Stanford University • April 2010

SIEPR policy brief

Stanford Institute for Economic Policy Research

on the web: http://siepr.stanford.edu

Going For Broke: Reforming California's Public Employee Pension Systems

By Howard Bornstein, Stan Markuze, Cameron Percy, Lisha Wang, and Moritz Zander.
Faculty Advisor: Joe Nation

Introduction

CalPERS, CalSTRS, and UCRS[1] together administer the pensions of approximately 2.6 million Californians. Between June 2008 and June 2009, these three public pension funds lost a combined $109.7 billion in portfolio value (see Table 1). The ability of these three funds to meet their future obligations has significant implications for the fiscal health of the state and public employers, the effective underwriters of many public pensions.

In this policy brief, we ask two questions: (1) what is the current funding shortfall of CalPERS, CalSTRS, and UCRS, and (2) what policies would prevent a similar shortfall in the future?

The data presented in this report are all from publicly available sources, primarily the quarterly and annually published financial reports of each fund. In addition, we sought and received input from economists and faculty advisors at Stanford University and other institutions to support our analysis and conclusions.

Measuring Today's Funding Status

Complying with Governmental Accounting Standards Board (GASB) Statement #25, public pension funds discount future pension liabilities at the same rate they expect to earn every year on invested assets.[2] We believe this rule leads to understated publicly reported pension liabilities.

continued on inside...

1 The California Public Employees' Retirement System (CalPERS), California State Teachers' Retirement System (CalSTRS), and University of California Retirement System (UCRS).

2 For a further discussion see: Peng, Jun, *State and Local Pension Fund Management.* Taylor and Francis, 2009.

About the Authors

Howard Bornstein, **Stan Markuze**, and **Cameron Percy** are graduate students in the Public Policy Program at Stanford. **Lisha Wang** and **Moritz Zander** are graduate students in Stanford's International Policy Studies Program.

This graduate team prepared this report on California public employee pensions as part of the graduate Practicum in Public Policy, a two-quarter sequence required for Master's students in both the Public Policy and International Policy Studies Programs. The client for this project was the Office of Governor Arnold Schwarzenegger. The full report can be obtained from the Public Policy Program at publicpolicy@stanford.edu .

Joe Nation served as the instructor and an advisor for this research team and directs the graduate student Practicum at Stanford University. He teaches climate change, health care policy, and public policy.

Nation represented Marin and Sonoma Counties in the State Assembly from 2000-2006. He received a Ph.D. in Public Policy Analysis from the Pardee RAND Graduate School; his graduate work focused on budget modeling and long-term budget projections.

When making an apples-to-apples comparison of pension obligations today relative to invested fund assets, choosing the correct discount rate for future liabilities is critical. Financial liabilities have to be discounted at the rate that most accurately reflects their inherent risk. What is the risk associated with public pensions in California? California law affirms vested public pensions are a form of deferred compensation and cannot be reduced: "A public employee's pension constitutes an element of compensation, and a vested contractual right to pension benefits accrues upon acceptance of employment. Such a pension right may not be destroyed, once vested, without impairing a contractual obligation of the employing public entity."[3] Since pension liabilities are effectively riskless, we believe they should be discounted and reported at risk-free rates.

Adjusting the discount rate used on liabilities to a risk-free rate, we estimate the combined funding shortfall of CalPERS, CalSTRS, and UCRS *prior* to the 2008/2009 recession at $425.2 billion (see Table 2). At the time of this writing, the funds have not released more recent financial reports, but due to the previously mentioned $109.7 billion loss the three funds collectively sustained, we estimate the current shortfall at more than half a trillion dollars.[4]

The traditional metric of pension fund health is the funding ratio (assets divided by liabilities). The target funding ratio for a plan considered fully funded is 100 percent. When the ratio is above or below 100 percent, pension plans amortize over- or under-funding by making adjustments to annual

Table 1 — Fund Summaries

	Active/Inactive Members	Current Retirees	Portfolio Value Change ($B) (FY ending 6/30/09)
CalPERS	1,134,000	493,000	– $56.9, (– 23.7%)
CalSTRS	609,000	224,000	– $43.1, (– 25.0%)
UCRS	171,000	43,000	– $9.7, (– 23.0%)
TOTALS	1,914,000	760,000	– $109.7

Sources: CalPERS, CalSTRS, UCRS financial reports, FY2008-2009.

Table 2 — Risk-Adjusted Pension Shortfall as of July 1, 2008 ($B)

	STATED					ADJUSTED			
	Discount Rate	Assets	Liabilities	Unfunded Liabilities	Funding Ratio	Discount Rate	Liabilities	Unfunded Liabilities	Funding Ratio
CalPERS	7.75%	238.6	277.2	**38.6**	86.1%	4.14%	478.3	**239.7**	49.9%
CalSTRS	8%	161.5	177.7	**16.2**	90.9%	4.14%	318.2	**156.7**	50.8%
UCRS	7.5%	42.0	42.6	**0.6**	98.6%	4.14%	70.8	**28.7**	59.3%
TOTAL		442.1	497.5	**55.4**			867.3	**425.2**	

Sources: CalPERS, CalSTRS, UCRS financial reports, FY2008-2009; Team analysis.

3 *Betts vs. Board of Administration* (1978) 21 Cal.3d 859.

4 We re-estimate liabilities, adjusted for risk, by using the average duration of liabilities, which at CalPERS is 16 years. For CalSTRS and UCRS we assume a similar 16-year duration. Knowing the present value of liabilities discounted at the fund's official rates, we can compound liabilities 16 years out, and discount back at the risk-free rate. As a proxy for the risk-free rate we use the yield-to-maturity (YTM) of 10-year US Treasury Bills in February 2010. Since public pensions include cost-of-living-adjustment (COLA) provisions, there remains an inflation risk mismatch. If we adjust for inflation using the yield of Treasury Inflation Protected Bonds (TIPS), liabilities and the shortfall would be significantly higher.

Figure 1 — Cumulative Probability of Shortfall in 16 Years

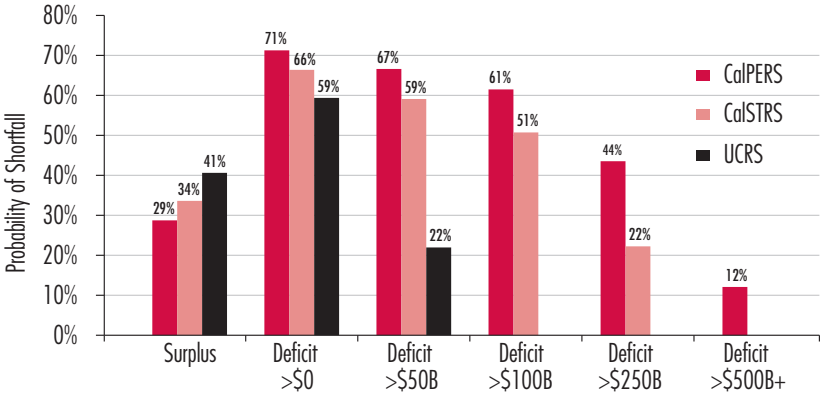
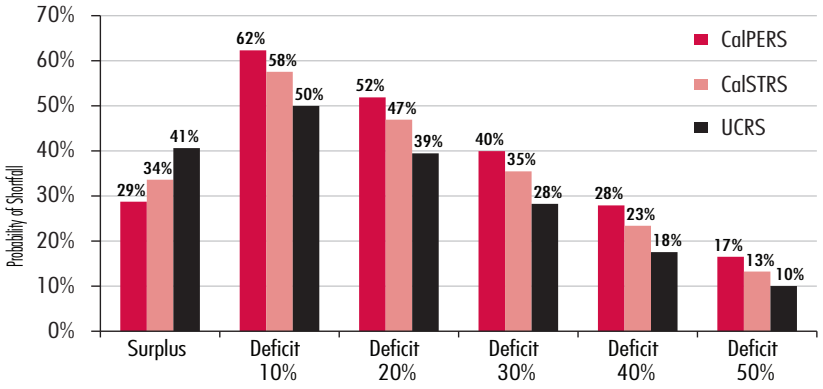


Figure 2 — Cumulative Probabilities of Shortfall in 16 Years (Deficits on a Percentage Basis)



contributions. We believe funding ratios constructed under GASB #25 belie the truth of fund health, because discounting liabilities above the risk-free rate ignores the risk that actual rates of return will be permanently below the expected level. More specifically, we estimate that the likelihood a "fully funded" pension plan (i.e., one with a funding ratio of 100 percent) will be unable to cover all of its liabilities is more than 50 percent due to geometric compounding.[5]

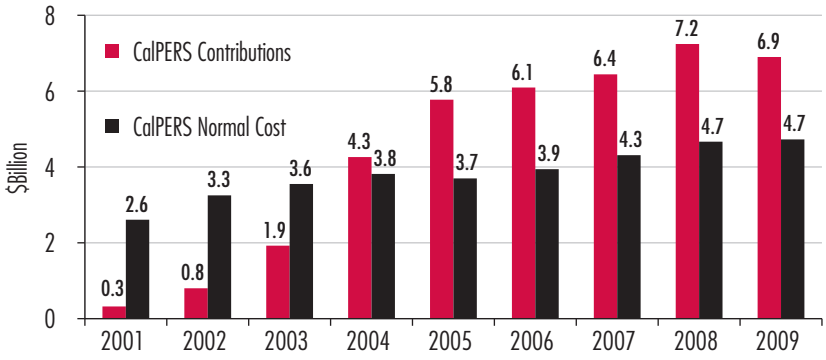
Instead of funding ratios, we believe a more relevant question for policymakers is — given current assets, projected liabilities, and the expected growth of assets — how likely is it that a pension fund will be able to cover its liabilities in the future. Under the GASB reporting rules there are no required "stress tests" for public pension funds that project scenarios in which actual investment returns are below expectations. We performed portfolio growth simulations for each of the three funds, assuming portfolios that achieve stated average investment returns and similar volatilities of returns as exhibited in the past. Assuming the funds' future liabilities have a 16-year duration,[6] compounded forward at official discount rates, we estimate the probabilities of different funding levels using a Monte Carlo simulation.[7] Figure 1 displays our findings. By example, our model indicates a 71 percent chance that CalPERS will have a deficit in 16 years and a 44 percent chance that deficit will exceed $250 billion. To make the funds more comparable regardless of size, we also calculated deficits as percentages of liabilities (Figure 2).

5 Geometric compounding means that if a portfolio increases by 10% in year 1 and decreases 10% in year 2, the net result is negative, not zero.

6 The 16-year duration of CalPERS was informally given to us by a senior executive at CalPERS in a personal conversation. We assumed the same duration for CalSTRS and UCRS.

7 We ran Monte Carlo simulations to create 16-year investment portfolio outcomes, each employing of 16 random rates of return, assuming a normal distribution around each of the expected rates and retaining historical standard deviation. We repeated random draws for a total sample size of 25,000 outcomes. Of the 25,000 different portfolio outcomes we then counted the number of observations for which net assets (assets minus liabilities) were above or below different threshold values. To determine probabilities we divided this number by the total number of observations. For example, our first threshold value is 0. To determine the probability that each of the three funds would end up in surplus by the average duration, (i.e. the average time pensions come due), we counted the number of times net assets were positive and divided this number by all observations.

Figure 3 — Actual CalPERS Contributions vs. Normal Cost Contributions



Sources: CalPERS financial reports.

Using this insight for policy-making, we propose an "80/80 strategy" as a prudent funding target: pension funds should contribute and invest their portfolios so that net assets limit the chance of a deficit greater than 20 percent to a likelihood of no more than 20 percent, (i.e., an 80 percent likelihood that a fund will be able to cover at least 80 percent of its liabilities). Even under this strategy, given the current investment portfolios and wide variance of returns, there is only a 60 percent chance of a surplus. Hence, we consider an 80/80 approach at the low end of cautious. (If under an 80/80 scheme a pension ends up overfunded, any surplus should only be allowed to be used to repay state debt, however in a prudent way such that an 80/80 strategy would always be preserved.)

We estimate that adopting an 80/80 strategy for all three funds as of June 2008 would have required a collective infusion of $200 billion. Under conventional funding metrics, this would translate into a funding ratio of 130 percent.

Avoiding Future Shortfalls

We believe there are three key determinants of avoiding future shortfalls: following prudent contributions policies, managing assets in a way that limits volatility, and setting sustainable benefit levels. We address each in turn.

Contributions

Prudent levels of annual contributions are generally defined as "the portion of the cost of projected benefits allocated to the current plan year."[8] The regular contributions required to fund fully an employee's retirement plan by the time he or she retires, allowing for investment gains, is referred to as the "Normal Cost." An additional metric usually used by managers is the "Level Percent Normal Cost": "the level percentage of payroll amount that would fund the projected benefit if it were paid annually from date of employment until retirement."[9]

Although Normal Cost calculations are made with the expectation that employers and employees will make regular contributions every year, contributions to CalPERS, CalSTRS, and UCRS have been highly inconsistent over the past 20 years, falling in times of market windfalls and rising when investments fall short. Figure 3 shows CalPERS' contributions relative to the calculated Normal Cost contributions that should have been made.

Based on approximate annual investment returns achieved by CalPERS, contributing at the Normal Cost from 2000 through 2009 would have resulted in assets with a value of $33.8 billion at the end of 2009 versus the value of the actual contributions, which totaled $36.6 billion at the end of 2009, a $2.8 billion difference. The total nominal dollars contributed under CalPERS' policy was $39.8 billion, while the Normal Cost method would have required $34.6 billion in contributions, or $5.2 billion less. Here, CalPERS' actual policy cost $5.2 billion more than a more prudent policy of consistently contributing at Normal Cost.

More surprisingly, under UCRS' funding policy, adopted in the fiscal year ending June 30, 1991, no contributions are made to the pension fund when "the market value or the actuarial

8 Office of the State Actuary, http://osa.leg.wa.gov/About_Pensions/Glossary.htm

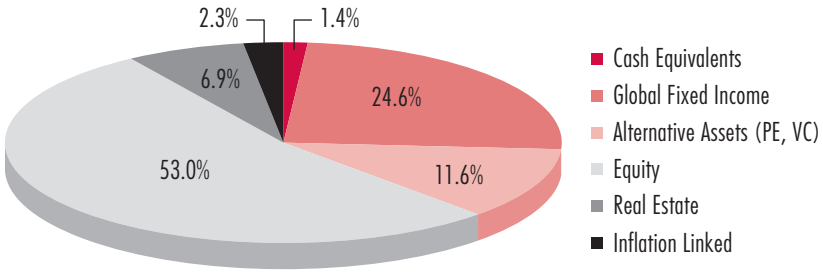
9 CalPERS 2008 annual report, p. 55.

value of plan assets (whichever is less) exceeds the lesser of the actuarial accrued liability plus Normal Cost or 150 percent of current liability plus Normal Cost."[10] In short, contributions to UCRS are suspended when the fund value is deemed sufficiently high relative to liabilities. Since UCRS was overfunded in 1991, contributions dropped to below 1 percent of covered payroll per year for every year between 1994 and 2007. UCRS does not disclose its Normal Cost in its annual report; however, it alludes to its Normal Cost being close to 16 percent of covered earnings.[11]

CalSTRS' contributions have been far more consistent than those of CalPERS and UCRS. CalSTRS follows a relatively prudent approach by making consistent contributions, achieving a standard deviation of contributions that was approximately one-fourth that of CalPERS.

Contributions to pension funds must be made consistently at the pre-determined Normal Cost level, which takes into account long-run investment return expectations, in order for the funds to meet their obligations to pension beneficiaries. Acknowledging that investment strategies can be wildly successful, we believe if investments exceed expectations by more than 20 percent per year for at least five years, a prudent strategy is to continue contributing at the Normal Cost rate and to use the excess returns to pay down state debt. However, in the case of a large market loss, we recommend making replenishing contributions rapidly so that they have a chance to grow before the liabilities they are marked against come due. We believe repayments should be amortized across a period that is no longer than half the duration of liabilities, (eight years in the case of CalPERS).

Figure 4 — CalPERS Asset Allocation (12/31/09)



Source: CalPERS Asset Allocation http://www.calpers.ca.gov/index.jsp?bc=/investments/assets/assetallocation.xml.

Investment Performance

As mentioned earlier, the pressing nature of California pension shortfalls is due in part to the losses CalPERS, CalSTRS, and UCRS sustained in the markets over the past 18 months. CalPERS expects an average annual investment return of 7.75 percent[12], CalSTRS targets 8.00 percent[13], and UCRS expects 7.50 percent[14]. Investment professionals at each fund have created asset allocations meant to achieve those targets. Understanding how pension fund assets are allocated can provide insight into how the losses occurred.

Again using CalPERS as an example, Figure 4 shows the asset allocation of the CalPERS portfolio. As we can see, a significant portion of the CalPERS portfolio is invested in "equities" and "alternative assets," which are largely equity instruments. This pattern is repeated at CalSTRS and UCRS, with no fund having more than one-quarter of its portfolio invested in fixed-income assets.

Aside from the cash, fixed-income, and inflation-linked assets, each portfolio is subject to significant volatility, especially since many of the investments are correlated with each other. (Here, correlation means that a significant drop in the value of equity investments is likely to be reflected in the value of private equity and venture capital investments as well.) Figure 5 demonstrates the risk/return

10 2008 UCRS CAFR, p. 6.

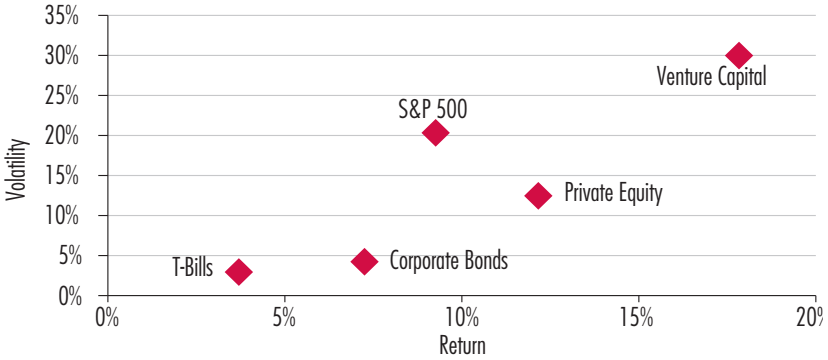
11 Ibid.; Based on statement that one of the changes approved in March 2006 was "a multi-year contribution strategy under which contribution rates will increase gradually over time to 16 percent of covered earnings, based on UCRP's current Normal Cost."

12 CalPERS Comprehensive Annual Financial Report 2009.

13 CalSTRS 2008 Comprehensive Annual Financial Report.

14 The University of California Retirement Plan Annual Financial Report 2008-2009.

Figure 5 — Asset Class Returns



Sources: S&P500: NYU Stern School of Business (Prof. Aswath Damoradan's website) http://pages.stern.nyu.edu/~adamodar/.

Corporate Bonds: Center for International Securities and Derivatives Markets 'The Benefits of Private Equity: 2006 Update http://www.marketobservation.com/blogs/media/blogs/priveq/2070309-benefitsofprivateinvestment.pdf.

Private Equity: Cambridge US Private Equity Index (Cambridge Associates: https://www.cambridgeassociates.com/foundations_endowments/working_together/specialized_expertise/alternative_assets/indicies_benchmarking.html.

Venture Capital: Cambridge US Venture Capital Index (Cambridge Associates: https://www.cambridgeassociates.com/pdf/Venture%20Capital%20Index.pdf.

tradeoff inherent in investments in each of the asset classes.

While above-average returns are available for savvy investors, taking risk, particularly in correlated asset classes, opens up the possibility of large investment shortfalls. Again using CalPERS as an example, as we can observe in Figure 6, the CalPERS portfolio has had returns averaging 7.91 percent over the last 25 years, with a standard deviation of 11.91 percent.[15] As expected, the high standard deviation means that 68 percent of the time, returns range from –4.0 percent to 19.82 percent. Historically, if CalPERS had simply invested in investment-grade corporate bonds, the fund could have earned 7.25 percent, only .66 percent less than it has earned with its highly volatile portfolio.[16] This small reduction in earnings would have allowed CalPERS to reduce volatility by a full 7.68 percentage points.

Therefore, in order to avoid future severe underfunded scenarios, we recommend that CalPERS, CalSTRS, and UCRS allocate more of their investment portfolios to fixed-income asset classes, thereby reducing risk with a minimal loss of long-term investment performance.

Benefit Levels

Benefit levels are yet another determinant of pension shortfalls. Public pension benefits are calculated for each retiree by multiplying years of service, benefit factor, and final compensation. In 1999 California passed Senate Bill 400 (SB400), substantially raising benefit factors and lowering retirement ages for public employees (see Table 3). Based on a National Institute on Retirement Security report, average monthly public pension benefits in California were $2,008 in 2006, the eighth highest nationwide.[17]

Many states experience increasing pension costs. The New York State Teacher Retirement System (NYSTRS) recently adopted a two-tier system to address the issue. Under Chapter 504 of the Laws of 2009, anyone entering New York State employment on or after January 1, 2010, will belong in "Tier 5," which features modified benefits criteria based on age and pension benefit factor. The rules of Tier 5 effectively reduced benefit levels for future employees.

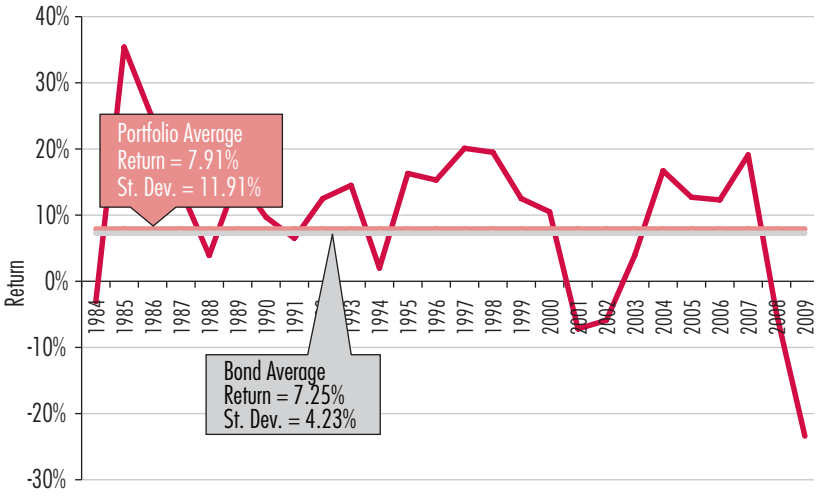
Another option to reduce benefit costs is to move away from the defined benefits system, common to most public pensions where retirees receive benefits indefinitely, to a 401(k)-style system with individual accounts. A partial solution is a hybrid defined benefits and 401(k)-style plan. By way of example, first-time public employees hired on or after August 29, 2003 in Oregon became part of the Oregon Public Service Retirement System (OPSRP). OPSRP is a hybrid plan with

15 CalPERS Facts at a Glance: Investments http://www.calpers.ca.gov/eip-docs/about/facts/investme.pdf

16 7.25% is the return on corporate bonds over the period from 1990 to 2005. Bond returns between 1984 and 2009 were not available.

17 National Institution on Retirement Security, Washington DC, Feb 2009 http://www.nirsonline.org/storage/nirs/documents/NIRS_NEI_state_factsheets.pdf.

Figure 6 — CalPERS Returns



Source: CalPERS: CalPERS website: http://www.calpers.ca.gov/eip-docs/about/facts/investme.pdf. Corporate Bonds: Center for International Securities and Derivatives Markets 'The Benefits of Private Equity: 2006 Update http://www.marketobservation.com/blogs/media/blogs/priveq/2070309-benefitsofprivateinvestment.pdf.

Table 3 — Comparison of Current Benefit Levels vs. Pre-SB-400

Retirement Category	Current Retirement Formulas	Pre SB-400 Formulas
Miscellaneous	2.5% at age 63+	2.0% at age 63+
State Safety	2.5% at age 55+	2.0% at age 55+
Peace Officer	3.0% at age 50+	2.5% at age 55+
Firefighter	3.0% at age 50+	3.0% at age 55+
Highway Patrol	3.0% at age 50+	3.0% at age 55+

Source: Senate Bill 400 (1999).

two components: the Pension Program (defined benefits) and the Individual Account Program (401(k)-style). When a member in the Individual Account Program retires, he receives access to the contributions stemming from his years of employment, plus any investment earnings or losses that have accrued.

A hybrid plan can include higher expectations of returns, reflecting a different asset portfolio from a defined benefit plan. Beneficiaries access the portfolio value more easily and make judgments as to its adequacy. However, the pension beneficiaries take on a higher concomitant portion of risk.

Such a plan appears to have popular support in California. A poll by the Public Policy Institute of California reported that two-thirds of Californians would favor modifying pensions for new public employees to 401(k)-style plans.[18] We therefore recommend a hybrid plan be considered through either the legislative or popular political processes.

Conclusions

We conclude that California's public pension liabilities are substantially understated. Given the consequences of pension underfunding, we believe every effort should be made in short order to implement policy changes to reverse the current shortfall and to prevent a similar shortfall in the future. Specifically, improved long-term funding outcomes can be influenced through higher contributions, investment in less risky assets, and lower benefit levels

Key Policy Recommendations

- Adopt probability-based funding targets.
- At a minimum, funds should be 80% certain of covering at least 80% of liabilities, (an "80/80 strategy").
- Make contributions at the Normal Rate without exception.
- Amortize shortfall repayments over at most half the duration of liabilities.
- Invest in less volatile asset classes (predominantly fixed income).
- Offer employees a hybrid system of both defined benefits and a 401(k)-style system.

18 Ed, Mendel, CHP Union Exec: lower pensions for new hires?, 1 Feb 2010 http://calpensions.com/2010/02/01/chp-union-exec-lower-pensions-for-new-hires/

SIEPR

About SIEPR

The Stanford Institute for Economic Policy Research (SIEPR) conducts research on important economic policy issues facing the United States and other countries. SIEPR's goal is to inform policymakers and to influence their decisions with long-term policy solutions.

Policy Briefs

SIEPR Policy Briefs are meant to inform and summarize important research by SIEPR faculty. Selecting a different economic topic each month, SIEPR will bring you up-to-date information and analysis on the issues involved.

SIEPR Policy Briefs reflect the views of the author. SIEPR is a non-partisan institute and does not take a stand on any issue.

For Additional Copies

Please see SIEPR website at *http://SIEPR.stanford.edu.*

SIEPR *policy brief*

A publication of the
Stanford Institute for Economic Policy Research
Stanford University
579 Serra Mall at Galvez Street
Stanford, CA 94305
MC 6015

Non-Profit Org.
U.S. Postage
PAID
Palo Alto, CA
Permit No. 28