



Sonoma County Employees' Retirement Association

Risk Assessment

**Including Review of Funded Status of the
Plan as of December 31, 2019**

May 8, 2020

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Section 1: Introduction and Executive Summary

Introduction

The purpose of this report is to assist the Board of Retirement,¹ participating employers and members and other stakeholders to better understand and assess the risk profile of the Association, as well as the particular risks inherent in using a fixed set of actuarial assumptions in preparing the results in our December 31, 2019 funding valuation for Sonoma County Employees' Retirement Association ("SCERA" or "the Plan").

The results included in our December 31, 2019 funding valuation report for the Plan were prepared based on a fixed set of economic and non-economic actuarial assumptions under the premise that future experience of SCERA 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 December 31, 2018 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 December 31, 2019. Due to the COVID-19 pandemic, market conditions have changed significantly since the valuation date. The Plan's actuarial 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. While it is impossible to determine how the market will perform over the next several months, and how that will affect the results of next year's valuation, 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. Additionally, Segal is available to prepare other projections of selected potential outcome scenarios upon request.

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 SCERA's December 31, 2018 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 SCERA 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

¹ This risk report has been prepared at the request of the Board of Retirement to assist in administering the Plan. This risk report may not otherwise be copied or reproduced in any form without the consent of the Board of Retirement and may only be provided to other parties in its entirety, unless expressly authorized by Segal. The measurements shown in this risk report may not be applicable for other purposes.

actuary to evaluate the particular 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 initial 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 in order to examine particular financial risks. When making that recommendation, the actuary will take into account 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 SCERA.

Plan Risk Assessment

In Section 2, we start by discussing some of the historical factors that have caused changes in SCERA'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. Even though we have not included a numerical analysis of all the risk factors, based on our discussions with SCERA we have illustrated 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 portfolio coming in differently from the current 7.00% annual investment return assumption used in the December 31, 2019 valuation. 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 in this report.

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. The unfunded actuarial accrued liability (UAAL)² and contribution rates³ increased primarily as a result of the strengthening of the actuarial assumptions used in preparing the valuations and unfavorable investment experience that were offset to some degree by favorable non-investment experience.

Valuation Date	Market Value Basis		Valuation Value Basis		Total (Aggregate) Employer Contribution Rate (% of Payroll)
	Funded Status	UAAL	Funded Status	UAAL	
December 31, 2010	81.9%	\$387.6 M	88.4%	\$248.6 M	17.1%
December 31, 2019	92.8%	\$226.4 M	89.4%	\$332.0 M	19.5%

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.

The total (aggregate) employer contribution rate for the plan is 19.5% of total payroll in the December 31, 2019 valuation. The employer contribution rates in the December 31, 2021 and December 31, 2022 valuations will increase as a result of

² For example, the UAAL increased by \$54 million in the December 31, 2010 valuation, \$81 million in the December 31, 2012 valuation, \$94 million in the December 31, 2015 valuation, and \$32 million in the December 31, 2018 valuation (for a total of \$261 million), as a result of the experience studies over the last ten years.

³ For example, the increase in the employer's total rate (normal cost plus UAAL) was 1.80% in the December 31, 2010 valuation, 1.79% in the December 31, 2012 valuation, 2.29% in the December 31, 2015 valuation, and 1.25% in the December 31, 2018 valuation, as a result of the experience studies over the last ten years.

the sunsets of the additional UAAL contributions⁴ paid by most Safety and General members, respectively. The increase will be about 3%, for both Safety and General.

Using a deterministic projection, this report shows the effect of either favorable (14.00%) or unfavorable (0.00%) hypothetical market returns for 2020 on key valuation results. In particular, the changes in the total employer contribution rate (relative to the December 31, 2019 valuation aggregate employer contribution rate of 19.5%) in the December 31, 2020 valuation and in the December 31, 2024 valuation (when all the investment gains or losses are fully recognized at the end of the five-year asset smoothing period) are as shown in the following table:

Contribution Rate Change	2020 Single Plan-Year Investment Return		
	14.00%	7.00% (Baseline)	0.00%
December 31, 2020	-1.9% of payroll	-1.2% of payroll	-0.5% of payroll
December 31, 2024	-9.3% of payroll	-1.6% of payroll	2.7% of payroll

Under the favorable (14.00%) hypothetical market return scenario for 2020, the Association would be expected to reach full funding by December 31, 2024 and the total employer contribution rate would be comprised of only normal cost contributions, resulting in a larger relative change from the baseline than the unfavorable (0.00%) hypothetical market return scenario. Furthermore, under all three hypothetical market return scenarios for 2020, the Association would be expected to reach full funding within 15 years and the total employer contribution rate would be expected to approach about 9% of payroll.⁵ This means 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 SCERA.

Plan Maturity Measures

During the past 10 valuations, the Association 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 8 on page 24*) and by an increase in the ratios of plan assets and liabilities to active member payroll (as shown in *Section 2, Chart 9 on page 25* and *Chart 10 on page 26*, respectively). We expect these 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

⁴ General County and Court members pay an additional UAAL contribution equal to 3.03% of payroll, with a sunset date of June 30, 2024. Safety County members pay an additional UAAL contribution equal to 3.00% of payroll, with a sunset date during the last pay period in June 2023. Due to the 18-month scheduled delay, the employer contribution rates projected for the December 31, 2021 valuation reflect the sunset of the UAAL contributions paid by the Safety members, and the contribution rates projected for the December 31, 2022 valuation reflect the sunset of the UAAL contributions paid by the General members, even though they would still be paying those contributions at the dates of those valuations. The exception is for members covered by the Salary Resolution who will continue to pay their applicable additional UAAL contribution until they terminate employment with the County.

⁵ Assuming no further assumption changes, method changes or experience that differs significantly from assumptions.

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 only active members. Put another way, as a plan grows more mature, its contribution rate becomes more sensitive to investment volatility and liability changes. As SCERA continues to mature with time, its risk profile will continue to evolve in this way and contributions will grow more sensitive to plan experience.

Section 2: Key Plan Risks on Funded Status, Unfunded Actuarial Accrued Liabilities, and Employer Contribution Rates

Evaluation of Historical Trends

Funded Status and Change in Unfunded Actuarial Accrued Liabilities

One common measure of SCERA's financial status is the funded ratio. This ratio compares the valuation⁶ and market value of assets to the actuarial accrued liabilities (AAL)⁷ of SCERA. After accounting for contributions made at the Actuarially Determined Contribution (ADC) amount, the overall level of funding of SCERA on a valuation basis has increased for the Plan as a result of proceeds from Pension Obligation Bonds and other favorable experience, offset by the strengthening of the actuarial assumptions and unfavorable investment experience. The funded ratios and UAAL for the past 10 valuations from December 31, 2010 to 2019 measured using both valuation and market value of assets are provided in *Chart 1*.

The factors that caused the changes in the UAAL for the past 10 valuations from December 31, 2010 to 2019 are specified in *Chart 2*. The results in *Chart 2* reflect the changes in the investment return assumption in the December 31, 2010⁸, 2012, 2015, and 2018 valuations. These reductions together with the changes in the mortality tables and other assumptions from the three triennial experience studies recommending assumptions used in the December 31, 2012, 2015, and 2018 valuations, have had the most impact on the UAAL for SCERA,⁹ followed by the investment experience, especially during 2010 to 2012.

⁶ The valuation value of assets is equal to the market value of assets excluding unrecognized returns from the last few years and any non-valuation reserves. Unrecognized return is equal to the difference between the actual market return and the expected return on the market value, and is recognized over a five-year period.

⁷ For the actives, the actuarial accrued liability is the value of the accumulated normal costs allocated to the years before the valuation date. For the pensioners, beneficiaries and inactive vested members, the actuarial accrued liability is the single-sum present value of the lifetime benefit expected to be paid to those members.

⁸ The Board has a practice of reviewing the investment return and other actuarial assumptions at the same time in the triennial experience study. However, as a result of the Great Recession in 2008 and 2009, the Board accepted Segal's recommendation to review the investment return and other economic assumptions as part of the December 31, 2010 valuation instead of the December 31, 2009 valuation.

⁹ For example, the UAAL increased by \$54 million in the December 31, 2010 valuation, \$81 million in the December 31, 2012 valuation, \$94 million in the December 31, 2015 valuation, and \$32 million in the December 31, 2018 valuation (for a total of \$261 million), as a result of the experience studies over the last ten years.

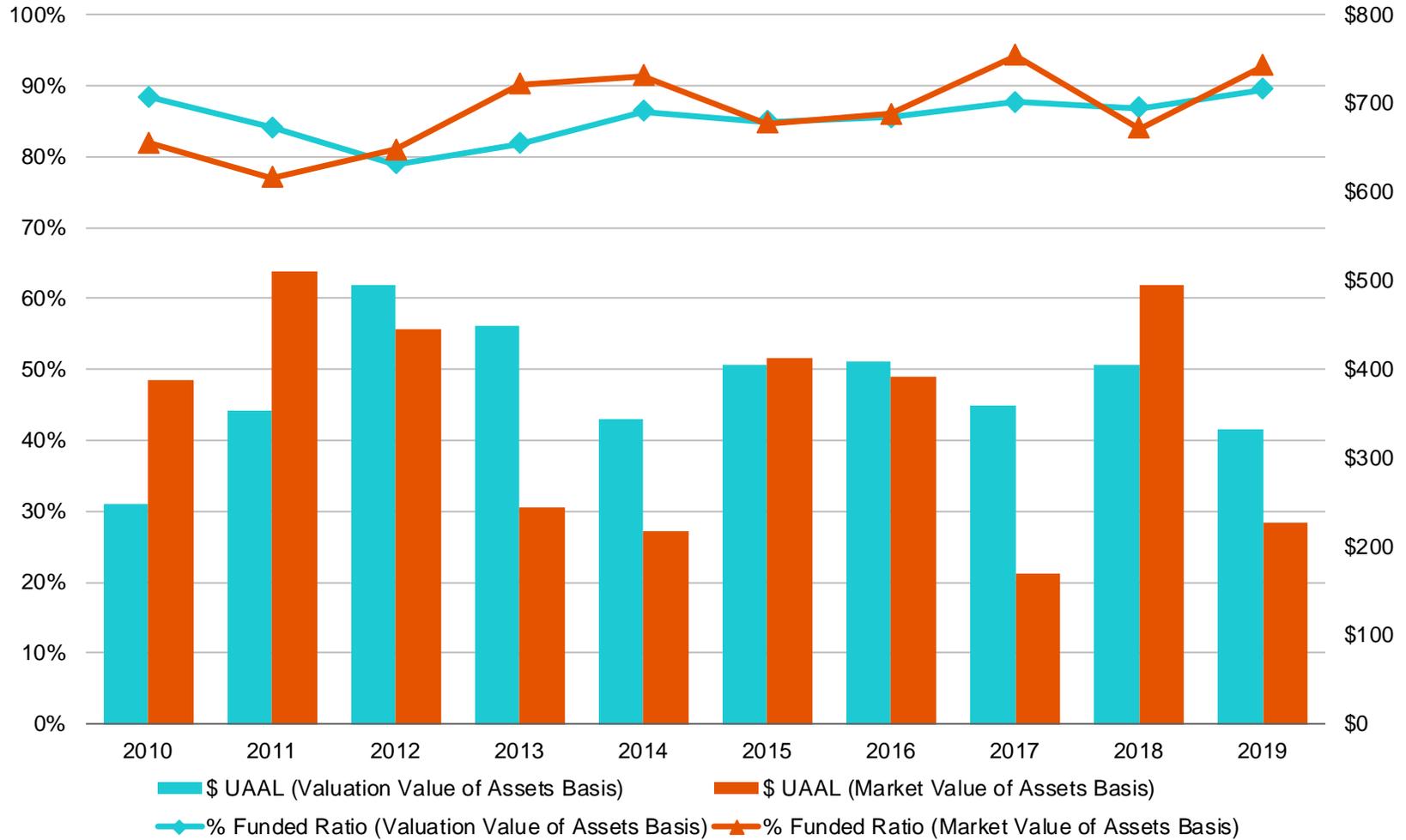
Chart 2 also shows that the unfavorable investment experience was offset to some extent by favorable non-investment experience and proceeds from Pension Obligation Bonds.¹⁰ The non-investment experience included smaller salary increases received by active members and changes in compensation earnable and cashout amounts. The non-investment experience also included the scheduled delay in implementing the contribution rates determined in the annual valuation.

Finally, *Chart 2* shows some “negative amortization” prior to 2012 due to SCERA’s previous amortization policy combined with the higher investment return and payroll growth assumptions used in those years. Current assumptions and amortization policy generally will not entail negative amortization in the future.

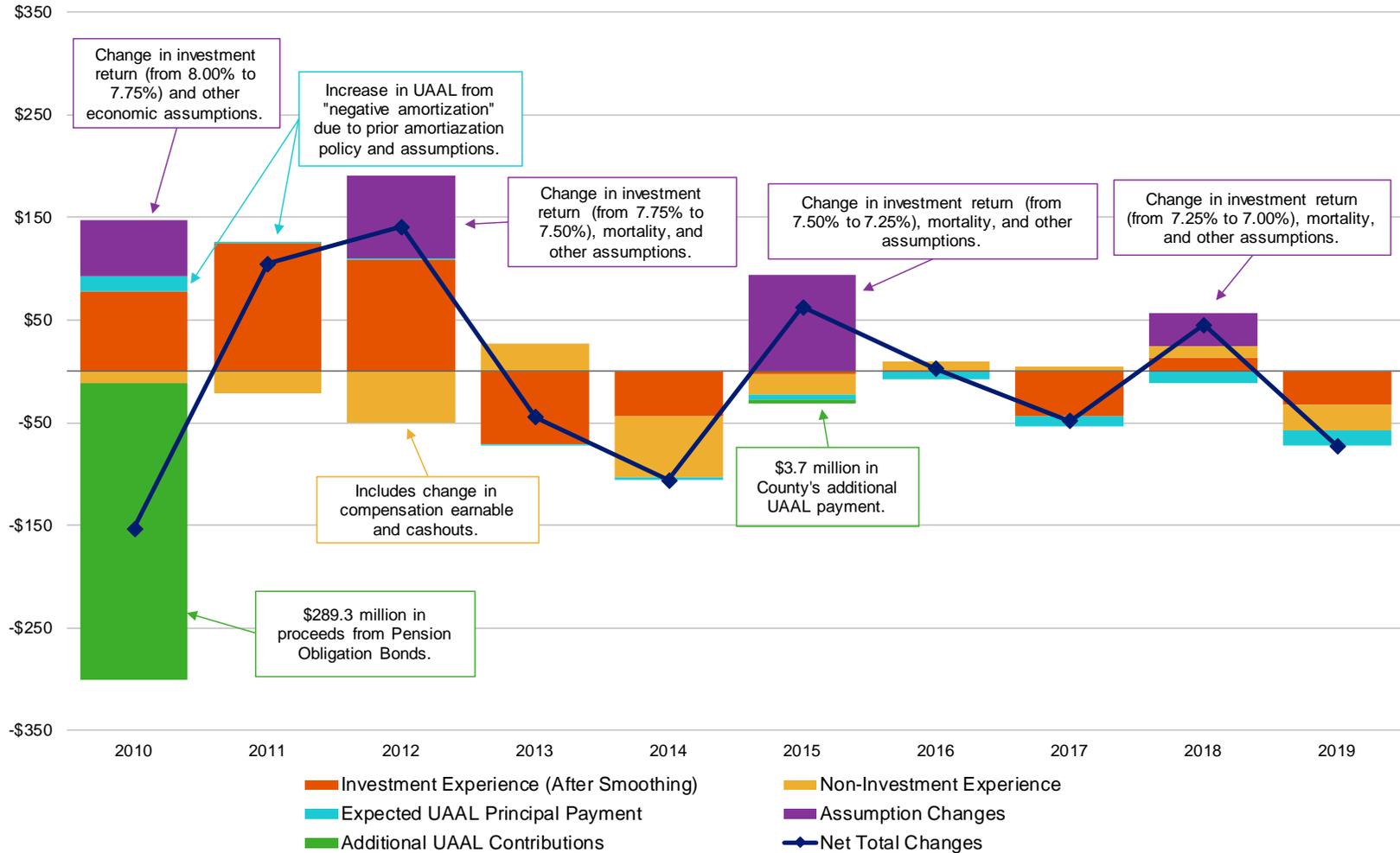
It is important to note that SCERA has taken strides in risk management and resulting long-term plan sustainability. This includes strengthening of assumptions, particularly the expected investment rate of return and mortality assumption (generational), and adopting a funding policy that eliminates negative 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 SCERA’s fiscal health going forward.

¹⁰ Besides \$289.3 million in proceeds from the issuance of Pension Obligation Bonds in September 2010, the County also made \$3.7 million in additional UAAL contributions during calendar year 2015.

Funded Ratio (Percentages) and Dollar UAAL (\$ Millions)
in December 31, 2010 to 2019 Valuations



Factors that Changed UAAL in December 31, 2010 to 2019 Valuations (\$ Millions)



Note: The primary source of investment losses starting in the December 31, 2008 valuation is the Great Recession, which was recognized in the valuation value of assets over five years.

Employer Contribution Rates

The total (normal cost¹¹ plus UAAL payment) employer contribution rates determined in the December 31, 2010 to 2019 valuations are provided in *Chart 3* and the factors that caused the changes in the total aggregate employer rates¹² are provided in *Chart 4*.

The aggregate employer normal cost rates shown in *Chart 3* have stayed relatively flat since the December 31, 2012 valuation. The aggregate employer normal cost rate increased between the December 31, 2011 and the December 31, 2012 valuation as a result of a change in how the additional contributions paid by most members are applied.¹³ While there have also been increases in the normal cost rates due to the changes in the actuarial assumptions, those increases were offset to some degree by the plan changes under the Public Employees' Pension Reform Act of 2013 (PEPRA) as new members have been enrolled in the lower cost PEPRA benefit tiers starting on January 1, 2013. In addition, active legacy members represented by some of the bargaining groups have agreed to pay additional employee Normal Cost contributions that are above those determined under the County Employees Retirement Law of 1937 (CERL), as permitted under PEPRA. As the specific amount of those higher contributions are dependent on the specific bargaining agreements, we have included in this report only the minimum member contribution rates specified in the CERL, consistent with how the employer normal cost rates have been reported in the annual valuation reports.

Chart 4 shows that the changes in the investment return, mortality tables and other assumptions have had the most impact on increasing the UAAL contribution rates¹⁴ for the employers. The next greatest impact was from the investment experience during 2010 to 2019. Favorable non-investment experience and the proceeds from Pension Obligation Bonds have decreased the contribution rates.

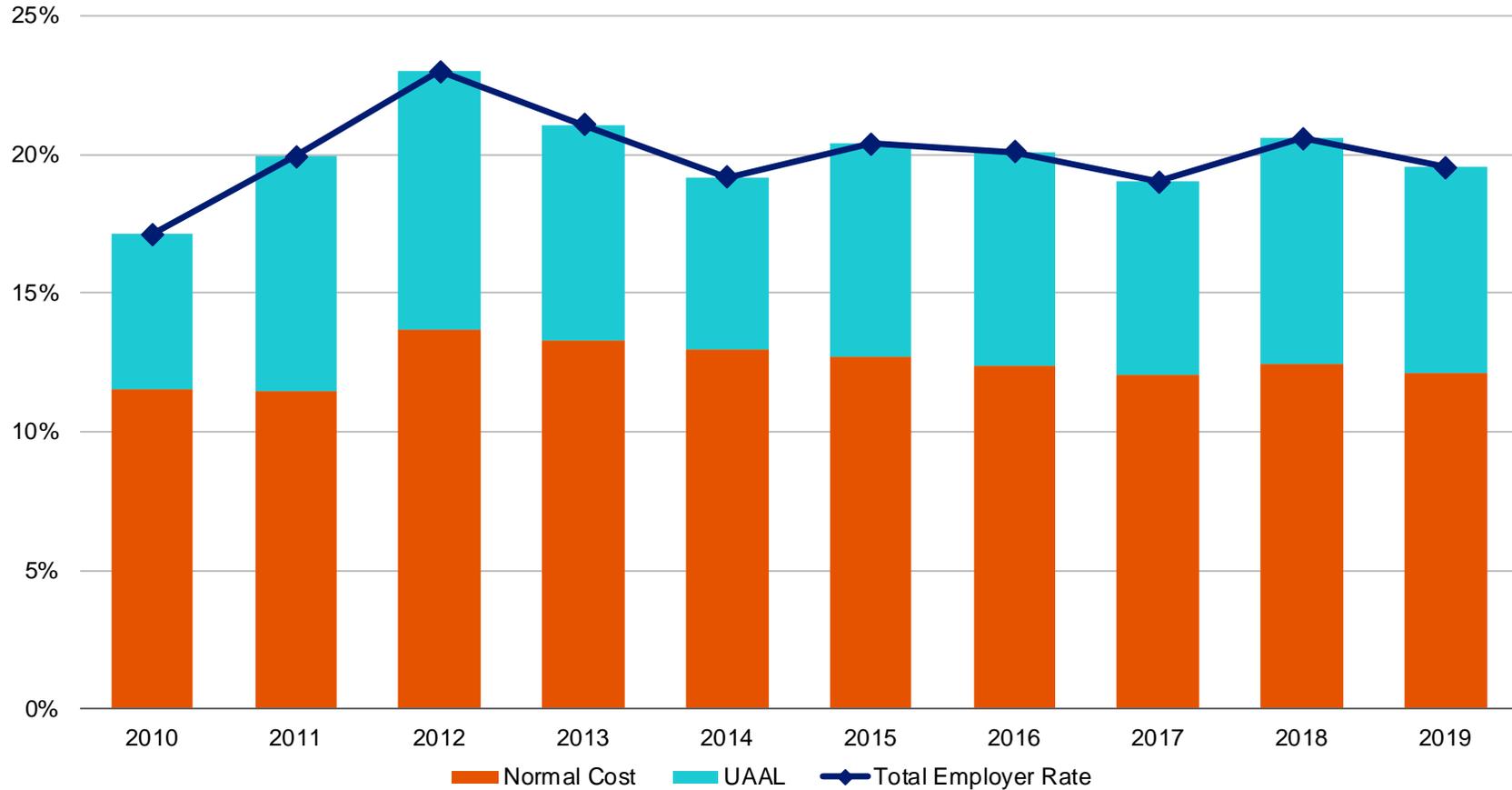
¹¹ The normal cost is the amount of contributions required to fund the portion of the level cost of the member's projected retirement benefit that is allocated to the current year of service.

¹² There are separate contribution rates determined in the valuation for the General and Safety membership groups and for the different benefit tiers and employers. The aggregate contribution rates have been calculated based on an average of those rates weighted by the payrolls of the active members reported in those valuations.

¹³ In the valuations prior to December 31, 2012, the employer normal cost rate was reduced to reflect the additional 3.03% and 3.00% of payroll contribution rates paid by most General and Safety members, respectively. Starting with the December 31, 2012 valuation, the employer UAAL contribution rate was reduced instead to reflect those contributions.

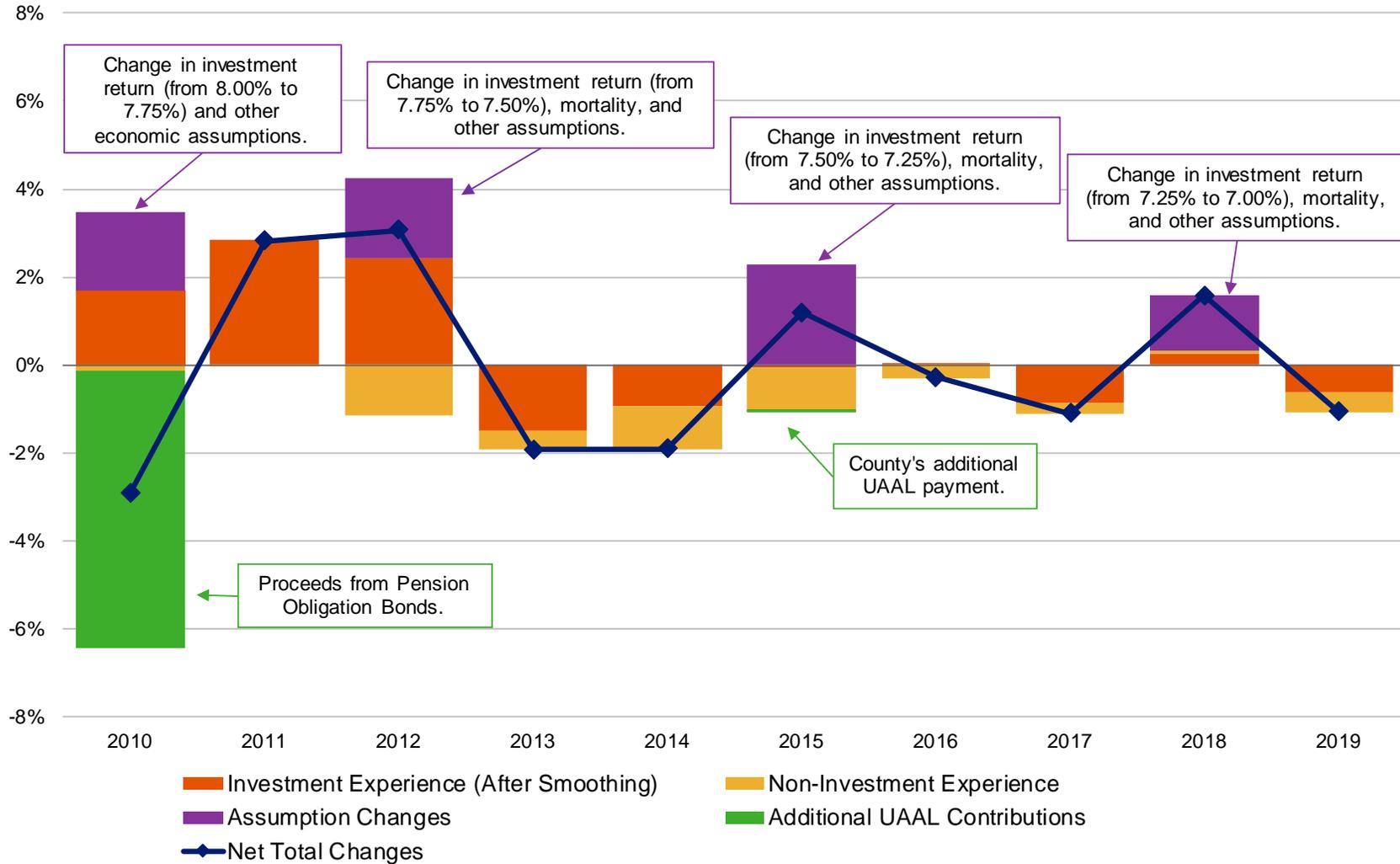
¹⁴ For example, the total aggregate employer contribution rate increased by 1.80% in the December 31, 2010 valuation, 1.79% in the December 31, 2012 valuation, 2.29% in the December 31, 2015 valuation, and 1.25% in the December 31, 2018 valuation (for a total of 7.13% of payroll) as a result of the experience studies over the last ten years.

Employer Contribution Rates in December 31, 2010 to 2019 Valuations
(% of Payroll)



Note: Consistent with the format of the annual valuations, the above rates were determined without adjustment for the phase-in of the increase in the employer contribution rates due to assumption changes (if any). In addition, employer normal cost rates have not been adjusted to reflect additional member contribution rates that some active legacy members have agreed to pay as permitted by PEPRA.

Factors that Affected Employer Contribution Rates in December 31, 2010 to 2019 Valuations (% of Payroll)



Note: The primary source of investment losses starting in the December 31, 2008 valuation is the Great Recession, which was recognized in the valuation value of assets over five years.

Assessment of Primary Risk Factors Going Forward

As discussed in the Evaluation of Historical Trends section, in the 2010 to 2019 valuations the funded ratios and the employer contribution rates have changed mainly as a result of changes in actuarial assumptions, investment experience, and non-investment experience.

In general, we anticipate the following risk factors to have an ongoing influence on those financial 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 SCERA 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 essentially 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 the experience of the asset values.

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 SCERA.

- Investment risk – the potential that future market returns will be different from the current expected 7.00% annual return assumption.

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 SCERA can better understand the risk associated with earning either more or less than the assumed rate.

Also, 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 December 31, 2021 actuarial valuations) scheduled to be performed in 2021.

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

Changes to the mortality tables were the most major change to the non-economic assumptions in the last experience study. As can be observed from *Charts 2 and 4*, there had been relatively small impact on the UAAL and employer contribution rates due to non-investment related experience relative to the assumptions used in the last 10 valuations. However, in the last triennial experience study recommending assumptions for the December 31, 2018 valuation, we alerted the Board that it should consider a new benefit weighted mortality basis when choosing the next mortality table, pending the availability of mortality experience from the Society of Actuaries (SOA) that includes data from public sector retirement plans.¹⁵ In January 2019, the SOA published the public sector mortality tables. While it is premature to estimate the impact of applying those new mortality tables on employer and employee contribution rates until we perform the next triennial experience study recommending assumptions for the December 31, 2021 valuation, the Board should still be aware that there may be some increase in liabilities and contribution rates.

- 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 particular 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 and impact of actual contributions deviating from expected in the future. SCERA's 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 SCERA has essentially no contribution risk.

Furthermore, when ADCs determined in accordance with the SCERA 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 Association would have enough assets to provide all future benefits promised to the current members enrolled in the Association, if all of the actuarial assumptions used in the valuation are met.

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

Scenario Tests: Deterministic Projections

Since the funded ratio, UAAL and the employer contribution rates have fluctuated as a result of deviation in investment experience in the last 10 valuations (and that volatility is currently evidenced by the market experience related to COVID-19), we have examined the risk for SCERA associated with earning either higher or lower than the assumed rate of 7.00% in future valuations using projections under a deterministic approach.

¹⁵ We note that a similar recommendation to use benefit weighted mortality tables was made by SCERA's actuarial auditor in 2018.

To measure such risk, we have included scenario tests to study the change in the UAAL and contribution rates if SCERA were to earn a market return higher or lower than 7.00% in the next year following the December 31, 2019 valuations. In *Charts 5, 6 and 7*, we show the aggregate employer contribution rates, funded ratios, and UAAL respectively assuming that the Association’s portfolio market return in 2020 will be as follows: Scenario 1: 14.00%, Scenario 2: 7.00% (baseline) or Scenario 3: 0.00%.

The following table summarizes the resulting contribution changes (relative to the December 31, 2019 valuation aggregate employer contribution rate of 19.5%) in the next valuation (i.e., December 31, 2020) as well as in the December 31, 2024 valuation when all of the investment gains and losses are fully recognized in the (smoothed) valuation value of assets.

Contribution Rate Change ¹⁶	2020 Single Plan-Year Investment Return		
	14.00%	7.00% (Baseline)	0.00%
December 31, 2020	-1.9% of payroll	-1.2% of payroll	-0.5% of payroll
December 31, 2024	-9.3% of payroll	-1.6% of payroll	2.7% of payroll

Under the favorable (14.00%) hypothetical market return scenario for 2020, the Association would be expected to completely pay off the unfunded liability and reach full funding by December 31, 2024. At that time the total employer contribution rate would be comprised of only normal cost contributions, resulting in a larger relative change from the baseline than in the unfavorable (0.00%) hypothetical market return scenario. Furthermore, under all three hypothetical market return scenarios for 2020, the Association would be expected to reach full funding within 15 years and the total employer contribution rate would be expected to approach about 9% of payroll.¹⁷ This means 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 SCERA.

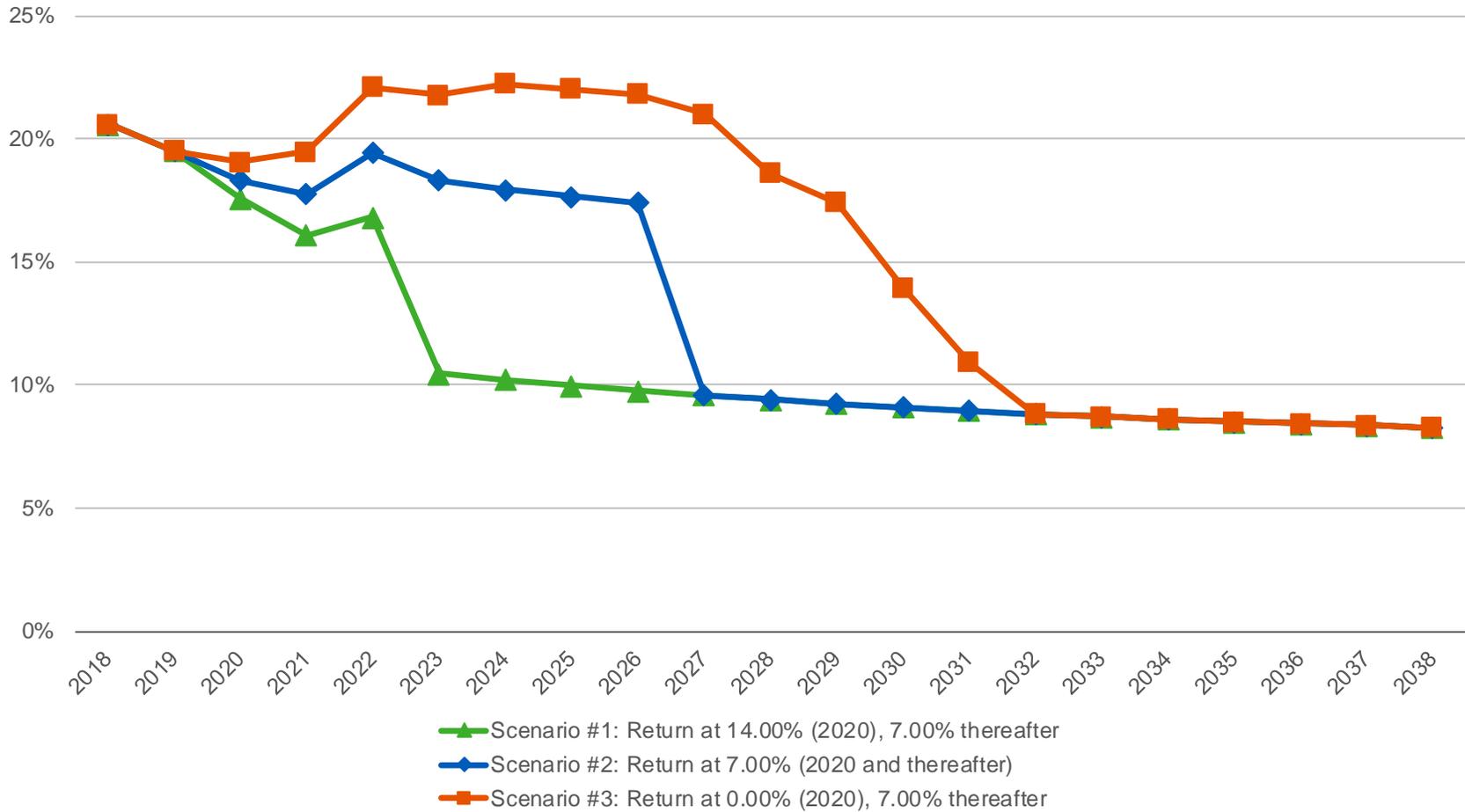
While we have not assigned a probability on the 2020 market return coming in at these rates, the Board and other stakeholders monitoring SCERA should still be able to interpolate in order to estimate the funded status and employer contribution rates for the December 31, 2020 and next several valuations as the actual investment experience for the

¹⁶ The employer contribution rates in the December 31, 2021 and December 31, 2022 valuations combined will increase by about 3% of payroll as a result of the sunsets of the additional UAAL contributions paid by most Safety and General members, respectively. General County and Court members pay an additional UAAL contribution equal to 3.03% of payroll, with a sunset date of June 30, 2024. Safety County members pay an additional UAAL contribution equal to 3.00% of payroll, with a sunset date during the last pay period in June 2023. Due to the 18-month scheduled delay, the employer contribution rates projected for the December 31, 2021 valuation reflect the sunset of the UAAL contributions paid by the Safety members, and the contribution rates projected for the December 31, 2022 valuation reflect the sunset of the UAAL contributions paid by the General members, even though they would still be paying those contributions at the dates of those valuations. The exception is for members covered by the Salary Resolution who will continue to pay their applicable additional UAAL contribution until they terminate employment with the County.

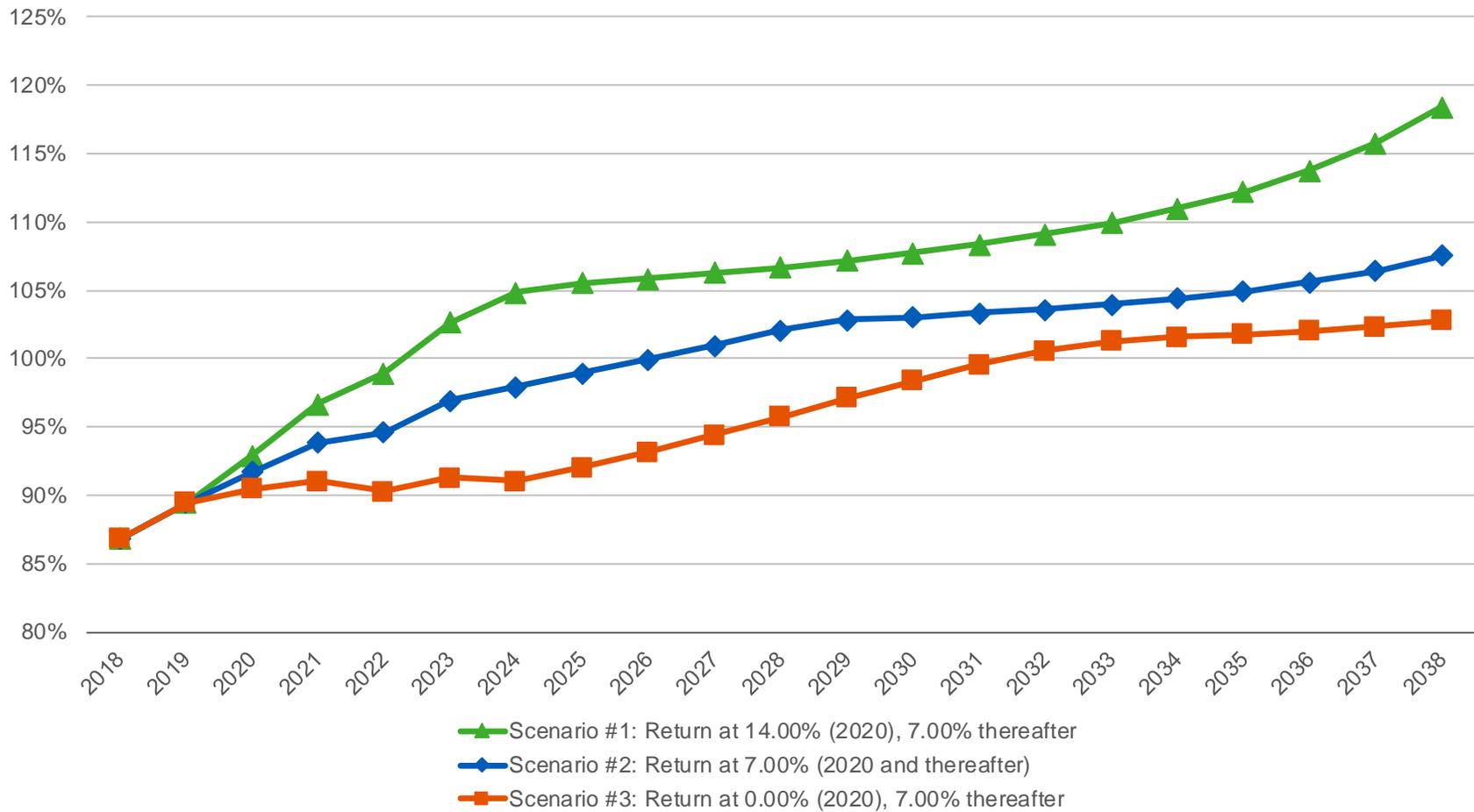
¹⁷ Assuming no further assumption changes, method changes or experience that differs significantly from assumptions.

2020 year becomes available throughout the year. Additionally, comparable experience in upcoming future years is likely to have a similar impact on the Association absent any significant plan or assumption changes.

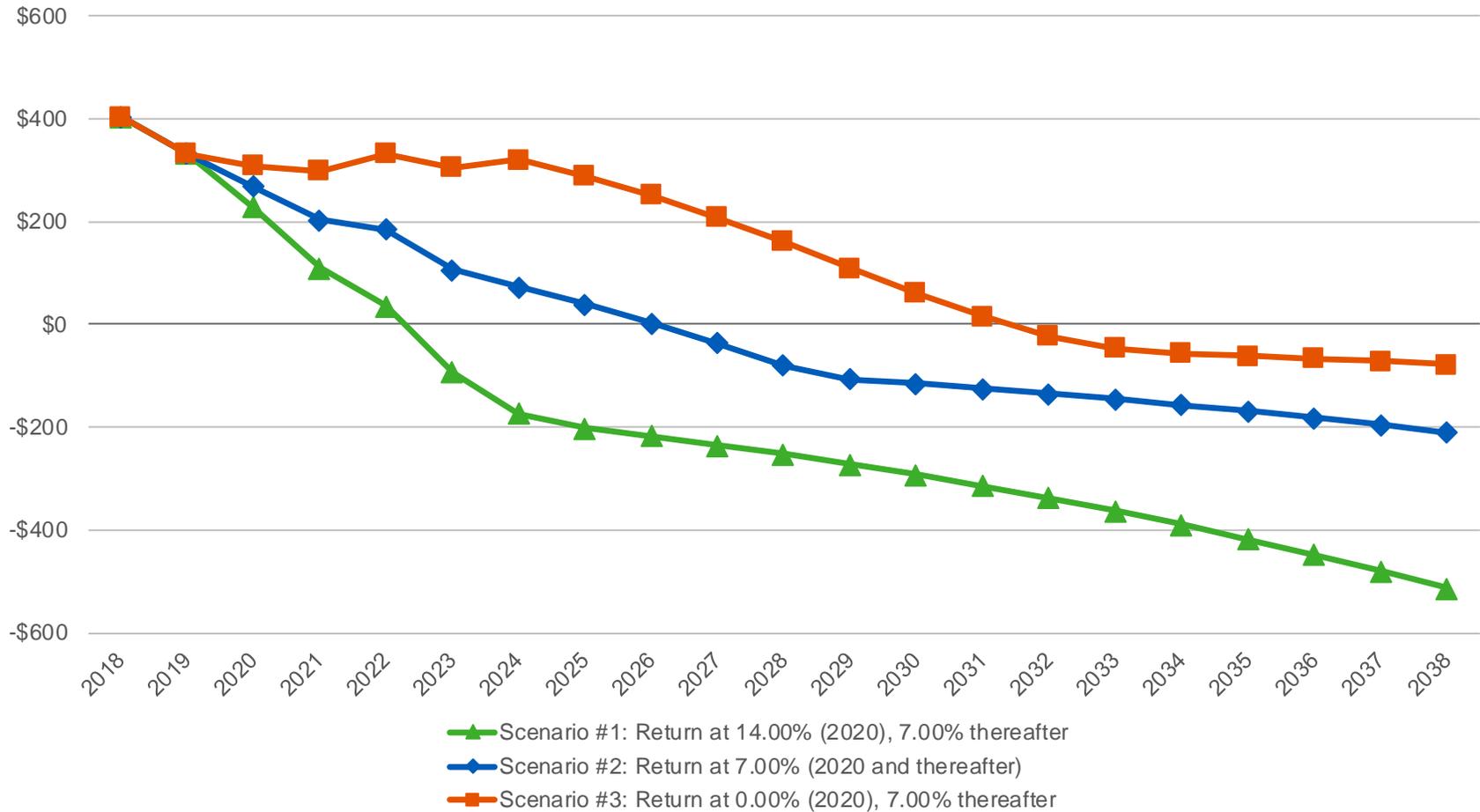
Projected Employer Contribution Rates Under Three Hypothetical Market Return Scenarios for 2020 (% of Payroll)



Projected Funded Ratios (on Valuation Value of Assets Basis) Under Three Hypothetical Market Return Scenarios for 2020



Projected UAAL (on Valuation Value of Assets Basis) Under
Three Hypothetical Market Return Scenarios for 2020
(\$ Millions)



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 vested, retirees and beneficiaries). In the past 10 valuations from December 31, 2010 to 2019, SCERA has become more mature, indicated by the continued increase in the ratio of non-active to active members covered by the Association as shown in *Chart 8*. The Chart also shows the ratio of members in pay status (retirees and beneficiaries) to active members. This ratio excludes the inactive vested 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.

Besides the ratio of members in pay status to 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 and is detailed in *Chart 9*. 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 detailed in *Chart 10*. 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, SCERA's AVR was 7.7 as of December 31, 2019. This means that a 1% asset gain or loss in 2020 (relative to the assumed investment return) would amount to 7.7% of one year's payroll. Similarly, SCERA's LVR was 8.3 as of December 31, 2019, so a 1% liability gain or loss in 2020 would amount to 8.3% of one year's payroll.¹⁸ Based on SCERA's policy to amortize actuarial experience over a period of 20 years, there would be a 0.5% of payroll decrease or increase in the required contribution rate for each 1% asset gain or loss, respectively, and a 0.6% of payroll decrease or increase in the required contribution rate for each 1% liability gain or loss, respectively.

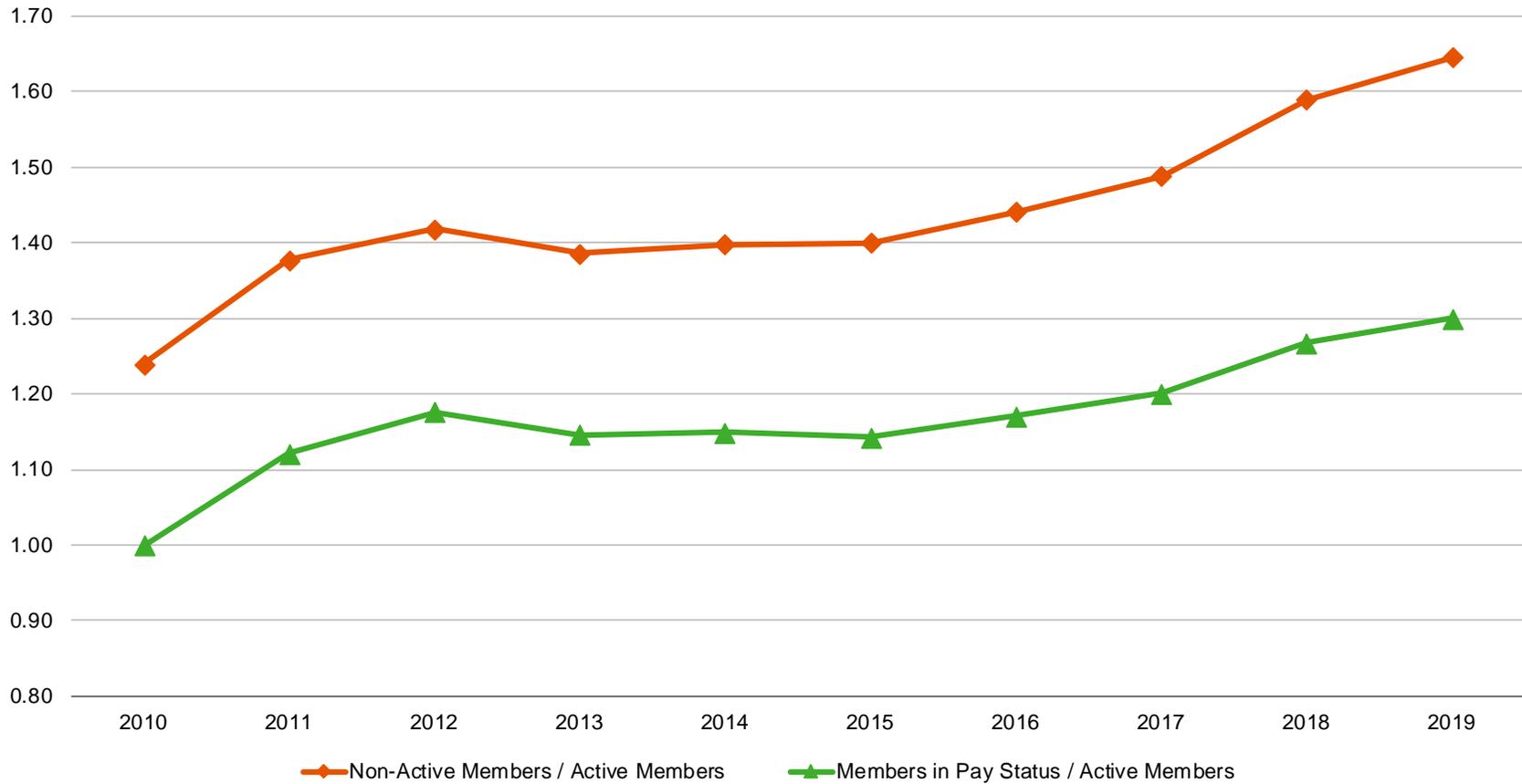
It is also informative to note that the AVR and LVR ratios for SCERA's Safety groups are higher than for the General groups. This means that both investment volatility and assumption changes will have a greater impact on the contribution rates of Safety groups than General groups. This is illustrated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

¹⁸The 7.7 and 8.3 are the AVR and LVR, respectively, for the entire Association. There are considerable differences in those ratios for the General and Safety membership groups.

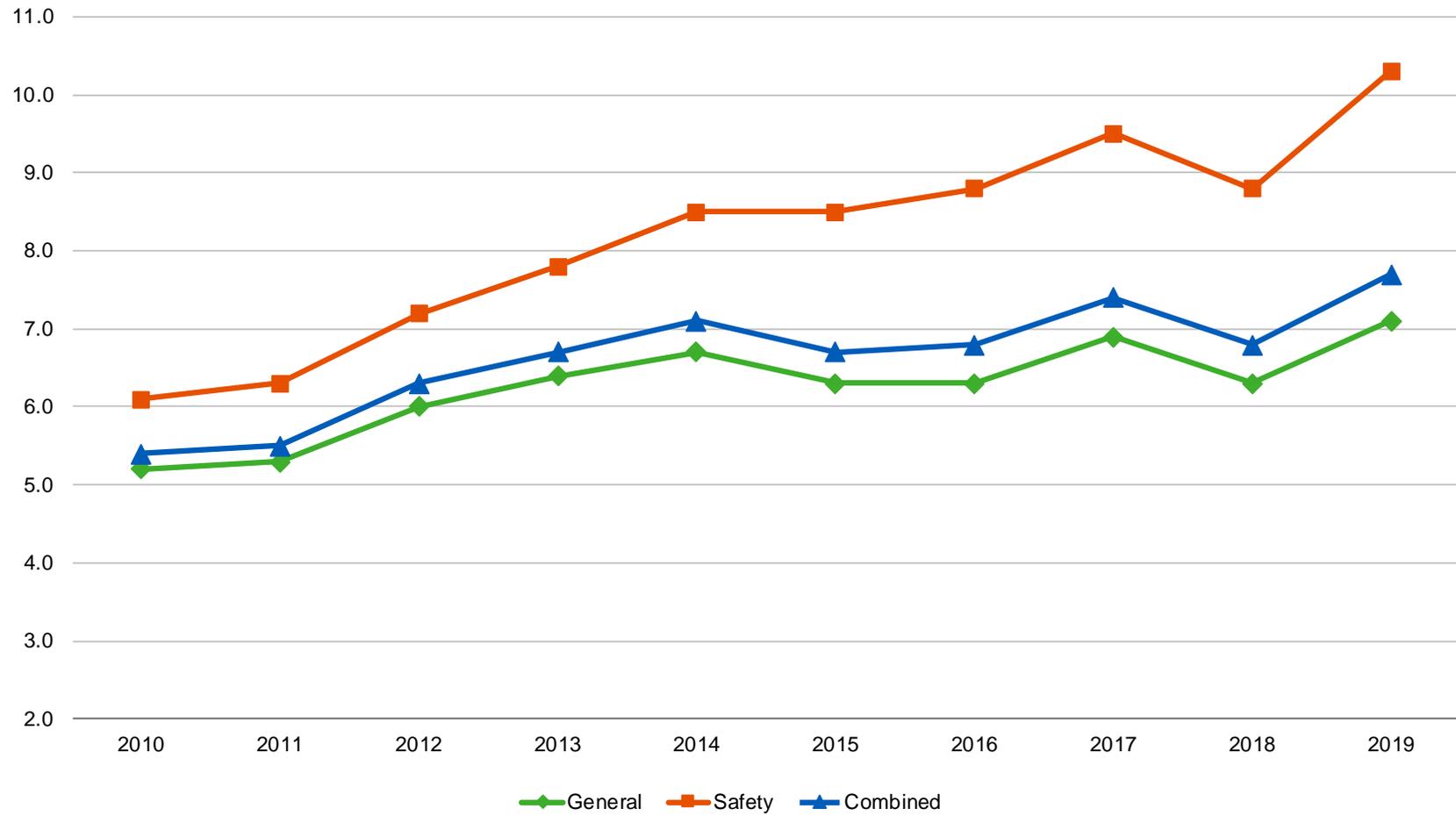
December 31, 2019

Employee Group	AVR	10% Loss Compares to	LVR	10% Change Compares to
General	7.1	71% of payroll	7.7	77% of payroll
Safety	10.3	103% of payroll	10.9	109% of payroll
Combined	7.7	77% of payroll	8.3	83% of payroll

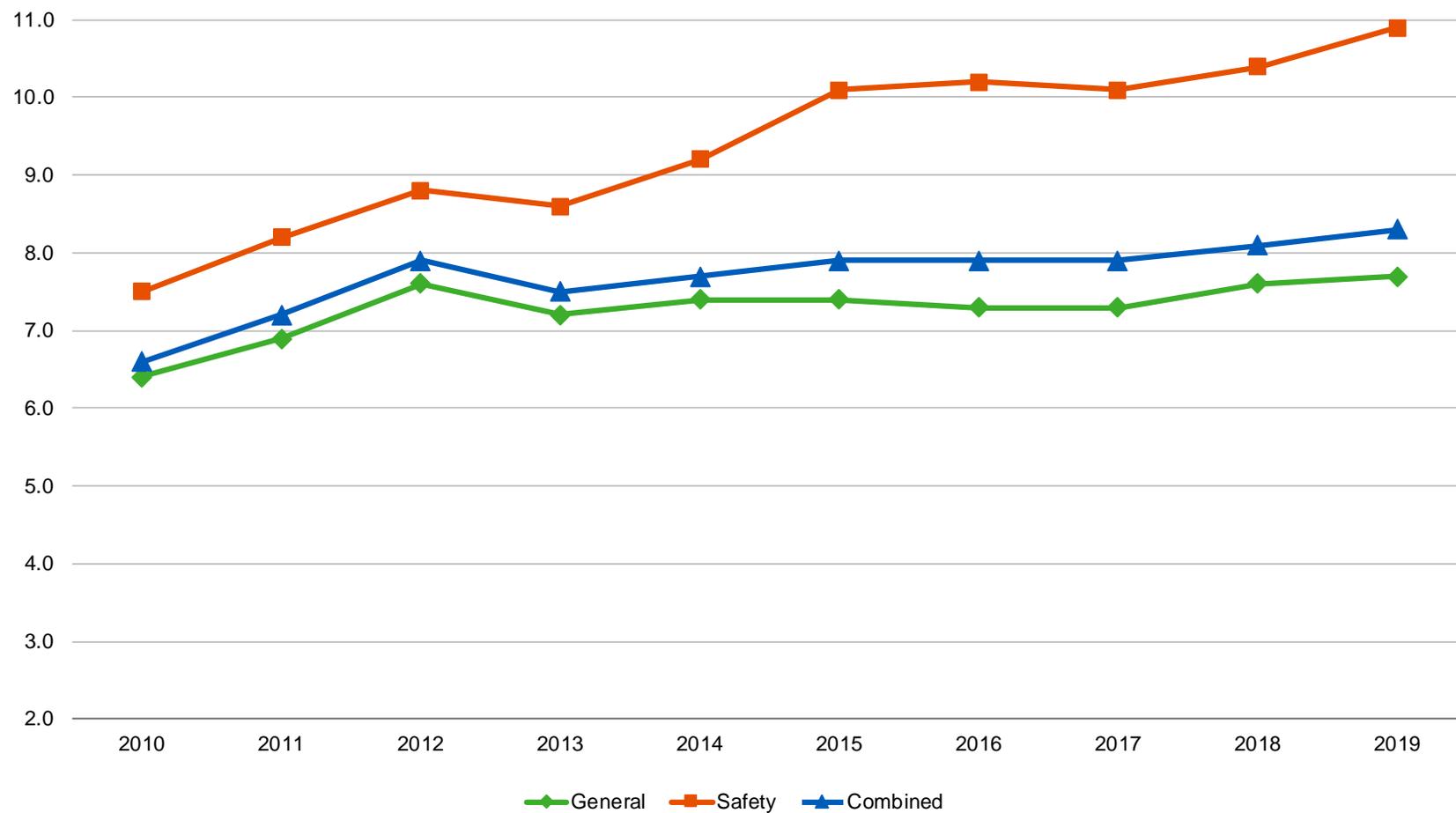
Ratios of Members in Pay-Status (Retirees and Beneficiaries) to Active Members & Non-Active Members (Inactive Vested, Retirees and Beneficiaries) to Active Members in December 31, 2010 to 2019 Valuations



Asset Volatility Ratios in December 31, 2010 to 2019 Valuations



Liability Volatility Ratios in December 31, 2010 to 2019 Valuations



Appendix: Actuarial Assumptions & Methods, Actuarial Certification, and Detailed Scenario Test Results

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 December 31, 2019 valuation.

Deterministic Projection

In addition, we have prepared the deterministic projection using the following assumptions and methods applied in the December 31, 2019 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., 20-year layers and level percent of pay).
- Economic assumptions will remain unchanged, including the annual 7.00% investment earnings and 3.25% active payroll growth assumptions.
- Deferred investment gains and losses will be recognized over a five-year period.
- In estimating the benefit payments for the open group, we have assumed that the annual payments will increase by 6% for the Plan.
- All other actuarial assumptions used in the December 31, 2019 actuarial valuation will be realized.

Other Considerations

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, we emphasize that deterministic projections, by their nature, are not a guarantee of future results. 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 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.

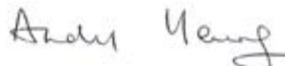
B: Actuarial Certification

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

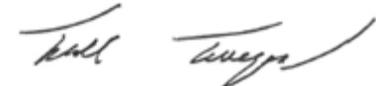
The actuarial opinions expressed in this report were prepared by Paul Angelo, FSA, MAAA, FCA, Enrolled Actuary, Andy Yeung, ASA, MAAA, FCA, Enrolled Actuary, and Todd Tauzer, FSA, MAAA, FCA, CERA. We are members of the American Academy of Actuaries and we meet the Qualification Standards of the American Academy of Actuaries to render the actuarial opinion herein.



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



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C: Detailed Scenario Test Results

The following table contains detailed results from each of the three hypothetical market return scenario projections.

- Scenario 1: Return at 14.00% (2020), 7.00% thereafter
- Scenario 2: Return at 7.00% (2020 and thereafter)
- Scenario 3: Return at 0.00% (2020), 7.00% thereafter

	Projected Employer Rates (% of Payroll)			Projected Funded Ratio (Valuation Value Basis)			Projected UAAL (\$ Millions)		
	Scenario 1	Scenario 2	Scenario 3	Scenario 1	Scenario 2	Scenario 3	Scenario 1	Scenario 2	Scenario 3
2018	20.6%	20.6%	20.6%	86.8%	86.8%	86.8%	405	405	405
2019	19.5%	19.5%	19.5%	89.4%	89.4%	89.4%	332	332	332
2020	17.6%	18.3%	19.1%	93.0%	91.7%	90.5%	228	269	309
2021	16.1%	17.8%	19.5%	96.7%	93.9%	91.0%	110	204	299
2022	16.8%	19.5%	22.1%	99.0%	94.6%	90.3%	36	184	333
2023	10.5%	18.3%	21.8%	102.7%	97.0%	91.3%	(93)	106	306
2024	10.2%	18.0%	22.2%	104.9%	98.0%	91.1%	(174)	73	320
2025	10.0%	17.7%	22.0%	105.6%	99.0%	92.1%	(202)	38	289
2026	9.8%	17.4%	21.8%	105.9%	99.9%	93.2%	(218)	2	252
2027	9.6%	9.6%	21.0%	106.3%	101.0%	94.4%	(235)	(37)	209
2028	9.4%	9.4%	18.6%	106.7%	102.1%	95.7%	(253)	(80)	161
2029	9.2%	9.2%	17.4%	107.2%	102.8%	97.1%	(272)	(107)	110
2030	9.1%	9.1%	13.9%	107.7%	103.1%	98.4%	(293)	(115)	60
2031	9.0%	9.0%	10.9%	108.4%	103.3%	99.6%	(314)	(125)	15
2032	8.8%	8.8%	8.8%	109.1%	103.6%	100.6%	(338)	(135)	(23)
2033	8.7%	8.7%	8.7%	110.0%	104.0%	101.3%	(363)	(146)	(46)
2034	8.6%	8.6%	8.6%	111.0%	104.4%	101.6%	(389)	(157)	(56)
2035	8.5%	8.5%	8.5%	112.2%	105.0%	101.8%	(417)	(169)	(61)
2036	8.4%	8.4%	8.4%	113.8%	105.6%	102.0%	(448)	(182)	(66)
2037	8.4%	8.4%	8.4%	115.8%	106.4%	102.4%	(480)	(195)	(72)
2038	8.3%	8.3%	8.3%	118.5%	107.5%	102.8%	(514)	(210)	(78)