



# **The Free Enterprise Nation**

## **Truth in Accounting: Calculating the market value of unfunded obligations in state and local government pensions**

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## **SUMMARY**

Government-sponsored pensions for state and local government workers report unfunded benefit obligations in the range of several hundred billion dollars. Public sector employees boost their pensions by working disproportionate hours of overtime in the few final years that determine their pensions. Moreover, public sector employees claim disability payments at higher rates than private sector workers, in part because qualification standards are lower. These too increase pension liabilities. Moreover, these structural problems are masked by accounting methods that significantly understate the market value of public sector pension shortfalls while encouraging pensions to overinvest in risky assets. State and local pension underfunding measured by market valuation – that is, the price that private financial markets would charge to take over the obligations of these plans – total over \$3.5 trillion, a figure 50 percent higher than the value of outstanding explicit state and local government debt. Given that law generally guarantees accrued pension benefits, state and local governments may face very significant financing problems in years ahead.

## **INTRODUCTION**

The retirement of the Baby Boom generation and the aging of the American population raise important concerns regarding the ability of retirement systems to function as the number of beneficiaries rises. Most attention has been focused on the Social Security program, corporate defined benefit pensions, and the 401(k) system of defined contribution retirement accounts. Significant reforms have been proposed for each of these three elements of the retirement income system, and a number of changes to private sector defined benefit plans and 401(k) plans have already been implemented.

However, the most significant funding shortfalls may lie with defined benefit pension plans for state and local government workers. Even under the plans' preferred accounting methods, state and local pensions are underfunded by over \$400 billion. For purposes of comparison, total outstanding state and local government bonds as of the first quarter of 2009 equals around \$2.26 trillion.<sup>1</sup>

Moreover, there is a consensus among financial economists that current accounting methods used by state and local government pensions significantly understate plans' true level of underfunding, as well as encouraging plans to invest in riskier assets. Underfunding when calculated on a market valuation basis – that is, the cost that could induce private financial entities to take over the obligations of state and local plans – is far higher than reported under the plans' preferred accounting methods.

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<sup>1</sup> Federal Reserve Board, "Flow of Funds Accounts of the United States," June 11, 2009. Table D.3.

These unfunded obligations are particularly important because, unlike Social Security benefits, which by law will be reduced if the program's trust fund becomes insolvent<sup>2</sup>, accrued benefits in state and local pension plans are ordinarily considered to be binding commitments of the governments. State courts and state constitutions have generally treated accrued benefits as a property right, such that reductions in these benefits are tantamount to a default by the sponsoring government entity. David Crane, a special economic advisor to California Governor Schwarzenegger has expressed concerns that state pensions will "dwarf" all other spending and remain legally protected. "[State pensions] are worse than Social Security and Medicare in one big way: they are not contractual, the Congress can change them and will change them," said Crane in a recent interview.<sup>3</sup>

Given this legal protection, and the political clout of government employee unions, it seems highly unlikely that governments could successfully renege on accrued pension benefits. For that reason, taxpayers and other stakeholders of state and local budgets must be prepared to make significant sacrifices as these pension benefits come due.

However, while accrued benefits are virtually sacrosanct, governments do have the ability to alter the terms on which *future* benefits are earned. Employee contributions can be increased, and the benefit formula made less generous moving forward. While government employees will understandably be upset, it is worth noting that state and local pension benefits are generally significantly more generous than pensions paid by Social Security and private sector defined benefit (DB) or defined contribution (DC) retirement programs. As the costs of an aging population come to bear, these costs should be shared proportionately between taxpayers and beneficiaries.

### **ACTUARIAL FUNDING VERSUS MARKET VALUATION**

A key calculation in determining the funding basis of a pension plan is to compare the plan's current assets to its future obligations. Dividing assets by liabilities produces the "funded ratio," which represents the degree to which future obligations are fully financed. While the value of current assets is generally known, actuaries and financial economists generally differ on how to translate the value of future benefit obligations to a figure that can be compared to the value of current assets. The key question here regards methods of "discounting." The approach used by most pension plans, here denoted "actuarial valuation," begins with the value of the plans' assets and compounds these assets forward at an expected rate of return to determine if they will be sufficient to pay promised benefits. An alternative approach, here denoted "market valuation," focuses on the plan's obligations, then discounts backward to see if obligations are

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<sup>2</sup> Congressional Research Service. "Social Security: What Would Happen If the Trust Funds Ran Out?" Updated April 25, 2008

<sup>3</sup> David Crane, "[California Crisis Continues.](#)" *CNBC Squawk Box*, , July 29, 2009,

matched by the plan's assets. In theory, this is a distinction without a difference: if the interest rate at which a plan's assets are compounded forward is the same as the rate at which the obligations are discounted back to the present, the ratio of assets to liabilities will be the same regardless of which method is used.

In practice, however, the results can be very different because focusing on the plan's assets or its liabilities implies different decisions regarding the proper interest rate. Actuaries focus on the returns expected from the plan's portfolio of investments. They compound the investments forward at the expected rate of return to determine whether the plan's funding is expected to be sufficient to meet its obligations. The problem with this approach is that it ignores the risk of the plan's investments, and particularly the mismatch in risk between the plan's investment portfolio – which may be quite risky, depending on its asset allocation – and its benefit obligations, which carry practically no risk to plan participants. Riskier portfolios generate higher average returns and therefore higher discount rates. By failing to account for uncertainty, this method allows riskier portfolios to achieve “fully funded” status with smaller amounts of money.

Financial economists, on the other hand, focus on the risk characteristics of the plan's benefit obligations and from these they infer an appropriate interest rate to use in discounting future benefits back to the present. A benefit that *must* be paid – that is, one that more closely resembles a bond issued by that government – should have an interest rate that more closely resembles that of a government bond. A benefit that can be adjusted carries more risk to the beneficiary, and less to the government, would carry a higher interest rate and should require less funding.

Now, at first glance, a benefit owed is a benefit owed. But a second look shows that benefit obligations can have very different levels of “bindingness.” Social Security benefits, for instance, carry a high level of risk to the beneficiary as they are not guaranteed by contractual law. Moreover, Social Security law states that if the program's trust fund becomes insolvent, the system will pay only the benefits it can afford to pay, which implies significant benefit cuts across the board. Corporate defined benefit pensions, are more binding, but only to a point: these pensions are guaranteed by the Pension Benefit Guaranty Corporation, but only to a maximum of around \$51,000 per year. In the event of the bankruptcy of the pension's sponsor, around 15 percent of retirees will receive cuts in benefits. State and local pensions, by contrast, are very binding: in most cases, state courts have treated accrued benefits as contractual agreements, and in 46 of the 50 states benefits have at least some level of constitutional protection. A lower interest rate implies a higher present value of future benefits owed, which thereby reduces the ratio of current funding to future benefit obligations.

Private financial markets evaluate the risk of a pension plan's obligations, *not* of its assets. The desired metric for comparison with private funds is the amount the government would have to pay – in addition to the assets the plan already holds – to induce the financial sector to take these plans “off their hands.” In short, the financial

economic approach answers the question, “How much would it cost to induce private financial markets to take over a pension plan’s obligations?”

By contrast, it is not clear what question actuarial measurements of funding levels answer. The question is not, “How much does the plan need on hand today to be able to guarantee payment of benefits in the future,” as a risky investment portfolio cannot guarantee anything. Likewise, the question is not even, “How much would the plan need on hand today to have the likelihood of being able to meet its benefit obligations in the future.” As will be demonstrated below, if future benefits are discounted at the average rate of return assumed for the plan’s investments, the probability of the portfolio meeting the plan’s obligations will be less than 50 percent.<sup>4</sup>

Rather, the reasoning appears to work in reverse: “fully funded” is merely a state that is defined as existing when the present value of a pension’s obligations, discounted at the expected return on its portfolio, equals the present value of the pension’s assets. There is no intuitive meaning of full funding other than the mathematical definition.

Defenders of the actuarial approach respond that public sector pensions differ from those of the private sector in that, unlike private corporations, governments cannot go out of business. This implies that if a pension plan’s funding proves insufficient, the government can turn to taxpayers for additional resources.

While certainly true, there are several responses to this argument. First, given state-level funding shortfalls, including California’s recent use of IOUs to parties owed money by the government; it is not clear that a state or local government *cannot* declare bankruptcy. Second, using this reasoning a public sector pension is *always* fully funded, making any measurement of funding levels redundant.

Third, and most important, is the fact that, as the Congressional Budget Office (CBO) has stated, “The government does not have a capacity to bear risk on its own.”<sup>5</sup> Rather, government merely transfers risk between different stakeholders, meaning taxpayers and those who receive funds from the government, both present and future. The

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<sup>4</sup> The reason for this is that state and local pension plans choose discount rates based on the projected average return of the plan’s portfolio of assets. As the average return for the plan will be higher than the median return – that is, the return above which exactly half of outcomes would fall – this implies that that a plan basing its discount rate on its fund’s average return would be fully funded less than 50 percent of the time. If the discount rate were based upon the portfolio’s geometric mean return – a compound return – then we could expect it to be fully funded precisely 50 percent of the time.

<sup>5</sup> Congressional Budget Office. [“Estimating the Value of Subsidies for Federal Loans and Loan Guarantees.”](#) August 2004. This article contains an extensive discussion of the treatment of risk of government programs, extending beyond federal loan guarantees. See also [Budget of the United States Government, Fiscal Year 2004: Analytical Perspectives](#). “Railroad Retirement Board Investments,” p. 471; and Congressional Budget Office, [“Evaluating and Accounting for Federal Investment in Corporate Stocks and Other Private Securities,”](#) January, 2003.

implication of this, as CBO has argued in contexts from student loan guarantees, to bank deposit insurance, to guarantees against market risk for Social Security personal accounts, is that governments should value risk the same way that their stakeholders do, using market signals and market prices.

There are instances in which the economics literature supports government ignoring the risk profile of its obligations. The Arrow-Lind theorem, for instance, holds that government can ignore the risk of its obligations if these obligations are small and the risk of these obligations is uncorrelated to the government's other costs.<sup>6</sup> But neither of these conditions holds in the case of public pensions: they are large in cost by almost any definition, and poor stock market returns correlate with poor economic conditions overall, which lower tax revenues and increase government's social protection costs.

### **WHAT THE SOPRANOS CAN TEACH YOU ABOUT DISCOUNT RATES**

Consider a simple, but vivid, example: imagine that you owe \$10,000 to Tony Soprano and he has told you that in five years time his boys will come knocking on your door looking to collect. This is a *very* binding obligation – you *will* pay Tony his \$10,000. Now ask yourself: how much would you have to put aside today in order to consider your debt to Tony “fully funded”? Well, you could invest some money in stocks – stocks provide the highest returns and so let you fund your obligation at the lowest cost. Stocks have an average return of 10.7 percent above inflation, so if you discounted your \$10,000 debt to Tony at a 10.7 percent interest rate, you could consider the debt fully funded by investing only \$6,015 in stocks today.

But here's the problem: 10.7 percent is stocks' average return, but stocks can be quite risky. Stocks' standard deviation of returns – a measure of their risk – is 18.5 percent per year. So there's very little chance that you'll receive exactly 10.7 percent returns over the next five years. You might receive more than 10.7 percent, which would be great: you could pay off your debt to Tony Soprano and keep the change. But there's also the chance that you'll receive less than a 10.7 percent return each year, and in that case the downside risks are a lot worse: you'll end up “sleeping with the fishes.”

The point here is that you need to focus on the risk characteristics of your obligations as well as those of your investments. Your debt to Tony Soprano is a very low risk investment to him: he's going to get his money, one way or the other. So you should treat it as such and use a discount rate appropriate for a low risk investment, such as U.S. Treasury bonds, in deciding how much you'll need to set aside to consider that obligation fully funded.

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<sup>6</sup> Arrow, Kenneth J. and R.C. Lind, “Uncertainty and the Evaluation of Public Investment Decisions,” *American Economic Review*, 1970, Vol. 60, p.364-78.

## **PENSION DATA**

This analysis utilizes data on state and local pensions compiled by the Center for Retirement Research (CRR) at Boston College. The CRR data is among the most comprehensive available. It contains 107 of 221 state-level defined benefit plans, including 96 percent of assets and 89 percent of workers. At the local level the sample is far more limited: only 84 plans are included in the dataset, versus the Census Bureau's reporting of 2,433 locally administered systems. However, most of the largest local plans are included: the CRR dataset includes 58 percent of local plan assets and 55 percent of local workers relative to totals reported by the Census Bureau in the Employee-Retirement Systems of State and Local Governments.<sup>7</sup>

Moreover, it is not necessary to have data on every state and local pension plan in order to draw national conclusions. So long as the sample of plans included in the CRR dataset is representative of the larger population of plans it should be possible to scale up conclusions drawn from sample data.

## **HOW STATE AND LOCAL PENSIONS WORK**

State and local government pension plans cover a variety of employee types, from teachers, to police, to firefighters, to general government employees. Benefit and retirement provisions often differ by employee type based on the historical evolution of these plans.

Around three-quarters of state and local government employees take part in an employer-provided pension plan.<sup>8</sup> Around 80 percent of these employees have only a defined benefit pension, with 14 percent having only a defined contribution pension, and 6 percent having both.

In general, state and local pensions work similarly to defined benefit pensions in the private sector. An employee becomes entitled to a benefit based upon a percentage of final salary – generally, an average of earnings over the last three to five years – multiplied by the number of years of service. In general, government employees receive around 2 percent of final earnings per year of employment, such that a full career worker with 40 years of tenure would receive a benefit replacement rate of 80 percent of pre-retirement earnings.

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<sup>7</sup> For details on the Center for Retirement Research's state and local pension data, see [http://crr.bc.edu/frequently\\_requested\\_data/state\\_and\\_local\\_pension\\_data\\_4.html](http://crr.bc.edu/frequently_requested_data/state_and_local_pension_data_4.html). Also see Alicia H. Munnell, Jean-Pierre Aubry, and Kelly Haverstick, "The Funding Status of Locally Administered Pension Plans," Center for Retirement Research, December 2008, in particular footnote 2. Available at [http://crr.bc.edu/images/stories/Briefs/slp\\_8.pdf](http://crr.bc.edu/images/stories/Briefs/slp_8.pdf)

<sup>8</sup> Alicia H. Munnell and Mauricio Soto. "State and Local Pensions Are Different From Private Pensions." Center for Retirement Research. November 2007.

Such formulas tend to be more generous than private sector pensions, however, for two reasons. First, the accrual rate of around 2 percent is higher than the private sector average of around 1.5 percent per year of service.<sup>9</sup> By itself, this would produce replacement rates around one-quarter higher than in the private sector.

Second, employees often strive to compress overtime into the years immediately preceding retirement, which increases the final salary upon which retirement benefits are computed. Doing so can significantly increase benefits paid and produce replacement rates in excess of 100 percent. While most private sector workers tend to reduce work hours as retirement nears, many public sector employees increase hours in order to boost their pensions. However, such practices are limited in some pension plans.<sup>10</sup>

Average annual retirement benefits are slightly higher at the local than the state level, at \$26,382 versus \$21,450. However, benefit data is available for only a small number of local plans, so this comparison must be treated only generally. For both state and local plans it is worth noting that average benefits for current retirees are generally lower than for new retirees, who due to economy-wide wage growth had higher earnings throughout their working careers. A new retiree in 2009 could receive significantly higher benefits than the averages listed above.

State and local pension plans are financed by a combination of employer contributions, employee contributions and earnings on investments. As of 2006, the typical contribution rate was 7 percent of wages from employers and 5 percent of wages from employees.<sup>11</sup> Investment earnings vary from year to year and are called upon as needed.

Typical investment portfolios are quite similar at the state and local levels. Around 59 percent of portfolios are held in stocks; 26-27 percent in bonds; 6-7 percent in real estate; 3 percent in cash; 6-7 percent in alternative investments, and 7-9 percent in other holdings.

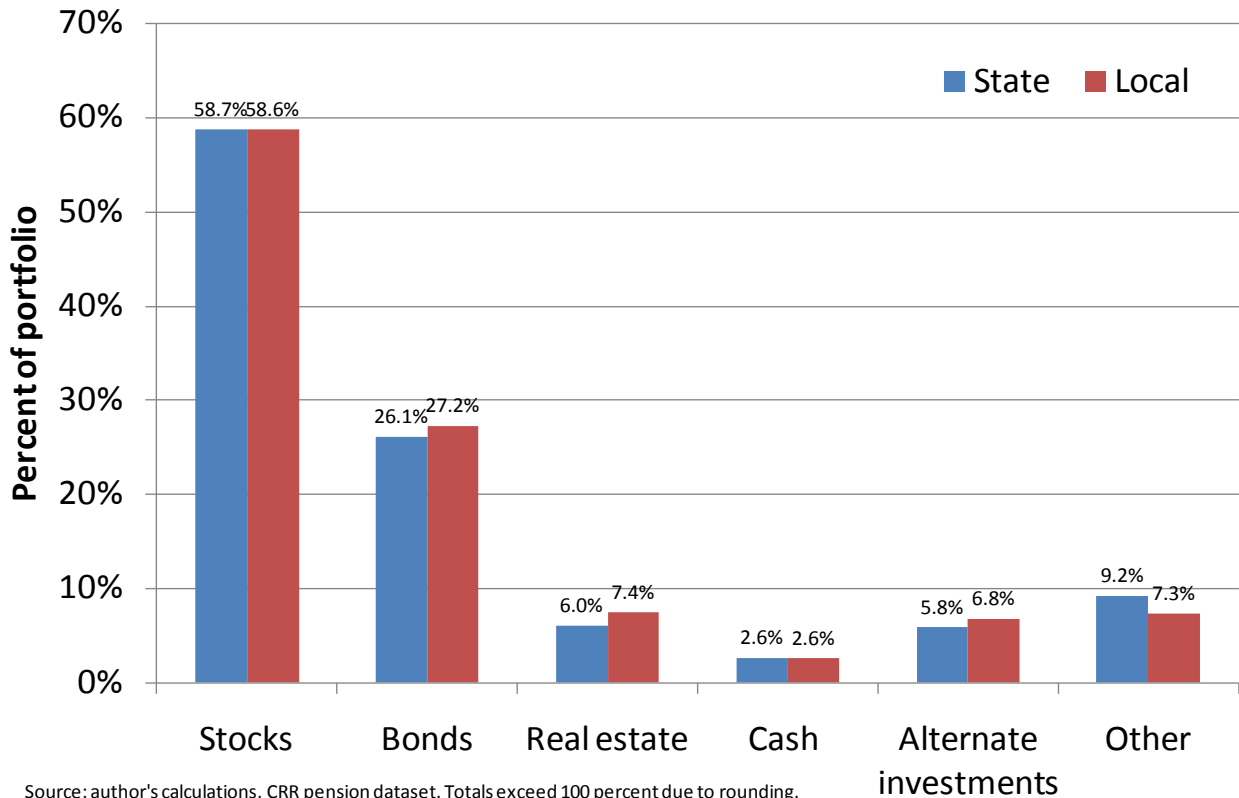
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<sup>9</sup> U.S. Department of Labor. Current Employment Statistics Survey, 2006.

<sup>10</sup> For instance, New York State pensions contain different “tiers” based upon the year the employee was hired. Among other differences, later tiers tend to have greater restrictions on the maximum salary that can be included in the retirement benefit calculation.

<sup>11</sup> Alicia H. Munnell and Mauricio Soto. “State and Local Pensions Are Different From Private Pensions.” Center for Retirement Research. November 2007.

## Average portfolio allocations, state and local pensions



State pensions on average project future nominal returns of 8 percent. Subtracting the average assumption for inflation, future real returns are projected at 4.5 percent. Projected returns are narrowly distributed, with real returns from 3.75 to 5 percent. Local plan projections are very similar, with a 7.9 percent average projected nominal return and a 4.4 percent real return.

Like corporate defined benefit pensions, the share of investments held in equities has risen over time, from approximately 40 percent in 1990 to around 70 percent as of 2006. State and local plans tend to hold a greater share of their portfolios in equities than do corporate pensions. The focus on expected returns rather than risk helps explain this allocation toward risky assets.

### MEASURING FUNDING ACCURACY OF STATE AND LOCAL PENSIONS

While some of the underlying issues that will be discussed below are complex, the basic measurement of a pension plan's funding adequacy is relatively simple. In all cases, the current value of the programs' assets are compared to the present, discounted value of its future benefit obligations. This comparison produces a funding ratio – that is, assets as a percentage of obligations – that provides information regarding the adequacy of

the program's current funding levels. For instance, a pension plan that has \$0.8 billion in assets but \$1.0 billion in obligations would be considered 80 percent funded.

The current value of a plan's assets can be measured in two ways: the market value at the time of valuation or a "smoothed" value that evens out changes due to market fluctuations by incorporating an average of returns over the prior several years. In general, the use of current market values or smoothed values has relatively little effect on funding ratios. However, in a period such as the present, when asset values have declined sharply over a relatively short period of time, a smoothed value may not fully account for recent declines and thus produce a higher funding ratio. Over time, however, the smoothed value and the current market value will more closely resemble each other. One result of this is that we can expect funding ratios calculated using smoothed values to decline over the next several years even if the stock market recovers.

Calculating the present value of a plan's benefit liabilities is somewhat more complex. These liabilities do not occur all at once, but rather over many years. Thus, calculating a present value requires detailed benefit data that is generally available only to the plan itself and to its actuaries. The present value of plan obligations is calculated by discounting future benefit obligations at the interest rate the plan projects will be earned by its portfolio of investments. While the underlying annual benefit data is generally not publicly available, the present value of total benefit obligations is published in a plan's actuarial report. Using methods described below, we will be able to calculate the present value of obligations using alternate discount rates, which is the core element of calculating a market valuation of plan liabilities.

## FUNDING RATIOS UNDER ACTUARIAL PROJECTION METHODS

This section summarizes funding ratios as reported under currently utilized actuarial methods. In this approach, as detailed above, the funding ratio represents current assets as a percentage of the present value of future benefit obligations, discounted at the expected return on the fund’s investment portfolio.

Funding levels are generally quite similar between state and local plans, as detailed in Table 1. On average, state plans are 83 percent funded while local plans are 85 percent. The minimum funding level for state plans was 32 percent, versus 37 percent for local plans. The maximum funding level was 116 percent for state plans, with a maximum for local plans of 134 percent. Summing state and local pension assets, the combined programs were 86 percent funded as of 2006.

Table 1: Actuarial method funding levels for state and local pension plans.		
Funding levels	State	Local
Average	83%	85%
Median	84%	87%
Min	32%	37%
Max	116%	134%
Source: Author’s calculations, CRR dataset		

This 14 percent underfunding translates to a shortfall of \$367 billion at the state level and local underfunding of approximately \$32 billion. However, these figures must be adjusted upward to account for the fact that the CRR dataset does not include every state and local pension plan. As the CRR set includes 96 percent of state pension assets, if plans included in the dataset are representative of the larger population of plans in terms of funding levels and investment return assumptions we can infer that state pensions as a whole were underfunded by approximately \$383 billion as of 2006. The CRR dataset contains around 58 percent of local plan assets, implying that local pensions nationwide were underfunded by around \$55 billion as of 2006. Total state and local pension underfunding nationwide as of 2006 thus totaled approximately \$438 billion.

The Pension Protection Act, which governs private sector defined benefit plans, required that plans move toward a 100 percent funding ratio. For public sector plans, many experts consider a funding level in excess of 80 percent appropriate, given that plans continue to receive contributions from their workforce on a pay-as-you-go method.<sup>12</sup> By this standard, 61 percent of state plans and 62 percent of local plans are adequately funded using the actuarial accounting method.

Funding levels for state plans seem not to be strongly affected by whether a state legislature is controlled by Democrats, Republicans, or split between the two.

<sup>12</sup> Government Accountability Office. [“State and Local Government Retiree Benefits: Current Funded Status of Pension and Health Benefits.”](#) GAO-08-223. Washington, D.C. Government Printing Office. January 2008.

## **THE DECLINE IN PENSION ASSETS SINCE 2006**

The pension data used in this analysis is from 2006. Since that time, equity markets have declined significantly and it can be expected that this decline in asset values has further exacerbated the underfunding of state and local pension plans. Munnell, et al report that equity assets in state and local pensions declined by \$1 trillion in the year spanning October 9, 2007 through October 9, 2008.<sup>13</sup> The authors project that declines in asset prices would reduce aggregate state and local funding from 86 percent as of 2006 to around 80 percent in 2008. Further declines in funding levels can be expected in future years, even if the stock market recovers, because pensions use smoothed asset values to calculate their funding status. As the market declines of 2008 and 2009 are more fully integrated into the plans' actuarial analysis, funding levels could decline to around 75 percent by 2013. If the stock market fails to recover, funding ratios by 2013 could fall as low as 57 percent. Proportional reductions in funding levels using market valuation, detailed below, would also hold.

## **ACCOUNTING FOR MARKET RISK**

The numbers reported above, calculated using the actuarial method of discounting liabilities at the expected rate of return on assets, show significant levels of pension underfunding. However, there is reason to believe that the true liabilities facing state and local taxpayers could be much larger than currently reported. The reason is that current actuarial methods, which discount future benefit liabilities at the rate of return projected for a portfolio of risky assets, do not properly account for the possibility that those assets will be insufficient to fund the plan's benefit obligations.

Let us first consider how plans create this risk. For simplicity of calculation, imagine a pension plan has a lump sum benefit obligation of \$1,000,000 that must be paid in 15 years time. The question is, how much must that plan set aside today so that it can consider that obligation "fully funded"? The actuarial approach argues that planners must first consider the rate of return they assume the plan can earn on its investment portfolio, and then discount the future liability back to the present at that interest rate.

For instance, imagine that the plan invests its portfolio 70 percent in stocks and 30 percent in bonds, which is roughly representative of the approach taken by most plans. Assuming a nominal stock return of 10.7 percent, a nominal bond return of 6 percent and a coefficient of correlation between the two of 0.26, this would produce a portfolio with an expected average return of 9.3 percent and a standard deviation of annual returns of 16.7 percent.

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<sup>13</sup> Alicia H. Munnell, Jean-Pierre Aubry, and Dan Muldoon. ["The Financial Crisis and State/Local Defined Benefit Plans."](#) Center for Retirement Research. November 2008

The present value calculation would equal the future liability divided by the gross return on assets – meaning, one plus the rate of return – to the  $n$ th power, where  $n$  equals the number of years between now and when the obligation comes due. In this case

$$\frac{\$1,000,000}{(1 + 0.093)^{15}} = \$263,450$$

If the plan held at least \$263,450 in assets, it would consider itself “fully funded.”

But herein lies the problem: all investments are risky, and stocks particularly so. The figure above gives only the expected amount required to fund the pension. Yet, risky assets experience so much variation— as noted, this portfolio would have an annual standard deviation of 16.7 percent—that real world results are unlikely to mimic the expected value over time.

To capture the full range of possible outcomes, we simulate the development of the fund multiple times. This model, known as a “Monte Carlo” simulation, produced 1,000 sample 15-year periods over which randomly generated returns on a 70-30 stock-bond portfolio were compounded over an initial investment of \$263,450. As one would expect, the *average* end balance after 15 years was very close to \$1,000,000. However, in a very large number of individual cases, the investment portfolio failed to fully fund the future obligation. In 60 percent of the 1,000 outcomes, the portfolio was worth less than \$1,000,000 after 15 years.<sup>14</sup> This produces a counter-intuitive interpretation of the phrase “fully funded,” in which a binding obligation of the government would be payable with only around 40 percent probability.

Now consider how an economist would approach this problem. First, he would assess the risk of the future benefits being promised. A benefit like Social Security, for instance, can be changed by Congress at any time, and according to law will not be paid in full if the Social Security trust fund becomes insolvent. Yet if state benefit liabilities are truly riskless, then a riskless interest rate – such as that on short-term Treasury bonds – should be applied to them. Given the legal status of state and local pension benefits, one might say that their risk is approximately that of bonds issued by state and local governments. These rates are higher than Treasury bonds, but lower than the equity-based rates of return the funds project for themselves. Thus the higher funding levels required by market valuation are not a cost but a proper compensation for risk protection.

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<sup>14</sup> The portfolio achieves its goal less than 50 percent of the time because the average return on stocks is higher than the median return.

## CHOOSING A DISCOUNT RATE

The interest rate paid on state-issued bonds seems a good place to start in choosing an appropriate discount rate for market valuation of public sector pension obligations. According to MunicipalBonds.com, which tracks yield curves for bonds on both a state-by-state and national basis, the average yield for municipal bonds over a 15-year horizon as of July 21, 2009 was 3.271 percent.

However, there are two issues to address in using this rate. First, state and local government bonds are exempt from federal income taxes. Lacking this exemption, these bonds would need to carry higher interest rates. This would argue for an upward adjustment, which can be accomplished by dividing the nominal interest rate by one minus the average marginal federal income tax rate of purchasers of state/local bonds (which is presumably 35 percent). Doing so would increase the nominal interest rate to an adjusted gross rate of 5.03 percent.

On the other hand, 46 states have at least some level of constitutional protection for pensions for government employees, ranging from court rulings that infer a property right on pension accruals<sup>15</sup> to explicit constitutional protections of pension obligations. These constitutional provisions would imply that pension benefits have even *lower* risk than state general obligation debt.<sup>16</sup>

For these reasons, as well as for the fact that interest rates vary among state and local governments, any single rate applied will necessarily be an approximation. I will utilize here the average 15-year year of 3.271 percent. Sensitivity analysis will be based on an after-tax rate of 5.03 percent.

## FUNDING RATIOS USING MARKET METHODS

We now recalculate state and local pension funding ratios using a market valuation approach.

First, we must convert publicly-released measures of the present value of pension obligations, which are discounted at the expected return on the plan's assets, to a present value discounted at a more appropriate rate of return. This process, which would normally require detailed data on a program's annual benefit costs spanning several decades, is simplified by the fact that a pension plan's annual liabilities are generally "centered" around 15 years forward from the data of assessment.<sup>17</sup> That is,

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<sup>15</sup> See Karen Steffen. "State Employee Pension Plans." In *Pensions in the Public Sector*, eds. Olivia S Mitchell and Edwin C. Husted. Philadelphia, PA. University of Pennsylvania Press, 2001.

<sup>16</sup> National Conference on Public Employee Retirement Systems (NCPERS), "[State Constitutional Protections for Public Sector Retirement Benefits](#)," 2007

<sup>17</sup> See M. Barton Waring. "Liability-relative investing," *Journal of Portfolio Management* 30(4). 2004. and M. Barton Waring. "Liability-relative investing II." *Journal of Portfolio Management* 31(1). Also

around half the plan’s future liabilities occur within the next 15 years and another half more than 15 years from now. This implies a two-step process in determining the market value of such liabilities. First, compound the present value of liabilities reported under the actuarial method *forward* by 15 years using the pension plan’s assumed return on plan investments. Second, discount this future value *back* to the present using a market-based rate of return.

Table 2: Market valuation funding levels for state and local pension plans.

	State	Local
Average	44%	44%
Median	44%	45%
Min	18%	18%
Max	62%	79%

Source: Author’s calculations, CRR dataset; 3.271 percent discount rate

Using an assumed interest rate of 3.271 percent produces strikingly different results from those reported in Table 1 above. Table 2 details that funding levels for a typical state or local pension plan are practically cut in half using market methods, from an average of around 84 percent using actuarial methods to 44 percent using a market approach.

Plans with the most aggressive rate of return assumptions for the investment portfolios will experience the largest difference between funding ratios under the actuarial method and the market valuation method. Those with more conservative assumptions see a smaller change, although in all cases funding ratios decline.

Using the market approach, not a single state or local pension plan exceeds the recommended 80 percent funding level. The best funded plan using the market approach is the Owensborough Kentucky City Employees' Pension Funds at 79 percent.

Total shortfalls for state government pension plans under market valuation equal \$2.84 trillion, while shortfalls for local government pension plans equal \$325 billion. Adjusting these estimates for the fact that the state pension database covers 96 percent of total state assets and the local pension database covers 58 percent of assets, the total shortfall nationwide of state and local pension plans can be estimated at approximately \$3.52 trillion. This legally binding shortfall significantly exceeds in size the \$2.26 trillion in outstanding state and local government bonds. This debt figure includes not simply general obligation bonds, but funding for specific projects such as schools, road construction and other capital investments. Appendices I and II list actuarial and market funding levels for state and local pensions.

If we assume a higher discount rate of 5.03 percent – equal to the average municipal bond rate of 3.271 percent divided by one minus the average marginal tax rate of municipal bond purchasers – aggregate pension shortfalls are lower at \$2.10 trillion. This amount is roughly equal to total state/local explicit borrowing of 2.26 trillion.

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see Robert Novy-Marx and Joshua D. Rauh. “The Intergenerational Transfer of Public Pension Promises.” (September 2, 2008). Chicago GSB Research Paper No. 08-13.

## **ACCOUNTING FOR COLAs IN STATE AND LOCAL PENSIONS**

One area of uncertainty regarding state and local pension financing is post-retirement Cost of Living Adjustments (COLAs). Most members of the public are aware of COLAs for Social Security benefits, which are automatically indexed each year to increases in the Consumer Price Index for Urban Wage Earners (CPI-W). In state and local pensions, however, the practice of granting COLAs – and how these COLAs are accounted for – is more complex.

This issue is worth considering because post-retirement inflation indexing is of great value to the beneficiary. For instance, consider an individual who retires at age 65 and survives to age 83. If this person receives \$1,000 per month in retirement benefits and these benefits do not increase with inflation, the present value of that individual's lifetime benefits is approximately \$177,000, assuming a 3 percent discount rate. But now consider the same person and the same initial monthly benefit of \$1,000, but now with annual inflation adjustments of 3 percent. The present value of lifetime benefits with these annual Cost of Living Adjustments rises to around \$301,000, a 70 percent increase. For that reason, it is important that post-retirement COLAs are accurately accounted for.

State and local pension plans grant COLAs in a variety of different ways. Some plans simply follow Social Security's convention and increase benefits by whatever the rate of increase in the CPI is for the prior year. Others also automatically increase benefits, but by different formulas. In some cases a given percentage increase is granted each year – 3 percent, for instance – while in others benefits are increased to compensate for a given percentage increase in the CPI, which implies less-than-total inflation adjustment. Either approach is fine from a financing viewpoint, so long as the costs are accurately accounted for.

However, in a number of cases COLAs are granted on an ad hoc basis, generally upon approval of the state legislator. This implies that current projections of a plans' financing may not capture the possibility that the plan will increase benefits to compensate for inflation. For state plans, 23 of 112 included in the CRR dataset grant COLAs on an ad hoc basis. For local plans data on COLA provisions is far more limited, such that it is not possible to generalize regarding their administration. Actuarial analyses for some plans appear to include assumptions regarding annual COLAs even if these are not explicitly included under the plan's rules. In other cases, however, details regarding COLAs are more difficult to discern. For these reasons, it is possible that shortfalls calculated above represent a lower bound on the underfunding for state and local pension plans.

## **DISABILITY BENEFITS**

In addition, large numbers of public sector employees claim disability rather than retirement pensions. In the Fire Department of New York, for instance, nearly three

quarters of recent retirees claimed disability pensions, which promise significantly higher benefits as well as an exemption from state income taxes. Incongruously, many of those claiming disability had previously logged high levels of overtime, boosting their benefits even more.<sup>18</sup> Likewise, the *Washington Post* reports that in Montgomery County, Maryland 41 percent of police officers retired on disability rather than retirement pensions over the period 2001-2006, versus zero percent in neighboring Fairfax County, Virginia.<sup>19</sup> Montgomery County has particularly lax standards for claiming disability benefits and, like New York, offers higher benefits and an exemption from income taxes. Montgomery County places no restrictions on re-employment by disabled police officers, such that many continue employment in strenuous positions.

Frivolous disability claims increase costs for public pension programs. It is less clear how well the level of disability claims is incorporated into published assessments of pension plan financing. From an examination of actuarial reports for the Montgomery County Public Employee System it appears that current high levels of disability claims are accounted in the actuarial assessment of the program's finances.<sup>20</sup> However, given the number of public employee retirement systems and the lack of detail in many actuarial reports, it is not possible to say with certainty that high levels of disability benefit claiming are incorporated into projections of these programs' finances. That said, it appears clear that low standards for claiming disability benefits increase direct costs to public sector pensions while reducing state tax revenues based on pension income.

## CONCLUSION

State pensions discount their benefit obligations based upon the expected rate of return on the pension's investment portfolio. Public pensions also tend to consider a funding ratio of 80 percent as sufficient, versus a 100 percent funding ratio demanded of private sector pensions by the Pension Protection Act passed in 2006. Combined, this approach makes the typical public sector pension appear adequately funded, despite overall funding shortfalls of over \$400 billion for state and local plans.

However, the current actuarial valuation method provides only information about the average outcome, with no consideration of the range of possible investment outcomes. When analyzed in the same manner as private sector pensions, using lower discount rates to account for the low risk of public sector pension benefits and aiming for a 100 percent funding ratio, state and local government pensions appear woefully underfunded. If state/local pension benefits are discounted at the 3.271 interest rate that is average for municipal bonds, total pension underfunding tops \$3.5 trillion. Even

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<sup>18</sup> *New York Post*. "[Raging Pension Fire.](#)" By Reuven Blau, February 8, 2009.

<sup>19</sup> *The Washington Post*. "[Montgomery Police Seeking Disability Find System Weighted in Their Favor.](#)" By Dan Morse and Ann E. Marimow March 9, 2009.

<sup>20</sup> Mercer Consulting. "Actuarial Valuation Report of Montgomery County Employee Retirement System." July 1, 2008 Available at [http://www.montgomerycountymd.gov/content/bit/pdffiles/bit\\_fy08\\_cafr.pdf](http://www.montgomerycountymd.gov/content/bit/pdffiles/bit_fy08_cafr.pdf)

at a higher discount rate of 5.03 percent, pension shortfalls are nearly equal to the total of explicit state and local debt. As public sector pension benefits are nearly impossible to reduce once accrued, these shortfalls compose a very significant fiscal cost for already-burdened state and local governments.

Given the legal protections for currently accrued benefits, policymakers should consider decreasing the rate of future benefit accruals or increase employee contribution contributions. Using market valuation techniques, which more accurately convey the costs and risks associated with pension funding, may assist in informing such reforms.

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Appendix I: Funding ratios for state government pension plans		
Plan name	Funding ratio	
	Actuarial method	Market valuation
Alabama ERS	81%	43%
Alabama Teachers	83%	44%
Alaska PERS	78%	40%
Alaska Teachers	68%	35%
Arizona Public Safety Personnel	77%	38%
Arizona SRS	84%	44%
Arkansas PERS	83%	44%
Arkansas Teachers	80%	42%
California PERF	87%	48%
California Teachers	87%	46%
Colorado Municipal	80%	39%
Colorado School	74%	36%
Colorado State	73%	36%
Connecticut SERS	53%	26%
Connecticut Teachers	63%	31%
DC Police & Fire	100%	59%
DC Teachers	100%	59%
Delaware State Employees	102%	54%
Florida RS	106%	58%
Georgia ERS	95%	53%
Georgia Teachers	97%	55%
Hawaii ERS	65%	34%
Idaho PERS	95%	52%
Illinois Municipal	95%	54%
Illinois SERS	52%	26%
Illinois Teachers	62%	31%
Illinois Universities	65%	32%
Indiana PERF	98%	57%
Indiana Teachers	44%	25%
Iowa PERS	88%	50%
Kansas PERS	69%	37%
Kentucky County	81%	44%
Kentucky ERS	61%	33%
Kentucky Teachers	73%	41%
Louisiana SERS	64%	33%
Louisiana Teachers	68%	34%
Maine Local	112%	61%
Maine State and Teacher	71%	39%
Maryland PERS	80%	44%
Maryland Teachers	84%	46%
Massachusetts SERS	85%	43%
Massachusetts Teachers	71%	36%
Michigan Municipal	76%	40%
Michigan Public Schools	88%	46%
Michigan SERS	85%	45%
Minnesota PERF	75%	37%
Minnesota State Employees	96%	47%
Minnesota Teachers	92%	45%
Mississippi PERS	74%	39%
Missouri DOT and Highway Patrol	56%	28%
Missouri Local	95%	54%
Missouri PEERS	81%	42%
Missouri State Employees	85%	42%
Missouri Teachers	83%	44%
Montana PERS	88%	47%
Montana Teachers	76%	42%
Nebraska Schools	87%	46%
Nevada Police Officer and Firefighter	69%	36%
Nevada Regular Employees	77%	40%
New Hampshire Retirement System	61%	30%
New Jersey PERS	78%	40%
New Jersey Police & Fire	78%	40%
New Jersey Teachers	78%	40%
New Mexico PERF	92%	49%
New Mexico Teachers	68%	36%
New York State Teachers	100%	53%
North Carolina Local Government	100%	58%
North Carolina Teachers and State Employees	106%	62%
North Dakota PERS	89%	47%
North Dakota Teachers	75%	40%
NY State & Local ERS	100%	53%
NY State & Local Police & Fire	100%	53%
Ohio PERS	93%	49%
Ohio Police & Fire	78%	40%

Ohio School Employees	76%	40%
Ohio Teachers	75%	40%
Oklahoma PERS	71%	40%
Oklahoma Teachers	49%	26%
Oregon PERS	111%	58%
Pennsylvania School Employees	81%	40%
Pennsylvania State ERS	93%	46%
Rhode Island ERS	53%	28%
Rhode Island Municipal	87%	46%
South Carolina Police	85%	50%
South Carolina RS	70%	41%
South Dakota PERS	97%	53%
Texas County & District	110%	58%
Texas ERS	95%	50%
Texas LECOS	102%	54%
Texas Municipal	82%	50%
Texas Teachers	87%	46%
TN Political Subdivisions	93%	49%
TN State and Teachers	100%	53%
University of California	104%	59%
Utah Noncontributory	96%	51%
Vermont State Employees	99%	52%
Vermont Teachers	85%	43%
Virginia Retirement System	81%	46%
Washington LEOFF Plan 1	116%	61%
Washington LEOFF Plan 2	100%	53%
Washington PERS 1	73%	39%
Washington PERS 2/3	100%	53%
Washington School Employees Plan 2/3	100%	53%
Washington Teachers Plan 1	80%	42%
Washington Teachers Plan 2/3	100%	53%
West Virginia PERS	87%	49%
West Virginia Teachers	32%	18%
Wisconsin Retirement System	100%	54%
Wyoming Public Employees	94%	50%
Note: Market valuation assumes discount rate of 3.271 percent.		