
**California State Teachers'
Retirement System**

**Experience Analysis
July 1, 2006 – June 30, 2010**

February 2012 Meeting

By

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February 7, 2012

Teachers' Retirement Board
California State Teachers' Retirement System

Dear Members of the Board:

It is a pleasure to submit this report of our investigation of the experience of the California State Teachers' Retirement System (CalSTRS) for the period July 1, 2006 through June 30, 2010. The results of this investigation are the basis for the actuarial assumptions and methods to be used in the actuarial valuations to be performed as of June 30, 2011.

The actuarial valuations as of June 30, 2011 will become the cornerstone for analyzing the funding status of the System's Defined Benefit (DB) Program, Defined Benefit Supplement (DBS) Program, and the Cash Balance Benefit (CBB) Program. The new assumptions will also be used for the June 30, 2011 actuarial projection of the Supplemental Benefit Maintenance Account (SBMA) and June 30, 2012 valuation of the Medicare Premium Payment (MPP) Program.

The purpose of this report is to communicate the results of our review of the actuarial methods and the economic and demographic assumptions to be used in the completion of the upcoming valuation. Several of our recommendations represent changes from the prior methods or assumptions and are designed to better anticipate the emerging experience of CalSTRS.

We have provided financial information showing the estimated impact of the recommended assumptions, if they had been reflected in the June 30, 2010 actuarial valuation. We believe the recommended assumptions provide a reasonable estimate of anticipated experience affecting CalSTRS. Nevertheless, the emerging costs will vary from those presented in this report to the extent that actual experience differs from that projected by the actuarial assumptions. Future actuarial measurements may differ significantly from the current measurements presented in this report due to factors such as the following:

- Plan experience differing from the actuarial assumptions,
- Future changes in the actuarial assumptions,
- Increases or decreases expected as part of the natural operation of the methodology used for these measurements (such as potential additional contribution requirements due to changes in the plan's funded status), and
- Changes in the plan provisions or accounting standards.

Due to the scope of this assignment, we did not perform an analysis of the potential range of such measurements.

This work product was prepared solely for CalSTRS for the purposes described herein and may not be appropriate to use for other purposes. Milliman does not intend to benefit and assumes no duty or liability to other parties who receive this work.

In preparing this report, 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, after discussion with CalSTRS and certain adjustments, we have found the data to be reasonably consistent and comparable with data used for other purposes. Since the experience study results are dependent on the integrity of the data supplied, the results can be expected to differ if the underlying data is incomplete or missing. It should be noted that if any data or other information is inaccurate or incomplete, our determinations might need to be revised.

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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.

On the basis of the foregoing, we hereby certify that, to the best of our knowledge and belief, this report is complete and accurate and has been prepared in accordance with generally recognized and accepted actuarial principles and practices.

We would like to acknowledge the help in the preparation of the data for this investigation given by the CalSTRS staff. We look forward to our discussions and the opportunity to respond to your questions and comments at your next meeting.

We are 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.

Respectfully submitted,



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**California State Teachers' Retirement System
Experience Analysis (2006-2010)**

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California State Teachers' Retirement System Experience Analysis (2006-2010)

Section 1: Executive Summary



Overview

Any actuarial valuation is based on certain underlying assumptions. The results of the actuarial valuation, including the determination of the sufficiency of the contributions being made by members, employers, and the State, are highly dependent on the assumptions that the actuary uses to project the future benefit payments and then to discount the value of future benefits to determine the present values. Thus, the assumptions are critical in assisting the system in adequately monitoring the funding of the promised benefits.

To ensure the on-going reasonableness of the assumptions used in the valuation, they should be studied regularly. This process is called an experience analysis (or experience study).

Summary of Results

This section describes the key findings of this experience analysis of the California State Teachers' Retirement System (CalSTRS) for the period July 1, 2006 through June 30, 2010. Note that because 2011 data was not available when the experience study commenced, we have performed a four-year study ending in 2010.

We are recommending several changes to the demographic assumptions, as well as certain changes to the economic assumptions. Throughout this report, we will refer to our recommended assumptions as the "proposed" assumptions.

There are three significant changes that we are recommending. In order of significance, they are:

- **Investment Return Assumption:** There is a less than 50% probability that the current assumption for the DB Program (7.75%) will be met over the long term. We are recommending a decrease in this assumption to 7.50%.
- **Mortality Assumption:** We are recommending a decrease in the mortality assumption (i.e., an increase in life expectancy) to account for recent experience and expected future improvements in mortality.
- **Wage Growth Assumption:** We are recommending a decrease in the general wage growth assumptions (from 4.00% to 3.75%) to account for recent experience and lower future expectations. This assumption will also be used to project payroll in the future.

All other recommended changes are expected to have only a minor impact on the funded status of the system.

**Summary of Results
(continued)**

If adopted, the new assumptions would result in a decrease in the Funded Ratio and an increase in the projected Additional Revenue Needed, as compared to the current assumptions. This is discussed further in the Financial Impact section at the end of the Executive Summary.

**Summary of Recommend Changes
(Economic)**

The following table shows a summary of our recommendations for the economic assumptions studied.

	DB Program		CBB / DBS Programs	
	Current	Recommended	Current	Recommended
Consumer Price Inflation	3.00 %	3.00 %	3.00 %	3.00 %
Net Real Rate of Return	<u>4.75</u>	<u>4.50</u>	<u>4.25</u>	<u>4.00/4.50</u>
Investment Return ⁽¹⁾	7.75 %	7.50 %	7.25 %	7.00/7.50 %
Interest on Member Accounts	6.00 %	4.50 %	7.25 %	7.00/7.50 %
Consumer Price Inflation	3.00 %	3.00 %	n/a	n/a
Real Wage Inflation	<u>1.00</u>	<u>0.75</u>	n/a	n/a
Wage Growth ⁽²⁾	4.00 %	3.75 %	n/a	n/a

⁽¹⁾ Net of investment and administrative expenses.

⁽²⁾ Payroll growth is assumed to be the same as wage growth.

**Summary of Recommend Changes
(Demographic)**

The following table shows a summary of our recommendations for all demographic assumptions (i.e., those relating to member behavior).

Demographic Assumption	Recommended Revisions
Mortality	
Healthy Retired Members	Increase in Life Expectancy
Beneficiaries	Increase in Life Expectancy
Disabled Members	Increase in Life Expectancy
Active Members	Increase in Life Expectancy
Service Retirement	
Retirement from Active Membership	Increased Rates for Service \geq 25
Retirement from Vested Membership	No Change
Disability	
Coverage A	Lower Rates
Coverage B	Lower Rates
Other Terminations of Membership	
Withdrawal	Rates by Gender and Service Only
Probability of Refund	No Change
Merit Scale Salary Adjustments	No Change
Miscellaneous Assumptions	
Load for Sick Leave Service	Small Reduction
Probability of Marriage	No Change
Number of Children	Small Reduction for Males
Offsets for Death & Disability	Reduction

**Summary of
Recommend
Changes
(Demographic)
(continued)**

NOTE: All assumptions recommended for the DB Program are also recommended to be used for the June 30, 2011 actuarial projection of the Supplemental Benefit Maintenance Account (SBMA) and the June 30, 2012 valuation of the Medicare Premium Payment (MPP) Program. Additional economic and demographic assumptions unique to the MPP Program will be developed in conjunction with the actuarial valuation.

**Economic
Assumptions**

Section 2 discusses the economic assumptions: price inflation, general wage growth (includes price inflation and productivity), interest credit on member accounts, and the investment return assumption. We have recommended changes to the current economic assumptions, with the most significant of these being a reduction in the investment return assumption for the DB Program.

As discussed in Section 2, inflation historically has averaged higher than the current 3.00% assumption; however, recent experience and forecasts for inflation are lower. We believe the current assumption is reasonable and are recommending no change.

We are recommending a decrease in the general wage growth assumption (from 4.00% to 3.75%). Over the last 50 years, wages have exceeded inflation by 0.7%. Additionally, wage increases over inflation have been lower for California teachers than the national average for all job types. Therefore, we are recommending the difference between wage growth and inflation be lowered from the current 1.00% difference to 0.75%, resulting in a total wage growth assumption of 3.75%. This assumption will also be used to project future payroll.

Based on current capital market expectations and CalSTRS' current asset allocation, the current 7.75% investment return assumption for the DB Program exceeds the expected long-term return. Therefore, we are recommending a reduction in this assumption to 7.50%. As previously noted, this has the most significant impact of all our recommendations. We are also recommending the DBS Program assumption be set equal to the DB Program (7.50%) since the DBS Program assets are now invested similarly to the DB Program. For the CBB Program, we are recommending the assumption be set to 7.00% (0.50% less than the DB Program) due to the different asset mix.

We are recommending a decrease in the interest assumed to be credited to members' accounts in the DB Program (from 6.00% to 4.50%). Since 2004, the actual return on two-year treasuries (which the interest rate is based on) has only been slightly greater than inflation. Therefore, we are recommending a reduction in the assumed interest credit so that it is closer to the inflation assumption.

Economic Assumptions (continued)

For the CBB and DBS Programs, we recommend the current practice of setting the assumed interest credit on member accounts equal to the investment return assumption be retained, as the long-term intention is to allocate all of the investment earnings to the member accounts.

Actuarial Methods and Miscellaneous Assumptions

Section 3 discusses the actuarial methods and other miscellaneous assumptions used in the valuation and administration of the system.

We are recommending changes in this area as follows:

- **Sick Leave** – Small reduction in the additional sick leave members are assumed to have at retirement.
- **Benefit Offsets** – Decrease in the offsets for other public benefits expected to be paid to future survivors and disabilities.
- **Children** – Small reduction in the expected number of children for married male members.

Demographic Assumptions

Sections 4-10 discuss the demographic assumptions. Unlike the economic assumptions, which are more global in nature, the demographic assumptions are based heavily on recent CalSTRS experience. Demographic assumptions are used to predict future member behavior (e.g., when will a member retire? How long will the member live?).

From a cost perspective, the most significant change that we have recommended to the demographic assumptions is the strengthening of the mortality assumption (i.e., increased life expectancies).

When reviewing the sections on demographic assumptions, please note the following:

- Our analysis uses the Actual-to-Expected (A/E) ratio to measure how well the current assumptions fit actual experience. For example, if the service retirement A/E is 80%, it indicates that there were 20% fewer service retirements than expected, and that we should consider decreasing the assumption. By decreasing the expected rates, this results in a higher ratio, in this case closer to 100%.
- When we refer to the “proposed” assumptions, these are the assumptions that we are recommending. The current assumptions are also referred to as the “expected” assumptions.

Demographic Assumptions (continued)

- For many of the assumptions, we show detail graphs of our analysis showing the actual experience for the study (blue bar), the actual experience from the prior study (green bar), the current assumption (red line), and the new proposed assumptions (yellow line).

The recommended rates are shown in detail in Appendix A.

Individual Salary Increases due to Promotion and Longevity (Merit)

Section 4 discusses the individual salary increases due to promotion and longevity – the merit component of salaries. Overall, the results of our last two salary studies show increases in line with what the current rates predicted (as shown in the following graph). We are not recommending any changes to this assumption. See Section 4 for more details on this analysis.



Mortality

The mortality assumption is used to predict the life expectancy of both members currently in pay status and those expected to receive a benefit in the future. We are recommending a decrease in the mortality assumptions (i.e., an increase in life expectancy) to account for recent experience and expected improvements in mortality.

The following chart shows that the recommended mortality tables project that future retirees will live almost a year longer, as compared to the current assumptions.

Expected Lifetime for Future Retirees				
	Males		Females	
	Current	Proposed	Current	Proposed
Age at Retirement	62.0	62.0	62.0	62.0
Expected Future Lifetime	25.1	25.9	27.2	27.9
Expected Age at Death	87.1	87.9	89.2	89.9

Service Retirement

For members with less than 25 years of service, the number of service retirements from active service was very close to what the assumptions predicted. For members with 25 or more years of service, the actual number of retirements was greater than the assumptions predicted.

The chart below illustrates the actual and expected number of service retirements for males and females combined, split by service level.

Number of Service Retirements			
	<u>Actual</u>	<u>Expected</u>	<u>Actual / Expected</u>
Less than 25 Years of Service	18,157	18,674	97%
25 Years or More of Service	28,556	24,433	117%

We are therefore recommending no changes to rates of retirement from active service for members with less than 25 years of service. For active members with 25 or more years of service, we are recommending increases in the assumed probability of service retirement.

In addition, we are recommending extending the proposed retirement rates at all levels of service to age 75 (current retirement rates assume 100% of members retire at or before age 70), as many teachers are working beyond age 70.

Further analysis is shown in Section 7 of this report.

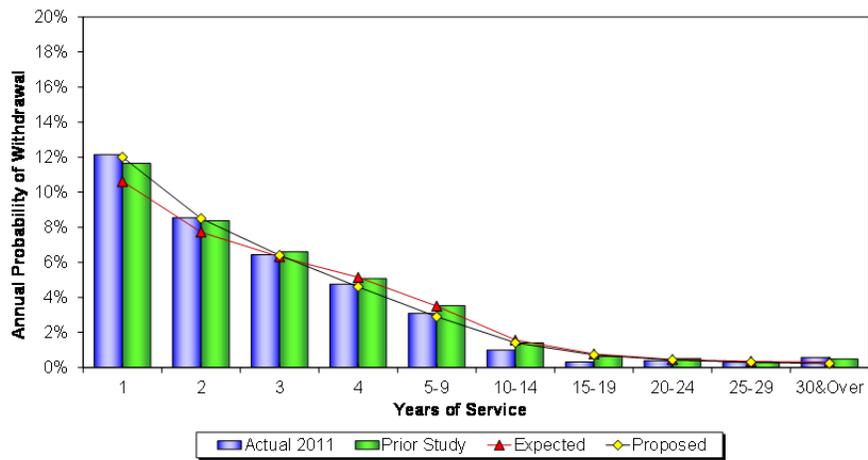
Disability Retirement

Overall, the actual number (1,975) of disability retirements was about 80% of what the assumptions predicted (2,436). We are recommending slightly lower rates of disability retirement for both Coverage A and Coverage B. Further analysis is shown in Section 8 of this report.

Other Terminations of Employment

The actual rates of termination were close to the assumptions. Generally, when this occurs we would not recommend a change in the assumption. However, our analysis by entry age showed no clear pattern of entry age impacting termination rates. Accordingly, we are recommending new terminations based on service and gender only with no distinction by entry age.

As indicated by the following graph showing rates of termination by years of service for females, the recommended changes are relatively small. Further analysis is shown in Section 9 of this report.



Probability of Refund upon Vested Termination

The actual number of refunds for vested members at termination was in line with the assumptions. We are recommending no change to this assumption. Further analysis is shown in Section 10 of this report.

Actual to Expected Number of Refunds			
Gender	Actual	Expected	Ratio
Males	2,042	1,994	102%
Females	4,257	3,838	111%
Total	6,299	5,832	108%

Financial Impact of the Recommended Assumptions (DB Program)

The following exhibit shows the expected financial impact the proposed changes would have on the funding of the DB Program. If the proposed changes are adopted, the calculated Additional Revenue Needed would increase (relative to if the changes were not made). This would not actually increase the additional contributions that would ultimately be needed, but it would set a higher funding target now. The Funded Ratio of the DB Program would decrease under the new assumptions.

The financial impact was evaluated by performing additional valuations with the June 30, 2010 valuation data and reflecting the proposed assumption changes. The actual financial impact will vary somewhat for the June 30, 2011 valuation due to year-to-year changes.

As shown in the chart, the proposed reduction in the investment return assumption has the largest impact, followed by the mortality change.

	Normal Cost %	Funded Ratio	Add'l Revenue Needed (% of Payroll)
June 30, 2010 Actuarial Valuation	17.71%	71.46%	14.24%
Demographic Assumptions			
Withdrawal Rate Changes	0.04%	0.0%	0.06%
Retirement Rate Changes	-0.11%	0.1%	-0.13%
Mortality Changes	0.30%	-1.2%	0.95%
Disability Rate Changes	-0.05%	0.0%	-0.04%
Miscellaneous Assumption Changes*	0.00%	0.0%	-0.02%
Demographic Subtotal	<u>0.18%</u>	<u>-1.1%</u>	<u>0.82%</u>
Economic Assumptions			
Interest on Member Accounts (4.50%)	-0.03%	0.3%	-0.18%
Wage Inflation (3.75%)	-0.65%	0.5%	-0.46%
Investment Return (7.50%)	1.09%	-2.0%	1.81%
Economic Subtotal	<u>0.41%</u>	<u>-1.2%</u>	<u>1.17%</u>
Total Assumption Change	0.59%	-2.3%	1.99%
June 30, 2010 Actuarial Valuation with All Changes	18.30%	69.16%	16.23%

* Assumptions for number of children, sick leave credit at retirement, and death and disability offsets.

Financial Impact of the Recommended Assumptions (DBS & CBB Programs)

The following exhibits show the expected financial impact the proposed changes would have on the funded status of the DBS and CBB Programs. The proposed changes would have no impact on the obligation for active and inactive members of either plan, since these obligations are equal to the sum of the members' account balances.

There would be a small impact on the obligation for retirees due to the proposed changes in mortality and the investment return assumption. As the retiree obligation is only a small portion of the total obligation, the overall impact is very minor. In fact, for the CBB Program, the difference is less than 0.01%.

CBB Program -- Financial Impact of Recommended Assumptions	
	Funded Ratio
June 30, 2010 Actuarial Valuation	88.30%
Mortality Rate Changes	0.00% *
Investment Return Assumption 7.00%	0.00% *
June 30, 2010 Actuarial Valuation with All Changes	88.30%

* Decrease is less than 0.01%.

DBS Program -- Financial Impact of Recommended Assumptions	
	Funded Ratio
June 30, 2010 Actuarial Valuation	86.00%
Mortality Rate Changes	-0.04%
Investment Return Assumption 7.50%	0.08%
June 30, 2010 Actuarial Valuation with All Changes	86.04%

Financial Impact of the Recommended Assumptions (SBMA)

The funding of the SBMA is currently projected to be sufficient at the 85% purchasing power level. There is some margin for possible adverse experience in the future. For example, if inflation was slightly higher than assumed for the next few years, the current funding is still expected to provide the same level of benefits. The recommended assumptions would reduce this margin; however, the SBMA funding would still be projected to be sufficient at the 85% level.

Revised Assumptions and Methods

Appendix A illustrates the Summary of Actuarial Assumptions as it will appear in the June 30, 2011 valuation report, if all recommended assumptions and methods are adopted. Proposed changes in assumptions are highlighted in yellow.

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This work product was prepared solely for CalSTRS for the purposes described herein and may not be appropriate to use for other purposes. Milliman does not intend to benefit and assumes no duty or liability to other parties who receive this work.

California State Teachers' Retirement System Experience Analysis (2006-2010)

Section 2: Economic Assumptions



Actuarial Standard of Practice (ASOP) No. 27, *Selection of Economic Assumptions for Measuring Pension Obligations*, provides guidance to actuaries giving advice on selecting economic assumptions for measuring obligations under defined benefit plans. Because no one knows what the future holds, the best an actuary can do is to use professional judgment to estimate possible future economic outcomes. These estimates are based on a mixture of past experience, future expectations, and professional judgment. The actuary should consider a number of factors, including the purpose and nature of the measurement, and appropriate recent and long-term historical economic data. However, the standard explicitly advises the actuary not to give undue weight to recent experience.

Recognizing that there is not one “right answer,” the standard calls for the actuary to develop a best estimate range for each economic assumption, and then recommend a specific point within that range. Each economic assumption should individually satisfy this standard. Furthermore, with respect to any particular valuation, each economic assumption should be consistent with every other economic assumption over the measurement period.

This section will discuss the economic assumptions. In our opinion, the economic assumptions recommended in this report have been developed in accordance with ASOP No. 27. The following table (changes are shown in bold) summarizes our recommendations.

	DB Program		CBB / DBS Programs	
	Current	Recommended	Current	Recommended
Consumer Price Inflation	3.00 %	3.00 %	3.00 %	3.00 %
Net Real Rate of Return	<u>4.75</u>	4.50	<u>4.25</u>	4.00/4.50
Investment Return ⁽¹⁾	7.75 %	7.50 %	7.25 %	7.00/7.50 %
Interest on Member Accounts	6.00 %	4.50 %	7.25 %	7.00/7.50 %
Consumer Price Inflation	3.00 %	3.00 %	n/a	n/a
Real Wage Inflation	<u>1.00</u>	0.75	n/a	n/a
Wage Growth ⁽²⁾	4.00 %	3.75 %	n/a	n/a

⁽¹⁾ Net of investment and administrative expenses.

⁽²⁾ Payroll growth is assumed to be the same as wage growth.

1. Price Inflation

Use in the Valuation

When we refer to inflation in this report, we are referring to price inflation. The current assumption for inflation is 3.00% per year. The inflation assumption has an indirect impact on the results of the actuarial valuation through the development of the assumptions for the investment return, the interest rate on member accounts, the general wage increases and the payroll increase assumption. It also has a direct impact on the actuarial projection of the SBMA, as it will be used to determine the expected future purchasing power payments.

The long-term relationship between inflation and investment return has long been recognized by economists. The basic principle is that the investors demand a “real return” – the excess of actual investment returns over inflation. If inflation rates are expected to be high, investors will demand investment returns that are also expected to be high enough to exceed inflation, while lower inflation rates will result in lower expected investment returns, at least in the long run.

Historical Perspective

The data for inflation shown below is based on the national Consumer Price Index, US City Average, All Urban Consumers (CPI-U) as published by the Bureau of Labor Statistics. The data for periods ending in December of each year is documented in Exhibit 2-1 at the end of this section.

Although economic activities in general, and inflation in particular, do not lend themselves to prediction on the basis of historical analysis, historical patterns and long term trends are a factor to be considered in developing the inflation assumption.

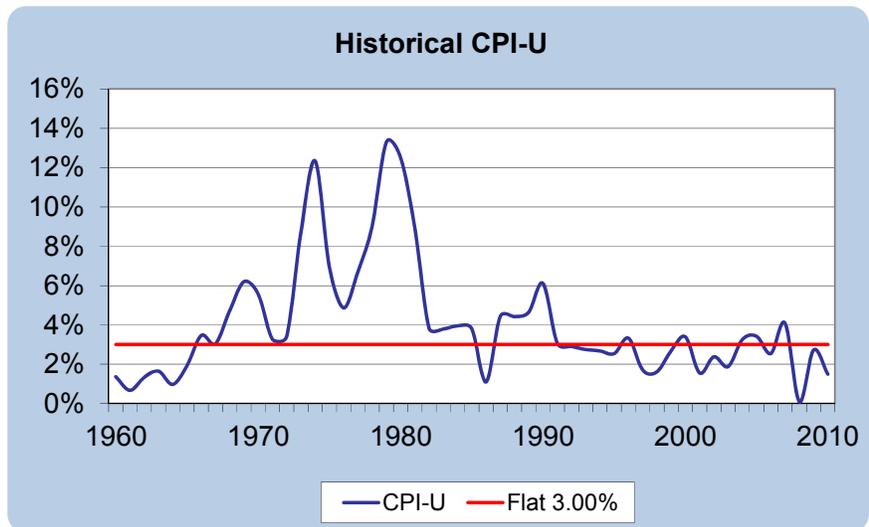
There are numerous ways to review historical data, with significantly differing results. The tables below show the compounded annual inflation rate for various 10-year periods, and for the 50-year period ended in December 2010. Note that the 50-year average is heavily influenced by the inflation of the late 1970's and early 1980's.

Decade	CPI Increase
2001-2010	2.3%
1991-2000	2.7%
1981-1990	4.5%
1971-1980	8.1%
1961-1970	2.9%
Prior 50 Years	
1961-2010	4.1%

These are national statistics. For comparison, the average CPI increase for California has been 4.2% for the same 50-year period.

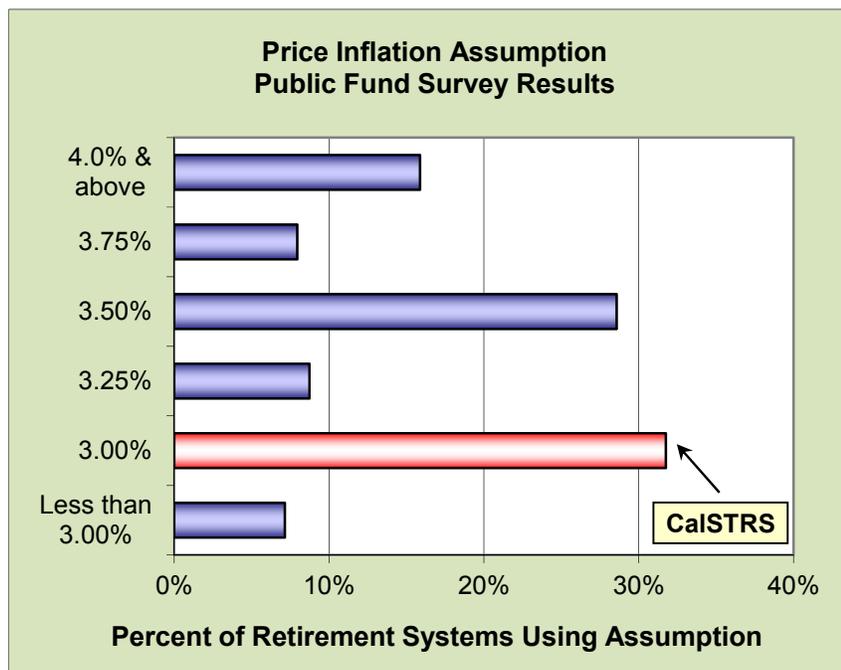
Historical Perspective (continued)

The following graph shows historical national CPI increases. Note that the actual CPI increase has generally been less than 3.00% during the most recent 20 years.



Peer System Comparison

According to the *Public Fund Survey* (a survey of approximately 125 statewide systems conducted by NASRA), the average inflation assumption for statewide systems has been steadily declining. As of the most recent study, the two most common assumptions are 3.00% and 3.50%, so CalSTRS is in the mainstream but on the lower side. The following graph shows this distribution.



Forecasts of Inflation

Since the U.S. Treasury started issuing inflation indexed bonds, it is possible to determine the approximate rate of inflation anticipated by the financial markets by comparing the yields on inflation indexed bonds with traditional fixed government bonds. Current market prices as of December 2011 suggest investors expect inflation to be about 2.2% over the next 30 years.

Many economists have been forecasting inflation lower than the current assumption of 3.00% for several years. Economists are generally considering shorter time periods (10 years or less) than may be appropriate for a pension valuation. To find an economic forecast with a time frame long enough to suit our purposes, we looked at the expected increase in the CPI by the Office of the Chief Actuary for the Social Security Administration. In the 2011 Trustees Report, the projected average annual increase in the CPI over the next 75 years under the intermediate cost assumptions was 2.80%, with lower inflation expected over the next several years. The reasonable range was stated as 1.80% to 3.80%.

Best Estimate Range and Recommendation

The consumer price inflation assumption does not directly impact the funding of the DB Program; however, it is used to determine the sufficiency of the SBMA funding to pay purchasing power benefits. It is also used in the determination of the investment return assumption, the assumed interest credit to member accounts, and the wage growth assumption.

We recommend no change in the long-term assumed inflation rate of 3.00% per year for the following reasons:

- We agree with the Social Security projections that a range between 1.80% and 3.80% is reasonable for an actuarial valuation of a retirement system.
- Although inflation has generally been less than 3.00% in the recent past, there have been periods historically where increases have been significantly higher.
- The current assumption is in the mainstream of inflation assumptions used by other retirement systems.

We believe that the current assumption of 3.00% per year is reasonable.

CONSUMER PRICE INFLATION	
Current Assumption	3.00%
Best Estimate Range	2.00% - 3.75%
Recommended Assumption	3.00%

**California State Teachers' Retirement System
Experience Analysis (2006-2010)**

Exhibit 2-1 US City Average, All Urban Consumers (CPI-U) - December

December of:	Index	Increase	December of:	Index	Increase
1928	17.1				
1929	17.2	0.6%	1969	37.7	6.2%
1930	16.1	-6.4	1970	39.8	5.6
1931	14.6	-9.3	1971	41.1	3.3
1932	13.1	-10.3	1972	42.5	3.4
1933	13.2	0.8	1973	46.2	8.7
1934	13.4	1.5	1974	51.9	12.3
1935	13.8	3.0	1975	55.5	6.9
1936	14.0	1.4	1976	58.2	4.9
1937	14.4	2.9	1977	62.1	6.7
1938	14.0	-2.8	1978	67.7	9.0
1939	14.0	0.0	1979	76.7	13.3
1940	14.1	0.7	1980	86.3	12.5
1941	15.5	9.9	1981	94.0	8.9
1942	16.9	9.0	1982	97.6	3.8
1943	17.4	3.0	1983	101.3	3.8
1944	17.8	2.3	1984	105.3	3.9
1945	18.2	2.2	1985	109.3	3.8
1946	21.5	18.1	1986	110.5	1.1
1947	23.4	8.8	1987	115.4	4.4
1948	24.1	3.0	1988	120.5	4.4
1949	23.6	-2.1	1989	126.1	4.6
1950	25.0	5.9	1990	133.8	6.1
1951	26.5	6.0	1991	137.9	3.1
1952	26.7	0.8	1992	141.9	2.9
1953	26.9	0.7	1993	145.8	2.7
1954	26.7	-0.7	1994	149.7	2.7
1955	26.8	0.4	1995	153.5	2.5
1956	27.6	3.0	1996	158.6	3.3
1957	28.4	2.9	1997	161.3	1.7
1958	28.9	1.8	1998	163.9	1.6
1959	29.4	1.7	1999	168.3	2.7
1960	29.8	1.4	2000	174.0	3.4
1961	30.0	0.7	2001	176.7	1.6
1962	30.4	1.3	2002	180.9	2.4
1963	30.9	1.6	2003	184.3	1.9
1964	31.2	1.0	2004	190.3	3.3
1965	31.8	1.9	2005	196.8	3.4
1966	32.9	3.5	2006	201.8	2.5
1967	33.9	3.0	2007	210.0	4.1
1968	35.5	4.7	2008	210.2	0.1
			2009	215.9	2.7
			2010	219.2	1.5

2. Wage Growth

Use in the Valuation

Estimates of future salaries are based on two types of assumptions: 1) general wage increase and 2) merit increase. Rates of increase in the general wage level of the membership are directly related to inflation, while individual salary increases due to promotion and longevity occur even in the absence of inflation. The promotion and longevity assumptions, referred to as the merit scale, will be reviewed with the other demographic assumptions.

The current assumption is for wage growth to be 1.00% above the inflation assumption.

Historical Perspective

We have used statistics from the Social Security Administration on the National Average Wage back to 1960.

There are numerous ways to review this data. For consistency with our observations of other indices, the table below shows the compounded annual rates of wage growth for various 10-year periods and for the 50-year period ended in 2010. The excess of wage growth over price inflation represents “productivity” (or the increase in the standard of living, also called the real wage inflation rate).

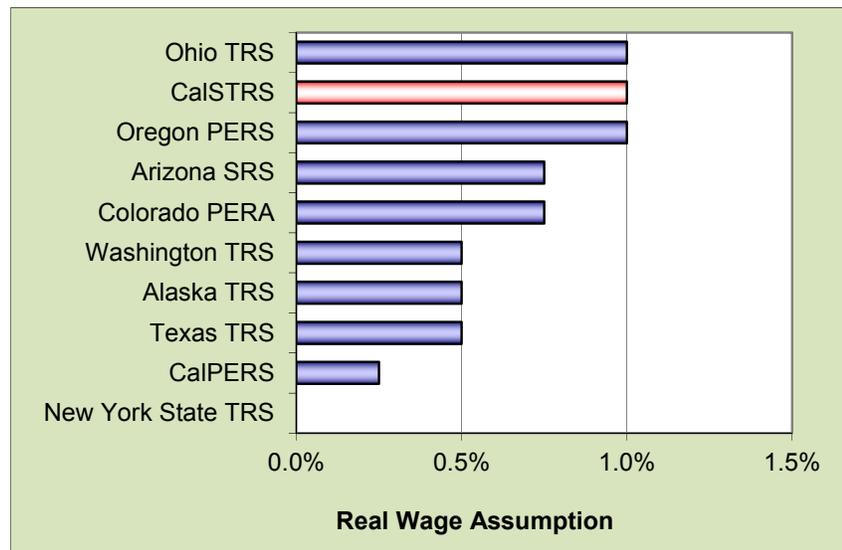
Decade	Wage Growth	CPI Increase	Real Wage Inflation
2001-2010	2.6%	2.3%	0.3%
1991-2000	4.3%	2.7%	1.6%
1981-1990	5.3%	4.5%	0.8%
1971-1980	7.3%	8.1%	-0.8%
1961-1970	4.4%	2.9%	1.5%
Prior 50 Years			
1961-2010	4.8%	4.1%	0.7%

These are national statistics for all jobs. For comparison, the average increase in the real wage for members of CalSTRS has been 0.3% for the most recent 30-year period. This is significantly less than the national average which increased 0.9% more than inflation over the last 30 years.

Peer System Comparison

The *Public Fund Survey* does not report the average wage growth assumption. Based on our experience with other systems, we believe the average total wage growth assumption for this group would be approximately equal to CalSTRS' assumption of 4.0%. However, as previously noted, CalSTRS' price inflation assumption is slightly below the median. This means that CalSTRS' real wage inflation assumption (wage inflation minus price inflation) of 1.00% is on the high side when compared to the average large retirement system.

Looking at selected statewide retirement systems, this is also true. The current real wage growth assumption for CalSTRS is the same as or higher than these other systems.



Forecasts of Future Wages

Wage inflation has been projected by the Office of the Chief Actuary of the Social Security Administration. In the 2011 Trustees Report, the long-term annual increase in the National Average Wage is estimated to be 1.2% higher than the Social Security intermediate inflation assumption of 2.8% per year. The range of the assumed real wage growth in the 2011 Trustees Report was from 0.6% to 1.8% per year.

**Reasonable
Range and
Recommendation**

We believe that a range between 0.25% and 1.25% is reasonable for the actuarial valuation. Real wage inflation in recent years has been very low or negative. Also, over the last 50 years, the actual experience, on a national basis, was less than the current assumption. We believe that this trend of lower increases in real wage will continue in the future, although probably not to the extent of recent years. Accordingly, we are recommending that the long-term assumed real wage inflation rate be decreased to 0.75% per year.

REAL WAGE INFLATION RATE	
Current Assumption	1.00%
Best Estimate Range	0.25% - 1.25%
Recommended Assumption	0.75%

The wage growth assumption is the total of the consumer price inflation assumption and the real wage inflation rate. If the real wage inflation assumption is decreased to 0.75% and the price inflation assumption remains at 3.00%, this would result in a total wage growth assumption of 3.75%.

**Payroll Increase
Assumption**

In addition to setting salary assumptions for individual members, the aggregate payroll of CalSTRS is expected to increase, without accounting for the possibility of an increase in membership (our current and recommended assumption is that no growth in membership will occur).

The current payroll increase assumption is equal to the general wage growth assumption of 3.75%. It is our general recommendation to set these two assumptions to be equal, unless there is a specific circumstance that would call for an alternative assumption. We are recommending that the payroll increase assumption be reduced to 3.75% to be consistent with the general wage growth assumption.

3. Investment Return

Use in the Valuation

The investment return assumption is one of the primary determinants in the calculation of the expected cost of the System's benefits, providing a discount of the future benefit payments that reflects the time value of money. This assumption has a direct impact on the calculation of liabilities, normal costs, and the factors for optional forms of benefits. The current investment return assumption for the CalSTRS DB Program is 7.75% per year, net of administrative and investment-related expenses. For the CBB and DBS Programs, the assumed return is 7.25%

Method to Determine Best-Estimate Range for Investment Return

We have determined the best-estimate range for the investment return assumption. As input, we have used the capital market assumptions from Pension Consulting Alliance, CalSTRS' investment consultant and CalSTRS' target asset allocation. CalSTRS' target asset allocation is summarized in the following chart:

Asset Class	Target Allocation	
	DB & DBS	CBB
Global Equity	47%	72%
Private Equity	12	0
Real Estate	15	0
Inflation Sensitive	5	0
Fixed Income	20	28
Cash	1	0
Total	100%	100%

We used a model developed by our investment practice to determine the range of assumptions appropriate for compliance with Actuarial Standard of Practice No. 27, "Selection of Economic Assumptions for Measuring Pension Obligations." The Standard defines the Best-Estimate Range as "the narrowest range within which the actuary reasonably anticipates that the actual results, compounded over the measurement period, are more likely than not to fall."

By assuming the portfolio is re-balanced annually and that annual returns are lognormally distributed and independent from year to year, we can develop expected percentiles for the long-term distribution of annualized returns.

Using properties of the lognormal distribution, we calculate the 25th and 75th percentiles of the long-term total return distribution. This becomes our best-estimate range because 50% of the outcomes are expected to fall within this range and it is centered about the mean.

Method to Determine Best-Estimate Range for Investment Return (continued)

The capital market assumptions were combined with the target asset allocation policy to generate expected real rates of returns (total return less assumed inflation based on capital market assumptions), which were then added to the valuation inflation assumption of 3.0%. The real rate of return is subject to significant year-to-year volatility as measured by the standard deviation. Volatility over time will lower the mean real rate of return but diversification by asset class will reduce the volatility and narrow the range of expected total returns for the entire portfolio. The results are summarized as follows:

Expected Investment Return with 3.00% Inflation
(after reflecting administrative and investment expenses)

Horizon In Years	Percentile Results for Nominal Rate of Return				
	5 th	25 th	50 th	75 th	95 th
1	-11.6%	-0.9%	7.3%	16.2%	30.3%
5	-1.6%	3.6%	7.3%	11.2%	17.1%
10	0.9%	4.6%	7.3%	10.1%	14.1%
20	2.8%	5.4%	7.3%	9.2%	12.1%
30	3.6%	5.8%	7.3%	8.9%	11.2%

The geometric mean (50th percentile) return is 7.3%, but due to the volatility associated with the asset allocation, the range of probable outcomes is quite large. For example, in the first year there is a 5% chance the rate of return will be less than -11.6% and a 5% chance it will be greater than 30.3%. As the time horizon lengthens, the range of the cumulative average results narrows. Note that these are net returns, after adjusting for investment and administrative expenses.

Over a 30-year time horizon, we estimate there is a 25% chance the nominal rate of return will be less than 5.8% and a 25% chance the return will be greater than 8.9% (bold numbers on the bottom line in the table above). Therefore, we can say the return is just as likely to be within the range from 5.8% to 8.9% as not.

Expected Return for the DBS and CBB Programs

The assets of the CBB Program have a different allocation than the DB Program because they are not invested in the full spectrum of instruments available in the DB Program portfolio. Currently, the investment return assumption for this program is 0.50% less than the DB Program to account for this.

Note that the DBS asset allocation was previously similar to the CBB Program. However, it was recently changed to be consistent with the DB Program. Therefore, we are recommending that the investment return assumption for the DBS Program be set equal to the DB Program assumption.

We performed similar modeling for the allocation of the CBB Program and found that the expected return is 0.6% less than that for the DB Program. Therefore, we are recommending a lower investment return assumption for the CBB Program.

Capital Market Assumptions

The capital market assumptions used in our analysis are the March 2011 assumptions from Pension Consulting Alliance.

Class	Expected Return *	Standard Deviation
Global Equity	7.50%	17.5%
Private Equity	9.20%	25.0%
Real Estate**	7.35%	18.9%
Inflation Sensitive***	6.20%	8.0%
Fixed Income	3.20%	4.5%
Cash	3.00%	2.0%

* 10-year geometric average.

** Provided separately by PCA.

*** Assumed to be equivalent to PCA's real return.

Investment and Administrative Expenses

The investment return used for the valuation is assumed to be net of all investment and administrative expenses. It is our understanding that PCA's capital market assumptions are already net of investment expenses, so we only need to adjust for administrative expenses. The following table shows the ratio of total administrative expenses to the fair market value of CalSTRS assets over the last nine fiscal years ending June 30. The expense ratio is calculated as the total administrative expense divided by the ending asset balance at fair market value.

(\$million)	Market	Admin.	Expense
Year	Assets	Expense	Ratio
2003	\$100,372	\$73	0.07%
2004	116,061	95	0.08
2005	129,524	95	0.07
2006	144,212	96	0.07
2007	172,378	106	0.06
2008	161,498	109	0.07
2009	118,430	113	0.10
2010	129,768	140	0.11
2011	155,346	110	0.07

The ratio of administrative expenses to market assets has averaged about 0.10% over the period shown. This amount does not have a direct impact on the actuarial valuation results, but it does provide a measure of the return on investments that will be needed to meet the actuarial assumption used for the valuation. For example, if the investment return assumption is set equal to 7.50%, then CalSTRS would need to earn a return on its assets, net of investment expenses, of about 7.60% in order to net the 7.50% for funding purposes.

**Best Estimate Range
Based on Current
Market Expectations**

Based on the ASOP No. 27 guidelines, we conclude that the best-estimate range is the expected real rates of return between the 25th and 75th percentile projected out 30 years, plus the assumed inflation rate, less administrative and investment-related expenses.

Based upon our model and the current inflation assumption, we have the following results:

Components of Return	Percentile Results		
	75th	50th	25th
Expected Real Rate of Return	2.9%	4.4%	6.0%
Inflation	3.0%	3.0%	3.0%
Total Expenses	-0.1%	-0.1%	-0.1%
Net Expected Return	5.8%	7.3%	8.9%

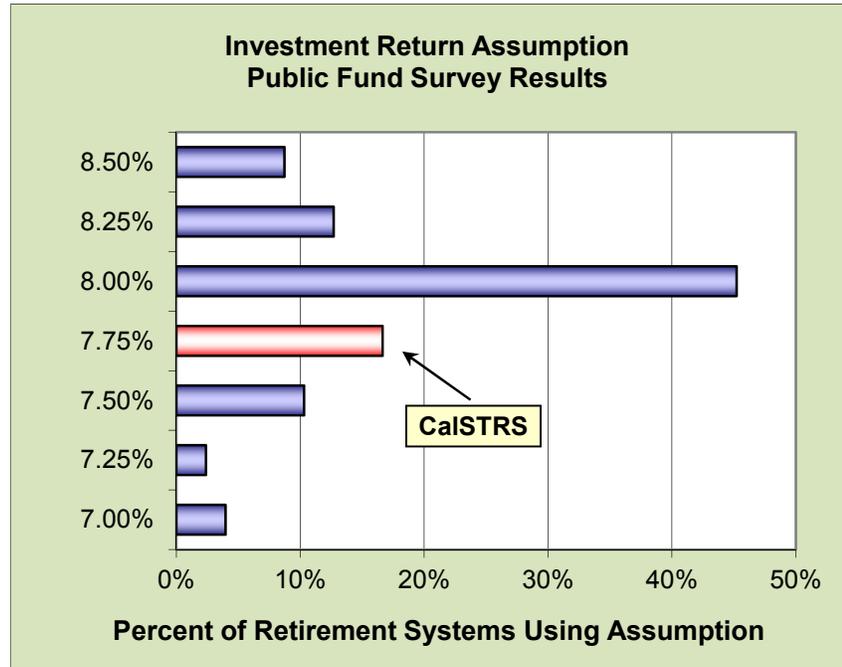
Based upon this model, there is approximately a 50% chance that the net return will be 7.3% or more over a 30-year period. Generally we like to allow some room for conservatism when recommending the investment return assumption to provide a buffer against future adverse experience. Since the expected return of 7.3% is less than the current assumed investment return of 7.75%, there is currently no buffer. Accordingly, we recommend lowering the investment return assumption.

Note that the 7.3% compares with an expected return of 7.4% from our prior analysis of the investment return assumption (presented at the December, 2010 Board meeting). This decrease is mainly due to lower expected returns on equities reflected in the current capital market assumptions.

It should be noted that the capital market assumptions are based on a 10-year horizon. These may not exactly correspond to the longer-term (30-year) expectations that we are using for our analysis, but we believe they are a good estimate. In particular, the expected fixed income return of 3.20% from the 10-year capital market assumptions may be somewhat low due to the potential for rising interest rates over the period. Over a 30-year period, we believe the expected annual return would be somewhat higher. However, even if this is factored in, we would still not expect it to impact our recommendation to reduce the investment return assumption.

Peer System Comparison

According to the *Public Fund Survey*, the average investment return assumption for statewide systems has been slowly declining. As of the most recent study, the average rate is 7.9%. The following chart shows the distribution of the investment return assumptions. As can be seen, CalSTRS current assumption is slightly below the median.



Other Factors for Board Consideration

Since economic assumptions are subjective in nature, it is our recommendation that the Board be fully comfortable with the implications of the economic assumptions, particularly with the investment return assumption. There is an “actuarial risk” associated with the economic assumptions, just as there is an investment risk associated with a given portfolio mix.

Actuarial assumptions are used to measure and budget future costs. Changing assumptions will not change the actual cost of future benefits (except as noted in the section titled ‘Additional Impact of Change’). Aggressive assumptions anticipate good future experience ahead of time and factor it into budget estimates. Conservative assumptions, on the other hand, tend to recognize good experience only after it happens.

The choice of assumptions depends on a system’s risk tolerance. The final determination on whether or not a set of assumptions is either conservative or aggressive will only be borne out by future experience.

Other Factors for Board Consideration (continued)

We generally believe some degree of conservatism should be built into the assumption. Therefore, we usually recommend the investment return assumption be set between the 50th and 75th percentiles (5.8% to 7.3% in this case). The main reason for this is that it is much easier to deal with actual returns exceeding the assumption in the future than lagging it. It should be noted that the current capital market assumptions are extremely low in a historical context. Therefore, our recommended investment return assumption of 7.50% is slightly higher than the 50th percentile of 7.30% shown above, so as to not fully reflect the very low current capital market assumptions.

Some degree of conservatism is particularly desirable for CalSTRS, since it is essentially a fixed contribution rate plan. In its current situation, CalSTRS needs significant additional funding. If CalSTRS obtains this additional funding, but actual returns in the future fall short of the investment return assumption, it is likely the contribution rate will again be insufficient. Setting a more conservative investment return assumption results in a targeted contribution rate that is more likely to be sufficient in the long term. That being said, the lower the investment return assumption is set, the harder it may be to get the full targeted contribution amount.

Additional Impact of Change

The investment return assumption also impacts the following:

- **Optional Forms of Payment:** CalSTRS members may elect to receive their DB Program benefit in several forms. The member's unmodified benefit amount is reduced to reflect the actual form of payment elected based on the investment return assumption and mortality rates used. Lowering the investment return assumption used in this calculation will tend to increase the expected cost of the optional form of payment and will therefore result in a slightly greater reduction in the benefit amount (all other things being equal).
- **Service Purchase Costs:** CalSTRS members may purchase additional retirement credit. If the actual rate of return earned in the long-term is less than the investment return assumption used in the service purchase cost calculation, the system will have charged the member less than the true cost, and the employer will ultimately have to make up this shortfall. Conversely, if the actual rate of return earned in the long term is greater than the investment return assumption, the system will have charged the member more than the full cost, and the employer will have to contribute less in the future.

Additional Impact of Change (continued)

- Interest Credited to SBMA:** The assumed return for the DB Program does not directly impact contributions to CalSTRS. However, it should be noted that it does have a direct, albeit currently small, impact on the actual investment return of the DB Program. The Supplemental Benefits Maintenance Account (SBMA) is credited with the assumed investment return for the DB Program, and the SBMA return is taken from the total CalSTRS return that also impacts the DB Program assets. To the extent actual returns are less than assumed return, the SBMA is receiving more than its “fair share” of the total return and the DB Program is receiving less. This is not necessarily a problem, but it does argue for setting the assumption closer to the expected return.

Conclusion

Based on portfolio analysis and the current inflation assumption, the current 7.75% investment return assumption for the DB Program is greater than the expected long-term return. Therefore, we are recommending a reduction in this assumption to 7.50%. We are also recommending the DBS Program return assumption be set equal to the DB Program (7.50%). For the CBB Program, we are recommending a reduction to 7.00% (from 7.25%) due to the different asset mix. Note that for accounting purposes, an alternate investment return assumption may be required in the future.

INVESTMENT RETURN (NET OF ALL EXPENSES)		
	DB & DBS ⁽¹⁾	CBB
Current Assumption	7.75%	7.25%
Best Estimate Range*	5.8% - 8.9%	5.2% - 8.3%
Recommended Assumption	7.50%	7.00%

⁽¹⁾ The current assumption for the DBS Program is 7.25%.

4. Interest on Member Accounts

Use in the Valuation

This assumption is used to predict the level of future member account balances. In the DB Program, the account balance may be refunded upon termination of membership. In the DBS and CBB Programs, all benefits are dependent on the level of the account balance.

The current assumption is 6.00% per year for the DB Program and 7.25% per year for the DBS and CBB Programs.

DB Program

The Board's policy is to credit interest to member accounts in an amount to be calculated annually based on the rate paid on two-year Treasury notes for the previous 12 months. The rate can go no higher than the actuarial assumed investment return, nor lower than a current passbook rate.

In light of this policy, the actuarial assumption in the valuation has been set equal to the assumed increase in the Consumer Price Index plus a margin to reflect the yield in excess of inflation on two-year Treasuries. The following table shows the average excess yield of two-year Treasuries over inflation since 1999.

Excess Yield over Inflation on 2-Year Treasuries			
Year	CPI	2-Year Treasury	
		Rate	Excess
1999	1.6%	5.0%	3.4%
2000	3.2	5.7	2.5
2001	3.5	6.0	2.5
2002	1.1	3.5	2.4
2003	3.0	2.4	(0.6)
2004	1.7	1.8	0.1
2005	3.0	2.6	(0.4)
2006	3.6	4.1	0.5
2007	2.4	5.0	2.6
2008	4.0	3.9	(0.1)
2009	0.2	1.8	1.6
2010	2.1	0.9	(1.2)
2011	2.1	0.7	(1.4)

As shown in the chart, since 2003 the excess has been negative in many years as the two-year Treasury rate has averaged only 0.1% greater than inflation. The four years prior to that, the average excess of the two-year Treasury rate over the CPI was 2.9%. We are recommending a partial reflection of the recent experience, so that the assumption decreases to 4.50%, which is 1.50% above the recommended inflation assumption.

DBS and CBB Programs

For these programs, the Board’s policy is to credit interest to member accounts based on the statutory minimum rate for the year, plus a portion of the returns in excess of the statutory minimum. The Board has the authority to establish a reserve for short-term fluctuations in the actual returns from year to year so that the minimum credit can be allocated from current invested assets. Nevertheless, the long-term intention is to allocate all of the investment earnings to the member accounts. Therefore, the assumed long-term credit to member accounts should be the same as the recommended investment return assumption for the DBS Program (7.50% per year) and the CBB Program (7.00% per year).

Recommendation

Our recommended assumptions are shown in the following table.

INTEREST ON MEMBER ACCOUNTS		
	DB	DBS & CBB
Current Assumption	6.00%	7.25% (DBS) 7.25% (CBB)
Recommended Assumption	4.50%	7.50% (DBS) 7.00% (CBB)

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This work product was prepared solely for CalSTRS for the purposes described herein and may not be appropriate to use for other purposes. Milliman does not intend to benefit and assumes no duty or liability to other parties who receive this work.

California State Teachers' Retirement System Experience Analysis (2006-2010)

Section 3: Actuarial Methods and Miscellaneous Assumptions



As part of the current experience analysis, we have reviewed the valuation methods and other issues related to the actuarial assumptions. This section contains a discussion of actuarial cost methods, the valuation of assets, and other miscellaneous assumptions used in the valuation.

Actuarial Cost Method

DB Program

The cost method used for the DB Program valuation is referred to as the Entry Age Normal Cost Method. Under this method, the actuarial present value of projected benefits for each individual member included in the valuation is allocated on a level basis over the earnings of the individual between entry age and assumed exit ages. The portion of this actuarial present value allocated to the valuation year is called the Normal Cost; the portion of the actuarial present value not provided for at a valuation date by the actuarial present value of future Normal Costs is called the Actuarial Obligation.

The Entry Age Normal Cost Method with projected benefits allocated over earnings (often referred to as “Level Percent of Pay”) is by far the most common cost method among public sector pension plans. The advantage to using this method is that the cost over time tends to remain fairly level as a percentage of overall payroll, all else being equal. This is well-suited to most public systems, which tend to contribute as a percentage of pay, and which benefit from a stable contribution rate for budgeting and planning purposes.

We believe that the Entry Age Normal Cost Method continues to be the most reasonable choice for the DB Program, and recommend no change.

CBB and DBS Programs

The cost method used for the CBB and DBS Program valuations is referred to as the Traditional Unit Credit Cost Method. Under this method, the projected benefits of each individual member are allocated by a consistent formula to valuation years. When the Traditional Unit Credit Method is applied to the DBS and CBB Programs, the result is that the Actuarial Obligation is equal to the accumulated account balances, and the Normal Cost is equal to the total annual contribution.

We believe that the Traditional Unit Credit Cost Method continues to be the most reasonable method for the valuation of the CBB and DBS Programs. In particular, if another cost method were used, then the situation could arise where the assets for either program were exactly equal to the associated accumulated account balances, and yet the Funded Ratio for the given program would be different from 100%. We believe such a situation would cause unnecessary confusion. We recommend no change to the cost method for the CBB and DBS Programs.

Note that under proposed GASB requirements, the Entry Age Normal Cost Method may be required for accounting purposes at some point in the future. However, we still recommend use of the Traditional Unit Credit Method for funding purposes.

MPP Program

The obligations of the Medicare Premium Payment Program differ from the DB Program, so a different cost method is used for funding purposes. Unlike the DB Program, where new members join the plan, members eligible for the MPP Program are a closed group. Only those hired prior to April 1, 1986 who retire on or before June 30, 2012 are eligible. Another difference is that in the DB Program, active members earn additional benefits based on service, whereas active members who may join the MPP Program have a fixed benefit equal to the Part A premium that is not based on service.

Accordingly, the actuarial obligation for the MPP Program is equal to the value of all benefits expected to be paid in the future. This obligation, less any assets currently residing in the Teachers' Health Benefit Fund (THBF), is included with the obligation of the DB Program.

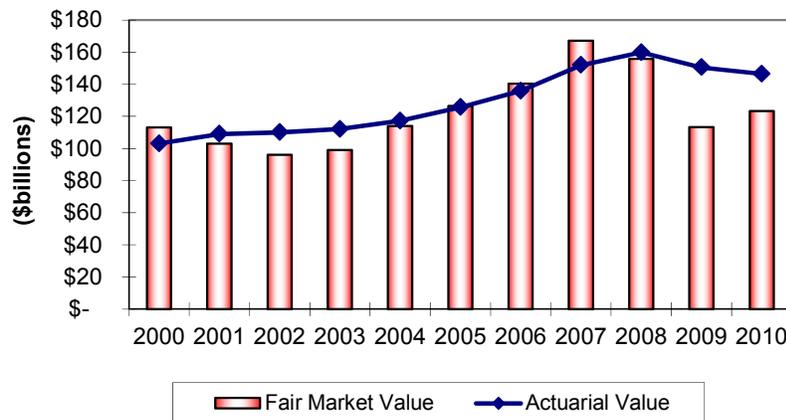
Valuation of Assets (DB Program)

The valuation of assets for an actuarial valuation of a defined benefit pension plan may be thought of in a different light than the value of assets for a retirement system's financial statement. The purpose in a financial statement disclosure is to make a representation of the current value of the assets on a fair value basis. Because the underlying calculations in the actuarial valuation are long term in nature, and one of the goals of the actuarial valuation process is to measure the funding stability of the DB Program, it can be advantageous to smooth out short-term fluctuations in the fair value of assets.

**Valuation of Assets
(DB Program)
(continued)**

Like the majority of large public retirement systems, the DB Program uses an asset smoothing method to determine the Actuarial Value of Assets. The assets are valued using a method that delays recognition of investment gains or losses. The expected actuarial value is the prior year's actuarial value increased with net cash flow of funds, and all increased with interest during the past year at the expected investment return assumption. One-third of the difference between the expected actuarial value of assets and the Fair Market Value of assets is added to the expected actuarial value of assets to arrive at the Actuarial Value of Assets.

The following chart shows a history of the Actuarial Value of Assets compared to the Fair Market Value of Assets.



Asset smoothing is a valuable tool for addressing contribution volatility. For fixed contribution rate plans like CalSTRS, there are some benefits, such as a more stable funded ratio, but the arguments are not as compelling. CalSTRS current method that smoothes gains and losses over roughly three years provides a reasonable compromise between minimizing volatility and not straying too far from the market value. We recommend retaining the current assumption.

**Valuation of Assets
(CBB & DBS
Programs)**

The assets are valued at Fair Market Value and the Gain and Loss Reserve acts as a smoothing technique. We recommend this method be continued.

Miscellaneous Assumptions

Inactive Member Retirement Age: We have studied the age at which inactive members commence retirement benefits. Based on the experience analysis, the average age at which such members retired over the period is 60.0. Our current assumption is age 60; therefore, we are recommending no change to this assumption.

Number of Children: We studied the number of children for surviving spouses and disability retirements. Based on this analysis, we are recommending a reduction in the number of children assumed for male members. The following chart shows the results of our study of married members.

Member's Gender	Actual # of Children	Current Assumption	Proposed Assumption
Male	0.63	0.75	0.65
Female	0.46	0.50	0.50

Assumed Offsets: A portion of disability and survivor benefits may be reduced (offset) if the member or beneficiary is receiving other public benefits related to the member's death or disability. We studied the benefit offset amounts for surviving spouses and disability retirements. Based on the current experience analysis, the actual offsets were significantly less than assumed. This is similar to the prior study. Accordingly, we are recommending a reduction in the offset amounts. The following chart shows our recommendations. All amounts are shown as a percentage of the member's final compensation.

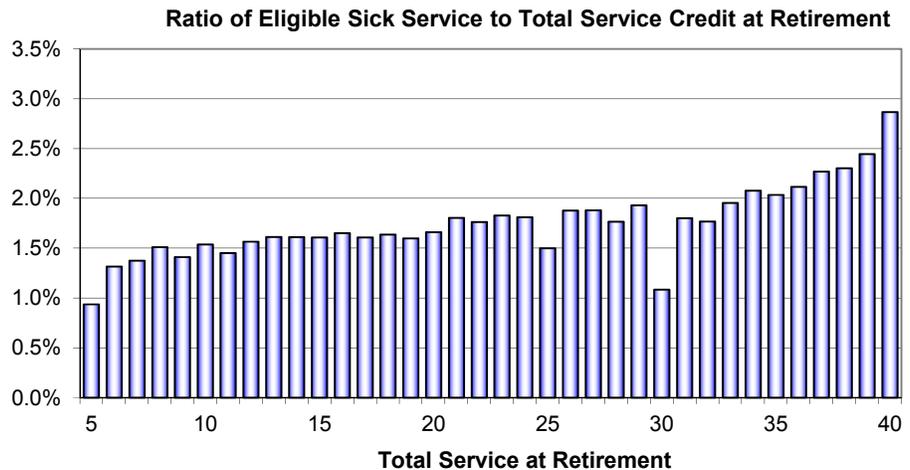
	Coverage A		Coverage B	
	Male	Female	Male	Female
Current Assumed Offsets*				
Death	8.00%	4.00%	0.00%	0.00%
Disability	2.50%	4.00%	2.20%	3.00%
Revised Assumed Offsets*				
Death	2.00%	1.00%	0.00%	0.00%
Disability	2.00%	1.00%	1.00%	1.00%

**Offsets are assumed to cease at age 60.*

Miscellaneous Assumptions (continued)

Probability of Eligible Survivor: Surviving beneficiaries may be eligible for a survivor benefit if a member dies during active employment. The valuation assumes a certain percentage of members will have an eligible survivor. The current assumption is that 90% of males and 70% of females will have an eligible survivor. There was insufficient data to study this assumption, but based on other retirement systems we have studied, we believe the assumption continues to be reasonable and are recommending no change.

Sick Leave Load: We have studied the unused sick leave for those members who retired during the study period. We found that this service was generally proportional to credited service. On average, new retirees had 0.50 years of unused sick leave service and 26.0 years of credited service (including unused sick leave service). This implies that sick leave service is approximately 1.94% of non-sick leave credited service. The current assumption is a 2.1% load on credited service to account for future sick leave service; we recommend adjusting this to 2.0%. The following graph shows the results of our study.



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California State Teachers' Retirement System Experience Analysis (2006-2010)

Section 4: Salary Increases Due to Promotion and Longevity (Merit)



Estimates of future salaries are based on assumptions for two types of increases:

- 1) Increases in each individual's salary due to promotion or longevity, which occur even in the absence of inflation (merit increases); and
- 2) Increases in the general wage level of the membership, which are directly related to inflation and increases in productivity.

Results

In Section 2 we recommend that the second of these rates, the general wage inflation, be lowered to 3.75%. See that section of the report for discussion.

The merit increases shown in this section are calculated as the total increase for each individual, less the observed general wage inflation during the four-year study period of 2.70%.

Exhibit 4-1 shows the actual merit increases in salary over the period July 1, 2006 – June 30, 2010. Increases were higher earlier in a member's career (lower service) and then decreased over time, consistent with the current assumptions. Overall, the actual increases were somewhat less than that predicted by the current assumptions.

The final years of the current experience study period were likely somewhat influenced by the recession that occurred during the study period. Our goal in recommending assumptions is to predict the long-term expectations for the system, not to alter assumptions based on temporary, short-term patterns. Therefore, we looked at both the current and the previous (2007) experience study in making our determinations.

The current salary assumptions are separated by entry age. Exhibit 4-2 shows the average increases by entry age group. This exhibit illustrates the varying pattern of merit increases based on the age at which a member enters the system. Specifically, at any given service level, members with younger entry ages tend to receive larger merit increases.

Recommendation

Based on the results of the prior two experience studies, we are recommending no change be made to the merit component of the salary increase assumption.

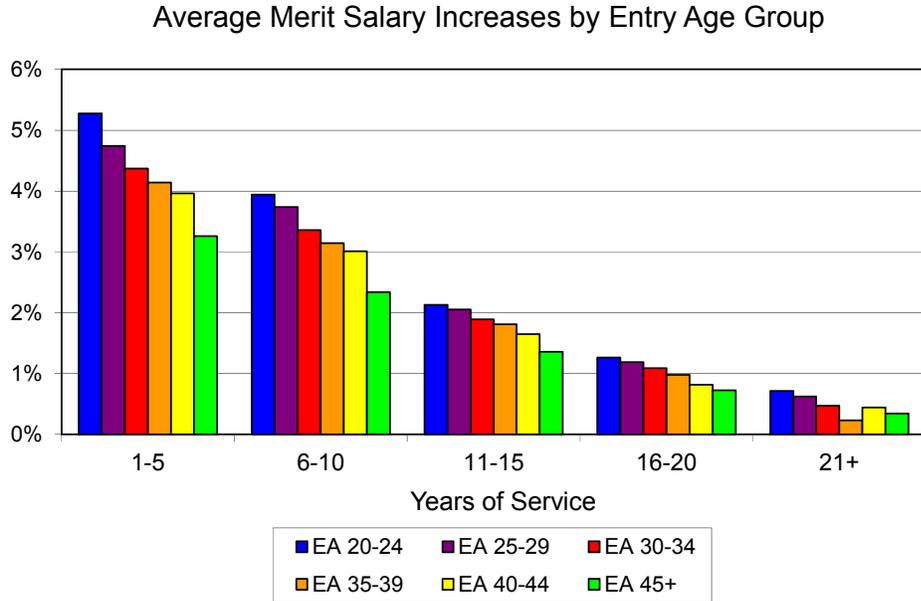
California State Teachers' Retirement System Experience Analysis (2006-2010)

**Exhibit 4-1 Total Rates of Increase in Salary Due to Merit and Longevity
All Members
(Excluding Actual General Wage Growth)**



California State Teachers' Retirement System Experience Analysis (2006-2010)

**Exhibit 4-2 Annual Rates of Increase in Salary by Entry Age
Due to Merit and Longevity
(Excluding Actual General Wage Growth)**



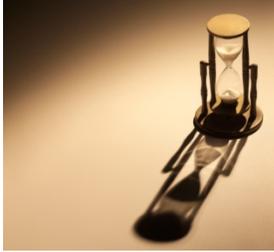
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California State Teachers' Retirement System Experience Analysis (2006-2010)

Section 5: Retired Mortality



In this section we look at the results of the study of actual and expected death rates of retired members. We studied rates of mortality among healthy and disabled retired members, as well as beneficiaries. Valuation mortality is a critical assumption, since, if members live longer than expected, we will be understating the true cost of the future plan obligations.

Mortality has been improving in this country and is expected to continue to improve. We generally recommend the inclusion of a margin in the mortality assumption to account for future improvements in mortality. Recently, the Actuarial Standards of Practice were updated to require an explicit assumption for expected future mortality improvements. This is discussed further in the "Recommendations" section below.

Results

Overall, we found there were fewer deaths over the study period than the current rates predicted for healthy retirees: 20,213 actual deaths, compared to 20,384 expected deaths (for a total actual/expected ratio of 99%). A similar pattern held for disabled retiree mortality, with an overall actual/expected ratio of just under 100%. (See charts at the end of this section for details).

In general, we propose mortality rates such that the ratio of actual/proposed deaths will be above 100%. There are three reasons for this:

1) Appropriate Valuing of Benefits

A ratio under 100% indicates that retirees are outliving our assumptions. This will understate the funding needed, since benefits are being paid out over a longer period than predicted.

**Results
(continued)**

2) Expected Future Mortality Improvement

A margin over 100% allows for future improvements in mortality. In general, we recommend around a 10% margin for such improvement.

The Actuarial Standards of Practice were recently updated to require an explicit non-zero assumption for future mortality improvement. The current CalSTRS assumptions project future retirees will live longer than current retirees by including a two-year setback. That is, a current active member who retires at age 62 is expected to live as long after retirement as a current retiree aged 60.

We believe that the proposed margin combined with the additional setback satisfies this requirement.

3) Correlation between benefit size and longevity

In our experience studying the mortality of public pension plan retirees, we have consistently found that retirees with the larger benefits tend to live the longer than retirees with smaller benefits. We have studied the mortality for CalSTRS with an adjustment for actual benefit amounts and found this to be true. Our proposed mortality assumptions take this into account.

The following shows a summary of the results of the study. Detailed results are shown graphically on the following pages.

Status	Actual to Expected			Actual to Proposed		
	Actual	Expected	A/E Ratio	Actual	Proposed	A/P Ratio
Healthy Male	8,125	8,181	99%	8,125	7,384	110%
Healthy Female	12,088	12,203	99%	12,088	11,258	107%
Healthy Total	20,213	20,384	99%	20,213	18,642	108%
Disabled Male	407	387	105%	407	376	108%
Disabled Female	706	732	96%	706	699	101%
Disabled Total	1,113	1,119	99%	1,113	1,075	104%
Beneficiary Male	666	757	88%	666	716	93%
Beneficiary Female	2,149	2,164	99%	2,149	2,013	107%
Beneficiary Total	2,815	2,921	96%	2,815	2,729	103%
Grand Total	24,141	24,424	99%	24,141	22,446	108%

Recommendation

We recommend strengthening the mortality assumption (i.e., increasing life expectancies). Note that this brings the total healthy retiree actual/proposed ratio to 108%, which allows for some increases in life expectancies.

CalSTRS uses custom mortality tables to best fit the patterns of mortality among its members. These custom tables are based on standard mortality tables adjusted to fit CalSTRS experience. The chart below describes the new tables being recommended for healthy and disabled retirees.

Note that for beneficiaries of healthy and disabled retirees, we recommend that the mortality for healthy retirees be used.

Rates of mortality among active members are discussed separately in Section 6 of this report.

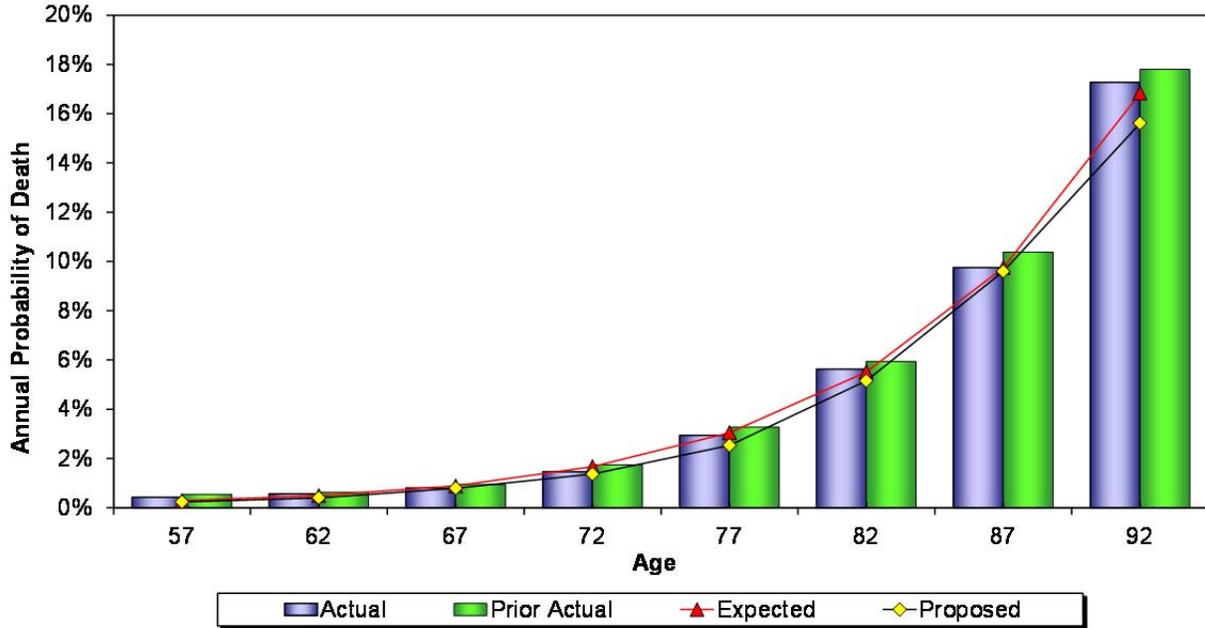
CalSTRS Custom Mortality Tables

Healthy (Service) Retirees and Beneficiaries -- Males*	
Expected:	RP2000 Healthy Male -5 to age 70 smoothed to -2 at age 95
Proposed:	RP2000 Healthy Male White Collar -2 Projected to 2025 to age 70 smoothed to -1 at age 90
Healthy (Service) Retirees and Beneficiaries -- Females*	
Expected:	RP2000 Healthy Female -5/-1 adj from 75 to 90
Proposed:	RP2000 Healthy Female White Collar -4 Projected to 2025 to age 75 smoothed to -0 at age 90
Disabled Retirees -- Males*	
Expected:	RP2000 Male (minimum 2.5% with select rates in first three years)
Proposed:	Age < 70: 2% at age 40 & under, graded to 3.2% at age 70 Age > 70: RP2000 Male White Collar +7 Projected to 2025 at age 70 smoothed to +1 age 85 (select rates in first three years, regardless of age)
Disabled Retirees -- Females*	
Expected:	RP2000 Female (minimum 2.0% with select rates in first three years)
Proposed:	Age < 70: 1.5% at age 40 & Less graded to 2.25% at age 70 Age > 70: RP2000 Female White Collar +6 Projected to 2025 at age 70 smoothed to +2 at age 80 (select rates in first three years, regardless of age)

* Tables shown are for current retirees as of the valuation date. Future retirees and beneficiaries are valued with a 2-year setback.

California State Teachers' Retirement System Experience Analysis (2006-2010)

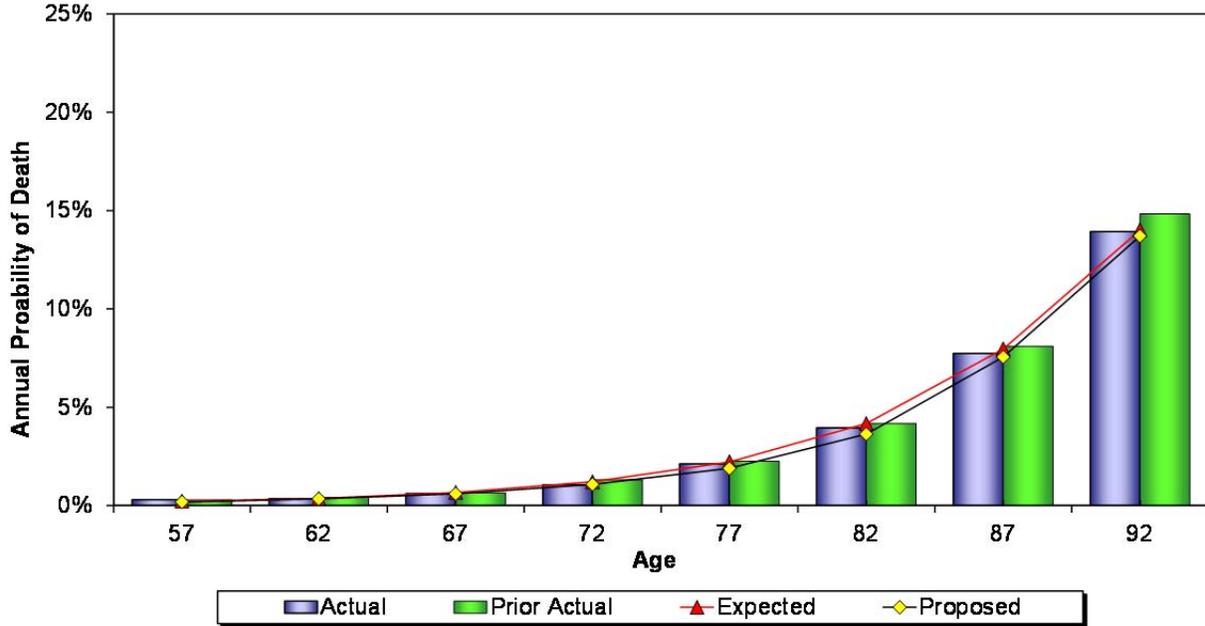
Exhibit 5-1 Mortality for Service (Healthy) Retirees Males



	Expected	Actual	Proposed
All Ages Total Count	8,181	8,125	7,384
Actual / Expected		99%	110%

California State Teachers' Retirement System Experience Analysis (2006-2010)

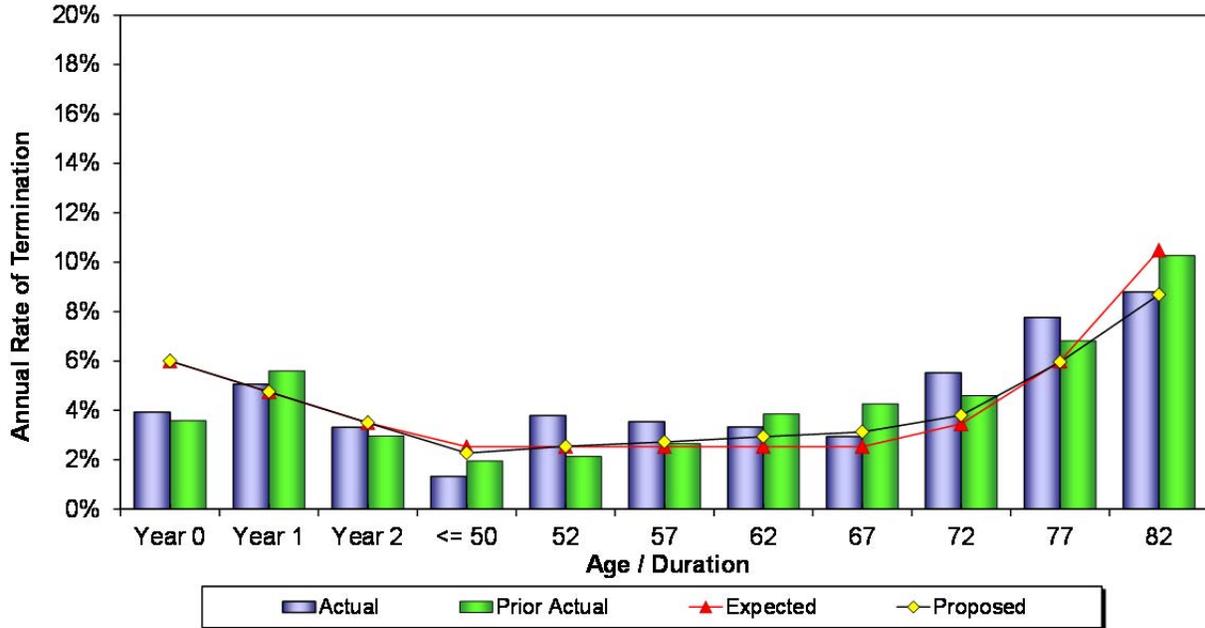
**Exhibit 5-2 Mortality for Service (Healthy) Retirees
Females**



	Expected	Actual	Proposed
All Ages			
Total Count	12,203	12,088	11,258
Actual / Expected	99%		107%

California State Teachers' Retirement System Experience Analysis (2006-2010)

Exhibit 5-3 Mortality for Disabled Retirees Males



All Ages

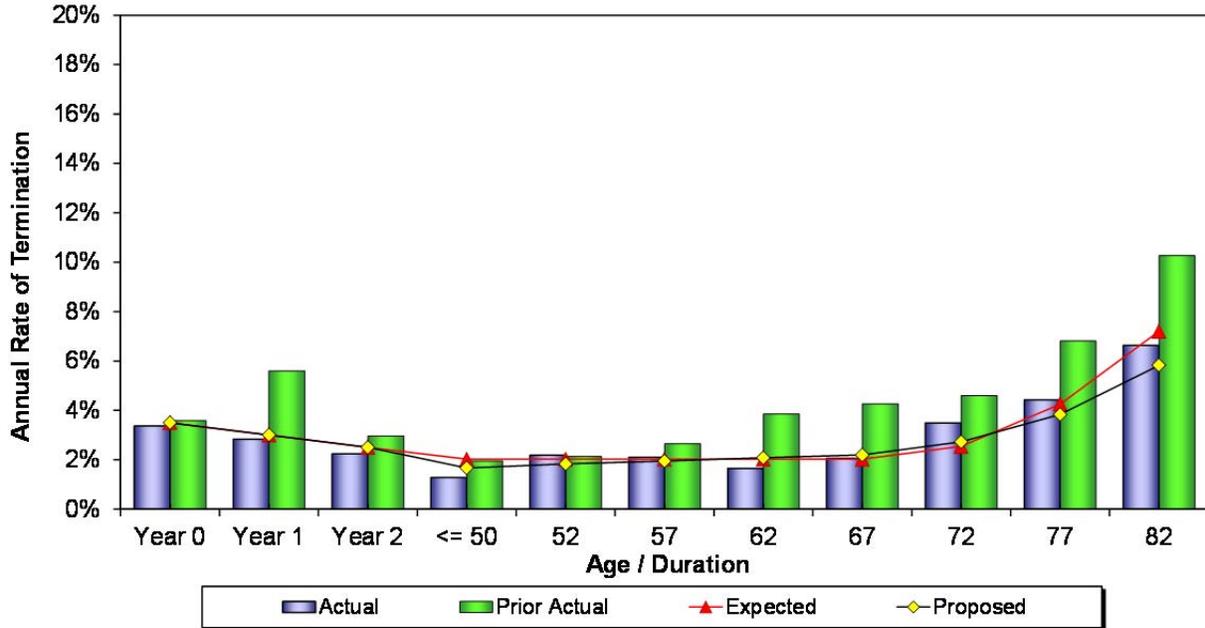
	Expected	Actual	Proposed
Total Count	387	407	376
Actual / Expected		105%	108%

First Two Years of Retirement

	Expected	Actual	Proposed
Total Count	92	79	92
Actual / Expected		86%	86%

California State Teachers' Retirement System Experience Analysis (2006-2010)

**Exhibit 5-4 Mortality for Disabled Retirees
Females**



All Ages

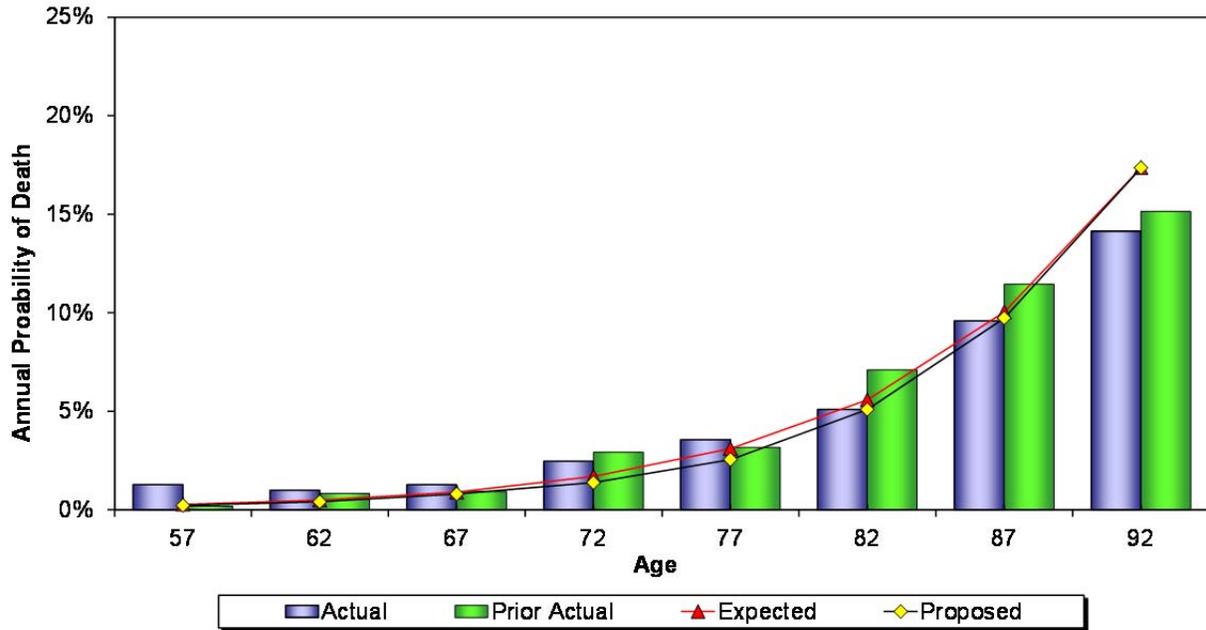
	Expected	Actual	Proposed
Total Count	732	706	699
Actual / Expected		96%	101%

First Two Years of Retirement

	Expected	Actual	Proposed
Total Count	171	161	171
Actual / Expected		94%	94%

California State Teachers' Retirement System Experience Analysis (2006-2010)

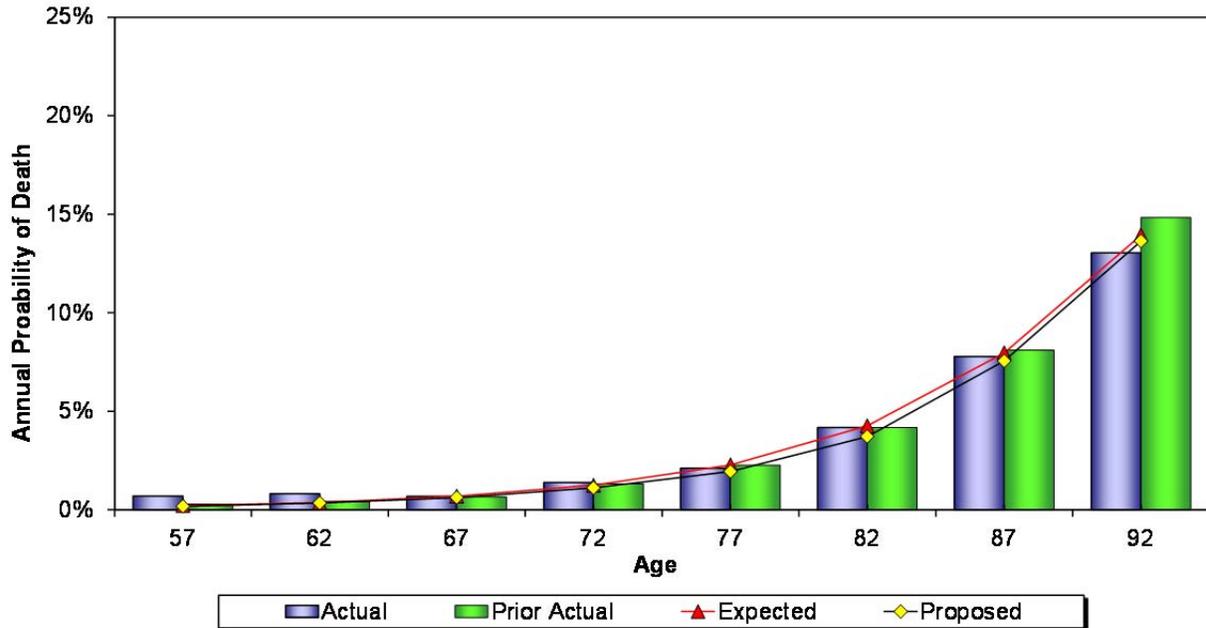
Exhibit 5-5 Mortality for Beneficiaries Males



	Expected	Actual	Proposed
All Ages			
Total Count	757	666	716
Actual / Expected	88%		93%

California State Teachers' Retirement System Experience Analysis (2006-2010)

Exhibit 5-6 Mortality for Beneficiaries Females



	Expected	Actual	Proposed
All Ages			
Total Count	2,164	2,149	2,013
Actual / Expected	99%		107%

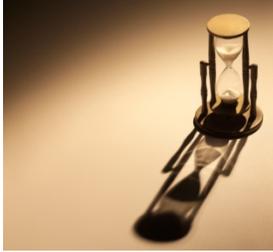
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California State Teachers' Retirement System Experience Analysis (2006-2010)

Section 6: Probability of Death from Active Status



In this section we look at the results of the study of actual and expected death rates for members in active status.

Our current approach has been to use the same mortality rates for active members as for healthy retired members, but with an additional setback of two years to explicitly provide for assumed mortality improvements in the future.

Results

As with the study of retired mortality, the number of active deaths was less than expected, with an actual-to-expected ratio of 86%. The proposed rates project lower mortality and provide some margin for future improvements.

Status	Actual to Expected			Actual to Proposed		
	Actual	Expected	A/E Ratio	Actual	Proposed	A/P Ratio
Active Male	775	812	95%	775	655	118%
Active Female	994	1,237	80%	994	953	104%
Active Total	1,769	2,049	86%	1,769	1,608	110%

Recommendation

We recommend the current approach be retained. Under the current approach, the mortality for active members is set equal to the rate for current healthy retirees with a two-year setback. Using a two-year setback means that an active employee age 60 is expected to have the same probability of death as a current retiree aged 58 of the same gender.

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California State Teachers' Retirement System Experience Analysis (2006-2010)

Section 7: Service Retirement from Active Status



Exhibits 7-1 through 7-6 show the actual and expected rates of service retirement from active status. Our analysis of rates of service retirement was by attained age and gender, and only includes active members who are eligible for service retirement.

Due to the different benefit provisions, we reviewed rates of retirement separately, depending on an individual member's years of service. Therefore, there are essentially three service retirement assumption categories:

- Less than 25 years of service: This is the basic group.
- Between 25 and 30 years of service: This group is eligible for one-year final compensation.
- 30 or more years of service: This group is eligible for the career factor (additional 0.2% in percentage formula). Some members of this group will be eligible for the longevity bonus; however, this will be a declining group.

Exhibits 7-1 through 7-6 study retirements for the following groups:

- Exhibit 7-1: Members with < 25 Years of Service – Males
- Exhibit 7-2: Members with < 25 Years of Service – Females

- Exhibit 7-3: Members with 25 to 30 Years of Service – Males
- Exhibit 7-4: Members with 25 to 30 Years of Service – Females

- Exhibit 7-5: Members with ≥ 30 Years of Service – Males
- Exhibit 7-6: Members with ≥ 30 Years of Service – Females

Results

For members with less than 25 years of service, the total actual retirements from active service was very close to what the assumptions predicted. For members with 25 or more years of service, the total actual retirements from active service were greater than the assumptions predicted.

The chart below illustrates the actual and expected number of decrements for males and females combined, split by service level.

Number of Service Retirements -- Expected			
	<u>Actual</u>	<u>Expected</u>	<u>Actual / Expected</u>
Less than 25 Years of Service	18,157	18,673	97%
25 to 30 Years of Service	5,972	4,378	136%
30 Years or More of Service	22,584	20,055	113%

Recommendation

We are recommending no change to the retirement rates for members with less than 25 years of service, since the actual rates were close to the expected rates and the pattern was very similar.

For members with 25 to 30 years of service, we are recommending an increase in the retirement rates, since the actual rates were significantly greater than the expected rates. Note that this assumption is actually broken down into two pieces: 1) 25 to 27 years of service where the rates are set equal to twice the rates for service less than 25; and 2) 28 to 29 years of service where the rates are set equal to the rates for service less than 25. Note that members with 28 or 29 years of service tend to wait to retire until they reach 30 years, likely to become eligible for the extra benefits.

We are recommending a small adjustment to the retirement rates for members with at least 30 years of service to reflect the actual retirement pattern, which showed higher rates of retirement, particularly for ages 60 to 65.

As illustrated in the following graphs, we have reflected only part of the recent experience. We have also taken the previous experience study into account to give more of a long-term picture of the recent retirement rates.

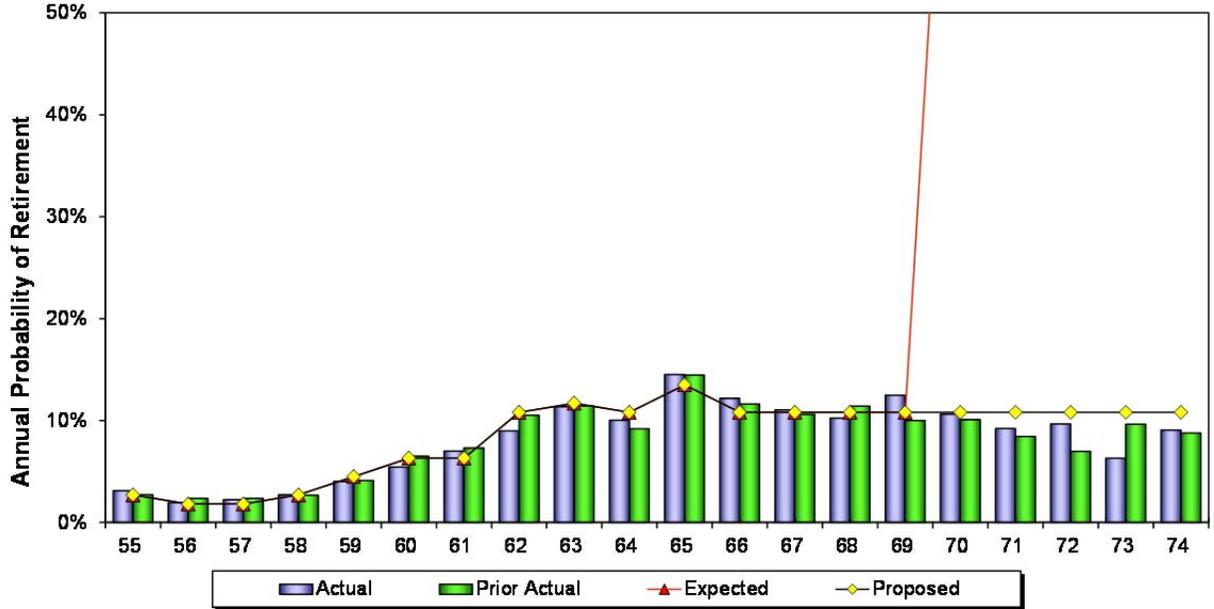
In addition to the above changes, based on the experience seen in this study, we are recommending extending the proposed retirement rates to age 75 (current retirement rates assume all teachers retire at or before age 70) as many teachers are working beyond age 70.

A comparison of the actual and expected retirements under the recommended assumptions is shown in the table below. Note that for consistency with the current assumptions we have only shown the actual and expected retirements at ages less than 70.

Number of Service Retirement -- Proposed			
	<u>Actual</u>	<u>Proposed</u>	<u>Actual / Proposed</u>
Less than 25 Years of Service	18,157	18,673	97%
25 to 30 Years of Service	5,972	5,429	110%
30 Years or More of Service	22,584	21,624	104%

California State Teachers' Retirement System Experience Analysis (2006-2010)

**Exhibit 7-1 Service Retirement Rates
Males—Less than 25 Years of Service**

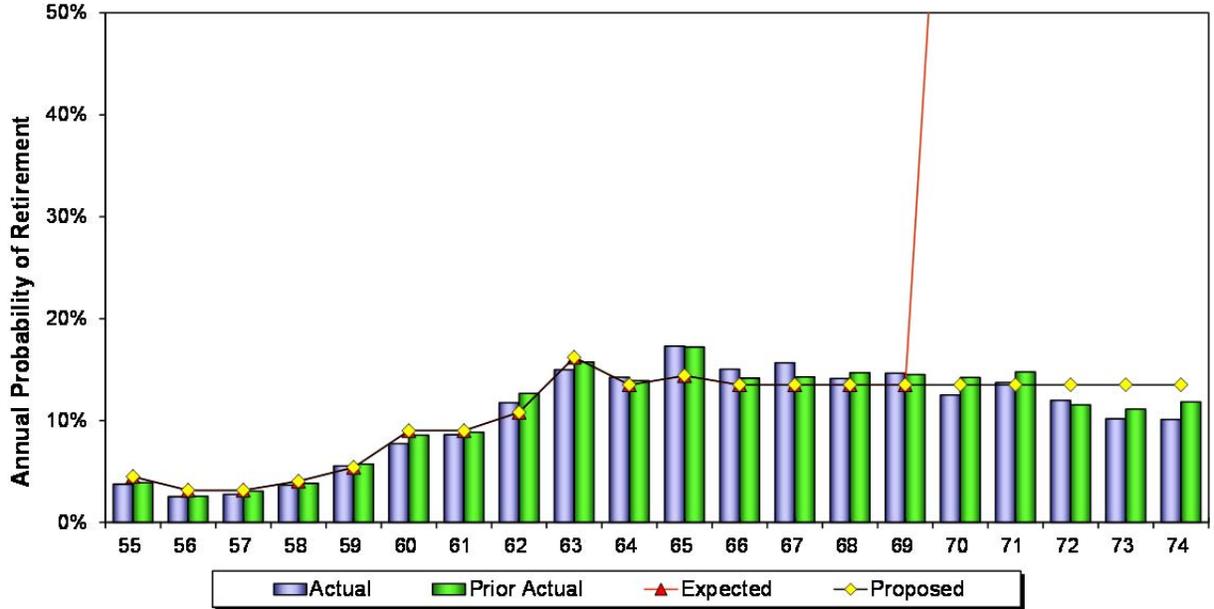


<25 Years of Svc	Expected	Actual*	Proposed*
Total Count	4,637	4,591	4,637
Actual / Expected	99%		99%

**Numbers shown are through age 69 for direct comparison purposes. Proposed rates will also include probabilities of retirement for ages 70-74, as illustrated by graph.*

California State Teachers' Retirement System Experience Analysis (2006-2010)

Exhibit 7-2 Service Retirement Rates Females—Less than 25 Years of Service

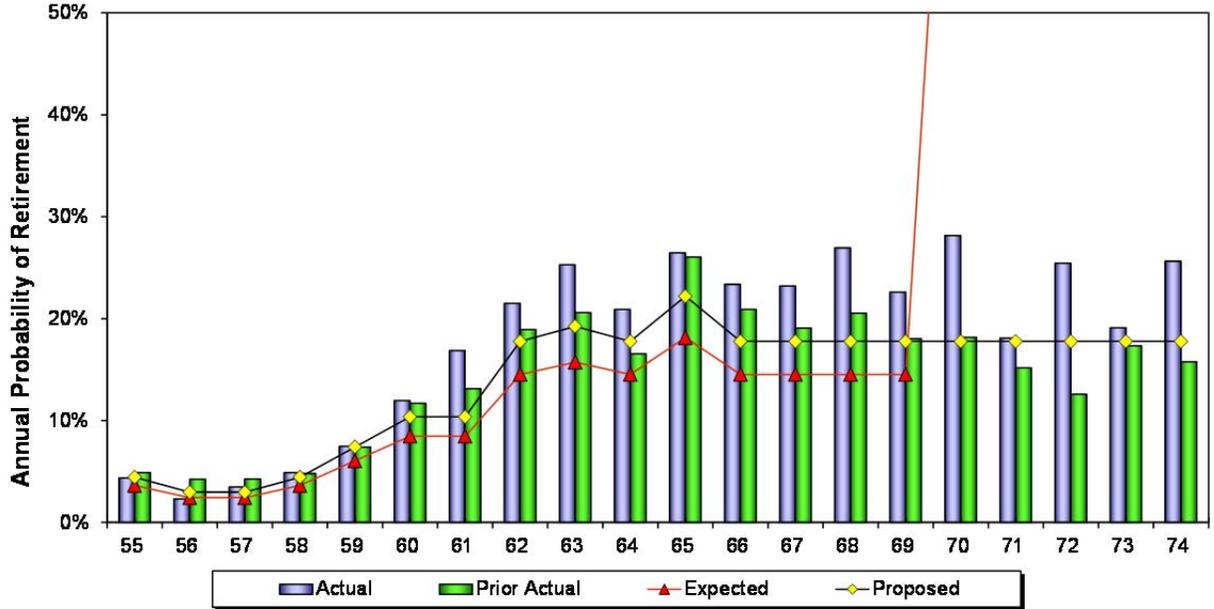


<25 Years of Svc	Expected	Actual*	Proposed*
Total Count	14,036	13,566	14,036
Actual / Expected		97%	97%

*Numbers shown are through age 69 for direct comparison purposes. Proposed rates will also include probabilities of retirement for ages 70-74, as illustrated by graph

California State Teachers' Retirement System Experience Analysis (2006-2010)

**Exhibit 7-3 Service Retirement Rates
Males—25 to 30 Years of Service**

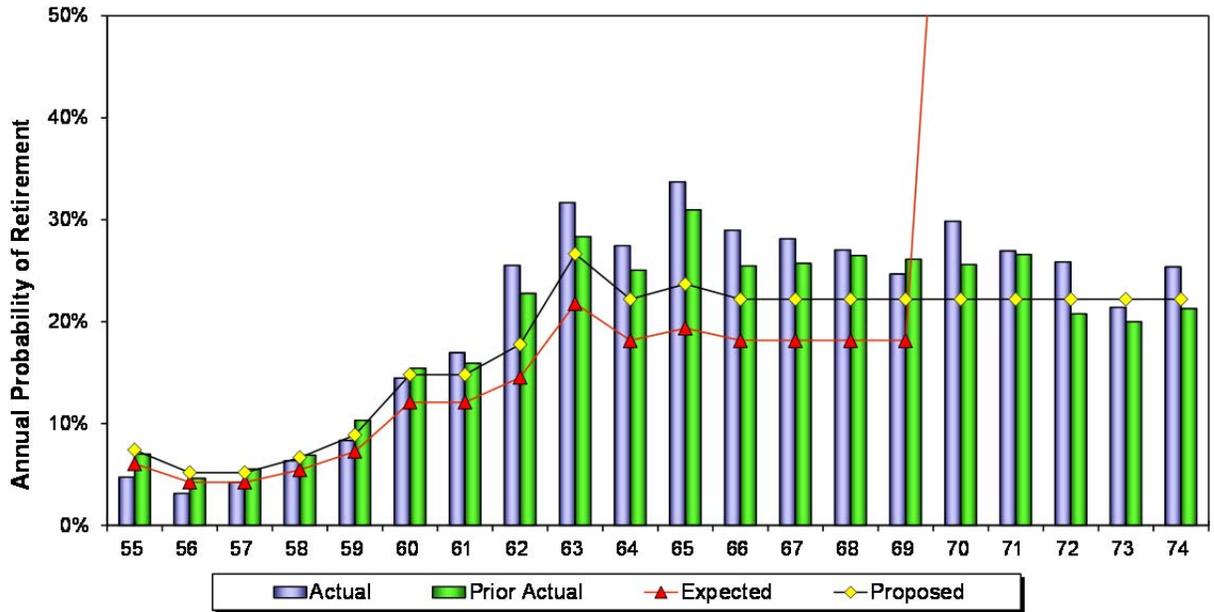


25 to 30 Years of Svc	Expected	Actual*	Proposed*
Total Count	975	1,446	1,205
Actual / Expected		148%	120%

**Numbers shown are through age 69 for direct comparison purposes. Proposed rates will also include probabilities of retirement for ages 70-74, as illustrated by graph*

California State Teachers' Retirement System Experience Analysis (2006-2010)

**Exhibit 7-4 Service Retirement Rates
Females—25 to 30 Years of Service**

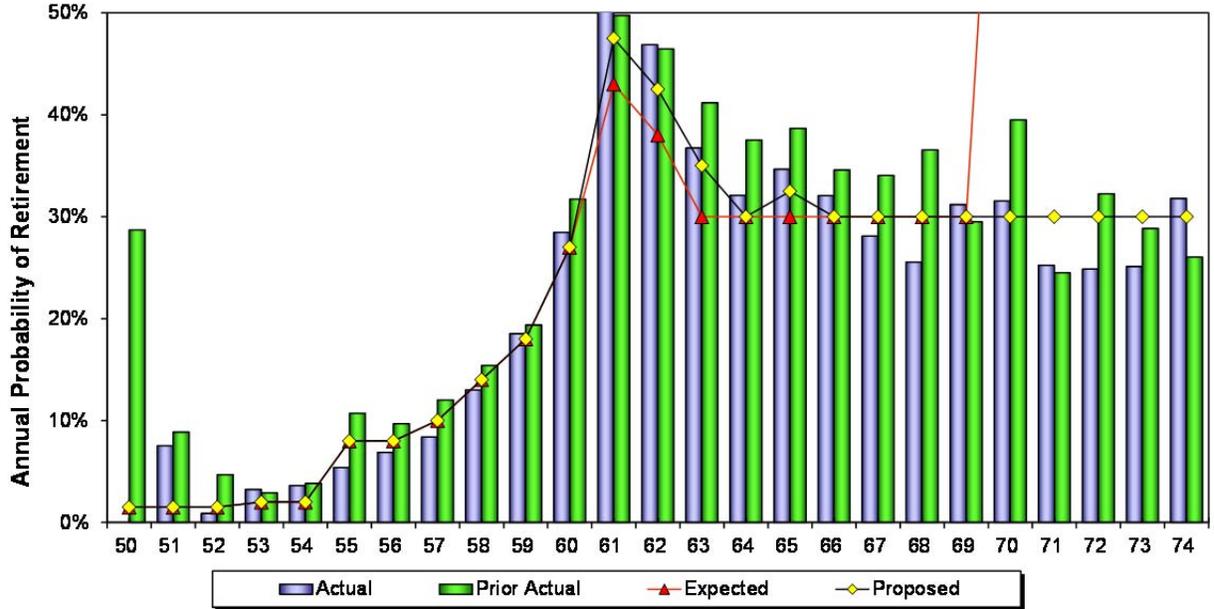


25 to 30 Years of Svc	Expected	Actual*	Proposed*
Total Count	3,403	4,526	4,224
Actual / Expected		133%	107%

**Numbers shown are through age 69 for direct comparison purposes. Proposed rates will also include probabilities of retirement for ages 70-74, as illustrated by graph*

California State Teachers' Retirement System Experience Analysis (2006-2010)

**Exhibit 7-5 Service Retirement Rates
Males—Greater than 30 Years of Service**

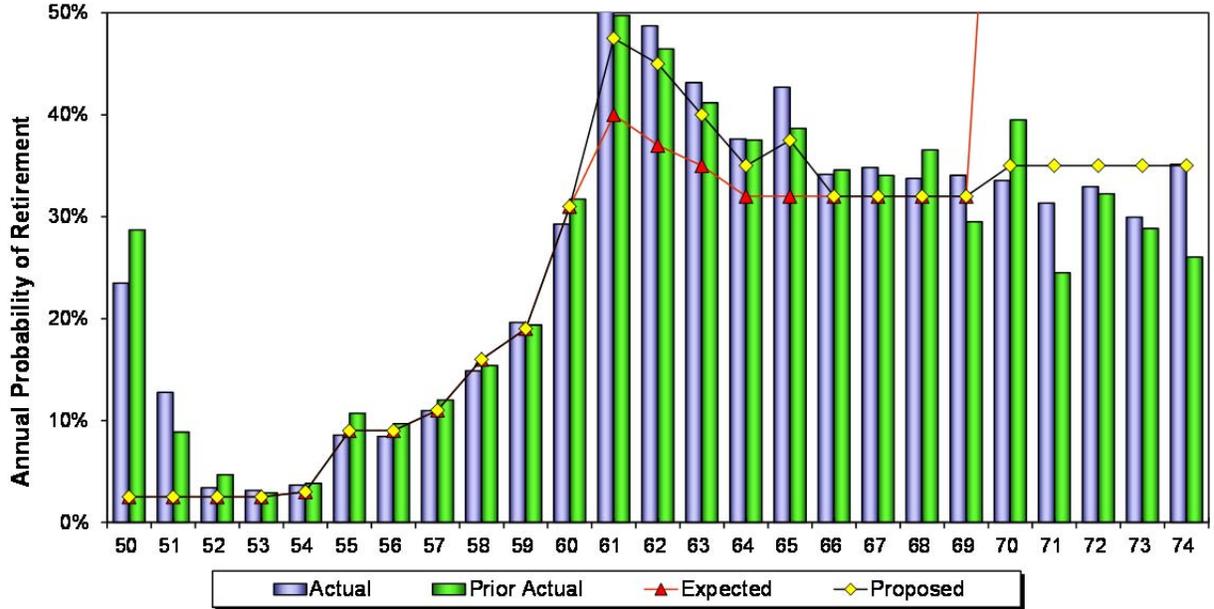


30+ Years of Svc	Expected	Actual*	Proposed*
Total Count	7,741	8,526	8,196
Actual / Expected		110%	104%

**Numbers shown are through age 69 for direct comparison purposes. Proposed rates will also include probabilities of retirement for ages 70-74, as illustrated by graph*

California State Teachers' Retirement System Experience Analysis (2006-2010)

**Exhibit 7-6 Service Retirement Rates
Females—Greater than 30 Years of Service**



30+ Years of Svc	Expected	Actual*	Proposed*
Total Count	12,314	14,058	13,428
Actual / Expected		114%	105%

**Numbers shown are through age 69 for direct comparison purposes. Proposed rates will also include probabilities of retirement for ages 70-74, as illustrated by graph*

California State Teachers' Retirement System Experience Analysis (2006-2010)

Section 8: Disability Retirement



Results

CalSTRS allows a member to start receiving benefits prior to eligibility for service retirement if they become disabled.

Rates of disability are studied separately for Coverage A and Coverage B members due to the different benefit provisions.

The following charts show the actual versus expected number of disabilities for Coverage A and Coverage B males and females. In all categories, there were fewer disabilities than expected.

Actual vs. Expected Disability Retirements			
Coverage A			
	Actual	Expected	Actual / Expected
Male	139	178	78%
Female	404	483	84%
Total	543	661	82%
Coverage B			
	Actual	Expected	Actual / Expected
Male	373	493	76%
Female	1,059	1,282	83%
Total	1,432	1,775	81%

Recommendation

Currently, rates of disability for Coverage B members are separated into three distinct groups based on entry age. Based on experience, we do not believe such a distinction is necessary. We are recommending removing the entry age distinction from Coverage B rates, and decreasing the rates of disability slightly. We are recommending decreasing the rates of disability slightly for Coverage A members.

Actual vs. Proposed Disability Retirements			
Coverage A			
	Actual	Proposed	Actual / Proposed
Male	139	160	87%
Female	404	435	93%
Total	543	595	91%
Coverage B			
	Actual	Proposed	Actual / Proposed
Male	373	405	92%
Female	1,059	1,122	94%
Total	1,432	1,527	94%

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California State Teachers' Retirement System Experience Analysis (2006-2010)

Section 9: Other Terminations of Employment (Withdrawal)



This section of the report summarizes the results of our study of terminations of employment for reasons other than death, service retirement, or disability. Rates of termination vary by years of service – the greater the years of service, the less likely a member is to terminate employment.

The current assumptions also vary by gender, with females having a slightly higher probability of terminating than males, and by entry age group.

Results

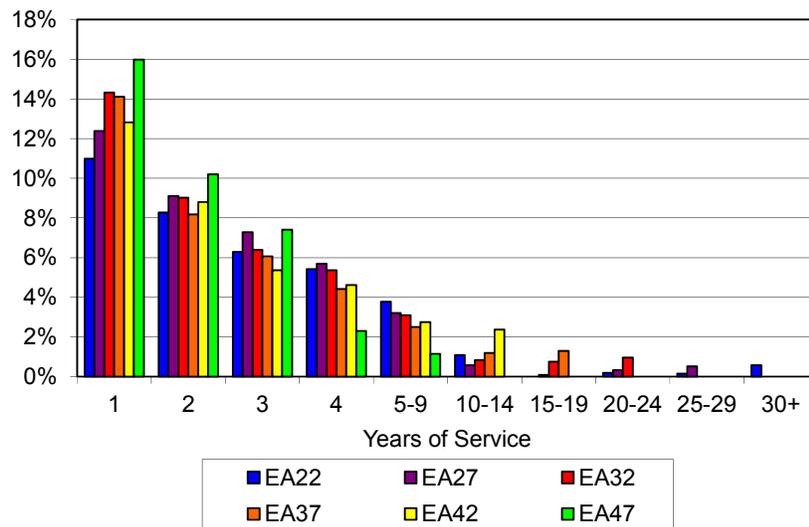
Overall, the actual number of terminations was very close to expected, with males being slightly higher than expected and females being slightly lower than expected. Note that we exclude retirement-eligible members from the study of non-retirement terminations.

Actual vs Expected Terminations*			
	Actual	Expected	Actual / Expected
Males	15,164	14,584	104%
Females	35,198	36,447	97%
Total	50,362	51,031	99%

* Excludes first year of service.

We also analyzed the impact of a member's entry age on their probability of termination as shown in the following graph.

Termination Rates by Entry Age Group (Females)



Recommendation

As noted, the actual rates were close to the assumptions. Generally, when this occurs we would not recommend a change in the assumption. However, our analysis by entry age showed no clear pattern of entry age impacting termination rates. Accordingly, we are recommending new termination rates based on service and gender only with no distinction by entry age. As illustrated in the following chart, the overall change is small with the A/E ratio changing from 99% to 101%.

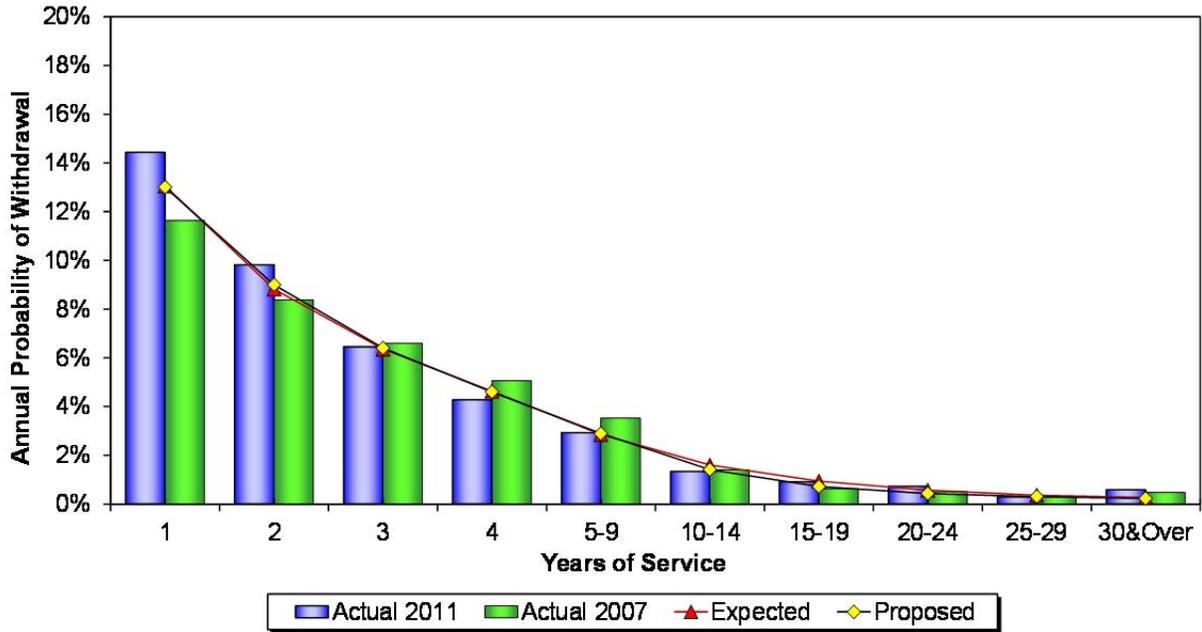
The results of these recommendations are shown in Exhibits 9-1 and 9-2. A summary of the revised results under the recommended assumptions is shown in the following table.

Actual vs Proposed Terminations*			
	<u>Actual</u>	<u>Proposed</u>	<u>Actual / Proposed</u>
Males	15,164	14,359	106%
Females	35,198	35,669	99%
Total	50,362	50,028	101%

** Excludes first year of service.*

California State Teachers' Retirement System Experience Analysis (2006-2010)

Exhibit 9-1 Termination by Years of Service – Males *

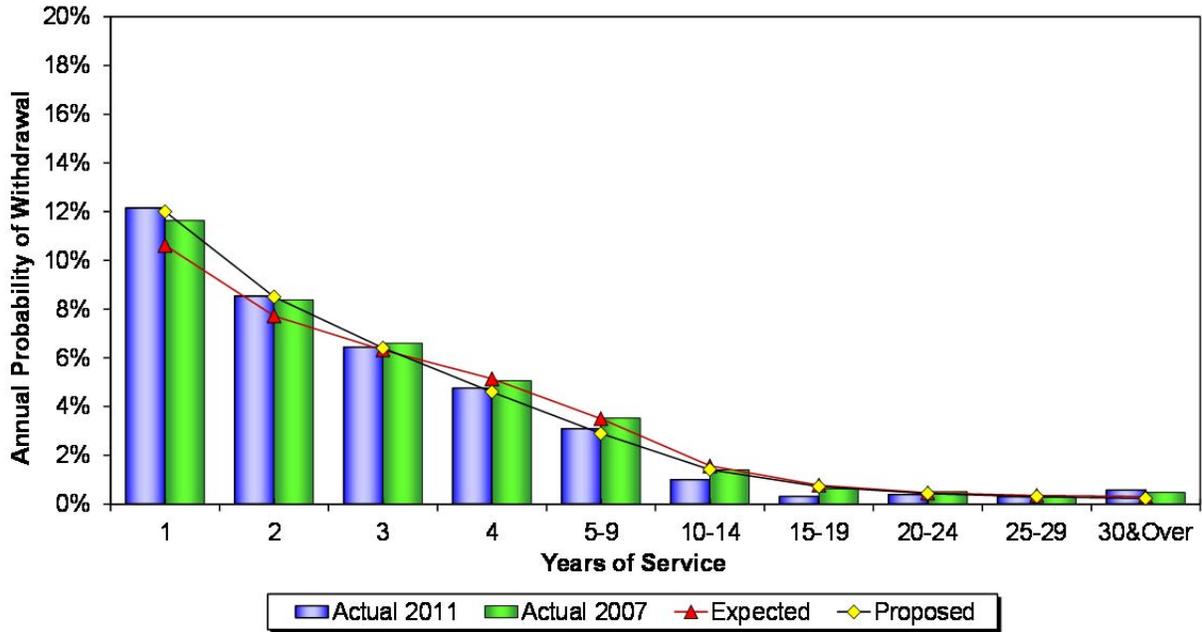


	Expected	Actual	Proposed
Total Count*	14,584	15,164	14,359
Actual / Expected		104%	106%

* Excludes retirement-eligible members and members with less than a year of service.

California State Teachers' Retirement System Experience Analysis (2006-2010)

Exhibit 9-2 Termination by Years of Service – Females *



	Expected	Actual	Proposed
Total Count*	36,447	35,198	35,669
Actual / Expected	97%		99%

* Excludes retirement-eligible members and members with less than a year of service.

California State Teachers' Retirement System Experience Analysis (2006-2010)

Section 10: Probability of Refund Upon Vested Termination



This section of the report deals with the rates at which employees elect a refund of their contributions upon termination of service. It only considers vested members who are not yet eligible for service retirement. Under the current assumptions, members who terminate with fewer years of service have a greater probability of electing to withdraw their contributions. All non-vested members are assumed to take a refund at termination. Note that the assumed probability of refund varies by entry age group.

Results

The following chart shows actual and expected number of refunds split by entry age group. Note that each entry age shown represents the midpoint of a five-year entry age group (so Entry Age 22 represents the group with entry ages between 20 and 25, etc.). Members with higher entry ages (who are closer to retirement at a given level of service) have a lower probability of refund. In aggregate, the actual total number of refunds was close to what the assumptions predicted.

Actual to Expected Number of Refunds			
Males			
Entry Age	Actual	Expected	Ratio
22	74	71	104%
27	793	723	110%
32	487	420	116%
37	281	244	115%
42	140	190	74%
47	267	346	77%
Total	2,042	1,994	102%
Females			
Entry Age	Actual	Expected	Ratio
22	416	401	104%
27	2,019	1,632	124%
32	760	671	113%
37	397	368	108%
42	305	324	94%
47	360	442	81%
Total	4,257	3,838	111%
Grand Total	6,299	5,832	108%

Recommendation

Based on the experience, we are recommending no change in the assumed rates at which members withdraw their contributions from CalSTRS.

California State Teachers' Retirement System Experience Analysis (2006-2010)

Appendix A: Summary of Proposed Assumptions

Appendix A-1 Defined Benefit Program

Actuarial Methods and Assumptions

This section of the report discloses the actuarial methods and assumptions used in this actuarial valuation. These methods and assumptions have been chosen on the basis of recent experience of the DB Program and on current expectations as to future economic conditions.

The assumptions are intended to estimate the future experience of the members of the DB Program and of the DB Program itself in areas that affect the projected benefit flow and anticipated investment earnings. Any variations in future experience from that expected from these assumptions will result in corresponding changes in estimated costs of the DB Program's benefits.

Actuarial Cost Method

The accruing costs of all benefits are measured by the Entry Age Actuarial Cost Method. The projected revenue in excess of the Normal Cost is tested for sufficiency to amortize the Unfunded Actuarial Obligation created by this method. Amortization is calculated on a level percentage of salary including general wage inflation but no increase or decrease in the number of active members.

Method: The actuarial present value of projected benefits for each individual member included in the valuation is allocated on a level basis over the earnings of the individual between entry age and assumed exit ages. The portion of this actuarial present value allocated to a valuation year is called the Normal Cost. The Normal Cost is based on the benefit structure available to new entrants on the valuation date. The portion of this actuarial present value not provided for at a valuation date by the actuarial present value of future Normal Costs is called the Actuarial Obligation. The excess of the Actuarial Obligation over the Actuarial Value of Assets is called the Unfunded Actuarial Obligation. If the Actuarial Value of Assets exceeds the Actuarial Obligation, the difference is called the Actuarial Surplus.

Entry Age: The ages at entry of future active members are assumed to average the same as the entry ages of the present active members they replace. If the number of active members should increase (or decrease), it is further assumed that the average entry age of the larger (or smaller) group will be the same, from an actuarial standpoint, as that of the present active group. Under these assumptions, the Normal Cost Rate will not vary with the termination of the present active membership, or with an expansion or contraction of the active membership.

Asset Valuation Method

The assets are valued using a method that delays recognition of investment gains or losses. The expected actuarial value is the prior year's actuarial value increased with net cash flow of funds, and all increased with interest during the past year at the expected investment return assumption. One-third of the difference between the expected actuarial value of assets and the Fair Market Value of assets is added to the expected actuarial value of assets to arrive at the Actuarial Value of Assets.

The asset smoothing method was adopted for the 1999 Actuarial Valuation and is effective for the investment experience beginning in July of 1993.

Actuarial Assumptions

The Actuarial Standards Board has adopted Actuarial Standard of Practice No. 27, *Selection of Economic Assumptions for Measuring Pension Obligations*. This Standard provides guidance on selecting economic assumptions under defined benefit retirement programs such as the System. In our opinion, the economic assumptions have been developed in accordance with the Standard.

The Actuarial Standards Board has adopted Actuarial Standard of Practice No. 35, *Selection of Demographic and Other Noneconomic Assumptions for Measuring Pension Obligations*. This Standard provides guidance on selecting demographic assumptions under defined benefit retirement programs such as the System. In our opinion, the demographic assumptions have been developed in accordance with the Standard.

The assumptions are intended to estimate the future experience of the members of the DB Program and of the System itself in areas that affect the projected benefit flow and anticipated investment earnings. Any variations in future experience from that expected from these assumptions will result in corresponding changes in estimated costs of the Program's benefits.

The demographic assumptions are listed in **Table A.1** and illustrated at selected ages and duration combinations in **Tables A.2 – A.7**.

Recommended assumptions that have been changed since the June 30, 2010 valuation, as a result of this study, are highlighted in yellow in the section following.

Table A.1
List of Major Valuation Assumptions

I. Economic Assumptions

A.	Investment Return (net of investment and administrative expenses)	7.50%
B.	Interest on Member Accounts	4.50%
C.	Wage Growth	3.75%
D.	Inflation	3.00%

II. Demographic Assumptions

A. Mortality*			
(1) Active	- Male	2011 CalSTRS Retired – M (-2 years)	Table A.2
	- Female	2011 CalSTRS Retired – F (-2 years)	Table A.2
(2) Retired & Beneficiary **	- Male	2011 CalSTRS Retired – M	Table A.2
	- Female	2011 CalSTRS Retired – F	Table A.2
(3) Disabled **	- Male	2011 CalSTRS Disabled – M	Table A.2
	- Female	2011 CalSTRS Disabled – F	Table A.2
(select rates in first three years for both Males and Females)			

* The mortality assumptions specified contain a margin for expected future mortality improvement. Refer to the 2011 Experience Analysis Report for details. See Table A.9 of this report for a key to the custom mortality tables used for CalSTRS.

** Future retirees and beneficiaries are valued with a 2-year age setback.

B.	Service Retirement	Experience Tables	Table A.3
C.	Disability Retirement	Experience Tables	Table A.4
D.	Withdrawal	Experience Tables	Table A.5
	Probability of Refund	Experience Tables	Table A.6
E.	Merit Salary Increases	Experience Tables	Table A.7
F.	Supplemental Assumptions		Table A.8

**Table A.2
Mortality**

Active Members				
Age	Male		Female	
25	0.023%		0.013%	
30	0.033		0.014	
35	0.034		0.018	
40	0.057		0.034	
45	0.076		0.041	
50	0.103		0.063	
55	0.143		0.093	
60	0.238		0.179	
65	0.435		0.368	

Age	Retired Members and Beneficiaries *		Disabled Members (After Year 3) *	
	Male	Female	Male	Female
50	0.114%	0.073%	2.400%	1.750%
55	0.164	0.118	2.600	1.875
60	0.300	0.254	2.800	2.000
65	0.596	0.468	3.000	2.125
70	1.095	0.864	3.054	2.331
75	1.886	1.451	4.972	3.334
80	3.772	2.759	7.285	4.477
85	7.619	5.596	9.797	8.367
90	14.212	11.702	17.639	14.007
95	22.860	17.780	27.005	20.992

Select rates for disability:

First year of disablement	6.0%	3.5%
Second year of disablement	4.8	3.0
Third year of disablement	3.5	2.5

* Future retirees and beneficiaries are valued with a 2-year age setback

**Table A.3
Service Retirement**

Age	Only for the 1990 Benefit Structure		For the DB Program			
	Male	Female	Under 30 Years *		30 or More Years	
			Male	Female	Male	Female
50	0.0%	0.0%	0.0%	0.0%	1.5%	2.5%
51	0.0	0.0	0.0	0.0	1.5	2.5
52	0.0	0.0	0.0	0.0	1.5	2.5
53	0.0	0.0	0.0	0.0	2.0	2.5
54	1.5	1.5	0.0	0.0	2.0	3.0
55	5.8	7.0	2.7	4.5	8.0	9.0
56	3.9	4.5	1.8	3.2	8.0	9.0
57	4.9	4.5	1.8	3.2	10.0	11.0
58	6.8	7.0	2.7	4.1	14.0	16.0
59	17.5	14.0	4.5	5.4	18.0	19.0
60	25.0	22.0	6.3	9.0	27.0	31.0
61	16.5	15.0	6.3	9.0	47.5	47.5
62	16.5	15.0	10.8	10.8	42.5	45.0
63	15.0	15.0	11.7	16.2	35.0	40.0
64	17.5	18.0	10.8	13.5	30.0	35.0
65	20.0	18.0	13.5	14.4	32.5	37.5
66	16.0	18.0	10.8	13.5	30.0	32.0
67	16.0	18.0	10.8	13.5	30.0	32.0
68	16.0	16.0	10.8	13.5	30.0	32.0
69	16.0	16.0	10.8	13.5	30.0	32.0
70	100.0	100.0	10.8	13.5	30.0	35.0
71			10.8	13.5	30.0	35.0
72			10.8	13.5	30.0	35.0
73			10.8	13.5	30.0	35.0
74			10.8	13.5	30.0	35.0
75			100.0	100.0	100.0	100.0

* If service is equal to or greater than 25 but less than 28 years, the assumed retirement rates shown above for members with less than 25 years of service are increased by 100%. For example, a 60-year old female member with 26 years of service would have an 18.0% probability of retirement (twice the rate for service less than 25 years of 9.0%). For members with 28 but less than 30 years of service, the assumed retirement rates shown above for members with less than 25 years of service apply.

The assumptions shown above are for retirement from active status. We assume that all vested terminated members retire at age 60.

**Table A.4
Disability Retirement**

Coverage A		
Age	Male	Female
25	0.018%	0.018%
30	0.027	0.027
35	0.045	0.054
40	0.072	0.081
45	0.099	0.099
50	0.144	0.198
55	0.189	0.252

Coverage B		
Age	Male	Female
25	0.010%	0.020%
30	0.020	0.020
35	0.030	0.040
40	0.060	0.070
45	0.100	0.110
50	0.140	0.185
55	0.245	0.300
60	0.365	0.380
65	0.400	0.400
70	0.400	0.400

**Table A.5
Withdrawal**

Year	Male	Female
0	16.0%	15.0%
1	13.0	12.0
2	9.0	8.5
3	6.4	6.4
4	4.6	4.6
5	3.9	3.9
10	1.8	1.8
15	0.9	0.9
20	0.5	0.5
25	0.3	0.3
30	0.2	0.2

**Table A.6
Probability of Refund**

Entry Ages - Male

<u>Year</u>	<u>Under 25</u>	<u>25 - 29</u>	<u>30 - 34</u>	<u>35 - 39</u>	<u>40 and Up</u>
Under 5	100%	100%	100%	100%	100%
5	50	50	46	45	35
10	46	46	38	36	36
15	38	38	31	21	
20	28	31	15		
25	15	15			
30	10				

Entry Ages - Female

<u>Year</u>	<u>Under 25</u>	<u>25 - 29</u>	<u>30 - 34</u>	<u>35 - 39</u>	<u>40 and Up</u>
Under 5	100%	100%	100%	100%	100%
5	40	35	38	38	35
10	34	32	32	29	29
15	27	24	24	24	
20	19	14	14		
25	10	10			
30	10				

**Table A.7
Merit Salary Increases**

Entry Age - Annual Increase in Salaries Due to Merit

Yr.	<u>Under 25</u>	<u>25 - 29</u>	<u>30 - 34</u>	<u>35 - 39</u>	<u>40 - 44</u>	<u>45 & up</u>
1	5.6%	5.3%	5.1%	4.8%	4.8%	3.5%
2	5.6	5.1	4.9	4.7	4.7	3.3
3	5.6	5.0	4.8	4.6	4.6	3.0
4	5.5	4.8	4.6	4.4	4.4	2.9
5	5.5	4.8	4.5	3.8	3.8	2.6
10	3.2	3.0	2.7	2.3	2.2	1.6
15	1.5	1.5	1.4	1.1	1.1	0.8
20	1.3	1.1	1.1	0.8	0.8	0.6
25	1.1	0.9	0.8	0.5	0.5	
30	0.9	0.7	0.6	0.5		
35	0.8	0.7	0.6			
40	0.8	0.6				
45	0.8					

**Table A.8
Supplemental Assumptions**

Unused Sick Leave: Credited Service is increased by 2.0%.

Optional Forms: Active & Inactive: Based on single life annuity assumed.
Retirees and Beneficiaries: Based on optional form in data.

Probability of Marriage: Male: 90%
Female: 70%

Male spouses are assumed to be three years older than female spouses.

Number of Children: Married members are assumed to have the following number of children:

<u>Member's Gender</u>	<u>Assumed No. of Children</u>
Male	0.65
Female	0.50

Assumed Offsets: The following offsets, expressed as a percentage of Final Compensation, are assumed to cease at age 60:

	<u>Coverage A</u>		<u>Coverage B</u>	
	<u>Male</u>	<u>Female</u>	<u>Male</u>	<u>Female</u>
Death	2.0%	1.0%	0.0%	0.0%
Disability	2.0%	1.0%	1.0%	1.0%

Valuation of Inactive Members

Reliable salary and benefit information is not available for inactive members. Therefore, the Actuarial Obligation for inactive members is valued using individual contribution account balances as follows:

- 1) Projected Account balances at assumed retirement age of 60 are multiplied by 310%. Note this factor is based on a study of the relationship between individual accumulated contribution balances for inactive members and the Actuarial Obligation at actual retirement.
- 2) An additional load of 10% is applied to account for the potential redeposit of member contributions.
- 3) A reduction of 17% is applied to non-vested inactives.

**Table A.9
Custom Mortality Table Key**

CalSTRS Custom Mortality Tables

Healthy (Service) Retirees and Beneficiaries -- Males*	
Expected:	RP2000 Healthy Male -5 to age 70 smoothed to -2 at age 95
Proposed:	RP2000 Healthy Male White Collar -2 Projected to 2025 to age 70 smoothed to -1 at age 90
Healthy (Service) Retirees and Beneficiaries -- Females*	
Expected:	RP2000 Healthy Female -5/-1 adj from 75 to 90
Proposed:	RP2000 Healthy Female White Collar -4 Projected to 2025 to age 75 smoothed to -0 at age 90
Disabled Retirees -- Males*	
Expected:	RP2000 Male (minimum 2.5% with select rates in first three years)
Proposed:	Age < 70: 2% at age 40 & under, graded to 3.2% at age 70 Age > 70: RP2000 Male White Collar +7 Projected to 2025 at age 70 smoothed to +1 age 85 (select rates in first three years, regardless of age)
Disabled Retirees -- Females*	
Expected:	RP2000 Female (minimum 2.0% with select rates in first three years)
Proposed:	Age < 70: 1.5% at age 40 & Less graded to 2.25% at age 70 Age > 70: RP2000 Female White Collar +6 Projected to 2025 at age 70 smoothed to +2 at age 80 (select rates in first three years, regardless of age)

* Tables shown are for current retirees as of the valuation date. Future retirees and beneficiaries are valued with a 2-year setback.

Appendix A-2

Cash Balance Benefit Program Actuarial Methods and Assumptions

This section of the report discloses the actuarial methods and assumptions used in the Actuarial Valuation of CBB Program. These methods and assumptions have been chosen on the basis of recent experience of the DB Program and on current expectations as to future economic conditions.

The assumptions are intended to estimate the future experience of the members of the CBB Program and of the CBB Program itself in areas that affect the projected benefit flow and anticipated investment earnings. Any variations in future experience from that expected from these assumptions will result in corresponding changes in estimated costs of the CBB Program's benefits.

Actuarial Cost Method

The accruing costs of all benefits are measured by the Traditional Unit Credit Actuarial Cost Method. Under this method, the projected benefits of each individual member are allocated by a consistent formula to valuation years. The actuarial present value of future projected benefits allocated to the current year is called the Normal Cost. The actuarial present value of future projected benefits allocated to periods prior to the valuation year is called the Actuarial Obligation.

The Actuarial Obligation is equal to the accumulated account balances and the Normal Cost is equal to the total annual contribution.

Asset Valuation Method

The assets are valued at Fair Market Value.

Actuarial Assumptions

The Actuarial Standards Board has adopted Actuarial Standard of Practice No. 27, *Selection of Economic Assumptions for Measuring Pension Obligations*. This Standard provides guidance on selecting economic assumptions under defined benefit retirement programs such as the System. In our opinion, the economic assumptions have been developed in accordance with the Standard.

The Actuarial Standards Board has adopted Actuarial Standard of Practice No. 35, *Selection of Demographic and Other Noneconomic Assumptions for Measuring Pension Obligations*. This Standard provides guidance on selecting demographic assumptions under defined benefit retirement programs such as the System. In our opinion, the demographic assumptions have been developed in accordance with the Standard.

The assumptions are intended to estimate the future experience of the members of the CBB Program and of the System itself in areas that affect the projected benefit flow and anticipated investment earnings. Any variations in future experience from that expected from these assumptions will result in corresponding changes in estimated costs of the Program's benefits.

The demographic assumptions are listed in **Table A-2.1** and illustrated at selected ages in **Table A-2.2**.

Table A-2.1
List of Major Valuation Assumptions for CBB Program*

I. Economic Assumptions

A. Investment Return (net of investment and administrative expenses)	7.00%
B. Interest on Member Accounts	7.00%
C. Wage Growth	4.00%
D. Inflation	3.00%

II. Demographic Assumptions

A. Mortality			
Retired &	- Male	2011 CalSTRS Retired – M	Table A-2.2
Beneficiary	- Female	2011 CalSTRS Retired – F	Table A-2.2

* Assumptions for active members do not apply to the CBB Program valuation, as each active and inactive member's liabilities are equal to their account balance.

**Table A-2.2
Mortality**

<u>Age</u>	<u>Retired Members and Beneficiaries</u>		<u>Disabled Members (After Year 3)</u>	
	<u>Male</u>	<u>Female</u>	<u>Male</u>	<u>Female</u>
50	0.114%	0.073%	2.400%	1.750%
55	0.164	0.118	2.600	1.875
60	0.300	0.254	2.800	2.000
65	0.596	0.468	3.000	2.125
70	1.095	0.864	3.054	2.331
75	1.886	1.451	4.972	3.334
80	3.772	2.759	7.285	4.477
85	7.619	5.596	9.797	8.367
90	14.212	11.702	17.639	14.007
95	22.860	17.780	27.005	20.992

Select rates for disability:

First year of disablement	6.0%	3.5%
Second year of disablement	4.8	3.0
Third year of disablement	3.5	2.5

Appendix A-3
Defined Benefit Supplement Program
Actuarial Methods and Assumptions

This section of the report discloses the actuarial methods and assumptions used in the Actuarial Valuation of DBS Program. These methods and assumptions have been chosen on the basis of recent experience of the DB Program and on current expectations as to future economic conditions.

The assumptions are intended to estimate the future experience of the members of the DBS Program and of the DBS Program itself in areas that affect the projected benefit flow and anticipated investment earnings. Any variations in future experience from that expected from these assumptions will result in corresponding changes in estimated costs of the DBS Program's benefits.

Actuarial Cost Method

The accruing costs of all benefits are measured by the Traditional Unit Credit Actuarial Cost Method. Under this method, the projected benefits of each individual member are allocated by a consistent formula to valuation years. The actuarial present value of future projected benefits allocated to the current year is called the Normal Cost. The actuarial present value of future projected benefits allocated to periods prior to the valuation year is called the Actuarial Obligation.

The Actuarial Obligation is equal to the accumulated account balances and the Normal Cost is equal to the total annual contribution.

Asset Valuation Method

The assets are valued at Fair Market Value.

Actuarial Assumptions

The Actuarial Standards Board has adopted Actuarial Standard of Practice No. 27, *Selection of Economic Assumptions for Measuring Pension Obligations*. This Standard provides guidance on selecting economic assumptions under defined benefit retirement programs such as the System. In our opinion, the economic assumptions have been developed in accordance with the Standard.

The Actuarial Standards Board has adopted Actuarial Standard of Practice No. 35, *Selection of Demographic and Other Noneconomic Assumptions for Measuring Pension Obligations*. This Standard provides guidance on selecting demographic assumptions under defined benefit retirement programs such as the System. In our opinion, the demographic assumptions have been developed in accordance with the Standard.

The assumptions are intended to estimate the future experience of the members of the DBS Program and of the System itself in areas that affect the projected benefit flow and anticipated investment earnings. Any variations in future experience from that expected from these assumptions will result in corresponding changes in estimated costs of the Program's benefits.

The demographic assumptions are listed in **Table A-3.1** and illustrated at selected ages in **Table A-3.2**.

Table A-3.1
List of Major Valuation Assumptions for DBS Program*

I. Economic Assumptions

A.	Investment Return (net of investment and administrative expenses)	7.50%
B.	Interest on Member Accounts	7.50%
C.	Wage Growth	4.00%
D.	Inflation	3.00%

II. Demographic Assumptions

A.	Mortality			
	Retired & Beneficiary	- Male	2011 CalSTRS Retired – M	Table A-3.2
		- Female	2011 CalSTRS Retired – F	Table A-3.2
	Disabled	- Male	2011 CalSTRS Disabled – M	Table A-3.2
		- Female	2011 CalSTRS Disabled – F	Table A-3.2

* Assumptions for active members do not apply to the DBS Program valuation, as each active and inactive member's liabilities are equal to their account balance.

**Table A-3.2
Mortality**

<u>Age</u>	<u>Retired Members and Beneficiaries</u>		<u>Disabled Members (After Year 3)</u>	
	<u>Male</u>	<u>Female</u>	<u>Male</u>	<u>Female</u>
50	0.114%	0.073%	2.400%	1.750%
55	0.164	0.118	2.600	1.875
60	0.300	0.254	2.800	2.000
65	0.596	0.468	3.000	2.125
70	1.095	0.864	3.054	2.331
75	1.886	1.451	4.972	3.334
80	3.772	2.759	7.285	4.477
85	7.619	5.596	9.797	8.367
90	14.212	11.702	17.639	14.007
95	22.860	17.780	27.005	20.992

Select rates for disability:

First year of disablement	6.0%	3.5%
Second year of disablement	4.8	3.0
Third year of disablement	3.5	2.5