Mendocino County Employees Retirement Association

Risk Assessment

Based on the Actuarial Valuation and Review as of June 30, 2023

Segal

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March 11, 2024

Board of Retirement
Mendocino County Employees Retirement Association
625-B Kings Court
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Dear Board Members:

We are pleased to submit this Risk Assessment based on the Actuarial Valuation and Review for the Mendocino County Employees Retirement Association ("MCERA" or "the Plan") as of June 30, 2023.

This risk report has been prepared at the request of the Board of Retirement to assist in administering the Plan. It includes discussion of the key risks that may have an ongoing influence on the Plan's financial health, as well as various projections of future results under different investment return scenarios together with the assumptions adopted for the June 30, 2023 valuation.

The actuarial calculations in this report were completed under the supervision of Andy Yeung, ASA, MAAA, FCA, Enrolled Actuary.

The actuarial opinions expressed in this report were prepared by Paul Angelo, FSA, MAAA, FCA, Enrolled Actuary and Andy Yeung, ASA, MAAA, FCA, Enrolled Actuary. 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.

Sincerely,

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

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

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Section 1: Introduction and Executive Summary

Introduction

The purpose of this report is to assist the Board of Retirement, participating employers and members and other stakeholders to better understand and assess the risk profile of the Plan, as well as the particular risks inherent in using a fixed set of actuarial assumptions in preparing the results in our June 30, 2023 funding valuation.

The results included in our June 30, 2023 funding valuation report for MCERA were prepared based on a specific set of economic and non-economic actuarial assumptions under the premise that future experience of MCERA would be consistent with those assumptions. While those assumptions are generally reviewed every three years (with the assumptions from the last triennial experience study adopted by the Board of Retirement for use starting with the June 30, 2023 valuation), there is a risk that emerging results may differ significantly as actual experience is fluid and will not completely track current assumptions.

It is important to note that this risk assessment is based on plan assets as of June 30, 2023. The Plan's funded status does not reflect short-term fluctuations of the market, but rather is based on the market values on the last day of the plan year. Moreover, this risk assessment does not include any possible short-term or long-term impacts on mortality of the covered population that may emerge after June 30, 2023 due to COVID-19. While it is impossible to determine the market conditions and other demographic experience of the plan in future valuations, the single year investment return scenario test included within this report provides an illustration of the impact of short-term market fluctuations on the Plan. Besides the stochastic projections included in this report, Segal is available to prepare other projections of selected potential outcome scenarios upon request.

Note that this report reflects the Board's November 15, 2023 decision to eliminate the 1% Contingency Reserve. That action will reduce the employer's contribution rate to the unfunded actuarial accrued liability starting with the June 30, 2024 valuation by about 0.6% of payroll.

Actuarial standard of practice on risk assessment

The Actuarial Standards Board approved the Actuarial Standard of Practice No. 51 (ASOP 51) regarding risk assessment when performing a funding valuation and it was effective with MCERA's June 30, 2019 actuarial valuation for benefits provided by the Plan. ASOP 51 requires actuaries to identify and assess risks that "may reasonably be anticipated to significantly affect the plan's future financial condition." Examples of key risks listed that are particularly relevant to MCERA are asset/liability mismatch risk, investment risk, and longevity and other demographic risks. ASOP 51 also requires an actuary to consider if there is any ongoing contribution

risk to the plan; however, it does not require the actuary to evaluate the ability or willingness of contributing entities to make contributions when due, nor does it require the actuary to assess the likelihood or consequences of future changes in applicable law.

The actuary's assessment can be strictly a qualitative discussion about potential adverse experience and the possible effect on future results, but it may also include quantitative numerical demonstrations where informative. The actuary is also encouraged to consider a recommendation as to whether a more detailed risk assessment would be significantly beneficial for the intended user to examine particular financial risks. When making that recommendation, the actuary will consider such factors as the plan's design, risk profile, maturity, size, funded status, asset allocation, cash flow, possible insolvency and current market conditions. This report incorporates a more detailed risk assessment as agreed upon with MCERA.

Plan risk assessment

In *Section 2*, we start by discussing some of the historical factors that have caused changes in MCERA's funded status and employer contribution rates. It is important to understand how the combination of decisions and experience has led to the current financial status of the Plan.

We follow this with a discussion of the most significant risk factors going forward. Based on our discussions with MCERA, we have provided a more detailed risk assessment that illustrates the impact on the funded status and employer contribution rates using relevant economic scenario tests. These tests illustrate the effect of future investment returns on the Plan's portfolio coming in differently from the current 6.50% annual investment return assumption used in the June 30, 2023 valuation. We have also included a projection of future results based on stochastic modeling of future investment returns for 2023/2024 and thereafter. The stochastic modeling is useful for assessing the projected distribution of future results based on random variations in actual investment returns each year and introduces a relative likelihood to the range of those potential outcomes.

ASOP 51 also requires disclosure of plan maturity measures and other historical information that are significant to understanding the risks associated with the Plan and this information is included at the end of *Section 2*.

Executive summary

Historical funded status and employer contribution rates

The following table provides a summary of financial changes to the Plan over the last 10 valuations. In the June 30, 2014 through June 30, 2023 valuations, the unfunded actuarial accrued liability (UAAL) on the valuation value of assets increased primarily as a result of the strengthening of the actuarial assumptions used in preparing the valuations ($113 million net increase) and unfavorable

non-investment experience ($54 million net increase), partially offset by favorable investment experience ($34 million net decrease after asset smoothing) and UAAL contributions paid by the employer. The contribution rates increased due to similar experience, including an increase of 17.6% from assumption changes. More details on the impact of actuarial assumption changes on the UAAL and the total aggregate employer contribution rate can be found on pages 13 and 17, respectively.

Valuation Date	Funded Status Market Value Basis	UAAL Market Value Basis	Funded Status Valuation Value Basis	UAAL Valuation Value Basis	Total Aggregate Employer Contribution Rate (% of Payroll)
June 30, 2014	75.7%	$142 million	69.3%	$180 million	33.38%
June 30, 2023	71.6%	$263 million[1]	72.4%	$255 million	40.26%

Future funded status and employer contribution rates

In this report, we highlight key factors besides assumption changes that may affect the financial profile of the Plan going forward. As investment experience in the past 10 years has had a significant impact on the funded status and employer contribution rates, we have also provided deterministic projections (using select scenarios for illustration) under hypothetical favorable and unfavorable future market experience so that the impact of market performance can be better understood. We have also included stochastic projections to assess the projected distribution of future results along with introducing a relative likelihood to the range of those potential outcomes.

Deterministic projections

The total aggregate employer contribution rate for the Plan is 40.26% of payroll in the June 30, 2023 valuation. Using a deterministic projection, this report shows the effect of unfavorable (0.00%), baseline (6.50%) or favorable (13.00%) hypothetical market returns for 2023/2024 on key valuation results. In particular, the projected changes in the total aggregate employer contribution rate (relative to the total aggregate employer contribution rate of 40.26% in the June 30, 2023 valuation) in the June 30, 2024 valuation and in the June 30, 2028 valuation (after recognizing deferred investment gains or losses under the five-year asset smoothing period) are shown in the following table. These projections assume no further assumption changes or method changes, and no non-investment experience that differs significantly from the assumptions.

[1] The difference between the UAAL on a market value basis and the UAAL on a valuation value basis as of June 30, 2023 is due to the $13.97 million deferred investment losses offset by the inclusion of the $6.63 million Contingency Reserve in the market value of assets.

Total Aggregate Employer Contribution Rate Change

Valuation Date	0.00% Return for 2023/2024	6.50% Return for 2023/2024	13.00% Return for 2023/2024
June 30, 2024	-0.3% of payroll	-1.0% of payroll	-1.8% of payroll
June 30, 2028	+3.1% of payroll	-0.8% of payroll	-4.8% of payroll

Under all three hypothetical market return scenarios for 2023/2024, the Plan would be expected to reach full funding within 17 years. The total aggregate employer contribution rate would be expected to approach about 10% of payroll at the end of the 20-year projection period under the three scenarios modeled. That employer contribution rate reflects the employer normal cost after MCERA's UAAL layers as of June 30, 2023 are paid off over periods ranging from 8 to 18 years and any new UAALs resulting from the hypothetical market experience in 2023/2024 are paid off over 18 years, all pursuant to the Board's actuarial funding policy. These scenarios illustrate that the Board's funding policy is very effective in achieving the general policy goal of achieving the long-term full funding of the costs of the benefits paid by MCERA.

Factors to consider in evaluating expected versus actual non-investment experience

We understand that the County is in the process of negotiating salary increases (or "market adjustments") with certain bargaining groups for a 3-year period starting July 1, 2024, though MCERA does not yet know the actual magnitude of those salary increases and how they may differ from the expected salary increases assumed in the valuation. Accordingly, we have not factored these potential salary increases in the deterministic projections included in this report, or in the stochastic projections discussed next. However, we note that we issued a letter on October 19, 2023 that provided an order of magnitude estimate of the effect on the June 30, 2025 UAAL, employer contribution rates, and annual contribution dollar amounts associated with total salary increases in the amount of $100,000 above those that would normally be granted as anticipated by the pay increase assumptions applied in our actuarial valuation, for each of the General, Safety, and Probation groups.[1,2] We indicated that the results of our analysis were scalable, so that the County could use those results to estimate the full cost of the actual salary adjustments once those market adjustments are known.[3]

[1] The analysis in the October 19, 2023 letter was based on the census data used to perform the June 30, 2022 valuation, as we were in the process of performing the June 30, 2023 valuation at that time, but it reflected the new actuarial assumptions adopted for the June 30, 2023 valuation.

[2] As noted in our October 19, 2023 letter, a $100,000 salary increase corresponds to an increase of 0.14%, 0.79%, and 2.60% of projected 2024/2025 payroll for each of the General, Safety, and Probation membership groups, respectively.

[3] In addition, for simplicity we noted that our results assumed that the $100,000 pay adjustments for the General membership group applied to all employers (i.e., County, Courts, and Cemetery District) even though that may not be the case in practice.

The results in our October 19, 2023 letter indicated that the June 30, 2025 estimated aggregate employer rate would increase by less than 0.01% of payroll for the aforementioned $100,000 scalable pay increases for each of the three membership groups, although the annual amount of contributions for fiscal year 2025/2026 would increase by roughly $146,000. In addition, the UAAL for the Plan would increase by roughly $1,370,000 as of June 30, 2025.

In addition to the unanticipated pay increases, there is also a risk if the employer offsets all or part of the increase in salary just described by reducing the number of total employees. In that scenario, there would be a reduction in the amount of employer normal cost dollars payable. If taken in conjunction with the unanticipated pay increase results from our October 19, 2023 letter, this means that the increase in the normal cost annual amounts of about $51,000 for fiscal year (FY) 2025/2026 (out of the $146,000 total increase in annual contribution amount noted above) would essentially be eliminated. That is, the total employer normal cost annual dollar amount for FY 2025/2026 would be roughly what it would have otherwise been without any unanticipated pay adjustments and without any reduction in the number of employees.

For the UAAL component of the employer contribution rate, the impact is going to be dependent on the membership group as explained in our October 19, 2023 letter.

If some employees are terminated in an effort to reduce the payroll, then there may be an actuarial gain component as these members would be terminating earlier than otherwise expected. It would be hard to estimate the impact of this potential gain without knowing which employees are terminated. For instance, if mostly younger and lower service employees are terminated, the gain may be relatively small since there would typically be less liability associated with these members than for older, longer service employees.

Note that the deterministic and stochastic projections provided in this report do not take into account any reduction in the number of employees.

Stochastic projections

The stochastic projection models market returns over the next 20 years by using expected return, standard deviation and other information specific to MCERA's asset portfolio. For the stochastic modeling, we have used the breakdown of MCERA's asset portfolio into the different asset classes that we used in developing the 6.50% expected investment return assumption we recommended to the Board for the June 30, 2023 valuation. However, instead of using the expected return from the 2022 capital market assumptions compiled by Horizon Actuarial Services based on their then most recent survey published in August 2022, we have used the 2023 capital market assumptions they published in August 2023. As we pointed out in our triennial experience study recommending the 6.50% investment return assumption, we anticipated increase in the likelihood of achieving the 6.50% investment

return assumption when we switch to the 2023 capital market assumptions.[1] The stochastic projections in this report show there is a 50% chance that the employer contribution rates would be between 10% and 42% of payroll at the end of 10 years and between 10% and 22% of payroll at the end of 20 years. Furthermore, there is a 46% chance MCERA would be fully funded at the end of 10 years and 66% chance MCERA would be fully funded at the end of 20 years.

Plan maturity measures

During the past 10 valuations, the Plan has become more mature as evidenced by an increase in the ratio of members in pay status (retirees and beneficiaries) to active members (as shown in *Section 2, Chart 12* on page 31). The Plan might also have an increase in the ratios of plan assets and liabilities to active member payroll absent the several market salary adjustments made by the County (as shown in *Section 2, Chart 13* and *Chart 14* on pages 32 and 33). We expect the Plan's maturity trends to continue going forward. This is significant for understanding the volatility of both historical and future employer contribution rates because any increase in UAAL due to unfavorable investment and non-investment experience for the relatively larger group of non-active members would have to be amortized and funded over the payroll of the relatively smaller group of active members. Put another way, as a plan grows more mature, its contribution rate becomes more sensitive to investment volatility and liability changes. As the Plan continues to mature with time, its risk profile will continue to evolve in this way and contributions will grow more sensitive to plan experience.

[1] As we pointed out in our triennial experience study, the increase in the real rates of return provided by the investment consulting firms for 2023 versus 2022 might 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."

Section 2: Key Plan Risks

Evaluation of historical trends

Funded status and change in unfunded actuarial accrued liabilities

One common measure of MCERA's financial status is the funded ratio. This ratio compares the valuation and market value of assets to the actuarial accrued liabilities (AAL) of MCERA. The overall level of funding of MCERA on a valuation basis has increased as a result of favorable investment experience and expected payments on the UAAL, offset to some degree by the strengthening of the actuarial assumptions and unfavorable non-investment experience. The UAAL and funded ratios are provided for the past 10 valuations from June 30, 2014 to June 30, 2023 measured using both valuation and market value of assets in *Chart 1*.

The factors that caused the changes in the UAAL in the past 10 valuations from June 30, 2014 to June 30, 2023 are specified in *Chart 2*. The results in *Chart 2* reflect that the assumption changes have had the most impact on the UAAL for MCERA, followed by the non-investment and investment experience. In particular, the assumption changes included in the last 10 valuations have had the following impact on the UAAL:

UAAL Impact from Assumption Changes

Valuation Date	Total UAAL Change
June 30, 2014	$50 million
June 30, 2017	$28 million
June 30, 2020	$16 million
June 30, 2023	$19 million
Net Change	**$113 million**

Chart 2 also shows that the unfavorable non-investment experience was offset to some extent by favorable investment experience in the past 10 valuations. The non-investment experience generally included higher than expected salary increases for continuing actives and higher than expected cost of living adjustment (COLA) increases for retirees and beneficiaries. The non-investment experience also includes the effect of the scheduled one-year delay in implementing the contribution rates determined in the annual valuation although that effect is taken into account when we establish the UAAL contribution rate under the Board's actuarial funding policy.

Section 2: Key Plan Risks

Chart 2(a) displays the aggregate change in unfunded liability by source over the last 10 years. In particular, it shows the continued effort made by MCERA in strengthening the actuarial assumptions. *Chart 2(a)* also shows the strength of the Plan's adopted funding policy working to reduce the unfunded liability consistently each year.

It is important to note that MCERA has taken strides in risk management and resulting long-term plan sustainability. This includes strengthening the assumptions (particularly lowering the expected investment rate of return from 7.75% to 6.50% over the last 10 years and adopting amount-weighted generational mortality) and adopting a funding policy that eliminates negative amortization and promotes intergenerational equity. Assumptions will continue to be reviewed in future experience studies to reflect the Plan's experience as well as future expectations. Those changes may result in higher contributions in the short term, but in the medium to longer term **avoid** both deferring contributions and allowing unmanaged growth in the UAAL. We believe these actions are essential for MCERA's fiscal health going forward.

Section 2: Key Plan Risks

Chart 1

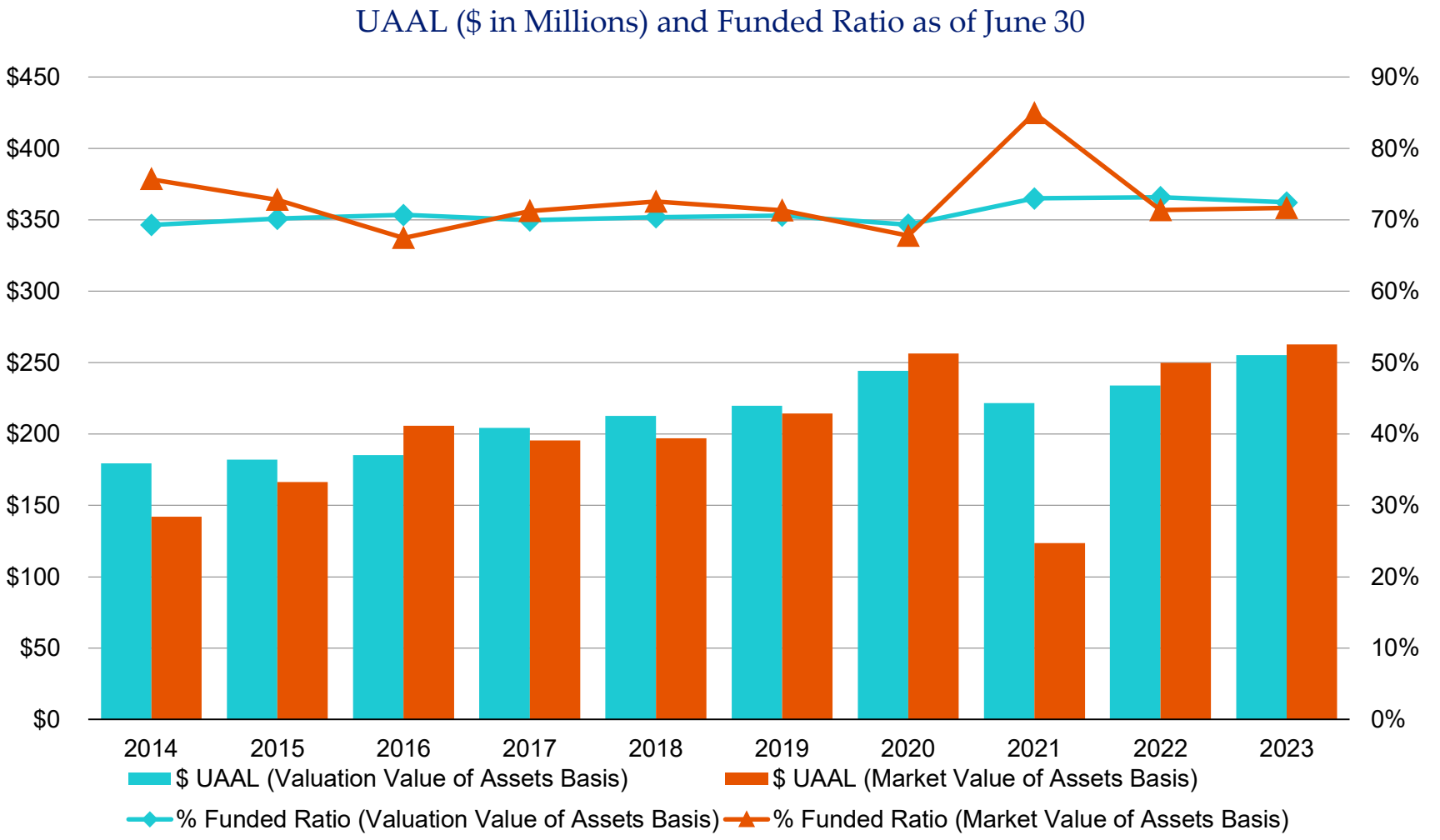


Chart 2

Factors that Changed UAAL for Year Ended June 30
($ in Millions)

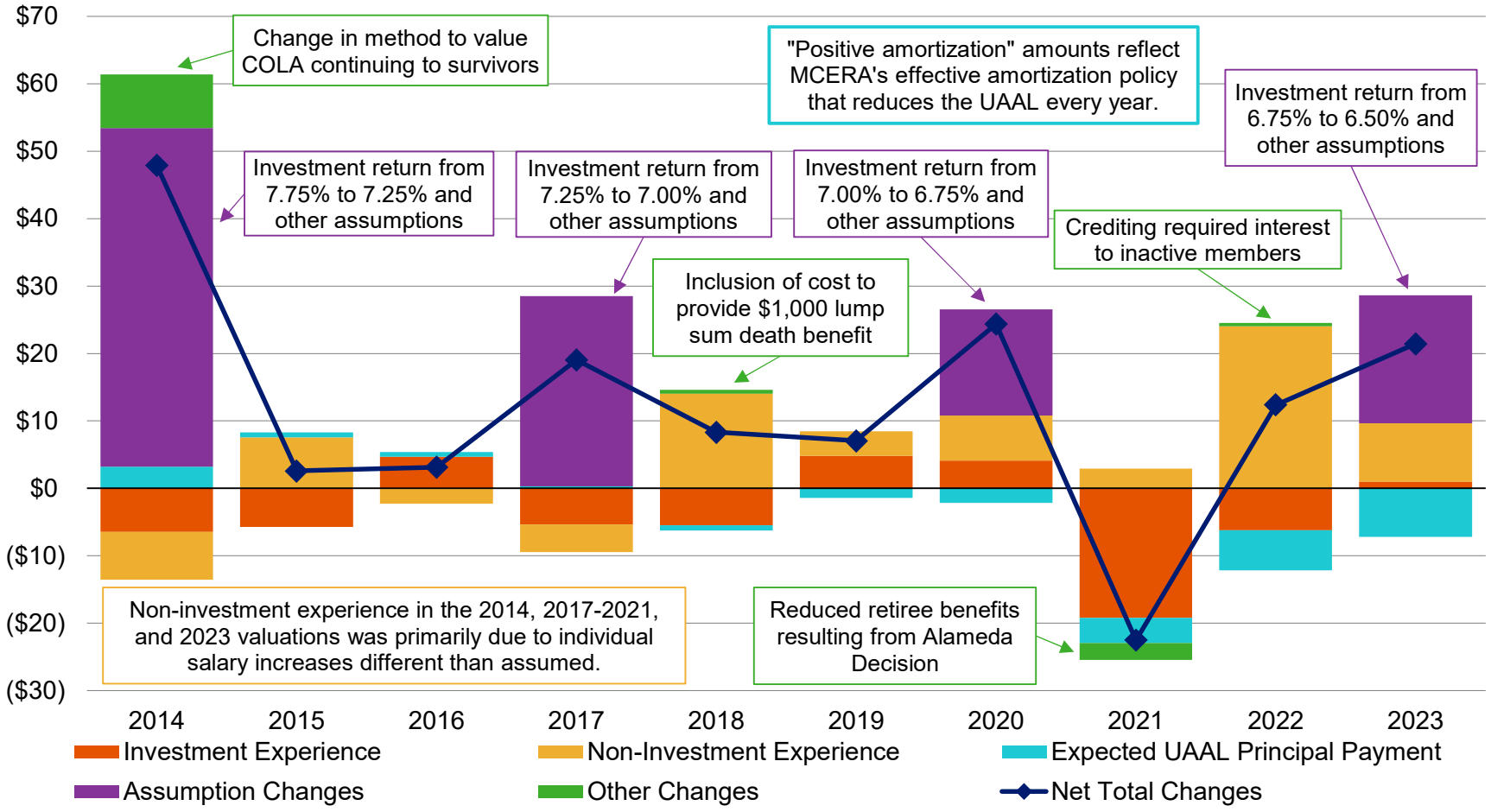
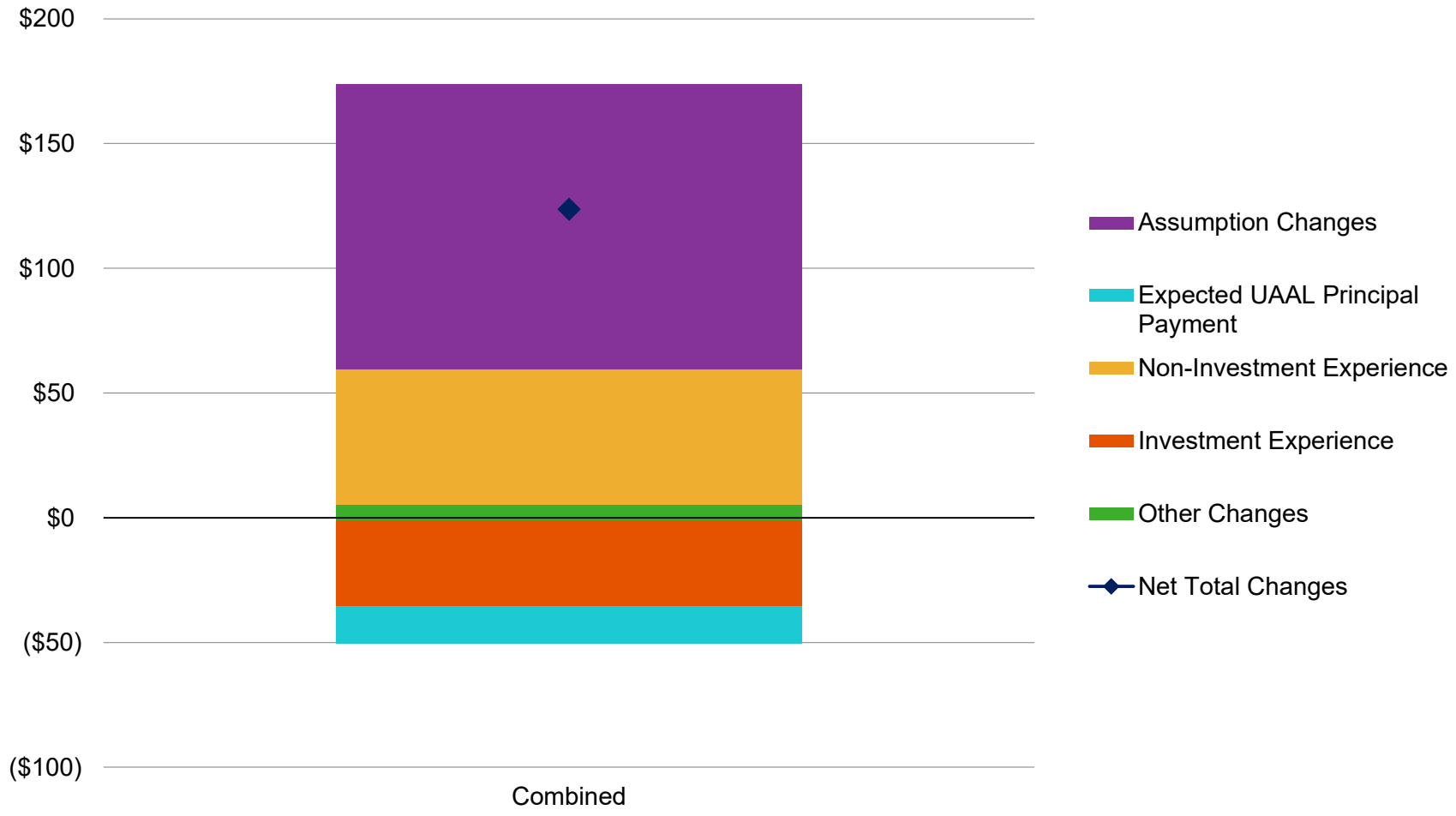


Chart 2(a)

Combined Factors that Changed UAAL in the June 30, 2014 to 2023 Valuations
($ in Millions)



Note: This summation of UAAL changes by source does not account for the timing of when they occurred nor any resulting compounding effects. Also, the investment experience shown is investment returns after asset smoothing compared to the expected returns.

Employer contribution rates

The total (normal cost plus UAAL payment) employer contribution rates[1] determined in the June 30, 2014 to June 30, 2023 valuations for the Plan are provided in *Chart 3*. This chart shows that the employer normal cost rates have increased slightly since the June 30, 2014 valuation while the UAAL rates have generally increased over this same period. These increases in the normal cost rates are generally due to the changes in the actuarial assumptions, offset to some degree by plan changes under the Public Employees' Pension Reform Act of 2013 (PEPRA) as new members continue to be enrolled in the lower cost PEPRA benefit tiers since January 1, 2013.

The factors that caused the changes in the total employer contribution rates for the Plan are provided in *Chart 4*.

Chart 4 shows that the changes in the actuarial assumptions in the June 30, 2014 to June 30, 2023 valuations have had the most impact on changing the employer contribution rates for the Plan (as detailed in the table below). The favorable investment and non-investment experience have helped offset the increases in contribution rates from those assumption changes.

Employer Contribution Rate Impact from Assumption Changes

Valuation Date	Total Aggregate Employer Contribution Rate Change
June 30, 2014	7.0% of payroll
June 30, 2017	4.2% of payroll
June 30, 2020	2.7% of payroll
June 30, 2023	3.7% of payroll
Net Change	**17.6% of payroll**

[1] There are separate contribution rates determined in the valuation for the General, Safety, and Probation membership groups and for the different benefit tiers. The aggregate contribution rates shown herein have been calculated based on an average of those rates weighted by the payrolls of the active members reported in those valuations.

Chart 3

Employer Contribution Rates Calculated as of June 30
(% of Payroll)

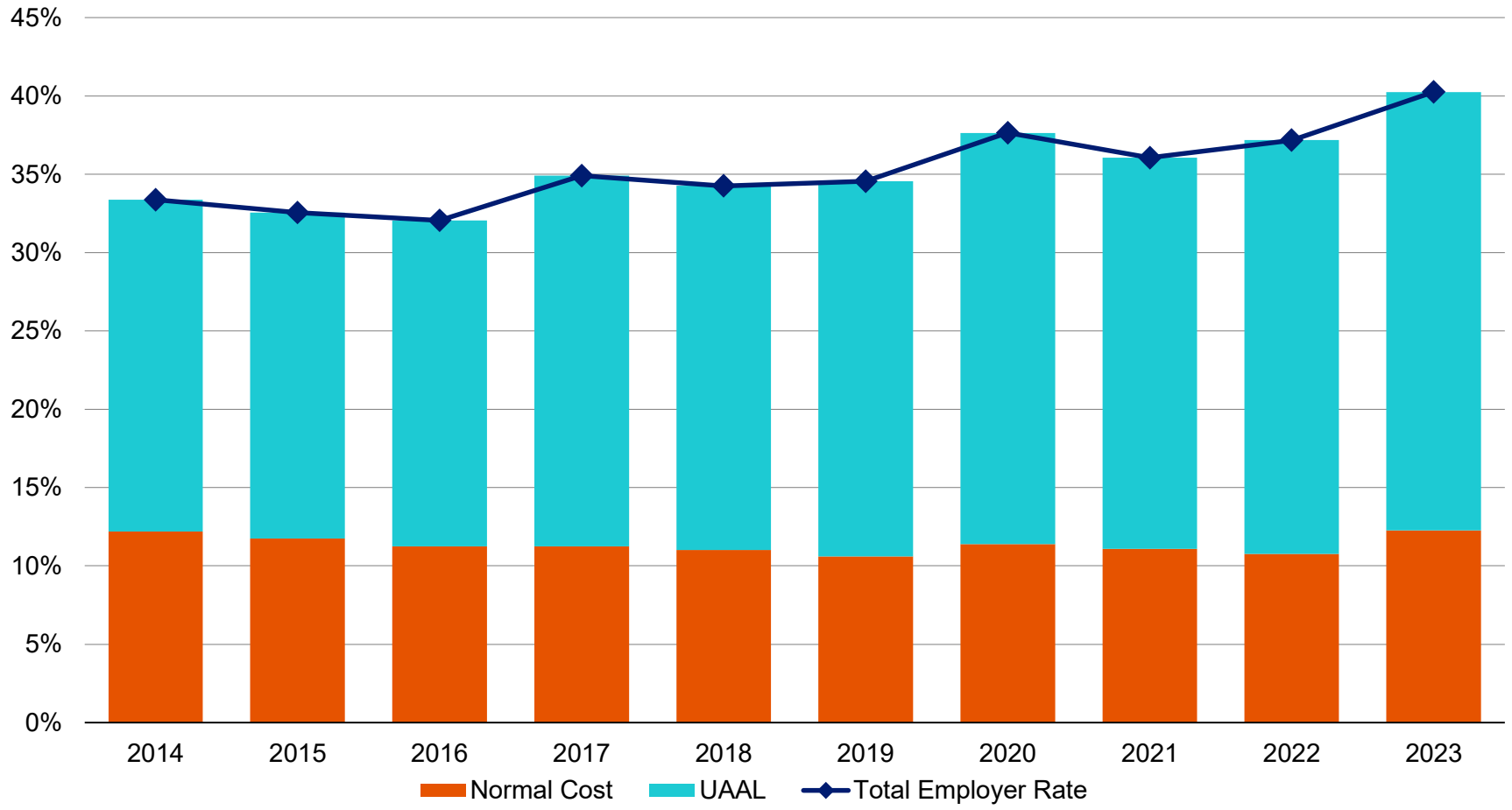
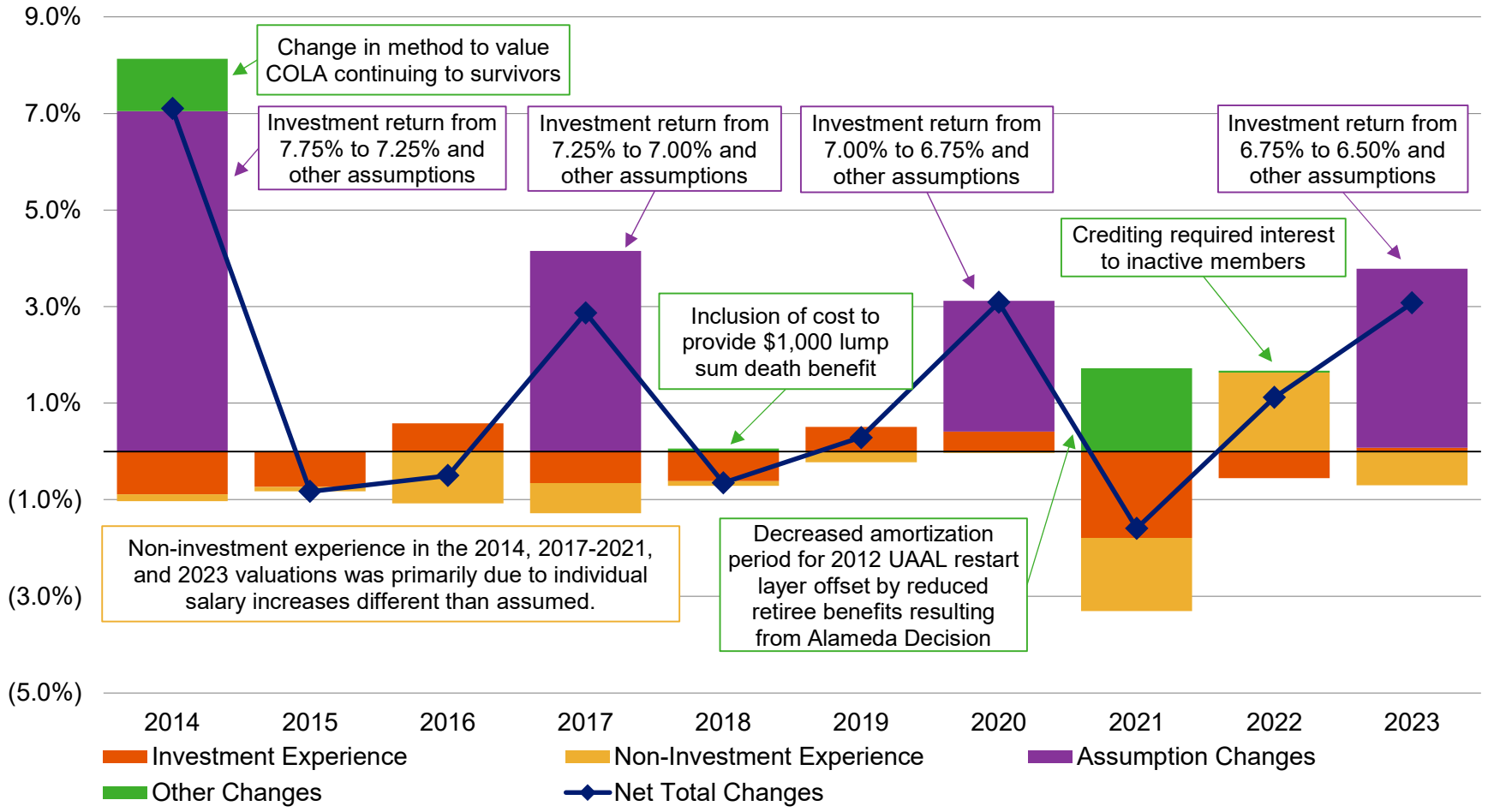


Chart 4

Factors that Affected Employer Contribution Rates Calculated as of June 30

(% of Payroll)



Assessment of primary risk factors going forward

As discussed under the evaluation of historical trends section, the funded ratios and employer contribution rates have changed mainly due to changes in actuarial assumptions, investment experience, and non-investment experience in the last 10 valuations.

In general, we anticipate the following risk factors to have an ongoing influence on those metrics in our future valuations:

- **Asset/liability mismatch risk** – the potential that future plan experience does not affect asset and liability values in the same way, causing them to diverge.

  The most significant asset/liability mismatch risk to MCERA is investment risk, as defined below. In fact, investment risk has the potential to impact asset/liability mismatch in two ways. The first mismatch is evident in annual valuations; when asset values deviate from assumptions, those changes are typically independent from liability changes. The second mismatch can be caused when systemic asset deviations from assumptions may signal the need for an assumption change, which causes liability values and contribution rates to move in the opposite direction from any change in the expected experience of asset growth rates.

  Asset/liability mismatch can also be caused by longevity and other demographic assumption risks, which affect liabilities but have no impact on asset levels. These risks are also discussed below.

  It may be informative to use the asset volatility and liability volatility ratios and associated contribution rate impacts provided in the following plan maturity measures section when discussing with the employers the effect of unfavorable or favorable actuarial experience on the assets and the liabilities of MCERA.

- **Investment risk** – the potential that future market returns will be different from the current expected 6.50% annual return assumption.

  The Board has a policy of reviewing the investment return and the other actuarial assumptions generally every three years, with the next triennial experience study (recommending assumptions for the June 30, 2026 actuarial valuation) scheduled to be performed in 2026.

  The investment return assumption is a long-term, deterministic assumption for valuation purposes even though in reality market experience can be quite volatile in any given year. We have included deterministic scenario tests later in this section so that MCERA can better understand the risk associated with earning either less or more than the assumed rate.

- **Longevity and other demographic risks** – the potential that mortality or other demographic experience will be different than expected.

  The change to using generational amount-weighted mortality tables that reflect data from public sector retirement plans was made in the 2020 experience study for use in the June 30, 2020 valuation. As can be observed from *Charts 2* and *4*, there has been a

smaller impact on the UAAL and employer contribution rates due to non-investment related experience compared to the assumptions used in the last 10 valuations. Future mortality risks should be further mitigated by the updated tables.

- **Contribution risk** – the potential that actual future contributions will be different from expected future contributions.

  ASOP 51 does not require the actuary to evaluate the ability or willingness of the plan sponsor or other contributing entity to make contributions to the plan when due. However, it does require the actuary to consider the potential for actual contributions deviating from expected in the future. The employers have a well-established practice of making the ADC determined in the annual actuarial valuations, based on the Board of Retirement's Actuarial Funding Policy. As a result, in practice MCERA has essentially no contribution risk.

  Furthermore, when ADCs determined in accordance with the MCERA Actuarial Funding Policy are made in the future by the employers (and contributions required by the statute are made by the employees), it is anticipated that the Plan would have enough assets to provide all future benefits promised to the current members enrolled in the Plan, if all of the actuarial assumptions used in the valuation are met.

ASOP 51 also lists interest rate risk as an example of a potential risk to consider. However, the valuations of the Plan's liabilities are not linked directly to market interest rates, so the resulting interest rate risk exposure is minimal.

Scenario tests

Since the funded ratio, UAAL and the employer contribution rates have fluctuated as a result of deviations in investment experience in the last 10 valuations, in this section we have examined this risk for MCERA using projections under a deterministic and stochastic approach.

Deterministic projections

To measure such risk, we have included scenario tests to study the change in the UAAL and employer contribution rates if MCERA were to earn a market return higher or lower than the assumed rate of 6.50% in the fiscal year following the June 30, 2023 valuation. In *Charts 5, 6* and *7*, we show the total aggregate employer contribution rates, funded ratios, and UAAL, respectively, assuming the Plan's portfolio market return in 2023/2024 will be as follows:

- Scenario 1: 0.00% market return for 2023/2024
- Scenario 2: 6.50% market return for 2023/2024 (baseline)
- Scenario 3: 13.00% market return for 2023/2024

Section 2: Key Plan Risks

All other assumptions used in the projections can be found in *Appendix A*, including the assumption that the Plan will earn the assumed 6.50% market return per year beginning July 1, 2024 under all three scenarios.

The following table summarizes the projected total aggregate employer contribution rate changes for the Plan, relative to the total aggregate employer contribution rate of 40.26% in the June 30, 2023 valuation, in the next valuation (i.e., June 30, 2024) as well as in the June 30, 2028 valuation after recognizing deferred investment gains and losses in the (smoothed) actuarial value of assets. These results assume no further assumption changes, method changes or experience that differs significantly from the assumptions.

Total Aggregate Employer Contribution Rate Change

Valuation Date	0.00% Return for 2023/2024	6.50% Return for 2023/2024	13.00% Return for 2023/2024
June 30, 2024	-0.3% of payroll	-1.0% of payroll	-1.8% of payroll
June 30, 2028	+3.1% of payroll	-0.8% of payroll	-4.8% of payroll

Under the unfavorable (0.00%), baseline (6.50%), and favorable (13.00%) hypothetical market return scenarios for 2023/2024, the Plan would be expected to reach full funding in 2040, 2037, and 2036, respectively. The total aggregate employer contribution rate would be expected to approach about 10% of payroll at the end of the 20-year projection period under the three scenarios modeled. That employer contribution rate reflects the employer normal cost after MCERA's UAAL layers as of June 30, 2023 are paid off over periods ranging from 8 to 18 years and any new UAALs resulting from the hypothetical market experience in 2023/2024 are paid off over 18 years, all pursuant to the Board's actuarial funding policy. This shows that the Board's funding policy is very effective in achieving the general policy goal of achieving the long-term full funding of the costs of the benefits paid by MCERA.

While we have not assigned a probability on the 2023/2024 market return coming in at these rates, the Board and other stakeholders monitoring MCERA can use these results to interpolate in order to estimate the funded status and employer contribution rates for the June 30, 2024 and next several valuations as the actual investment experience for the 2023/2024 year becomes available. Additionally, comparable experience in upcoming future years is likely to have a similar impact on the Plan absent any significant plan or assumption changes.

Chart 5

Projected Employer Contribution Rates Under Hypothetical Market Return Scenarios for 2023/2024

(% of Payroll)

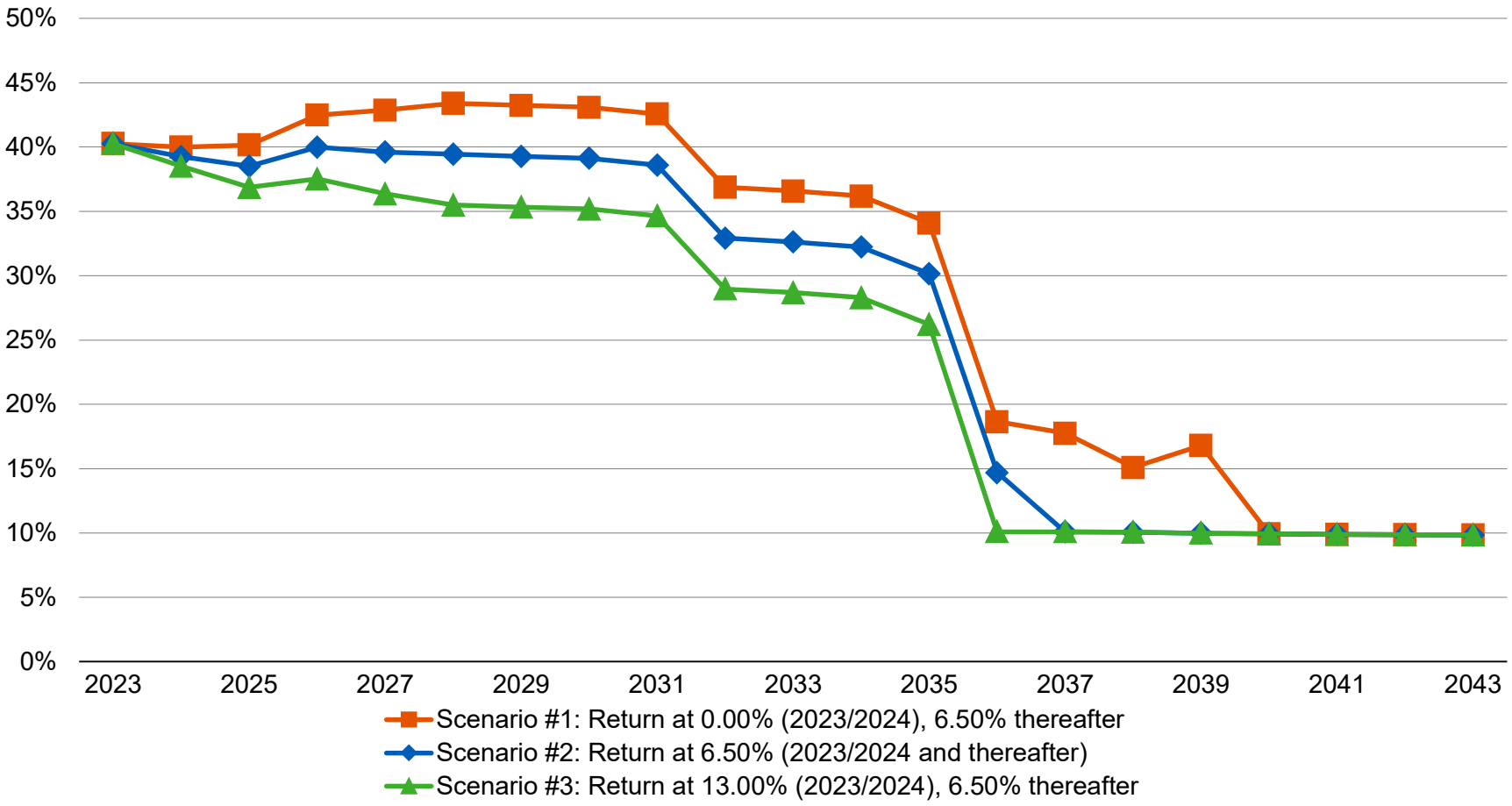


Chart 6

Projected Funded Ratios Under Hypothetical Market Return Scenarios for 2023/2024

(Valuation Value of Assets Basis)

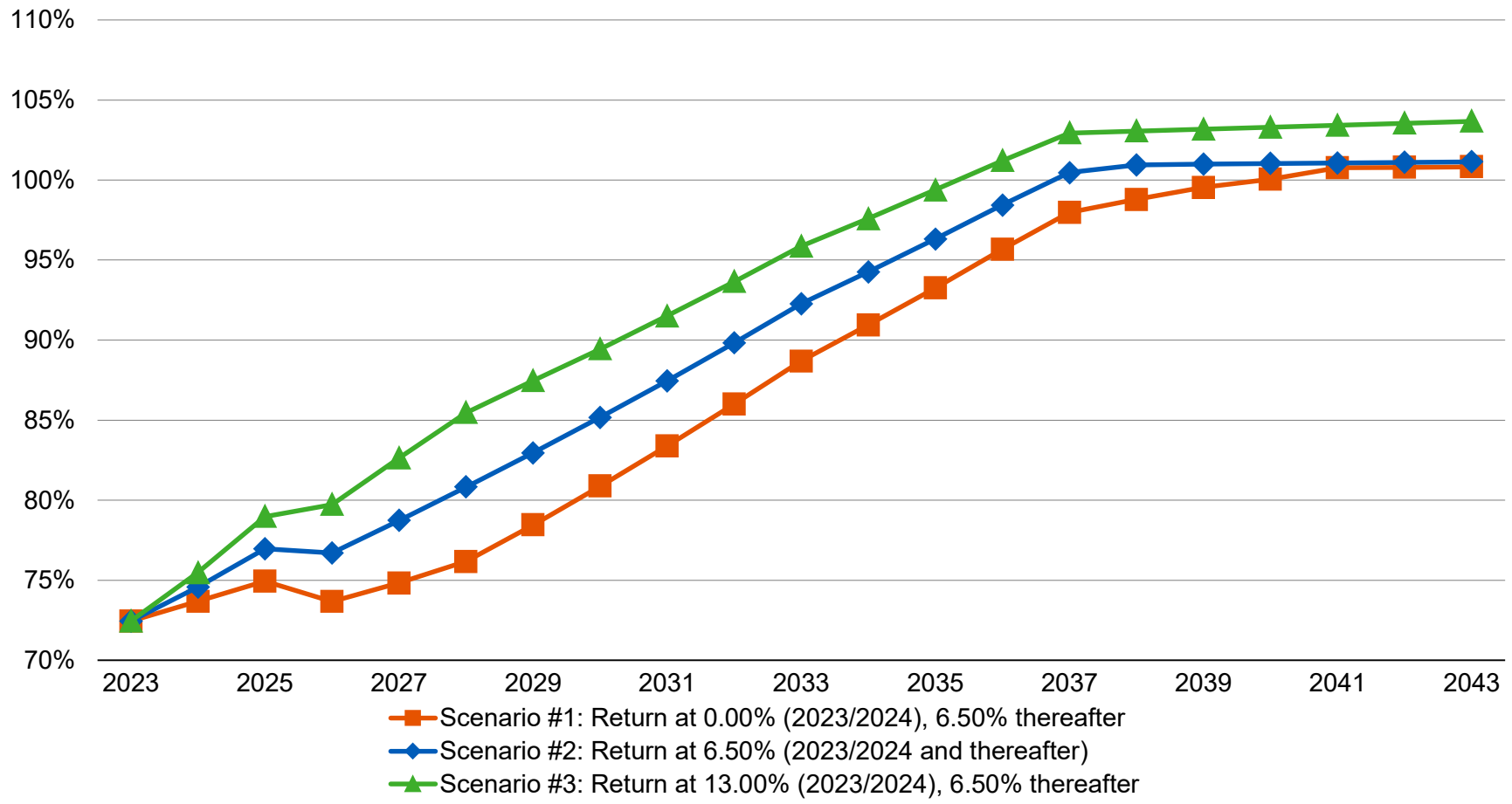
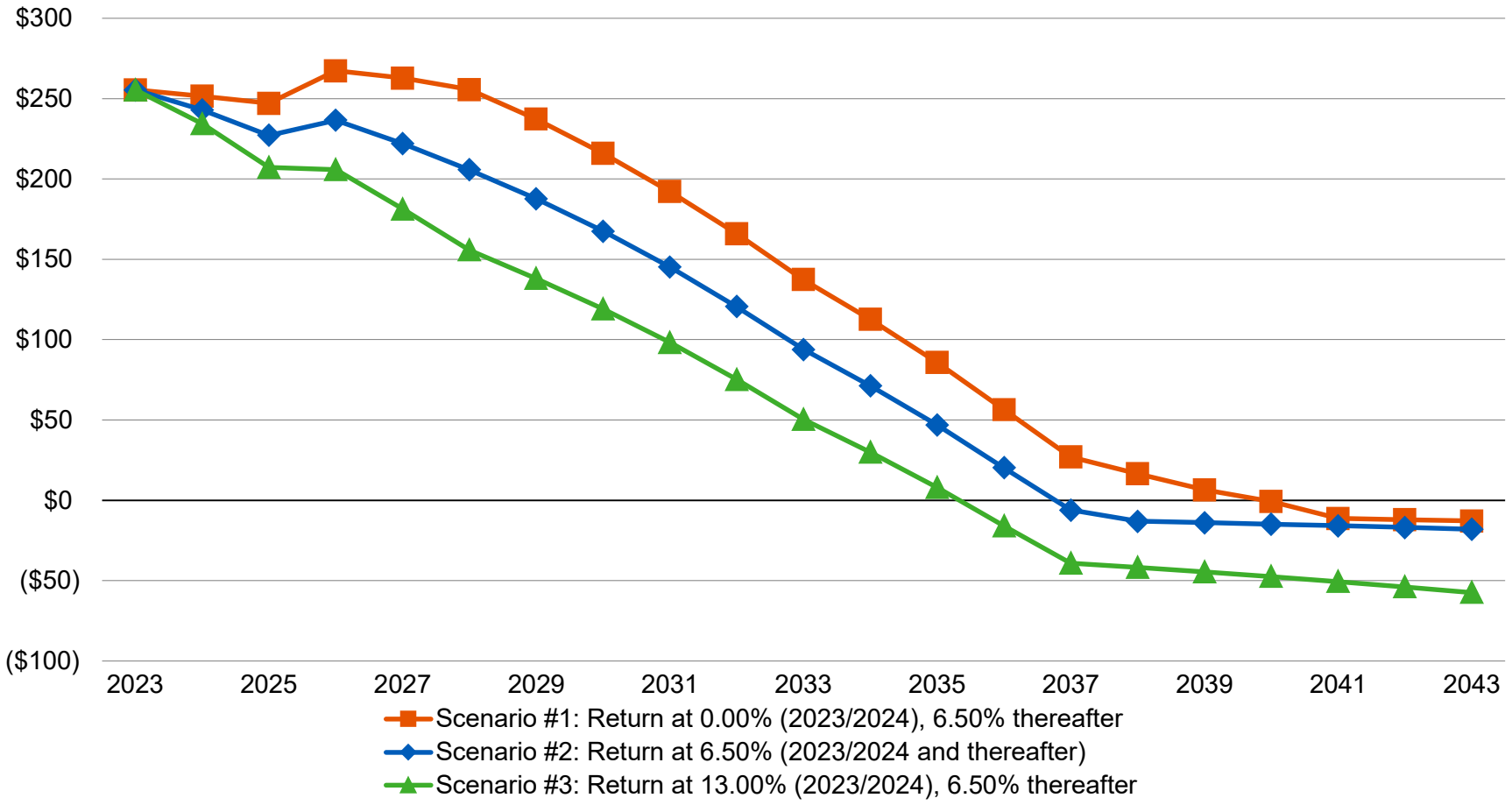


Chart 7

Projected UAAL Under Hypothetical Market Return Scenarios for 2023/2024

(Valuation Value of Assets Basis – $ in Millions)



Section 2: Key Plan Risks

Stochastic projection

Based on our discussions with MCERA, we have also been directed to supplement the deterministic scenario tests by another analysis that shows the range of possible changes in funded status and contribution rates under a statistical distribution of potential market returns for 20 years following the June 30, 2023 valuation. We have accomplished the stochastic modeling of future market returns by using the expected return, standard deviation and other information about MCERA's asset portfolio[1] as provided in *Appendix A* of this report, assuming no future assumption or method changes to the plan.

In *Chart 8*, we summarize the cumulative compounded rate of return of MCERA's investment portfolio over the next 20 years based on performing 10,000 trial outcomes of future market returns. The projected funded ratios for those trials are provided in *Chart 9*. The UAAL and the resultant employer contribution rates are provided in *Charts 10* and *11*, respectively.

At the end of 20 years, there is a 50% chance[2] that the annual return of MCERA's investment portfolio would average between 5.4% and 9.2%, the funded ratio would be between 91% and 166% and the corresponding UAAL would be between $143 million and a surplus (or a negative UAAL) of $1,026 million.

The funded ratio is about 72% in the June 30, 2023 valuation. There is a 46% chance MCERA would be fully funded at the end of 10 years and a 66% chance MCERA would be fully funded at the end of 20 years. The probabilities that the funded ratio would fall below 50%, 60% or 70% at any point in the next 20 years are as follows:

Probability of Various Funded Ratios

	Below 50%	Below 60%	Below 70%
Current (06/30/2023) Analysis Probability	3%	13%	34%
Prior (06/30/2019) Analysis Probability	5%	21%	58%

At the end of 10 years (i.e., the June 30, 2033 valuation), there is a 50% chance that the employer contribution rates would be between 10% and 42% of payroll. At the end of 20 years (i.e., the June 30, 2043 valuation), there is a 50% chance that the employer contribution rates would be between 10% and 22% of payroll. 10% of payroll is about the level of the employer normal cost rate. Note that we have not offset the normal cost by any available actuarial surplus.[3]

[1] For the stochastic modeling, we have used the expected return, standard deviation and other information about MCERA's asset portfolio that we applied in developing the 6.50% expected investment return assumption we recommended to the Board for the June 30, 2023 valuation.

[2] This is based on the 25th to the 75th percentile results.

[3] Under PEPRA, actuarial surplus may be used to offset the normal cost contributions only when the funded ratio is at or over 120% and certain other conditions are met. For the purposes of these projections, we have assumed that those other conditions have not been met and therefore we did not amortize such actuarial surplus over a rolling (non-decreasing) 30-year period as described in the Board's funding policy.

Section 2: Key Plan Risks

The total employer contribution rate is about 40% payroll in the June 30, 2023 valuation. The probabilities that the total employer contribution rate would increase at least by 5%, 10% or 15% of payroll at any point in the next 20 years are as follows:

Probability of Total Employer Rate Increases

	5% of Payroll (to 45% of Payroll)	10% of Payroll (to 50% of Payroll)	15% of Payroll (to 55% of Payroll)
Current (06/30/2023) Analysis Probability	41%	27%	17%
Prior (06/30/2019) Analysis Probability	57%	44%	32%

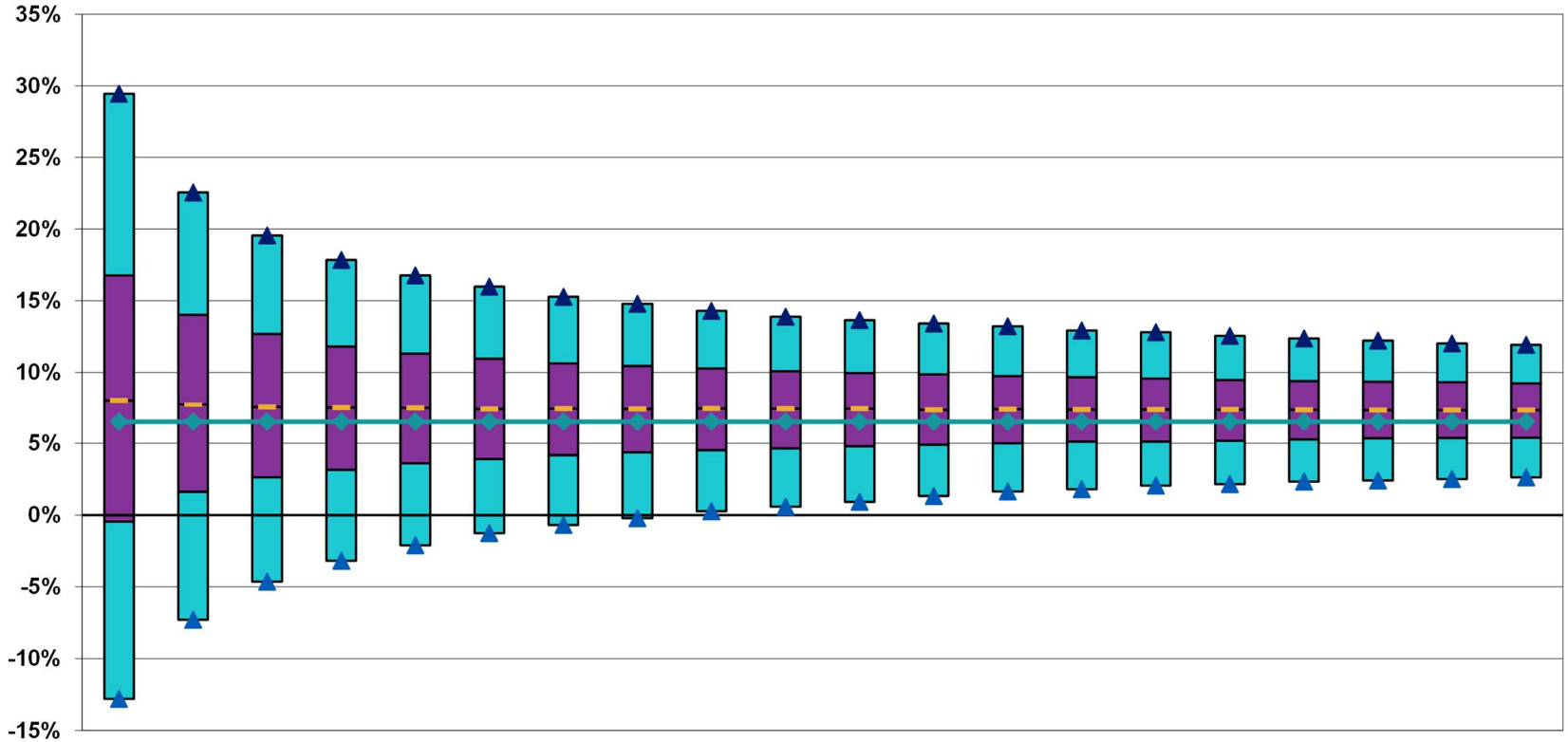
Finally, the probabilities that the total employer contribution rate would spike by 3%, 5% or 7% of payroll in any single year during the next 20 years are as follows:

Probability of Total Employer Rate Spike in a Single Year

	3% of Payroll	5% of Payroll	7% of Payroll
Current (06/30/2023) Analysis Probability	9%	3%	1%
Prior (06/30/2019) Analysis Probability	11%	3%	1%

Chart 8

Projected Cumulative Investment Return for Plan Years Ending June 30



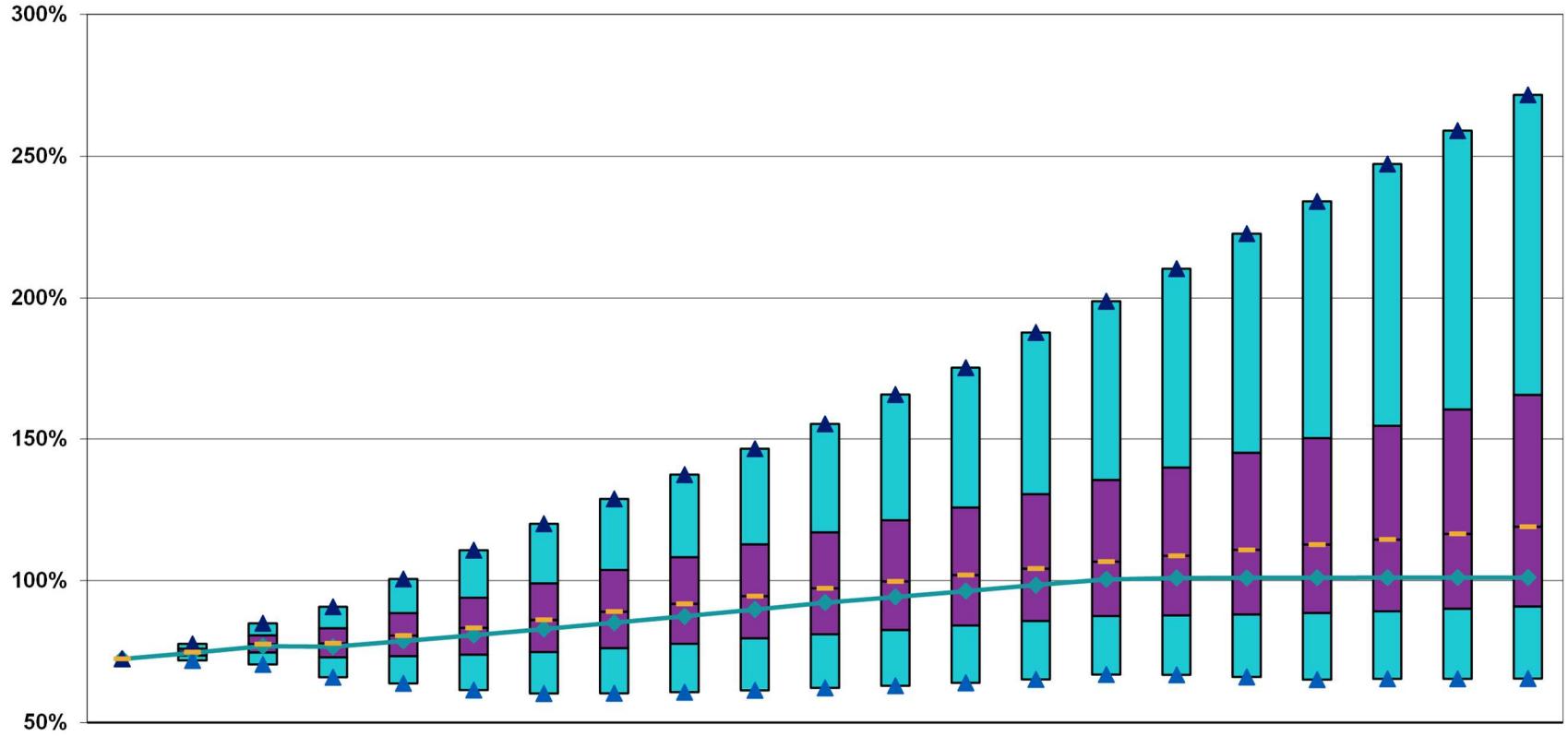
	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043
▲ 95th	29.4%	22.6%	19.5%	17.8%	16.8%	16.0%	15.3%	14.8%	14.3%	13.9%	13.6%	13.4%	13.2%	12.9%	12.8%	12.5%	12.4%	12.2%	12.0%	11.9%
— 75th	16.8%	14.0%	12.7%	11.8%	11.3%	11.0%	10.6%	10.4%	10.3%	10.1%	10.0%	9.9%	9.7%	9.7%	9.6%	9.5%	9.4%	9.3%	9.3%	9.2%
— 50th	8.0%	7.7%	7.5%	7.5%	7.5%	7.4%	7.4%	7.4%	7.4%	7.4%	7.4%	7.3%	7.4%	7.3%	7.3%	7.4%	7.3%	7.3%	7.3%	7.3%
— 25th	-0.5%	1.6%	2.6%	3.2%	3.6%	3.9%	4.2%	4.4%	4.5%	4.6%	4.8%	4.9%	5.0%	5.1%	5.1%	5.2%	5.3%	5.3%	5.4%	5.4%
▲ 5th	-12.8%	-7.3%	-4.6%	-3.2%	-2.1%	-1.3%	-0.7%	-0.2%	0.3%	0.6%	0.9%	1.3%	1.6%	1.8%	2.1%	2.1%	2.3%	2.4%	2.5%	2.6%
◆	6.5%	6.5%	6.5%	6.5%	6.5%	6.5%	6.5%	6.5%	6.5%	6.5%	6.5%	6.5%	6.5%	6.5%	6.5%	6.5%	6.5%	6.5%	6.5%	6.5%

◆ Current investment return assumption

Note: Please see footnote 1 as provided on page 9 that explains why the above returns might be viewed with caution when considering the long-term portfolio return for MCERA.

Chart 9

Projected Funded Ratios
(Valuation Value of Assets Basis)

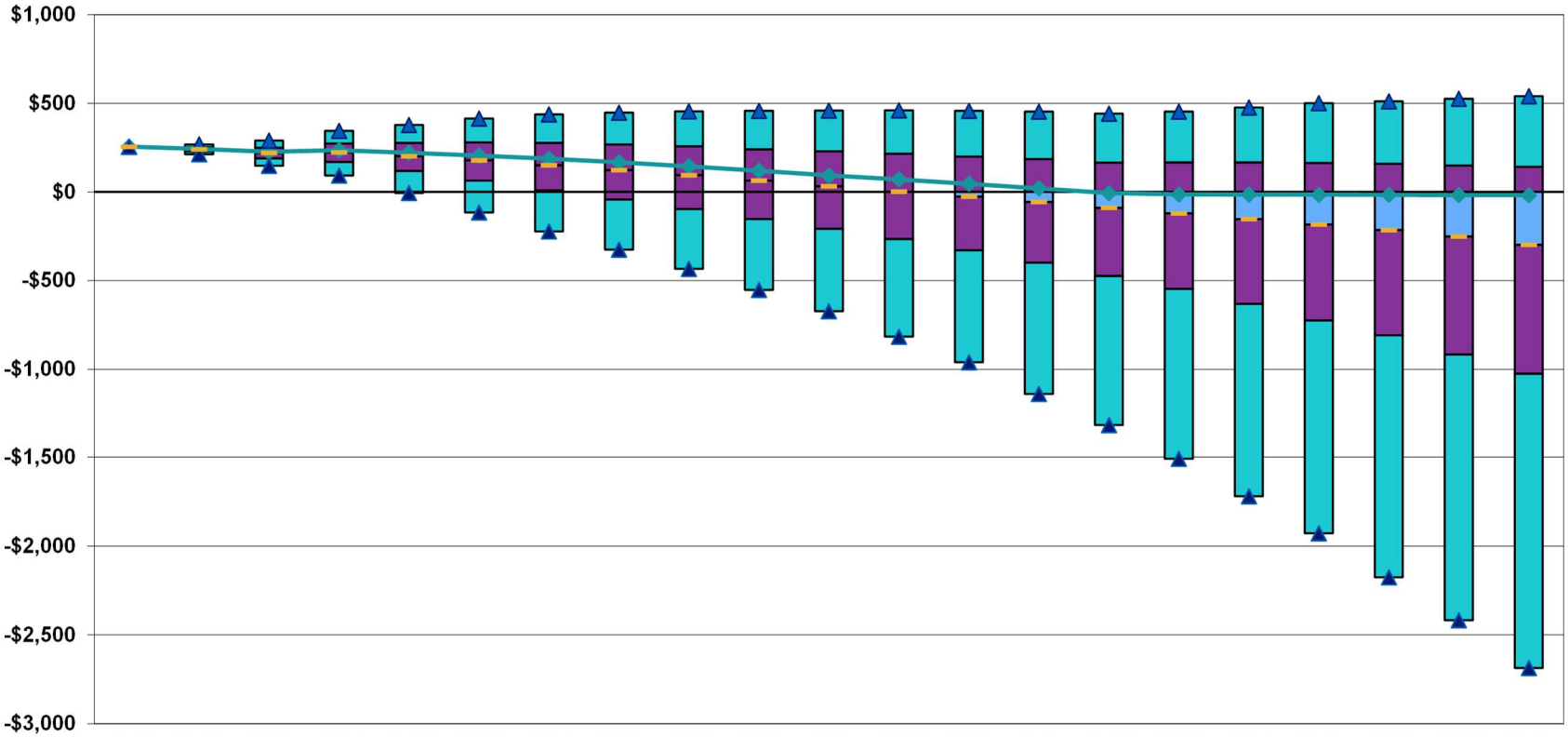


	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043
▲ 95th	72.4%	77.7%	84.9%	90.8%	100.6%	110.8%	120.1%	128.8%	137.4%	146.5%	155.3%	165.6%	175.4%	187.8%	198.9%	210.3%	222.6%	234.0%	247.2%	259.0%	271.6%
— 75th	72.4%	76.0%	80.7%	83.3%	88.5%	94.0%	99.1%	103.8%	108.3%	112.8%	117.1%	121.3%	125.8%	130.6%	135.5%	140.0%	145.1%	150.3%	154.6%	160.3%	165.5%
— 50th	72.4%	74.8%	77.6%	77.9%	80.6%	83.4%	86.2%	89.1%	91.8%	94.5%	97.3%	99.8%	102.0%	104.3%	106.7%	108.8%	110.9%	112.7%	114.6%	116.5%	119.0%
— 25th	72.4%	73.6%	74.7%	73.0%	73.4%	73.9%	74.8%	76.2%	77.7%	79.7%	81.1%	82.6%	84.2%	85.8%	87.6%	87.8%	88.1%	88.6%	89.2%	90.1%	90.9%
▲ 5th	72.4%	71.9%	70.5%	66.0%	63.8%	61.4%	60.2%	60.3%	60.7%	61.4%	62.2%	62.9%	64.0%	65.2%	66.9%	66.8%	66.0%	65.1%	65.4%	65.4%	65.5%
◆	72.4%	74.6%	77.0%	76.7%	78.7%	80.8%	83.0%	85.2%	87.5%	89.8%	92.3%	94.3%	96.3%	98.4%	100.5%	101.0%	101.0%	101.0%	101.1%	101.1%	101.2%

◆ Baseline deterministic projection with current assumptions

Chart 10

Projected UAAL
(Valuation Value of Assets Basis – $ in Millions)

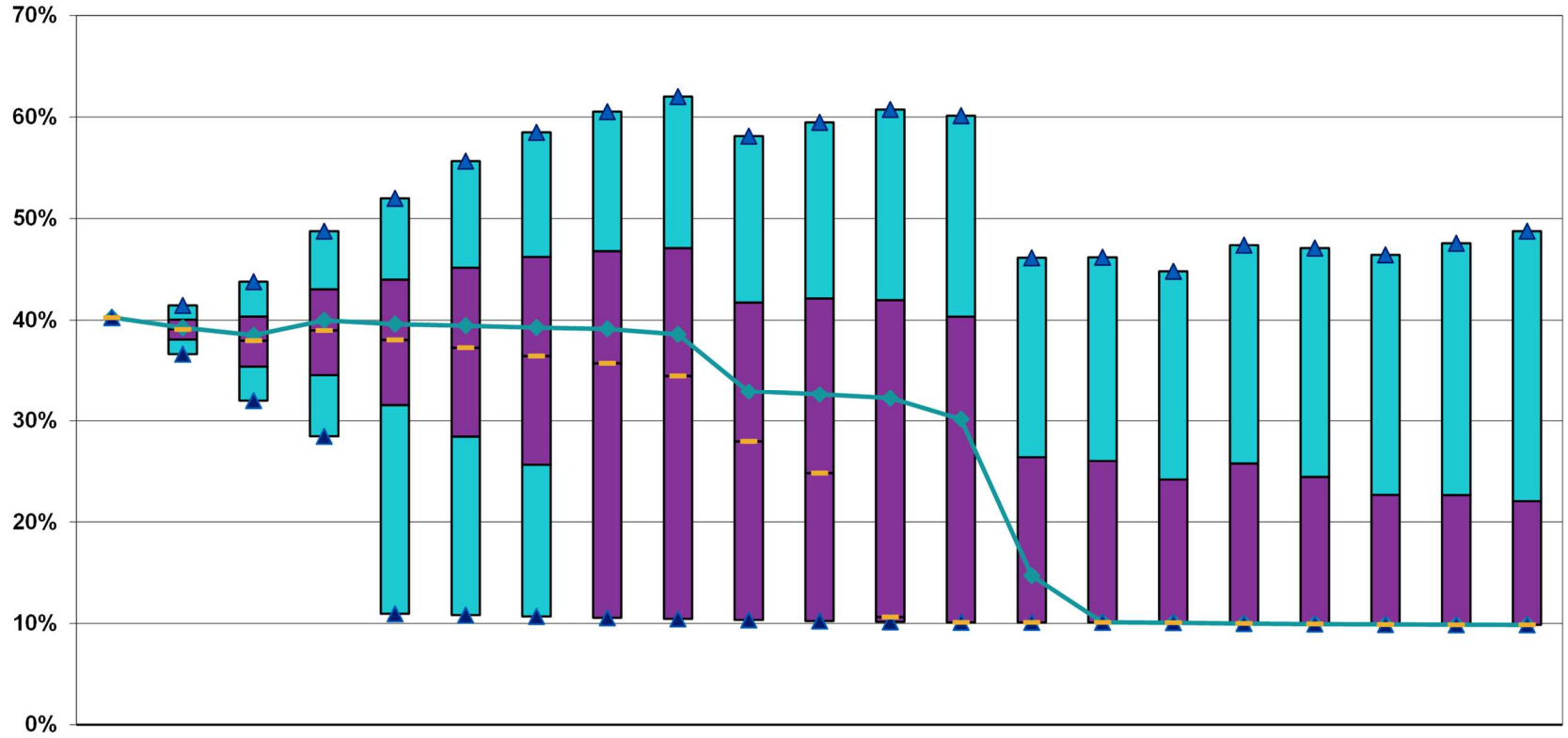


	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043
▲ 95th	255	213	148	94	-6	-115	-222	-325	-433	-552	-672	-815	-960	-1,144	-1,320	-1,509	-1,720	-1,929	-2,176	-2,417	-2,686
— 75th	255	229	190	170	120	64	10	-43	-96	-152	-208	-265	-329	-398	-474	-547	-632	-724	-808	-917	-1,026
— 50th	255	241	221	224	202	178	152	123	95	65	33	3	-25	-56	-89	-121	-152	-183	-215	-251	-298
— 25th	255	252	250	274	278	280	277	268	258	241	229	216	201	185	166	166	167	164	160	150	143
▲ 5th	255	268	291	345	378	414	438	448	455	458	459	461	458	453	442	453	476	502	512	526	541
◆	255	243	227	237	222	206	188	168	145	121	94	71	47	20	-6	-13	-14	-15	-16	-17	-18

◆ Baseline deterministic projection with current assumptions

Chart 11

Projected Employer Contribution Rates
(% of Payroll)



	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043
▲ 95th	40.3%	36.6%	32.0%	28.4%	11.0%	10.8%	10.7%	10.6%	10.4%	10.3%	10.2%	10.1%	10.1%	10.1%	10.1%	10.1%	10.0%	9.9%	9.9%	9.9%	9.8%
— 75th	40.3%	38.1%	35.4%	34.6%	31.5%	28.4%	25.7%	10.6%	10.4%	10.3%	10.2%	10.1%	10.1%	10.1%	10.1%	10.1%	10.0%	9.9%	9.9%	9.9%	9.8%
— 50th	40.3%	39.1%	38.0%	39.0%	38.1%	37.3%	36.5%	35.8%	34.5%	27.9%	24.8%	10.6%	10.1%	10.1%	10.1%	10.1%	10.0%	9.9%	9.9%	9.9%	9.8%
— 25th	40.3%	40.1%	40.4%	43.1%	44.0%	45.2%	46.2%	46.8%	47.1%	41.7%	42.1%	42.0%	40.3%	26.4%	26.0%	24.2%	25.8%	24.5%	22.7%	22.7%	22.1%
▲ 5th	40.3%	41.5%	43.8%	48.8%	52.0%	55.7%	58.5%	60.5%	62.0%	58.1%	59.5%	60.8%	60.1%	46.1%	46.2%	44.8%	47.4%	47.1%	46.4%	47.6%	48.8%
◆	40.3%	39.3%	38.5%	40.0%	39.6%	39.5%	39.3%	39.1%	38.6%	32.9%	32.6%	32.2%	30.2%	14.7%	10.1%	10.1%	10.0%	9.9%	9.9%	9.9%	9.9%

◆ Baseline deterministic projection with current assumptions

Plan maturity measures that affect primary risks

The annual actuarial valuation considers the number and demographic characteristics of covered members, including active members and non-active members (inactive members, retirees and beneficiaries). Over the past 10 valuations from June 30, 2014 to June 30, 2023, MCERA has become more mature as indicated by the general increase in the ratio of non-active to active members covered by the Plan as shown in *Chart 12*. This chart also shows the ratio of members in pay status (retirees and beneficiaries) to active members. This ratio excludes the inactive members who have relatively smaller liabilities. The increase in the ratios is significant because any increase in UAAL due to unfavorable future investment and non-investment experience for a plan with a relatively larger group of non-active members would have to be amortized and funded using the payroll of a relatively smaller group of active members.

Another indicator of a more mature plan is relatively large amounts of assets and/or liabilities compared to active member payroll, which leads to increasing volatility in the level of required contributions. The **Asset Volatility Ratio (AVR)**, which is equal to the market value of assets divided by total payroll, provides an indication of contribution sensitivity to changes in the current level of assets in *Chart 13*. The **Liability Volatility Ratio (LVR)**, which is equal to the actuarial accrued liability divided by payroll, provides an indication of the contribution sensitivity to changes in the current level of liability and is also detailed in *Chart 14*. Over time, the AVR should approach the LVR because when a plan is fully funded the assets will equal the liabilities. As such, the LVR also indicates the long-term contribution sensitivity to the asset volatility, as the plan approaches full funding.

In particular, the Plan's AVR was 7.3 as of June 30, 2023. This means that a 1% asset gain or loss in 2023/2024 (relative to the assumed investment return) would amount to 7.3% of one year's payroll. Similarly, the Plan's LVR was 10.2 as of June 30, 2023, so a 1% liability gain or loss in 2023/2024 would amount to 10.2% of one year's payroll. Based on MCERA's policy to amortize actuarial experience over a period of 18 years when the Plan has an unfunded liability, there would be a 0.6% of payroll decrease or increase in the required contribution rate for each 1% asset gain or loss, respectively, and a 0.8% of payroll decrease or increase in the required contribution rate for each 1% liability gain or loss, respectively.

It is also informative to note that the AVR and LVR for MCERA's Safety and Probation groups are significantly higher than for the General group. This means that both investment volatility and assumption changes will have a greater impact on the contribution rates of the Safety and Probation groups than on the contribution rates of the General group. This is illustrated in the following table:

Membership Group	AVR	10% Investment Loss Compares to	LVR	10% Liability Change Compares to
General	6.3	63% of payroll	8.8	88% of payroll
Safety	12.5	125% of payroll	18.3	183% of payroll
Probation	11.7	117% of payroll	12.9	129% of payroll
Combined	**7.3**	**73% of payroll**	**10.2**	**102% of payroll**

Chart 12

Ratio of Retirees and Beneficiaries (Pay Status) to Active Members &
Ratio of Inactive, Retirees and Beneficiaries (Non-Active) to Active Members as of June 30

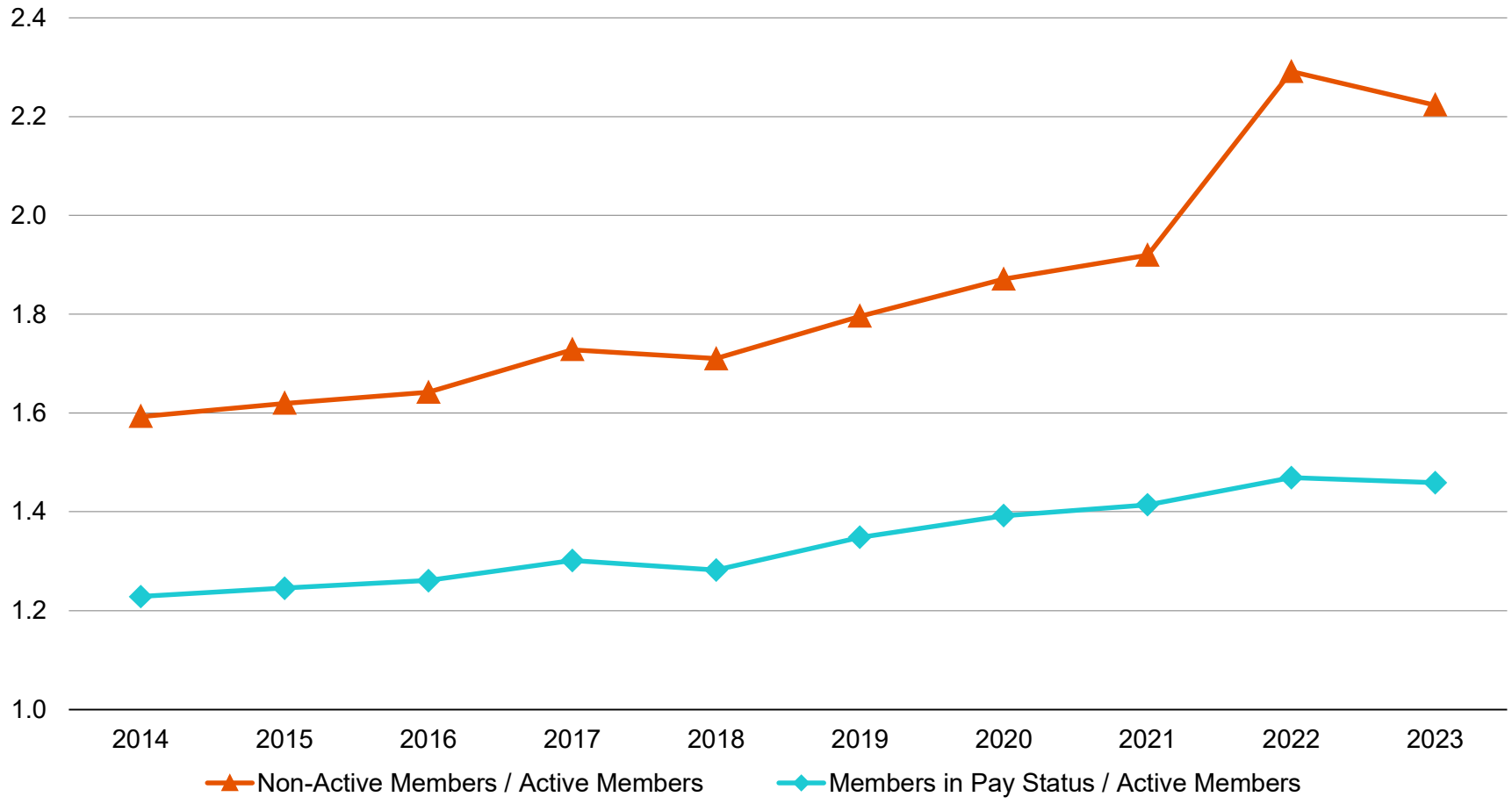


Chart 13

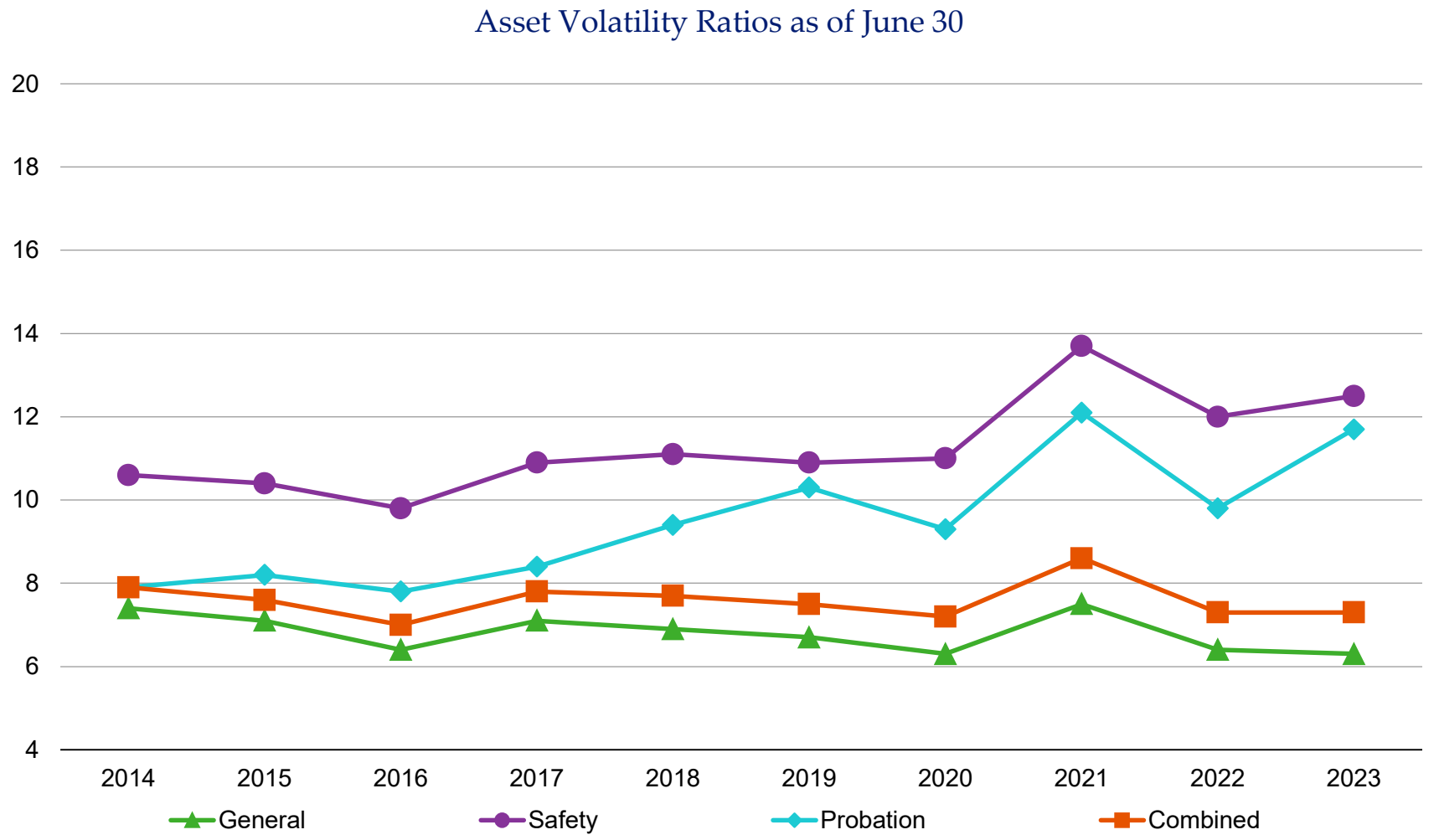
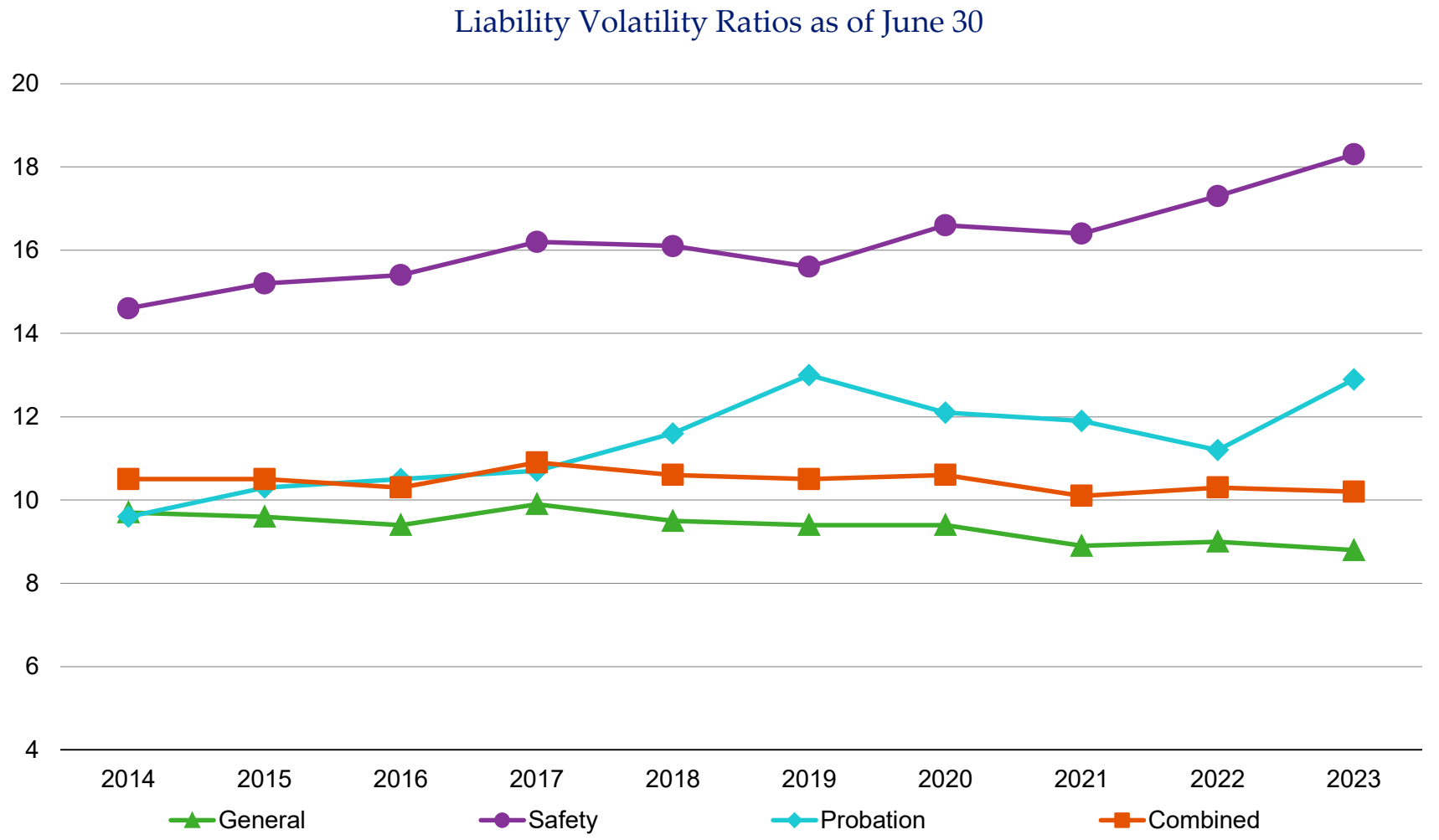

Asset Volatility Ratios as of June 30
20
18
16
14
12
10
8
6
4
2014
2015
2016
2017
2018
2019
2020
2021
2022
2023
General
Safety
Probation
Combined

Chart 14


Liability Volatility Ratios as of June 30
20
18
16
14
12
10
8
6
4
2014
2015
2016
2017
2018
2019
2020
2021
2022
2023
General
Safety
Probation
Combined

Appendix A: Actuarial Assumptions & Methods

Unless otherwise noted, the results included in this report have been prepared based on the assumptions and methods used in preparing the June 30, 2023 actuarial valuation.

Deterministic projection

In addition, we have prepared the deterministic projection using the following assumptions and methods applied in the June 30, 2023 actuarial valuation:

- Non-economic assumptions will remain unchanged.
- Retirement benefit formulas will remain unchanged.
- 1937 Act and PEPRA statutes will remain unchanged.
- UAAL amortization method will remain unchanged (i.e., 18-year layers for actuarial gains/losses and assumption changes, and level percent of pay).
- Economic assumptions will remain unchanged, including the annual 6.50% investment earnings and 3.00% active payroll growth assumptions.
- Deferred investment gains and losses will be recognized over a five-year period.
- The 1% Contingency Reserve will be eliminated at June 30, 2024.
- All other actuarial assumptions used in the June 30, 2023 actuarial valuation will be realized.

Stochastic projection

Besides the assumptions and methods discussed above for the deterministic projection, the following additional assumptions or parameters are used in projecting MCERA's investment portfolio over the next 20 years based on performing 10,000 trial outcomes of future market returns.

Target asset allocation

The target asset allocation is based on that provided by MCERA at the last triennial experience study and used by Segal to set the investment return assumption of 6.50%. That target asset allocation is as follows:

Appendix A: Actuarial Assumptions & Methods

Target Asset Allocation

Asset Class	Target Allocation
Large Cap U.S. Equity	25.9%
Small Cap U.S. Equity	11.1%
Global ex-US Equity	25.0%
US Fixed Income	21.0%
Real Estate	11.0%
Private Infrastructure	6.0%
Total	**100.0%**

Simulation of future returns

In preparing the 10,000 trial outcomes of future market returns, we performed simulations using assumptions regarding the 20-year arithmetic returns, standard deviations and correlation matrix that were found in the 2023 survey prepared by Horizon Actuarial Services.[1] We used the assumptions that were closest to the asset classes found in MCERA's investment portfolio.

A summary of the 20-year arithmetic returns,[2] standard deviations and correlation matrix for each of the different asset classes used in the modeling is as follows:

[1] That survey included responses from 42 investment advisors, including MCERA's investment advisor at Callan.

[2] Note that only 27 investment advisors provided long-term (e.g. 20-year) capital market assumptions in the survey. These returns are gross of inflation and net of administrative and investment expenses. The annual inflation assumption based on the Horizon Survey was 2.47%.

Appendix A: Actuarial Assumptions & Methods

20-Year Arithmetic Return and Standard Deviation

Asset Class	20-Year Arithmetic Return	Standard Deviation
Large Cap U.S. Equity	8.67%	16.64%
Small Cap U.S. Equity	9.72%	20.51%
Global ex-US Equity	9.38%	18.26%
US Fixed Income	4.93%	5.85%
Real Estate	7.48%	16.72%
Private Infrastructure	8.38%	17.10%

Correlation Matrix

Asset Class	Large Cap U.S. Equity	Small Cap U.S. Equity	Global ex-US Equity	US Fixed Income	Real Estate	Private Infrastructure
Large Cap U.S. Equity	1.00	N/A	N/A	N/A	N/A	N/A
Small Cap U.S. Equity	0.89	1.00	N/A	N/A	N/A	N/A
Global ex-US Equity	0.81	0.77	1.00	N/A	N/A	N/A
US Fixed Income	0.26	0.22	0.24	1.00	N/A	N/A
Real Estate	0.56	0.55	0.50	0.25	1.00	N/A
Private Infrastructure	0.64	0.60	0.60	0.29	0.47	1.00

Other considerations

This risk report has been prepared for the exclusive use and benefit of MCERA, based upon information provided by MCERA and MCERA's other service providers or otherwise made available to Segal at the time this document was created. The results presented in this report are intended to provide insight into key plan risks that can inform financial preparation and future decision making. However, Segal makes no representation or warranty as to the accuracy of any forward-looking statements and does not guarantee any particular outcome or result. The modeling projections are intended to serve as illustrations of future financial outcomes that are based on the information available to us at the time the modeling is undertaken and completed, and the agreed-upon assumptions and methodologies described herein. Emerging results may differ significantly if the actual experience proves to be different from

Appendix A: Actuarial Assumptions & Methods

these assumptions or if alternative methodologies are used. Actual experience may differ due to such variables as demographic experience, the economy, stock market performance and the regulatory environment.

Segal valuation results are based on proprietary actuarial modeling software. The actuarial valuation models generate a comprehensive set of liability and cost calculations that are presented to meet regulatory, legislative and client requirements. Deterministic cost projections are based on a proprietary forecasting model. Our Actuarial Technology and Systems unit, comprising both actuaries and programmers, is responsible for the initial development and maintenance of these models. The models have a modular structure that allows for a high degree of accuracy, flexibility and user control. The client team programs the assumptions and the plan provisions, validates the models, and reviews test lives and results, under the supervision of the responsible actuary.

Appendix B: Detailed Scenario Test

The following page contains an illustration of projected employer contribution rates and projected employer actuarially determined contribution amounts.

In addition to the assumptions outlined in *Appendix A* of this report, we have used the following market return assumptions to model three hypothetical market return scenarios:

- Scenario 1: Assumed market return of 0.00% for 2023/2024, 6.50% market return per year thereafter
- Scenario 2: Assumed market return of 6.50% for 2023/2024, 6.50% market return per year thereafter
- Scenario 3: Assumed market return of 13.00% for 2023/2024, 6.50% market return per year thereafter

While we have not assigned a probability on the 2023/2024 market returns coming in at these rates, the Association can use these results to interpolate in order to estimate the employer contribution rates and amounts for the June 30, 2024 and next several valuations as the actual investment experience for 2023/2024 becomes available. Additionally, comparable experience in upcoming future years is likely to have a similar impact on the Plan absent any significant plan or assumption changes.

Appendix B: Detailed Scenario Test

Illustration of Projected Employer Contribution Rates and Amounts *($ in Millions)*

Valuation Date	Employer Rate Scenario 1	Employer Rate Scenario 2	Employer Rate Scenario 3	Fiscal Year End	Employer Contributions Scenario 1	Employer Contributions Scenario 2	Employer Contributions Scenario 3
June 30, 2023	40.3%	40.3%	40.3%	2025	$38	$38	$38
June 30, 2024	40.0%	39.3%	38.5%	2026	38	38	37
June 30, 2025	40.2%	38.5%	36.9%	2027	40	38	37
June 30, 2026	42.5%	40.0%	37.5%	2028	43	41	38
June 30, 2027	42.9%	39.6%	36.4%	2029	45	42	38
June 30, 2028	43.4%	39.5%	35.5%	2030	47	43	38
June 30, 2029	43.2%	39.3%	35.3%	2031	48	44	39
June 30, 2030	43.1%	39.1%	35.2%	2032	50	45	40
June 30, 2031	42.6%	38.6%	34.7%	2033	50	46	41
June 30, 2032	36.9%	32.9%	29.0%	2034	45	40	35
June 30, 2033	36.6%	32.6%	28.7%	2035	46	41	36
June 30, 2034	36.2%	32.2%	28.3%	2036	47	42	37
June 30, 2035	34.1%	30.2%	26.2%	2037	45	40	35
June 30, 2036	18.6%	14.7%	10.1%	2038	26	20	14
June 30, 2037	17.8%	10.1%	10.1%	2039	25	14	14
June 30, 2038	15.1%	10.1%	10.1%	2040	22	15	15
June 30, 2039	16.8%	10.0%	10.0%	2041	25	15	15
June 30, 2040	9.9%	9.9%	9.9%	2042	15	15	15
June 30, 2041	9.9%	9.9%	9.9%	2043	16	16	16
June 30, 2042	9.9%	9.9%	9.9%	2044	16	16	16
June 30, 2043	9.9%	9.9%	9.9%	2045	17	17	17

Appendix C: Definition of Pension Terms

The following list defines certain technical terms as they relate to MCERA for the convenience of the reader:

Term	Definition
Actuarial accrued liability for actives	The equivalent of the accumulated normal costs allocated to the years before the valuation date.
Actuarial accrued liability for retirees and beneficiaries	Single-sum present value of the lifetime benefits expected to be paid to the existing retirees and beneficiaries. This sum takes account of life expectancies appropriate to the ages of the annuitants and the interest that the sum is expected to earn before it is entirely paid out in benefits.
Actuarial value of assets	The value of the Plan's assets that is equal to the market value of assets less unrecognized returns. Unrecognized returns are equal to the difference between the actual market return and the expected return on the market value and are recognized over a five-year period per MCERA's funding policy.
Employer normal cost	The portion of the normal cost to be paid by the employer. This is equal to the normal cost less expected member contributions.
Funded ratio	The ratio of the valuation value of assets to the actuarial accrued liability. Plans sometimes also calculate a market funded ratio, using the market value of assets, rather than the valuation value of assets.
Generational mortality	A generational mortality table provides dynamic projections of mortality experience for each cohort of current and future retirees. For example, the mortality rate for someone who is 65 next year will be slightly less than for someone who is 65 this year. In general, using generational mortality anticipates increases in the cost of the Plan over time as participants' life expectancies are projected to increase. This is in contrast to updating a static mortality assumption with each experience study as we had proposed in experience studies prior to 2020.
Normal cost	The amount of contributions required to fund the portion of the level cost of the member's projected retirement benefit that is allocated to the current year of service.
Unfunded actuarial accrued liability	The excess of the actuarial accrued liability over the valuation value of assets. This value may be negative, in which case it may be expressed as a negative unfunded actuarial accrued liability, also called the funding surplus or an overfunded actuarial accrued liability.
Valuation value of assets	The actuarial value of assets reduced by the value of non-valuation reserves.

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