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POLICY BRIEF

CAN A PUBLICLY SPONSORED RETIREMENT PLAN FOR PRIVATE SECTOR WORKERS GUARANTEE BENEFITS AT NO RISK TO THE STATE?

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August 2012

HIGHLIGHTS

The California legislature is currently considering SB 1234, a bill that would create the California Secure Choice Retirement Savings Trust—a state-sponsored retirement plan for private sector workers who lack access to a workplace plan. Although the plan would technically be a defined-contribution (DC) program based on an individual retirement account (IRA) platform, assets would be managed in a pooled fund and workers would be guaranteed a rate of return on their contributions, insured by private underwriters rather than the state. This Policy Brief broadly assesses the feasibility of such a plan by analyzing the private cost of guarantees, probable investment returns simulated through a hypothetical pension investment portfolio, and the long-term funded status of a hypothetical pension plan given conservative assumptions.

1. **Experts agree that while government is in the best position to insure DC plans, the private financial market can also insure benefit guarantees—for a price. The question is how much insurance is optimal in terms of costs and benefits.**

    - Recent research based in finance theory finds that the private market cost for insuring a minimum rate-of-return guarantee rises steeply with the level of the guarantee, and is much higher than the cost that would be charged by government.

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- While the market is unlikely to guarantee a high enough rate of return to provide adequate retirement income, private insurance can still be used to backstop a modest *minimum* guarantee—likely somewhere below the riskless rate—that insures against the worst outcomes but allows workers to capture higher investment returns.
- A pooled DC plan with nominal accounts rather than individual investment accounts that accumulates its own reserve fund and pools risks can incorporate features to help reduce insurance costs associated with the minimum guarantee. It can also strive to provide target level benefits in order to generate greater retirement income security for workers than is provided by a minimum guarantee alone.

2. **Based on a hypothetical conservative portfolio split 50/50 between equities and bonds/treasuries, a publicly sponsored retirement plan is likely to generate an average annual real rate of return over the long term of 5 percent real (i.e., after inflation), with very little risk of the rate dropping below 2.3 percent over a 30-year period, or below 2.9 percent over a 50-year period.**

- Looking retrospectively at overlapping periods between 1926 and 2010, the portfolio would never have earned an annual average real rate of return of less than 3.2 percent over 30 years, or less than 3.6 percent over 50 years.
- Random-draw simulations using bootstrapping and Monte Carlo methodologies yielded an average rate of return of 5.0 percent and 5.1 percent real, respectively, for 30- and 50-year investment horizons. Tenth percentile returns were at least 2.3 percent for 30 years and at least 2.9 percent for 50 years.
- Remaining uncertainty regarding long-term market performance can be managed in multiple ways, by carefully setting minimum benefits, periodically readjusting benefits, accumulating reserves, and—absent a government backstop—privately insuring benefits.

3. **Results from a plan model based on conservative assumptions indicate that a hypothetical state-sponsored retirement plan with a modest minimum return guarantee would be fully funded or over-funded during its first 40 years of operation.**

- The model assumes a minimum return guarantee of 3 percent nominal (essentially 1 percent real with 2 percent projected inflation), generous expense ratios, and very low discount rates. The low level of the guarantee reflects private insurance constraints and market interest rates, and would be higher if based on probable portfolio returns and a government backstop.
- Whether the hypothetical plan is publicly insured or privately insured at additional cost, the system stays solvent across a wide range of likely rate of return scenarios, from 2.5 percent real to 7.0 percent real, over its first 40 years.
- In the middle-range investment return scenario (5 percent real), the plan becomes substantially over-funded in relation to both accrued and future liabilities, with a funded ratio of 170 percent by the end of the 40 year period in the privately insured model. The surplus can be distributed plan retirees over time and/or used as a reserve fund in order to lower insurance costs.

Introduction

With 6.3 million private sector workers age 25 to 64 in California lacking access to a workplace retirement plan, and nearly half of workers in that age group projected to retire in or near poverty, the state faces a severe retirement crisis in the coming decades.[1] Nationally, the retirement income deficit is estimated at $6.6 trillion.[2] Several policy experts have proposed the creation of an automatic retirement savings plan to fill the gap, either at the state or national level.[3] And in the face of growing evidence that workers have not been able to adequately manage the risks associated with 401(k)-style individual investment accounts, some propose that such a plan—especially one that targets lower-income workers—should be publicly sponsored and offer some form of insurance against adverse outcomes through risk-pooling and guaranteed returns.[4]

This Policy Brief assesses the general feasibility of a publicly sponsored plan with a rate of return guarantee in California by considering privately insured guarantees, simulating returns on a hypothetical pension portfolio, and modeling the long-term funded status of a hypothetical plan with conservative assumptions. In conducting this assessment, the authors incorporated key provisions of SB 1234, a bill currently being considered in the California legislature that would to create a California Secure Choice Retirement Savings Trust, a state-sponsored retirement plan for workers who do not have access to a workplace plan.

The proposed California Secure Choice Retirement Savings Trust is essentially an auto-IRA defined contribution (DC) program, with an important twist. In conventional DC plans, individuals are responsible for navigating complex investment decisions and bear all the risks. In the plan proposed by SB 1234, investment of contributions would be professionally managed in a pooled fund. There would be a guaranteed rate of return on contributions, although the nature of the guarantee remains to be defined. The fund is required to maintain a Gain/Loss Reserve—i.e., a reserve fund—presumably to help protect the plan against becoming underfunded. Finally, the bill exempts the state from liability for the guarantee and proposes to use private insurance as a backstop if the plan ever falls short.

The findings of this Brief suggest that although it would be optimal to have government provide the guarantee, a model backed by private insurance—one that will not put the state at risk—is feasible for two reasons. First, recent research by economists indicates that a modest minimum rate of return guarantee can be privately insured at a workable cost. Second, the range of probable long-term real returns on a conservative, diversified investment portfolio—combined with the ability of a pooled fund to accumulate surplus funding even under very conservative assumptions in a low-return scenario—makes it very unlikely that the fund will ever need to tap private insurance. Ultimately, the real question is not whether a guaranteed plan is feasible without putting the state budget at risk, but how to design the plan to offer a meaningful guarantee at the lowest possible private insurance cost, while meeting the ultimate goal of secure and adequate retirement income for future retirees.

We offer two important caveats regarding the findings in this Brief. First, because SB 1234 establishes broad parameters for the California Secure Choice Retirement Savings Trust and leaves plan design to the program's Board of Trustees, the authors necessarily filled the gap with assumptions about investment portfolio composition and benefit structure. Thus the findings are not definitive, but broadly suggestive of the possibilities and constraints on guaranteed benefits and plan design.

Key Provisions of SB 1234/California Secure Choice Retirement Savings Trust

- Employers that do not offer their own retirement plan are required to make their payroll systems available for employees to contribute via payroll deduction to a state-sponsored payroll deduction IRA program.
- Employees are automatically enrolled unless they opt out.
- Employees contribute a default 3 percent of gross pay via automatic payroll deduction; individual workers can change the rate.
- Accounts stay with workers from job to job, with no need to roll over balances.
- Accounts are nominal accounts rather than individual investment accounts, with funds pooled for the purposes of investment and benefit allocation.
- Investment decisions are managed by professionals rather than individual accountholders.
- The investment portfolio is diversified to minimize risk, with a maximum of 50 percent in equities.
- Guaranteed rate of return on contributions is set by the Board of Trustees, and can be periodically adjusted.
- The state is legally protected from liability for making good on guaranteed benefits, and the plan will only offer guarantees to the extent that they can be underwritten by private insurers.
- Plan administration and investment management will be contracted out to third parties through a bid process. This means private financial service firms may administer the plan according to policies set by the Board. The bill also authorizes CalPERS to bid for part or all of the work.

The second caveat is that our findings regarding probable returns and feasible guarantees are defined by the rather strict constraints on plan design set by SB 1234. An ideal retirement plan would incorporate significant employer funding and assumption of at least some risk, enabling substantially higher guarantees and a more efficient and secure system for retirement income building. In contrast, the findings of this paper reflect the possibilities of a plan that targets workers left out of the employer-sponsored retirement system and that does not require any financial commitment from employers or the state.

This Brief is organized as follows. Section 1 briefly discusses the rationale for guaranteed DC plans, highlights real-world examples, and then examines recent research on the private market cost of rate of return guarantees. Section 2 presents findings from three methodologies to simulate probable rates of return on a hypothetical conservative investment portfolio divided between equities, corporate bonds and Treasuries in proportions consistent with the investible size of those markets and asset allocation restrictions contained within SB 1234. Drawing on those results, Section 3 projects the funded status of a hypothetical plan over a period of 40 years given a modest minimum rate of return guarantee and a range of long-term investment performance scenarios. The paper concludes with some suggestions on how to think about potential insurance costs, reserve fund accumulation, and benefit allocation in a way that takes advantage of the opportunities provided by a pooled retirement fund.

1. What Guarantees Are Possible in a Defined Contribution Plan through Private Insurance?

As firms and governments move towards increasing reliance on DC schemes to fund retirement income, there is also growing concern that such schemes expose workers to too much risk. In the US, for example, three decades of experience with 401(k)s and the aftermath of the recent financial meltdown has generated widespread consensus among policy experts that the traditional DC model—in which individual workers bear all investment, market, and longevity risk—has created a widespread retirement crisis.[5] Moreover, workers in the bottom half of the income distribution—such as those targeted by SB 1234—are especially ill-equipped to manage such risks individually. Given these realities, a more secure DC system has the potential to increase voluntary savings among workers. Such a system could fill part of the void left by the decline of defined-benefit (DB) pensions and generate another layer of secure retirement income to supplement Social Security.

It might come as a surprise to some that the guaranteed DC program proposed by SB 1234 is not entirely novel. Guaranteed DC accounts are rare in the US, but they do exist. A key example is the TIAA Traditional Annuity Fund offered by TIAA-CREF to nonprofits and colleges through a 401(k) platform, which guarantees a minimum nominal interest rate on contributions plus additional dividends tied to investment performance.[6] The guarantee is set at the time of contribution, and is valid on sums contributed in that year until retirement. Currently, during a time of historical low interest rates, the minimum guarantee is 3 percent a year, and the average annual rate of return including additional dividends for the past ten years is 4.94 percent.[7]

There are several international examples as well. In Switzerland, pension funds must meet a minimum return threshold set by the government and adjusted on a periodic basis, currently set at 2 percent. Denmark's nationwide, mandatory DC plan is required to provide a minimum return guarantee tied to current long-term interest rates.[8] Several other Organisation for Economic Cooperation and Development (OECD) member countries have less extensive guarantee programs. Other major OECD economies have mandatory or quasi-mandatory DC programs without guarantees—for instance Australia's Superannuation System and the U.K's National Employment Savings Trust (NEST). These countries generally have generous government pension (i.e., Social Security) programs that ensure a basic standard of living and require substantial employer contributions to their DC program.

Cost Estimates from Finance Theory

In light of growing interest in reducing the risks associated with 401(k) style plans, several recent studies based in finance theory have estimated private market risk-based premiums for rate of return guarantees on DC plans.[9] There is broad agreement among these studies that insofar as workers need insurance against poor outcomes in DC plans, the government is the best provider of that insurance and can generally do it at a significantly lower cost to workers compared to the private market. At the same time, these studies demonstrate that private market provision of guarantees are theoretically feasible, but incur steeper cost/benefit trade-offs than would a public guarantee. Thus privately provisioned insurance, alone, cannot provide optimal rates of return necessary to turn workers' savings into adequate retirement income. Rather, they can provide protection against the worst outcomes. Fortunately, a pooled DC system has the potential to be structured in such a way as to lower insurance costs and provide additional safeguards against market fluctuations by pooling risk among participants.

First, how would a guaranteed DC plan work? For insured individual DC accounts, the insurer promises to make up any shortfall between actual account values at retirement age and the minimum benefit as determined by the guaranteed rate of return. In exchange, the participant pays a fee—either as a percentage of initial contributions or as an annual fee assessed as a percentage of net asset value in the account. At retirement age, if the account balance after actual investment returns is equal to or above the guaranteed minimum, the participant receives nothing from the insurer. If the account balance falls short, then the insurer "tops off" the account up to the minimum amount.

In order to calculate the cost of guarantees, the following studies estimated the market price of a put option on a retirement portfolio. In this case, a put option is a contract that allows the retirement plan participant—or the plan itself—to sell the assets of a retirement account to the insurer at a fixed price at a given time, e.g., when the participant retires. The cost to the seller depends on several factors. These include whether the guarantee is in real or nominal terms, floating or fixed, and high or low. They also include the length of the investment period and the composition of the investment portfolio (the share in stocks, bonds, and treasuries).

To begin, a 2009 study by the Center for Retirement Research (CRR) at Boston College outlines fundamental constraints on private market insurance for guaranteeing rates of return.[10] The authors find that the maximum feasible effective guarantee is the risk-free rate, defined in their paper as 2 percent real. The cost of a 2 percent minimum real return guarantee (with the worker keeping excess investment returns) is a steep 29 percent of total contributions. In contrast, the government has the potential to offer rate of return guarantees at significantly lower cost to participants and ultimately can offer much higher guarantees at an affordable cost.

What are potential costs for a guarantee that is lower than the riskless rate? In a paper commissioned by the OECD, Scheuenstuhl et al. estimate guarantee fees for individual accounts using a lifecycle (target date fund) investment strategy over an investment horizon of 40 years.[11] An investment strategy with 50 percent equities through age 60, stepping down to 20 percent by age 65, yields the following guarantee costs: less than 3 basis points (.03 percent) for a nominal principal guarantee, about 14 basis points for a 2 percent nominal return guarantee, and about 71 basis points for a 4 percent nominal return guarantee.[12] Guarantees for just the principle in nominal terms cost much less. However, it is unlikely that the auto-IRA program currently being considered in California will be invested in lifecycle funds.

The closest estimate for the type of plan proposed by SB 1234 can be found in a study by Grande and Visco, which examines potential costs in the European market for guarantees in a DC plan. Costs are estimated for a range of investment strategies.[13] The strategy most similar to the one proposed by SB 1234 is 50 percent equities and 50 percent in 10-year Treasury Bonds, albeit in an individual portfolio. In this case, the 2.5 percent nominal guarantee costs 37 basis points for a 30-year horizon, and 26 basis points for a 40-year horizon.

Implications for Plan Design: Reserves, Guarantees, and Targets

Importantly, the above cost estimates are based on individual investment accounts over individual career spans. However, in a pooled DC plan such as proposed by SB 1234, insurance costs would likely be assessed at the plan level where the systematic accumulation of a reserve fund could reduce the risk to insurers and thus lower costs. Actual cost estimates will require a study with specific data about actual plan structure.

The above research findings have important implications for the type of plan being proposed by SB 1234. If private guarantees are expensive, then policymakers must weigh the costs of insurance against trade-offs (lower overall returns) in setting the minimum guarantee rate. But more importantly, they should explore other avenues in addition to the minimum guarantee for providing more stable retirement income, which in turn involves deciding how much risk should be pooled among plan members. For instance, the plan could smooth returns across age cohorts so that workers' retirement income depends more on long-run average returns rather than short-term market fluctuations in the value of plan assets. In practical terms, this means setting a reasonable target rate of return and taking the surplus returns above that amount during bull markets and holding it in reserve for bear markets. Disbursement from the reserve would be contingent on established funding requirements.

2. Realistic Rates of Return: Results from Hypothetical Portfolio Simulations

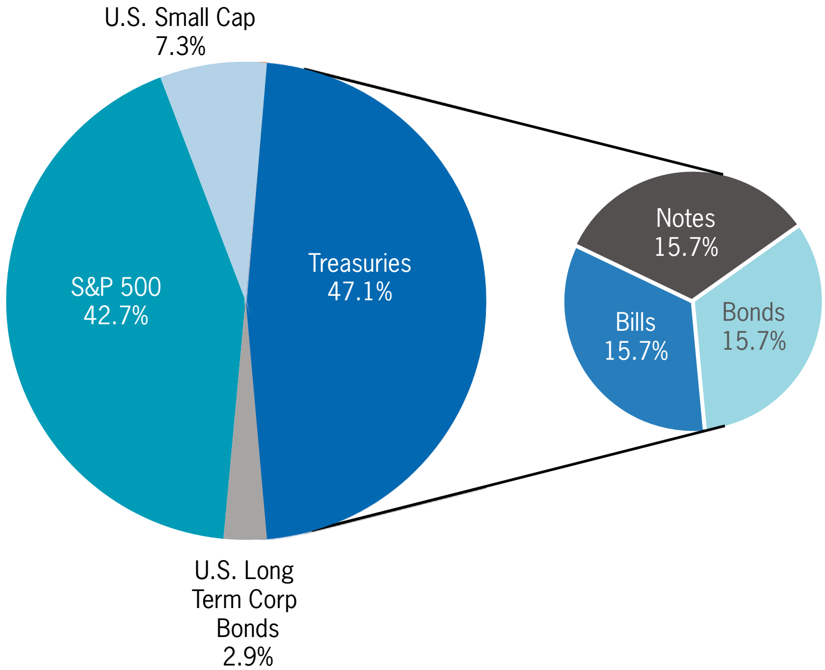
In addition to the availability of private insurance, another critical question is what returns could be realized by a state-sponsored retirement plan and at what probability. In order to address this question, we estimate the range of long-term average rates of return that are likely to be generated by a conservative pension portfolio similar to the type prescribed for the California Secure Choice Retirement Savings Trust in SB 1234. A hypothetical portfolio is constructed and then subjected to three methods of evaluating possible achievable long-run returns based on historical data dating back to just before the Great Depression. The three methods consist of overlapping period analysis, bootstrapping simulations, and Monte Carlo simulations. We present summary findings from each methodology, highlighting their strengths and weaknesses, and then discuss the implications of these findings for designing a guaranteed retirement plan.

In constructing a hypothetical portfolio, the authors first considered the investible size of four key asset classes and the restrictions on portfolio allocation in the latest available draft of SB 1234, amended June 27, 2012. The largest asset class by market value is the large cap stock market, followed by the Treasury market which consists of the traditional maturity buckets of Bills, Notes, and Bonds. The remainder consists of small stocks and the long term corporate bond market. Because SB 1234 stipulates that equities cannot exceed 50 percent of the portfolio, the authors chose to allocate half the portfolio to large cap and small cap stocks, proportionate to relative market capitalization. The other half of the portfolio was allocated to corporate bonds and Treasuries in proportion to market capitalization. The Treasury portion of the portfolio, in turn, was evenly broken up into Bills, Notes, and Bonds. The resulting portfolio composition is illustrated in **Figure 1** (page 8). For the purposes of this study, the portfolio is assumed to be rebalanced at the end of each calendar year.

It is important to note that the hypothetical portfolio does not include other assets allowed by SB 1234 such as private equities and real estate investment trusts (REITs). Actual investment strategy for any retirement plan would have to be carefully designed with specific retirement income objectives and risk management goals.

The authors sourced annual total return data on six asset classes for the years 1926 to 2010 from Ibbotson Morningstar. Those assets classes were the large cap stock market (proxied by S&P 500), an index of small stocks (proxied by Russell 2000), long-term corporate bonds, 30-day Treasury Bills, intermediate-term

Figure 1
Composition of Hypothetical Portfolio



Note: Totals may not add up due to rounding.

Treasury Notes, and long-term Treasury Bonds. By adjusting all the return series to account for inflation, the authors constructed real returns for each year.

Overlapping Period Analysis

Based on the hypothetical portfolio, the mean, minimum, and maximum annual compound percentage return were calculated for every overlapping period of 5, 10, 20, 30, 40, 50, and 60 years for which data was available. The results are shown in **Table 1** (page 9).

Investing for any 30- or 40-year period, on average, produced annual compound real returns well in excess of 4.5 percent. Indeed, even if one invested at the worst possible 20-year period, the annual average compound real return would still have reached 1 percent while the worst 30- and 40-year periods produced average annual compound real returns of over 3 percent. For periods of 30 or 40 years, 90 percent of periods delivered annual real returns of 3.5 percent and above, while 100 percent of 50-year periods saw returns above that level.

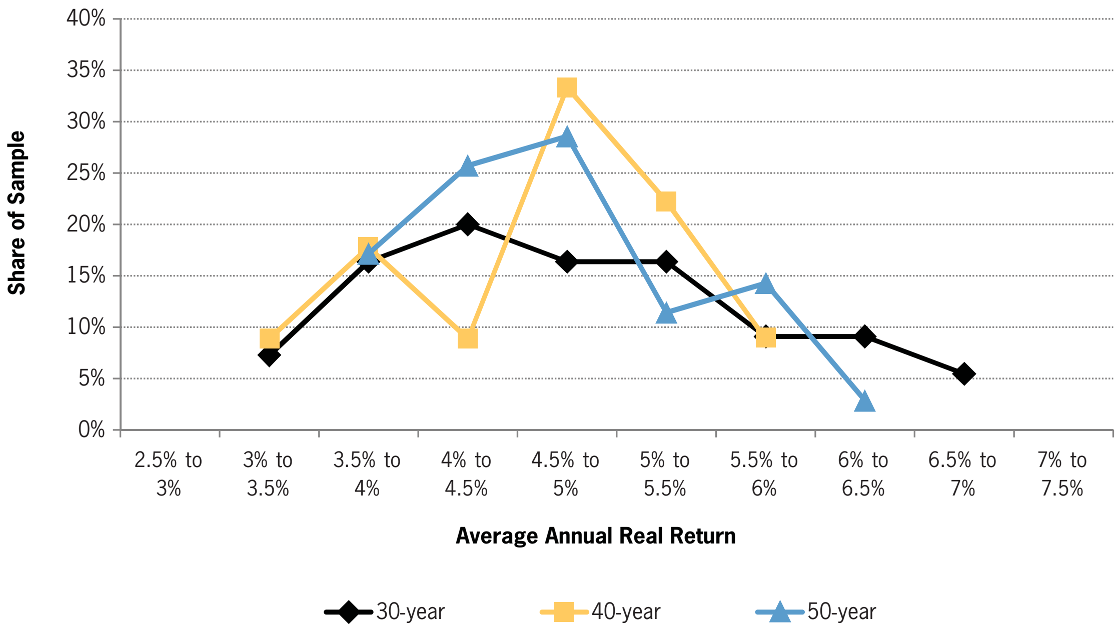
Figure 2 (page 9) illustrates the distribution of returns over 30-, 40-, and 50-year periods in more detail. It shows that the longer the investment period, the tighter the distribution of returns.

Table 1
Historical Real Returns for Hypothetical Portfolio
Overlapping Periods, 1926–2010

		Average Annual Real Returns		
Time Frame (years)	Number of Periods	Mean	Minimum	Maximum
1	85	5.7%	-21.6%	41.3%
5	80	5.0%	-3.8%	18.6%
10	75	5.1%	-1.3%	10.3%
20	65	5.0%	1.0%	9.0%
30	**55**	**4.8%**	**3.2%**	**6.9%**
40	**45**	**4.6%**	**3.3%**	**5.9%**
50	**35**	**4.7%**	**3.6%**	**6.1%**
60	25	4.9%	4.2%	5.4%

Source: Authors' calculations.

Figure 2
Distribution of 30-, 40-, and 50-year Historical Real Returns for Hypothetical Portfolio, 1926–2010



Source: Authors' calculations.

Readers should note that the annual average return categories used in all frequency charts in this Brief are exclusive of the upper boundary; for instance, the category "4.5% to 5%" includes values equal to or greater than 4.5 percent but less than 5.0 percent.

Overlapping period analysis, especially covering a long historical time frame, has the benefit of picking up path dependency—i.e., the fact that asset values are related to each other across time, in particular due to economic cycles. Periods of underperformance are often followed by periods of over performance, and vice versa. For example, in the three years from 1929, the hypothetical portfolio would have dropped by 27 percent in real terms. But in the next four years the portfolio would have roughly doubled. A similar "snap back" pattern has been exhibited in the aftermath of the massive declines seen in 2008 and 2009. The overlapping period method therefore takes into account not only the historical frequency of such crisis periods but also how asset markets react during and after crises.

One common critique of the overlapping period approach is that the samples are not independently drawn from an underlying distribution, but are obviously related because they overlap.[14] Another critique is the possibility that the future involves asset market performance that was never witnessed in the preceding century. Such uncertainties will always cloud conclusions drawn from historical data.

However, applying overlapping period methodology to a very long period allows one to examine the impact of starting to invest under very different circumstances: when markets are high and overvalued or low and undervalued, times of high inflation or times of very slight changes in the price level, times of war and peace, etc. Some assurance can be derived from the fact that the underlying data in our analysis includes ample examples of difficult times for asset markets—e.g., periods of systemic economic crisis (such as the Great Depression) and periods with high inflation that caused poor performance in real terms (much of the 1970s)—but still yields a minimum real rate of return higher than 3 percent.

Bootstrapping Simulations and Monte Carlo Simulations

Because bootstrapping and Monte Carlo methodologies share key features, we present their results in tandem and evaluate their strengths and weaknesses together.

Bootstrapping simulations involve taking historical data and drawing a large number of random samples from it to see what outcomes are the most likely. In this case, annual real returns for each portfolio between 1926 and 2010 comprised the underlying historical data. Simulations were run for 30- and 50-year investment horizons. For example, for the 30-year simulations, 30 annual returns from the historical data were selected at random, and then the total rate of return on a fixed sum of money was calculated from the resulting data series. This exercise was repeated 10,000 times.

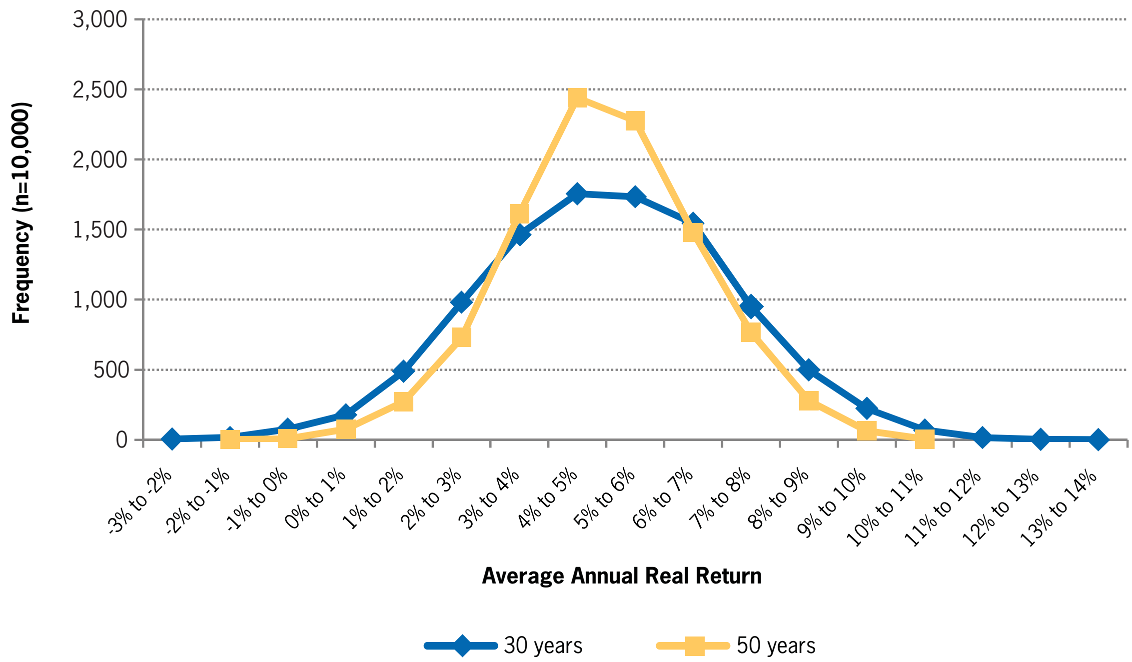
Table 2 (page 11) displays summary data for the 30- and 50-year bootstrapping simulations. For both 30-year and 50-year periods, the simulations generated an average (mean) compound annual real return of 5.0 percent. Predictably, the range of outcomes is somewhat wider for the 30-year simulations than for the 50-year simulations. For example, the middle 80 percent of returns fall between 2.4 percent and 7.8 percent real for the 30-year period, and between 2.9 percent and 7.1 percent for the 50-year period. This pattern is illustrated in **Figure 3** (page 11), which shows the frequency of simulated returns by the annual average rate of return. The well-recognized significance for pension plan design is that the longer the investment horizon, the less volatility in the average rate of return for a given portfolio.

Table 2
Bootstrapping Simulation Results
Average Annual Real Returns from Hypothetical Portfolio

	30-year	50-year
Statistical Summary		
Mean	5.0%	5.0%
Minimum	-2.6%	-1.7%
Maximum	13.4%	10.8%
Standard Deviation	2.1%	1.6%
Percentile Distribution		
10th	2.4%	2.9%
25th	3.7%	3.9%
50th (Median)	5.1%	4.9%
75th	6.6%	6.1%
90th	7.8%	7.1%

Source: Authors' calculations.

Figure 3
Bootstrap Simulation Results: Distribution of Portfolio Returns



Source: Authors' calculations.

Monte Carlo simulations involve using the statistical moments of a historical distribution to generate a probability distribution and then drawing a large number of random samples from it to see which outcomes are the most likely. In this case, annual real returns for each portfolio for the years 1926 through 2010 constituted the historical data, the mean and standard deviation from which were used to generate an assumed normal distribution (in laymen's terms, a bell-shaped curve) of annual returns. Again, simulations were run for 30- and 50-year investment horizons. For example, for the 30-year investment horizon, 30 annual returns from the normal distribution were selected at random. The performance of a fixed sum of money was then calculated from the resulting data series. This exercise was repeated 10,000 times. Results are summarized in **Table 3**.

Table 3
Monte Carlo Simulation Results
Average Annual Real Returns from Hypothetical Portfolio

	30-year	50-year
Statistical Summary		
Mean	5.1%	5.1%
Minimum	-3.9%	-1.1%
Maximum	13.8%	11.0%
Standard Deviation	2.1%	1.6%
Percentile Distribution		
10th	2.3%	3.0%
25th	3.6%	4.0%
50th (Median)	5.0%	5.1%
75th	6.5%	6.2%
90th	7.7%	7.2%

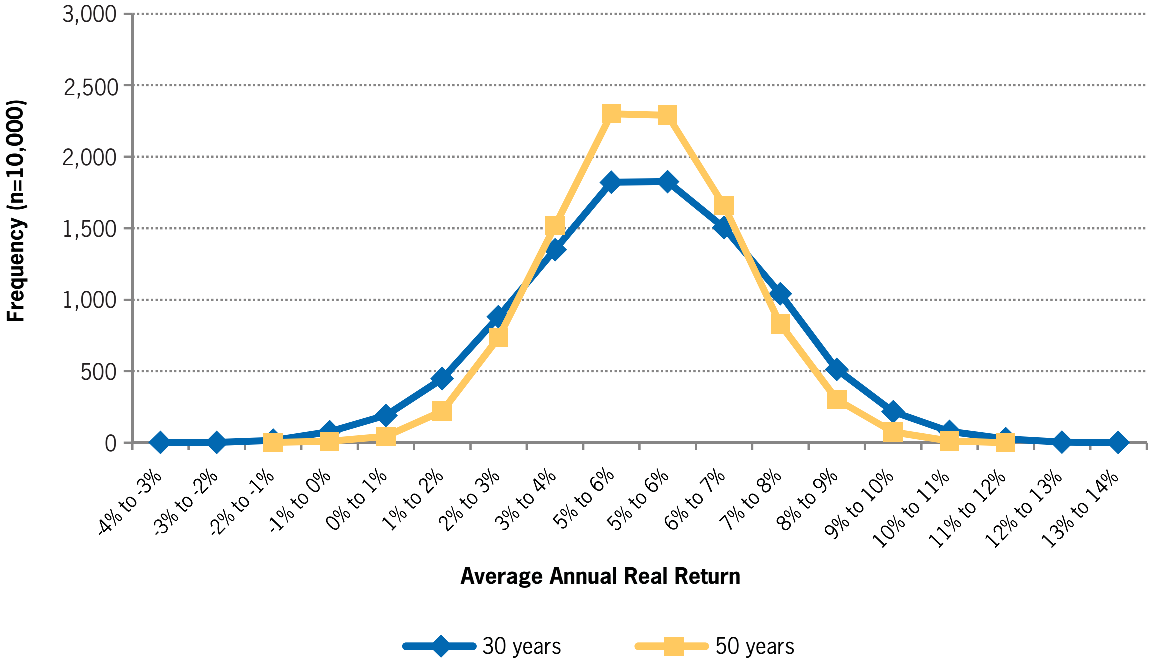
Source: Authors' calculations.

The Monte Carlo simulation results are very similar to the bootstrapping simulation results, with a slightly higher mean of 5.1 percent but with values at the 10th and 90th percentiles about .1 percentage point lower (2.3 percent and 7.7 percent). The Monte Carlo results are slightly higher for 50 years compared to Bootstrapping results, but again, the differences are very small—about .1 percentage point.

The distribution of returns from the Monte Carlo simulations is illustrated in **Figure 4** (page 13), which shows the frequency of returns by one percentage point groupings. As with the bootstrapping simulations, the chart shows that a large majority of returns were predicted to be between 3 and 7 percent in real terms.

Bootstrapping and Monte Carlo simulations have similar strengths and weaknesses. They use historical data and as such, the conclusions drawn from them are subject to the same caveats about reliance on the past as the overlapping period model that were discussed above. On the plus side, both methods allow a

Figure 4
Monte Carlo Simulation Results: Distribution of Portfolio Returns



Source: Authors' calculations.

very large number of simulations to be carried out. For example, this study ran results for 10,000 simulations per method for each investment horizon. This allows the most likely outcome to emerge and generates detailed estimates of the probability of different outcomes given the underlying assumptions and data.

At the same time, bootstrapping and Monte Carlo methodologies do not account for path dependency in asset markets. In both models, each random draw is totally unrelated to any other. For example, in a bootstrapping simulation the same year can be drawn more than once in one simulation if it is selected at random more than once.

This explains the presence of a small number of very low return results from the simulations. These individual simulations selected several of the worst years in the historical data (for the bootstrapping) or several draws from the left tail of the distribution (Monte Carlo) at the beginning of the hypothetical investment period. The effect is the same as going through several financial collapses in succession without any recovery in between, creating such a large fall in portfolio value that subsequent positive returns cannot make up lost ground. These results are not found in the overlapping methodology because large declines are rare and usually followed by good performance in the next few years, as discussed above.

The strengths and weaknesses of each approach make combining these methodologies a good way to produce robust estimations of probable returns. It should provide some reassurance that the separate methodologies have actually produced similar results: the large majority of probable returns fall between about 2.5 and 7 percent real with a mean of about 5 percent over long investment horizons.

Significantly, all three methodologies saw improved investment performance with longer investment periods. This is of crucial significance because if a publicly sponsored retirement plan was set up in California, it would exist for several decades and possibly in perpetuity. This would mean that although there would be times when investment returns may undershoot the target—set by the average projected return for a given investment portfolio—these would be balanced by the excess funds generated when returns exceed the target. Indeed, if the minimum guarantee is set below the average expected return, then there is a high degree of probability that the surplus would collect over time and provide ever greater insurance against the possibility of a sustained period of disappointing returns. The plan could also make periodic extra payments to participants if the surplus became really large. Generating such a surplus would not only build up a safety net for the system and thereby reduce private insurance costs, but it would also help solidify public confidence in the program. Finally, the ability to periodically readjust the guarantee upwards or downwards in accordance with market interest rates and long-range economic forecasts will further protect the plan from becoming under-funded.

3. Modeling Plan Funded Status

The purpose of this section is to project the financial status of a hypothetical state-sponsored retirement plan with a modest minimum rate of return guarantee over time, given conservative actuarial assumptions and a range of scenarios regarding long-term rates of return on fund investments. We developed two plan models—one that is self-insured with a government backstop, and one that pays private insurers to backstop the guarantee at an extra cost. We then exposed the models to a range of scenarios concerning rates of return in order to determine how the plan fares financially over time under different circumstances, both in terms of the ratio of assets to current guaranteed account balances and the funded status of the plan calculated as the ratio of assets to the present value of liabilities.

Model Parameters

Key assumptions and inputs for the model are listed in **Table 4** and further explained in the **Appendix**. A critical assumption is the guaranteed rate of return. If we were to base it on the probable rates of return on the hypothetical portfolio found in Section 2, a 2 to 3 percent real rate of return guarantee would be very safe. However, as discussed in Section 1, the use of private market insurance imposes heavy cost constraints. In light of this, the authors chose 1 percent real, the equivalent of 3 percent nominal with 2 percent inflation. This is roughly the yield on long-term treasuries over the past few years, although as of this writing the nominal yield on 30-year rates has dropped to around 2.5 percent. Significantly, TIAA-CREF's Traditional Annuity now guarantees a minimum of 3 percent nominal on current contributions.

The model assumes 100 percent distribution of benefits as a lump sum at age 65, for the sake of simplicity. In real life, most workers and the plan as a whole would be better off if the former annuitized at least a portion of their benefits and spread out lump sum withdrawals over time.

We ran two permutations of the model, called **Model 1** and **Model 2**, in order to illustrate the trade-offs imposed by the use of private insurance to underwrite the guarantee, as opposed to government backing the plan. **Model 1** serves as a baseline and treats the plan as being self-insured, with government implicitly serving as the backstop. The retirement plan in this scenario holds back a small portion of each retiring cohort's surplus earnings in reserve—in addition to accumulated surpluses for workers who have not yet retired (see Appendix for details). **Model 2** includes an insurance premium of 80 basis points. We believe this is a crude but reasonable estimate given the discussion in Section I. Surplus earnings belonging to each year's retiring cohort are fully distributed in addition to the guaranteed minimum. If the assets associated with contributions belonging to the retiring cohort fall short of the minimum guaranteed amount, the insurer fills the gap.

Table 4
Hypothetical Retirement Fund Assumptions and Parameters

Model Assumptions	
Participation rate among eligible participants	70.0%
Employee contribution rate (% of annual earnings)	3.0%
Retirement age	65
Inflation rate	2.0%
Annual earnings growth rate	1.4% real/3.4% nominal
Baseline expense ratio as % of assets	.7%
Percentage of participants living until retirement age	100.0%
Percentage of benefits taken as lump sum	100.0%

	Rate of Return Scenarios			
Model 1 Parameters—Publicly Insured Plan	Very Low	Low	Middle	High
Achieved return on portfolio (real)	2.5%	3.0%	5.0%	7.0%
Annual costs as a percentage of assets	0.7%	0.7%	0.7%	0.7%
Net return on portfolio (real)	1.8%	2.3%	4.3%	6.3%
Discount rate (real)	1.0%	1.5%	2.0%	2.0%
Surplus earnings distribution policy for retiring cohort	Proportional share of system surplus in excess of 120%			

	Rate of Return Scenarios			
Model 2 Parameters—Privately Insured Plan	Very Low	Low	Middle	High
Achieved return on portfolio (real)	2.5%	3.0%	5.0%	7.0%
Annual costs as a percentage of assets (incl. insurance)	1.5%	1.5%	1.5%	1.5%
Net return on portfolio (real)	1.0%	1.5%	3.5%	5.5%
Discount rate (real)	1.0%	1.5%	2.0%	2.0%
Surplus earnings distribution policy for retiring cohort	100% of net earnings attributable to cohort contributions			

In both Model 1 and Model 2, we applied a range of scenarios concerning long-term average real rates of return: 2.5 percent (very low), 3.0 percent (low), 5 percent (middle), and 7 percent (high). We also applied conservative discount rates to value future liabilities associated with guaranteed minimum returns (see Appendix). In traditional DB pensions, it makes little sense to use such low discount rates when the expected rate of return is much higher, because this forces systematic over-funding and thus may not be efficient for employers or workers. However, we chose to cap the discount rate at the risk-free rate—estimated as 2 percent real for the purposes of this study—in order to have greater comparability across scenarios, and for the specific purpose of severely shocking the hypothetical plan.

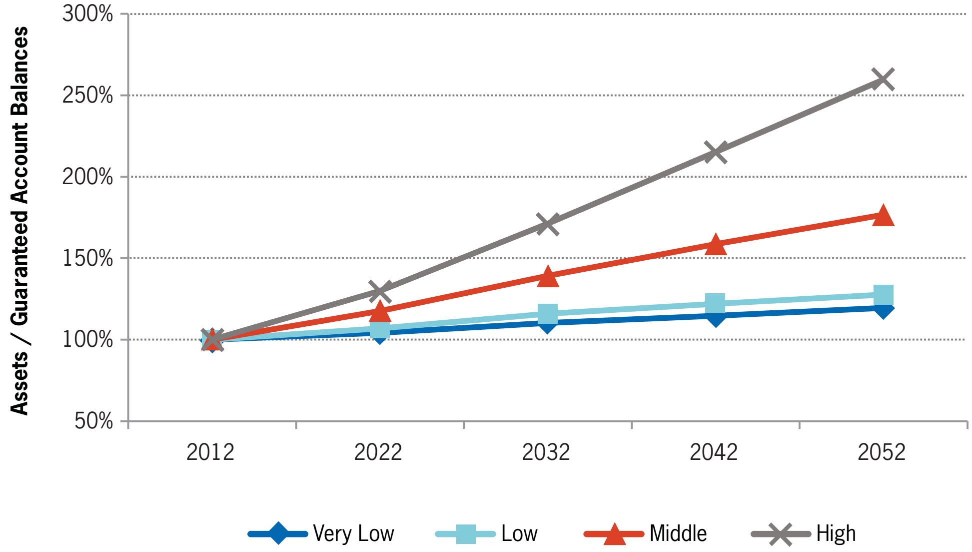
Ratio of Assets to Guaranteed Balances

Figures 5 and 6 (page 17) show the ratio of assets to guaranteed account balances over 40 years for Model 1 (publicly insured plan) and Model 2 (privately insured plan). Each figure depicts outcomes for Very Low, Low, Middle, and High return scenarios. They show whether the fund has enough assets to cover current liabilities, and the magnitude of any surplus. All scenarios start at a 100 percent ratio of assets to guaranteed balances. Both models accumulate substantial surpluses in the Middle and High scenarios. However, as would be expected, lower annual expenses combined with the ability to accumulate a reserve lead to significantly faster growth rates in Model 1 than in Model 2. Even the Very Low return scenario accumulates a meaningful surplus by the end of the 40-year period in Model 1, but in Model 2, the ratio of assets to guaranteed balances remains just above or exactly at 100 percent for the Low and Very Low rates of return.

In order to assess the health of a pension plan, we must also account for future liabilities resulting from plan guarantees. **Figures 7 and 8** (page 18) show the actuarial funded status of the plan, calculated as the ratio between assets and the sum of the present value of guarantees redeemable at retirement age (see **Appendix** for details). The plan starts out actuarially over-funded in both models across all scenarios except for Very Low. The Very Low scenario remains at 100 percent funded throughout the 40 years in Model 2, but accumulates a surplus in Model 1 thanks to lower expenses. Looking at the trajectory for the Middle return scenario, by 2052, the publicly insured plan in Model 1 will likely have more than twice the assets needed to cover minimum benefit liabilities, even when using discount rates that are considerably lower than achieved net returns on investment. Looking at the Middle scenario in Model 2, the privately insured plan is likely to have 170 percent of actuarially required assets.

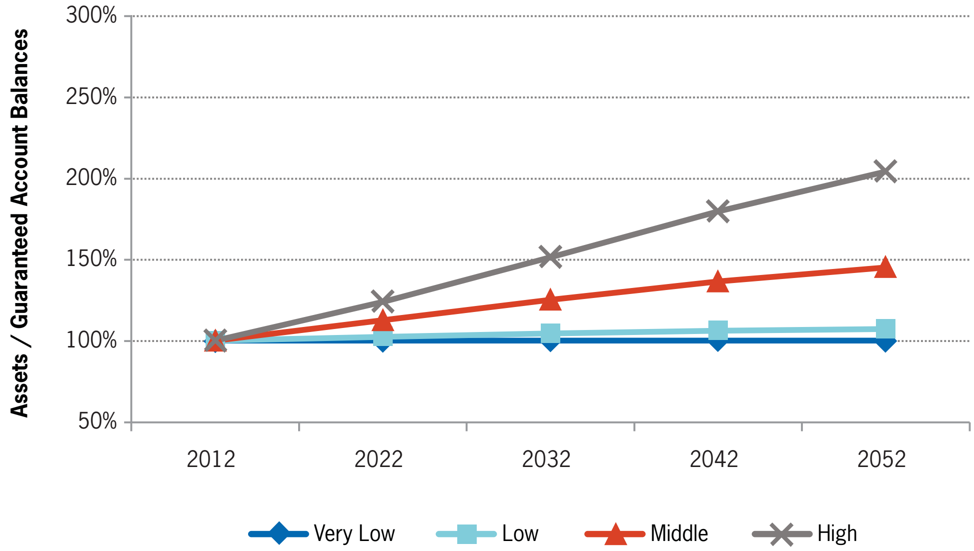
The above results on the ratio of assets to current and future liabilities do not show the effect of year-to-year volatility in asset values, but they do illustrate the long-run financial status of the plan given a range of outcomes in investment performance. They show that the plan stays solvent within the expected range of returns on the hypothetical pension investment portfolio inferred from three different methodologies—overlapping period analysis, bootstrapping simulations, and Monte Carlo simulations. This is true with high expense estimates and low discount rates, and even within a very low rate of return scenario (2.5 percent real) that is significantly lower than we would have seen in any 30 year period since 1926. To be sure, there is a small chance of long-run investment performance being even lower, for which reason the plan needs to be insured either by the government or by the private market.

Figure 5
Model 1 – Publicly Insured Plan
Ratio of Assets to Guaranteed Balance



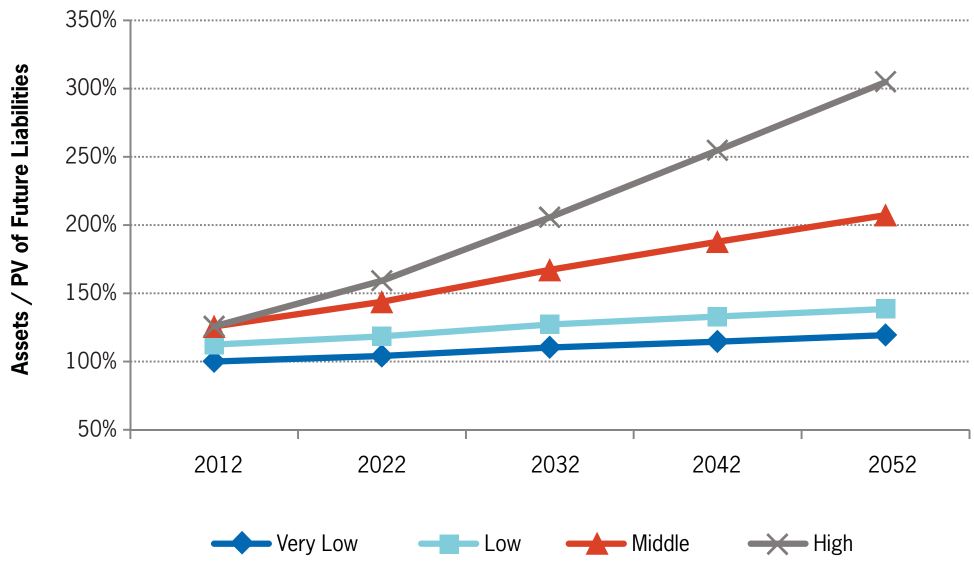
Source: Authors' calculations.

Figure 6
Model 2 – Privately Insured Plan
Ratio of Assets to Guaranteed Balance



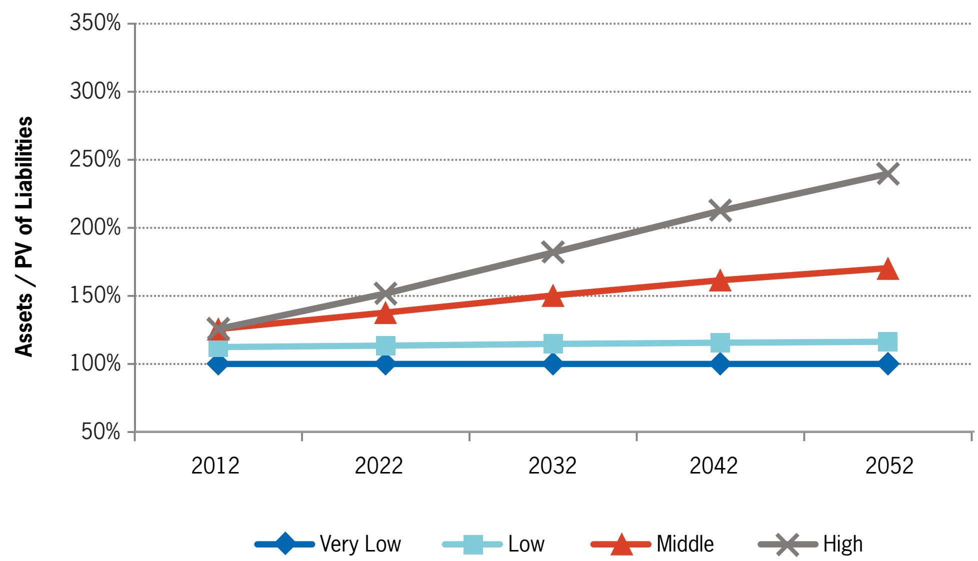
Source: Authors' calculations.

Figure 7
Model 1 – Publicly Insured Plan
Funded Status



Source: Authors' calculations.

Figure 8
Model 2 – Privately Insured Plan
Funded Status



Source: Authors' calculations.

Conclusion

The findings of this Policy Brief have two key implications for a publicly sponsored retirement plan with a guaranteed rate of return.

First, it is possible to privately insure a rate of return guarantee. The main question facing policymakers is at what cost, and for what level of benefit. If the plan were publicly insured, it could hypothetically offer a rate of return guarantee of 2 to 3 percent real at minimal risk to taxpayers given likely returns on a conservative investment portfolio and the ability of the plan to self-insure against periodic fluctuations in asset values. However, in the absence of a public guarantee or shared responsibility with employers, a publicly sponsored plan in California would be constrained by insurance cost as determined by market tolerance for risk. In that context, the low level of likelihood of a conservative hypothetical portfolio returning less than 2 percent real indicated by this study indicates the potential to insure a modest minimum benefit at a workable cost. Beyond that, the ability of a pooled DC plan to accumulate a reserve fund opens up the potential to use surpluses to reduce insurance costs. Precise cost estimates can only be derived once the state establishes a plan and determines its investment strategy and benefit allocation policy.

Second, although reliance on private market insurance means that the minimum benefit alone will not be sufficient to prevent significant variation in retirement incomes due to market conditions when workers retire, this need not limit the ability of the plan to strive to smooth returns across retirement cohorts. This is especially true because a publicly sponsored retirement plan with a modest minimum rate of return guarantee and a diversified, well managed investment portfolio is very likely to run significant surpluses in excess of the minimum guaranteed benefit. Given this prospect, such a plan can aim for a reasonable target rate of return above and beyond the privately insured minimum guarantee, for instance the net after expenses and reserve fund building from the expected average rate of return. If investments perform worse over the long term than expected, the target benefit can be adjusted downwards. If they perform better than expected, supplemental benefits can be distributed to retirees. This is essentially the approach taken by the National Council of Public Employee Retirement Systems in their Secure Choice Pension proposal (distinct from SB 1234) for a multiple-employer cash balance plan.[15] That proposal entails a target rate of return of 5 percent nominal and the flexibility to reduce benefits to a minimum of 3 percent nominal if markets consistently under-perform over the long term.[16]

If California moves forward with a publicly sponsored retirement plan for private sector workers who have been excluded from the employer-sponsored retirement system, policymakers and stakeholders will face critical choices regarding plan goals, investment policy, and benefit structure. Many of these choices will entail complex trade-offs under the constraints imposed by SB 1234. Nonetheless, the idea of a pooled DC plan with guaranteed returns holds promising opportunities to improve the retirement income security of lower-income workers.

Appendix: Methodology

Hypothetical Portfolio Returns

Data. Annual total return data from 1926 to 2010 were provided by Ibbotson Morningstar for the following series: S&P500, U.S. Small Stocks, U.S. Long Term Corporate Bonds, U.S. Long Term Government, U.S. Intermediate Term Government, and U.S. 30 Day T-Bill. Data was inflation-adjusted using the CPI-U from the U.S. Department of Labor.

Note on simulation methodologies. Both bootstrapping and Monte Carlo simulation methodologies drew from the constructed portfolio rather than from separate indices. Some may criticize this on the grounds that this approach assumes that correlations between asset returns in the future will mirror those in the past. However, many of the correlations between these series have either changed over the sample period (for instance between Treasuries and equities), or can be assumed to be relatively constant (for instance between intermediate and long term Treasuries). We believe that this makes drawing from the model portfolio acceptable.

Hypothetical Plan Actuarial Model

See Table 4 on page 15 for key assumptions.

Data. Data from the 2009, 2010, and 2011 Current Population Survey March Supplement (for calendar years 2008–2010) was used to generate an estimate of the number of eligible participants and average earnings.[17] The universe consisted of California private sector wage and salary workers and self-employed workers with incorporated businesses, age 16 to 64, whose primary employer during the reference year did not offer a retirement plan. Data was aggregated into the following age cohorts: ages 16 to 19 and five year groups for ages 20 to 64. The resulting employment figures were indexed to annual compound growth rates calculated from age cohort population projections from the California Department of Finance for 2010–2050.[18] Growth rates derived from 2045–2050 were used to estimate numbers for 2051 and 2052. Finally, an annual growth rate was applied to the average earnings data over the 40 years covered by the model.

Life expectancy. The model did not include mortality rates. All entering participants were assumed to live to age 65, at which point they collected full benefits.

Inflows and outflows. Each year's inflows for each cohort equaled the average earnings for that age cohort multiplied by the participation rate, then multiplied by the employee contribution rate. The outflows were comprised by fund expenses, insurance payments, and benefit distributions. Inflows and outflows were assumed to occur at the end of each year.

Fund expenses. Expenses for large pension funds typically can cost about 50 basis points due to economies of scale, while conventional IRAs and 401(k)s are much less efficient and cost upwards of 150 basis points, especially for those who make small contributions and have low account balances. Because the type of pooled plan being considered should have similar investment costs as a DB pension but somewhat higher account administration costs, we set the expense ratio at 70 basis points, or .7 percent of assets.

Benefit distribution upon retirement. Minimum guaranteed benefits are always disbursed at retirement age. In addition, Model 2 always disburses the net investment returns on cohort contributions after fund expenses. Model 1 follows the following rules for distributing surplus investment earnings in excess of the minimum guarantee. If the plan as a whole is less than or equal to 120 percent funded, then each year's cohort of 65 year olds receive only their minimum benefit. If the plan funded status exceeds 120 percent, then the retiring cohort receives a proportionate share (by minimum guaranteed account balance) of the system surplus as additional benefits. This might seem to hold back a large share of the surplus belonging to the retiring cohort, equal to 20 percent of the guaranteed account balance. However, the actual share is significantly smaller because the funded status for the oldest working age cohort is generally lower than for the system as a whole. In theory, if the fund as a whole falls short of the level needed to pay minimum benefits (i.e., if the plan's funded status drops below 100 percent in a given year), then government fills the gap by topping off accounts for retiring members until plan assets rebound.

Calculation of assets and liabilities. Each year, 20 percent of assets and guaranteed account balances from each age cohort from the previous year were transferred to the next age cohort. The resulting balances were grown by the net rate of return after expenses (for assets) and the minimum guarantee rate (for guarantee balances), respectively. Finally, contributions and benefit payments were added/subtracted from assets and guaranteed balances.

To project future liabilities associated with each year's guaranteed account balances, we calculated midpoint ages for each of the age cohort and the number of years remaining until age 65. For example, the midpoint age for the 20 to 24 age group is 22, with 43 years remaining until age 65. We applied a compound interest rate equal to the minimum guarantee rate to the age cohort's guaranteed account balance over the number of years remaining until retirement in order to arrive at the future value of liabilities. We then calculated the present value of the result using the discount rates chosen for each return scenario to arrive at the present value of liabilities.

Discount rates. We applied rules for setting discount rates for each investment return scenario in the following order of precedence: no higher than the risk-free rate of 2.0 percent approximating the average yield on 10-year Treasuries over the past 15 years (1997-2011), no higher than the lowest net return after expenses in each scenario across Model 1 and Model 2, and no lower than the minimum guarantee.

Endnotes

[1] Sylvia A. Allegretto, Nari Rhee, Joelle Saad-Lessler, and Lauren Schmitz, Oct. 2011, "California Workers' Retirement Prospects," pp. 21-41 in Nari Rhee (ed.), *Meeting California's Retirement Security Challenge,* UC Berkeley Center for Labor Research and Education, Berkeley, CA, http://laborcenter.berkeley.edu/research/CAretirement_challenge_1011.pdf.

[2] The $6.6 trillion retirement income deficit estimate was calculated for RetirementUSA by the Center for Retirement Research at Boston College, based on their National Retirement Risk Index model using data from the 2007 Survey of Consumer Finances.
See http://www.retirement-usa.org/retirement-income-deficit-0.

[3] Proposals range from automatic enrollment in defined-contribution accounts such as automatic IRAs or universal 401(k)s to guaranteed, cash-balance style retirement accounts with a rate of return guarantees backed by government. See Michael Calabrese, Oct. 2011, "Facing Up to the Retirement Savings Deficit: From 401(k)s to Universal and Automatic Accounts," New America Foundation, Washington, D.C.; Jacob Hacker, 2011, "Restoring Retirement Security: The Market Crisis, the Great Risk Shift, and the Challenge for Our Nation," *Elder Law Journal,* v19n1; and Teresa Ghilarducci, Nov. 2007, "Guaranteed Retirement Accounts: Toward Retirement Income Security," EPI Briefing Paper No. 204, Economic Policy Institute, Washington, D.C., http://www.gpn.org/bp204/bp204.pdf; and Teresa Ghilarducci, Oct. 2011, "High Performance Pensions for All Californians," pp. 94-112 in Rhee (ed.), op cit. Most proposals call for restructuring tax subsidies for retirement savings, which currently favor high-income households, to provide more progressive benefits to low- and moderate-income households.

[4] See for instance Ghilarducci 2007, op. cit. and Hank Kim, 2011, "The Secure Choice Pension: A Way Forward for Retirement Security in the Private Sector," National Conference on Public Employee Retirement Systems, Washington, D.C., http://www.sdcera.org/PDF/Secure_Choice.pdf.

[5] There is an abundant literature on the shortcomings of 401(k)s. For a summary, see Hacker (op cit.) or Jacob Hacker, 2011, "The Coming Age of Retirement Insecurity," pp. 4-20 in Rhee, op cit.

[6] See John H. Biggs, Feb. 2010, "How TIAA-CREF Funded Plans Differ from a Typical 401(k) Plan," *Trends and Issues*, TIAA-CREF Institute, New York, http://www.tiaacrefinstitute.org/ucm/groups/content/@ap_ucm_p_tcp_docs/documents/document/tiaa02029460.pdf.

[7] TIAA-CREF, "Retirement Investments & IRAs: Current Performance," http://www.tiaa-cref.org/public/performance/retirement/index.html#TIAATraditionalAnnuity, accessed July 29, 2012.

[8] OECD, 2012, OECD *Pensions Outlook 2012*, OECD Publishing, http://dx.doi.org/10.1787/9789264169401-en, pp. 135-136.

[9] Alex Golub-Sass, Alicia H. Munnell, Anthony Webb, and Richard W. Kopcke, Feb. 2009, "What Does It Cost To Guarantee Returns?," Brief No. 9-4, Chestnut Hill, MA: Center for Retirement Research at Boston College; Gerhard Scheuenstuhl, Sandra Blome, David Karim, Matthias Moch, Stefanie Brandt, 2011, "Financial Study: Assessing the Nature of Investment Guarantees in Defined Contribution Pension Plans: A Background Paper to the OECD Policy Report 'The Role of Guarantees in Defined Contribution Pensions,'" Risklab, Munich; Giuseppe Grande and Ignazio Visco, Jun. 2010, "A Public Guarantee of a Minimum Return to Defined Contribution Pension Scheme Members," Working Paper No. 762, Banca D'Italia Eurosistema.

[10] Golub-Sass et al., op cit.

[11] Scheuenstuhl et al., op cit.

[12] Ibid, p. 18, Table 4.

[13] Grande and Visco, op cit., p. 22, Table 2.

[14] Zvi Bodie, 2001, "Financial Engineering and Social Security Reform," in J. Campbell and M. Feldstein (Eds.), *Risk Aspects of Social Security Reform,* University of Chicago Press, Chicago.

[15] A cash balance plan is a type of DB pension in which benefits are calculated as a percentage of annual salary plus interest, rather than a lifelong monthly benefit calculated as a percentage of final salary.

[16] Kim, op cit.

[17] Microdata for the CPS March Supplement Survey (aka Annual Social and Economic (ASEC) Supplement) extracted March 25, 2012 from Miriam King, Steven Ruggles, J. Trent Alexander, Sarah Flood, Katie Genadek, Matthew B. Schroeder, Brandon Trampe, and Rebecca Vick, 2010, Integrated Public Use Microdata Series, Current Population Survey: Version 3.0. (Machine-readable database), University of Minnesota, Minneapolis, http://cps.ipums.org/cps/index.shtml.

[18] California Department of Finance, May 2012, "Interim Population Projections for California and Its Counties 2010-2050," http://www.dof.ca.gov/research/demographic/reports/projections/interim/view.php.

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Acknowledgements

The authors would like to acknowledge Christian Weller at the University of Massachusetts Boston, Teresa Ghilarducci at the New School for Social Research, and Rocky Joyner at The Segal Company for their advice regarding some of the methodologies used in this brief. However, the contents of this brief are solely the responsibility of the authors.