

CALSTRS

2022 Review of Funding Levels and Risks

Presented November 2, 2022

TABLE OF CONTENTS

Introduction	3
Path to full funding	5
The risk environment	13
Measures of plan maturity and volatility	28
Ability to reach full funding under different actuarial assumptions	33
Conclusion	37

INTRODUCTION

This is the seventh annual edition of the CalSTRS *Review of Funding Levels and Risks* report. The CalSTRS *Review of Funding Levels and Risks* report provides information to the Teachers' Retirement Board, stakeholders, policymakers and the public to assess the soundness and sustainability of the CalSTRS Defined Benefit Program and to promote a better understanding of how well the CalSTRS Funding Plan is expected to accomplish its goal of achieving full funding by 2046.

To better understand the risks associated with funding the system, this report examines a range of potential negative outcomes, both economic and demographic, that could endanger the long-term funding of the system and prevent the system from reaching full funding.

This report is based on the June 30, 2021 annual valuation of the Defined Benefit Program and reflects all relevant changes that have occurred since the valuation, including the investment loss reported for the 2021–22 fiscal year.

This report includes four main sections focusing on the following:

- **Path to full funding:** Discusses the significant changes in the past year and their impact on long-term funding and contribution rates.
- **The risk environment:** Discusses the risks to long-term funding, including longevity risk, risks related to membership decline, and future payroll growth and investment-related risk.
- **Measures of plan maturity and volatility:** Discusses how increasing maturity levels impact contribution rate volatility.
- **Ability to reach full funding under different actuarial assumptions:** Discusses how changes to some of the key economic assumptions would impact CalSTRS' ability to reach full funding.

EXECUTIVE SUMMARY

The California State Teachers' Retirement System was founded in 1913 with 120 retired members and 15,000 active members. More than 100 years later, CalSTRS remains committed to its mission to secure the financial future and sustain the trust of California's educators and to provide retirement, disability and survivor benefits to them and their families.

To that end, CalSTRS has come a long way. Prior to the 2014 adoption of the funding plan, the Defined Benefit Program was expected to run out of assets in about 30 years. Thanks to the funding plan and the limited rate-setting authority it provides the board to adjust the state and employer contribution rates, CalSTRS is now financially stronger and better positioned to achieve full funding and react to demographic and economic changes.

CalSTRS continually monitors the funding plan and the financial health of the fund and provides formal assessments of funding levels and risks to the board twice a year. These formal assessments are presented in the spring through the annual actuarial valuation report and in the fall through the *Review of Funding Levels and Risks* report. In addition to these two formal reports, CalSTRS provides updates to the board on the status of various funding-related risks as part of the semi-annual enterprise risk management report. These semi-annual reports are generally presented in March and September of each year.

CalSTRS is also required by statute to provide a report to the Legislature every five years on the progress of the funding plan. The first progress report was completed and provided to the Legislature in June 2019. The next progress report is due in June 2024.

As shown in this year's *Review of Funding Levels and Risks* report, even with the investment loss suffered by CalSTRS in 2021–22, CalSTRS remains slightly ahead of schedule in its goal of having the Defined Benefit Program reach full funding by 2046. For more details, please refer to the "Path to full funding" section.

Key results and findings of this report include:

- The state's share of the CalSTRS unfunded actuarial obligation is still projected to be eliminated prior to 2046, but not as early as projected in the June 30, 2021 actuarial valuation.
- The current contribution rates for the state and employers are projected to be sufficient to allow both the state and the employers to eliminate their share of the CalSTRS unfunded actuarial obligation by 2046. Contribution rate increases are not expected to be needed for fiscal year 2023–24.
- The largest risk facing CalSTRS' ability to reach full funding remains investment-related risk, especially considering the Defined Benefit Program continues to mature, which will increase the system's sensitivity to investment experience. The state's share of the unfunded actuarial obligation could quickly increase if CalSTRS were to experience another year in which the investment return is significantly below the assumed rate of return.
- Anticipated continued decreases in enrollment in K–12 public schools could lead to future declines in the size of the active membership, resulting in lower than anticipated payroll growth. This could negatively impact CalSTRS' ability to achieve full funding, requiring contribution rate increases, especially for employers.
- A recession resulting in a period of low investment returns and a decline in the size of the active membership could hurt CalSTRS' ability to reach full funding. However, by having a funding plan in place, CalSTRS remains in a favorable position to be able to react to a future recession to keep the funding plan on track.
- The ability of the funding plan to allow CalSTRS to reach full funding is dependent on CalSTRS meeting its current actuarial assumptions over the long term. Uncertainty around inflation, investment markets and payroll growth could put pressure on CalSTRS' ability to meet some of its long-term actuarial assumptions.

Path to full funding

Key findings:

- Despite the investment loss experienced by CalSTRS in 2021–22, CalSTRS remains slightly ahead of schedule in its goal of having the Defined Benefit Program reach full funding by 2046.
- Contribution rates for the state and employers will not need to increase in fiscal year 2023–24 to allow both the state and the employers to eliminate their share of the CalSTRS unfunded actuarial obligation by 2046.

PATH TO FULL FUNDING

One of CalSTRS' main goals is to ensure a financially sound retirement system for California's educators. Progress toward this goal was made possible in 2014 with the passage of the CalSTRS Funding Plan.

The funding plan set out a measured schedule of contribution rate increases for members, employers and the state with the goal of achieving full funding by 2046. It also provided the board with limited authority to adjust rates to help keep the funding plan on schedule.

This section discusses how significant changes in the past year have impacted future funding levels and the contribution rates needed for the state and employers to continue the progress toward reaching full funding by 2046.

Significant changes in the past year

Over the last year, the board continued to exercise its rate setting authority to keep the funding plan on track for the Defined Benefit Program to reach full funding by 2046. At the May 2022 meeting, the board voted to keep the state and employer contribution rates at existing levels. Although both contribution rates could have been reduced and still allow the Defined Benefit Program to reach full funding by 2046, the board took the prudent approach of keeping contribution rates at existing levels knowing CalSTRS would likely suffer an investment loss in fiscal year 2021–22. The board kept the state contribution rate to the Defined Benefit Program at 8.328% of payroll and the employer contribution rate at 19.1% of payroll. Note that throughout this report, only the state contribution rate to the Defined Benefit Program is being analyzed. The state also pays 2.5% of payroll to fund the Supplemental Benefit Maintenance Account, CalSTRS' inflation protection program.

Even though the board voted to keep the total employer rate at 19.1% of payroll for the second year in a row, the net employer contribution rate paid to CalSTRS increased from 16.92% of payroll in fiscal year 2021–22 to 19.1% in fiscal year 2022–23 due to the expiration of the rate relief provided by the state. As part of the 2020–21 state budget, the state redirected supplemental payments paid on behalf of employers to provide short-term contribution rate relief for anticipated economic conditions associated with the COVID-19 pandemic. The rate relief was set at 2.95% of payroll in fiscal year 2020–21 and 2.18% of payroll in 2021–22. Since the state did not provide additional rate relief for fiscal year 2022–23, employers experienced a rate increase of 2.18% of payroll in fiscal year 2022–23.

After a year in which CalSTRS earned a 27.2% investment return, one of the highest investment returns in CalSTRS history, fiscal year 2021–22 was a bumpy year for financial markets. In the second half of the fiscal year, U.S. equity markets were down more than 20%. In July 2022, CalSTRS reported a -1.3% investment return for fiscal year 2021–22. Although the return was negative, many retirement systems in the U.S. reported returns ranging between -5% and -10% for fiscal year 2021–22.

Note that the -1.3% investment return for last fiscal year 2021–22 is a time-weighted rate of return. A time-weighted rate of return is used to measure an investment managers' performance without considering the impact of cashflows (benefit payments, contributions, etc.) because they are not controlled by the investment manager. For financial reporting purposes, CalSTRS calculates and prepares disclosures for the money-weighted rate of return on pension plan investments. The money-weighted rate of return provides information about the performance of the investment portfolio while considering the effects of all pertinent cashflows.

There is no expectation that the two measures will be the same for any given fiscal year, but the two calculations for CalSTRS have been historically close. For fiscal year 2021–22, the money-weighted rate of return was calculated to be -2.4%. In addition to the differences in the nature and purpose of the return measures noted above, differences in the timing of the recognition of unrealized gains and losses for private asset investments have also contributed to the difference seen for fiscal year 2021–22.

Note that this is a common practice for retirement systems where the value of private asset investments generally lags by one quarter when

PATH TO FULL FUNDING

the time-weighted investment returns is reported in July. For funding purposes, the -2.4% money-weighted rate of return will be the return that will be reflected in the asset values that will be used for the June 30, 2022 actuarial valuation to determine funding levels and set contribution rates. Therefore, the -2.4% return was used for the projections performed for this report.

Despite the investment loss experienced by CalSTRS in 2021–22, CalSTRS remains slightly ahead of schedule in its goal of the Defined Benefit Program reaching full funding by 2046. This is due to the exceptional investment return earned by CalSTRS in fiscal year 2020–21. The 27.2% return in fiscal year 2020–21 was more than 20% higher than the assumed investment return of 7%. Based on a -2.4% return for 2021–22, CalSTRS earned a return that was 9.4% below its assumed investment return. Even with the investment loss in 2021–22, CalSTRS exceeded on average its assumed investment return assumption of 7% over the last two years.

Although it does not have an immediate impact on funding levels or contribution rates to the Defined Benefit Program, inflation over the past year was the highest seen in over forty years. Inflation was 8.3% in California in fiscal year 2021–22. The level of inflation is a significant assumption used in funding the program as it's a building block in determining both the assumed rate of return as well as the assumed annual growth of the total payroll. The impact of the inflation assumption is discussed further in the section on CalSTRS' ability to reach full funding under different actuarial assumptions.

Finally, after seeing decreases in the number of active members who participate in the Defined Benefit Program in each of the last two years, the number of active teachers increased by about 20,000 in 2021–22. The number of active members increased from 429,000 to 449,000, returning to the levels seen two years ago. As a result, the total payroll increased by about 6%, more than the assumed 3.5% annual growth.

The impact of these events on projected funding levels and contribution rates is discussed in more details in the next few sections.

Changes since the passage of the CalSTRS Funding Plan

When the funding plan was adopted by the Legislature in 2014, it was based on CalSTRS' annual actuarial valuation as of June 30, 2013, which was the most recent actuarial valuation available at the time. It's important to remember that the funding plan was developed based on the actuarial assumptions in place at that time, which included a long-term investment return assumption of 7.5%.

Since the passage of the funding plan, the board has taken several steps to further strengthen the funding of the system. In 2015, the board recognized the importance of protecting against equity market downturns by creating and investing in a Risk Mitigating Strategies asset class. In 2017, the board adopted new actuarial assumptions, reflecting lower future investment earnings and longer life expectancies. The long-term investment return assumption was lowered from 7.5% to 7.0% over a two-year period, while the assumed life expectancy of CalSTRS members was increased by two to three years through the adoption of updated mortality assumptions.

Since fiscal year 2017–18, the first year the board was given the authority to set the state contribution rate, the board has increased the state contribution rate by 0.5% of payroll on four occasions to keep the funding plan on track. The board also voted to keep the employer rate at 19.1% for the last two years to keep the employers on track to eliminate their share of CalSTRS unfunded actuarial obligation by 2046.

Given all these actions, it's instructive to see how the total unfunded actuarial obligation has changed since the adoption of the funding plan. When the funding plan was adopted in 2014, the unfunded actuarial obligation on June 30, 2013, was \$73.7 billion. In the June 30, 2021 actuarial valuation, the unfunded actuarial obligation was \$89.7 billion—about \$16 billion higher than in 2013.

When the funding plan was adopted in 2014, the unfunded actuarial obligation was expected to go through a period of growth. When a pension plan is less than 100% funded, contributions toward the

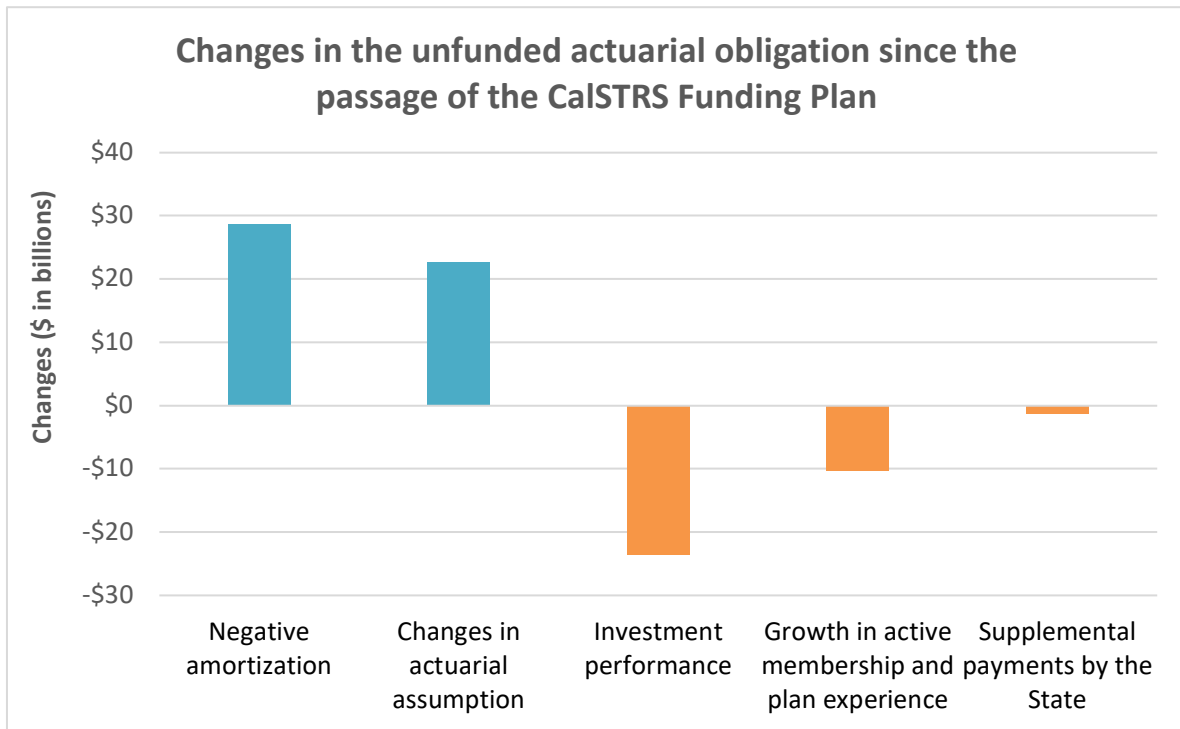
PATH TO FULL FUNDING

unfunded actuarial obligation must exceed the interest on the unfunded actuarial obligation to prevent it from increasing over time. Failing to contribute an amount greater than the interest will result in an increase of the unfunded actuarial obligation from year to year. This is referred to as negative amortization. For CalSTRS to avoid negative amortization, payments toward the unfunded actuarial obligation must be more than 7% of the unfunded actuarial obligation.

With the phased-in rate increases established through the funding plan, it was anticipated that contributions would not be sufficient to prevent the unfunded actuarial obligation from increasing over the first few years. Since the June 30, 2013 actuarial valuation, the unfunded actuarial obligation increased by about \$29 billion as a result of negative amortization.

Another big contributor to the increase in the unfunded actuarial obligation since the passage of the funding plan is the board's adoption of new demographic and investment return assumptions. Changes in actuarial assumptions have resulted in an increase of about \$23 billion in the unfunded actuarial obligation. Note that the changes in actuarial assumptions have put CalSTRS in a stronger financial position long term, even if they resulted in a one-time increase in the unfunded actuarial obligation.

The chart below illustrates the major factors that have led to the changes in the unfunded actuarial obligation since the passage of the funding plan.



As can be seen in the chart above, positive plan experience, mainly investment performance and growth in the active membership, combined with the supplemental payments made by the state to reduce their share of CalSTRS' unfunded actuarial obligation, have resulted in a total decrease of about \$35 billion in the unfunded actuarial obligation.

PATH TO FULL FUNDING

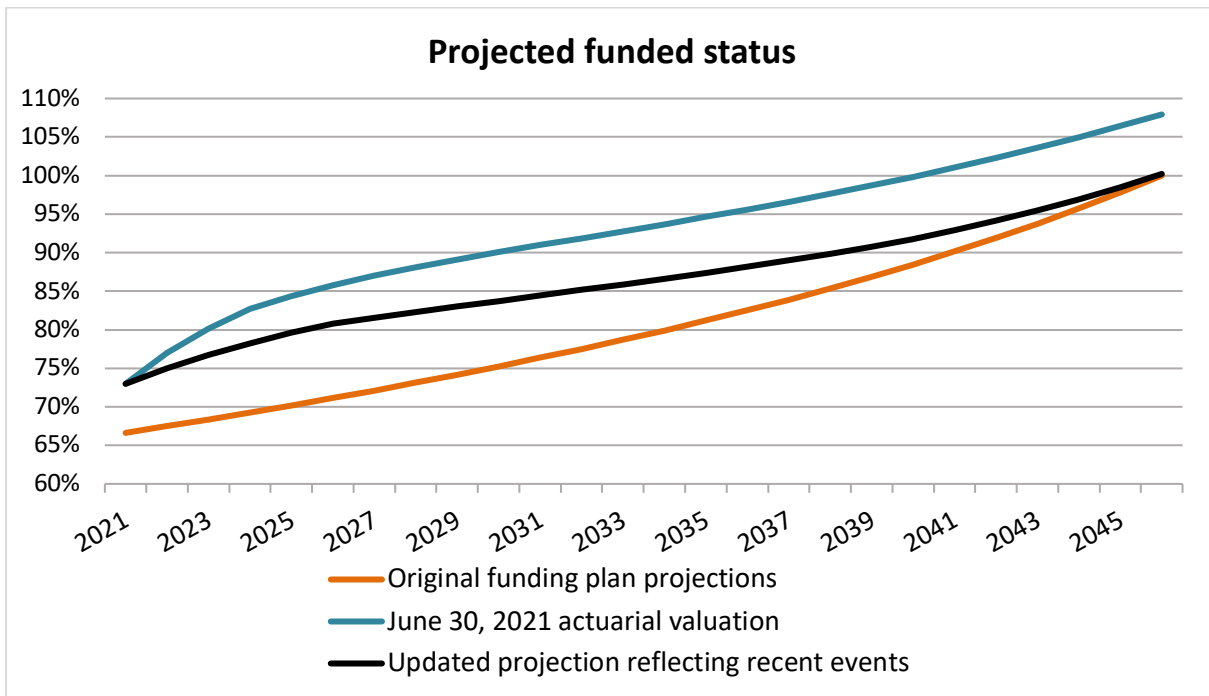
Although the unfunded actuarial obligation has increased by \$16 billion since 2013, funding levels have gradually improved. On June 30, 2013, the funded status of the Defined Benefit Program was 66.9%. On June 30, 2021, the most recent actuarial valuation, the funded status was 73.3%. It's worth noting that when the funding plan was adopted in 2014, it was projected at the time that the funded status would be 66.6% on June 30, 2021.

The next section provides more details on projected funding levels and the projected unfunded actuarial obligation.

Projected funding levels

When the June 30, 2021 actuarial valuation was completed and presented to the board in May 2022, it showed the funded status for the Defined Benefit Program was 73.3%. The valuation also showed projected funding levels had improved greatly compared to the previous year as a result of the 27.2% investment return in 2020–21 and that CalSTRS was ahead of the funding plan's schedule to reach full funding by 2046. However, these projections assumed CalSTRS would earn a 7% investment return in all future years and did not reflect the investment loss for 2021–22.

The following chart compares projected funding levels that were expected when the funding plan was adopted in 2014 to those presented to the board in May 2022 as part of the June 30, 2021 actuarial valuation and to the revised projected funding levels reflecting last year's investment loss. Note that the chart assumes the fund will earn 7% every year into the future.



As shown above, although funding levels are now projected to be lower than anticipated in the June 30, 2021 actuarial valuation, full funding is still expected to occur by 2046. When compared to the original funding level projections when the funding plan was adopted in 2014, CalSTRS is slightly ahead of schedule.

PATH TO FULL FUNDING

Note that for funding purposes, the funded ratio reported by CalSTRS is based on the actuarial value of assets calculated using the three-year asset smoothing policy adopted by the board. This value is a “smoothed” value that differs from the market value by reflecting only one-third of the net accumulated investment gains and losses. This approach is used to smooth out the impact of investment volatility on funding levels and contribution rates.

As a result of this asset smoothing policy, only one third of the investment gain from the 27.2% return was reflected in funding levels and contribution rates. Looking at it another way, two-thirds of investment gains from last year will be set aside and be available to dampen the impact of any potential investment losses over the next few years, acting like a rainy day fund.

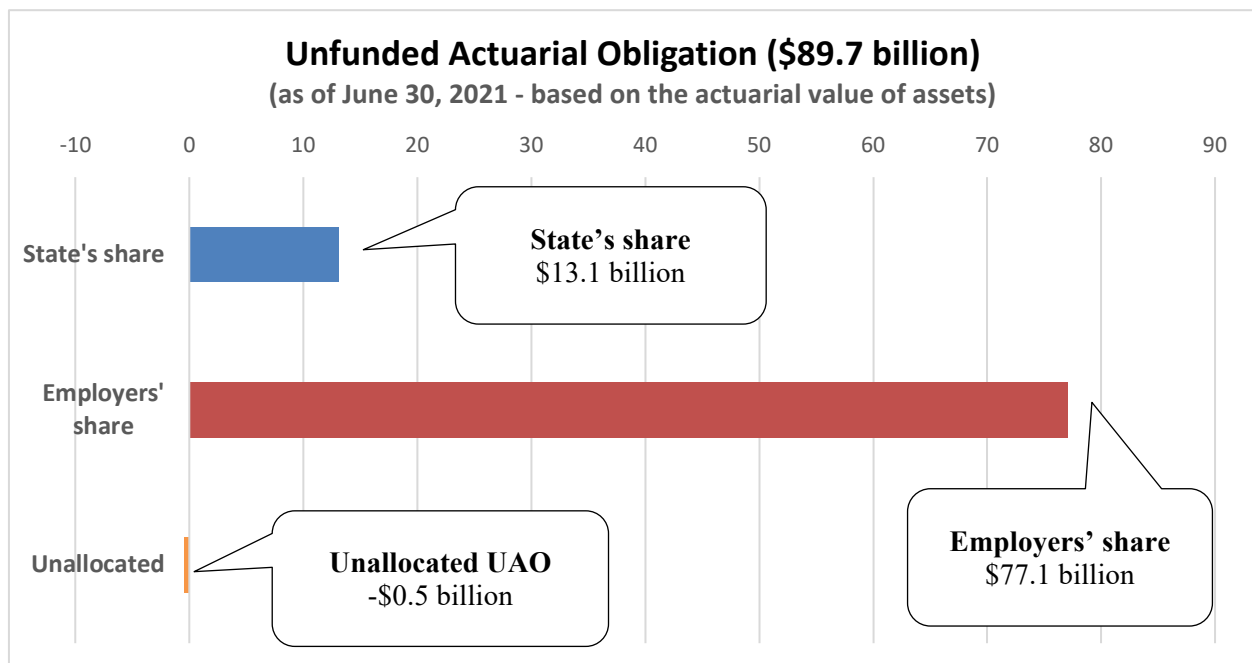
It’s important to remember that these projections assume all actuarial assumptions will be met in the future. Specifically, it assumes the fund will meet its 7% return assumption and that payroll will grow at 3.5% over the long term. A period of low investment returns could materially impact future funding levels. However, as will be demonstrated later in this report, even if the risk of not reaching full funding by 2046 is still present and will never be fully eliminated, CalSTRS remains in a favorable position to be able to react to a future recession to keep the funding plan on track.

Projected unfunded actuarial obligation

Although the system is currently on a path to full funding, it’s important to understand how the unfunded actuarial obligation and its various components are expected to change over time.

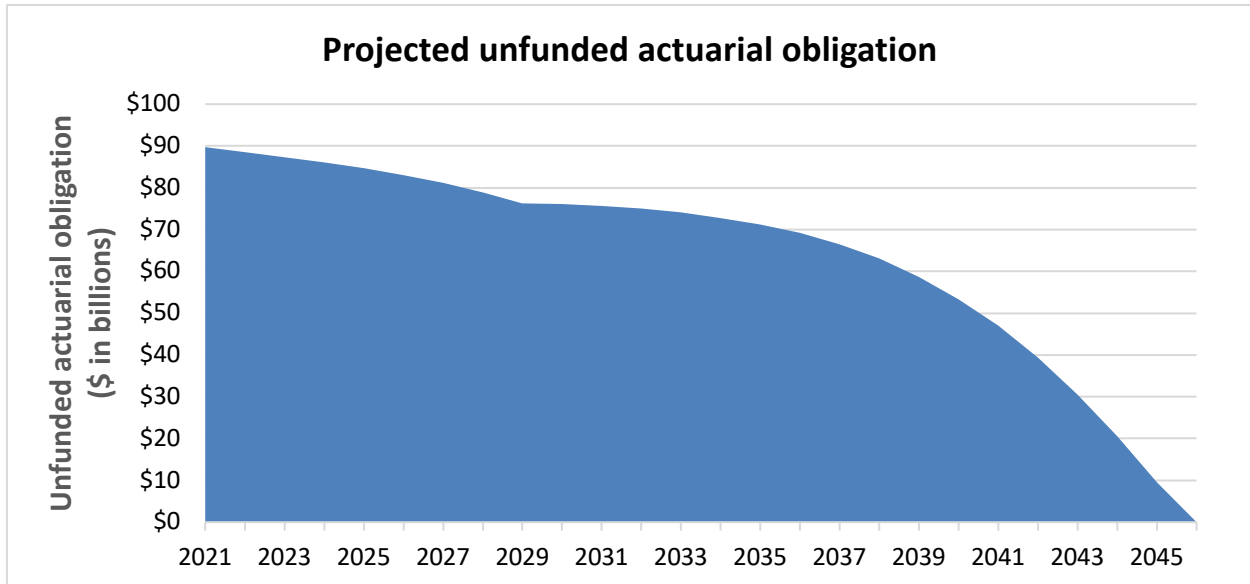
As per the rules of the funding plan, the unfunded actuarial obligation is divided between the state, the employers and the unallocated portion. The unallocated portion of the unfunded actuarial obligation is the portion for which the funding plan did not provide any authority to CalSTRS to adjust contribution rates to pay it down.

The following chart illustrates the breakdown of the unfunded actuarial obligation as of June 30, 2021. As can be seen, the unallocated portion was negative, i.e. it was in a surplus position. Prior to 2021, the unallocated had always been positive.



PATH TO FULL FUNDING

The following chart illustrates how the unfunded actuarial obligation is expected to change over time. As can be seen, the total unfunded actuarial obligation is projected to decline each year in the future and be eliminated by 2046. Note that as a result of the investment loss in fiscal 2021–22, the unfunded actuarial obligation is not projected to decline as fast as projected in the June 30, 2021 actuarial valuation.



When looking at the separate components of the unfunded actuarial obligation, it's worth noting the employers' share of CalSTRS' unfunded actuarial obligation is expected to continue to slightly increase over the next few years and will start to significantly decrease in the last 10 years of the funding plan and is expected to be eliminated in 2046. The state's share is expected to decrease quickly over the next few years and is expected to be eliminated by 2028. In the 2021 valuation, it was expected to be eliminated by 2023.

This illustrates how sensitive the state's share is to investment performance. If CalSTRS were to experience another year with an investment return well below its 7% assumed return, the state's share could be materially impacted. Since the unallocated portion is in a surplus position, this unallocated surplus is expected to grow over time and reach \$2.8 billion by 2046. The unallocated portion could quickly become unfunded again if CalSTRS were to have another year in which the investment return is well below 7%.

PATH TO FULL FUNDING

Projected contribution rates

In May 2022, the board took the prudent approach of keeping contribution rates at existing levels knowing CalSTRS would likely suffer an investment loss in fiscal 2021–22. The board kept the state contribution rate to the Defined Benefit Program at 8.328% of payroll and the employer contribution rate at 19.1% of payroll. Keeping contribution rates stable provides budget stability for the state and employers and strengthens the funding plan by reducing the risk the state and employers may not be able to eliminate their share of the unfunded actuarial obligation by 2046.

Assuming the board continues to keep contribution rates at existing levels, it's expected that the state would be able to fully eliminate their share of the unfunded actuarial obligation by 2028. By keeping the employer rate at 19.1% of payroll, the employers' share is expected to be eliminated by 2046.

As per the rules of the funding plan, once the state has eliminated its share of CalSTRS' unfunded actuarial obligation, the state contribution rate will be immediately reduced to the base contribution rate of 2.017% of payroll. The state contribution rate is now expected to drop to the base contribution rate by fiscal year 2029–30. A year ago, it was anticipated the state contribution rate would drop to the base contribution rate by fiscal year 2024–25. This change highlights once again how sensitive the state contribution rate is to investment performance. It's important to remember these projections assume the fund will meet its 7% return assumption and that payroll will grow at 3.5% over the long term. A period of low investment returns could materially impact future state contribution rates.

Note that the board could also lower the state contribution rate by 0.5% each year going forward and still allow the state to eliminate their share of the unfunded actuarial obligation by 2032 instead of 2028. Doing so, however, could potentially increase the risk to the funding plan especially if CalSTRS were to experience a year in which the investment return is well below 7%. Keeping the state contribution rate at existing levels would not only help improve funding levels faster but would also allow CalSTRS, if necessary, to increase and bring the state contribution rate to the adequate levels more rapidly.

The risk environment

Key findings:

- Anticipated continued decreases in enrollment in K-12 public schools could negatively impact CalSTRS' ability to achieve full funding if it leads to future declines in the number of teachers in California.
- The largest risk facing CalSTRS' ability to reach full funding remains investment-related risk.
- As a result of the investment loss in 2021-22, the probability of reaching full funding has been slightly reduced while the probability of seeing lower funding levels has increased. However, by having a funding plan in place, CalSTRS remains in a favorable position to be able to react to a future recession to keep the funding plan on track.

THE RISK ENVIRONMENT

The risk environment is dynamic. In fiscal year 2020–21, CalSTRS experienced one of the highest investment returns in its history. The following fiscal year, CalSTRS had its first negative investment return in over 10 years. Inflation for the past year has been the highest in over 40 years. Although the COVID-19 pandemic seems to be on the wane, the lingering effect on people’s health has resulted in decreases in life expectancies and raised the questions of what the long-term impact on mortality will be. Furthermore, CalSTRS has experienced significant swings in the number of active members over the last few years.

This section discusses the long-term funding impact of risks like these going forward. Specifically, this section will examine the risk associated with longevity, payroll growth and investments.

Longevity risk

Each year, this report updates and examines the impact of longevity on the funding of the system. Longevity risk refers to the potential that members live longer than anticipated, and thus, the lifetime benefit they receive lasts longer than expected. This section includes information on how the COVID-19 pandemic has impacted the number of CalSTRS members’ deaths. It also analyzes longevity from a historical perspective and how CalSTRS addresses the risk using generational mortality.

Long term impact of the COVID-19 pandemic

The COVID-19 pandemic adds extra uncertainty to CalSTRS’ projections of life expectancy. Although the number of people dying directly as a result of the coronavirus has decreased in the past year, the question remains what the long-term impact will be on the mortality of CalSTRS members. Expert opinions vary but it’s likely the effects on health and mortality from the COVID-19 virus will linger in the overall population for several years.

In April 2020, CalSTRS began a process of tracking mortality and collecting information for deaths of members and their beneficiaries related to the COVID-19 virus. CalSTRS relies on the death certificates indicating the COVID-19 virus as a reason of death. From these certificates, CalSTRS then collects the associated demographic information (e.g., age, gender, geographical location and CalSTRS membership status). The first known COVID-19 related death of a CalSTRS member was reported in March 2020.

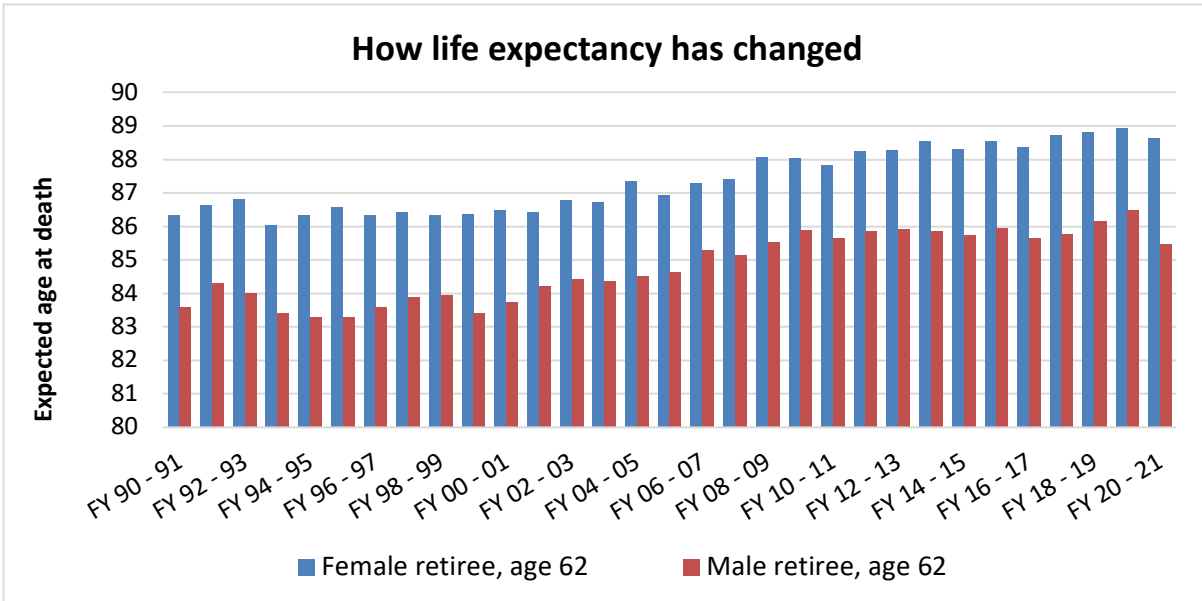
The availability of effective vaccines has significantly reduced the number of COVID-19 related deaths of CalSTRS members in the first half of 2022. As a result, CalSTRS stopped tracking COVID-19 related deaths as of April 30, 2022. During the tracking period there were a total of 1,146 COVID-19 related deaths of CalSTRS members, with a relatively even split of deaths between male and female members. The patterns of death followed closely the trends for the U.S. population as a whole with the peak number of deaths occurring in the December 2020 through January 2021 period.

If we include all deaths, CalSTRS observed about 20,000 deaths over the last two fiscal years. The total number of deaths was about 2,250 more than expected. Again, a similar pattern has been observed worldwide where the actual number of deaths has exceeded what would normally be anticipated. These excess deaths have also been greater than the number of reported COVID-19 related deaths, potentially due to an under-reporting of COVID-19 related deaths. The impact of the COVID-19 pandemic on life expectancy is discussed in the next section.

THE RISK ENVIRONMENT

Historical and projected life expectancy

CalSTRS has been tracking the period life expectancy of CalSTRS retired members since 1990. The following chart shows the historical trend of life expectancy for a CalSTRS member retiring at age 62.

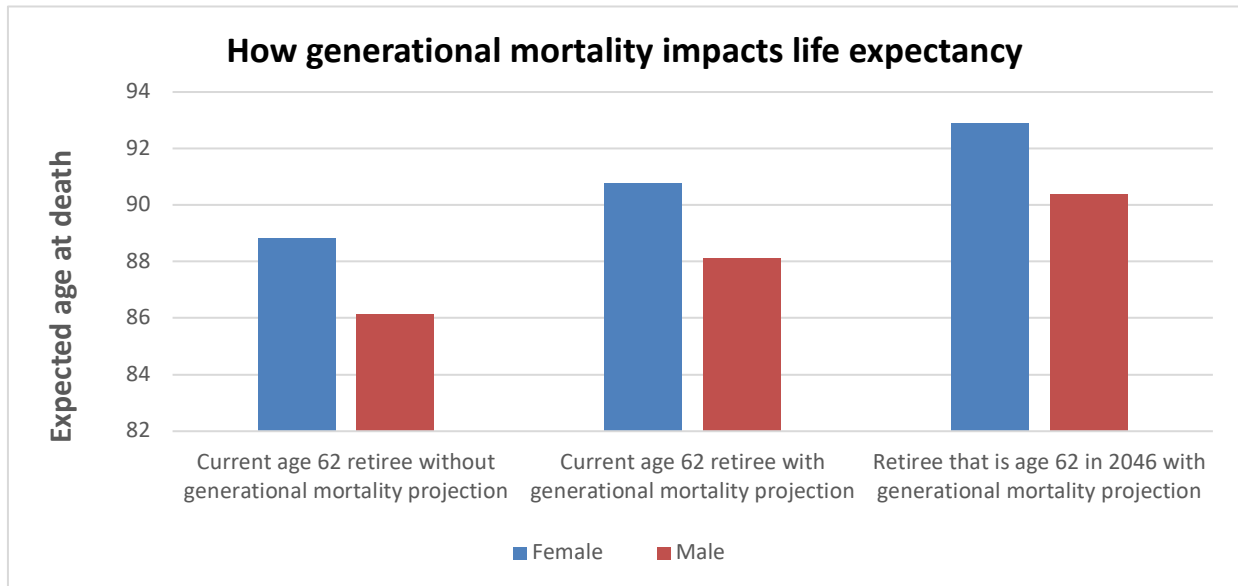


As illustrated, there are small variations from year to year. Until the COVID-19 pandemic, the overall trend was an increasing life expectancy over the past 30 years. In fact, between 1990 and 2020, both male and female members saw an almost two and a half-year increase in life expectancy. With higher than expected deaths caused by the COVID-19 pandemic, the life expectancy in 2020–21 dropped by about 0.3 years for female and one year for male. This is consistent with what has been experienced across the U.S. CalSTRS will continue to monitor changes in life expectancies to analyze whether the impact of the COVID-19 virus on life expectancies was temporary.

In 2017, the board made an important decision for the long-term sustainability of CalSTRS when it adopted the use of a technique known as generational mortality. This technique anticipates future improvements in life expectancy in the funding of the system, recognizing potential improvements in mortality ahead of time. CalSTRS currently uses an annual mortality improvement factor of 1.1% for most ages.

THE RISK ENVIRONMENT

The following chart illustrates the impact of generational mortality on a typical member retiring at age 62. Without generational mortality, a member retiring today would be expected to live to the age of about 89 for a female and age 86 for a male. By including generational mortality, the same member would be expected to live to age 91 for a female and to age 88 for a male. This effect compounds over time as the chart shows: By 2046, a member retiring at age 62 would be anticipated to live two additional years—to age 93 for a female and age 90 for a male.



To get an idea of the financial implications of the improvement in life expectancy, consider that, for the 2021–22 fiscal year, CalSTRS paid close to \$17 billion in benefits. If each member receiving a benefit today lives an additional two years, that would result in an additional \$34 billion in benefits over the life of the members as compared to what would have been paid if there were no improvements in mortality over time.

By adopting generational mortality, CalSTRS is accounting for these anticipated increases in life expectancy when determining the contribution rates needed to fund the system, putting CalSTRS in a stronger funding position as a result. CalSTRS reaffirmed its assumptions on both mortality rates and the 1.1% mortality improvement factor when it adopted the 2020 Actuarial Experience Analysis in January 2020. The next review will be presented to the board in the winter of 2024 and will include the impact of the COVID-19 pandemic. In addition to the formal review of actuarial assumptions every four years, CalSTRS monitors life expectancy annually through this report.

THE RISK ENVIRONMENT

Membership and payroll growth risk

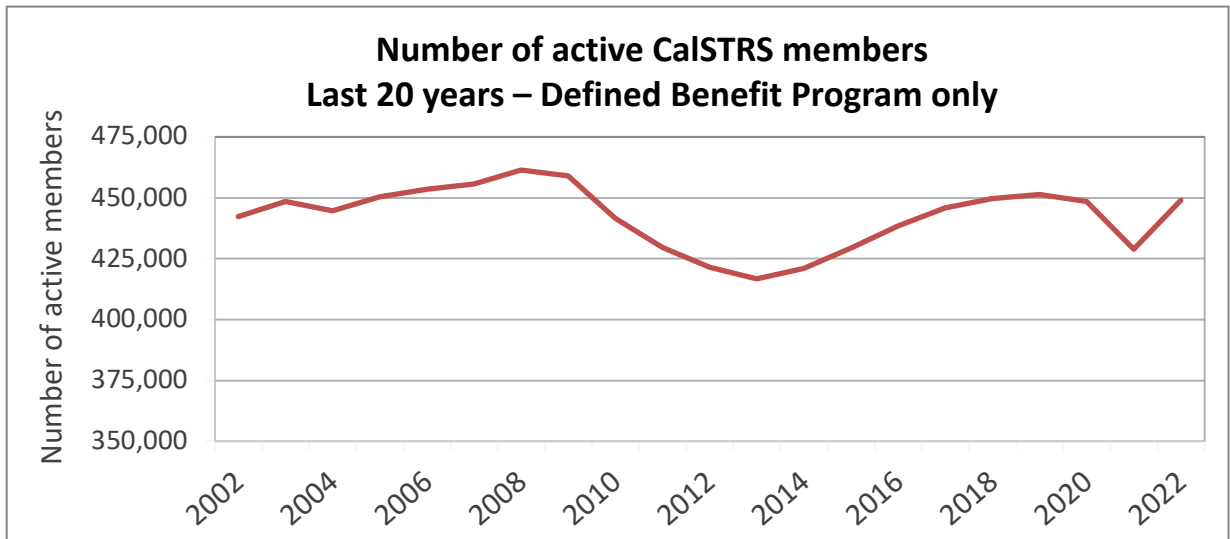
The risks associated with the number of active members and the growth of their overall payroll is another area that can have an impact on both funding levels and contribution rates. CalSTRS assumes the Defined Benefit Program payroll will grow by 3.5% annually over the long term. This assumption implies in part that the number of active members in the Defined Benefit Program will remain stable over time. This assumption is key in determining contribution rates and whether the funding plan will successfully eliminate the current unfunded actuarial obligation by 2046 since CalSTRS collects contributions as a percentage of payroll. If the payroll declines or fails to grow as assumed, CalSTRS' ability to make progress toward full funding could be at risk.

It's important to realize that when payroll fails to increase as assumed, it does not increase the overall cost to fund retirement benefits, nor does it change the dollar amount required to eliminate the unfunded actuarial obligation. However, the contribution rates needed to collect these contributions must increase just to collect the same amounts. If the needed increases in the contribution rates exceed the limits imposed by the funding plan, CalSTRS may not be able to reach full funding by 2046. Later in this report, the impact of payroll growth on CalSTRS' ability to reach full funding is measured in combination with the impact of lower than assumed investment performance.

Note that if high inflation were to persist and result in faster than expected payroll growth for teachers, it could have a positive impact on CalSTRS' ability to reach full funding.

Recent changes in active membership

The following chart shows the number of active members participating in the Defined Benefit Program for the last 20 years.



After seeing the number of active teachers drop for the last two years, the total number of active members has increased by about 20,000 in the last fiscal year. The number of active members is back to the levels last seen prior to the start of the COVID-19 pandemic. The total payroll increased by more than 6% over the last fiscal year, resulting in CalSTRS collecting more contributions from employers than expected. Over the last fiscal year, CalSTRS collected about \$300 million more in contributions from employers than anticipated in 2021–22.

THE RISK ENVIRONMENT

A likely contributor to the decline in active membership in 2020–21 was the higher than expected retirements CalSTRS experienced in that fiscal year and the uncertainties related to the COVID-19 pandemic. Although an increase in retirements would normally not impact long-term funding, not replacing the teachers who have retired can impact CalSTRS' ability to reach full funding by 2046, especially if it leads to an overall reduction in the number of teachers working in California and a reduction in total payroll. The increase in active teachers in 2021–22 is good news and helps strengthen the funding plan. CalSTRS will continue to monitor retirements, the number of active teachers and their impact on long-term funding.

Enrollment in K–12 public schools and community colleges

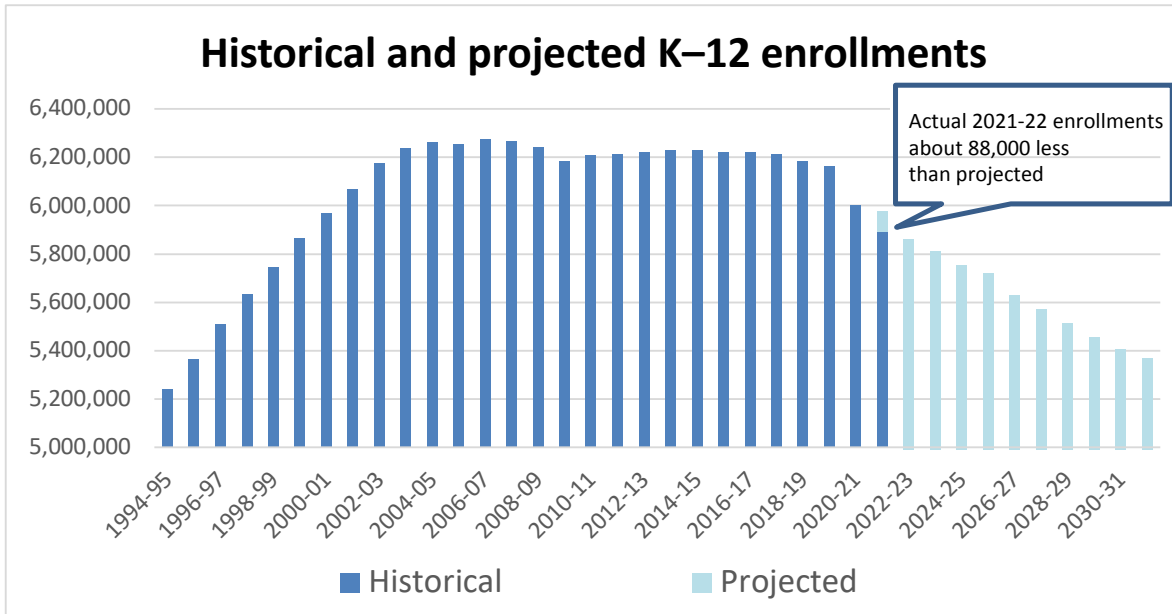
An area of particular concern related to payroll growth and the number of teachers in California is the decreasing population of children enrolled in K–12 public schools and those enrolled in community colleges in California. Over the last two school years, California experienced a decline in enrollment in both K–12 public schools and community colleges. Total enrollment in K–12 public schools in California dropped by about 271,000, or a 4.4% reduction, between 2019–20 and 2021–22. At the same time, the number of students enrolled at community colleges dropped by 316,000 or 20%, between the fall of 2019 and the fall of 2021.

This declining trend was experienced throughout the country. Even states such as Texas, Florida, Arizona, North Carolina and Georgia that saw population increases during the pandemic experienced similar decreases in school enrollment.

Several factors likely contributed to these drops in enrollments. Since the beginning of the COVID-19 pandemic, the number of homeschool students in grades K–12 in the U.S. doubled from about 2.5 million in 2019 to almost 5 million in 2021. Enrollment in private schools also increased during the pandemic. The number of children enrolled in private schools in California increased by 4% in 2020–21. What is unclear is whether the decrease in overall enrollment is permanent or simply a temporary effect of the COVID-19 pandemic.

Looking ahead further, in September 2022, the State of California updated its projection of K–12 enrollments for California. The updated projection assumes the number of children enrolled in K–12 public schools will continue to decline for the next 10 years. The most recent projection anticipates a decline of about 9% over the next 10 years. Compared to five years ago, this would represent a 12% reduction in K–12 enrollment. As shown below, the number of children enrolled in K–12 public schools is now expected to drop to levels last seen in California in the mid-1990s. Note that enrollment projections for community colleges are not available.

THE RISK ENVIRONMENT

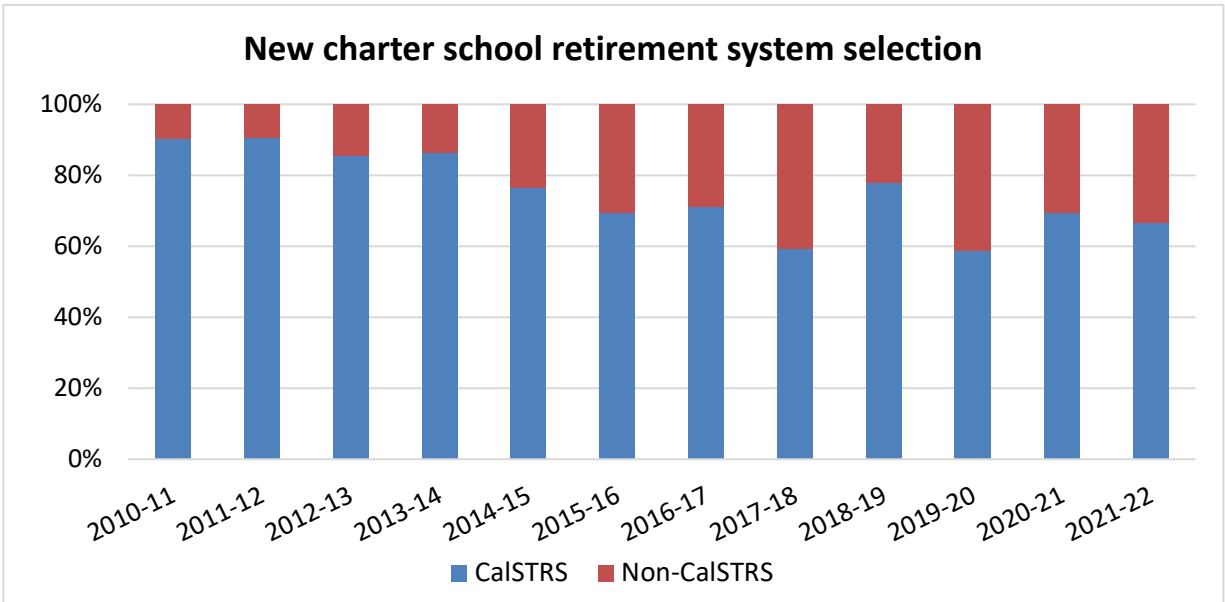


If the anticipated reduction in enrollment results in a need for fewer teachers in California, it would impact the number of active teachers who participate in the Defined Benefit Program and ultimately the growth in payroll. The situation could worsen if school districts were to face budget issues and rely either on layoffs or hiring freezes, leaving positions vacant as teachers leave or retire to reduce budget pressure. One countervailing force that could potentially offset some of the factors listed above is the adoption of universal transitional kindergarten that was included in the 2021–22 state budget. This essentially creates a new grade that will likely require more teachers to staff the new classes. This initiative is currently being phased in over several years. It's unclear how this will impact future payroll and the number of teachers, however it should be noted that the enrollment projections from the Department of Finance above include projections of TK students. CalSTRS will continue to monitor the situation closely. However, based on the revised projected decline in K–12 enrollment, it might be necessary to adjust the payroll growth assumption as part of the next experience study.

Update on charter schools not electing CalSTRS

For the past several years, CalSTRS has observed a trend among newly created charter schools of selecting a retirement system other than CalSTRS. When initially created, a charter school has the option to join CalSTRS or provide an alternate retirement benefit. Before the adoption of the funding plan, it was typical to have over 90% of newly created charter schools opting for CalSTRS benefits. However, as the following chart shows, since about 2014, between 20% and 40% of newly created charter schools have been selecting an alternate retirement system and have not elected to join CalSTRS. Note that the COVID-19 pandemic seemed to have slowed the growth in the number of charter schools in California. In 2020–21, only 23 new charter schools were created while 21 were created in 2021–22. Just two years ago, 113 new charter schools were created in California.

THE RISK ENVIRONMENT



Despite this recent trend, most charter schools still provide a CalSTRS benefit to their teachers. In the 2021–22 fiscal year, about 88% of the 1,294 charter schools provided a CalSTRS benefit. In terms of number of teachers, based on the most recent data from the California Department of Education, there were approximately 37,000 full-time equivalent teachers working in charter schools. Of those, about 32,200, or 87%, are covered by CalSTRS, and 4,800 have a non-CalSTRS benefit. Note that 4,800 represents just over 1% of CalSTRS’ active member population. It’s likely that if all these charter schools had instead elected to provide CalSTRS benefits, CalSTRS payroll would be about 1% higher today.

If the total payroll was 1% higher, the employer contribution rate could be reduced by about 0.15% of payroll and still allow the employers to eliminate their share of the unfunded actuarial obligation by 2046. A higher payroll would not result in a lower unfunded actuarial obligation and would not impact the overall dollar amount needed to pay it down. However, as a percentage of payroll, the contribution rates would be lower.

Investment risk

Investment volatility and the risk that CalSTRS may not be able to meet its assumed investment return over the long-term remains the greatest risk facing CalSTRS today. The combination of a maturing system and the decreasing timeframe of the funding plan only serves to exacerbate this risk.

The funding plan interacts with investment volatility risk in several ways. First, when investment returns are below expectations, the unfunded actuarial obligation increases, requiring additional contributions to bridge the gap. The funding plan provides the board limited authority to increase contribution rates for both the state and employers through 2046 for this purpose.

THE RISK ENVIRONMENT

Second, although employers are currently responsible for the greatest share of the unfunded actuarial obligation, the state bears the greatest risk when it comes to investment volatility. This is due to rules set in the funding plan that allocate the largest share of the assets to the state. As a result, its share of the unfunded actuarial obligation is most sensitive to investment volatility. There is also the issue of the unallocated share of the unfunded actuarial obligation. As stated earlier in this report, the unallocated portion of the unfunded actuarial obligation is the portion for which the funding plan did not provide any authority to CalSTRS to adjust contribution rates to pay it down. Even though the unallocated portion is in a surplus position, it could quickly become unfunded again if CalSTRS were to have another year in which the investment return is well below 7%.

Third, the specific restrictions that the funding plan places on contribution rate increases for both the state and employers limit CalSTRS' ability to respond to investment volatility. The board has authority to increase the state's contribution rate by a maximum 0.5% of payroll each year with no limit on the maximum rate. The employer rate can be increased by 1.0% of payroll each year with a maximum rate of 20.25% for employers. Another risk related to the state contribution rate is that the state contribution rate will be reduced to 2.017% of payroll once the state has eliminated its share of the unfunded liability. The risk associated with this aspect of the funding plan is particularly evident given the sensitivity of the state's share to investment volatility, which will be demonstrated in this report.

Finally, since the funding plan has an expiration date, the time period over which to fund any existing and new unfunded actuarial obligation is declining each year. The funding plan set the target of 2046 to fully fund the Defined Benefit Program, after which the board's authority to adjust contribution rates expires. As the 2046 deadline approaches, CalSTRS' capacity to withstand economic stresses will be limited and will make it harder for CalSTRS to reach full funding.

Risk of a large investment loss in a single year

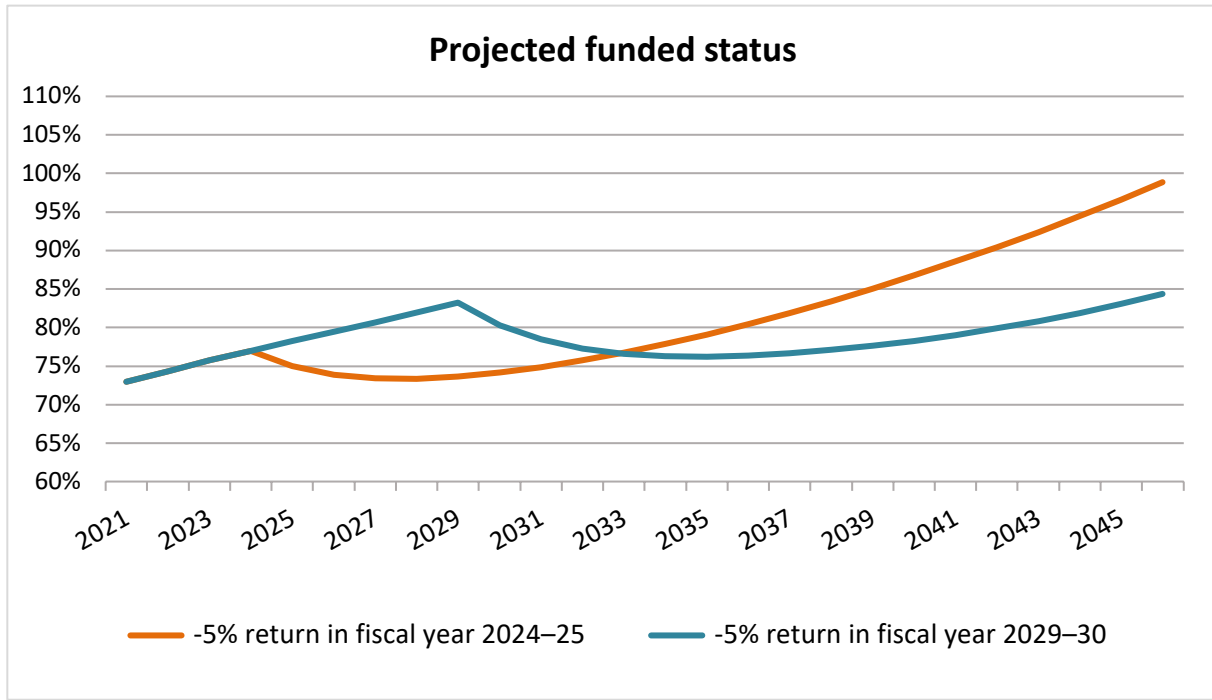
The purpose of this section is to highlight an investment-related risk that is exacerbated by one of the weaknesses in the funding plan. Specifically, the funding plan has a provision that requires the state's supplemental contribution rate be reduced to 0% of payroll immediately once the state's share of the unfunded actuarial obligation has been eliminated, as it's currently projected to do so by 2028. Once this occurs, the state's total contributions toward the Defined Benefit Program will drop from the current level of 8.328% of payroll to the base rate of 2.017% in fiscal year 2028–29. This provision essentially overrides any discretion the board has in setting the state supplemental rate.

The challenge this introduces to funding the Defined Benefit Program is that once the state's supplemental rate has been reduced to zero, if it were ever needed to be increased again, the board will be limited to increases of only 0.5% of payroll each year as per the funding plan. Since at that point the state supplemental rate will be starting from 0% and increasing by only half a percent each year, it could take many years before the board is able to increase the rate to the levels necessary to reduce any newly realized unfunded actuarial obligation.

To illustrate this risk, consider two simple scenarios. In both scenarios it's assumed that CalSTRS will earn its expected rate of investment return of 7% in most years, however the first scenario considers the results from an investment loss in a single year if it occurs in fiscal year 2024–25 and the second scenario considers the results from a loss in fiscal year 2029–30. The scenarios will consider a loss of the same magnitude but five years apart. The key point that will be important in the resulting impact on funding levels and contribution rates is that in the first scenario the loss occurs before the state's supplemental rate has been reduced and in the second scenario the loss occurs after the reduction in the state rate.

THE RISK ENVIRONMENT

The following chart highlights the results of this exercise. This analysis used a -5% return in the relevant fiscal years.



Although the loss was the same in both scenarios, the timing of the loss resulted in different outcomes. If the loss occurs in 2024–25, before the state supplemental contribution rate drops to 0%, the board would be able to increase the state supplemental contribution rate to the levels needed for the state to eliminate its share of the unfunded actuarial obligation by 2046.

If instead, the -5% investment loss occurs in 2029–30, after the state supplemental contribution rate drops to 0%, the board would never be able to bring the state contribution rate to the levels needed for the state to eliminate its share of the unfunded actuarial obligation by 2046. In this example, negative amortization would cause the state's share of the unfunded actuarial obligation to increase every year until reaching about \$112 billion on June 30, 2046. In both examples, the unallocated portion of the unfunded actuarial obligation would no longer be in a surplus position and since the board cannot adjust contribution rates to eliminate it, it would be expected to grow to about \$9 billion by June 30, 2046.

Risk of sustained low returns and lower payroll growth

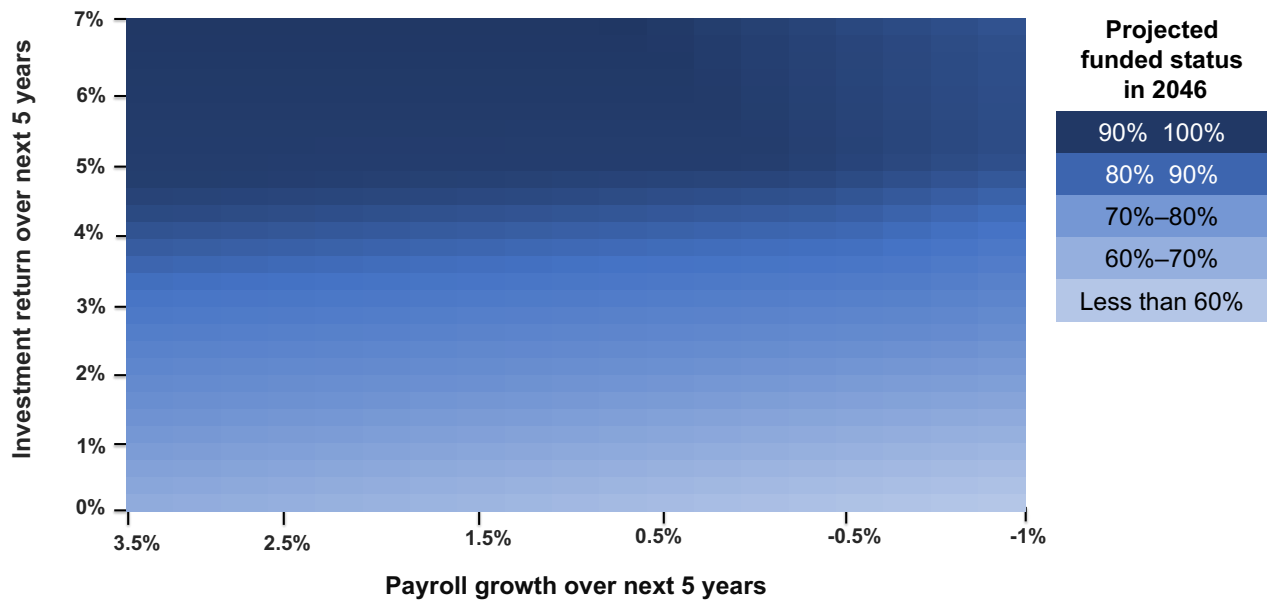
A useful way to analyze the ability of the funding plan to react to economic and demographic changes to reach full funding is to analyze both the impact of low investment returns with the impact of significant reductions in the number of active members and payroll generally seen with recessions. In past recessions, CalSTRS experienced both periods of low investment returns combined with significant reductions in the number of active members and payroll. These are the situations that would most stress the funding plan.

For this section, various combinations of investment returns and payroll growth over a five-year period were analyzed to see how the funding plan would react and whether CalSTRS would still be able to reach full funding by 2046.

THE RISK ENVIRONMENT

The results of this analysis are presented in the form of a heat map, below. The darkest shade of blue indicates the projected funded status in 2046 is at or near 100% while the lightest shade of blue indicates the funded status would be below 60% in 2046, below the levels when the funding plan was adopted. Note that beyond the first five years, it's assumed that all actuarial assumptions, including the 7% investment return assumption, will be realized through 2046.

Impact of next 5 years on projected 2046 funding levels



As seen, CalSTRS remains in a favorable position to be able to react to a recession to stay on track toward reaching full funding by 2046. However, CalSTRS is still at risk of not being able to reach full funding if faced with a more severe recession. These more severe scenarios are in the bottom right corner of the chart. For example, the financial crisis in 2007 through 2009 triggered a severe recession that, if repeated, would fit in the bottom right corner in the above chart.

In the scenarios where CalSTRS would not be able to reach full funding, additional funding would have to be provided to CalSTRS in the form of supplemental payments or changes would be needed to the funding plan either to allow for higher contribution rates, to provide the board with the authority to address the unallocated portion of the unfunded actuarial obligation, or to extend the funding plan.

It's worth noting that these scenarios do not assume that an economic recovery will occur. Past recessions were typically followed by some level of economic rebound with the number of teachers and corresponding payrolls recovering to prerecession levels. A recovery would likely relieve some of the stress placed on the funding plan's capacity to recover funding levels.

A period of sustained low returns and lower payroll growth would also impact the state and employer contribution rates. Note that member contribution rates are not impacted by plan experience but could be impacted if actuarial assumptions were to change. This is discussed in more details later in this report. A lower payroll growth would have the most impact on the employer rate. For example, if investment returns were 7% over the next five years,

THE RISK ENVIRONMENT

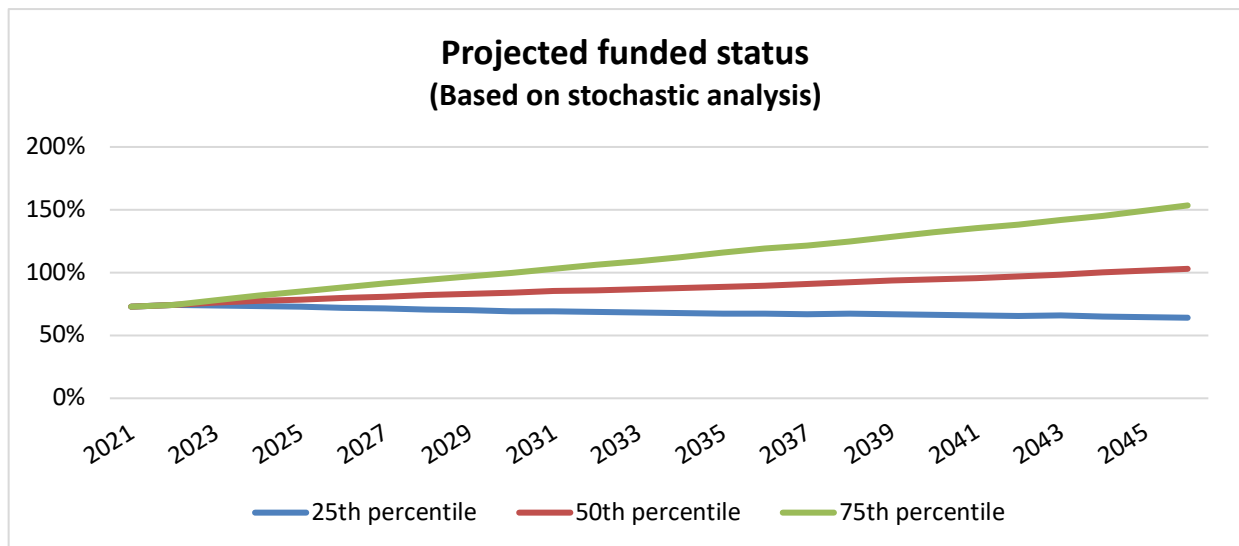
but payroll growth is flat, the employer rate would reach the maximum rate of 20.25% by 2024–25 and stay there through the end of the funding plan. However, if investment returns were to be 0% for the next five years while payroll grows at the assumed rate, the state contribution rate would need to increase to about 18% of payroll while the employer rate would not have to increase for employers to eliminate their share of the unfunded liability by 2046.

A combination of both lower returns and lower payroll growth would normally result in both the state and the employers having to contribute more. In the worst-case scenario in the above heat map, the employer rate would have to be set at the maximum rate of 20.25% while the state rate would increase until reaching about 19% of payroll. These increases would not be enough to allow CalSTRS to reach full funding. In that scenario, the Defined Benefit Program would be expected to be about 57% funded in 2046.

Impact of long-term investment performance

Another useful way to analyze the ability of the funding plan to react to investment volatility and meet its full funding goal is to use a stochastic model. A stochastic model uses a technique known as Monte Carlo simulation in which a large number of random hypothetical scenarios are generated. These scenarios are calibrated to have the statistical characteristics of the CalSTRS Investment Portfolio, using both the capital market assumptions and asset allocation adopted by the board in 2019, as part of the most recent asset liability management study. For this analysis, 5,000 simulations of hypothetical future returns were generated. For each simulation, the assets and liabilities for the system were projected forward for more than 30 years. With this information, it's possible to assess the impact of long-term investment performance and volatility on the funding levels.

The following chart shows the 25th, 50th and 75th percentiles of the projected funded status for the Defined Benefit Program. Note that the compounded investment return over the period was about 5.7% for the 25th percentile and just above 8.6% for the 75th percentile.



These simulations illustrate clearly just how much volatility there is in the future funding of the system. In 2046, the 25th percentile funded status is 64%, and the 75th percentile is 153%. This means there is a one in two chance that the funded status in 2046 will fall in this wide range. The 50th percentile in 2046 is now 102%, a significant improvement over last year when the 50th percentile was 113%. This exemplifies again how a single year of investment loss can impact the strength of the funding plan and CalSTRS' ability to reach full funding.

THE RISK ENVIRONMENT

Risk measures

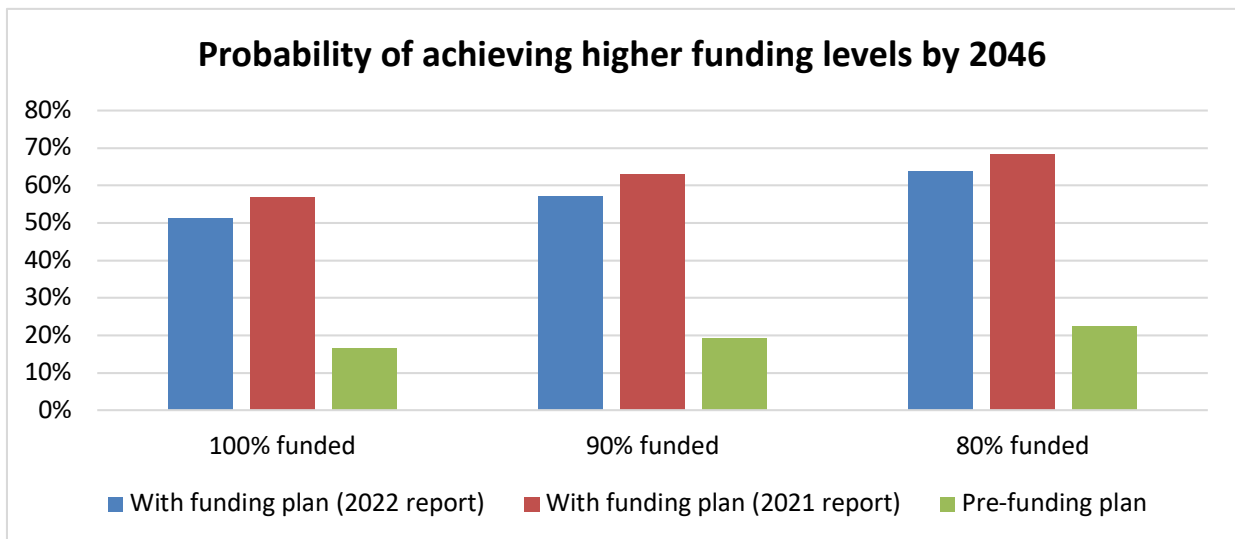
This section updates the risk measures that were introduced in previous *Review of Funding Levels and Risks* reports. These measures were reassessed for this report using the 5,000 stochastic scenarios discussed earlier, which were calibrated to simulate possible future investment returns from the recently adopted asset allocation and capital market assumptions. These measures are intended to assess three main risks:

- Ability of achieving full funding.
- Risk of low funding levels.
- Risk of high state contribution rates.

Probability of achieving full funding

The funding plan sets a target of achieving a 100% funded status by the target year of 2046. As discussed earlier, the fund was previously projected to reach a funded status near but just below 100% by 2046. However, because of last year's events, it's currently projected to reach 100% funded by 2041. There is a great deal of uncertainty in this projection. To better understand how likely the plan is to make progress toward its goal of reaching full funding by 2046, the first risk measure quantifies the probability that the funded status attains specific funding thresholds by the 2046 target date.

The following chart illustrates the probability that, by the 2046 target year, the fund will have attained a funded status of either 100%, 90% or 80%. For comparison, the chart also shows the risk measure's levels from the previous year's report.



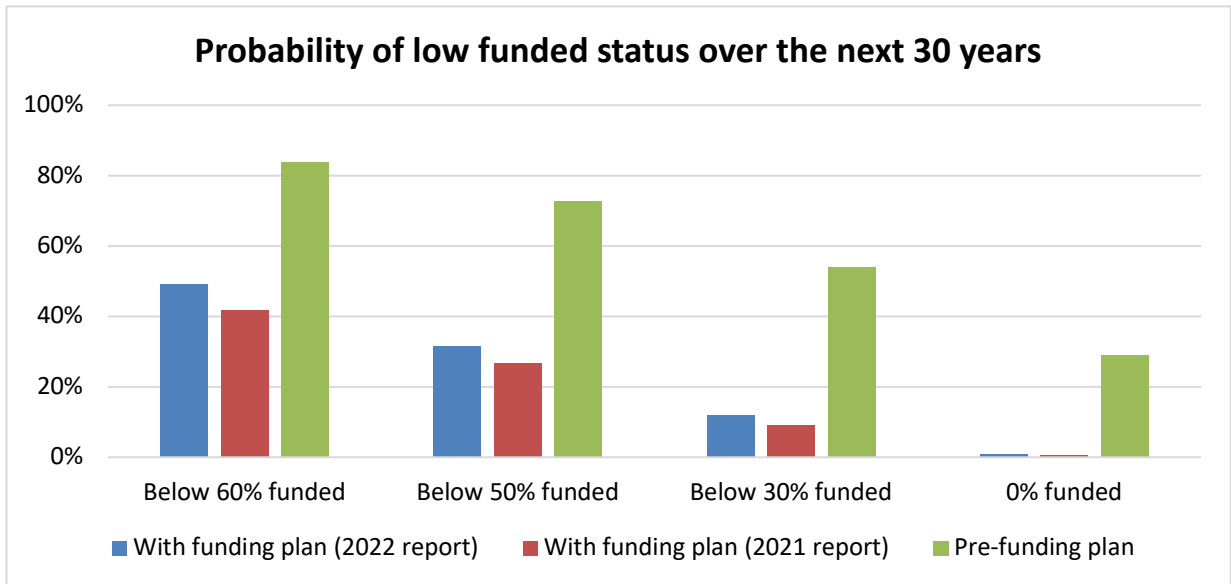
As a result of the investment loss in fiscal year 2021–22, the probabilities of reaching each of the threshold funding levels have decreased since the previous report. It highlights once again how investment volatility creates the most risk for CalSTRS to be able to reach full funding. The above chart also shows the probability of reaching the various funding levels had the funding plan not been implemented. As shown, the fund would have much lower probabilities of reaching full funding by 2046 had the funding plan not been adopted.

THE RISK ENVIRONMENT

Probability of low funding levels

Prior to the passage of the funding plan in 2014, the fund was projected to run out of assets by 2046. Although the funding plan has almost eliminated the risk of completely depleting the assets by 2046, there is still a risk that the funded status would decline and fall to uncomfortably low levels. This risk will never be fully eliminated due to the maturity level of the system, the investment volatility implied by the CalSTRS asset allocation and the rules of the funding plan.

The second risk measure quantifies the risk of funding levels declining by measuring the probability that the funded status will fall below certain thresholds at any point over the next 30 years. The following chart shows the probability that the funded status will fall below 60%, 50%, 30% or down to 0% at some point over the next 30 years. It compares how this risk measure has changed over the last year and compares to the probabilities had the funding plan not been adopted.



As illustrated above, the probability the fund will run out of assets in the next 30 years has been almost eliminated, falling to below 1%. Had the funding plan not been adopted, there would be about a 30% chance of running out of assets. The chart also shows the probability of falling to a low-funded status increased over the last year as of the investment loss last fiscal year.

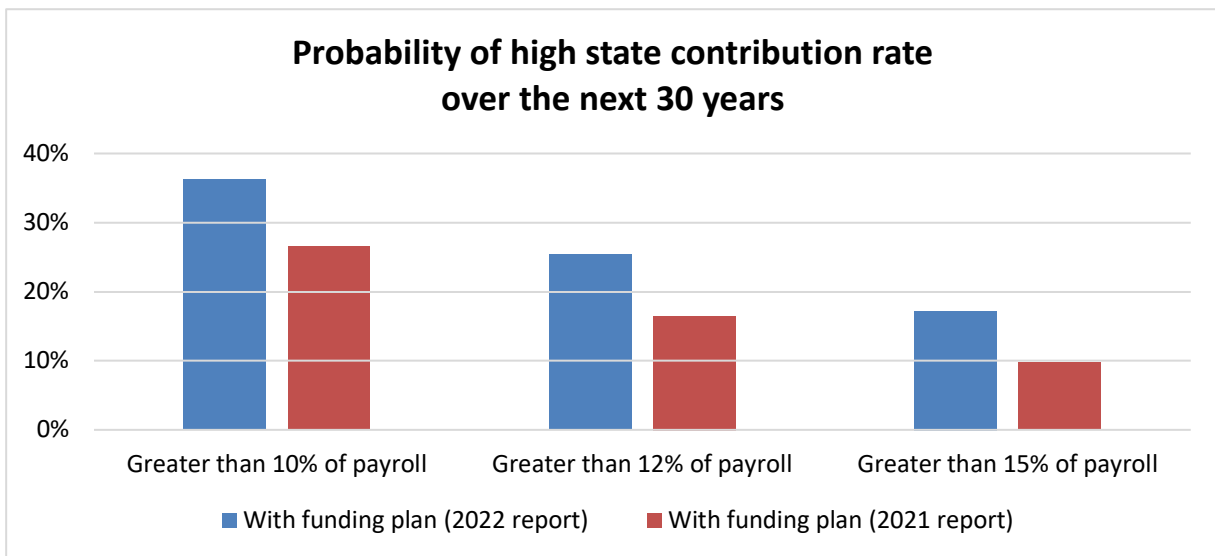
Probability of high contribution rates

The final risk measure considers the likelihood that the state's contribution rate increases to specified thresholds. This risk measure focuses specifically on the state because the employers have a cap of 20.25% on their contribution rate, and the employer rate is generally not significantly impacted by investment performance under the rules of the funding plan. Thus, the risk is essentially mitigated in statute for employers. Furthermore, the state's share of the unfunded actuarial obligation has greater sensitivity to volatility in the investment returns, increasing the risk that the state rate will need to be increased in the future.

THE RISK ENVIRONMENT

Under the rules set in the funding plan, the state contribution rate can increase each year by no more than 0.5% of payroll with no limit on the actual rate. Last June, the board adopted an increase of 0.5% of payroll in the state supplemental contribution rate. As a result, the state supplemental rate is 6.311% for fiscal year 2021–22. This supplemental rate is in addition to the state base rate of 2.017%. In total, the state contributes 8.328% of payroll to fund its share of the unfunded actuarial obligation of the Defined Benefit Program for fiscal year 2021–22.

The following chart updates the probabilities that the state contribution rate exceeds specified thresholds over the next 30 years. For comparison, the chart also shows the probabilities that were reported for this risk measure last year. For context, the state's contribution rate is currently projected to go down to the base contribution rate of 2.017% by fiscal year 2029–30. As a comparison, last year the state contribution rate was to go down to the base rate in fiscal year 2024–25. The rates do not include the 2.5% contribution rate contributed by the state for the Supplemental Benefit Maintenance Account.



The above chart shows that, at all levels, the probability the state experiences a high contribution rate has increased since the previous year. The increases in the probabilities were caused by the investment loss for fiscal year 2021–22.

Measures of plan maturity and volatility

Key findings:

- As the Defined Benefit Program continues to make progress toward full funding, it's also expected to continue to mature, which will increase its sensitivity to investment experience.
- Reacting to an investment loss will become much harder in 15 years compared to today because of the increased maturity levels and the decreasing funding period resulting from the 2046 end date for the funding plan.

MEASURES OF PLAN MATURITY AND VOLATILITY

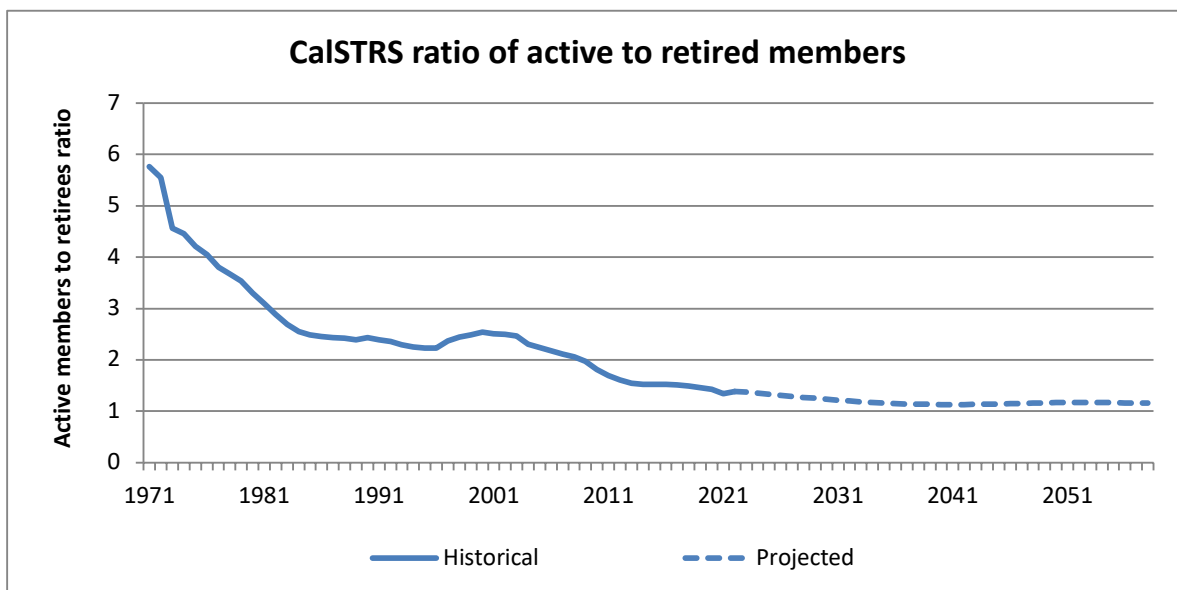
As expected, CalSTRS continues to mature as a pension plan. As pension plans mature, they become more sensitive to certain risks. Understanding plan maturity and how it affects the ability of CalSTRS to tolerate risk is essential when analyzing how investment return volatility, improvements in longevity or even growth in payroll and size of active membership could impact the ability of CalSTRS to reach full funding.

In this section, the maturity of the system is examined in the context of the number of active members to retirees, the projected cash flows, and the volatility ratios, which measure the volatility in contribution rates in response to the volatility in investment returns.

Ratio of active to retired members

The aging of the population and the retirement of the baby boomers has been felt by all retirement systems across the nation. This demographic shift has long been predicted by actuaries and reflected in the funding of the system. Even though it was anticipated, this demographic shift has increased the amount of risk faced by the system.

There are various ways to assess the maturity level of a retirement system. One is to look at the ratio of active to retired members. In the early years of a retirement system, the ratio of active to retired members will be very high as the system will be mostly composed of active members. As the system matures, the ratio starts declining. A mature system will often have a ratio near or below one. For CalSTRS and other retirement systems in the U.S., these ratios have been declining steadily in recent years. The following chart illustrates CalSTRS' historical and projected ratio of active to retired members. Note that the count of retired members for this ratio also includes beneficiaries currently receiving a benefit.



As can be seen in the chart above, the ratio of active to retired members for CalSTRS was about 6-to-1 in 1971. The ratio has decreased steadily over time. Today the ratio is about 1.4-to-1. The ratio is projected to approach 1-to-1 over the next 40 years. Assuming the number of active members in the system remains at today's level, this ratio is not expected to go below one over that time period.

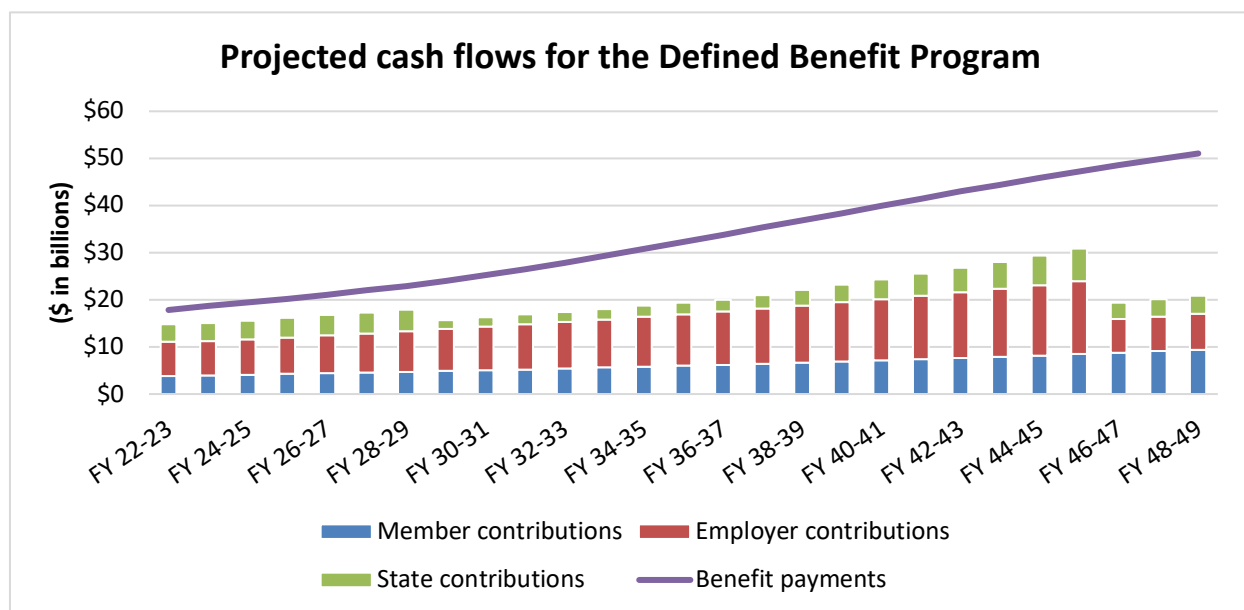
MEASURES OF PLAN MATURITY AND VOLATILITY

A decline in the CalSTRS active member population could accelerate this trend and push the ratio below one. Similarly, if improvements in life expectancy end up being greater than the improvements currently built into the actuarial assumption, it would impact the ratio of active to retired members and potentially bring the ratio closer to one over a shorter period of time and even possibly below one.

Projected cash flows

The cash flows for a retirement system are another good indicator of the maturity level of the system. As a pension plan matures, it's normal for benefit payments to exceed contributions coming into the system. Having negative cash flows does not indicate the plan has been poorly managed. When prefunding a pension plan, it's important to remember that the objective is to accumulate assets to pay benefits. Put another way, the objective of prefunding is to ultimately create negative cash flows.

CalSTRS first experienced negative cash flows in 1999. The gap between contributions and benefits paid increased in the years leading to the funding plan. With the passage of the funding plan and the increased contributions from members, employers and the state, the gap has narrowed the last few years. The following chart shows the projected cash flows for the Defined Benefit Program and Supplemental Benefit Maintenance Account combined.



As shown in the chart above, the gap between benefit payments and contributions will continue to increase year after year, especially after the state supplemental contribution rate is expected to be eliminated in fiscal year 2029–30. Beyond 2046, the gap is expected to sharply increase once the contribution rates return to their pre-funding plan level.

It's important not to view negative cash flows as an issue and to remember pension plans are designed to pay benefits. It's normal for mature pension plans to have benefit payments that exceed contributions coming into the system. Even if negative cash flows are a natural state for any mature pension fund and must be considered as part of the asset liability management process of a pension plan, negative cash flows do not necessarily imply the system will have to sell assets to make benefit payments. Cash generated from investments such as coupons on bonds, rent on real estate and dividends must be considered as well as the relative size of the cash flows compared to the total assets in the fund.

MEASURES OF PLAN MATURITY AND VOLATILITY

Today, enough cash is being generated from investment income to cover the gap. The gap between projected benefit payments and future contributions is expected to represent between 1% to 2.5% of the assets through the end of the funding plan. Cash generated by investments would have to be at least 2.5% of total assets to avoid having to sell assets to pay benefits. Over the last 30 years, cash generated by investments has averaged 2.7%.

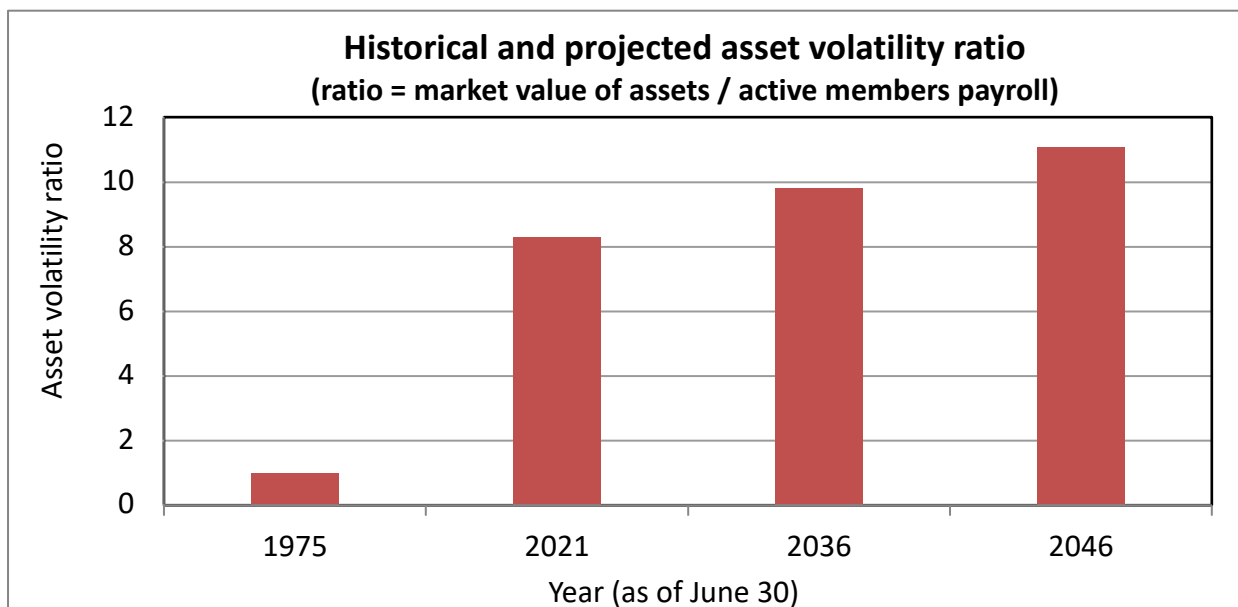
Increasing volatility

As retirement systems become more mature, these systems are subject to increased volatility in the contribution rates needed to fully fund the benefits. The drop in the active-to-retiree ratio over the last decade has increased the contribution volatility risk for CalSTRS, and this volatility risk will continue to increase as the ratio continues to drop in the future.

One indicator of the contribution volatility is the asset volatility ratio. The asset volatility ratio is the ratio of the market value of assets over the total payroll for active members. Plans with a high ratio will be subject to higher contribution volatility.

The asset volatility ratio for CalSTRS has increased significantly over the last 40 years. Back in 1975, the asset volatility ratio was at about one, meaning the assets of the plan were about the same size as the payroll. The size of the assets, when compared to payroll, has increased steadily over time. As of the most recent actuarial valuation, the asset volatility ratio was about eight. This is typical for a mature system like CalSTRS. This means that the contribution volatility is currently about eight times higher than it was in 1975. As shown on the following chart, the asset volatility ratio for CalSTRS is expected to continue to increase over time, reaching about 10 in 15 years and 11 by the end of the funding plan.

There are various reasons why the asset volatility ratio is projected to increase over time. One is expected improvements in funding levels. As of the June 30, 2021 actuarial valuation, the Defined Benefit Program was about 73% funded. If the system was 100% funded today, the asset volatility ratio would be 9.4. As additional contributions flow into the system pursuant to the funding plan, the funded ratio is projected to improve and move toward the target of being 100% funded. As a result, the asset volatility ratio will increase over time. In addition, the system has not yet reached its full maturity stage. As more members retire, the asset volatility ratio is also expected to continue to increase.



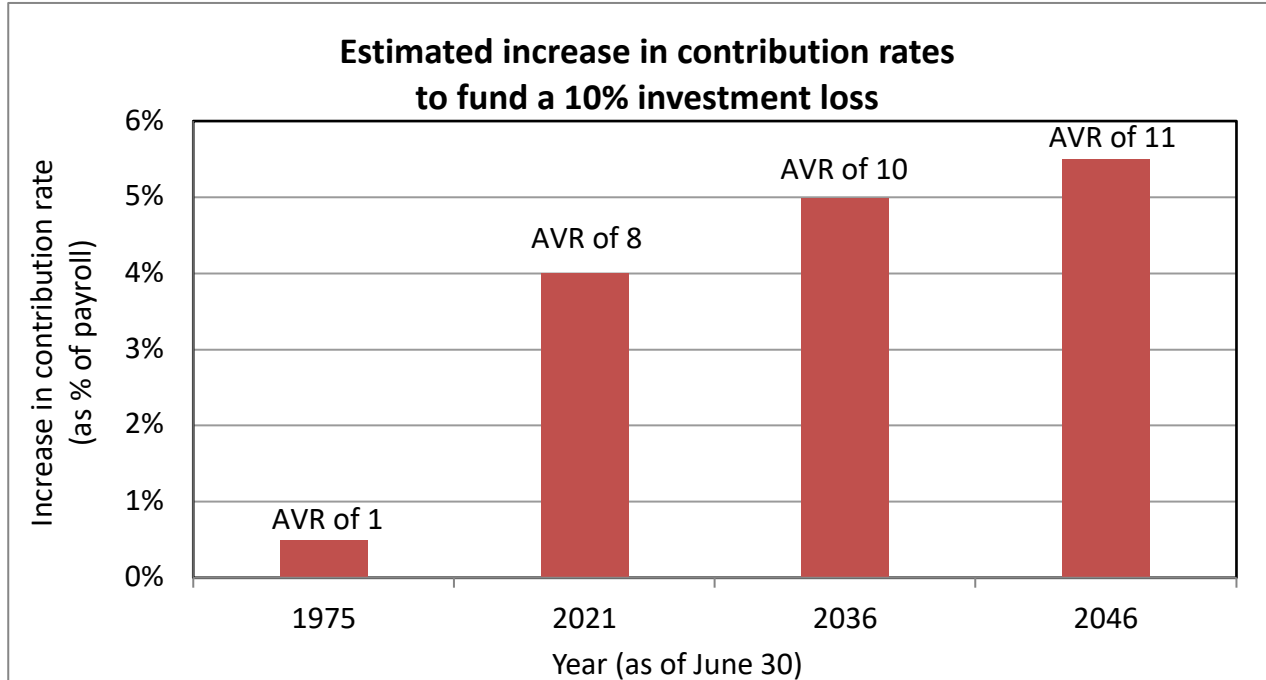
MEASURES OF PLAN MATURITY AND VOLATILITY

It's important to keep in mind that there is nothing to “fix” if the asset volatility ratio is high. A high asset volatility ratio simply indicates that there is more money invested for the plan—a good thing overall. It should, however, serve as a reminder that the more money invested, the more of an impact investment gains and losses will have on the contribution levels needed to fully fund the system.

With the expected increases in asset volatility ratio over time, the funding risk of the system will be greater in 20 years than it is today, resulting in greater volatility in the level of contributions that would be needed to ensure the plan remains 100% funded over the long term.

To help demonstrate this increased contribution volatility, the following chart displays the cost to eliminate, over a 30-year funding period, the unfunded actuarial obligation created from a 10% investment loss. Note that a 10% investment loss represents a return of -3%, or a return 10% less than the assumed 7% investment return. Over the last 20 years, the system has experienced a loss of this magnitude or worse on four occasions.

Further compounding contribution rate volatility is an aspect of the funding plan that is often overlooked. The fixed time frame for paying down the unfunded actuarial obligation by 2046 will result in a declining amortization period, increasing contribution volatility going forward. Today, the existing shortfall is amortized through 2046, over a period of 24 years. In 10 years, any remaining shortfall will be amortized over 14 years. If markets were to fall short of expectations in 20 years, the shortfall would have to be paid over a four-year period, requiring higher contributions than would normally be needed if the funding period was 20 years. As a result, the limited rate-setting authority granted to the board is more likely to be insufficient in 20 years, following an economic downturn, due to the combined impact of the funding period shortening and maturity levels increasing.



Ability to reach full funding under different actuarial assumptions

Key findings:

- Formal reviews of the actuarial assumption are part of the ongoing monitoring of the funding plan and performed every four years. The next review will be conducted in 2023 and presented to the board in the winter of 2024.
- CalSTRS is still in a favorable position and would be expected to reach full funding if the board elected to adopt more conservative actuarial assumptions in the funding of the system.

ABILITY TO REACH FULL FUNDING UNDER DIFFERENT ACTUARIAL ASSUMPTIONS

So far, this report has included discussions and risk measures illustrating the funding plan’s capacity to react to short-term and long-term deviations from the current actuarial assumptions and meet the goal of reaching full funding by 2046. For all scenarios analyzed in this report, it was assumed that actuarial assumptions would remain the same when calculating the liabilities.

For this section, the ability for the funding plan to reach full funding by 2046 will be tested against different economic actuarial assumptions. For each scenario analyzed, both the liabilities and the assets were projected using the revised set of assumptions, assuming the change would be long-term and permanent.

Including this information in this report is not an indication that actuarial assumptions must be changed. The information is provided for informational purposes only to help illustrate how the funding plan would absorb the impact of using more conservative actuarial assumptions in the funding of the system.

Various combinations of actuarial assumptions for the investment return, price inflation and payroll growth were analyzed to see how the funding plan would react and whether CalSTRS would still be able to reach full funding by 2046. These assumptions were selected since they have been impacted the most by recent economic and demographic trends and could be subject to change in the next review of actuarial assumptions.

Note that even if price inflation was 8.3% in California last fiscal year, inflation over the long term is still forecasted to be lower than 2.75% by many economists. Many retirement systems in the nation have lowered their inflation assumption below the 2.75% assumption currently used by CalSTRS.

Inflation is a key component of two important economic actuarial assumptions used in the funding of the Defined Benefit Program. It impacts expected payroll growth and the assumed investment return.

Regarding the investment return assumption, return expectations for each asset class will be reviewed as part of the 2023 asset liability management study. The ultimate board decision on how to invest the portfolio long term, combined with return expectations will be key in determining CalSTRS’ ability to keep using a 7% investment return assumption in the funding of the system.

As indicated earlier in the report, if the anticipated reduction in enrollment in K–12 public schools results in a need for fewer teachers in California, it would impact the number of active teachers who participate in the Defined Benefit Program and ultimately the growth in the payroll.

For this report, the ability of the funding plan to react to changes in actuarial assumptions was tested by lowering the investment return assumption to 6.75% and 6.5%. The price inflation was lowered to 2.5% when the investment return was lowered. For all scenarios, the payroll growth assumption varied from 3.5% to 3% and 2.5%. The current assumptions are 7% for the investment return, 2.75% for price inflation and 3.5% for the payroll growth.

The table below shows the projected funded status in 2046 for each set of actuarial assumptions.

Projected funded status on June 30, 2046

Future payroll growth	Investment return 7%	Investment return 6.75%	Investment return 6.5%
3.50%	100%	100%	100%
3.00%	100%	100%	100%
2.50%	100%	100%	100%

ABILITY TO REACH FULL FUNDING UNDER DIFFERENT ACTUARIAL ASSUMPTIONS

As can be seen in the table on page 34, under all scenarios, the funded status is expected to be 100% by June 30, 2046.

Adopting more conservative assumptions could also impact contribution rates for the state, employers and CalSTRS 2% at 62 members. The state contribution rate would normally be most impacted by a change in actuarial assumptions. However, the 27.2% investment return in 2020–21 has drastically changed this situation.

The table below shows the average state contribution rate to the Defined Benefit Program through 2046 under each assumption scenario. The board elected to keep the state contribution rate at 8.328% of payroll for the Defined Benefit Program for fiscal year 2022–23. Currently, the state contribution rate is expected to drop to 2.017% in fiscal year 2029–30. As a result, the state contribution rate is currently expected to average 4.8% of payroll through 2046.

Average state contribution rate through 2046

Future payroll growth	Investment return 7%	Investment return 6.75%	Investment return 6.5%
3.50%	4.8% of payroll	6.7% of payroll	9.6% of payroll
3.00%	4.8% of payroll	6.8% of payroll	9.7% of payroll
2.50%	4.8% of payroll	6.8% of payroll	9.9% of payroll

Adopting more conservative actuarial assumptions would increase the average state contribution rate. The average rate is lower than the current state contribution rate if the investment return assumption were lowered to 6.75%, indicating the board could be in a position to lower the state contribution rate even if more conservative assumptions were used in the funding of the system. If the investment return assumption was lowered to 6.5%, increases in the state contribution rate would be required to allow the state to eliminate its share of the unfunded actuarial obligation by 2046.

The table below shows the average employer contribution rate to the Defined Benefit Program through 2046 under each assumption scenario. The board adopted an employer contribution rate of 19.1% of payroll for fiscal year 2022–23.

Average employer contribution rate through 2046

Future payroll growth	Investment return 7%	Investment return 6.75%	Investment return 6.5%
3.50%	19.1% of payroll	18.2% of payroll	17.6% of payroll
3.00%	19.3% of payroll	18.9% of payroll	18.3% of payroll
2.50%	20.1% of payroll	19.7% of payroll	19.1% of payroll

ABILITY TO REACH FULL FUNDING UNDER DIFFERENT ACTUARIAL ASSUMPTIONS

Although counterintuitive, adopting a more conservative investment return assumption would decrease the average employer contribution rate through 2046. Also, although lowering the assumed rate of return increases the employers' share of the unfunded actuarial obligation, this increase is small compared to the cumulative impact of a lower interest rate being charged to amortize their share of the unfunded actuarial obligation. When the investment return assumption is lowered, it also lowers the interest charges on the payments made by employers to eliminate their share of the unfunded actuarial obligation. In a sense, it's similar to the interest charged on a mortgage. In this situation, the lower interest charges on the existing unfunded actuarial obligation more than offset the initial increase in the unfunded actuarial obligation caused by the lowering of the investment return assumption. Note that lowering the payroll growth assumption results in an increase in the average employer contribution rate for similar reasons to those discussed in the Membership and payroll growth risk section.

Adopting more conservative actuarial assumptions could also impact the CalSTRS 2% at 62 member contribution rate. Under the California Public Employees' Pension Reform Act of 2013 (PEPRA), CalSTRS 2% at 62 members are required to pay at least one-half of the normal cost of their Defined Benefit Program benefit, rounded to the nearest quarter of one percent. The normal cost is the annual cost for each year of service that is necessary to adequately fund the benefits over time if all assumptions are met. Adopting a more conservative investment assumption will increase the normal cost. However, to impact CalSTRS 2% at 62 members, the normal cost would have to change by more than 1% since the last time the member contribution rate was set. The table shows the CalSTRS 2% at 62 member contribution rate and whether an increase would be required under each assumption scenario.

CalSTRS 2% at 62 member contribution rate

Future payroll growth	Investment return 7%	Investment return 6.75%	Investment return 6.5%
3.50%	10.205% No increase	10.205% No increase	11.205% 1% increase
3.00%	10.205% No increase	10.205% No increase	11.205% 1% increase
2.50%	10.205% No increase	10.205% No increase	11.205% 1% increase

The contribution rate for CalSTRS 2% at 62 members would not have to increase if the investment return assumption was reduced to 6.75%. It would have to increase by 1% if the investment return assumption was lowered to 6.5%. As indicated earlier, the price inflation assumption was also lowered to 2.5% for these scenarios. Had price inflation been kept at 2.75%, the CalSTRS 2% at 62 member contribution rate would have had to increase by 0.5% of salary under the 6.75% investment return assumption.

This analysis shows that CalSTRS is still in a favorable position today and would be expected to reach full funding if the board elected to adopt more conservative actuarial assumptions in the funding of the system.

Although the current assumptions are still appropriate for use in the funding of the system, the situation could change between now and the next review of the actuarial assumptions. The next formal review of the actuarial assumption will be conducted in 2023 and presented to the board in the winter of 2024. This formal review is part of the ongoing monitoring of the funding plan and is performed every four years.

CONCLUSION

This report discusses a variety of risks associated with the funding of CalSTRS. Even if baseline projections indicate CalSTRS is expected to reach full funding by 2046, significant risks remain that could prevent the system from reaching full funding by 2046.

Although the risks related to longevity, active membership decline and future payroll growth are real and important, the fact remains that the largest risk facing CalSTRS is risk from investment returns falling short of the assumed return. This risk will continue to increase over time simply due to the natural maturing of the system and the scheduled end date of the funding plan, currently set at 2046.

As noted in this report, some of the features of the funding plan contribute to the likelihood CalSTRS may not be able to react adequately to changes in economic and demographic conditions and reach full funding. These features include:

- End date of 2046.
- Unallocated share of the unfunded actuarial obligation for which the board does not have authority to adjust contribution rates.
- 0.5% limit on state contribution rate increases.
- Requirement that the state contribution rate immediately drop to 2.017% once the state has eliminated its share of CalSTRS' unfunded actuarial obligation.

Prior to the next progress report to the Legislature, due in June of 2024, the board will have the opportunity to discuss and consider whether improvements should be recommended to the Legislature to further strengthen the funding plan and CalSTRS ability to reach full funding. Making minor modifications to the funding plan, by addressing the above features, would help mitigate the impact of some of the risks identified in this report. In March 2021, the California Legislative Analyst's Office published a **report** recommending that minor modifications be made to strengthen the funding plan to address some of the above features.

In fiscal year 2022–23, CalSTRS will start the important asset liability management study that occurs every four years. This process is critical to the long-term sustainability of CalSTRS. It's the process used to assist the board in making the very important decision of how to invest the portfolio. In conjunction with the asset liability management study, CalSTRS also performs a formal review of the actuarial assumptions. This is part of CalSTRS' ongoing effort to monitor the funding plan. Ensuring that the actuarial assumptions used to assess funding levels are consistent with long-term expectations is a key component of having a strong funding plan. If the review indicates, for example, that long-term economic outlooks have changed to the point where an adjustment to key economic actuarial assumptions should be made, these recommendations would be brought to the board when the experience study report is presented. The review of the actuarial assumptions will be performed in calendar year 2023, with the findings and recommendations expected to be presented to the board for adoption in early 2024.