



City of Fresno  
Retirement Systems

# Actuarial Experience Study

**Review of Economic Actuarial Assumptions  
for the June 30, 2022 Actuarial Valuation**

May 3, 2022

Board of Retirement  
City of Fresno Retirement Systems  
2828 Fresno Street, Suite 201  
Fresno, CA 93721-1327

**Re: Review of Economic Actuarial Assumptions for the June 30, 2022 Actuarial Valuation**

Dear Members of the Board:

We are pleased to submit this report of our review of the economic actuarial experience for use in the City of Fresno Retirement Systems' June 30, 2022 actuarial valuation. This report includes our recommendations and the analysis supporting their development.

We have also reviewed the demographic "non-economic" actuarial experience for the three-year period from July 1, 2018 to June 30, 2021 for use in the June 30, 2022 actuarial valuations. The non-economic actuarial assumptions we recommend are provided in a separate report for each of the two Systems.

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,

A handwritten signature in black ink, appearing to read "Paul Angelo".

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

A handwritten signature in black ink, appearing to read "Andy Yeung".

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

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# I. Introduction, Summary, and Recommendations

To project the cost and liabilities of the pension plan, 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 modified, 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 means that year's experience is treated as temporary and that, over the long run, experience will return to what was originally assumed. For example, it is impossible to determine how and to what extent the economy and future mortality rates will be affected by the COVID-19 pandemic.<sup>1</sup> 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 in maintaining adequate funding, while paying the promised benefit amounts to participants already retired and to those near retirement. The actuarial assumptions used 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, 2019.

<sup>1</sup> An analysis of the ongoing impact of the COVID-19 pandemic is beyond the scope of the current experience study.

We are recommending changes in the inflation and investment return assumptions. An alternative investment return assumption is also discussed. Our recommendations for the economic actuarial assumptions for the June 30, 2022 Actuarial Valuation are as follows:

Pg #	Actuarial Assumption Categories	Recommendation
5	<b>Inflation:</b> Future increases in the Consumer Price Index (CPI) which drives investment returns, cost-of-living-adjustments for retirees and active member salary increases.	Reduce the inflation assumption from 2.75% to 2.50% per annum as discussed in Section (III)(A).
7	<b>Investment Return:</b> The estimated average net rate of return on current and future assets of the Systems as of the valuation date. This rate is used to discount liabilities.	<p>Recommend lowering the investment return assumption to 6.75% per annum as discussed in Section (III)(B).</p> <p>An alternative investment return assumption of 6.50% per annum is also discussed.</p>
15	<p><b>Individual Salary Increases:</b> Increases in the salary of a member between the date of the valuation to the date of separation from active service. This assumption has three components:</p> <ul style="list-style-type: none"> <li>• Inflationary salary increases</li> <li>• Real “across the board” salary increases</li> <li>• Merit and promotional increases</li> </ul>	<p>Reduce the current inflationary salary increase assumption from 2.75% to 2.50% and maintain the current real “across the board” salary increase assumption at 0.50%. This means that the combined inflationary and real “across the board” salary increases will decrease from 3.25% to 3.00%.</p> <p>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, 2022 valuation.</p>

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 assumption and reasons for the proposed changes are 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, 2022 valuations.

## II. Background and Methodology

For this study, we analyzed the “economic” assumptions only. Our analysis of the demographic (“non-economic”) assumptions for the June 30, 2022 valuations are provided in separate reports. 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” real pay increases that are assumed.

The setting of these economic 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 our analysis begins with a review of historical information. Following is an analysis of 15 and 30 year moving averages of historical inflation rates:

Historical Consumer Price Index – 1930 to 2021<sup>2</sup>  
(U.S. City Average - All Urban Consumers)

	25 <sup>th</sup> Percentile	Median	75 <sup>th</sup> Percentile
15-year moving averages	2.4%	3.3%	4.4%
30-year moving averages	2.9%	3.7%	4.8%

With the exception of the spike in inflation in 2021<sup>3</sup>, the average inflation rates have continued to decline gradually over the last several years due to the relatively low inflationary environment over the past two decades. Also, the later 15-year averages during the period are lower because they do not include the high inflation years of the mid-1970s and early 1980s.

Based on information found in the Public Plans Database, which is produced in partnership with the National System of State Retirement Administrators (NASRA), the median inflation assumption used by 188 large public retirement funds in their 2020 fiscal year valuations was 2.50%.<sup>4</sup> In California, CalSTRS and twelve 1937 Act CERL systems use an inflation assumption of 2.75%, eight 1937 Act CERL systems use an inflation assumption of 2.50%<sup>5</sup> and CalPERS uses an inflation assumption of 2.30%.

The Systems’ investment consultant, NEPC, anticipates an annual inflation rate of 2.60% over a 30-year horizon, while the average inflation assumption provided by NEPC and five other investment advisory firms retained by Segal’s California public sector clients, as well as Segal’s investment advisory division (Segal Marco Advisor)<sup>6</sup>, was 2.31%. Note that, in general,

<sup>2</sup> Source: Bureau of Labor Statistics – Based on annual-to-annual CPI for All Items in U.S. city average, all urban consumers, not seasonally adjusted (Series ID: CUUR0000SA0).

<sup>3</sup> The inflation rate from December 2020 to December 2021 was 7.0% while the inflation rate from all of calendar year 2020 to 2021 was 4.7%.

<sup>4</sup> Among 209 large public retirement funds, the 2020 fiscal year inflation assumption was not available for 21 of the public retirement funds in the survey data as of March 2022.

<sup>5</sup> Three of these 1937 Act CERL systems use a 2.50% inflation assumption with a 2.75% COLA assumption.

<sup>6</sup> We note that this is the first time we have included inflation and real rate of return assumptions used by Segal Marco Advisor in our review of economic assumptions.

investment consultants use a time horizon for this assumption that is shorter than the time horizon we use for the actuarial valuation.<sup>7</sup>

To find a forecast of inflation based on a longer time horizon, we referred to the Social Security Administration's (SSA) 2021 report on the financial status of the Social Security program.<sup>8</sup> 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 2.40%. The SSA report also includes alternative projections using lower and higher inflation assumptions of 1.80% and 3.00%, respectively.

We also compared the yields on the thirty-year inflation indexed U.S. Treasury bonds to comparable traditional U.S. Treasury bonds.<sup>9</sup> As of March 2022, the difference in yields is about 2.49% which provides a measure of market expectations of inflation. It is worth noting that this market expectation for long term inflation has risen during the recent spike in inflation.

**Based on all of the above information, we recommend reducing the annual inflation assumption from 2.75% to 2.50%.**

The setting of the inflation assumption using the information outlined above is a somewhat subjective process, and Segal does not apply a specific weight to each of the metrics in determining our recommended inflation assumption. Based on a consideration of all of the above metrics, beginning in 2021 we are generally recommending the same 2.50% inflation assumption in our experience studies for our California public retirement system clients.

## Retiree Cost of Living Increases

The retiree cost-of-living adjustments assumed in the prior valuations were 2.75% for the Employees System; and 3.25% and 2.75% for Tier 1 and Tier 2 employees, respectively, in the Fire and Police System.

**Consistent with our 2.50% inflation assumption, we recommend a 2.50% COLA assumption for the Employees System and the Tier 2 Fire and Police System. As the Tier 1 Fire and Police System has a “pay” based COLA, we recommend a 3.00% COLA assumption consistent with the total of the recommended price inflation assumption plus the “across the board” real pay increase assumption of 0.50% detailed later in this report.**

In developing the COLA assumption, we also considered the use 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:

<sup>7</sup> The time horizon used by the six investment consultants included in our review generally ranges from 10 years to 30 years, with NEPC using a 30 year-horizon.

<sup>8</sup> Source: Social Security Administration: The 2021 Annual Report of the Board of Trustees of the Federal Old-Age and Survivors Insurance and Federal Disability Insurance Trust Funds

<sup>9</sup> Source: Board of Governors of the Federal Reserve System.



- 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 assumptions.
- Using lower long-term COLA assumptions based on a stochastic analysis would mean that an actuarial loss would occur even when the inflation assumption of 2.75% 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 assumptions. Therefore we continue to recommend setting the COLA assumptions based on the lesser of the plan specific COLA and the long-term annual inflation assumption, as we have in prior years. (As discussed earlier, for the Tier 1 Fire and Police System we have also included an additional 0.50% “across the board” real pay increase assumption on top of the long-term annual inflation assumption to reflect the “pay” base COLA.

## 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. Generally when an investor takes on greater investment risk, the return on the investment is expected to also be greater, at least in the long run. This additional risk and 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 association’s portfolio will vary with the Board’s asset allocation among asset classes.

The following is the Systems’ current target asset allocation and the assumed real rate of return assumptions by asset class are shown in the following table. The first column of real rate of return assumptions are determined by reducing NEPC’s total or “nominal” 2022 return assumptions over a 30-year horizon by their assumed 2.60% inflation rate. The second column of returns (except for Private Real Assets - Infrastructure/Land, Private credit – credit opportunities, China Equity, and Hedge fund – macro) represents the average of a sample of real rate of return assumptions. The sample includes the expected annual real rate of return provided to us by NEPC and five other investment advisory firms retained by Segal’s public sector clients, as well as Segal’s investment advisory division. We believe these averages are a reasonable consensus forecast of long-term future market returns in excess of inflation.<sup>10</sup>

<sup>10</sup> 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 assumption is shorter than the time horizon encompassed by 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 <sup>11</sup>	Average Assumed Real Rate of Return from a Sample of Consultants to Segal's California Public Sector Clients <sup>12</sup>
Large Cap Equities	18.00%	4.71%	5.40%
Small/Mid Cap Equities	3.00%	5.86%	6.17%
Int'l Equities (Unhedged)	13.00%	5.28%	6.13%
Emerging Int'l Equities	5.00%	9.40%	8.17%
Core Bonds	12.00%	0.67%	0.39%
Private Equity	8.00%	12.06%	10.83%
Private Debt	14.00%	7.39%	5.93%
Real Estate <sup>13</sup>	15.00%	5.85%	4.59%
Private Real Assets - Infrastructure/Land	7.00%	6.19%	6.19% <sup>14</sup>
Private credit – credit opportunities	2.50%	7.18%	7.18% <sup>14</sup>
China Equity	1.25%	9.53%	9.53% <sup>14</sup>
Hedge fund – macro	1.25%	2.72%	2.72% <sup>14</sup>
<b>Total</b>	<b>100.00%</b>	<b>5.90%</b>	<b>5.56%</b>

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 No. 27, Section 3.8.3.d, which states:

“Investment Manager Performance - Anticipating superior (or inferior) investment manager performance may be unduly optimistic (or 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 believes, based on relevant supporting data, that such superior or inferior returns represent a reasonable expectation over the measurement period.”

The following are some observations about the returns provided above:

1. The investment consultants to our California public sector clients, as well as Segal's investment advisory division, 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 that are shorter than the durations of a retirement plan's liabilities.

<sup>11</sup> Derived by reducing NEPC's nominal return assumptions by their 2.60% inflation assumption over a 30-year horizon.

<sup>12</sup> These are based on the projected arithmetic returns provided by NEPC and five other investment advisory firms serving the City retirement systems of Fresno and 16 other city and county retirement systems in California, as well as Segal's investment advisory division. These return assumptions are gross of any applicable investment expenses.

<sup>13</sup> The allocation of 15% Real Estate includes 9% Core Real Estate and 6% Non-Core Real Estate.

<sup>14</sup> For these asset classes, NEPC's assumptions are applied in lieu of the average because there is a larger disparity in returns for these asset classes among the firms survey and using NEPC's assumptions should more closely reflect the underlying investments made specifically for the Systems.

2. Using a sample average of expected real rate of returns 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 investment return assumption.
3. Therefore, we recommend that the 5.56% portfolio real rate of return be used to determine the Systems' investment return assumption. This is 0.06% higher than the return that was used three years ago in the review of the recommended investment return assumption for the June 30, 2019 valuation.

The difference is due to changes in the real rate of return assumptions provided to us by the investment advisory firms (-0.04% under the 2019 asset allocation), changes in the Systems' target asset allocation (+0.005%) and the interaction effect between these changes (+0.095%).

## 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. 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, 2021.

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

Year Ending June 30	Actuarial Value of Assets <sup>15</sup>	Administrative Expenses	Investment Expenses <sup>16</sup>	Administrative %	Investment %	Total %
2017	\$1,087,125	\$1,387	\$7,150	0.13	0.66	0.79
2018	1,145,061	1,619	8,452	0.14	0.74	0.88
2019	1,202,691	1,663	11,511	0.14	0.96	1.10
2020	1,238,651	1,749	12,139	0.14	0.98	1.12
2021	1,269,173	2,058	13,659	0.16	1.08	1.24
<b>Five-Year Average</b>				<b>0.14</b>	<b>0.88</b>	<b>1.03</b>
<b>Current Assumption</b>				<b>0.12</b>	<b>0.63</b>	<b>0.75</b>
<b>Recommendation</b>				<b>0.13</b>	<b>0.87</b>	<b>1.00</b>

<sup>15</sup> As of beginning of plan year.

<sup>16</sup> Net of securities lending expenses. Because we do not assume any additional net return for this program, we effectively assume that any securities lending expenses will be offset by related income.

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

Year Ending June 30	Actuarial Value of Assets <sup>9</sup>	Administrative Expenses	Investment Expenses <sup>10</sup>	Administrative %	Investment %	Total %
2017	\$1,276,604	\$1,500	\$8,471	0.12	0.66	0.78
2018	1,354,974	1,710	10,021	0.13	0.74	0.87
2019	1,436,725	1,897	13,696	0.13	0.95	1.08
2020	1,495,023	1,839	14,534	0.12	0.97	1.09
2021	1,547,641	2,282	16,439	0.15	1.06	1.21
<b>Five-Year Average</b>				<b>0.13</b>	<b>0.88</b>	<b>1.01</b>
<b>Current Assumption</b>				<b>0.12</b>	<b>0.63</b>	<b>0.75</b>
<b>Recommendation</b>				<b>0.13</b>	<b>0.87</b>	<b>1.00</b>

The average expense percentage over the most recent five-year period for the two Systems combined is 1.01%. According to our discussions with the Systems, the main driver of the increase in investment expenses was due to increased allocation to private markets, particularly private equity, private debt, and infrastructure.

Note that 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. As cited in our analysis of the Systems’ real rate of investment return, according to Section 3.6.3.d of ASOP No. 27 the effect of an active investment management strategy “should not assume that superior or inferior returns will be achieved, 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.” However, we did observe the following from the City’s Annual Comprehensive Financial Report (ACFR) for the fiscal year ended June 30, 2021:

Data as of 6/30/2021	1 Yrs(%)	3 Yrs(%)	5 Yrs(%)	10 Yrs(%)
Systems’ Total Return (Gross of Fees)	30.83	11.96	11.88	9.32
Systems’ Total Return (Net of Fees)	30.40	11.60	11.52	8.93
Weighted Benchmark	28.20	10.73	10.94	8.64

For this study, we have continued to use the current approach that any “alpha” that may be identified, including any alpha to cover investment expenses, would be treated as an increase in the risk adjustment and corresponding confidence level. 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).

**Based on above experience, we have increased the future expense assumption from 0.75% to 1.00%. This assumption will be re-examined in subsequent assumption reviews as new data becomes available.**

## 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.<sup>17</sup> This is consistent with our experience that retirement plan fiduciaries would generally prefer that returns exceed the assumed rate more often than not.

The 5.56% expected real rate of return developed earlier in this report was based on expected mean or average arithmetic returns. In our model, the confidence level associated with a particular risk adjustment represents the relative likelihood that future investment earnings would equal or exceed the assumed earnings over a 15-year period on an expected value basis.<sup>18</sup> 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. Note that, based on the investment return assumptions recently adopted by systems that have been analyzed under this model, we observe a confidence level in the range of 50% to 60%.

Three years ago, the Boards adopted an investment return assumption of 7.00%. That return implied a risk adjustment of 0.50%, reflecting a confidence level of 56% 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.<sup>19</sup>

If we use the same 56% confidence level from our last study to set this year's risk adjustment, based on the current long-term portfolio standard deviation of 12.70% provided by NEPC, the corresponding risk adjustment would be 0.50%. Together with the other investment return components, this would result in an investment return assumption of 6.56%, which is 0.46% lower than the current assumption of 7.00%.

However, based on the general practice of using one-quarter percentage point increments for economic assumptions (a reduction in the long term investment return assumption by more than 0.25% is a big reduction in the assumption), together with the System's historical risk adjustment and confidence levels adopted by the Board in setting the investment return assumption, we recommend lowering the current net investment return assumption of 7.00% to

<sup>17</sup> This type of risk adjustment is referred to in the Actuarial Standards of Practice as a "margin for adverse deviation."

<sup>18</sup> If a retirement system uses the expected arithmetic average return as the discount rate in the funding valuation, that retirement system is expected to have no surplus or asset shortfall relative to its expected obligations assuming all actuarial assumptions are met in the future.

<sup>19</sup> Based on an annual portfolio return standard deviation of 12.74% provided by NEPC. 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.

6.75%, which would have a risk adjustment of 0.31% and corresponds to a somewhat lower confidence level of 54%.

Alternatively, lowering the net investment return assumption to 6.50%, together with the other investment return components, would produce a risk adjustment of 0.56% and corresponds to a somewhat higher confidence level of 57%.

The table below shows the Systems’ recommended investment return assumption, the risk adjustment and confidence level compared to the historical values for 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	7.25%	0.37%	54%
2019	7.00%	0.50%	56%
2022 Recommended	6.75%	0.31%	54%
2022 Alternative	6.50%	0.56%	57%

As we have discussed in prior experience studies, the risk adjustment model and associated confidence level is most useful as a means for comparing how the Systems’ have positioned themselves relative to risk over periods of time.<sup>20</sup> The use of expected returns with either a 54% or a 57% confidence level under Segal’s model 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.
- A confidence level of 54% or 57% are both consistent with the range of about 50% to 60% confidence levels that correspond to the risk adjustments currently used by most of Segal’s other California public retirement system clients.
- We have not taken into account any additional returns (“alpha”) that might be earned on active management. This means that if active management generates enough alpha to

<sup>20</sup> 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.”

cover its related expenses, this would increase returns. This aspect of Segal’s model is further evaluated below.

- 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 “Comparisons with Other Public Retirement Systems”.

Taking into account the factors above, we recommend the Boards lower the 7.00% assumption to 6.75% that includes a 0.31% risk adjustment, with a corresponding confidence level of 54%. Alternatively, lowering the assumption to 6.50% would include a 0.56% risk adjustment, with a corresponding confidence level of 57%.

## 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 study.

Assumption Component	June 30, 2019	June 30, 2022	
	Adopted	Recommended	Alternative
Inflation	2.75%	2.50%	2.50%
Plus Portfolio Real Rate of Return	5.50%	5.56%	5.56%
Minus Expense Adjustment	(0.75%)	(1.00%)	(1.00%)
Minus Risk Adjustment	(0.50%)	(0.31%)	(0.56%)
<b>Total</b>	<b>7.00%</b>	<b>6.75%</b>	<b>6.50%</b>
<b>Confidence Level</b>	<b>56%</b>	<b>54%</b>	<b>57%</b>

**Based on this analysis, we recommend that the investment return assumption be lowered to 6.75% per annum.**

## Comparison with Alternative Model used to Review Investment Return Assumption

Since our appointment as actuary for the Systems in 2006, we have consistently reviewed investment return assumptions based on our model that incorporates expected arithmetic real returns for the different asset classes and for the entire portfolio as one component of that model.<sup>21</sup> The use of “forward looking expected arithmetic returns” is one of the approaches discussed for use in the Selection of Economic Assumptions for measuring Pension Obligations under Actuarial Standards of Practice (ASOP) No. 27.

Besides using forward looking expected arithmetic returns, ASOP No. 27 also discusses setting investment return assumptions using an alternative “forward looking expected geometric

<sup>21</sup> Again, as discussed in footnote 17, if a retirement system uses the expected arithmetic average return as the discount rate in the funding valuation, that retirement system is expected to have no surplus or asset shortfall relative to its expected obligations assuming all actuarial assumptions are met in the future.

returns” approach.<sup>22</sup> Even though expected geometric returns are lower than expected arithmetic returns, public retirement systems that have set investment return assumptions using this alternative approach have in practice adopted investment return assumptions that are comparable to those adopted by the Board for the Systems. This is because under the model used by those retirement systems, their investment return assumptions are not reduced to anticipate future investment expenses.<sup>23</sup>

For comparison, we evaluated both the 6.75% recommended and 6.50% alternative assumptions based on the expected geometric return for the entire portfolio, gross of the investment expenses under that model, over a 20-year period, there is a 57% likelihood that future average geometric returns will meet or exceed 6.75% and a 61% likelihood that future average geometric returns will meet or exceed 6.50%.<sup>24</sup>

## Comparisons 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 an investment return of 7.00% or lower is the most common among California public sector retirement systems. In particular, of the twenty 1937 Act CERL systems, ten use a 7.00% investment return assumption, six use 6.75%, one uses 6.50% and one uses 6.25%. The remaining two 1937 Act CERL systems currently use a 7.25% earnings assumption. Furthermore, CalSTRS currently uses a 7.00% earnings assumption and CalPERS uses a 6.80% earnings assumptions, while the San Jose and San Diego City retirement systems use investment return assumptions of 6.625% and 6.50%, respectively.

The following table compares the Systems’ recommended net investment return assumption against those of the 207 large public retirement funds in their 2021 fiscal year valuations based on information found in the Public Plans Database, which is produced in partnership with NASRA<sup>25</sup>:

Assumption	City of Fresno Retirement Systems	Public Plans Data <sup>26</sup>		
		Low	Median	High
Net Investment Return	6.75% or 6.50%	4.25%	7.00%	8.25%

The detailed survey results show that more than 80% of the systems have an investment return assumption in the range of 6.75% to 7.50%. Also, over half of the systems have reduced their

<sup>22</sup> If a retirement system uses the expected geometric average return as the discount rate in the funding valuation, that retirement system is expected to have an asset value that generally converges to the median accumulated value as the time horizon lengthens assuming all actuarial assumptions are met in the future.

<sup>23</sup> This means that if that model were to be applied to Systems, the expected geometric return would not be adjusted for the approximately 0.87% expenses paid by the Systems.

<sup>24</sup> We performed this stochastic simulation using the capital market assumptions included in the 2021 survey prepared by Horizon Actuarial Services. That simulation was performed using 10,000 trial outcomes of future market returns, using assumptions for 20-year arithmetic returns adjusted by 0.13% for administrative expenses, standard deviations, and correlation coefficients from 39 investment advisors, as found in the 2021 survey.

<sup>25</sup> Among 209 large public retirement funds, the 2021 fiscal year investment return assumption was not available for 2 of the public retirement funds in the Public Plans Database as of March 2022.

<sup>26</sup> Public Plans Data website – Produced in partnership with the National Association of State Retirement Administrators (NASRA)



investment return assumption from 2017 to 2021. 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 the recommended assumption of 6.75% provides for an appropriate risk margin within the risk adjustment model and is consistent with the Systems' current practice relative to other public systems.

## 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. 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 may require an employer to maintain its employees' standards of living.

**As discussed earlier in this report, we are recommending that the assumed rate of inflation be reduced from 2.75% to 2.50% per annum.** This inflation component is used as part of the salary increase assumption.

2. **Real "Across the Board" Pay Increases:** These increases are typically 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 0.5% – 0.8% 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 August 2021. 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. We note that for the Systems' active non-DROP and DROP members, the actual average inflation plus "across the board" increase (i.e., wage inflation) over the three-year period ending June 30, 2021 was 3.47% for the Employees and Fire & Police Systems members combined, which is greater than the change in CPI of 2.60% during that same period:

Valuation Date	Actual Average Increase for active non-DROP and DROP members <sup>27</sup>	Actual Change in CPI <sup>28</sup>
June 30, 2019	4.12%	2.67%
June 30, 2020	3.98%	1.94%
June 30, 2021	2.31%	3.18%
<b>Three-Year Average</b>	<b>3.47%</b>	<b>2.60%</b>

**Based on all of the above information, we recommend maintaining the real “across the board” salary increase assumption at 0.50%. This means that the combined inflation and “across the board” salary increase assumption will decrease from 3.25% to 3.00%.**

## Active Member Payroll

Projected active member payrolls are used to develop the UAAL contribution rate. 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 increases only by inflation and real “across the board” pay increases. The merit and promotion increases are not an influence, because this average pay is not specific to an individual.

Under the Boards’ current practice, the UAAL contribution rate (if any) is developed by assuming that the total payroll for all active members will increase annually over the amortization periods at the same assumed rates of inflation plus real “across the board” salary increase assumptions as are used to project the members’ future benefits.

**Consistent with the combined recommended inflation and real “across the board” salary increase assumptions, we recommend reducing the payroll growth assumption from 3.25% to 3.00% annually.**

<sup>27</sup> Reflects the increase in average salary for 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 members who worked the full year.

<sup>28</sup> Based on the change in 1<sup>st</sup> Semiannual CPI for the Western Region compared to the prior year.

# Appendix A: Current Actuarial Assumptions

## Economic Assumptions

<b>Net Investment Return:</b>	7.00%, net of administrative and investment expenses.
<b>Employee Contribution Crediting Rate:</b>	7.00%, assumed in the valuation
<b>Consumer Price Index:</b>	<p>Increase of 2.75% per year, retiree COLA increases due to CPI are limited to a maximum of 5.00% per year for Employees System members and 3.00% per year for Tier 2 Fire &amp; Police System members.</p> <p>Tier 1 retiree COLA increases due to changes in average compensation or new salaries adopted are equal to total wage growth of 3.25% per year (composed of 2.75% CPI plus 0.50% across-the-board salary increase), limited to maximum of 5.00% per year.</p>
<b>Payroll Growth:</b>	Inflation of 2.75% per year plus “across the board” real salary increases of 0.50% per year.
<b>Inflationary and Real “Across the Board” Salary Increases:</b>	Inflation of 2.75% per year plus “across the board” real salary increases of 0.50% per year.

# Appendix B: Proposed Actuarial Assumptions

## Economic Assumptions

<b>Net Investment Return:</b>	6.75% (recommended) or 6.50% (alternative), net of administrative and investment expenses.
<b>Employee Contribution Crediting Rate:</b>	6.75% or 6.50%, assumed in the valuation
<b>Consumer Price Index:</b>	<p>Increase of 2.50% per year. Retiree COLA increases due to CPI are limited to a maximum of 5.00% per year for Employees System members and 3.00% per year for Tier 2 Fire &amp; Police System members.</p> <p>Tier 1 retiree COLA increases due to changes in average compensation or new salaries adopted are equal to total wage growth of 3.00% per year (composed of 2.50% CPI plus 0.50% across-the-board salary increase), limited to maximum of 5.00% per year.</p>
<b>Payroll Growth:</b>	Inflation of 2.50% per year plus “across the board” real salary increases of 0.50% per year.
<b>Inflationary and Real “Across the Board” Salary Increases:</b>	Inflation of 2.50% per year plus “across the board” real salary increases of 0.50% per year.

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