



Fresno County Employees'
Retirement Association

Economic Assumptions Review

**Review of Economic Actuarial Assumptions
for the June 30, 2023 Actuarial Valuation**

July 11, 2023

Board of Retirement
Fresno County Employees' Retirement Association
7772 N Palm Ave
Fresno, CA 93711

Re: Review of Economic Actuarial Assumptions for the June 30, 2023 Actuarial Valuation

Dear Members of the Board:

We are pleased to submit this report on our review of the June 30, 2023 economic actuarial assumptions for the Fresno County Employees' Retirement Association (FCERA). This report includes our recommendations and the analysis supporting their development.

It has been the general practice of the Board of Retirement to review both the economic and non-economic¹ actuarial assumptions every three years. Two years ago, the Board requested that Segal perform an out-of-cycle review of the economic assumptions for use in the June 30, 2021 valuation and directed Segal to perform another review of the economic assumptions for use in the June 30, 2023 valuation. Last year, Segal also performed a review of the non-economic assumptions in the triennial experience study as of June 30, 2022.

With this review of the economic assumptions as of June 30, 2023, we have reflected FCERA's most recent target asset allocation resulting from their investment consultant's updated asset liability study.

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".

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

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

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

A handwritten signature in black ink, appearing to read "Todd Tauzer".

Todd Tauzer, FSA, MAAA, FCA, CERA
Senior Vice President and Actuary

AW/jl

¹ The non-economic assumptions include rates of service and disability retirement, withdrawals, pre-retirement and post-retirement mortality, merit and promotion salary increases, etc.

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1. 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. Changing assumptions reflects a basic change in thinking about the future, and 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."¹ These Standards of Practice provide guidance for the selection of the various actuarial assumptions utilized in a pension plan actuarial valuation.

The primary recommended change as a result of this study relates to the cost-of-living adjustment (COLA) currently used by the Board for the Legacy members enrolled in those tiers with a maximum 3.0% COLA.

¹ References made later in this report are with respect to the revised ASOP 27 adopted in June 2020.

Our recommendations for the economic actuarial assumptions for the June 30, 2023 actuarial valuation are as follows:

Pg #	Actuarial Assumption Category	Recommendation
8	Inflation: Future increases in the Consumer Price Index (CPI), which drives investment returns and active member salary increases.	Maintain the inflation assumption of 2.50% per annum as discussed in Section (3)(A).
12	Retiree Cost-of-Living Increases: Future increases in the cost-of-living adjustment for retirees.	Increase the retiree cost-of-living adjustment assumption from 2.50% to 2.75% per annum for General Tiers 1, 2 and 3 and Safety Tiers 1 and 2 members as discussed in Section (3)(A). Increase the member contribution crediting rate from 2.50% to 2.75% per annum.
13	Investment Return: The estimated average future net rate of return on current and future assets of the Association as of the valuation date. This rate is used to discount liabilities.	Maintain the current investment return assumption of 6.50% per annum as discussed in Section (3)(B).
22	Individual Salary Increases: 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: <ul style="list-style-type: none"> • Inflationary salary increases • Real “across the board” salary increases • Merit and promotion increases 	Maintain the current inflationary salary increase assumption of 2.50% and 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 remain unchanged at 3.00%. The current merit and promotion salary increase assumption ranges from 9.00% to 1.10% for General and 8.50% to 1.50% for Safety. The merit and promotion increases will remain unchanged; they were reviewed in the Review of Demographic Actuarial Assumptions as of June 30, 2022 and will be reviewed again at the next triennial experience study as of June 30, 2025.
24	Administrative Expenses: Fees for administration and other functions carried out by the Association.	Maintain the explicit administrative expense load at 1.30% of projected payroll as discussed in Section (3)(D).

We have estimated the impact of the recommended economic assumptions as if they were applied to the June 30, 2022 actuarial valuation. The table below shows the changes in the average employer and member contribution rates due to the recommended economic assumption changes (as recommended in Section 3 of this report).

Note this impact excludes the effect of higher than expected COLA increases granted by the Board in April 2023.¹

The cost associated with the administrative expense load has continued to be allocated to both the employer and the member based on the components of the total contribution rate (before administrative expenses) for the employer and the member.²

¹ The annual CPI for the West Region used by the Board to set April 1, 2023 COLA came in at 8.0%. For Tiers with a maximum 3.0% COLA, there will be an actuarial loss between the expected benefit increase (2.50% assumed annually starting April 1, 2023 in the June 30, 2022 valuation) and the actual benefit increase (3.0% granted on April 1, 2023 and on every April 1 thereafter until the COLA banks used to track the difference between the 8.0% actual CPI and the actual COLA granted are fully exhausted).

² The actual allocation of contribution rates for administrative expenses will be determined in each actuarial valuation to reflect the relative proportion of employer and member contributions.

Cost Impact of the Recommended Economic Assumptions Based on June 30, 2022 Actuarial Valuation

	Impact on Average Employer Contribution Rates
Increase in average employer rate	2.37%
Estimated increase in annual dollar amount (\$000s) ¹	\$11,644

	Impact on Weighted Average Member Contribution Rates
Increase in average member rate	0.24%
Estimated increase in annual dollar amount (\$000s) ¹	\$1,170

	Impact on UAAL and Funded Percentage
Increase in UAAL (\$000s)	\$121,410
Change in Funded Percentage on VVA basis	-1.5%

In preparing the above estimated contribution rate impact for the employer, we have not taken into consideration the effect of the prior Unfunded Actuarial Accrued Liability (UAAL) amortization layers that are expected to become fully amortized. However, we note the UAAL layer added as a result of the June 30, 2008 valuation would be fully amortized in the June 30, 2023 valuation and the resulting reduction in the average employer contribution rate is expected to be about 2.31% of payroll for the Association as a whole.

Section 2 provides some background on the basic principles and methodology used for the experience study and for the review of the economic and demographic actuarial assumptions. A detailed discussion of each assumption and reasons for the proposed changes are found in Section 3. The cost impact of the proposed changes is detailed in Section 4.

¹ Based on June 30, 2022 projected annual payroll as determined under each set of assumptions.

2. Background and Methodology

In this report, we analyzed the economic assumptions only. The primary economic assumptions reviewed are inflation, retiree cost-of-living increases, investment return, administrative expenses and the inflationary and real “across-the-board” components of 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 employees and drives increases in the allowances of retired members (if any).
- **Investment Return:** Expected long-term rate of return on the Association’s investments after accounting for investment 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 real “across the board” pay increases in excess of price inflation. It is also assumed that employees will receive raises above these average increases as they advance in their careers. These are commonly referred to as merit and promotion increases. Payments to amortize any Unfunded Actuarial Accrued Liability (UAAL) are assumed to increase each year by the price inflation rate plus any real “across the board” pay increases that are assumed.
- **Administrative Expenses:** These include expenses incurred in connection with the Association’s operation.

The setting of these economic assumptions is described in Section 3.

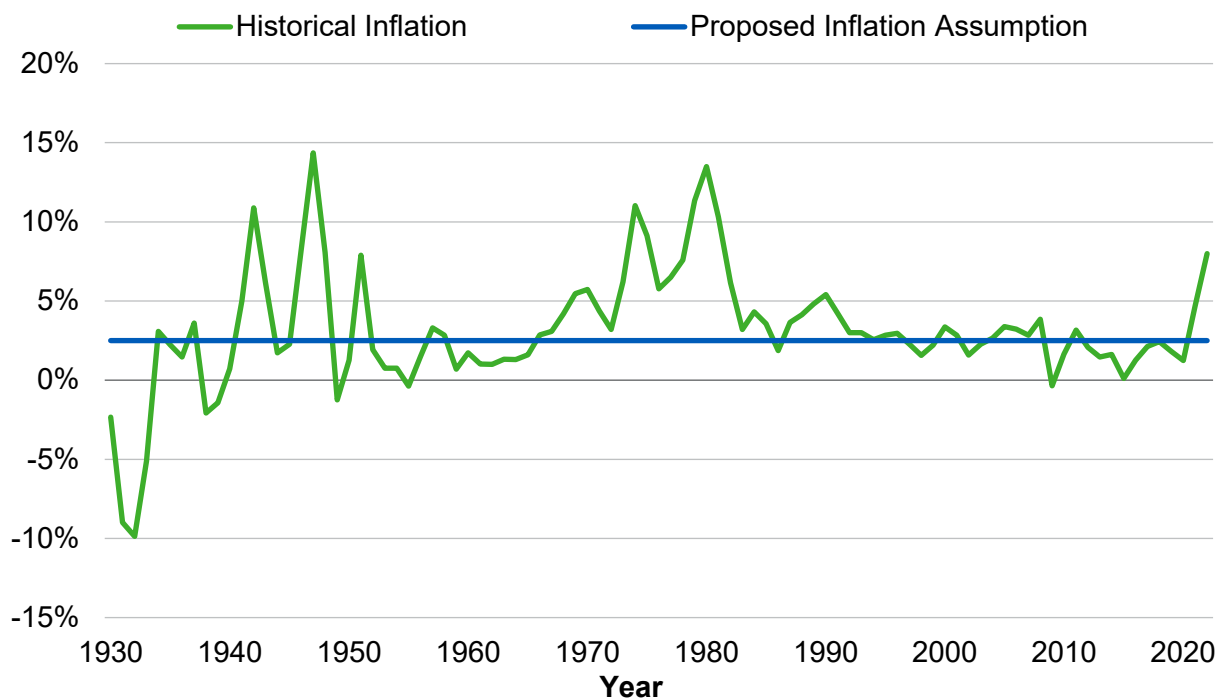
3. Economic Assumptions

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 a graph showing historical inflation rates and a comparison with the inflation assumption of 2.50% that we recommend in this report:

Historical Consumer Price Index – 1930 to 2022¹
(U.S. City Average - All Urban Consumers)



There has been a spike in inflation that started in the second quarter of 2021 and continued into 2022. However, the rate of inflation, while still elevated, has leveled off and started to decline since the Federal Reserve began to increase interest rates starting around the second quarter of 2022.

¹ 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).

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 194 large public retirement funds in their 2021 fiscal year valuations was 2.50%.¹ In California, CalSTRS and seven² 1937 Act CERL systems currently use an inflation assumption of 2.75%, the other thirteen 1937 Act CERL systems (including FCERA) use an inflation assumption of 2.50%³ and CalPERS uses an inflation assumption of 2.30%.

FCERA's investment consultant, Verus, anticipates an annual inflation rate of 2.10% over a 30-year horizon,⁴ while the average inflation assumption provided by Verus and five other investment advisory firms retained by Segal's California public sector clients, as well as Segal's investment advisory division (Segal Marco Advisors),⁵ was 2.43%. Note that, in general, investment consultants use a time horizon for this assumption that is shorter than the time horizon we use for the process of setting actuarial assumptions.⁶

To find a forecast of inflation based on a longer time horizon, we referred to the Social Security Administration's (SSA) 2023 report on the financial status of the Social Security program.⁷ 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 30-year inflation indexed U.S. Treasury bonds to comparable 30-year traditional U.S. Treasury bonds.⁸ This "break-even rate" is commonly regarded as a market-based gauge of future inflation expectations. As of May 2023, the difference in yields is about 2.26% which provides a measure of market expectations of inflation. This market expectation for long-term inflation can be quite volatile and has dropped from the high of 2.55% over the last 12 months, which is illustrated in the table below. It is worth noting that even during the peak of the recent inflation spike this break-even rate exceeded 2.50% in only a single month, April 2022.

¹ Among 219 large public retirement funds, the 2021 fiscal year inflation assumption was not available for 25 of the public retirement funds in the survey data as of March 2023.

² We note that out of these seven 1937 Act CERL Systems, two of those are served by Segal and we would generally expect to recommend 2.50% as the inflation assumption in their next experience study.

³ Five of these 1937 Act CERL systems use a 2.50% inflation assumption with a 2.75% COLA assumption.

⁴ The annual inflation assumption used by Verus is 2.5% over a 10-year horizon.

⁵ We note that this is the first time we have included inflation and real rate of return assumptions used by Segal Marco Advisors in our review of economic assumptions for FCERA.

⁶ The time horizon used by the six investment consultants included in our review, with the exception of one investment consultant that uses a 1-year horizon, generally ranges from 20 years to 30 years, with Verus using a 30-year horizon.

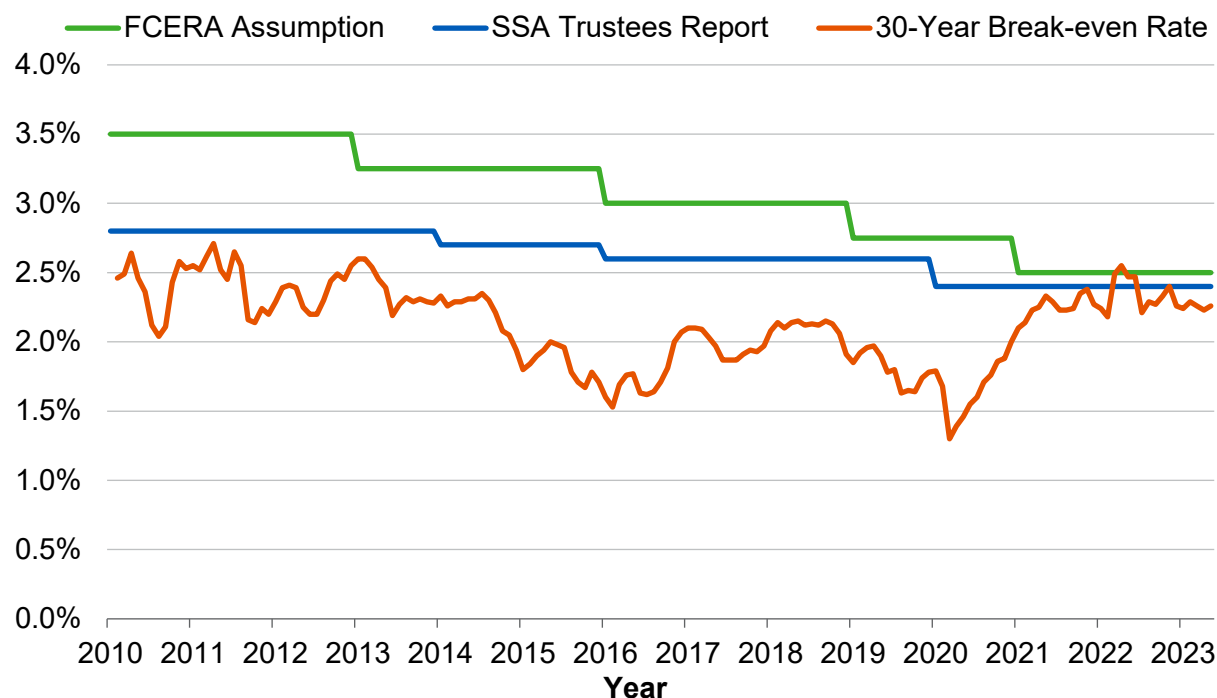
⁷ Source: Social Security Administration: The 2023 Annual Report of the Board of Trustees of the Federal Old-Age and Survivors Insurance and Federal Disability Insurance Trust Funds.

⁸ Source: Board of Governors of the Federal Reserve System.

Observation Month	Difference in Yields	Observation Month	Difference in Yields
December 2021	2.27%	September 2022	2.27%
January 2022	2.24%	October 2022	2.33%
February 2022	2.18%	November 2022	2.40%
March 2022	2.49%	December 2022	2.26%
April 2022	2.55%	January 2023	2.24%
May 2022	2.47%	February 2023	2.29%
June 2022	2.47%	March 2023	2.26%
July 2022	2.21%	April 2023	2.23%
August 2022	2.29%	May 2023	2.26%

The following graph shows FCERA's historical and current proposed inflation assumptions compared to the two other metrics just discussed, going back to 2010. In effect, this compares FCERA's assumption to two separate independent forecasts, one based on market observations and one developed by economists at the SSA. The graph shows that over the observed period, FCERA's assumption has been higher but consistently moving towards these other forecasts.

Historical Inflation Forecasts



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.

Based on all of the above information, we recommend maintaining the annual inflation assumption at 2.50%.

Retiree Cost-of-Living Increases

In our last economic assumptions review as of June 30, 2021, consistent with the 2.50% annual inflation assumption adopted by the Board, the Board also reduced the assumption for retiree cost-of-living adjustment to 2.50% for all General Tiers 1, 2 and 3 and Safety Tiers 1 and 2 members.¹ Members in Tiers 4 and 5 receive no COLA increases.

However, we observed in the table below that during the most recent 5-year, 10-year and 20-year periods ending before December 31, 2022, the changes in the annual average CPI for the West Region used by the Board to set COLAs have exceeded those of the annual average CPI for the U.S. City Average.

	Change in Average Annual CPI for West Region	Change in Annual Average CPI for U.S. City Average
5-Year Period	4.04%	3.61%
10-Year Period	2.94%	2.46%
20-Year Period	2.63%	2.46%

In order to reflect this experience and to mitigate actuarial losses which may arise from future COLA increases greater than the inflation assumption, we believe it is reasonable for the Board to consider adopting an extra margin above the general price inflation in anticipating future COLAs for all General Tiers 1, 2 and 3 and Safety Tiers 1 and 2 members.

We recommend increasing the current assumptions to value the post-retirement COLA benefit from 2.50% to 2.75% per year for all General Tiers 1, 2 and 3 and Safety Tiers 1 and 2 members. This recommendation includes a 0.25% margin above our recommended inflation assumption.

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 assumptions.

¹ For current retirees and beneficiaries, we would utilize the accumulated COLA banks to value an annual 3.00% COLA increase to General Tiers 1, 2 and 3 and Safety Tiers 1 and 2 payees until those banks become depleted.

- 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 2.50% 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 consistent with the COLA assumption we have used in prior years.

Member Contribution Crediting Rate

Based on FCERA's Interest Crediting and Undistributed Earnings Policy, the Employee Reserve is credited semi-annually at the Board-approved Member Crediting Rate that is one-half of the cost-of-living increase percentage provided to FCERA members enrolled in tiers with a maximum 3.0% COLA and retired on or before April 1 of that calendar year.

Consistent with our recommendation of increasing the current assumption to value the post-retirement COLA benefit from 2.50% to 2.75% per year for all General Tiers 1, 2 and 3 and Safety Tiers 1 and 2 members, **we recommend increasing the expected member contribution crediting rate from 2.50% to 2.75% per year.**

B. Investment Return

The investment return assumption is comprised of two primary components, inflation and real rate of investment return, with adjustments for certain 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 plan's portfolio will vary with the Board's asset allocation among asset classes.

The Association's 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 Verus' total or "nominal" 2023 return assumptions by their assumed 2.10% inflation rate. The second column of returns (except for Value Added Real Estate, Opportunistic Real Estate, and Infrastructure) 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 Verus 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.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 assumption is shorter than the time horizon encompassed by the actuarial valuation.

FCERA’s Target Asset Allocation and Assumed Arithmetic Net Real Rate of Return Assumptions by Asset Class and for the Portfolio

Asset Class	Percentage of Portfolio	Verus’ Assumed Net Real Rate of Return ¹	Average Assumed Net Real Rate of Return from a Sample of Consultants to Segal’s California Public Sector Clients ²
Large Cap U.S. Equity	23.00%	5.30%	6.00%
Small Cap U.S. Equity	6.00%	5.70%	6.65%
Developed International Equity	15.00%	7.40%	7.01%
Emerging Markets Equity	6.00%	7.60%	8.80%
U.S. Core Fixed Income	12.00%	2.60%	1.97% ³
High Yield Bond	4.00%	5.00%	4.63%
Bank Loan	4.00%	4.20%	4.07%
Emerging Market Debt	2.00%	6.60%	4.72%
Real Estate	4.00%	4.30%	3.86%
Value Added Real Estate	2.00%	6.70%	6.70% ⁴
Opportunistic Real Estate	2.00%	8.60%	8.60% ⁴
Infrastructure	4.00%	7.30%	7.30% ⁴
Private Credit	8.00%	8.86%	6.75%
Private Equity	<u>8.00%</u>	<u>10.60%</u>	<u>9.98%</u>
Total	100.00%	6.27%	6.13%

Generally, the above are representative of “indexed” returns for securities that are publicly traded, returns net of fees for securities that are non-publicly traded and do not include any additional returns (“alpha”) from active management. Consideration of returns without alpha 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 has reason to believe, based on relevant supporting data, that such superior or inferior returns represent a reasonable expectation over the long term.”

¹ The rates shown have been estimated by Segal by taking Verus’ nominal projected arithmetic returns and reducing by Verus’ assumed 2.10% inflation rate to develop the assumed real rate of return shown.

² These are based on the projected arithmetic returns provided by Verus and five other investment advisory firms serving the county retirement system of FCERA and 16 other city and county retirement systems in California, as well as Segal’s investment advisory division. These return assumptions are net of any applicable investment management expenses.

³ Instead of the 2.6% real return for the Core Fixed Income, the portfolio average arithmetic return would increase from 6.13% to 6.14% if we use the Core Plus Fixed Income real return of 3.1% provided by Verus in our average calculation.

⁴ For this asset class, Verus’ assumption is applied in lieu of the average because there is a larger disparity in returns for these asset classes among the firms surveyed and using Verus’ assumption should more closely reflect the underlying investments made specifically for FCERA.

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.
2. As discussed in the next section, the real rates of return provided this year by the investment consultants reflect a change in how investment expenses are reported.
3. Using a sample average of expected net real rates of return allows the Association's 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.
4. Therefore, we recommend that the 6.13% portfolio net real rate of return be used to determine FCERA's investment return assumption, but with some caution. This return is 1.06% higher than the 5.07% gross return that was used two years ago in the review of the recommended investment return assumption for the June 30, 2021 valuation even before we consider the approximately 0.55% in investment management expense that, as discussed in the next section, will no longer be subtracted from the 6.13% return.
5. The 1.06% increase in the portfolio net real rate of return since the 2021 return is due to changes in the real rate of return assumptions provided to us by the investment advisory firms (+0.70% under the 2021 asset allocation), changes in FCERA's target asset allocation (+0.47%) and the interaction effect between these changes (-0.11%). We believe the increase in the portfolio net real rate of return attributable to those real rate of return assumptions may be due to the very low returns earned in the 2021-2022 plan year, as well as the increase in the federal funds rate during 2022, and so should be used with caution in selecting a long-term investment return assumption.

Investment Expenses

For funding purposes, the real rate of return assumption for the portfolio needs to reflect investment expenses expected to be paid from investment income. In prior experience studies, we have adjusted the gross real rate of return developed using the target asset allocation by the investment expenses expected to be paid by FCERA.

However, as prevailing practice by investment advisory firms is to provide us with the real rates of return net of expected investment expenses, especially for active portfolio management, we now need to make adjustments only for investment consulting fees, custodian fees and other miscellaneous investment expenses. The following table provides these investment expenses in relation to the actuarial value of assets as of the beginning of the year, for the six-year period ending June 30, 2022.

Investment Expenses as a Percentage of Actuarial Value of Assets (Dollars in 000's)

Year Ending June 30	Actuarial Value of Assets ¹	Investment Expenses ²	Investment %
2017	\$4,278,161	\$910	0.02%
2018	4,529,508	871	0.02
2019	4,802,958	727	<u>0.02</u>
Three-Year Average (2017-2019)			0.02
2020	4,971,255	648	0.01
2021	5,226,009	675	0.01
2022	5,710,379	771	<u>0.01</u>
Three-Year Average (2020-2022)			0.01
Six-Year Average			0.02
Current Assumption (including investment management fees)			0.60
Proposed Assumption (excluding investment management fees)			0.05

Based on the above experience, we recommend reducing the investment expense component of the investment return assumption from 0.60% to 0.05%.

Note related to investment expenses paid to active managers – 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. For this study, we will continue to use the current approach that any “alpha” that may be identified would be treated as an increase in the risk adjustment and corresponding confidence level that are discussed in the next section. However, as discussed above, the real return assumptions provided by the investment advisory firms assume that active management will generate additional returns to cover the expense of such management, an assumption that is consistent with ASOP No. 27.

Risk Adjustment

The real rate of return assumption for the portfolio is adjusted to reflect the potential risk of shortfalls in the return assumptions. FCERA’s 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.

¹ As of beginning of plan year.

² Equals the sum of investment consulting fees, custodian service fees, and other investment expenses. Excludes investment manager fees.

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.¹ This is consistent with our experience that retirement plan fiduciaries would generally prefer that returns exceed the assumed rate more often than not.

The 6.13% expected real rate of return developed earlier in this report was based on expected arithmetic average returns. A retirement system using an expected arithmetic average return as the discount rate in a funding valuation is expected on average to have no surplus or asset shortfall relative to its expected obligations assuming all other actuarial assumptions are met in the future.² That is the basis used in Segal's previous experience studies for FCERA.

Beginning with this study, in addition to no longer including an explicit adjustment for investment management fees, we are converting the portfolio's expected arithmetic average return to an expected geometric average return. A retirement system using an expected geometric average return as the discount rate in a funding valuation will, over long periods of time, have an equal likelihood of having a surplus or asset shortfall relative to its expected obligations assuming all actuarial assumptions are met in the future.³

Under either the arithmetic or geometric model, the confidence level associated with a particular risk adjustment represents a relative likelihood that future investment earnings would equal or exceed the assumed earnings over a 15-year period. 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.

For comparison purposes we first consider how the earlier model would look if used in this year's study. Two years ago, the Board adopted an investment return assumption of 6.50%. Under the model used in that experience study, that return implied a risk adjustment of 0.47%, corresponding to a 15-year confidence level of 56%, based on an annual portfolio return standard deviation of 12.10% provided by Verus in 2021.

If we use the same 56% 15-year confidence level from our last study to set this year's risk adjustment and the current annual portfolio return standard deviation of 13.10% provided by Verus, the corresponding risk adjustment would be 0.51%. Together with the other investment return components (including for this comparison updated expected arithmetic average returns and the same expense adjustment as used in the prior study), this would result in an investment return assumption of 7.52%, which is higher than the current assumption of 6.50%.

Based on the general practice of using one-quarter percentage point increments for economic assumptions, we evaluated the effect on the confidence level of other alternative investment return assumptions. We also considered that, as discussed above, the increase in the real rates of return provided by the investment consultants may reflect the very low returns earned in the 2021-2022 plan year, as well as the increase in the federal funds rate during 2022, and so could be overly optimistic when used for selecting a long-term investment return assumption. For that reason, for this comparison value we considered the current net investment return assumption of 6.50% which, together with the other investment return components, would produce a risk adjustment of 1.53% which corresponds to a confidence level of 67% under the model and

¹ This type of risk adjustment is referred to in the Actuarial Standards of Practice as a "margin for adverse deviation."

² The mathematical terminology for this is that the mean (or average) surplus or asset shortfall is expected to be zero.

³ The mathematical terminology for this is that over time the median surplus or asset shortfall is expected to be zero.

expense adjustment used in prior studies. We believe this increase in confidence level would be appropriate given the concerns stated regarding the increase in the portfolio net real rate of return.¹

As noted above, beginning with this study, in addition to no longer including an explicit adjustment for investment management fees, we are converting the portfolio's expected arithmetic average return to an expected geometric average return. For any given asset portfolio, the expected geometric average return will be less than expected arithmetic average return.² The difference depends on the variability of the portfolio as measured by its standard deviation. Based on the annual portfolio return standard deviation of 13.10% provided by Verus, the adjustment to an expected geometric average return reduces the expected return by 0.80%.

Together with the other investment return components (now excluding investment management expenses) and prior to any risk adjustment, this would result in a median expected assumption of 7.78%, which is higher than the current assumption of 6.50%. In applying this model to FCERA for the first time we again considered the current net investment return assumption of 6.50% which, together with the other investment return components, would produce a risk adjustment of 1.28% which under the expected geometric average return model corresponds to a confidence level of 65%. **We recommend this increased confidence level given our stated concerns that current capital market assumptions could be overly optimistic when used for selecting a long-term investment return assumption.**

Recommended Investment Return Assumption

The following table summarizes the components of the recommended investment return assumption developed in the previous discussion. For comparison purposes, we have also included similar values from the last study as well as the comparison values discussed above that apply the prior year's model to this year's information.

Assumption Component	June 30, 2023 Recommended Value	June 30, 2023 Comparison Values	June 30, 2021 Adopted Value
Inflation	2.50%	2.50%	2.50%
Portfolio Expected Arithmetic Real Rate of Return	6.13%	6.13%	5.07%
Expense Adjustment	(0.05)%	(0.60)% ³	(0.60)%
Adjustment to Expected Geometric Real Rate of Return	(0.80)%	N/A	N/A
Risk Adjustment	<u>(1.28)%</u>	<u>(1.53)%</u>	<u>(0.47)%</u>
Total	6.50%	6.50%	6.50%
Confidence Level	65%	67%	56%

Based on this analysis, we recommend maintaining the investment return assumption at 6.50% per annum.

¹ We note that part of the increase in FCERA's projected real investment returns is due to an adjustment to the asset allocation into assets that have a higher expected return and higher corresponding risk. This increase in risk may also support an increase in the risk adjustment and confidence level.

² This is because the expected geometric average return reflects expected median outcomes, while the expected arithmetic average return reflects expected average or mean outcomes. Expected median outcomes are lower than expected average outcomes because they are less affected by the possibility of extraordinary ("outlier") favorable outcomes.

³ For purposes of these comparison values we have assumed the same investment expenses as in the previous study, which included investment management fees.

The table below shows FCERA’s recommended investment return assumption and the corresponding risk adjustment and confidence level compared to the similar values for prior studies.

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

Years Ending June 30	Investment Return ¹	Risk Adjustment	Corresponding Confidence Level
2010 - 2012	7.75%	1.05%	64%
2013	7.25%	0.68%	59%
2014 - 2015	7.25%	0.80%	61%
2016 - 2018	7.00%	0.58%	58%
2019 - 2020	7.00%	0.54%	57%
2021 - 2022	6.50%	0.47%	56%
2023 (Comparison)	6.50%	1.53%	67%
2023 (Recommended)	6.50%	1.28%	65%

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 FCERA has positioned itself relative to risk over periods of time.² The use of either a 67% or 65% 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. This is particularly true when comparing confidence levels developed using different models, as we are doing in this transitional year from one model to another.
- The confidence level is based on the standard deviation of the portfolio that is determined and provided to us by Verus. 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.
- 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 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 “Comparison with Other Public Retirement Systems.”
- As noted earlier, we believe the increased confidence level is appropriate given our stated concerns that current capital market assumptions could be overly optimistic when used for selecting a long-term investment return assumption.

¹ The investment returns starting in 2014 are gross of administrative expenses.

² 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.”

Comparison with Alternative Model used to Review Investment Return Assumption

In previous studies, 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.¹ 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 returns” approach, which is the model we have used in this study.² Even though as noted earlier expected geometric returns are lower than expected arithmetic returns, public retirement systems that have set investment return assumptions using this geometric approach have in practice adopted investment return assumptions that are comparable to those adopted by the Board for FCERA under the arithmetic approach. This is because under the model used by those retirement systems and by Segal in this report, the investment return assumption is not reduced to anticipate future investment management expenses. That is also why the comparison values and recommended values discussed earlier reach the same 6.50% expected return with generally comparable confidence levels.

In the interest of still having an alternative model for comparison, we evaluated the recommended 6.50% assumption based on the expected geometric return for the entire portfolio gross of investment management expenses, but using a fully stochastic approach and a different source for capital market assumptions. Under this alternative model, over a 15-year period, there is a 58% likelihood that future average geometric returns will meet or exceed 6.50%³ developed using the capital market assumptions compiled by Horizon Actuarial Services based their most recent survey published in August 2022. This 58% likelihood is lower than the corresponding likelihood of 65% that we observed in this comparison during the assumption review in 2021. However, note that some of the investment advisory firms that participated in the 2022 Horizon survey have since raised their capital market assumptions and it is reasonable to expect the 58% likelihood to increase if we were to revise these results using the updated capital market assumptions when the 2023 Horizon survey becomes available.

¹ Again, as discussed earlier in this section, 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.

² As also noted earlier in slightly different terms, 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.

³ We performed this stochastic simulation using the capital market assumptions included in the 2022 survey prepared by Horizon Actuarial Services. That simulation was performed using 10,000 trial outcomes of future market returns, using assumptions from 20-year arithmetic returns, standard deviations and correlation matrix that were found in the 2022 survey that included responses from 24 investment advisors.

Comparison 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 6.75% or lower is becoming more common among California public sector retirement systems. In particular, of the twenty 1937 Act CERL systems, eight use a 7.00% investment return assumption, seven use 6.75%, three use 6.50% (including FCERA) and one uses 6.25%. The remaining 1937 Act CERL system currently uses a 7.25% investment return assumption. Furthermore, CalSTRS currently uses a 7.00% investment return assumption and CalPERS uses a 6.80% investment return assumption, 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 FCERA’s recommended net investment return assumption against those of the 210 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:¹

Assumption	FCERA	Public Plans Data ²		
		Low	Median	High
Net Investment Return	6.50%	4.25%	7.00%	8.25%

The detailed survey results show that over 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 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 the recommended assumption of 6.50% provides for an appropriate risk margin within the risk adjustment model and is consistent with FCERA’s historical practice relative to other public systems.

¹ Among 219 large public retirement funds, the 2021 fiscal year investment return assumption was not available for 9 of the public retirement funds in the Public Plans Database as of March 2023.
² Public Plans Data website – Produced in partnership with the National System of State Retirement Administrators (NASRA).

C. Salary Increase

Salary increases impact plan costs in two ways: (1) by increasing members' benefits (since benefits are a function of the members' highest average pay) and future normal cost collections; and (2) by increasing total active member payroll which in turn generates lower UAAL contribution rates as a percent of payroll. These two impacts are discussed separately as follows:

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 recommend maintaining the annual inflation assumption at 2.50%. 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 June 2022. In that report, real "across the board" pay increases are forecast to be 1.15% 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 FCERA's active members, the actual average inflation plus "across the board" increase (i.e., wage inflation) over the three-year period ending June 30, 2022 was 3.35%, which is lower than the change in annual average CPI for the West Region of 4.76% during that same period, largely as a result of the inflation spike discussed above:

Valuation Date	Actual Average Increase ¹	Change in Annual Average CPI for West Region
June 30, 2020	3.42%	1.74%
June 30, 2021	2.13%	4.52%
June 30, 2022	4.51%	8.01%
Three-Year Average	3.35%	4.76%

¹ 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.

Even though the actual average salary increase was lower than the average change in the CPI over the 3-year period ending June 30, 2022, this was in part due to the spike in inflation in 2021-2022.

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 remain at 3.00%

- 3. Merit and Promotion Increases:** As the name implies, these increases come from an employee’s career advances. This form of pay increase differs from the previous two, since it is specific to the individual. For FCERA, there are service-specific merit and promotion increase assumptions that range from 9.00% to 1.10% for General and 8.50% to 1.50% for Safety. Generally, we review this merit and promotion salary increase component as part of the triennial experience study or demographic assumptions review study.

We recommend maintaining the merit and promotion salary increase assumptions last examined in the Review of Demographic Actuarial Assumptions as of the June 30, 2022 Actuarial Valuation.

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 Board’s current practice, the UAAL contribution rate 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 maintaining the payroll growth assumption at 3.00% annually.

D. Administrative Expenses

Like benefit payments made to members, expenses incurred in connection with the plan's operation are paid from FCERA's assets. These expenses include fees for personnel salaries and benefits as well as routine costs for printing, mailings, computer-related activities, and other functions carried out by the plan. They do not include investment-related expenses.

In order to reflect future administrative expenses in the contribution rates, the total assumed administrative expense load is allocated to both the employer and the member based on contribution rates (before expenses) for the employer and the member in each actuarial valuation.

The following table shows actual administrative expenses as a percent of payroll.

Administrative Expenses as a Percentage of Projected Payroll (Dollars in 000's)

Year Ending June 30	Projected Payroll	Administrative Expenses	Administrative %
2017	\$402,535	\$4,762	1.18%
2018	413,760	5,677	1.37
2019	431,678	5,981	<u>1.39</u>
Three-Year Average (2017-2019)			1.31
2020	457,759	6,422	1.40
2021	485,587	6,074	1.25
2022	482,500	6,460	<u>1.34</u>
Three-Year Average (2020-2022)			1.33
Six-Year Average			1.32
Current Assumption			1.30
Proposed Assumption			1.30

Based on this experience, we recommend maintaining the current administrative expense assumption at 1.30% of projected payroll.

This expense will be allocated to the employer and member based on the total average contribution rates in the upcoming June 30, 2023 actuarial valuation, as determined before including the administrative expenses. The allocation of the total administrative expenses between employer and member is subject to change with each actuarial valuation.

4. Cost Impact

We have estimated the impact of the recommended economic assumptions as if they were applied to the June 30, 2022 actuarial valuation. Note that impact excluded the effect of higher than expected COLA increases granted by the Board in April 2023.¹

The cost associated with the administrative expense load has continued to be allocated to both the employer and the member based on the components of the total contribution rate (before expenses) for the employer and the member.

Cost Impact of the Recommended Economic Assumptions Based on June 30, 2022 Actuarial Valuation

	Impact on Average Employer Contribution Rates
Increase in average employer rate	2.37%
Estimated increase in annual dollar amount (\$000s) ²	\$11,644

	Impact on Weighted Average Member Contribution Rates
Increase in average member rate	0.24%
Estimated increase in annual dollar amount (\$000s) ²	\$1,170

	Impact on UAAL and Funded Percentage
Increase in UAAL (\$000s)	\$121,410
Change in Funded Percentage on VVA basis	-1.5%

¹ The annual CPI for the West Region used by the Board to set April 1, 2023 COLA came in at 8.0%. For Tiers with a maximum 3.0% COLA, there will be an actuarial loss between the expected benefit increase (2.50% assumed annually starting April 1, 2023 in the June 30, 2022 valuation) and the actual benefit increase (3.0% granted on April 1, 2023 and on every April 1 thereafter until the COLA banks used to track the difference between the 8.0% actual CPI and the actual COLA granted are fully exhausted).

² Based on June 30, 2022 projected annual payroll as determined under each set of assumptions.

The tables below show the average employer and member contribution rate impacts for each Tier due to the recommended assumption changes as if they were applied to the June 30, 2022 actuarial valuation.

Employer Contribution Rate Impact (% of Payroll)

	Normal Cost	UAAL	Total	Annual Amount ¹ (\$000s)
General Tier 1	0.47%	1.94%	2.41%	\$3,713
General Tier 2	0.38%	1.94%	2.32%	175
General Tier 3	0.41%	1.94%	2.35%	694
General Tier 4	0.00%	1.94%	1.94%	289
General Tier 5	0.00%	1.94%	1.94%	3,974
Safety Tier 1	0.76%	3.13%	3.89%	1,277
Safety Tier 2	0.75%	3.13%	3.88%	146
Safety Tier 4	0.00%	3.13%	3.13%	155
Safety Tier 5	0.00%	3.13%	3.13%	<u>1,221</u>
All Categories Combined	0.23%	2.14%	2.37%	\$11,644

In preparing the above estimated contribution rate impact for the employer, we have not taken into consideration the effect of the prior Unfunded Actuarial Accrued Liability (UAAL) amortization layers that are expected to become fully amortized. However, we note the UAAL layer added as a result of the June 30, 2008 valuation would be fully amortized in the June 30, 2023 valuation and the resulting reduction in the average employer contribution rate is expected to be about 2.31% of payroll for the Association as a whole.

¹ Based on June 30, 2022 projected annual payroll as determined under each set of assumptions.

Average Member Contribution Rate Impact
(% of Payroll)

	Total	Annual Amount ¹ (\$000s)
General Tier 1	0.48%	\$739
General Tier 2	0.39%	29
General Tier 3	0.39%	115
General Tier 4	0.00%	0
General Tier 5	0.00%	0
Safety Tier 1	0.79%	259
Safety Tier 2	0.76%	28
Safety Tier 4	0.00%	0
Safety Tier 5	0.00%	<u>0</u>
All Categories Combined	0.24%	\$1,170

Appendix A: Current Actuarial Assumptions

Economic Assumptions

Net Investment Return:	6.50%, net of investment expenses.
Administrative Expenses:	1.30% of payroll allocated to both the employer and member based on the components of the total contribution rate (before expenses) for the employer and member.
Inflation Rate:	Increase of 2.50% per year.
Member Contribution Crediting Rate:	2.50%, compounded semi-annually. (The difference between the 6.50% net investment return assumption and 2.50% is credited to the other valuation reserves.)
Cost-of-Living Adjustments (COLA):	<p>Retiree COLA increases of 2.50% per year per year for General Tiers 1, 2 and 3, and Safety Tiers 1 and 2. General and Safety Tiers 4 and 5 receive no COLA increases.</p> <p>For members that have COLA banks, we assume they receive 3.00% COLA increases until their COLA banks are exhausted and 2.50% thereafter.</p>
Payroll Growth:	Inflation of 2.50% per year plus “across the board” real salary increases of 0.50% per year.
Increases in Internal Revenue Code Section 401(a)(17) Compensation Limit:	Increase of 2.50% per year from the valuation date.
Increase in Section 7522.10 Compensation Limit:	Increase of 2.50% per year from the valuation date.

Appendix B: Proposed Actuarial Assumptions

Economic Assumptions

Net Investment Return:	6.50%, net of investment expenses.
Administrative Expenses:	1.30% of payroll allocated to both the employer and member based on the components of the total contribution rate (before expenses) for the employer and member.
Inflation Rate:	Increase of 2.50% per year.
Member Contribution Crediting Rate:	2.75%, compounded semi-annually. (The difference between the 6.50% net investment return assumption and 2.75% is credited to the other valuation reserves.)
Cost-of-Living Adjustments (COLA):	<p>Retiree COLA increases of 2.75% per year per year for General Tiers 1, 2 and 3, and Safety Tiers 1 and 2. General and Safety Tiers 4 and 5 receive no COLA increases.</p> <p>For members that have COLA banks, we assume they receive 3.00% COLA increases until their COLA banks are exhausted and 2.75% thereafter.</p>
Payroll Growth:	Inflation of 2.50% per year plus “across the board” real salary increases of 0.50% per year.
Increases in Internal Revenue Code Section 401(a)(17) Compensation Limit:	Increase of 2.50% per year from the valuation date.
Increase in Section 7522.10 Compensation Limit:	Increase of 2.50% per year from the valuation date.

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