PUBLIC SECTOR PENSIONS: HOW WELL FUNDED ARE THEY, REALLY?

BY
ANDREW G. BIGGS

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Dear Reader:

This report, authored by Andrew Biggs, resident scholar at the American Enterprise Institute in Washington, D.C., analyzes public pension fund data using universally accepted methods of economists. This analysis determines that public pension funds' true liability is greatly understated.

As this report reveals, the average public pension official funding level has fallen to about 75 percent in 2011, versus 103 percent in 2000.

Officially public pensions as of mid-2011 were underfunded by around $885 billion, based on accounting guidelines established by the Governmental Accounting Standards Board.

However, the true state of public pension funding is far worse. The accounting rules followed by public pensions are more forgiving than those required for private sector pensions. In addition, "fair market valuation" more fully reveals the value of public-sector plan liabilities.

It shows that the average public employee pension plan in the United States is only around 41 percent funded while total unfunded liabilities as of 2011 are roughly $4.6 trillion, more than five times the official estimate.

Accurate accounting of public employee pension liabilities leads to the conclusion that elected officials must do much more to make these plans financially sustainable. While state and local governments around the country have enacted reforms to public-sector pension plans, including contribution increases, less generous benefits for newly hired employees, and in some cases reductions in cost of living adjustments (COLAs) for current beneficiaries, those efforts have fallen short. Much more is needed.

We hope that you find the report informative and recognize that the time for corrective action on public pensions is now. Please feel free to contact me with any questions regarding this report.

Best,

Bob Williams, President
State Budget Solutions
P: 253.884.4665
BobWilliams@statebudgetsolutions.org
www.StateBudgetSolutions.org

About the Author

Andrew G. Biggs is a resident scholar at the American Enterprise Institute in Washington, DC. Prior to joining AEI he was the principal deputy commissioner of the Social Security Administration (SSA), where he oversaw SSA's policy research efforts and led the agency's participation in the Social Security Trustees working group. In 2005 he worked on Social Security reform at the National Economic Council and in 2001 was on the staff of the President's Commission to Strengthen Social Security. Andrew's work at AEI focuses on Social Security reform, state and local government pensions, and comparisons of public and private sector compensation. His work has appeared in academic publications as well as outlets such as the Wall Street Journal, New York Times and Washington Post, and he has testified before Congress on numerous occasions. He holds a Bachelors degree from the Queen's University of Belfast, Masters degrees from Cambridge University and the University of London and a Ph.D. from the London School of Economics.

PUBLIC SECTOR PENSIONS: HOW WELL FUNDED ARE THEY, REALLY?

I. INTRODUCTION AND SUMMARY

Around the country, the financial health of defined benefit pension plans for state and local government workers is a matter of concern for elected officials, taxpayers and the financial markets, all of whom worry about governments' long-term ability to meet their financial obligations. These pension plans have come under increased scrutiny as funding levels have dropped and required contributions have risen.

According to standard actuarial accounting, the average public pension has fallen to around 75 percent in 2011, versus 103 percent in 2000.[1] Annual Required Contributions to public pensions have more than doubled since 2001,[2] though researchers at the Center for Retirement Research at Boston College project that state and local governments will meet only around 79 percent of required payments this year. Public sector pensions, as of mid-2011, were underfunded by around $885 billion, based on accounting rules established by the Governmental Accounting Standards Board applied to a large sample of plans from the Public Plans Database.[3]

However, reports from academic economists and nonpartisan government agencies strongly suggest that the true state of public sector pension funding is far worse than suggested by official plan disclosures.[4] The accounting rules followed by U.S. public sector pensions are more forgiving than those required for private sector pensions or public sector plans in other countries. So-called "fair market valuation" more fully reveals the value of public sector plan liabilities and shows that the average public employee pension plan in the United States is only around 41 percent funded while total unfunded liabilities as of 2011 are roughly $4.6 trillion.

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[1] Munnell, Alicia H., Jean-Pierre Aubry, Josh Hurwitz, Madeline Medenica and Laura Quinby. "The Funding Of State And Local Pensions: 2011-2015" Center for Retirement Research, Boston College. May 2012.
[2] Author's calculations from Public Plans Database.
[3] The database is available at http://pubplans.bc.edu.
[4] Academic discussions of pension accounting include Novy-Marx, Robert, and Joshua Rauh, 2009. "The Liabilities and Risks of State-Sponsored Pension Plans." *Journal of Economic Perspectives* 23(4), 191-210; and Biggs, Andrew G. "An Options Pricing Method for Calculating the Market Price of Public Sector Pension Liabilities." *Public Budgeting and Finance*, Fall 2011.

While state and local governments around the country have enacted reforms to public sector pension plans, including contribution increases, less generous benefits for newly hired employees, and in some cases reductions in cost of living adjustments (COLAs) for current beneficiaries, accurate accounting of public employee pension liabilities shows that elected officials must do much more to make these plans financially sustainable.

This paper first describes how public employee pensions currently measure their financial health; then describes the strong consensus from economists that current accounting rules significantly understate pension liabilities and overstate pension funding levels; and finally, describes how pension financing across the country would appear using accounting rules similar to those required for private sector pensions or which are used by public employee plans in other countries.

II. BACKGROUND ON PUBLIC EMPLOYEE PENSION PLANS

Most state and local governments provide a defined benefit pension plan for public employees as part of their overall compensation.[5] These plans generally provide for retirement, disability and survivors benefits and may either supplement or substitute for Social Security benefits. Around three-quarters of all state and local government employees take part in an employer-provided pension plan, with coverage rates among full-time employees being significantly higher.[6] Around 80 percent of public employees have only a defined benefit pension, with 14 percent having only a defined contribution pension and 6 percent having both.

State and local pensions work similarly to defined benefit pensions in the private sector. Once vested, an employee becomes entitled to a benefit based upon a percentage of final salary – ordinarily, an average of earnings over the last three to five years – multiplied by the number of years of service. Public pensions typically pay benefits equal to around 2 percent of final earnings per year of employment, although these replacement factors can differ from place to place, in particular based upon whether the employee also participates

[5] Defined benefit plans base retirement benefits upon a formula deriving from the employee's earnings and years of service; any investment risk is borne by the plan sponsor.
[6] Munnell, Alicia H. and Soto, Mauricio, "State and Local Pensions Are Different From Private Pensions," Center for Retirement Research, November 2007.

in Social Security. Some public sector employees take part in Social Security, while others are not covered by Social Security and receive their principal retirement income from their employer's program.[7]

One important difference between public sector and private sector defined benefit pensions is that adjustment for inflation is virtually absent in private plans but common in public sector programs. Provisions for inflation adjustment vary significantly from plan to plan. In some cases adjustment to changes in the Consumer Price Index are automatic; in others, a fixed rate of increase is applied regardless of the realized rate of inflation; in others, inflation adjustment is provided only up to a limit. In many plans, inflation adjustments are ad hoc, such that adjustments are made only upon approval of the state legislature or when certain funding or investment return requirements are met. These requirements are less likely to be met in the near future, given low investment returns and widespread underfunding. Over the past year, some states have enacted reductions to post-retirement benefit increases as cost-saving measures, although public employees or public employee unions may challenge these changes in court.

Public sector pensions generally allow earlier retirement than in the private sector, in particular for public safety officers. Reductions in benefits for early retirement are generally smaller than actuarially fair, meaning that early retirees tend to receive higher total benefits over the course of their retirements. As a result, public sector employees tend to retire younger than private sector workers. The average age of retirement in the Public Plans Database as of 2009 was 60, although only a small number of plans report ages of benefit claiming. The typical new retiree had almost 24 years of government service.

Public sector pensions are financed through a combination of employee and employer contributions and investment earnings. Contribution rates vary from program to program, as do the criteria by which rates may be altered. In some cases contribution rates are set by law, while in other cases contributions are automatically adjusted based on regular actuarial valuations of plan financing. The average employee contribution rate as of 2009

[7] For individuals spending part of their careers in public employment not covered by Social Security and part under Social Security covered employment, the Government Pension Offset and Windfall Elimination Provision may affect the Social Security benefits they or their spouses are eligible to receive.

was 6.4 percent of wages, according to the Public Plans Database, although contributions vary significantly from place to place. In addition, some public employees have their formal contributions "picked up" by their employers, a fact which is not captured in the Public Plans Database. One aspect of the controversial reforms passed in Wisconsin in 2011 was a prohibition on government employers picking up employee pension contributions.

According to the most recent asset data available, via the Public Funds Survey, 52 percent of pension funds are allocated to equities, 26 percent to fixed investments such as bonds, 6 percent to real estate, 11 percent to "alternative" investments such as hedge funds and private equity, and 3 percent to absolute/real return investments. The share of assets held in equities has risen significantly from the early 1980s, when only around one-third of pension portfolios were in stocks. A more recent trend is the shift to alternative investments, which hold the promise of higher returns than equities but with greater risk.

III. HOW PENSIONS VALUE THEIR LIABILITIES

Pensions calculate their financial health by comparing their assets to their liabilities, that is, the investments they hold today relative to the benefits they must pay in the future. The key question for pension valuation is how to assign a value today to benefit liabilities that will be paid years or decades in the future. Without such a "present value," it is impossible to accurately compare a pension's liabilities to the assets held by plans today and thereby determine how well funded it is.

The present value of a plan's liabilities is calculated using a method known as discounting, which is equivalent to compound interest in reverse. While compound interest involves taking a current dollar amount and adding interest each year, discounting begins with the future dollar amount and subtracts interest each year until a present value is arrived at. The present value of a future dollar amount depends crucially upon the interest rate at which the liability is discounted.

Under current pension accounting rules, which are established by the Governmental Accounting Standards Board, a public pension plan discounts its liabilities using the rate of return the plan assumes will be generated by the portfolio of assets it holds. The average expected return on assets used in such valuations is close to 8 percent, with a range from 6

percent to 8.5 percent. The discounted value of plan liabilities is then compared to the value of assets to calculate the plan's funding ratio (assets divided by liabilities) and its unfunded liability (assets minus liabilities). Similar values are used to calculate the plan's Annual Required Contribution (ARC).

Each year, public employee pensions disclose the values of the plans' assets and liabilities. Because such reports are released with a significant lag, the most recent data available is as of the year 2010. However, we here rely upon projected values generated by researchers at the Center for Retirement Research at Boston College. These analysts generated estimates of the values that would be reported by plans for 2011 and beyond.

According to the Boston College researchers, as of 2011 the average state and local pension plan is about 75 percent funded. If these figures are correct, public employee pension plans face a large yet nevertheless potentially manageable funding shortfall, assuming they make future contributions as scheduled. The Boston College researchers project that, based on recent trends regarding pension contributions and investment returns, average funding could rise to 82 percent of liabilities by the year 2015.

However, there is an emerging consensus among economists and government agencies that the official figures calculated using GASB accounting rules significantly underestimate the value of public pension liabilities. The following section will outline the so-called "fair market valuation" critique of current pension accounting standards.

IV. THE FAIR MARKET VALUATION CRITIQUE

The current approach to measuring pension liabilities established by GASB make sense at first glance: if you expect plans assets to appreciate 8 percent per year, then discounting the plan's liabilities at 8 percent will tell you the exact assets the plan would need to hold today in order to meet its liabilities in the future. In this way, the current GASB rules may appear to be more "realistic" than alternative approaches. It might appear even more puzzling that financial economists argue that the discount rate applied to a benefit liability should have *nothing* to do with how the plan's assets are invested. Nevertheless, this is how the vast majority of economists viewed the valuation argument, and it is also how private financial markets assign values to liabilities. This section discusses why that is the case.

To economists, the discount rate you apply to a liability should be based on the risk of the liability itself, *not* of any assets used to fund the liability.[8] If public pension benefits are guaranteed – as they are intended to be, and as legal rulings and state constitutions have determined them to be – then they should be discounted using the interest rates that the markets pay on guaranteed investments, such as U.S. Treasury securities.[9]

To understand this principle, consider a simplified example of a pension plan's lump sum payment of $100 million in 20 years time. The plan assumes it can earn 8 percent annual returns on a mixed portfolio of stocks, bonds and alternative investments such as private equity and hedge funds. Under GASB rules, the plan discounts the $100 million liability using an 8 percent interest rate, resulting in a present value of $21 million. Assuming the plan has assets equal to at least $21 million, it can call itself fully funded.

However, stocks, bonds and alternative investments can be very risky. While a $21 million investment in such assets today might be expected to reach $100 million over 20 years, there is no guarantee of it doing so. In fact, there is actually less than a 50% probability that the plan will achieve its assumed rate of return over any given period of time.[10] However, due to legal protections for public pension benefits, taxpayers have a 100 percent obligation to make good on the plan's benefit promises. Thus, there is a *contingent liability* to pay full benefits even if the pension's investments do not produce the expected returns. As the federal government's Bureau of Economic Analysis notes:

> "If the assets of a defined-benefit plan are insufficient to pay promised benefits, the plan sponsor must cover the shortfall. This obligation represents an additional source of pension wealth for participants in an underfunded plan."[11]

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[8] This view derives from the Modigliani-Miller theorem of corporate finance.

[9] Brown and Wilcox discuss legal protections for accrued pension benefits in Brown, Jeffrey R. and Wilcox, David W., "Discounting State and Local Pension Liabilities," *American Economic Review,* vol. 99, May 2009.

[10] This is because stock returns are skewed, meaning there are a small number of very high returns -- which drive up the average -- but larger numbers of lower returns. Thus, the probability of achieving the "average" return is less than 50 percent.

[11] Marshall B. Reinsdorf and David G. Lenze. "Defined Benefit Pensions and Household Income and Wealth."Bureau of Economic Analysis. Research Spotlight. August 2009. Also see David G. Lenze. "Accrual Measures of Pension-Related Compensation and Wealth of State and Local Government Workers."Bureau of Economic Analysis. April 2009.

This obligation also represents an additional cost to the taxpayer The fair market valuation approach is designed to capture the value of benefits not simply expected to be paid, but *guaranteed* to be paid. Current pension accounting standards ignore the value of this contingent liability.

The way to calculate the full value of public pension liabilities is through a risk-adjusted discount rate, that is, an interest rate derived from investments that have approximately the same risk as the liability the discount rate is being applied to. As Federal Reserve Board economist David Wilcox wrote, "These happen to be really simple cash flows to value. They're free of credit risk. There's only one conceptually right answer to how you discount those cash flows. You use discount rates that are free of credit risk. This is one of those things where it just really is that simple."[12]

An alternate, but equivalent, approach is to calculate how much markets would charge to guarantee that a pension be able to meet its obligations. A pension could purchase such a guarantee—known as a "put option"—that would kick in if the pension's investments failed to reach their assumed rates of return. The combination of upfront funding calculated using GASB rules and the put option would make the plan truly fully funded, in the sense of *guaranteeing* payment of benefits without imposing any contingent liabilities on future taxpayers. The sum of these two costs would almost exactly equal the pension's liabilities when calculated using a riskless interest rate.[13] This example illustrates that fair market valuation isn't simply an academic abstraction; rather, this approach calculates how much taxpayers would willingly spend to remove the threat of contingent liabilities for pension benefits.

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[12] Wilcox, David. Testimony before the Public Interest Committee Forum sponsored by the American Academy of Actuaries, September 4, 2008.

[13] For more details see Biggs, Andrew G. "An Options Pricing Method for Calculating the Market Price of Public Sector Pension Liabilities." *Public Budgeting and Finance*, Fall 2011. Also see Biggs, Andrew G. "Proposed GASB Rules Show Why Only Market Valuation Fully Captures Public Pension Liabilities." *Financial Analysts Journal*, March/April 2011.

Some have mistakenly interpreted a riskless discount rate as a "worst case scenario."[14] A moment's reflection shows why this cannot be the case. Millions of knowledgeable investors around the world hold long-term U.S. Treasury securities, with durations up to 30 years, instead of riskier but higher-yielding investments such as stocks. The low yields offered on such safe investments reflect the returns investors are willing to forgo in order to receive protection against the small -- but not zero -- chance of doing even worse over the long term. This protection is especially valuable because stock returns are correlated with the state of the economy, meaning that poor investment outcomes would happen at the same time that other sources of income to the individual or firm would likely be low.

While public pension advocates have remained steadfast in defending the use of expected investment returns in valuing guaranteed pension liabilities, an increasing research interest from academic economists and nonpartisan government agencies has almost universally lined up against such practices. For instance, in a recent report the Congressional Budget Office concluded that:

> "By accounting for the different risks associated with investment returns and benefit payments, the fair-value approach provides a more complete and transparent measure of the costs of pension obligation…"[15]

Similarly, Donald Kohn, then-Vice Chairman of the Federal Reserve Board, declared in 2008:

> "While economists are famous for disagreeing with each other on virtually every other conceivable issue, when it comes to this one there is no professional disagreement: The only appropriate way to calculate the present value of a very-low-risk liability is to use a very-low-risk discount rate."[16]

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[14] See California Legislative Analysts Office. " Summary of LAO Findings and Recommendations on the 2011-12 Budget." January 24, 2011.
http://www.lao.ca.gov/laoapp/budgetlist/PublicSearch.aspx?Yr=2011&KeyCol=305
[15] Congressional Budget Office. "The Underfunding of State and Local Pension Plans." May, 2011.
[16] Kohn, Donald L. "Statement at the National Conference on Public Employee Retirement Systems Annual Conference." New Orleans, Louisiana, May 20, 2008.

Academic economists view the situation similarly. Jeffrey Brown and David Wilcox write in the *American Economic Review*, "Finance theory is unambiguous that the discount rate used to value future pension obligations should reflect the riskiness of the liabilities."[17] Likewise, Robert Merton, the 1997 winner of the Nobel Prize in Economics, writes that:

> "The conventional actuarial practice of using the expected return on the assets of the pension fund to determine the discount rate for valuing pension liabilities systematically understates their value by large amounts."[18]

This is not a "he said, she said" argument; while public pensions are following GASB rules in calculating their liabilities, nearly all disinterested outside observers have concluded that these rules seriously understate pension's true benefit liabilities.

Moreover, as discussed below, corporate pensions in the U.S. use discount rates whose risk matches that of their liabilities, as do public sector pensions in other countries. U.S. public employee pensions are an outlier in how they calculate their funding health.

V. IS GOVERNMENT "DIFFERENT"

Pension advocates argue that government is inherently different from the private sector and thus different accounting standards should apply. Specifically, private corporations can go out of business while not all governments can do so and thus governments may think only about the average return on assets without considering year-to-year risks.

This argument is wrong for several reasons. First, the fact that governments cannot go out of business implies that government pension benefits are more likely to be paid than private pensions; under standard economic reasoning, this justifies a *lower* rather than higher discount rate. Second, government's longevity does not make costs go away; instead, it implies that rather than defaulting on pension liabilities -- as a private corporation facing bankruptcy might do -- the government shifts the cost of these liabilities to future taxpayers. The Congressional Budget Office points out that "[t]he government does not

[17] Jeffrey R. Brown and David W. Wilcox, "Discounting State and Local Pension Liabilities," *American Economic Review* 99 (May 2009): 538-42.
[18] Robert C. Merton. Introduction to *Pension Finance*, by M. Barton Waring. Wiley Finance. 2012.

have a capacity to bear risk on its own."[19] Rather, government *transfers* risk between different stakeholders, who include taxpayers, public employees, bondholders, and those who receive funds from the government. The fact that governments can impose costs on future generations does not make these costs go away.

And third, public sector pension plans in other countries do not rely upon GASB-like discounting rules. In Canada, for instance, accounting rules state that the discount rate for both public and private sector pensions be based on market yields of high-quality corporate debt that matches both the timing and amount of expected benefit payments. In the United Kingdom, public pension plans discount their benefit liabilities at the rate of growth of Gross Domestic Product, a rate that is generally *below* the interest rate on riskless bonds.[20]

In addition, standards established by the International Public Sector Accounting Standards Board (IPSASB) -- essentially the international version of GASB -- dictate that the discount rate should not incorporate a risk premium and should be based upon government bonds or high-quality corporate bonds, not, as U.S public pensions do, the expected return on stocks, private equity or hedge funds.

Finally, as pointed out above, almost no government agency other than GASB accepts the "government is special" argument. Beginning in 2013, the National Income and Product Accounts calculated by the federal Bureau of Economic Analysis will measure pension obligations using fair market valuation techniques. This will put pension liabilities as calculated using GASB accounting rules out of step with the official ledger book of the United States economy.[21]

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[19] Congressional Budget Office, "Estimating the Value of Subsidies for Federal Loans and Loan Guarantees," August 2004.

[20] See Andonov, Aleksandar, Bauer, Rob and Cremers, Martijn, Pension Fund Asset Allocation and Liability Discount Rates: Camouflage and Reckless Risk Taking by U.S. Public Plans? (May 1, 2012).

[21] For background, see Marshall B. Reinsdorf and David G. Lenze. "Defined Benefit Pensions and Household Income and Wealth."Bureau of Economic Analysis. Research Spotlight. August 2009. Also see David G. Lenze. "Accrual Measures of Pension-Related Compensation and Wealth of State and Local Government Workers."Bureau of Economic Analysis. April 2009.

VI. WHAT THE MARKET VALUATION CRITIQUE DOES *NOT* SAY

It is sometimes argued that the market valuation critique claims that public pensions will earn no more than the riskless rate of return on their investments. For instance, Monique Morrissey of the Economic Policy Institute states that "… the critics contend that when pensions calculate the amount of money they need to set aside today to make promised payments to retirees in the future, they should assume that pension investments will earn rates equivalent to those of Treasury bonds and similarly low-risk to no-risk assets."[22] Similarly, columnist Gerard Miller writes, "Pension funds are not going to invest their entire portfolio in 3 percent Treasury bonds right now — or ever — so the risk-free model is not even descriptive of reality and has little normative value."[23]

In fact, economists say nothing of the sort. The issue is not whether pensions can achieve 8 percent returns "in expectation." In expectation, they can achieve almost *any* return they wish by taking sufficient risk. For instance, there are mutual funds that double the returns on the S&P 500 index — of course, by doubling the risk. Economists' argument is simply that pensions cannot achieve 8 percent returns without taking significant market risk, and that this risk should not be interpreted as a benefit to taxpayers without any cost.

It may be that pension plans wishing to truly fully fund their liabilities would invest in a so-called "matching portfolio" consisting mostly of low-risk assets. Doing so would raise contributions today, but eliminate contingent liabilities of equal value on future taxpayers. Nevertheless, economic theory states clearly that the liability is best measured using a risk-adjusted discount rate regardless of what pensions invest in. If, for instance, a pension plan wished to hire an insurance company to take over its benefit liabilities — something which is not uncommon in the United Kingdom, but generally not tax-favorable in the U.S. — the insurance company would set the price without regard to how the pension plan invested its assets. What matters is how much the pension owes and with what level of guarantee.

More broadly, the use of a risk-adjusted discount rate captures the value of taxpayers' obligation to make good on benefit promises even if pension investments don't achieve

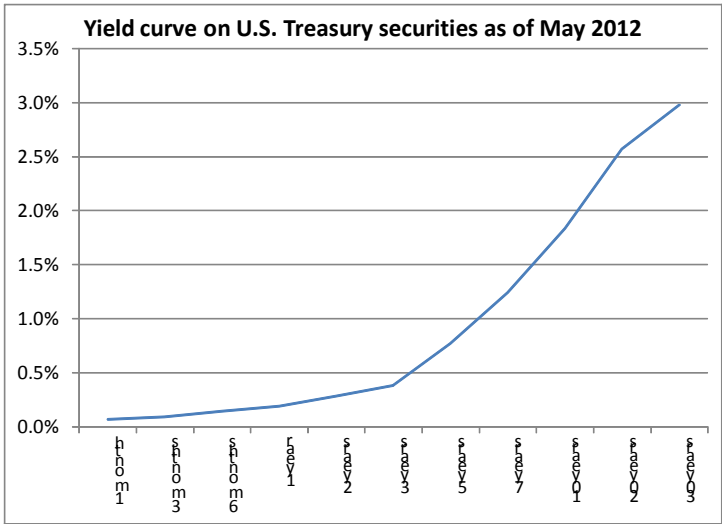
[22] Morrissey, Monique. "Discounting Public Pensions: Reports of trillions in shortfalls ignore expected returns on assets," Economic Policy Institute, April 14, 2011.
[23] Miller, Gerard. "Pension Puffery." Governing Magazine. January 5, 2012.

their assumed returns. This obligation has legal, political and moral force alongside a significant monetary value. While GASB acknowledges that this obligation exists[24], current GASB pension accounting rules entirely ignore its value.

VII. HOW DOES PENSION FINANCING LOOK UNDER MORE ACCURATE ACCOUNTING?

The first step to determining an accurate estimate of public pension liabilities is to choose the appropriate discount rate. We know from the above discussion that discounting guaranteed benefit liabilities using an interest rate derived from risky portfolio investments is incorrect. We also know that the discount rate used to value government guaranteed benefits should be derived from an investment that is practically free of credit risk – that is to say, an investment that is almost guaranteed against default.

Beyond this, there is some controversy among economists regarding a specific interest rate to use. For instance, some economists point out that yields on U.S. Treasury securities – which are free from credit risk – are low in part because they are highly liquid and freely tradable, an attribute that pension liabilities neither share nor need. On the other hand, most public pension benefits are at least partially protected against inflation, which U.S. Treasury securities are not. Economists Joshua Rauh of Northwestern University and Robert Novy-Marx of the University of Rochester, who are perhaps the leading academic experts on public pension valuation, assume that these two effects are roughly offsetting and therefore use Treasury interest rates to value public pension liabilities. They discount pension liabilities at the yield on Treasury Inflation



[24] See Biggs, Andrew G. "Proposed GASB Rules Show Why Only Market Valuation Fully Captures Public Pension Liabilities." *Financial Analysts Journal*, March/April 2011.

Protected Securities (TIPS) plus market expectations of inflation.

Alternately, Figure 1 shows the yield curve on nominal U.S Treasury securities as of May of 2012. For instance, a 1-month Treasury bill currently offers an effective interest rate (or yield) of 0.07 percent, rising to 0.77 percent over 5 years and 2.97 percent over 30 years. What relevance do these rates have to public sector pensions? It is simple: if you wish to *guarantee* the payment of a given dollar amount at a given future time, which public sector pensions aim to do and are obliged to do by state laws and state constitutions, then these Treasury rates are the best guide to the cost today of doing so.

For our purposes, we will use the average of rates on Treasury bonds with durations of 10 and 20 years. We use rates that were current as of the time pension valuations were undertaken. As of mid-2010, these averaged 3.36%, while as of mid-2011 the average yield was 3.64%. As a broad rule of thumb, pension liabilities rise by around one-fifth for each percentage point change in the discount rate. Thus, a Treasury rate produces dramatically higher liabilities than the 8 percent average discount rate used by pensions today.

We begin with 2010 data on pension assets, liabilities and assumed rates of return from the Public Plans Database. Based on analysis from the Boston College researchers, we assume that all plan liabilities increased at a rate of 4.6% during 2010. We then calibrate a rate of increase in plan assets such that each plan's 2011 funding ratio matches the Boston College projections. From these results we calculate unfunded liabilities by plan, which are aggregated to the state level.

Total underfunding nationwide will be understated because not every pension plan is represented in the Public Plans Database. The Database contains information on plans holding roughly 90 percent of state pension assets and 30 percent of total local plan assets. While data limitations make it impossible to assign liabilities not contained in the Database across plans or states, total plan liabilities nationwide would be roughly 21 percent larger than those reported in the Database.

As of 2010, public employee pensions in the Database were 77 percent funded and faced unfunded liabilities of $783 billion. At market value, discounted using a 3.36% interest rate,

plans are only 40.6% funded and face unfunded liabilities of around $3.8 trillion. If this figure is grossed up by 21 percent to account for the incompleteness of the public plans database, then total unfunded liabilities as of 2010 would reach roughly $4.6 trillion.

Table 1. Summary data for 2010 and 2011 (projected, in billions).

	2010	2011
Actuarial assets	$2,613	$2,689
Actuarial liabilities	$3,396	$3,574
Actuarial funding ratio	77%	75%
Unfunded liability	$783	$885
Adjusted unfunded liability*	$947	$1,071
Market liabilities	$6,444	$6,522
Market funding ratio	40.6%	41.2%
Market unfunded	$3,830	$3,833
Adjusted market unfunded liability*	$4,635	$4,638

*Adjusted upward by 21% to account for plan assets not included in Public Plans Database. 2010 market figures calculated using 3.36% discount rate; 2011 figures calculated using 3.64% rate.

From 2010 to 2011, the average funding ratio for public plans measured using current GASB rules declined from around 77 percent to around 75 percent, while unfunded liabilities rose to about $885 billion. (see Table 1). However, due to the increase in riskless interest rates from 2010 to 2011, pension funding on a market basis actually *improved* somewhat. A higher riskless interest rate means that it is cheaper to fund any given level of future guaranteed benefits, and thus the costs of the plan decline. The average funding ratio increased from 40.6 percent in 2010 to 41.2 percent in 2011, while total unfunded liabilities remained constant at around $4.6 trillion.

This change in funding health from 2010 to 2011 raises a significant side issue: some opponents of fair market valuation claim that valuing pension liabilities using risk-adjusted discount rates introduces volatility into pension financing. As interest rates change, the value of liabilities may shift up or down by a significant margin. This objection is incorrect for several reasons. First, any year-to-year fluctuation in liabilities based on changing interest rates is real: if you wish to guarantee payment of some given dollar amount in the future, it actually *is* cheaper to do it when interest rates are high than when they are low -- just as it actually is cheaper to purchase a house when mortgage interest

rates are low. Pretending otherwise doesn't make sense. Second, plans can easily hedge against interest rate risks by holding Treasuries in their investment portfolios; if interest rates on newly-issued bonds fell, thereby increasing the value of the plan's liabilities, a portfolio of existing Treasury bonds would rise in value due to their higher interest rates, keeping plan funding levels roughly constant. The fact that public pensions choose not to hedge their interest rate risk is not a reason for accounting rules to cover it up. Finally, a central point of fair market valuation is that how a plan is funded is distinct from the value of its liabilities. If a plan chooses to fund its liabilities on a smoothed basis to avoid year-to-year fluctuations in contribution rates, that is a policy decision distinct from the value of those liabilities at any given time.

Economists Robert Novy-Marx and Joshua Rauh project that for pensions to reach fully funded status over a 30-year period, contributions must rise from the current level of 5.7 percent of government revenues to 14.1 percent of revenues. Put another way, contributions would need to average 40.1 percent of public employees' salaries, considerably increasing labor costs for state and local governments.[25]

Overall unfunded pension liabilities are equal to roughly 30 percent of gross domestic product, a significant burden to add to rising explicit debt and unfunded entitlement costs at the federal, state and local levels. Unfunded pension and health liabilities in state and local government are important to consider in terms of the nation's broader fiscal and budgetary picture. Unlike other developed countries, where most government activity takes place at the national level, a significant level of both spending and debt in the United States is centered in state and local government. Thus, an accurate depiction of the United States' overall debt burden -- and the economy's ability to service this debt -- requires an accurate picture of state and local government obligations.

Table 2 highlights the considerable range of funding ratios for the sample of 126 plans analyzed. (Details on a plan-by-plan basis are available in Table 3 in the Appendix.) The mean funding ratio under fair market valuation is 41 percent while the median is 39

[25] Novy-Marx, Robert and Rauh, Joshua D. "The Revenue Demands of Public Employee Pension Promises." Working paper. May 2012.

percent. Half of all plans are between 35 and 47 percent funded under fair market valuation. The best funded plan is the Washington Law Enforcement Plan 2, which is 68 percent funded, while the worst-funded plan in the sample is the Illinois State Employees Retirement System, which is only 18 percent funded on a fair market basis.

Table 2. Range of funding ratios under GASB accounting and fair market valuation.

	Assumed investment return	Funding ratio: GASB	Funding ratio: market
Median	8.0%	74%	39%
Mean	8.0%	74%	41%
25th percentile	7.8%	64%	35%
75th percentile	8.0%	83%	47%
Min (Illinois SERS)	6.0%	36%	18%
Max (Washington LEOFF Plan 2)	8.5%	126%	68%

Author's calculations based on Public Plans Database data.

Plans that make aggressive investment return assumptions fare more poorly under fair market valuation, where those risk-based excess returns are not counted toward plan funding. Plans that made more conservative investment return assumptions of 7 percent saw their funding ratios cut by around one-third, while plans making more aggressive 8.5 percent investment return assumptions had their funding ratios cut roughly in half. This reflects the fact that liabilities for this latter group were artificially lowered based on high, but risky, assumed investment returns.

VIII. EFFECTS ON RISK-TAKING

The debate over pension accounting rules is not merely an argument over valuation of liabilities, important as that may be. Because investments with higher risk have higher expected returns, current actuarial standards incorrectly imply that a pension plan that takes more risk immediately becomes better funded as a result. For instance, were pension plans across the country to shift from portfolios with an expected return of 8 percent to riskier investments with expected returns of 8.5 percent, the value of their liabilities — under GASB accounting rules, at least — would immediately decline by around 10 percent, before a single penny of higher returns had been earned.

The effect of discounting at the expected return on a risky investment portfolio is so powerful that a pension could improve its financial health — again, according to GASB rules — by literally *burning* any safe assets in its portfolio.[26] Destroying cash or Treasury bonds would reduce the plan's assets, but would shift the overall portfolio toward higher risk and higher expected returns, which allows for a higher discount rate to be applied to liabilities. The fact that it's better to assume high returns for the future than to actually have money today illustrates the absurdity of GASB's accounting rules. Nobel Laureate Merton warns that:

> "Because a larger expected return on assets generally implies that the assets have greater risk, the pension fund that invests in riskier assets will have a lower actuarial valuation of its pension liabilities and thus a lower required contribution rate. This process not only distorts the economic valuation of pension liabilities, it creates incentives for more risk taking in the pension fund."[27]

Empirical research has borne out Merton's concerns that GASB accounting rules encourage excessive risk-taking. My own work has shown that, since the financial crisis, public plans are actually taking *more* investment risk than before.[28] This suggests that at least some pensions are doubling down on risk to restore their weakened finances.

Likewise, Economists Aleksandar Andonov and Rob Bauer of Maastricht University and Martijn Cremers of the University of Notre Dame compared how public and private sector pensions in the U.S., Canada and Europe manage their investments.[29] They point out that, according to economic theory, as a pension plan's population ages -- meaning there are greater numbers of retirees relative to workers -- and as interest rates on government bonds fall, a pension should take a more conservative investment approach and assume a lower discount rate for its liabilities. Private sector pensions and public plans outside the U.S. follow this logic, according to data examined by the authors. U.S. public sector plans, by

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[26] Novy-Marx (2011): "Logical Implications of GASB's Methodology for Valuing Pension Liabilities," *Working Paper,* University of Rochester and NBER.
[27] Robert C. Merton. Introduction to *Pension Finance*, by M. Barton Waring. Wiley Finance. 2012.
[28] Biggs, Andrew G. "How Have Public Sector Pensions Responded to the Financial Crisis?" Pension Research Council. Working paper WP2011-18. 2011.
[29] Andonov, Aleksandar, Bauer, Rob and Cremers, Martijn, Pension Fund Asset Allocation and Liability Discount Rates: Camouflage and Reckless Risk Taking by U.S. Public Plans? (May 1, 2012).

contrast, have taken on *greater* investment risk, because doing so allows them to lower the accounting value of their liabilities and put off difficult decisions such as raising contributions or lowering benefits. The problem with this strategy, of course, is that this investment risk is shifted onto future taxpayers. These accounting-driven choices by public sector pensions, the authors say, "have large economic effects and could have potentially severe future consequences."

IX. RECENT EVENTS: REVISED GASB RULES AND MOODY'S PROPOSED CHANGES

The issue of public pension valuation has been evolving quickly, and in recent weeks two important proposals has been made public. First, in response to criticism from economists of its methods, in June GASB proposed two significant changes to how pensions' financial health is measured. Second, in July the ratings agency Moody's released draft changes to its own methodology for valuing pension liabilities that could significantly increase measured pension shortfalls.

On June 25, 2012, GASB released Statements 67 and 68, which revise earlier accounting guidelines for public sector pensions.[30] These revisions make two important changes to help pensions value their assets and their liabilities.

First, when pensions compare assets to liabilities they must rely on the market value of assets, rather than an actuarial value that smoothes investment returns over 5 to 10 years. Smoothing means that investment losses or gains this year wouldn't be fully incorporated into a plan's funding disclosures until at least 2016. Eliminating smoothing would reduce current funding ratios by around 10 percentage points. More importantly, eliminating smoothing would show the true volatility of plan funding and the degree to which even supposedly healthy plans depend upon risky investments.

Second, the discount rate used to value plan liabilities would change. Instead of applying an 8 percent discount rate to all liabilities, under the new rules this rate could be applied to benefits only through the period in which the plan's assets are expected to last. Following the exhaustion of plan assets, any remaining liabilities must be valued using a lower

[30] See Governmental Accounting Standards Board. "News Release: Adjustments to US State and Local Government Reported Pension Data." June 25, 2010.

municipal bond rate. This split discount rate approach would reduce pension funding ratios further by 10 percentage points or so.

Any step toward reality would seemingly be welcome. But GASB's new approach to discounting is, if anything, even less economically coherent than the current rules. To the degree there is any insecurity to public pension benefits, it is due to plan underfunding. Since benefits that are backed by assets are presumably more secure, they would be discounted using a lower interest rate. Likewise, if benefit liabilities that are not backed by assets are less secure, they might be valued using a higher discount rate. Even if you accept the idea of a bifurcated discount rate, the new GASB rules have economic logic precisely backward.

But the dangers of GASB's discounting rules are far from merely academic. Like the current rules, the new regulations cement in place the flawed notion that boosting investment risk makes a pension better funded, before a dime of higher returns have been realized. Under the current rules, a pension that shifts to riskier investments can discount its liabilities using a higher interest rate. Under the new rules, a plan that takes greater investment risk can assume its trust funds will last longer and therefore fewer years of benefits would be discounted using lower municipal bond rates. The incentives to take greater investment risk, particularly at a time when state and local governments would be hard-pressed to increase pension funding, are obvious. And, as shown above, these incentives have real effects on the amount of risk public sector pensions choose to take.

GASB's revised pension accounting rules may have been designed to placate critics of their current approach without excessively angering public pension administrators, who are effectively GASB's "customers." However, these changes neither accurately measure the value of unfunded public pension liabilities nor eliminate incentives for pensions to take excessive investment risk.

Recent proposals from the ratings agency Moody's, however, are more hopeful. Until now, Moody's has accepted state and local governments' own measures of pension liabilities at face value. However, Moody's has recognized the debate over pension valuation and has proposed an approach that, while not perfect, is far closer to the market based approaches

that economists favor. In a July 2 draft, Moody's has proposed discounting pension liabilities using yields on Citibank's Pension Discount Curve, which is derived from high quality corporate bonds as used by private sector defined benefit pensions to value their own liabilities.[31] For years 2010 and 2011, to which Moody's will apply this revised discount rate, the yield average 5.5%. As of June 30, 2012, the average yield on bonds with the duration of 15 years was 3.9 percent while for over 20 years the average yield was 4.1 percent. Thus, Moody's would use a discount rate around 0.6 percentage points higher than the U.S. Treasury yields used above.

Under Moody's revised approach, unfunded pension liabilities as of 2010 would rise from around $770 billion to around $2.2 trillion. While not as high as a pure market based approach, Moody's comes far closer to the truth than do either current accounting rules or GASB's proposed revisions. Moreover, Moody's new approach could have significant beneficial effects. First, because Moody's would not discount pension liabilities using the expected return on pensions investments, this would eliminate incentives for public employee pensions to take on excessive investment risk. Second, Moody's new disclosures would be aimed at investors in debt issued by state and local governments, with the goal of providing these investors with better information regarding the true debt obligations of governments issuing municipal bonds. Market participants could demand higher interest rates of governments with excessive levels of unfunded pension liabilities, thereby punishing those who fail to reform their pension plans while rewarding those who manage their pensions responsibly.

That said, there is reason to believe that the corporate bond yield is too high to be used as a discount rate for government-guaranteed public employee pension benefits. The interest rate paid by corporate bonds relative to riskless treasury securities reflects the risk that the corporation will be unable to meet its debt payments, generally as a result of bankruptcy. In the event of bankruptcy, the corporation also would be unlikely to meet its pension benefit payments. Given that even very large corporations from time to time go bankrupt while even small local governments rarely do, and given the strong legal and

[31] Moody's Investor Services. "Request for Comment: Adjustments to US State and Local Government Reported Pension Data." July 2, 2012.

constitutional guarantees for public employee benefits in many states, the corporate bond yield simply appears to be too high to accurately reflect the low risk of public employee pension benefits.[32]

X. CONCLUSION

Around the country, elected officials have undertaken pension reforms to correct these funding shortfalls, which were caused by market declines, funding holidays, and benefit increases passed during the prosperous days of the late 1990s. Numerous states have enacted pension reforms, although these mostly have been incremental reforms such as increasing contributions or retirement ages, and most significant benefit or structural changes have been aimed only at newly hired employees. A few states, such as Utah, have made more far-reaching reforms to limit pension liabilities. Michigan and Alaska have shifted newly hired employees into defined contribution (DC), 401(k)-style pension plans. In other places, powerful public employee unions have rebuffed attempted reforms.

Unfortunately, these reforms won't come close to restoring plans to true full funding, because current accounting conventions systematically understate pensions' benefit liabilities and thereby overstate their financial health. Current pension accounting standards also encourage pensions to take excessive investment risk. Correct accounting reveals that the costs of putting the plans back on a stable financial basis is likely prohibitive, which may prompt a shift to defined contribution pensions, mirroring the shift experienced in the private sector and in other countries.

If public pensions wish to offer less-than-guaranteed benefits to their participants, they are free to discount their liabilities using higher interest rates to represent that risk. If so, however, pensions should openly state that benefits once thought to be ironclad no longer are so. Alternately, if pensions wish to lower their current contributions by investing in riskier, higher returning assets they also are free to do so. But then they must acknowledge

[32] It could be argued that corporate pension benefits are, like public employee benefits, very low risk due to the insurance provided to private pensions by the Pension Benefit Guaranty Corporation. However, this insurance is financed via premiums paid separately from the funding of the pension plan itself. Thus, the cost of a private pension plan is a function both of the discount rate applied liabilities and the premiums charged by the PBGC. Lacking these premiums, the risk of default on private pension benefits would be roughly equal to the risk of default on corporate bond payments.

that they are passing a contingent obligation on to future taxpayers to make good on pension benefits if today's investments don't turn out as planned. In other words, they must admit that they're not truly fully funding their future benefits. There is simply no argument supportable by either economic theory or the practice of actual financial markets through which public sector pensions can claim that they are fully funding guaranteed benefits for their participants.

Viewed through the lens of fair market valuation, which captures the full cost to taxpayers of providing guaranteed pension benefits to future retirees, public employee pension plans around the country are not nearly as well-funded as they claim. Fair market valuation shows that public plans are on average only around 41 percent funded and face unfunded liabilities of approximately $4.6 trillion.

APPENDIX

Table X	2011 Estimate Pension Funding Ratios & Unfunded Liabilities, GASB Accounting	
State	**Funding Ratio**	**Unfunded liability**
AK	61%	$6,149,523
AL	70%	$16,167,445
AR	74%	$6,583,615
AZ	76%	$13,268,153
CA	80%	$107,291,288
CO	69%	$27,224,350
CT	53%	$23,006,670
DC	111%	$(309,209)
DE	96%	$447,224
FL	87%	$19,251,403
GA	86%	$14,861,996
HI	69%	$7,917,621
IA	81%	$5,523,922
ID	79%	$1,071,017
IL	54%	$95,109,875
IN	63%	$13,653,081
KS	64%	$9,519,623
KY	57%	$24,340,898
LA	56%	$17,166,816
MA	73%	$23,402,890
MD	64%	$18,170,103
ME	73%	$2,240,347
MI	78%	$33,047,057
MN	79%	$11,644,085
MO	77%	$10,510,821
MS	64%	$12,446,303
MT	70%	$3,590,283
NC	99%	$4,054,615
ND	71%	$1,656,674
NE	82%	$1,757,009
NH	58%	$3,980,194
NJ	62%	$42,524,079
NM	72%	$10,866,143
NV	70%	$10,797,260
NY	90%	$51,716,116

OH	67%	$68,048,289
OK	54%	$9,021,071
OR	86%	$13,135,023
PA	78%	$41,169,019
RI	64%	$8,982,964
SC	69%	$15,906,182
SD	96%	$263,679
TN	90%	$2,982,895
TX	84%	$35,840,443
UT	82%	$4,775,598
VA	80%	$23,862,072
VT	73%	$1,149,708
WA	92%	$3,008,243
WI	100%	$126,485
WV	57%	$4,771,213
WY	85%	$1,294,818
Totals	**77%**	**$884,986,992**