.*

City of Fresno Fire and Police Retirement System
Administrative and Investment Expenses as a Percentage of Actuarial Value of Assets
(All dollars in 000's)

Year Ending June 30	Actuarial Value of Assets*	Administrative Expenses	Investment Expenses**	Administrative %	Investment %	Total %
2011	$1,018,605	$1,080	$5,622	0.11%	0.55%	0.66%
2012	1,022,996	1,118	5,137	0.11%	0.50%	0.61%
2013	1,003,929	1,182	5,616	0.12%	0.56%	0.68%
2014	1,061,399	1,119	6,084	0.11%	0.57%	0.68%
2015	1,142,649	1,108	6,396	0.10%	0.56%	0.66%
Average				0.11%	0.55%	0.66%

* *As of beginning of plan year.*

** *Net of securities lending expenses and interest paid to prepaid employer contributions.*

The average expense percentage over this five year period for the two plans combined is 0.65%. Based on this experience, we would maintain the future expense assumption of 0.65% used in our review for the June 30, 2013 valuation. This assumption will be re-examined in subsequent assumption reviews as new data becomes available.

Note related to investment expenses paid for active asset management – As cited above under Section 3.8.3.d of ASOP No. 27, the effect of an active investment management strategy should be considered "net of investment expenses…unless the actuary believes, based on relevant data, that such superior or inferior returns represent a reasonable expectation over the measurement period."

We have not performed a detailed analysis to measure how much of the investment expenses paid to active managers might have been offset by additional returns ("alpha") earned by that active management. However, we did observe the following from the Investment Report provided by NEPC dated October 22, 2015 for the fiscal year ended June 30, 2015:

Data as of 6/30/2015	1 Yr(%)	3 Yrs(%)	5 Yrs(%)	10 Yrs(%)
Systems' Total Return (Gross of Fees)	3.3	11.3	11.3	6.9
Systems' Total Return (Net of Fees)	2.9	10.9	10.9	6.4
Weighted Benchmark	2.4	10.6	10.8	6.8

As shown above, the Systems' total investment performance net of fees over the longest time period of 10 years as provided in that report has been somewhat below the weighted benchmark. However, we note the opposite relationship over the shorter time periods, particularly for the time period of 1 year. Based on this, we will continue to use the current approach of treating any "alpha" that may be identified as an implicit increase in the risk adjustment and corresponding confidence level in developing the investment return assumption rather than as an explicit offset to any related active management expenses.[3] For example, 0.25% of alpha would increase the confidence level by 3% (see discussions that follow on definitions of risk adjustment and confidence level).

Approaches to Account for Administrative Expenses in Developing Investment Return Assumption for use in the Funding Valuation and the Financial Reporting Valuation.

As noted above, the Systems' investment return assumption has historically been developed net of both investment and administrative expenses. In a letter dated August 22, 2014 Segal brought to the Boards' attention a new discrepancy between valuations for funding and for financial reporting. Briefly, GASB Statements 67 and 68 require that the investment return assumption for financial reporting be developed gross, not net, of administrative expenses. Under this approach administrative expenses are accounted for explicitly as an outflow of assets, rather than implicitly as a reduction in investment return. In September 2014, as recommended by Segal, the Boards adopted a practice of assuming for financial reporting the same

[3] As noted earlier, Actuarial Standard of Practice (ASOP) No. 27, Section 3.8.3.d states "Investment Manager Performance - Anticipating superior (or inferior) investment manager performance may be unduly optimistic (pessimistic). The actuary should not assume that superior or inferior returns will be achieved, **net of investment expenses**, from an active investment management strategy compared to a passive investment management strategy unless the actuary believe, based on relevant supporting data, that such superior or inferior returns

rate of investment return as used for funding (at that time 7.50% with a confidence level of 51%) but to treat that rate as gross of administrative expenses for financial reporting.

As part of that same discussion Segal also presented to the Boards an alternative approach of using for the funding valuation the same "explicit" treatment of administrative expenses as used in the financial reporting valuation required by GASB. We presented this for consideration as a more transparent treatment of administrative expenses but noted that it would require an explicit "loading" on contributions from both the employer and the members that would total about 0.95% and 1.05% of payroll for the Employees System and Fire and Police System respectively. This approach was presented in our letters to the two Boards both dated August 22, 2014 for an interim decision by the Boards, to be followed by revisiting the issue as part of the next full review of economic assumptions. The Boards chose to continue the current practice on an interim basis.

We have provided a review of that discussion in Appendix A as is relates to the funding assumption (the approach adopted for financial reporting in 2014 continues to be appropriate and does not require further review). We continue to believe that, for funding, the "explicit" treatment of administrative expenses separate from the investment return assumptions warrants further consideration by the Boards at some time, but not necessarily as part of a full review of economic assumptions. Meanwhile, we believe that the current approach of "implicit" treatment of administrative expenses in the selection of an investment return assumption for use in the funding valuation is reasonable and we have developed our recommendations in this report on that basis.

Risk Adjustment

The real rate of return assumption for the portfolio is adjusted to reflect the potential risk of shortfalls in the return assumptions. The Systems' asset allocation determines this portfolio risk, since risk levels are driven by the variability of returns for the various asset classes and the correlation of returns among those asset classes. This portfolio risk is incorporated into the real rate of return assumption through a risk adjustment.

The purpose of the risk adjustment (as measured by the corresponding confidence level) is to increase the likelihood of achieving the actuarial investment return assumption in the long term. The 5.27% expected real rate of return developed earlier in this report was based on expected mean or average arithmetic returns. This means there is a 50% chance of the actual return in each year being at least as great as the average (assuming a symmetrical distribution of future returns). The risk adjustment is intended to increase that probability

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represent a reasonable expectation over the measurement period." (emphasis added). We believe this means that assuming only enough superior return to cover related investment expenses would not require the relevant supporting data referenced in ASOP No. 27.

somewhat above the 50% level. This is consistent with our experience that retirement plan fiduciaries would generally prefer that returns exceed the assumed rate more often than not.[4]

Three years ago in the last full review of the economic assumptions, the Boards adopted our recommendation to reduce the investment return assumption from 8.00% adopted for the 2010 review to 7.50%. That return implied a risk adjustment of 0.07%, reflecting a confidence level of 51% that the actual average return over 15 years would not fall below the assumed return, assuming that the distribution of returns over that period follows the normal statistical distribution.[5] There was a reduction in both the risk adjustment and the confidence level associated with the 7.50% assumption as the risk adjustment and the confidence level were 0.19% and 53% associated with the 8.00% assumption.[6]

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% chance (6 out of 10) that the average return over 15 years will be equal to or greater than the assumed value. The 15-year time horizon represents an approximation of the "duration" of the fund's liabilities, where the duration of a liability represents the sensitivity of that liability to interest rate variations.

If we use the same 51% confidence level from our last full study to set this year's risk adjustment, based on the current long-term portfolio standard deviation of 13.00% provided by NEPC, the corresponding risk adjustment would again be 0.07%. Together with the other investment return components, this would result in an investment return assumption of 7.55%, which is slightly higher than the current assumption of 7.50%.

As discussed above and further detailed later in this section, the investment return assumption adopted in 2014 resulted in a lower confidence interval of 51%. For that reason, for this study we evaluated the effect on the confidence level of other alternative investment return assumptions. In particular, a net investment return assumption of 7.25%, together with the other investment return components, would produce a risk adjustment of 0.37%, which corresponds to a confidence level of 54%. This is closer to the confidence levels used in the Systems' prior reviews of economic assumptions, and is more in line with the confidence levels used in

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4 Note that for investment return assumptions recently adopted by systems that have been analyzed under this model, the confidence levels are generally in the range of 51% to 55%. We also note a trend towards lower confidence levels (closer to 50%) over the last several years.

5 Based on an annual portfolio return standard deviation of 12.50% provided by the Systems' investment consultant in 2013. Strictly speaking, future compounded long-term investment returns will tend to follow a log-normal distribution. However, we believe the normal distribution assumption is reasonable for purposes of setting this type of risk adjustment.

6 These reductions were caused by reduction in the inflation assumption and the expected portfolio real rate of return, and an increase in the standard deviation of the portfolio.

setting the investment return assumption by Segal's other California public retirement system clients. We believe this analysis supports reducing the current assumption of 7.50% to 7.25%.

The table below shows the Systems' investment return assumptions and, for the years when an analysis was performed, the risk adjustments and corresponding confidence levels as determined in those prior studies.

Historical Investment Return Assumptions, Risk Adjustments and Confidence Levels Based on Assumptions Adopted by the Board

Year Ending June 30	Investment Return	Risk Adjustment	Corresponding Confidence Level
2007	8.25%	0.34%	55%
2010	8.00%	0.19%	53%
2013	7.50%	0.07%	51%
2016 (Recommended)	7.25%	0.37%	54%

As we have discussed in prior years, the risk adjustment model and associated confidence level is most useful as a means for comparing how the Systems have positioned themselves over periods of time[7]. The use of the 54% confidence level should be considered in context with other factors, including:

- As noted above, the confidence level is more of a relative measure than an absolute measure, and so can be reevaluated and reset for future comparisons.

- The confidence level is based on the standard deviation of the portfolio that is determined and provided to us by NEPC. The standard deviation is a statistical measure of the future volatility of the portfolio and so is itself based on assumptions about future portfolio volatility and can be considered somewhat of a "soft" number.

- The reduction from 7.50% to 7.25% could be viewed as reflecting the lower inflation expectation while applying the increased real return expectation (due to the new asset allocation) to increase the confidence level rather than reduce the nominal expected return.

- A confidence level of 54% (which is associated with a 7.25% investment return assumption) is more toward the conservative end of the range of 51% to 55% as determined for most of Segal's other California public retirement system clients under this risk adjustment model.

[7] In particular, it would not be appropriate to use this type of risk adjustment as a measure of determining an investment return rate that is "risk-free."

- Most public retirement systems that have recently reviewed their investment return assumptions have considered adopting more conservative investment return assumptions for their valuations, mainly to maintain the likelihood that future actual market return will meet or exceed the investment return assumption.

- As with any model, the results of the risk adjustment model should be evaluated for reasonableness and consistency. This is discussed in the later section on "Comparison with Other Public Retirement Systems".

Taking into account the factors above, our recommendation is to reduce the net investment return assumption from 7.50% to 7.25%. As noted above, this return implies a 0.37% risk adjustment, reflecting a confidence level of 54% that the actual average return over 15 years would not fall below the assumed return.

Recommended Investment Return Assumption

The following table summarizes the components of the investment return assumption developed in the previous discussion. For comparison purposes, we have also included similar values from the last two studies of investment return.

Assumption Component	June 30, 2016 Recommended Value	June 30, 2013 Adopted Value	June 30, 2010 Adopted Value
Inflation	3.00%	3.25%	3.50%
Plus Portfolio Real Rate of Return	5.27%	4.97%	5.39%
Minus Expense Adjustment	(0.65%)	(0.65%)	(0.70%)
Minus Risk Adjustment	(0.37%)	(0.07%)	(0.19%)
Total	7.25%	7.50%	8.00%
Confidence Level	54%	51%	53%

Based on this calculation, we recommend that the investment return assumption be decreased from 7.50% to 7.25% per annum.

Comparing with Other Public Retirement Systems

One final test of the recommended investment return assumption is to compare it against those used by other public retirement systems, both in California and nationwide.

We note that 7.25% is one of most common investment return assumptions among those California public sector retirement systems. In particular, the 7.25% assumption is used by six county employees retirement systems.

The following table compares the Systems' recommended net investment return assumptions against those of the nationwide public retirement systems that participated in the NASRA 2015 Public Fund Survey for 125 large public retirement funds in their 2014 valuations:

Assumption	**City of Fresno Retirement Systems**	**NASRA 2015 Public Fund Survey**		
		Low	Median	High
Net Investment Return	7.25%	6.50%	7.75%	8.50%

The detailed survey results show that more than one-half of the systems that have an investment return assumption in the range of 6.75% to 7.75%. The survey also notes that several plans have reduced their investment return assumption during the last year, and others are considering doing so. State systems outside of California tend to change their economic assumptions less frequently and so may lag behind emerging practices in this area.

In summary, we believe that both the risk adjustment model and other considerations indicate a lower earnings assumption. The recommended assumption of 7.25% continues to provide for similar risk margin within the risk adjustment model as compared to the previous studies and is consistent with the Systems' current practice relative to other public systems.

Consideration Regarding Actuarial Surplus Allocation

The Actuarial Standards Board has adopted Actuarial Standard of Practice (ASOP) No. 4 that provides guidance for actuaries to follow when valuing pension liabilities. For plans such as that offered by the Systems that utilize the actuarial surplus to provide contribution rate offsets and a PRSB benefit, we are

required to indicate in the valuation reports that the impact of the application of any future actuarial surplus on the future financial condition of the plan has not been explicitly measured in the valuation. Furthermore, under the revised ASOP No. 4 that became effective starting with the valuations as of June 30, 2015, we have to consider using alternative procedures (such as stochastic modeling) for "sharing provisions that trigger benefit increases when investment returns are favorable but do not trigger benefit decreases when investment returns are unfavorable." Based on our analysis, we do not believe the Systems' actuarial surplus distribution provisions would necessarily require quantification under the new guidelines of ASOP No. 4. This is based on the observation that only a portion of the surplus is available for distribution (on an amortized basis over 25 years) when the funded statuses of the Systems are over 110% in a particular valuation but surplus distribution will be suspended immediately in the following valuation if the funded statuses fall below 110% in the following valuations. Nonetheless, it should be understood that there is still a financial impact associated with the surplus distribution provision. The Boards may wish to consider authorizing a supplemental study following the triennial experience studies.

C. SALARY INCREASE

Salary increases impact plan costs in two ways: (i) by increasing members' benefits (since benefits are a function of the members' highest average pay) and future normal cost collections; and (ii) by increasing total active member payroll which in turn generates lower UAAL contribution rates (if any). These two impacts are discussed separately below.

As an employee progresses through his or her career, increases in pay are expected to come from three sources:

1. Inflation – Unless pay grows at least as fast as consumer prices grow, employees will experience a reduction in their standard of living. There may be times when pay increases lag or exceed inflation, but over the long term, labor market forces will require an employer to maintain its members' standards of living.

   As discussed earlier in this report, we are recommending that the assumed rate of inflation be reduced from 3.25% to 3.00%. This inflation component is used as part of the salary increase assumption.

2. Real "Across the Board" Pay Increases – These increases are sometimes termed productivity increases since they are considered to be derived from the ability of an organization or an economy to produce goods and services in a more efficient manner. As that occurs, at least some portion of the value of these improvements can provide a source for pay increases. These increases are typically assumed to extend to all employees "across the board." The State and Local Government Workers Employment Cost Index produced by the Department of Labor provides evidence that real "across the board" pay increases have averaged about 0.6% - 0.9% annually during the last ten to twenty years.

   We also referred to the annual report on the financial status of the Social Security program published in July 2015. In that report, real "across the board" pay increases are forecast to be 1.2% per year under the intermediate assumptions.

   The real pay increase assumption is generally considered a more "macroeconomic" assumption, that is not necessarily based on individual plan experience. However, recent salary experience with public systems in California as well as anecdotal discussions with plans and plan sponsors indicate lower future real wage growth expectations for public sector employees. The following table compares actual changes in average salaries for Systems' members with actual price inflation as measured by changes in the CPI.

Valuation Date	Employees Actual Change in Average Salary for Non-DROP Actives[1]	Fire and Police Actual Change in Average Salary for Non-DROP Actives[1]	Actual Change in CPI[2]
June 30, 2011	2.37%	1.33%	4.06%
June 30, 2012	0.13%	2.40%	1.58%
June 30, 2013	3.54%	1.76%	1.75%
June 30, 2014	-3.76%	-2.84%	2.04%
June 30, 2015	-0.51%	-0.77%	-0.38%
Average	0.35%[3]	0.38%[3]	1.81%

(1) *Reflects the increase in average salary for all members at the beginning of the year versus those at the end of the year. It does not reflect the average salary increases received by individual members who worked the full year.*

(2) *Based on the change in the Annual CPI for the United States City average for urban wage earners and clerical workers (all items) compared to the prior year.*

(3) *We have also determined the average 5-year change in average salary for each system **including** active members currently participating in DROP—0.39% and 0.71% for the Employees' and Fire and Police systems, respectively.*

Considering all these factors, we recommend that the 0.50% assumption adopted by the Board for the June 30, 2013 valuation be maintained for the June 30, 2016 valuation. This is based predominately on macroeconomic information and despite the fact that, over the last several years, actual average increases in salary have been lower than the actual change in CPI. This means that the combined inflation and "across the board" salary increase assumption will decrease from 3.75% to 3.50%.

3. Individual Merit and Promotional Increases – As the name implies, these increases come from a member's career advances. This form of pay increase differs from the previous two, since it is specific to the individual. For the Systems, there are service-specific merit and promotional increases. These assumptions have been reviewed as part of our triennial experience study as of June 30, 2015.

   Recommended merit and promotional assumptions are provided as part of our triennial experience study of non-economic assumptions for the June 30, 2016 valuation.

All three of these components are incorporated into a salary increase assumption that is applied in the actuarial valuation to project future benefits and future Normal Cost contribution collections.

Active Member Payroll

Projected active member payrolls are used to develop the UAAL contribution rate (if any). Future values are determined as a product of the number of employees in the workforce and the average pay for all employees.

The average pay for all employees is assumed to increase only by inflation and real "across the board" pay increases. The merit and promotional increases are not an influence, because this average pay is not specific to an individual.

For the June 30, 2016 valuation, we recommend that the active member payroll increase assumption be reduced from 3.75% to 3.50% annually, consistent with the combined inflation and "across the board" salary increase assumptions.

APPENDIX A

Developing an Investment Return Assumption for use in Accounting and Financial Reporting under GASB Statement 67 and 68

The Governmental Accounting Standards Board (GASB) has adopted Statements 67 and 68 that replace Statements 25 and 27 for financial reporting purposes. This appendix reviews policy alternatives available to the Systems for developing its investment return assumptions in a manner that will allow the Plans to maintain consistency in its liability measurements for funding and financial reporting purposes. This issue was originally presented to the Boards in our letters dated August 22, 2014. In September 2014, as recommended by Segal, the Boards adopted a practice of assuming for financial reporting the same rate of investment return as used for funding but to treat that rate as gross of administrative expenses for financial reporting. That approach continues to be appropriate for financial reporting in 2014 and does not require further review.

As part of that same discussion Segal also presented to the Boards an alternative approach of using for the funding valuation the same "explicit" treatment of administrative expenses as used in the financial reporting valuation required by GASB. This review of that discussion is as it relates to the funding assumption has been updated to reflect the economic assumption recommended in the body of this report.

Background

GASB Statement 67 governs the Plans' financial reporting and is effective for plan year 2013/2014, while GASB Statement 68 governs the employer's financial reporting and is effective for fiscal year 2014/2015. The new Statements specify requirements for measuring both the pension liability and the annual pension expense incurred by the employer. The new GASB requirements are only for financial reporting and do not affect how the Plans determine funding requirements for its employer. Nonetheless, it is important to understand how the new financial reporting results compare with the funding requirement results. The comparison between funding and GASB financial reporting results differ dramatically depending on whether one is considering measures of the accumulated pension liability or measures of the current year annual pension contribution/expense:

- When measuring pension liability GASB uses the same actuarial cost method (Entry Age method) and the same type of discount rate (expected return on assets) as the Systems use for funding. Note that, unrelated to the investment return assumption, the new GASB rules use a version of the Entry Age method where the Total Pension Liability (TPL) must be fully accrued by the time a member either enters DROP or is expected to elect the DROP. This is in contrast to the version of the Entry Age method used for funding,

where the Actuarial Accrued Liability (AAL) does not have to be fully accrued until members retire from employment after participation in the DROP. Under GASB, actives who are expected to enroll in the DROP in the future would report a Service Cost that is higher than the Normal Cost used for funding, while members already in the DROP would report no Service Cost even though their Normal Cost continues to accrue.

- When measuring annual pension expense, GASB requires more rapid recognition of investment gains or losses and much shorter amortization of changes in the pension liability (whether due to actuarial gains or losses, actuarial assumption changes or plan amendments). Because of GASB's more rapid recognition of those changes, retirement systems that have generally used the same "annual required contribution" amount for both funding (contributions) and financial reporting (pension expense) now have to prepare and disclose two different annual cost results, one for contributions and one for financial reporting under the new GASB Statements.

This situation facilitates the explanation of why the funding and financial reporting results are different: with the exception of the adjustment for the DROP, the liabilities and Normal Costs are generally the same, and the differences in annual costs are due to differences in how changes in liability are recognized. However, there is one other feature that makes the liability and Normal Cost measures different under current practice.

Treatment of Expected Administrative Expenses when Measuring Liabilities

As noted above, according to GASB, the discount rate used for financial reporting purposes should be based on the long-term expected rate of return on a retirement system's investments, just as it is for funding. However, GASB requires that this assumption should be net of investment expenses but not net of administrative expenses (i.e., without reduction for administrative expenses). Currently, the Systems' investment return assumption used for the annual funding valuations is developed net of both investment and administrative expenses.

While the Systems could continue to develop their funding investment return assumption net of both investment and administrative expenses, that would mean that the Systems would then have two slightly different values for the investment return assumption, one for funding and one for financial reporting. To avoid this difference and to maintain the general consistency of liability and Normal Cost measures described above, we have recommended and the Boards have decided to use the same value of the investment return assumption for both funding and financial reporting purposes. One way to do this would be that the assumption for funding purposes would be developed on a basis that is net of only investment expenses, with an explicit assumption for administrative expenses. Alternatively, the same value of the assumption could be

assumed to be net of administrative expenses for funding but gross of administrative expenses for financial reporting. This latter approach was adopted by the Boards on an interim basis in 2014.

To review, using the same investment return assumption for both purposes would be easier for the Systems' stakeholders to understand and should result in more consistency between the Systems' Actuarial Accrued Liability (AAL) calculated for funding purposes as the Total Pension Liability (TPL) calculated for financial reporting purposes. Based on the Boards' prior action regarding financial reporting, the only open question is whether to take the "explicit" approach to administrative expenses adopted for financial reporting and use it for funding as well.

In the rest of this Appendix, we will first discuss that "explicit" approach that develops the 7.25% investment return assumption (recommended earlier in this report) net of (only) investment expenses but gross of administrative expenses for both funding and financial reporting. That is followed by a review of the current "implicit" approach that develops the 7.25% investment return assumption net of both investment and administrative expenses for funding, while then using the same rate of return under the "explicit" approach for financial reporting.

Development of Investment Return Assumption For Funding on a Gross of Administrative Expenses Basis – "Explicit Approach"

If the Boards wish to use the same approach for developing the investment return assumption for both funding and financial reporting purposes, then it would be necessary to exclude the administrative expense component of about 0.12% and 0.11% from development of the 7.25% investment return recommendation for the Employees System and the Fire and Police System, respectively. Under this approach, we would not change our recommended investment return assumption as developed earlier in this report. Instead, there would be an increase in the risk adjustment of either 0.11% or 0.12%, with a corresponding increase in the confidence level from 54% to 56%.

Under this approach, there would also be an explicit charge for administrative expenses. There are various ways to set the amount of explicit administrative expense charge, but ultimately the method should result in an assumption that is approximately equivalent to about $1.1 million annually (calculated by averaging the administrative expenses from the last 5 years for each system), or 1.0% and 1.1% of payroll for the Employees System and the Fire and Police System, respectively.

This approach is presented in the following table.

Calculation of Net Investment Return Assumption

Assumption Component	June 30, 2016 Recommended Values as Developed for Funding (Net of Administrative. Expenses)	Employees June 30, 2016 Values for Funding (Gross of Administrative. Expenses)	Fire and Police June 30, 2016 Values for Funding (Gross of Administrative. Expenses)
Inflation	3.00%	3.00%	3.00%
Plus Portfolio Real Rate of Return	5.27%	5.27%	5.27%
Minus Expense Adjustment	(0.65%)	(0.54%)	(0.53%)
Minus Risk Adjustment	(0.37%)	(0.48%)	(0.49%)
Total	7.25%	7.25%	7.25%
Confidence Level	54%	56%	56%
Increase in combined Employer and Employee Contributions Due to Explicit Charge for Administrative Expenses (Cost as % of Payroll)	Not Applicable	1.0% of pay	1.1% of pay

There is an additional complication associated with eliminating the administrative expenses in developing the investment return assumption used for funding that relates to the allocation of administrative expenses between the employers and employees:

1. Even though GASB requires the exclusion of the administrative expenses from the investment return assumption, such expense would continue to accrue for a retirement system. For private sector retirement plans, where the investment return is developed using an approach similar to that required by GASB (i.e., without deducting administrative expenses), contribution requirements are increased explicitly by the anticipated annual administrative expense. That approach is illustrated in the table above.

2. Under the Systems' current approach of subtracting the administrative expense in the development of the investment return assumption, such annual administrative expense is funded implicitly by effectively deducting it from future expected investment returns. Since an investment return assumption net of investment and administrative expenses has been used historically to establish both the employer's and the employee's contribution requirements in the case of the Employees System and

the Tier 1 Fire and Police System, these administrative expenses have been funded implicitly by both the employer and the employees.

3. A switch from the method described in (2) to the method described in (1) would require a new discussion on how to allocate administrative expenses between employers and employees, including establishing a new method to allocate the anticipated annual administrative expense between them. Under current practice, part of the implicit funding of administrative expenses is in the Normal Cost and so is shared between the employer and the employees. However, the rest of the implicit expense funding is in the (Unfunded) Actuarial Accrued Liability (if any), which is generally funded solely by the employers.

4. It is not straightforward to quantify precisely the current implicit sharing of administrative expenses between employer and employees. This means that an exact reproduction of that allocation on an explicit basis will be difficult to develop. This in turn means that the Systems would need to develop a new basis for sharing the cost of administrative expenses, one that if desired, approximately reproduces the current allocation. Alternatively, the Systems could decide to treat administrative expenses as a charge applied only to the employer contribution rates, which is the practice followed by private plans, both single employer and multi-employer.

If the Boards wish to use the same approach for developing the investment return assumption for both funding and financial reporting purposes, the Boards should adopt a change in the funding of administrative expenses from the method described in (2) above with an implicit allocation of administrative expenses to the method described in (1) above with an explicit allocation of administrative expenses.

Under this approach, we would recommend that the total amount of explicit administrative expense charge be set at 1.0% and 1.1% of payroll for the Employees System and the Fire and Police System, respectively. This assumption would be reviewed with each triennial experience study, along with the other economic assumptions.

The more significant issues mentioned in (3) and (4) above concern whether or not the costs associated with the administrative expenses should continue to be allocated to both the employers and the employees. Unless the Boards wish to charge administrative expenses only to the employer, we propose a method whereby the costs associated with the explicit charge for administrative expenses continue to be allocated to both employer and employees. We recommend a straightforward way to do that in a manner generally consistent with current practice, which is to allocate expenses based on the components of the total contribution rate (before

expenses) for employer and employees. These components would be employee Normal Cost contributions, employer Normal Cost contributions, and employer UAAL contributions.

Development of Investment Return Assumption for Funding on a Net of Administrative Expenses Basis but use that Same Assumption for Financial Disclosure Development – "Implicit Approach"

If the Boards decide to leave the recommended investment return assumption of 7.25% on a net of administrative expense basis for funding purposes, then the Boards would continue to use that same 7.25% for financial reporting purposes under GASB. Under this approach, what appears to be the same 7.25% assumption is actually used as two slightly different assumptions: 7.25% net of administrative expenses for funding, and 7.25% gross of administrative expenses for financial reporting. This indirectly results in an increase in the margin for adverse deviation or "confidence level" associated with the use of the recommended 7.25% assumption from 54% as used for funding purposes to 56% only as used for financial reporting purposes.

As discussed earlier, the Boards previously adopted this approach for use in performing the June 30, 2014 and subsequent GASB 67 financial reporting valuations.

The following table summarizes the components of the investment return assumption under this approach, using the recommended 7.25% assumption for both funding (net of administration expenses) and financial reporting (gross of administration expenses), but with differing treatment of administrative expenses:

Calculation of Net Investment Return Assumption

Assumption Component	June 30, 2016 Recommended Values as Developed for Funding (Net of Administrative. Expenses)	Employees June 30, 2016 Values for Financial Reporting (Gross of Administrative Expenses)	Fire and Police June 30, 2016 Values for Financial Reporting (Gross of Administrative Expenses)
Inflation	3.00%	3.00%	3.00%
Plus Portfolio Real Rate of Return	5.27%	5.27%	5.27%
Minus Expense Adjustment	(0.65%)	(0.54%)	(0.53%)
Minus Risk Adjustment	(0.37%)	(0.48%)	(0.49%)
Total	7.25%	7.25%	7.25%
Confidence Level	54%	56%	56%

Note that under both approaches the confidence level for financial reporting increases from 54% to 56% (because the risk adjustment increases from 0.37% to 0.48% and 0.49% for the Employees and Fire and Police systems, respectively). The difference is that under the implicit approach the same confidence level increase would apply for funding purposes, along with the addition of an explicit charge on the contribution rates for administrative expenses.

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