

TEACHERS' RETIREMENT BOARD

REGULAR MEETING

Item Number: **10**

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SUBJECT: Impact of Alternative Investment Returns on Projected Program Funding

CONSENT: \_\_\_

ATTACHMENT(S): 1

ACTION: \_\_\_

MEETING DATE: June 11, 2015/60 mins.

INFORMATION: X

PRESENTER: Rick Reed and Nick Collier, Milliman

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**PURPOSE**

The purpose of this item is to provide the board the impact of alternative investment experience on the funded ratio of and future state and employer contributions to the Defined Benefit Program.

**BACKGROUND**

Chapter 47, Statutes of 2014 (AB 1469—Bonta) was enacted in June 2014 to address the funding shortfall facing the Defined Benefit (DB) Program. The legislation increased contributions paid in the future by members, employers and the state, with member and state contribution rate increases being phased in over a three-year period, and employer contribution rate increases phased in over a seven-year period, in order to fully fund the DB Program by 2046. After the state and employer contribution levels reached the rates specified in AB 1469, the board would have authority to adjust, on a limited basis, those contribution rates.

As part of its comprehensive review of the DB Program asset allocation, the board requested an analysis of the impact of varying long-term investment returns on the program's funded ratio, which represents the ratio of program assets to liabilities, as well as on future state and employer contributions. Milliman has undertaken that analysis, which is attached.

**SUMMARY OF ANALYSIS**

In its analysis, Milliman performed a stochastic analysis of the current allocation of DB Program assets, and projected the funded ratio and changes in employer and state contribution rates over the 32-year funding period identified in AB 1469, based on the results of the June 30, 2014, actuarial valuation of the DB Program. Specifically, the analysis projected how achieving a 5.7 percent, a 7.5 percent (the current investment return assumption) and a 9.1 percent annual return on investments, which represent the 75<sup>th</sup>, 50<sup>th</sup> and 25<sup>th</sup> percentile returns, respectively, would affect the funded ratio and state and employer contribution rates. Milliman's analysis indicates that, if investments underperform as modelled, the funded ratio of the DB Program would, by 2046, decline to just below 50 percent, but would achieve a 100 percent funded ratio in 2046 if investment returns are at assumed levels, and be fully funded in 2024 if investments outperform the current assumption, assuming adjustments are made to the state and employer contribution rates consistent with the valuation policy.

Because state and employer contribution rates would be subject to adjustment by the board in 2017 and 2021, respectively, contribution rates would be reduced for the DB Program if full funding was projected to be achieved prior to 2046. As such, state contribution rates are projected to be adjusted to their minimum level of 2.017 percent if the investment returns are at their assumed levels or better prior to 2017, and would increase to 12.5 percent if investments underperform. Similarly, employer contribution rates would decline to its pre-AB 1469 level of 8.25 percent by 2033 if investments outperform the assumed rate, and would gradually decline from its maximum scheduled rate of 19.1 percent in 2020 to just above 14 percent in 2045, if investments perform as assumed, and to 17 percent in 2045 if investments underperform.

Milliman also evaluated the impact on the future funded status of the DB Program of a one-time major downturn in the financial markets, followed by a recovery. Specifically, it analyzed the impact of a 20 percent investment loss in 2019, and the impact of a 20 percent investment loss in 2030. In both cases, the median investment return over the entire funding period is assumed to remain at 7.5 percent. Milliman's analysis indicates that such a downturn would result in a reduction in the funded status immediately after the downturn, but that the funded status would begin to increase more rapidly in future years, resulting in a funded status in 2046 that is slightly lower than would occur if the returns had been consistent during the funding period. In addition, the funded ratio in 2046 would be similar whether the downturn occurs in five years or in 15 years, although, as a result of limitations in AB 1469 in the allowable annual increase in the state contribution rate, the state's contribution rate in 2046 would be materially higher if the downturn occurred in 2019, as compared to the rate if the downturn occurred in 2030.



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May 28, 2015

Teachers' Retirement Board

Re: Projection Analysis for DB Program – Impact of Variable Returns

Dear Members of the Board:

As the Board is aware, future investment returns will have a significant effect on the funded status of the DB Programs. We have modeled a variety of investment return scenarios to show the potential impact on DB Program funding.

### Baseline Results – Funded Ratio

We used a stochastic model to assess the likelihood of realizing certain funding and contribution levels in the future. See the Basis of Projections section later in this letter for details on the stochastic model.

We have shown the projected funded ratio at three different levels.

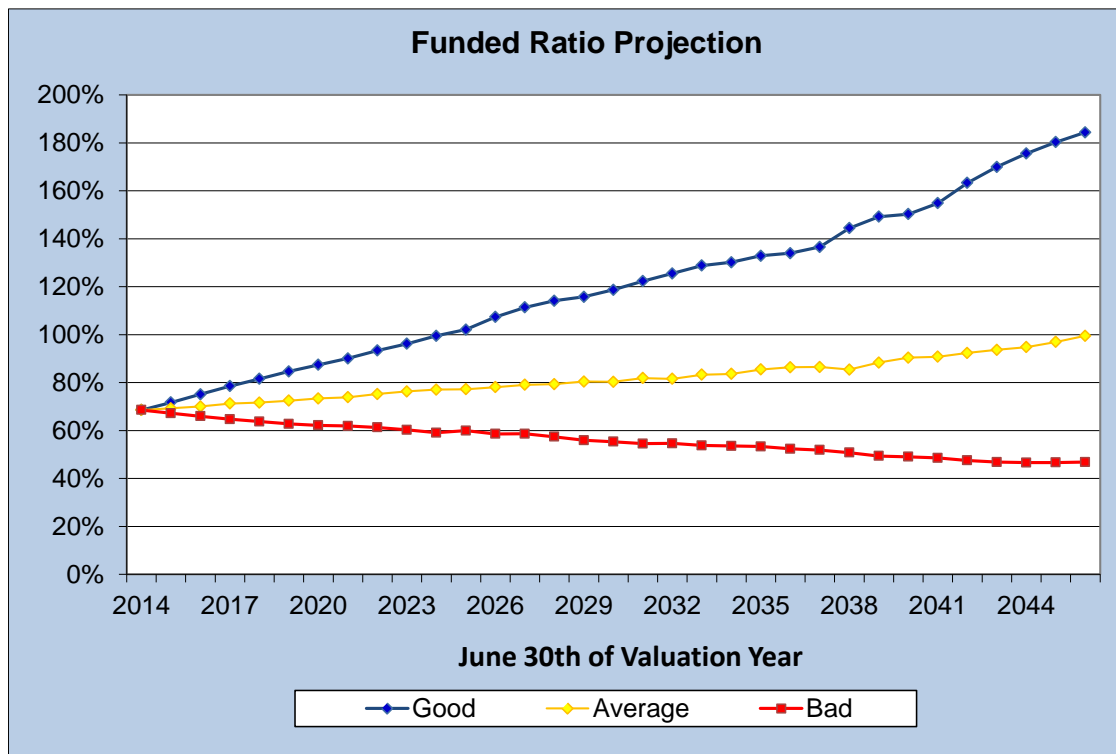
- **Average:** Average results shown on the graph on the next page are represented by the median funded ratio for each year based on the various economic scenarios created by the stochastic model. The median (50<sup>th</sup> percentile) funded ratio indicates there is approximately a 50% probability that the DB Program will be at or above a 100% funded ratio by 2046 (and a 50% probability it will be below 100% in 2046). Note that for purposes of this analysis, we have used a 7.50% median return for consistency with the valuation assumption.
- **Good:** Good results are represented by the 25<sup>th</sup> Percentile. The “Good” line indicates that there is a 25% probability in the corresponding year the funded ratio will be at or above that level. For example, as shown in the graph, there is a 25% likelihood the funded ratio will reach 100% funding by 2025. Over the next 30 years, the 25<sup>th</sup> percentile investment return is estimated to be 9.1%. Note that the 25<sup>th</sup> percentile funded ratio results are not exactly the same as earning a 9.1% return each year, but it does provide a reasonable approximation of the return necessary to reach the funding levels shown by the blue line.

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- **Bad:** Bad results are represented by the 75<sup>th</sup> Percentile. The “Bad” line indicates that there is a 75% probability in the corresponding year the funded ratio will be at or above that level. Conversely, there is a 25% probability the funded ratio will be below the level shown. Over the next 30 years, the 75<sup>th</sup> percentile investment return is estimated to be 5.7%.



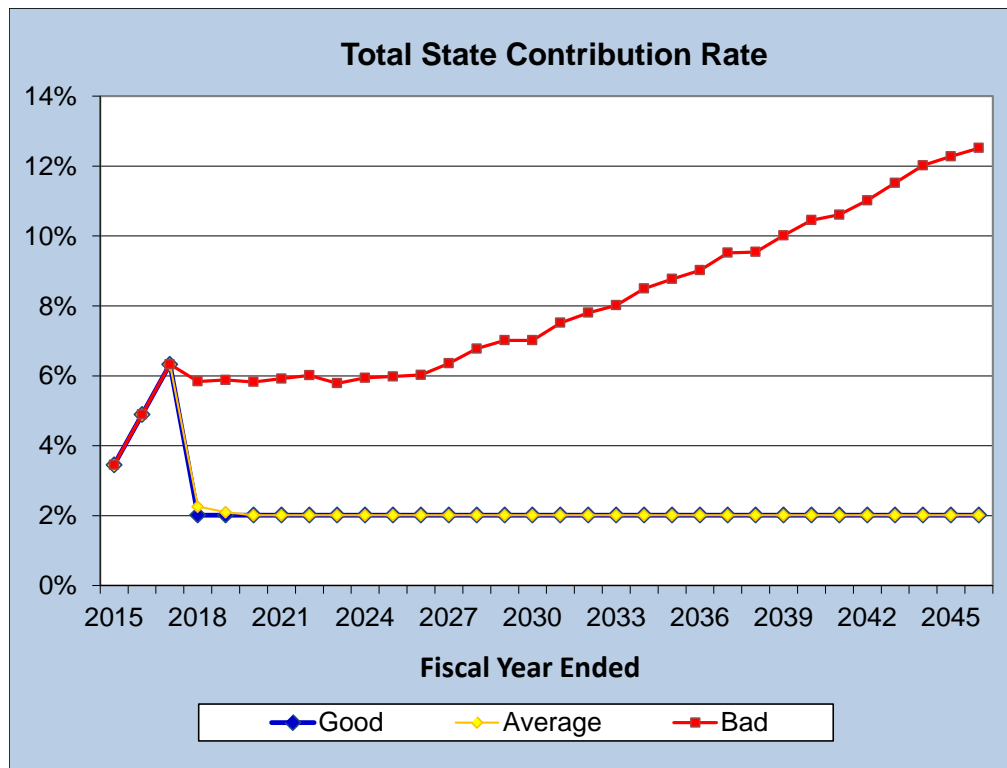


**Baseline Results – State Contribution Rate**

Based on the model discussed above, we also looked at the impact variable returns might have on the state contribution rate. Under both the Average and Good results, the total state contribution rate is projected to decrease to 2.017% of payroll before 2020 (the base rate of 2.017% plus a supplemental rate of 0.00%).

The reason for the projected decrease in the state supplemental contribution rate is the strong returns that were reflected in the June 30, 2014 actuarial valuation for the DB Program. The state supplemental contribution rate is scheduled to increase to 4.311% of payroll effective July 1, 2016 and then vary depending on funded status. The 4.311% was calculated to pay off the June 30, 2013 Unfunded Actuarial Obligation (UAO) attributable to the 1990 Benefit Structure. Therefore, based on the 2013 valuation, the expected supplemental rate needed was approximately 4.3%. However, the market return of over 18% reflected in the June 30, 2014 actuarial valuation significantly improved the funded status and therefore caused a decrease in the projected supplemental state contribution rate needed which is reflected in the Average and Good lines.

The Bad line shows a fairly level rate followed by a steady increase. Over the first few years, the impact of the recognition of the deferred gains (primarily due to the 2013-14 market return) is offset by the assets losses that are projected to occur under the Bad scenario. Ultimately, the impact of future losses exceeds the impact of the currently deferred gains resulting in a steady increase in the state contribution rate in about 10 years.



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### Baseline Results – Employer Contribution Rate

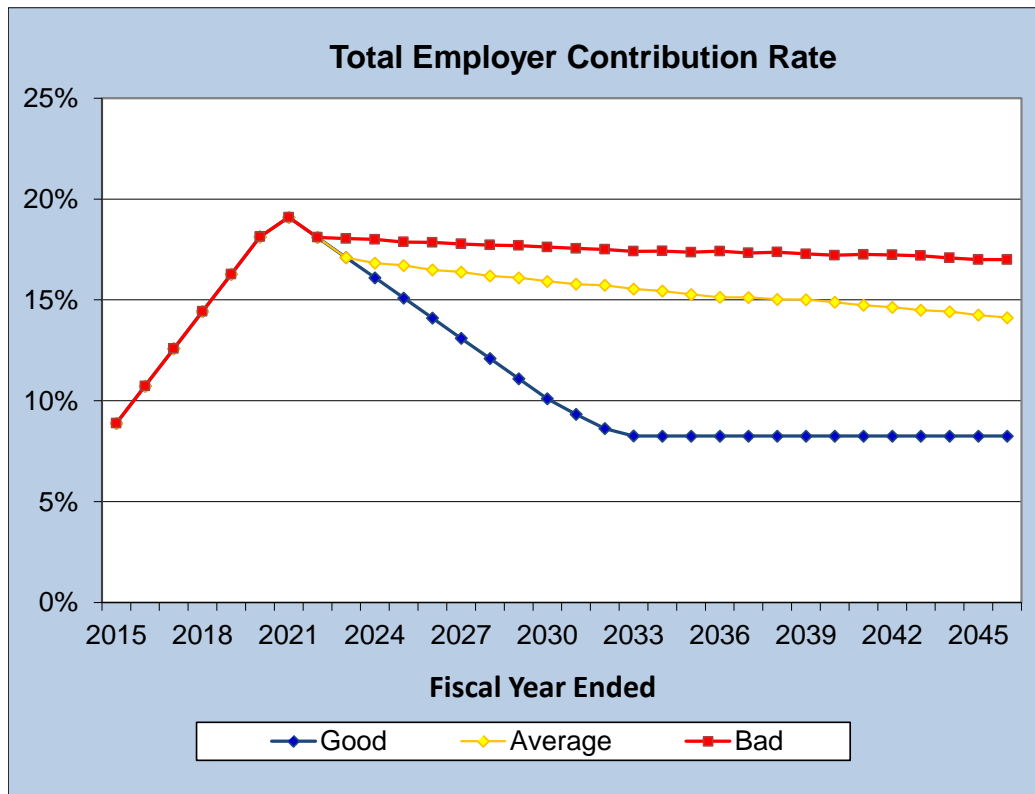
We also modeled the impact variable returns might have on the employer contribution rate. Under both the Average and the Bad results, the total employer contribution rate is projected to gradually decrease in the future, after the ultimate rate has been reached. Under the Good scenario, the projected employer rate decreases more significantly, about 1% a year, and then levels off at the base contribution rate of 8.25%.

The reason that the contribution rate decreases occur under both the Good and Bad scenarios is the way the UAO for pre-2014 service is shared between the state and the employers under the valuation policy. First, the UAO for pre-2014 service for the 1990 Structure is allocated to the state to fund. Next, the remaining UAO for pre-2014 service is allocated for the employers to fund. Currently, and projected for a number of years in the future, the value of the assets allocated to fund the state UAO is greater than the assets for the total UAO attributable to pre-2014 service. This is because the assets allocated to the state are a theoretical value based on the 1990 Structure and are adjusted for several factors which result in a higher value than the total pre-2014 assets. For example, the state assets are increased to account for post-90 benefits that were paid, but would not have been paid under the 1990 Benefit Structure. This difference in assets results in the following:

- **Bad:** When the returns fall short of the assumption, the state portion of the pre-2014 UAO will grow faster than the total UAO for pre-2014 service, because there will be a bigger loss on the state-allocated assets than the total assets allocated to pre-2014 service. Therefore, the employer-allocated UAO will generally decrease in situations where the asset returns are less than the assumption.
- **Good:** Conversely, when the returns exceed the 7.5% assumption, the state-allocated UAO for pre-2014 service will tend to decrease faster than the total UAO for pre-2014 service. This will tend to increase the employer-allocated portion of the UAO for pre-2014 service. However, when returns have consistently exceeded the assumption, this will likely cause the pre-2014 UAO allocated to the state to move to a surplus position. Under the valuation policy, if a surplus exists for the state-allocated UAO for pre-2014 service, an equal amount is temporarily credited the employer to offset the employer-allocated UAO. This will tend to lower the employer contribution requirement.



Thus, both good returns and, to a lesser extent, poor returns, can reduce the employer contribution rate.



**Consideration for when Valuation Policy is Reviewed**

Although the result just discussed (impact of returns on employer contribution rate) does not mean the funding is inappropriate, there is one scenario that we believe merits review. In cases where the 1990 Structure becomes significantly underfunded, the state contribution may be insufficient to pay off the 1990 UAO by 2046 due to the cap of 0.5% on state contribution increases. This, in turn, could lead to the total contribution rate toward the UAO for pre-2014 service being insufficient while at the same time, the employer contribution rate is being decreased. Consideration should be given to adding a provision to the valuation policy that links the employer contribution rate to the funding of the total UAO attributable to pre-2014 service; however, since the employer rate is on a fixed schedule through 2021, no action needs to be taken immediately.

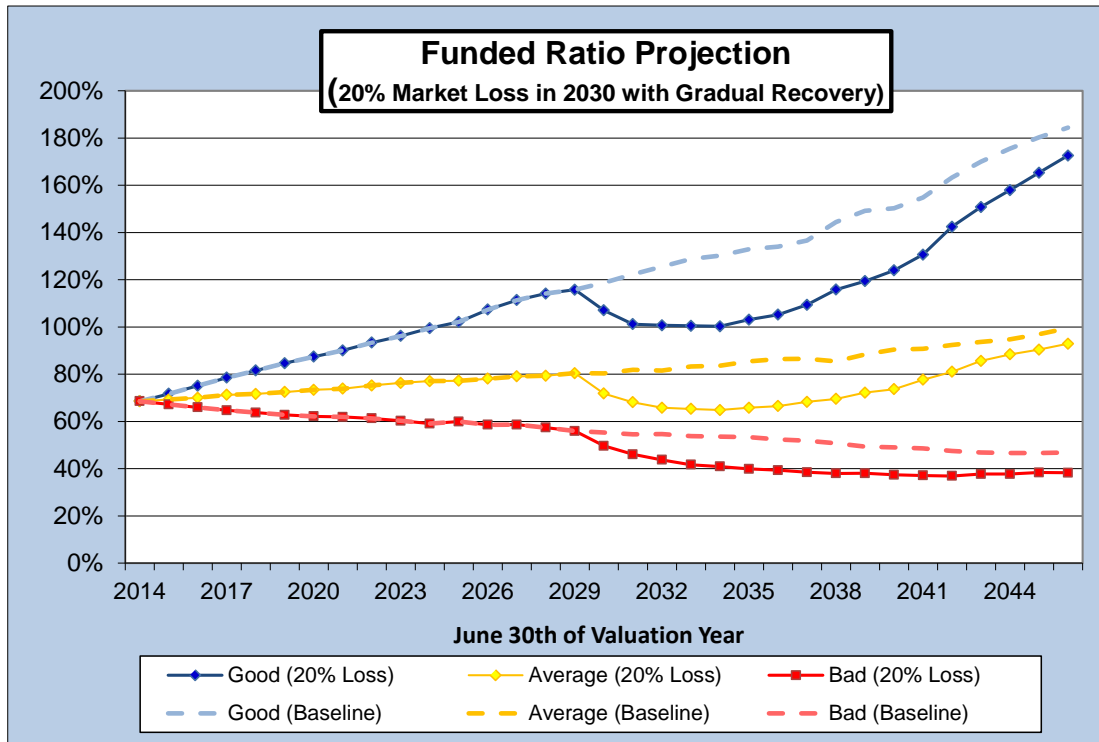
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**Impact of Significant Market Loss in 2030 (Gradual Recovery)**

The previous results reflected a wide variety of future investment return scenarios. We believe the returns and variance of the returns are consistent with CalSTRS target asset allocation. The following graph shows the impact if additional negative volatility is introduced. Specifically, it assumes that there will be one year (2030) where there is a 20% market loss. It is further assumed that there would be a market recovery over the following 15 years, such that the overall average return for all investment return scenarios is consistent with the baseline returns.

This type of market loss with a recovery would significantly stress the system. However, by 2046, the fund rebounds close to where it would have been without the additional volatility. In this example, we have shown the projected funded ratio with the 20% market loss in 2030. For comparison, we have shown the baseline scenarios as dashed lines.



It should be noted that under the investment scenarios we modeled, there was a loss of more than 20% in less than 2% of the years, so the probability is low that this would occur in any given year; however, this type of loss has occurred within the last decade so it is clearly a possibility.

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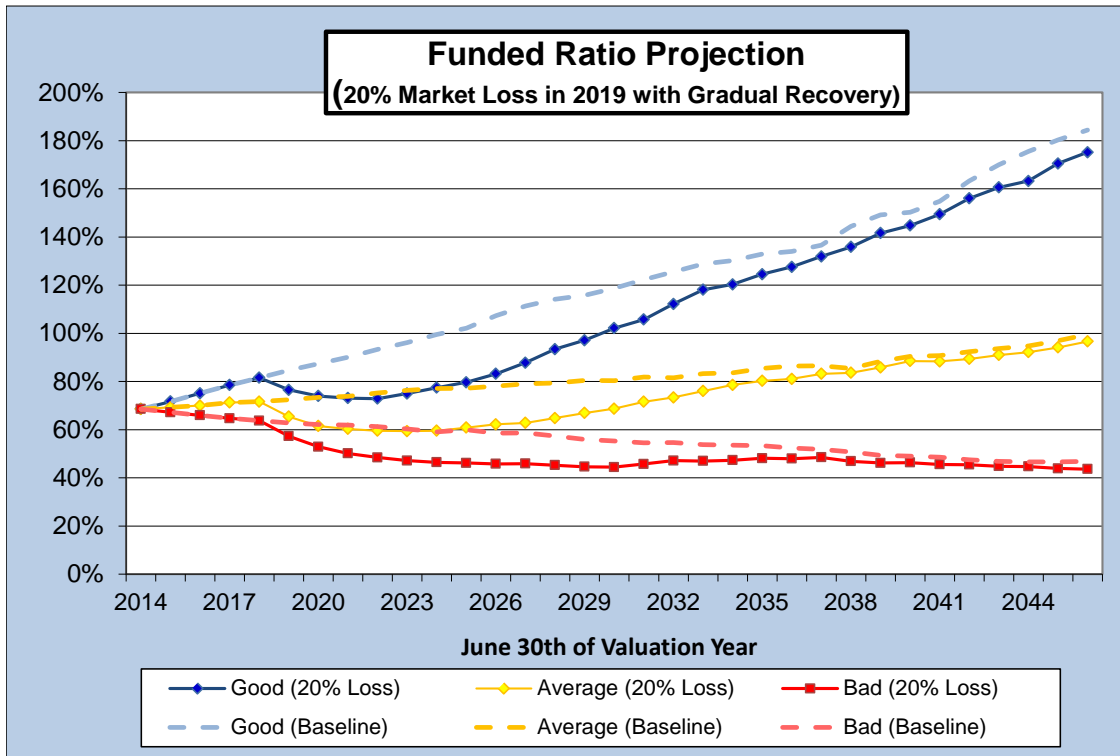




**Impact of Significant Market Loss in 2019 (Gradual Recovery)**

The previous example showed the impact of additional volatility in the form of a 20% market loss in 2030. For comparison, we have shown the impact if the loss occurred sooner (five years after the last valuation in this case), giving CalSTRS more time to recover. The following graph shows the impact if the 20% loss occurred in 2019. Similar to the prior example, it assumes that there would be a market recovery over the 15 years following the 20% loss.

A market loss that occurs sooner would still stress the system. However, the additional time allows for a greater ability to react. This results in projected funded ratios being close to the baseline results; whereas, in the prior example they still tended to lag somewhat. This is primarily due to an increased state contribution rate over a longer period of time (see table on following page).



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As noted, with the market loss occurring earlier, the state contribution rate would be higher. The table below shows a comparison of the total state contribution rate under the Bad return scenario for the baseline and the two market loss examples. As can be easily seen, the state rate is higher every year under the last column, except for the first year. The reason the state rate under the 2019 scenario is so much higher than the 2030 scenario is that when the loss occurs later, the state contribution rate cannot adjust to the full actuarial rate due to the 0.5% cap on annual increases.

Year	Total State Contribution Rate Under Bad Return Scenario		
	Baseline	20% Loss in 2030	20% Loss in 2019
2015	3.5%	3.5%	3.5%
2020	5.8%	5.8%	6.4%
2025	6.0%	6.0%	8.5%
2030	7.0%	7.0%	9.9%
2035	8.8%	9.5%	11.0%
2040	10.5%	11.4%	12.8%
2045	12.3%	13.1%	15.0%

### Basis of Stochastic Projections

The calculations performed in this model are based on the results of the June 30, 2014 actuarial valuation of the DB Program. The model also relies on the following assumptions regarding future events:

- The current actuarial assumptions/methods remain unchanged in the future.
- There are no changes in the benefit structure.
- The funded ratio shown is equal to assets (actuarial value) divided by the actuarial obligation.

Additional assumptions apply to the stochastic assumptions:

- Future investment returns have a geometric average return of 7.5% with an annual standard deviation of about 14.0%.
- The starting point for the projection is the June 30, 2014 actuarial valuation. For all future years, we used stochastically generated returns.
- The investment returns used in the stochastic analysis are based on 1,000 independent random generated trials.

The actual assets and liabilities in future years will vary from the projected amount to the extent actual experience differs from that projected by the assumptions and methods outlined above.



### **Limitations and Certification**

In developing the stochastic model, we have relied upon the data, methods, assumptions and plan provisions provided to us by CalSTRS for the June 30, 2014 actuarial valuation of the DB Program, except where noted. Please refer to that report for further details. The cost estimates presented in this letter reflect possible outcomes as described in this letter. These cost estimates are subject to the uncertainties of a regular actuarial valuation; the costs are inexact because they are based on assumptions that are themselves necessarily inexact, even though we consider them reasonable.

In preparing the valuation upon which this letter was based, we relied without audit, on information (some oral and some in writing) supplied by CalSTRS staff. This information includes, but is not limited to, statutory provisions, employee data and financial information. In our examination of these data, we have found them to be reasonably consistent and comparable with data used for other purposes. It should be noted that if any data or other information is materially inaccurate or incomplete, our calculations may need to be revised.

All costs, liabilities, rates of interest, and other factors for CalSTRS have been determined on the basis of actuarial assumptions and methods which are individually reasonable (taking into account the experience of CalSTRS and reasonable expectations); and which, in combination, offer a reasonable estimate of anticipated experience affecting CalSTRS.

Future actuarial measurements may differ significantly from the current measurements presented in this report due to such factors as the following: plan experience differing from that anticipated by the economic or demographic assumptions; changes in economic or demographic assumptions; increases or decreases expected as part of the natural operation of the methodology used for these measurements (such as the end of an amortization period or additional cost or contribution requirements based on the plan's funded status); and changes in plan provisions or applicable law. Due to the limited scope of our assignment, we did not perform an analysis of the potential range of future measurements. The Retirement Board has the final decision regarding the appropriateness of the assumptions and adopted them as indicated in Appendix B of the June 30, 2014 valuation report.

Actuarial computations presented in this letter are for purposes of estimating the cost impact of varying future investment returns. The calculations in this letter have been made on a basis consistent with our understanding of CalSTRS current funding requirements. Determinations for purposes other than meeting these requirements may be significantly different from the results contained in this letter. Accordingly, additional determinations may be needed for other purposes.

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No third party recipient of Milliman's work product should rely upon Milliman's work product. Such recipients should engage qualified professionals for advice appropriate to their own specific needs.

The consultants who worked on this assignment are pension actuaries. Milliman's advice is not intended to be a substitute for qualified legal or accounting counsel. These possible changes should be reviewed by counsel. Note that we have not explored these or any other legal issues with respect to the potential policy changes. We are not attorneys and cannot give legal advice on such issues.

The signing actuaries are independent of the plan sponsor. We are not aware of any relationship that would impair the objectivity of our work.

On the basis of the foregoing, we hereby certify that, to the best of our knowledge and belief, this cost study letter is complete and accurate and has been prepared in accordance with generally recognized and accepted actuarial principles and practices which are consistent with the Actuarial Standards of Practice promulgated by the Actuarial Standards Board and the applicable Guides to Professional Conduct, amplifying Opinions, and supporting Recommendations of the American Academy of Actuaries.

We are consulting actuaries for Milliman, Inc. We are also members of the American Academy of Actuaries and meet the Qualification Standards of the American Academy of Actuaries to render the actuarial opinion contained herein.

If you have any questions, please contact us.

Sincerely,

Handwritten signature of Nick J. Collier in black ink.

Nick J. Collier, ASA, EA, MAAA  
Consulting Actuary

NJC/MCO/nlo

cc: Mr. Ed Derman  
Mr. Rick Reed  
Ms. Jennifer Senta

Handwritten signature of Mark C. Olleman in black ink.

Mark C. Olleman, FSA, EA, MAAA  
Consulting Actuary