FUNDING STATUS, ASSET MANAGEMENT, AND A LOOK AHEAD

STATE AND LOCAL PENSION PLANS

JAGADEESH GOKHALE

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Contents

Executive Summary 1

Introduction 3

1. State and Local Government Pension Plan Funding Changes, 2001–2009 4

2. State and Local Government Pension Plan Funding: Best and Worst States 7

3. What's behind the General Pension Funding Decline during 2001–2009? 9

4. State and Local Government Pension Fund Boards' Investment Management Strategies 12

5. Are Employers and Employees Contributing Sufficiently to State and Local Government Pension Funds? 15
    - Does Poor Initial Pension Plan Funding Stimulate Pension Contributions? 17
    - Does the Size of Government Affect Pension Plan Funding? 18
    - Do Pension Plan Funding Contributions Depend on Federal Budget Support? 18

6. State and Local Government Pension Plan Funding Shortfalls: Understated under Standard Actuarial Accounting 19
    - State and Local Government Pension Plan Funding Conditions: Considerably Worse since 2001 20
    - State and Local Government Pension Plan Funding Conditions in 2009 under Alternative Discounting of Future Benefit Obligations 22
    - State and Local Government Pension Plan Funding Conditions, Including Future Expected Pension Benefit Accruals 22

Conclusion 26

Notes 27

Executive Summary

State and local employee pension plans, which are primarily defined benefit plans, have come under increased scrutiny of late. Plan funding conditions have worsened during the early years of the 21st century, especially during the aftermath of the post-2007 recession. But the patterns of financial changes vary considerably across the U.S. states and under alternative ways of measuring plan funded status. Much of the worsening in plan funding conditions between 2001and 2009 occurred in states with initially well-funded pension plans. Much of the blame for this must be placed on the illogical accounting standards set by the Governmental Accounting Standards Board (GASB), which allow plan managers to discount accrued pension liabilities at rates of return expected on plan asset portfolios. But accrued pension liabilities are guaranteed under the constitutions of many states, or are at least protected by the courts, suggesting that the appropriate discount rates would be those of municipal or U.S. Treasury yield curves. Instead of the very low risk nature of pension liabilities inducing fund investments in low-risk assets, GASB accounting standards may be inducing plan managers to assume unwarranted risks by heavily weighting plan investments toward equities and real estate securities and promoting liability mismeasurement. The accounting methodology permitted by the GASB may also promote improper pension plan asset management—the failure to periodically rebalance pension plan asset portfolios. States that have smaller governments, Republican control of their legislatures, initially better funding conditions, and those less dependent on federal support for budget expenditures generally contribute more into pension plans than other states. Calculating pension funding conditions by including contributions and pension benefits that will accrue through 2045 alters the funding status of pension plans in states with robust projected growth in worker populations and those with a conservative historical record of awarding pension benefit increases. Other states will continue to struggle in improving their pension funding conditions.

Jagadeesh Gokhale is a senior fellow at the Cato Institute and a member of the Social Security Advisory Board. He is a co-author of Fiscal and Generational Imbalances: New Budget Measures for New Budget Priorities *(AEI Press, 2003),* Social Security: A Fresh Look at Policy Alternatives *(University of Chicago Press, 2010), and* The New Health Care Law's Effect on State Medicaid Spending: A Study of the Five Most Populous States*, Cato Institute White Paper no. 31, April 2011.*

Introduction

Pension and health care benefits provided to state and local government employees are considerably broader in coverage and more generous compared with those for private sector employees. According to the Bureau of Labor Statistics' Employee Compensation Survey (March 2010), 84 percent of all state and local government employees had access to a defined benefit retirement plan, 29 percent to a defined contribution retirement plan, and 23 percent to both types of plans during 2009. The corresponding numbers for all private-sector workers are 20 percent with access to defined benefit plans, 59 with access to defined contribution plans, and 14 with access to both types of plans. Using employer costs per hour worked as an indicator of the relative generosity of defined benefit pension plans, state and local government costs are \$3.32 per hour worked, of which \$3.00 is accounted for by defined benefit plans. Private industry costs are \$1.03 per hour worked, of which \$0.46 is accounted for by defined benefit plans.[1]

A three-decade-long transition away from defined benefit plans and toward defined contribution plans has resulted in the current predominance of defined contribution plans in the private sector. That shift has transferred the responsibility of ensuring sufficient retirement resources away from private-sector employers and onto the workers themselves. However, it has also enabled workers to acquire new amenities and flexibilities in retirement saving: portability across jobs, greater choice in tailoring investment risks to individual preferences, a resource to draw upon during emergencies, the ability to annuitize retirement funds to suit personal needs, and the ability to retain funds in bequeathable form according to workers' particular preferences. State and local governments, in contrast, have opted to continue providing defined benefit retirement plans to employees, although a small minority of state and local governments also offer defined contribution retirement plans. The continued predominance of defined benefit plans among state and local government entities means that those agencies continue to assume the responsibilities and risks associated with funding and managing retirement plans for their employees.

Those responsibilities and risks, however, coexist—and sometime run counter to—economic imperatives facing state and local governments. Moreover, state and local government pension boards may be influenced by the political preferences of their elected representatives. Given the desire of policymakers to allocate government revenues primarily to projects that immediately and directly benefit their taxpayers and residents—for instance, education, health care, infrastructure, community development, and so on—makes ensuring adequate funding of state and local government defined benefit retirement plans (especially when their benefit obligations won't come due for many years) a challenging task even during years when revenue growth is robust.

Many pension boards have made questionable decisions about valuing their future pension plan liabilities, managing their risk exposures, and communicating their shortfalls in a timely manner.

Asset price declines during recessions (2001–02 and 2007–09) and the slow economic rebound since the latter recession ended have exacerbated the funding problems of state and local government retirement plans. But beyond the difficulties of ensuring adequate contributions into those plans, many pension boards also appear to have made questionable decisions about valuing their future pension plan liabilities, managing the risk exposures of pension plan assets, and communicating information about pension shortfalls to state and local government employees and taxpayers in a timely manner. These continuing deficiencies in pension plan management may soon force a wrenching transformation of state and local government pension plans in a direction similar to that which has already occurred in the private sector, but the public sector pension plan transformation is likely to occur much more quickly. As a result, current and new state and local government employees in several states may soon be forced to assume the responsibilities and risks associated with providing retirement security for themselves, their dependents, and their survivors.

This report contains a detailed description of the funding erosion in state and local government employee pension plans during the last decade. Controlling for the declines in pension plan asset values during the recent recession, it also analyzes whether at least some of the blame for the current poor funding condition of state and local government pension plans can be assigned to insufficient contributions by both employers and employees. Finally, because the pension plans are operated by government entities that are unlikely to be shut down, it is useful to examine how their pension funding conditions would change if future contributions and benefits are taken into account. Such an assessment is implemented by anchoring demographic changes on the Census Bureau population projections by state and by projecting pension plan contributions and benefits using state-specific historical rates for both.

The information on state and local government pension plan finances and features is drawn from various sources: Comprehensive Annual Financial Reports of state governments, state fiscal reports, annual fiscal reports of specific state and local government employee plans, actuarial analyses provided by state and local pension plan consultants, and data collections provided by private research consortiums—especially pension plan data files from the Center for Retirement Research at Boston College.

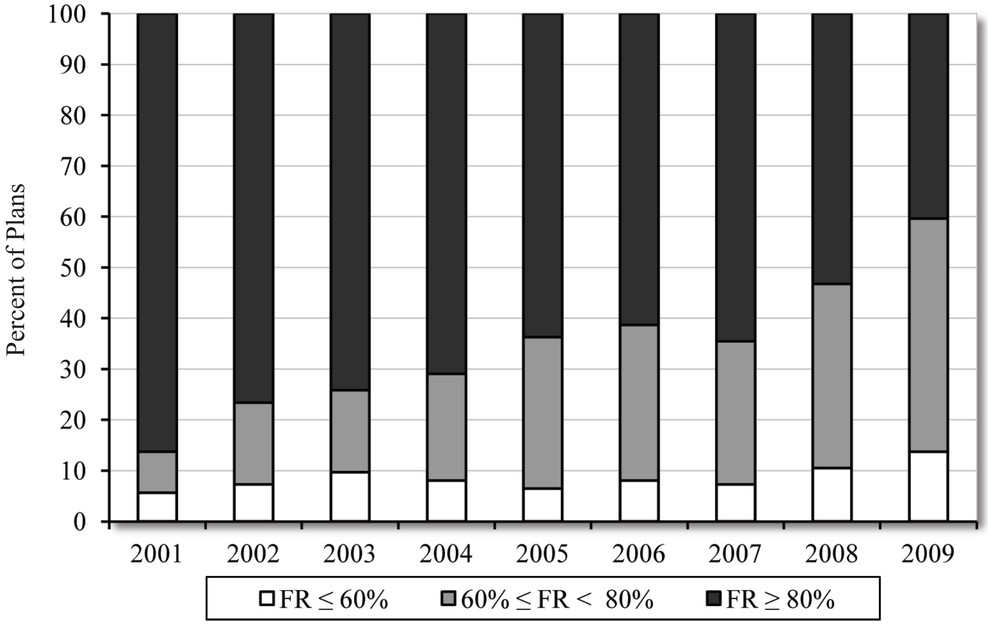
A direct comparison of official actuarial reports of plan finances clearly reveals that the funding status of major state and local government pension plans worsened rapidly after 2001.

1. State and Local Government Pension Plan Funding Changes, 2001–2009

Each state and local government pension plan's funding status is officially reported under different demographic and economic assumptions about the future. These assumptions are approved by each plan's board of trustees and used by plan actuaries to develop projections of future employment, employee retirements, and sequence of benefit obligations that would become due and payable over time. Different assumptions would naturally generate different estimates of future plan liabilities over the time horizon selected by each plan's board. However, accounting methodologies also differ across plans, as allowed under the accounting regulations of the Government Accounting Standards Board (GASB).[2] These caveats should be noted when making financial comparisons across state and local government pension plans. Nevertheless, a direct comparison based on official actuarial reports of plan finances clearly reveals that the funding status of major state and local government pension plans worsened rapidly after 2001.[3] Figure 1 shows the percentage of these pension plans by various funding categories for each year of the last decade. Plans with actuarial asset values less than 60 percent of liabilities are considered *poorly funded*; plans with assets between 60 and 80 percent of plan liabilities are considered *inadequately funded*; and plans with assets above 80 percent of plan liabilities are considered *adequately funded*.[4] Because state and local government pension liabilities are constitutionally guaranteed, the standard for "adequate" funding would ordinarily be 100 percent. However, state and local governments' authority to tax residents confers an ability to shift funding burdens onto future taxpayers. The fact that these plans are operated by sovereign entities explains why the "adequately funded" threshold is set to 80 percent.

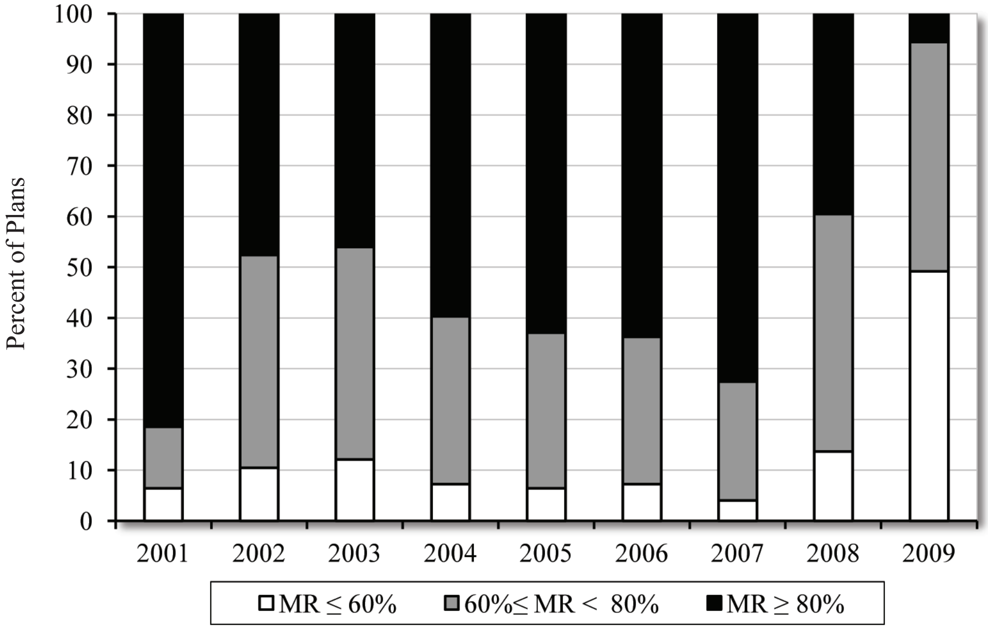
As is evident from Figure 1, the vast majority (86.3 percent) of state and local government pension plans were adequately funded in 2001. But the share of inadequately funded pension plans—those with assets below 80 percent of liabilities—increased almost consistently during the first decade of the 21st century, and did so even during the boom years of 2004–06, despite increases in asset prices that accompanied the housing and economic bubble. Only during 2007 did

Figure 1
State and Local Government Pension Plans by Funding Ratios Based on *Actuarial* Value of Assets (FR)



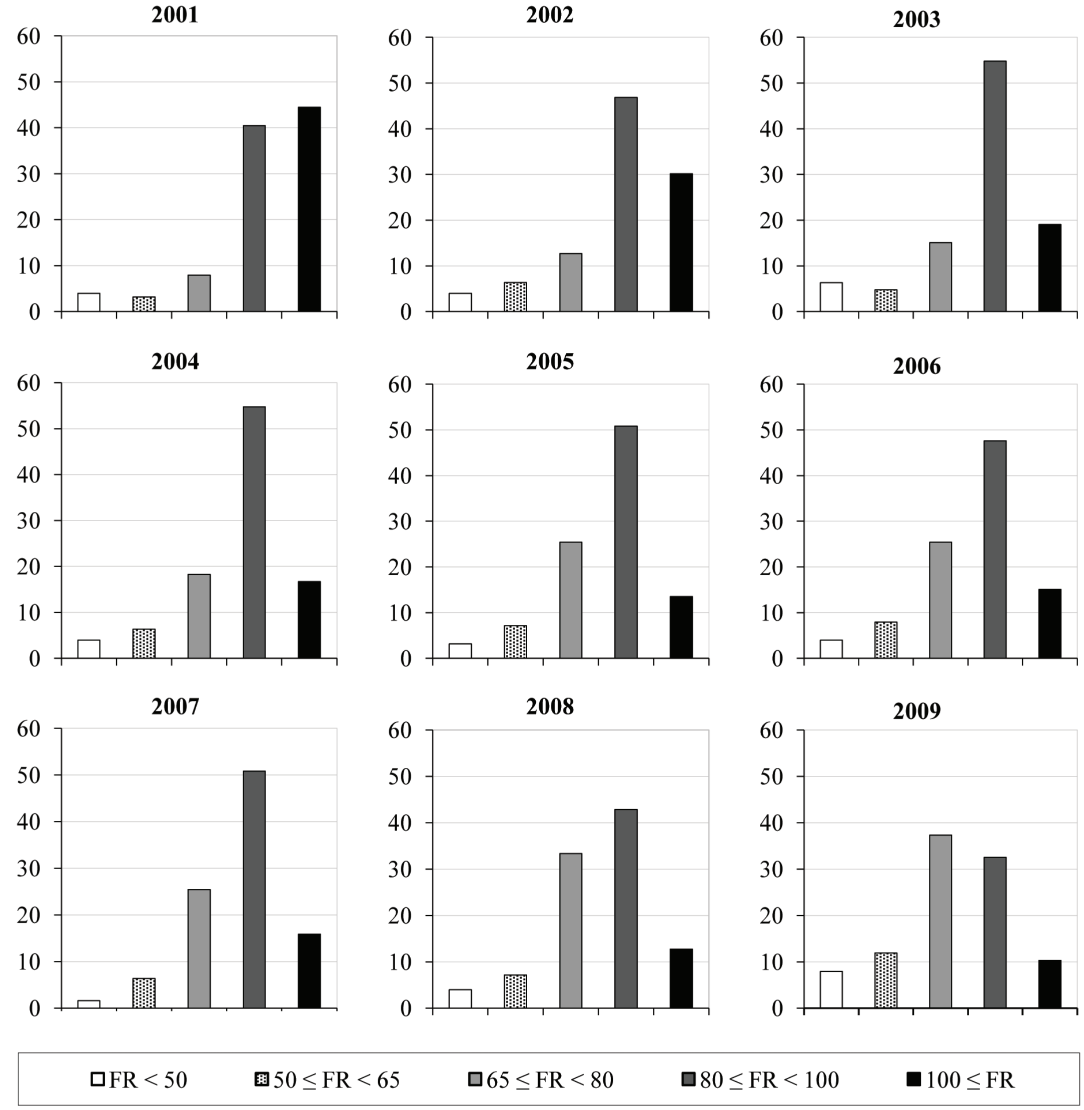
Source: Author’s calculations based on data from Boston College, Center for Retirement Research.

Figure 2
State and Local Government Pension Plans by Funding Ratios Based on Market Value of Assets (MR)



Source: Author’s calculations based on data from Boston College, Center for Retirement Research.

Figure 3
State and Local Government Funding Status Change: 2001–09



Source: Author's calculations based on data from Boston College, Center for Retirement Research.

The number of inadequately funded plans increased steeply during 2008–09, when the recession induced implosions in asset prices and state tax revenues.

the share of inadequately funded plans decline, and then by only a small amount. But the inadequately funded share increased steeply during 2008–09 when the recession induced implosions in asset prices and state tax revenues, making adequate plan contributions difficult to achieve. During the same timeframe, the share of poorly funded state and local government pension plans more than doubled, increasing from 5.6 percent in 2001 to 13.7 percent by 2009.

One could argue that rather than basing funding ratios on plans' actuarial value of assets, which are past market values of assets adjusted for investment returns that are smoothed over a number of past years (between three and seven, usually five), one should calculate funding ratios using current market values of assets. The latter would be a truer and more direct measure of the plans' capacities to cover accrued pension benefits that will become due and payable in the future. The slide in pension funding ratios based on current market value of assets shows an even steeper decline during the first decade of the 21st century, as shown in Figure 2. Notable in Figure 2 is the considerably greater volatility in the number of well-funded plans under the market-based funding ratio. The overall percentage of well-funded plans increased after asset values recovered during 2004–07, only to suffer a sizable setback in 2008–09 as asset prices tumbled again. By 2009, almost half of the 124 state and local government pension plans considered here were below the critical funding level of 60 percent under current market valuations of plan assets.

Figure 3 shows in greater detail how the slide in funding status occurred among state and local government pension plans. It shows frequency distributions of state employee pension plans according to their actuarial funding ratio categories for the years 2001–09. Here, the funding ratio denotes the ratio of actuarial assets to actuarial liabilities.[5] After 2001, the funding slide began in plans with actuarial assets exceeding 100 percent of actuarial liabilities. Many of those plans ended up with actuarial funding ratios between 80 percent and 100 percent. During the middle of the decade, however, pension plans began to exit that category and migrate to even lower categories. Again, the sharpest increases in the shares of plans in low funding categories occurred during 2008–09.

2. State and Local Government Pension Plan Funding: Best and Worst States

Pension funding conditions and changes thereto are reported on an actuarial basis by state actuaries under the standard accounting and reporting methods specified by GASB. This section highlights the best and worst performers on several criteria, cross-referencing each state's initial funding condition with the change in its funding status during the first decade of the twenty-first century. Rather than provide a full set of rankings for all 50 states, only the best and worst defined benefit pension funding performances by state pension funds on average are reported below, based on several alternative criteria.

First, take the five states with the lowest actuarial funding ratios in 2001. Those states are Illinois, Indiana, Connecticut, Oklahoma, and West Virginia. The first panel of Table 1 shows several statistics for these states. Their 2001 actuarial funding ratios (AFRs) were low to begin with, all being "inadequately" funded based on an 80 percent AFR threshold. Perhaps because of this, their pension plan authorities made a valiant effort to improve funding: all of these states ranked high in terms of the percentage point "change in AFR" between 2001 and 2009 (with the largest positive change being ranked first through the largest negative change being ranked fiftieth). However, those high ranks do not imply that these states actually improved their funding ratios, just that they did not worsen them as much as other states did. Indeed, for one of the states—Illinois—the average AFR among its defined benefit pension plans declined by more than 16 percentage points.[6] The AFRs declined marginally for three of the remaining four states and improved by just 5.2 percentage points for West Virginia, which ranked first among all 50 states when ranked according to the change in funding ratios between 2001 and 2009. Thus, states with lowest AFRs as of 2001 predominantly worsened their funding ratios during the last decade.[7]

The second panel of Table 1 lists states with the best-funded defined benefit pension plans in 2001: Florida, Arizona, Pennsylvania, Delaware, and California. Each of those states' AFRs exceeded 100 percent. However, all but one of them ranked among the top half of states according to the "change in AFR" metric during 2001–09. All five experienced significant regressions in their AFRs during that time, by more

After 2001, the funding slide began in plans with actuarial assets exceeding 100 percent of actuarial liabilities.

Table 1
State Rankings by Funding Ratios and Changes in Funding Ratios Since 2001

States With the *Lowest* Average Actuarial Funding Ratio in 2001

	2001 AFR %	2001 AFR Rank	AFR Change 2001–09 Rank	AFR Percentage Change 2001–09	2009 AFR
Illinois	74.7	46	20	-16.5	58.2
Indiana	66.6	47	6	-3.5	63.1
Connecticut	63.1	48	5	-1.6	61.5
Oklahoma	62.3	49	9	-6.9	55.4
West Virginia	45.1	50	1	5.2	50.3

States With the *Highest* Average Actuarial Funding Ratio in 2001

	2001 AFR %	2001 AFR Rank	AFR Change 2001–09 Rank	AFR Percentage Change 2001–09	2009 AFR
Florida	117.9	1	44	-30.8	87.1
Arizona	116.3	2	48	-39.1	77.2
Pennsylvania	115.0	3	46	-34.2	80.8
Delaware	112.4	4	15	-13.6	98.8
California	109.4	5	37	-25.9	83.5

States With the *Most Improved* Average Actuarial Funding Ratio During 2001–09

	2001 AFR %	2001 AFR Rank	AFR Change 2001–09 Rank	AFR Percentage Change 2001–09	2009 AFR
West Virginia	45.1	50	1	5.2	50.3
Wisconsin	96.5	29	2	3.3	99.8
New York	100.0	17	3	0.0	100.0
Nebraska	87.2	38	4	-0.6	86.6
Connecticut	63.1	48	5	-1.6	61.5

States With the *Most Worsened* Average Actuarial Funding Ratio During 2001–09

	2001 AFR %	2001 AFR Rank	AFR Change 2001–09 Rank	AFR Percentage Change 2001–09	2009 AFR
Pennsylvania	115.0	3	46	-34.2	80.8
Alaska	98.6	21	47	-37.8	60.8
Arizona	116.3	2	48	-39.1	77.2
New Jersey	109.1	6	49	-43.2	65.9
Kentucky	108.5	8	50	-47.5	61.0

Source: Author's calculations based on state pension actuarial reports and state government comprehensive annual financial reports.

than 30 percentage points for the pension plans of Florida, Arizona, and Pennsylvania. California's pension plan's AFR dropped by 26 percentage points while Delaware's experienced a decline of 14 percentage points. Notwithstanding such steep declines, four out of these five states retained their pension plans' "adequately funded" status, judging from their AFRs.[8] Only Arizona's 2009 AFR declined to slightly below the 80 percent threshold.

The third panel of Table 1 lists the five states with the largest increase in their AFRs during 2001–09: West Virginia, Wisconsin, New York, Nebraska, and Connecticut. It shows that most of those states had poor rankings on the basis of their 2001 AFRs. This confirms the impression from the first panel that pension-plan authorities in states with the smallest AFRs in 2001 made relatively much stronger efforts to improve their plans' funding conditions, notwithstanding the fact that three of these five states had "adequately funded" statuses in 2001 based on their AFRs. However, their relatively strong efforts to improve plan funding resulted in meager advances in AFRs, with the largest being 5.2 percent for West Virginia. During 2001–09, Nebraska and Connecticut experienced small declines in their AFRs,while New York had no change to its AFR. The result is that these states' 2009 AFRs remained close to their 2001 values.

The last panel of Table 1 lists the states with the steepest declines in their AFRs during 2001–09: Pennsylvania, Alaska, Arizona, New Jersey, and Kentucky. As in the second panel, these five states began with very healthy pension funding statuses in 2001. Steep as the declines in AFRs in the second panel of the table are, only Pennsylvania is common to the table's second and fourth panels. The declines in AFRs for the other four states (in the fourth panel) are sizable. Alaska's and Arizona's percentage-point AFR declines are in the upper 30s. The declines in New Jersey and Kentucky exceed 40 percentage points. The result is that the pension plans of all of these five states, except Pennsylvania, shift to the "inadequately funded" status by 2009.

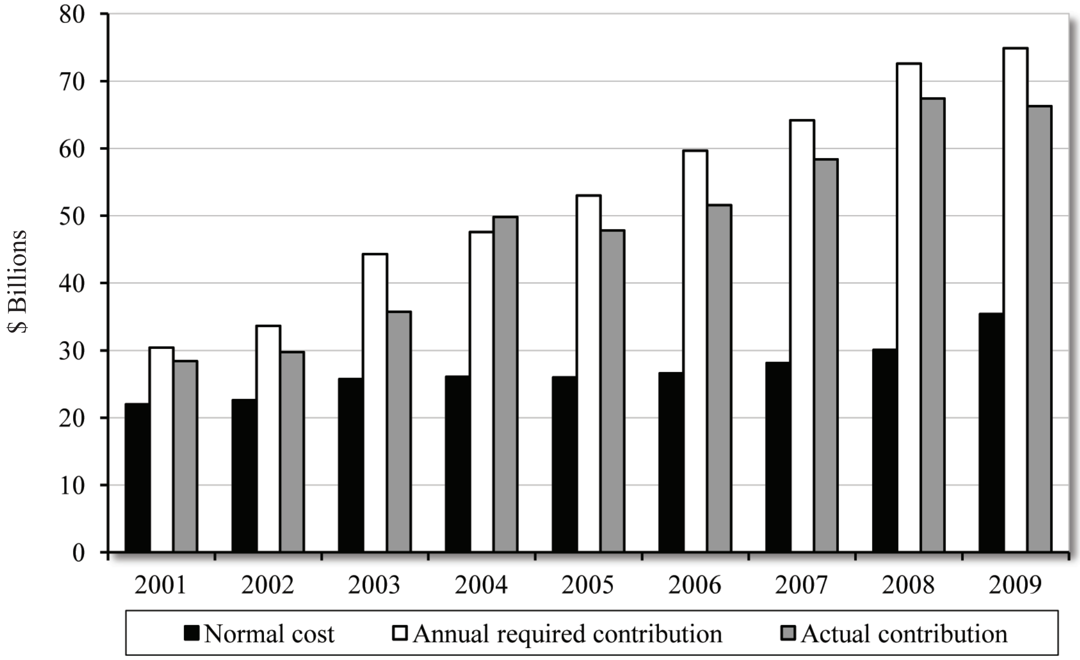
The lessons from Table 1 are, first, that the first decade of the 21st century saw a general decline in state and local government pension funding status, consistent with the description of earlier sections. One could view these results in two ways. First, despite the best efforts to improve funding status by the worst-funded plans in 2001, states made little headway in improving their plans' funding conditions. Moreover, although the best-funded pension plans allowed their plan funding conditions to worsen quite a lot, their overall pension funding status mostly remained "adequate." An alternative conclusion is that states with poorly funded plans could not allow funding conditions to worsen any further. When state budget resources were especially tight during the early and later years of the decade, these states apparently were forced to trim other government expenditures by a lot more than states that began the decade with well-funded pension plans. Second, states with the best- and worst-funded pension plans in 2001 did not change their funding status by much during the decade. The former were so well funded initially that, despite experiencing a steep slide in their average funding ratios, they mostly retained an "adequately funded" status. And the latter managed to hang onto their 2001 funding ratios by limiting the decline in their plans' funding ratios. However, states that experienced the largest declines in plan funding ratios during the 2000s shifted from "well funded" to "inadequately funded" status by 2009.

Although the best-funded pension plans allowed their plan funding conditions to worsen quite a lot during 2001, their overall pension funding status mostly remained "adequate."

3. What's behind the General Pension Funding Decline during 2001–2009?

The funding status of any pension plan equals the ratio of its assets to its liabilities. Both values are actuarially calculated by each state and local government pension

Figure 4
Annual State and Local Government Pension Costs and Contributions



Source: Author's calculations based on data from Boston College, Center for Retirement Research.

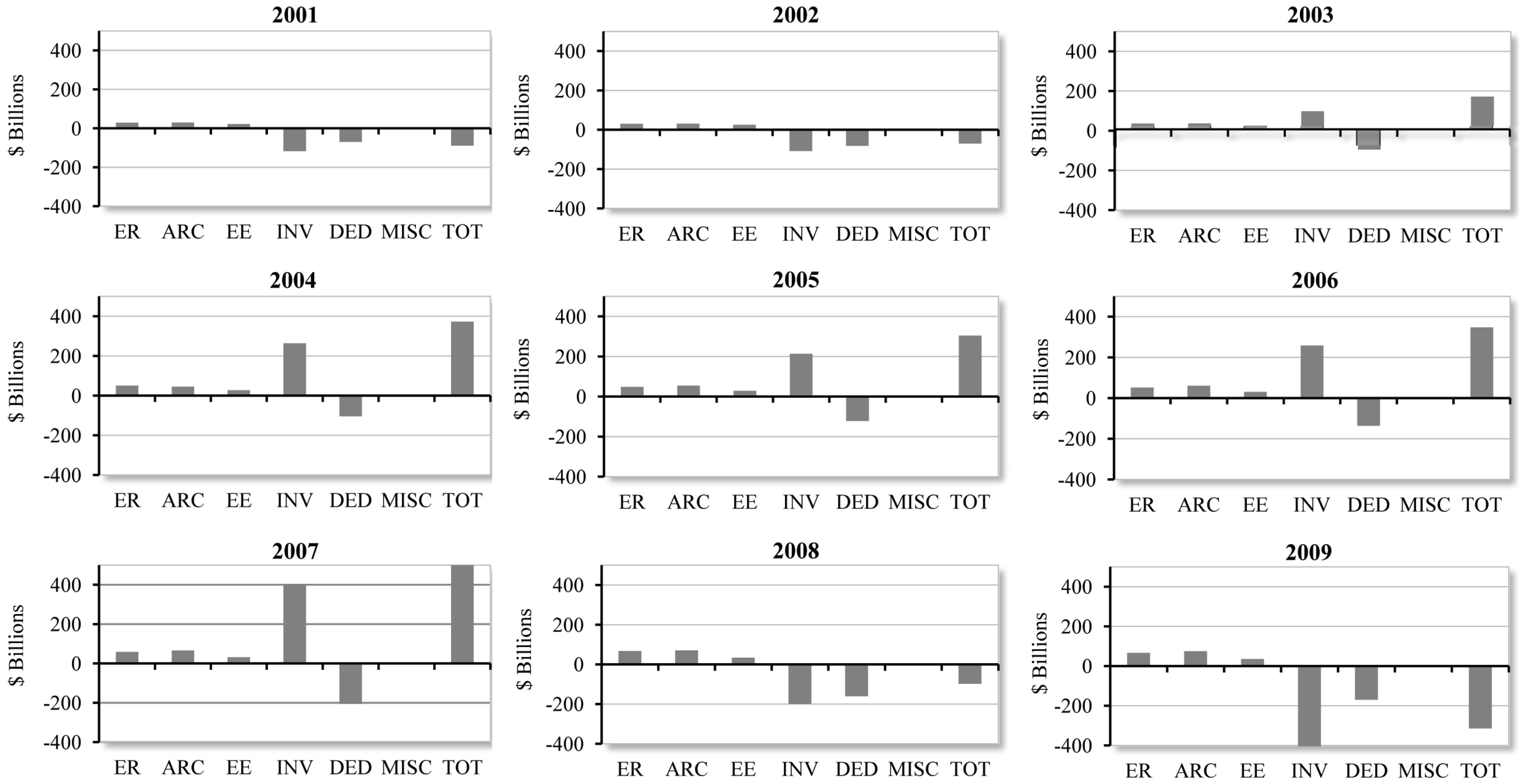
Unlike private employers, state and local government pension plan authorities have considerable discretion in deciding the amount of current-year employer and employee contributions.

plan authority. There is considerable variation in the methods used across states, and also across pension plans within some states, because GASB's accounting guidelines permit a range of alternative accounting methodologies. However, given those estimates, neither GASB guidelines nor political preferences control current-year outflows from pension funds. Plan financial outflows are largely determined by benefit obligations that become due within the year based on relatively inflexible benefit formulas and the number of current and past workers that are eligible to collect benefits in the current year. Outflows attributable to investment losses are only partially controllable through asset-value smoothing methods used by each plan but, given that method, the amount of the outflow is also mostly market-determined.[9]

Pension plan authorities can control fund inflows through a direct decision about employer and employee contribution rates. States have no obligation to stick to actuarially determined annual required contributions (ARCs). The ARC is the sum of the "normal cost" (the present value cost of future benefits that accrue to current state and local government workers from providing one additional year of service) and the "amortization cost" (the amount of additional contributions required to maintain the plan on schedule to eliminate its unfunded liability to zero by a specific future date). The latter includes one year's interest cost on the net pension obligation (the cumulative sum of past pension underfunding). However, unlike private employers, state and local government pension plan authorities have considerable discretion in deciding the amount of current-year employer and employee contributions.

Figure 4 shows defined benefit pension plan normal costs, ARC, and actual employer contributions aggregated across all 124 major plans from across the 50 states. It shows that the normal cost increased gradually since 2001, consistent with steady employment and wage increases for state and local

Figure 5
Aggregated Financial Flows for State and Local Government Defined Benefit Pension Plans



Legend: ER = employer contribtions; ARC = annual required contributions; EE = employee contributions; INV - investment income net of costs; DED = total deductions for benefit payments and administrative costs; MISC = miscellaneous adjustments; TOT = total (net) financial inflow
Source: Author’s calculations based on data from Boston College, Center for Retirement Research.

Pension funding status in state and local government defined benefit pension plans is significantly dependent on plan managers' investment strategies as much as any other aspect of pension funds' financial management.

government workers.[10] Because state and local government pension plans are underfunded, on average, the plans' ARC is much larger than their total normal cost. However, total employer contributions are considerably smaller than the ARC, implying that these pensions on the whole have not remained on schedule to fully amortize their unfunded obligations according to their (separate) future target dates. The shortfall in actual contributions relative to required employer contributions also explains why ARCs have accelerated faster than increases in the plans' aggregate normal cost during the first decade of the 21st century.

The overall shortfall in annual employer contributions relative to ARCs for major state and local government plans, however, is only a part of the reason for the decline in their overall funding condition during 2001–09. The remainder of the gap is explained by asset-value declines during the early years of the 21st century and in the aftermath of the recent recession. Figure 5 shows aggregate annual inflows into state and local government defined benefit pension plans on account of employer and employee contributions, net investment income, and deductions for benefit payments and administrative costs. Total net inflows are shown in the final column in each of the nine charts in Figure 5. The notable feature of Figure 5 is that the size and sign of total net inflows are highly correlated with net investment income. Investment income net of expenses was negative during 2001–02, the aftermath from the bursting of the tech bubble. And total net inflows into pension funds were also negative in both years. During the stock market boom years of 2003–07, both net investment incomes and total net pension fund inflows were positive. Large positive net investment gains during 2004 and 2007 were associated with large total net inflows into pension funds. Both net investment incomes and total net pension fund inflows were negative during 2008–09. This pattern suggests that pension funding status in state and local government defined benefit pension plans is significantly dependent on plan managers' investment strategies as much as any other aspect of pension funds' financial management.

4. State and Local Government Pension Fund Boards' Investment Management Strategies

The boards of multiple state defined benefit pension funds frequently employ the same financial management consultants to reduce costs and ensure proper oversight. Hence, although pension funds in some states may have independent investment policies, the asset allocations of all pension funds within a state are added together in this paper to provide a state-by-state picture of investment strategies and performance.

Conventional financial management principles of asset-liability matching suggest that maturities of pension fund financial assets should be selected to deliver funds as required when fund liabilities are to become due and payable. In addition, where the liabilities are more certain and inviolable, financial investments of commensurately low risk should be selected. These rules minimize the risk of running short of assets to make timely benefit payments.

However, state and local government pension liabilities are long-term obligations of sovereign entities that possess the power to levy taxes on state residents to cover any future shortfalls of resources compared with due and payable benefits. Therefore, state and local governments may be justified in assuming pension fund investment strategies that are riskier than the above rules suggest. Indeed, despite greater return volatility, riskier asset portfolios may generate higher average returns in the long term and reduce taxpayer and employee costs of funding their retirement benefits.

This calculus appears to underlie state and local government plan managers' asset

Table 2
Portfolio Shares (percent) of State and Local Government Defined Benefit Pension Funds

	2001	2002	2003	2004	2005	2006	2007	2008	2009
Cash	2.2	2.3	2.6	2.5	2.1	2.0	2.4	2.0	2.5
Bonds	31.4	32.2	29.7	27.2	27.3	26.4	25.6	27.7	28.4
Equity	56.7	55.4	58	60.7	60.7	60.5	59.6	54.1	51.4
Real estate	4.3	4.7	4.3	4.1	4.5	5.2	5.5	6.7	6.1
Other	5.4	5.4	5.4	5.4	5.4	5.8	6.8	9.6	11.6
Total	100	100	100	100	100	100	100	100	100
Equity + Real Estate Share									
Average	61.0	60.1	62.2	64.8	65.2	65.7	65.1	60.8	57.5
Standard Deviation	9.65	9.19	8.60	7.13	6.88	6.49	6.87	8.03	10.24

Source: Author's calculations based on data from Boston College, Center for Retirement Research.

portfolio choices. Table 2 shows the average portfolio compositions across the sample of 124 major state and local government pension funds in the 50 states during 2001–09. It shows that fund managers had invested considerably more than one half of state and local government employee defined benefit pension assets in equities. As expected, the portfolio shares of equities were depressed after years of negative returns, such as during the early and late years of the first decade of the 21st century. During the middle of the decade, however, the share of equity and real estate increased to an average of 65.7 percent by 2006. It's noteworthy that the distribution of the equity plus real estate pension plan portfolio shares across the 50 states was considerably compressed during the peak of the housing boom. This suggests that states with portfolios that were already heavily weighted toward risky investments may have rebalanced their equity and real estate portfolio shares, but other states allowed their risky portfolio shares to drift upward with appreciating asset values through 2006. States with the most and least volatile equity plus real estate portfolio shares between 2001 and 2009 are identified in Table 3.

Table 3 shows average equity plus real estate (E+RE) portfolio shares across all pension funds within the states listed during 2001–09. Only states with the five most and five least volatile portfolio shares are included. Volatility is measured relative to the mean portfolio share of E+RE investments, by the coefficient of variation shown in the next-to-last column of the table. It's clear from the table that South Carolina is an outlier in terms of adopting a highly risky investment strategy. Its portfolio share of equities plus real estate investments more than doubled between 2001 and 2006, only to fall back to one-half of its 2001 value by 2009—just 10 percent! Clearly, this bust-boom-bust swing in South Carolina's pension fund portfolios arose from following a passive investment strategy, possibly a deliberate choice to double down on high-risk investments as asset values increased, coupled with investment withdrawals during market slides. That allowed the state's portfolio share of E+RE to rise with the home- and asset-price bubble during the middle of the decade and then decline as those bubbles burst after 2007. A similar but relatively milder bust-boom-bust pattern of E+RE portfolio shares is evident in the four states in the "most volatile" category in Table 3: Pennsylvania, Indiana, Alabama, and Tennessee. The five states with the most volatile portfolio shares vary widely in their

States with portfolios already heavily weighted toward risky investments rebalanced their equity and real estate portfolio shares, but others allowed their risky portfolio shares to drift upward with appreciating asset values through 2006.

Table 3

Average Equity Plus Real Estate (E+RE) Shares in Pension Fund Portfolios: States with the Most and Least Volatile E+RE Shares (in percent)

	2001	2002	2003	2004	2005	2006	2007	2008	2009	Mean	Coefficient of Variation	Covariance
Most Volatile (Passive Investment Strategy)												
South Carolina	22.2	26.7	35.1	42.6	43.2	52.4	46.6	25.2	10.8	33.9	40.0	59.7
Pennsylvania	64.1	62.8	68.2	67.2	64.0	67.4	63.3	56.7	39.1	61.4	14.7	50.2
Indiana	50.3	52.4	54.3	65.2	66.0	66.3	74.2	66.8	53.7	61.0	13.8	77.1
Alabama	49.0	50.0	59.6	64.4	66.2	70.1	72.0	68.5	67.9	63.1	13.4	33.5
Tennessee	41.9	41.4	37.4	43.0	43.0	46.0	52.0	55.0	45.0	45.0	12.1	34.2
Least Volatile (Rebalancing Investment Strategy)												
South Dakota	62.6	65.5	64.6	66.1	67.3	63.3	64	62.8	61.4	64.2	2.9	3.6
Alaska	68.4	64.4	66.7	65.8	65.1	65.4	66.6	63.1	70.6	66.2	3.4	-14.3
New Hampshire	64.3	62.8	64.2	67.7	68.7	69.8	67	64.8	65.4	66.1	3.5	4.7
Missouri	57.9	54.8	53.3	56.9	56.8	59.1	60.6	56.0	56.2	56.8	3.8	15.4
Wisconsin	65.7	64.9	70.4	70.8	70.5	69.4	70.1	68.0	64.0	68.2	3.9	15.3

Source: Author's calculations based on data from Boston College, Center for Retirement Research.

mean E+RE share, suggesting that states that follow passive investment strategies include those with high and low exposures to risky investments.

In sharp contrast, the E+RE portfolio shares are considerably steadier among the five "least volatile" states: South Dakota, Alaska, New Hampshire, Missouri, and Wisconsin. South Dakota's E+RE share is the steadiest, suggesting disciplined portfolio rebalancing to maintain the share very close to its average of 64 percent. These five states also differ in terms of their desired exposure to risky investments, with Missouri choosing to hold about 57 percent of its pension fund assets in E+RE investments whereas Wisconsin held 68 percent of its assets in those investments.

It is difficult to infer conclusively that states with greater volatility in E+RE portfolio share follow a passive investment strategy. That's because states could change the portfolio shares through marginal investments of contribution surpluses during the year or selective sale of securities when contributions are short of that year's benefit obligations.

One way to test whether states with the most volatile E+RE portfolio shares in pension fund assets are adopting passive investment strategies or rebalancing their portfolios is to calculate the covariance between the fund's annual changes in E+RE portfolio share and its annual asset returns over time. If a pension fund's change in E+RE portfolio share is large and positive when annual returns are large and positive, it means the pension fund's investment strategy is mostly passive or, possibly, that investment managers are purchasing more E+RE assets when their values have increased. In this case, the covariance between annual changes in E+RE portfolio shares would be large and positive. If, however, annual changes in the E+RE portfolio share are large and negative when annual returns are large and positive, the covariance between the two would be large and negative. It means that the fund's portfolio managers are selling E+RE investments when they have increased in value or, at least, investing the fund's surplus contributions in non-E+RE assets.

The last column of Table 3 shows these covariance statistics for states with the most and least volatile E+RE portfolio shares. They increase confidence that the pension funds of the states with greatest volatility in E+RE portfolio shares are following passive investment strategies and that those with the least volatile E+RE shares may be periodically rebalancing their pension fund portfolios. Note, however, that the covariance statistic is negative only for Alaska. It means that pension fund managers in other states may be engaging in less-than-complete rebalancing of their asset portfolios.

5. Are Employers and Employees Contributing Sufficiently to State and Local Government Pension Funds?

Theoretically, if employer and employee contributions into a defined benefit pension plan are consistently maintained equal to the annual required contributions, the plan would become fully funded by the end of the planned amortization period used to calculate the ARC. Although employer and employee contributions are instrumental in maintaining adequate state and local government pension plan funding, there could be a host of reasons for employer contributions falling short in particular years: competing uses of funds, inadequate revenues and surges in expenditures across business cycles, higher state budget expenditures because of high health care costs or temporary cost increases, emergency expenditures arising from natural disasters, and so on. State and local authorities are guided by GASB rules about making contributions to their pension funds but retain discretion on exactly how much to contribute each year, including setting employee contribution levels from year to year. Hence, the estimates reported below are conditional on pension board perspectives that standard GASB accounting of pension liabilities and—by implication—standard calculations of the ARC are the "correct" values that they should target when setting their pension plans' contributions policies.[11]

The primary drivers of state and local government pension contributions are

- the need to fund accruing future pension benefits from current employee services (normal cost), and
- the need to reduce any inherited and accumulating unfunded liability from past failures to contribute sufficiently into the funds (unfunded liability amortization costs).

The total plan contribution that would cover both of these objectives is summarized in the ARC, which is the sum of normal and amortization costs. This section studies the response of state and local government employer and total (employer plus employee) annual contributions to pension funds in light of annual changes in ARC calculated under GASB's actuarial standards.[12]

To isolate the policy decision from other influences on pension plan funding conditions, changes in the level and logarithm of employer (alternatively, total) pension plan contributions are regressed on annual changes in the level and logarithm, respectively, in each plan's ARC, along with controls for plan characteristics, the pension plan's funding characteristics, indicators of the state's overall finances (budget), and indicators of capital market performance related to the investment of pension fund assets. Presumably, all of these factors influence the pension fund authority's decisions on employer and employee contributions.

The chief objective here is to examine how contribution decisions respond to changes

Employer and employee contributions are instrumental in maintaining adequate state and local government pension plan funding, but there could be a host of reasons for employer contributions falling short.

Table 4
Response of Employer and Total Contributions to Plan and State Budget Conditions
(year and state dummies and other controls not shown)

Dependent variable	Change in Employer Contributions	Change in Total Contributions	Change in the Log of Employer Contributions	Change in the Log of Total Contributions
Intercept	-94850.03	-119076.24	-0.25	-0.16
	(-0.6)	(-0.8)	(-0.6)	(-0.6)
Variables in Levels				
Lump sum option	19298.25	26929.58	-0.05	-0.07
	-0.8	-1.1	(-0.8)	(-1.8)*
Number of participants on board	7052.37	9076.15	0	0.01
	(1.9)*	(2.3)**	-0.3	-1.4
Members covered by Social Security	56803.49	57097.39	0.18	0.07
	(1.7)*	-1.6	(1.9)*	-1.3
Democrat majority	3082.98	266.51	-0.03	0.08
	-0.1	0	(-0.3)	-1.1
Republican majority	24376.37	30754.69	0.16	0.15
	-0.9	-1.1	(1.9)*	(3.1)**
Plan closed to new members	-1978.32	-6711.98	0.34	0.02
	0	(-0.1)	(1.8)*	-0.2
Change in variables	**vt – vt-1**		**log(vt) – log(vt-1)**	
Annual required contribution	0.76	0.88	0.57	0.24
	(14.9)**	(16.4)**	(6.7)**	(5.0)**
Ratio of market to actual plan assets	180733.29	282974.13	-0.59	-0.36
	(2.7)**	(4.0)**	(-0.8)	(-0.8)
Total benefits + other costs	0.01	0	0.03	0.04
	(2.2)**	(2.0)**	-0.2	-0.5
Net investment income	0	0	-0.01	-0.01
	(-1.6)	(-2.9)**	(-0.5)	(-0.9)
Total plan membership	0.15	0.29	0.01	0.01
	-0.9	(1.7)*	-0.3	-0.4
State budget balance	-3.14	-11.63	-0.04	-0.03
	(-0.2)	(-0.6)	(-1.7)*	(-2.5)**
N	772	766	274	270
Adj-R2	0.28	0.34	0.26	0.28

Note: T-statistics in parentheses; * = significant at 10% level; ** = significant at 5% level.
Source: Author's calculations based on data from Boston College, Center for Retirement Research.

in the ARC. The latter are considered as given based on employee current services, current investment income, past returns on assets, and accrued interest on the inherited unfunded liability. All of these quantities are assumed to be information available at the time of making the decision on annual employer and total contributions. If, controlling for these effects, state and local government pension plan authorities decide to contribute less than the ARC, the plan's funding status will deteriorate over time. Note that such an estimation of funding deterioration is sourced exclusively to the contributions decision because other influences on plan funding are already controlled for in the estimation regression.

Table 4 reports the results obtained from implementing the aforementioned regressions on data for 124 state and local government pension plans spanning the years 2001–09.[13] As it turns out, most of the control variables—plan and state budget characteristics, market outcomes, political controls, et cetera—are not statistically significant. Table 4 shows the results for the subset of variables that were statistically significant at the 90 and 95 percent confidence levels in at least one of the regression specifications shown.

The first two columns of Table 4 show the effect of changes in the ARC on changes in employer and total contributions. For every $1 increase in the ARC, employer contributions are increased by $0.76. The second column shows that total employer-plus-employee contributions increase by $0.88 for every $1 increase in the ARC.[14] These results suggest that the pension authorities undercontribute to pension funds 12 cents for each dollar of annual contributions required to maintain the plans on schedule to eliminate the unfunded obligations by the preselected amortization window. Assuming no asset market fluctuations for the moment, it is clear that even initially well-funded pension plans that undercontribute by 12 cents on the dollar per year will significantly worsen their funding status within a few years.

These regressions show other interesting features. The size of the board of directors influences contributions positively, but participation on the board by plan members does not seem to matter (latter not shown). Contributions increase by more when Republicans control the state legislature. Of marginal positive significance is coverage of plan members under the federal Social Security program. Pension contributions are boosted when market values of assets increase relative to the actuarial asset values, presumably reflecting generally good economic conditions.

The last two columns of Table 4 show the regressions on differences in the logarithms of the variables. The resulting coefficients on the ARC variables show elasticities of employer and total contributions to changes in the ARC. As expected, the elasticity of total contributions, 0.24, is smaller than that of employer contributions, 0.57.

Does Poor Initial Pension Plan Funding Stimulate Pension Contributions?

One interesting question is whether state and local government authorities of pension plans that are initially funded at better than adequate levels subsequently underfund their plans to revert to adequately funded status. Similarly, do authorities of poorly funded plans make larger contributions to catch up? The alternative set of hypotheses are that plans that are more than adequately funded are so because their authorities consistently follow good funding policies and plans that are poorly funded are so because their authorities consistently follow bad funding policies.

These opposing cases can be distinguished by re-implementing the regressions for just those plan years when initial plan funding ratios (actuarial assets/actuarial liabilities) were less than 0.80. Doing so generates a point estimate of total contributions per dollar of ARC of $0.53 (regression not shown). Although it is also not statistically significantly, less than $1.0 (just barely so with standard error of $0.24), the lower point estimate, suggests that plans that are relatively poorly funded do not subsequently make more in contributions. Indeed, it suggests that although the plans' funding status may recover as asset values recover, their funding policies would place a drag on that recovery.

Underfunding state and local government pensions systematically implies that these governments are shifting pension costs onto future generations.

In contrast, the coefficient estimate is $0.90 for plans with funding ratios at or above 0.80, and it is not statistically different from $1.0 (again, just barely, with a standard error of $0.057). This suggests that initially well-funded plans are unlikely to suffer major worsening of plan funding conditions on account of inadequate employer and employee contributions.

Does the Size of Government Affect Pension Plan Funding?

Underfunding state and local government pensions systematically implies that these governments are shifting pension costs onto future generations. A possible reason for this is that policymakers in states with smaller governments (measured by the ratio of state and local employees to the state's resident population) might decide to employ this strategy in order to postpone difficult fiscal decisions. Such states may have small governments because their residents are unwilling to pay more for public goods, including pensions for current employees. The alternative hypothesis is that governments are small because they are fiscally responsible and prioritize paying for ongoing public purchases in a timely manner, including recognizing and adequately funding accruing pension costs for current state and local government employees.

To investigate these alternatives, states are ranked by the ratio of state government employment to state population, and the regression sample is restricted to pension plans in 15 states with the smallest ratios.[15] The coefficient on the change in the ARC variable is $1.05 and it is not statistically different from $1.0. It suggests that pension authorities in small-government states exhibit greater responsibility in funding their employee pensions.

Do Pension Plan Funding Contributions Depend on Federal Budget Support?

A final experiment explores the response of state and local government employer-plus-employee pension contributions to changes in the ARC across states that receive a large share of their budget expenditures as federal grants-in-aid. Federal funds, even if dedicated to specific spending items, free up state and local government resources for other uses. This might induce states with the smallest budget shares of federal grants-in-aid to have less ability to make timely contributions into pension funds. Alternatively, such state characteristics may indicate well-off states—the reason for their small budget share of federal funding—or primarily fiscally responsible governments that make timely contributions to their pension funds.

Running the regression on the sample of pension plans in the 15 states with the smallest budget (expenditure) share of federal grants-in-aid produces a coefficient of $0.98 with a standard error of $0.093—that is, statistically not significantly different from $1.0. The coefficient on the pension plans of states with the largest budget share of federal grants-in-aid is 0.38 with a standard error of 0.32—that is, imprecisely estimated. These results suggest either that generally well-off states with fewer federal dollars in total spending are timely contributors to their employee pension funds or, alternatively, that state and local government authorities' motivation toward maintaining fiscal responsibility, rather than the size of federal funding, is the primary driver of adequate pension funding.

The take-away message from this section's analysis is that the overt reason for inadequate pension funding appears to be poor recent asset market performance. As shown in earlier sections, the negative impact of poor post-2007 investment returns and the implosion of asset values have led to sizable reductions in the funding ratios of pension plans. However, the regression results presented in this section suggest that, controlling for asset market returns, plan characteristics, budget outcomes, and political control aspects in state and local legislatures, there appears to be an overall and systematic underfunding of pension plans relative to actuarially

There appears to be an overall and systematic underfunding of pension plans relative to actuarially required contributions in state and local government pension plans.

required contributions in state and local government pension plans. That shortfall is about 12 percent on average. The average size of pension underfunding through contributions is much larger—43 percent—among states with smaller initial funding ratios. Since poorly funded states appear to have made smaller plan contributions, relative state rankings of pension funding status have not changed by much during the last decade. This is consistent with the results discussed in the earlier section in relation to Table 1. The results of this section also suggest that states with relatively well-funded pensions are proactively prioritizing pension funding to avoid shifting burdens onto future generations of state and local residents: either government employees through less generous pension benefits or taxpayers for making larger plan contributions, or conditioning pension funding on the extent of federal budget support.

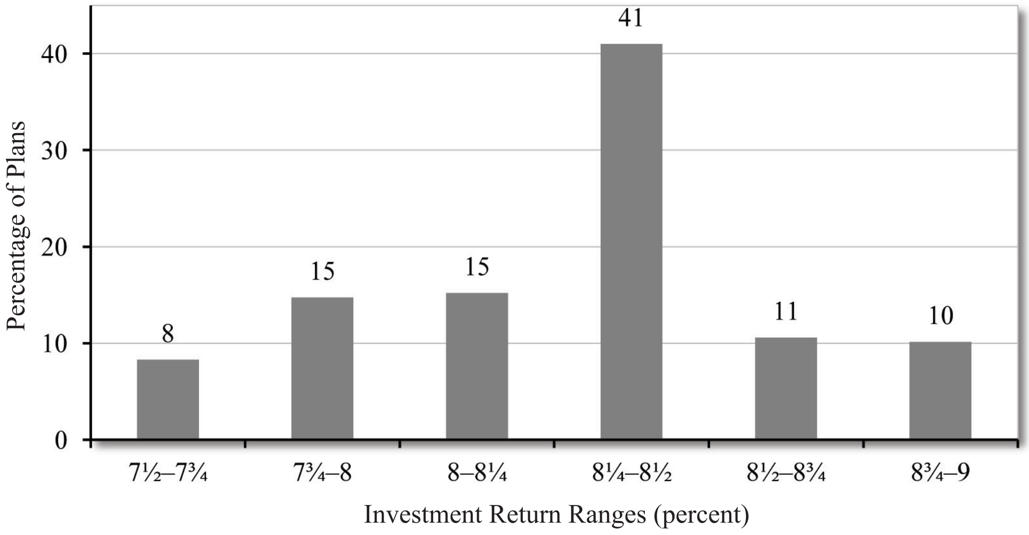
6. State and Local Government Pension Plan Funding Shortfalls: Understated under Standard Actuarial Accounting

The accounting for government pension liabilities has long been a contentious issue. Two key points need to be made regarding the metrics appropriate for disclosing gross and net funding shortfalls in state and local government defined benefit pension plans. First, disregarding clear and logical guidelines from financial economics, defined benefit pension liabilities of state and local governments continue to be mismeasured under the rules established by GASB. GASB Statement No. 25, *Financial Reporting for Defined Benefit Pension Plans and Note Disclosures for Defined Contribution Plans*, which has been in effect since 1994, requires state and local government defined benefit pensions to discount actuarially determined future flows of retirement, survivor, and other pension benefits at the rate of return expected on investments that are earmarked to pay those benefits. The use of the expected return on a pension plan's assets to value its liabilities violates a fundamental tenet of financial economics that prescribes that future payment streams should be discounted at interest rates on securities traded in capital markets and whose financial payoffs have similar attributes: uncertainties associated with default risk, illiquidity, erosion through inflation, and so on. Indeed, usually the plan's assets may be invested in risky securities—equities; corporate bonds; securitized mortgage, consumer, or commercial loans; and so on—that have very different attributes than pension plan liabilities. Such investments are riskier and may, therefore, earn relatively high average rates of return over time. But using those high returns over time to discount future pension benefit flows introduces a significant downward bias into the present value measure of those liabilities. The reason, simply, is that state and local pension liabilities have very different attributes from the investment of plan assets: they are much more certain because, once accrued, they are constitutionally protected from cuts and rescissions of future cost-of-living adjustments. These features of accrued pension benefits make the GASB prescribed rule for calculating present values technically inappropriate.[16]

Figure 6 shows the distribution of expected annual plan investment returns that are used in the sample of 124 state and local government plans examined in this paper. The figure shows that an overwhelming majority—77 percent—of of these defined benefit pension plans use investment returns in excess of 8 percent per year to discount future benefit flows and other costs. As Table 2 showed, about 60 percent of plan assets are invested in equities and real estate investments. These classes of assets have yielded double-digit rates of returns during some historical periods, but have suffered significantly negative returns in others, implying consider-

Since pension authorities in states with poorly funded plans appear to have made smaller plan contributions, the relative state rankings of pension funding status have not changed by much during the last decade.

Figure 6
Pension Plan Distribution by Assumed Investment Returns



Source: Author's calculations based on data from Boston College, Center for Retirement Research.

Because pensions enjoy constitutional or court protections in many states, pension defaults may be less likely and may generate larger post-default payoffs than municipal obligations.

able volatility in their payoffs over time. However, benefits accrued based on past services (by current workers and retirees) are fixed and certain under the laws governing them, making discount rates of 8 percent or higher inappropriate for discounting them to form present values and compare to current (actuarial) plan assets. Financial economists consider it more appropriate to use much lower discount rates: those earned on municipal bonds (corrected for their tax-exempt status) that are expected to default rarely relative to private-sector company defaults.[17] This discounting method involves the implicit assumption that governments would default on pension liabilities at the same time as they default on their other payment obligations, and that pension benefits would be reduced in the same proportion as cuts in general obligation payments.[18] Alternatively, in light of their constitutionally protected status, pension defaults may be less likely and may result in larger post-default payoffs than defaults on municipal obligations. That makes it more appropriate to discount state and local government pension obligations at even lower discount rates: those on U.S. Treasury securities that are considered to be the safest of all financial assets.[19]

State and Local Government Pension Plan Funding Conditions: Considerably Worse Since 2001

Figure 7 shows classifications of U.S. states according to the aggregate funding condition of their major pension plans, the 124 state and local government pension plans covering state general employees, teachers, firefighters, and police personnel. Figure 7.1 shows the funding condition in 2001 under standard (GASB) actuarial accounting of plan assets and liabilities. It shows that the majority of states were more than adequately funded according to the funding ratio threshold of 80 percent. West Virginia is the only state with severely underfunded pension plans, with a funding ratio of less than 50 percent. Pension funding in Oklahoma and Connecticut was also impaired, with funding ratios below 65 percent. Pension plan funding in Illinois, Indiana, Louisiana, and Maine was inadequate (below 80 percent).

Figure 7
State and Local Pension Funds: Funding Changes since 2001 and Funding Conditions under Alternative Liability Discounting Assumptions

Figure 7.1: S & L Pension Plan Funding Ratios—2001

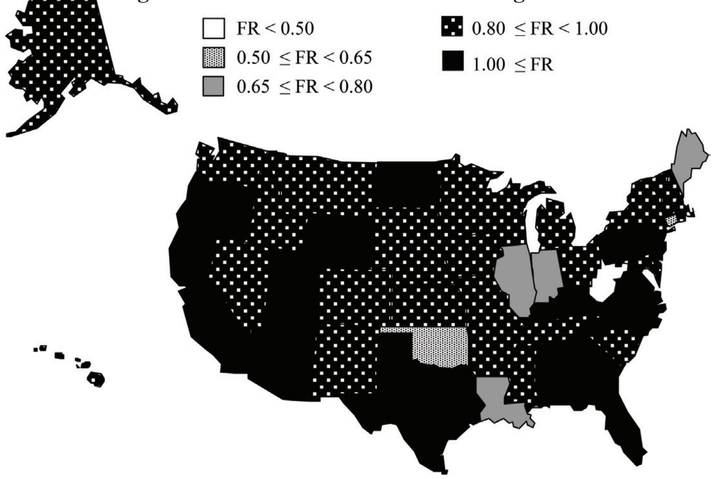

FR < 0.50
0.50 ≤ FR < 0.65
0.65 ≤ FR < 0.80
0.80 ≤ FR < 1.00
1.00 ≤ FR

Figure 7.2: S & L Pension Plan Funding Ratios—2006

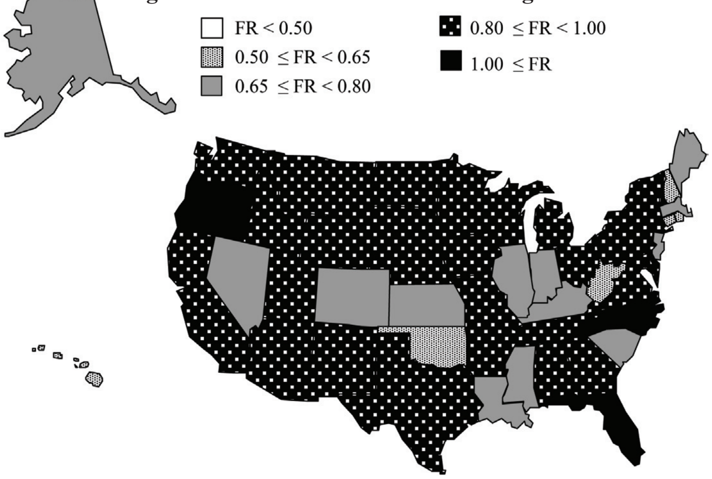

FR < 0.50
0.50 ≤ FR < 0.65
0.65 ≤ FR < 0.80
0.80 ≤ FR < 1.00
1.00 ≤ FR

Figure 7.3: S & L Pension Plan Funding Ratios—2009

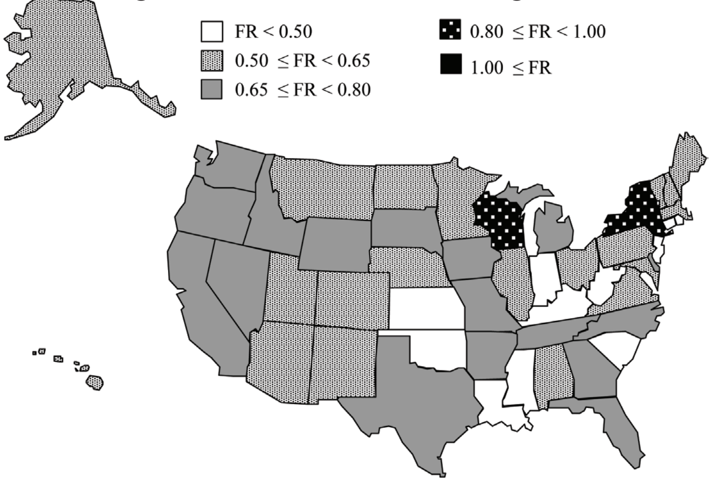

FR < 0.50
0.50 ≤ FR < 0.65
0.65 ≤ FR < 0.80
0.80 ≤ FR < 1.00
1.00 ≤ FR

Figure 7.4: S & L Pension Plan Funding Ratios—2009 (Municipal Yield Curve Discounting)

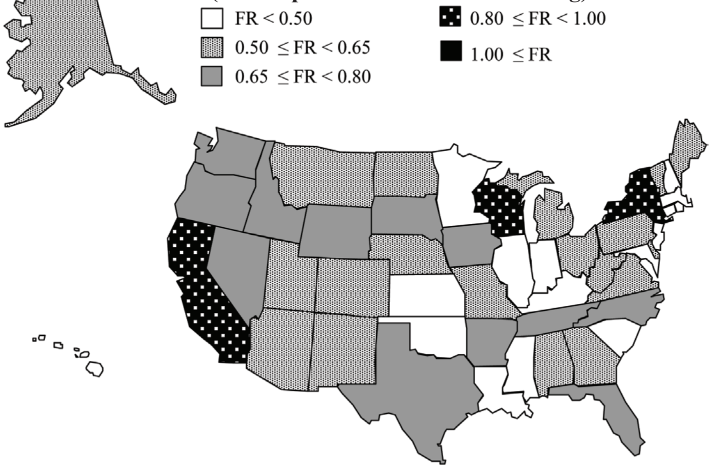

FR < 0.50
0.50 ≤ FR < 0.65
0.65 ≤ FR < 0.80
0.80 ≤ FR < 1.00
1.00 ≤ FR

Figure 7.5: S & L Pension Plan Funding Ratios—2009 (Treasury Yield Curve Discounting)

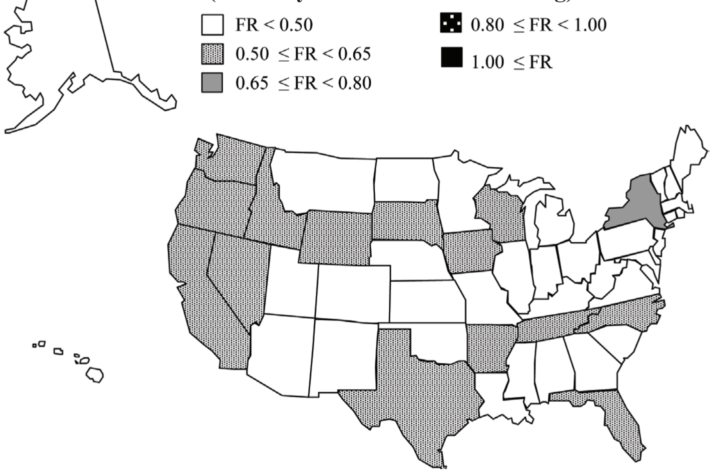
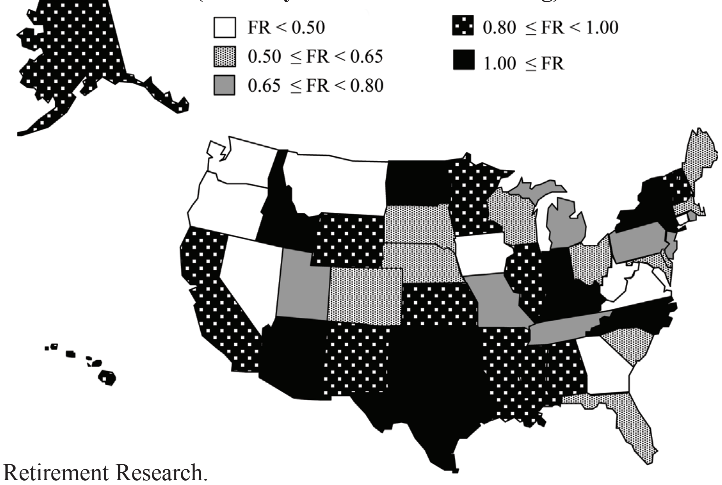

FR < 0.50
0.50 ≤ FR < 0.65
0.65 ≤ FR < 0.80
0.80 ≤ FR < 1.00
1.00 ≤ FR

Figure 7.6: S & L Pension Plan Funding Ratios Includes Benefit Accruals and Contributions Through 2045 (Treasury Yield Curve Discounting)


FR < 0.50
0.50 ≤ FR < 0.65
0.65 ≤ FR < 0.80
0.80 ≤ FR < 1.00
1.00 ≤ FR

Source: Author's calculations based on data from Boston College, Center for Retirement Research.

The steep declines in asset values in 2009 clearly had a considerable negative impact on funding ratios, despite smoothing investment returns to calculate actuarial assets.

Figure 7.2 shows state and local government pension plan funding conditions as of 2006—the peak of the housing boom—again under actuarial GASB accounting. Surprisingly, funding conditions deteriorated in many states from adequate to inadequate. This is likely the result of asset smoothing, which means the high asset returns of 2004–06 were not fully factored into actuarial assets and pension boards failed to make adequate contributions through the boom years—preferring to expand spending on other public services. Notably, Nevada, Colorado, and Kansas are now added to the list of states with inadequately funded pension plans.

Figure 7.3 shows pension funding conditions as of 2009 under GASB actuarial standards as reported by each of the state and local government plans. The steep declines in asset values clearly had a considerable negative impact on funding ratios, despite smoothing investment returns to calculate actuarial assets. The pension plans of only two states—Wisconsin and New York—continued to remain adequately funded, with funding ratios equal to or greater than 80 percent. Many states experienced severely deteriorated funding ratios by 2009, notably Indiana, Kansas, Kentucky, Louisiana, Mississippi, New Jersey, Rhode Island, and South Carolina.

State and Local Government Pension Plan Funding Conditions in 2009 under Alternative Discounting of Future Benefit Obligations

Thus far, changes in state pension plan funding conditions over time through 2009 have been considered under standard GASB accounting of assets and liabilities. However, many financial economists have questioned those accounting rules, especially the discounting of future pension benefit obligations. As noted above, however, financial economists suggest that because future pension benefits that are already accrued enjoy considerable constitutional and court protections, they should be considered fixed and certain. As such, the present value liabilities they represent should be measured using a risk-adjusted discount rate such as those based on the yield curve of municipal obligations, or even U.S. Treasury obligations that are considered to have extremely low default risks. Figure 7.4 shows the implications of applying the municipal discount rate to accrued state and local government pension benefit obligations as reported by Novy-Marx and Rauh.[20] They show that the pension plans in several additional states would fall under the severely underfunded category as of 2009—namely, Illinois, Massachusetts, Maryland, Minnesota, and New Hampshire.

Applying the municipal bond yield curve, however, admits that pension benefit obligations would face the same default risk as historically experienced on municipal obligations. However, the constitutional guarantees and court protections of accrued pension obligations suggest that those benefit payments are even more certain, justifying the use of the U.S. Treasury yield curve to estimate the present-value obligations that they represent. Figure 7.5 shows the results. Under Treasury discounting, all U.S. states are classified as inadequately funded. The best-funded state is New York, with a funding ratio of 73 percent. States with the lowest funding ratios include Connecticut, Oklahoma, Rhode Island, South Carolina, Kentucky, Indiana, and Louisiana—all of which had a funding ratio of 33 percent or smaller in 2009 under liability discounting using the U.S. Treasury yield curve.[21]

State and Local Government Pension Plan Funding Conditions, Including Future Expected Pension Benefit Accruals

GASB rules governing pension funding disclosures and most of the discussion on reporting pension liabilities are centered on the concept of the plans' "accrued benefit obligations"—those payable in the future as a result of services rendered to date by state and local government employees. They do not include benefit accruals that will result from future service of current and yet-to-behired employees. There are two related reasons why limiting pension liability reporting to benefits accrued in the past—the so-called "termination liability"—is insufficient.

Calculating the termination liability is appropriate for private-sector companies because those entities can and do go out of business. A state or local government, however, cannot simply cease to exist by terminating all public services and firing all employees. Although it is true that such government entities can change the type and generosity of the public services they provide, it is very unlikely (and probably unacceptable to voters) that the operation and continued provision of basic public service operations such as police, fire, the legislature, judiciary, and so on, would be discontinued if the budget situation becomes too tight.[22] These government entities will continue to attract and hire workers by including in their compensation packages promises and guarantees of future pension and other post-employment benefits. They imply continued accrual of pension benefits even if they occur under amended pension programs, requiring larger payroll contributions and less generous benefits.

Changing pension plan rules requires, as a starting point, information about expected future accruals under continued operation of *current* pension plan rules. This is the main objective of calculating and reporting pension plan shortfalls, but GASB's standard methodology does not require reporting on future accruing shortfalls under current pension plan rules. Not reporting expected future liability accruals—both gross and net of incoming future plan contributions—under current and alternative pension plan rules leaves policymakers blind to the implications of changing those rules. State and local governments should therefore include in their annual budget reports a statement on net pension obligations that are projected to accrue under existing plan rules.

The most accurate way of estimating these obligations would incorporate a full set of information on current employees—their tenures, age distribution, probable future termination and retirement dates, current contribution and benefit rules, and so on—and on likely future hiring policies and the attributes of future state and local government employees. However, the pension authorities generally do not make such information publicly available. Lacking that information, this paper estimates future contributions and pension accruals using a simple procedure. The Census Bureau's population projections by state and age are split into two groups by age for each state—those 18–60 (the working-age population) and those older than age 60 (the retirement-age population). For each state, these groupings are used to calculate the ratios of covered workers to the state's working-age population and the ratio of retirees plus terminated-but-vested workers to the retirement-age population between 2004 and 2006.[23] The participants of all state and local government pension plans for a given state are aggregated in these calculations.

Three alternative methods are used to project future worker and retiree participants in the pension plans for each state. Under Alternative I, future retiree and worker populations are projected by applying the 2009 worker and retiree ratios to Census population projections of workers and retirees, respectively, for years after 2009. Under Alternative II, the growth in the ratios between 2004 and 2009 is projected using asymptotic regressions to determine the target ratios to which the series of ratios between 2004 and 2009 would converge—separately for each state—in future years. The ratios for future years predicted along the path to convergence to the estimated state-specific asymptote are applied to the Census Bureau's projected populations of those states. Under Alternative III, the estimated average growth rate in the ratios between 2004 and 2009 is applied to determine future ratio values, which are then applied to projected Census Bureau total populations of workers and retirees, respectively, to obtain the worker and

A state or local government cannot simply cease to exist by terminating all public services and firing all employees.

Table 5
The Aggregate Funding Condition of State and Local Pension Plans when Projected Contributions and Benefits Are Included (present values in billions of inflation-adjusted dollars)*

	Assets			Liabilities				
Projection Assumption	**Financial**	**Present Value of Future Contributions**	**Total Present Value**	**Accrued**	**Present Value of Future Benefits**	**Total Present Value**	**Present Value of Total Unfunded Liabilities**	**Funding Ratio (Percent)****
Fixed Ratio of Workers and Beneficiaries to Their Populations, Respectively	2,597	6,069	8,666	4,427	14,013	18,441	9,774	47
Ratio of Workers and Beneficiaries to their Populations, Respectively, Asymptotes to Estimated Limit	2,597	6,251	8,848	4,427	14,548	18,975	10,128	47
Ratio of Workers and Beneficiaries to their Populations, Respectively, Growing at Historical Rate	2,597	5,767	8,365	4,427	18,986	23,414	15,049	36

* Total contributions, total liabilities, and unfunded liabilities calculated on open group basis through 2045.

** Calculated as (total present value of assets ÷ total present value of liabilities) x 100.
Source: Author's calculations.

retiree participants in state and local government pension plans. Finally, growth in average pre-retiree benefits between 2004 and 2009 is used to project benefit payouts for years after 2009. Worker contributions are projected using the average of assumed future growth rates of nominal wages by plan boards. All projections are in nominal dollars, are carried out through the year 2045, and projected values are discounted using the current nominal Treasury yield curve.[24]

Table 5 shows the results of this exercise. It's noteworthy that under GASB accounting rules, estimated aggregate accrued pension liabilities of the 124 major state and local government pension plans amount to $3.2 trillion, and financial assets on hand equal $2.5 trillion as of 2009. The implied funding ratio equals 80.0 percent—just adequate on an aggregate basis. However, Table 5 shows that when discounted at the Treasury yield-curve discount rates, actuarial accrued liabilities amount to $4.2 trillion, reducing the accrued funding ratio to 59 percent.

Including future accruals of contributions and benefits, as estimated using the procedure described above, changes the picture considerably. Calculating total assets and liabilities under a forward-looking metric of pension liabilities—the 35-year (through 2045) open-group liability—results under Alternative I in a funding ratio of just 47 percent. That's because built into the Census population projections is a decline in worker populations, implying fewer contributions and an increase in retiree populations drawing benefits under current pension rules (including past accrued and future accruing benefits). Note that open-group liabilities imply that some future accruing benefits—those accruing from contributions made before 2045, but payable beyond 2045—are not included in the total liabilities measure. Thus, the estimates of total unfunded liabilities shown in Table 5 understate the full extent of liabilities that state and local governments would face under current pension rules. Under Alternative I (which fixes the ratios of retirees and workers in these pension plans to the states' worker and retiree populations at their 2009 levels) the 35-year open-group unfunded liability amounts to $9.7 trillion, far higher than the accrued net liability of $649 billion (total liability of $3.2 trillion minus assets worth $2.5 trillion) calculated under standard GASB accounting rules by the pension authorities.

The results are not substantially different under Alternative II (which uses asymptotic regressions to estimate future worker and retiree participant-to-population ratios). The total liability is slightly higher because retiree population ratios are allowed to grow slightly larger before converging to a constant value under this alternative compared with Alternative I. The total unfunded liability under Alternative II is estimated to be $10.1 trillion.

Alternative III produces much larger total and unfunded liability estimates. The present value of future worker contributions is smaller because some states (such as Oregon) reduced contribution rates prior to 2010, affecting projections of future contributions. Other states (such as Montana and North Dakota) face adverse demographics by way of low growth rates of state and local government worker populations and high growth rates of retiree populations (projected as described above).

Figure 7.6 shows states classified according to funding-ratio categories based on Alternative II. Under the projection method employed here, states' funding ratios—including future accruing liabilities and future projected contributions through 2045—would improve in many states, but would remain poor in some others compared with those shown in Figure 7.5. It's useful to isolate the sources of these effects. One possibility is adverse demographics. The projections of future state and local government pension plan members—retirees and workers—are assumed to mirror the states' overall population as projected by the Census Bureau. Thus, states experiencing low growth in working-age populations and high retiree populations should expect to face strong demographic pressures on pension programs that project to pay out a lot by way of retiree benefits and/or collect few employer and employee contributions. A second possibility is that states experienced high benefit growth rates that are projected into the future using asymptotic regressions on historical benefits per retiree. Third, some state and local government employers may be contributing too little themselves, requiring workers to contribute too little, or expecting (or assuming) that future nominal growth rates would be low. Each of these would translate into fewer future worker contributions to worsen the open-group measure.

Of these possible sources of effects on projected pension liability accruals net of contributions, the most dominant is the second effect: the rate of historical growth in benefits per retiree that is projected to eventually stabilize (asymptotically) during future years. States with rapid pre-retiree benefit growth include Georgia, Iowa, Montana, Nevada, Virginia, Washington, and West Virginia (shaded white in Figure 7.6). These states are shown in Figure 7.6 to be among those with the worst funding ratios when calculated using the 35-year open-group liability measure.

Among states where funding conditions are expected to improve are Alaska, Arizona, Kentucky, Minnesota, New York, North Carolina, North Dakota, and Texas. The primary reasons for this improvement are that these states are projected to maintain low benefit levels per beneficiary, and they face favorable demographic conditions with rapid growth in workers. Contrast those states with Connecticut, which is facing moderate demographic pressure (negative growth in the working population but moderate growth in the retiree population) and has maintained higher-than-average benefit growth rates.

States where funding conditions are expected to improve include Alaska, Arizona, Kentucky, Minnesota, New York, North Carolina, North Dakota, and Texas.

The combination of those effects results in a poor funding ratio for Connecticut. This combination of moderate demographic pressure and relatively rapid growth in per-retiree benefits will also be experienced by Maine, Ohio, Massachusetts, Nebraska, South Carolina, South Dakota, and Wisconsin, among others (shaded white with black dots in Figure 7.6). Finally, Oregon's state employee plan reduced employer and employee contributions drastically during the mid-2000s, which reduces prospective contributions and worsens its net open-group liability and funding condition.

Overall, however, the worsening of state pension plan finances—and their seeming dire condition (Figure 7.5)—is not likely to last for all states. Pension plan conditions will improve in many states over time, even if current policies are maintained. However, some states such as Georgia, Iowa, Nevada, Virginia, and West Virginia are likely to experience further challenges in funding their state and local government employee pension plans.

States such as Georgia, Iowa, Nevada, Virginia, and West Virginia are likely to experience further challenges in funding their state and local government employee pension plans.

Conclusion

State and local pension plan funding—measured under GASB accounting rules—deteriorated during the first decade of the 2000s. Despite the best efforts to improve funding status by the worst-funded plans in 2001, they could make little headway in improving their plans' funding conditions. And although the best-funded pension plans in 2001 allowed plan funding conditions to worsen considerably, their overall pension funding status remained "adequate"—above 80 percent. One possible inference is that states with poorly funded plans could not allow funding conditions to worsen any further. When budget resources were low, they were compelled to trim other government expenditures by a lot more than states that began the decade with well-funded pension plans. Moreover, states with the best- and worst-funded pension plans in 2001 did not change their funding status by much during the 2000s. However, states that experienced the largest declines in plan funding ratios during the 2000s shifted from "well-funded" to "inadequately funded" status by 2009. Calculations reported here also suggest that pension funds of the states with greatest volatility in equity plus real estate portfolios have followed passive asset management strategies, and states with the least volatile equity and real estate portfolio shares periodically rebalance their pension fund portfolios.

State and local government pension funding conditions are generally considerably overstated under the actuarial accounting standards set by GASB. The overstatement occurs from setting discount rates equal to the expected rates of return on plan asset portfolios that are generally heavily weighted toward equities and real estate investments. Given that plan liabilities are much more secure and certain than the investment return flows on plan assets, the former should, instead, be discounted using risk-adjusted interest rates, either municipal or Treasury yield curve rates. Under the latter discounting choice, the pension plans of more than half of U.S. states would, on average, be less than 50 percent—a condition that can only be labeled as "dire."

Indeed, both the evaluation and asset management methods should be dictated by the generally secure nature of state and local government pension liabilities. Since accrued benefits are generally constitutionally guaranteed under most states, pension plan authorities should not only use risk-adjusted discount rates to evaluate the present value of those payment obligations, they should also make larger contributions (commensurate with larger liability valuations under risk-adjusted discount rates) and strictly follow asset-liability matching procedures by investing plan contributions in commensurately safe assets. Of course, rates of return on such assets would be smaller. But only under such procedures would the assets become fully capable of meeting the secure and inescapable payment liabilities that the plans carry. The "discounting of plan liabilities using asset rates of return" procedure set by GASB would be validated and justified only if such a liability evaluation and investment methodologies were strictly followed. State constitutions that guarantee accrued pension liabilities, but which do not simultaneously place correspondingly appropriate constraints on plan liability evaluations, contribution determinations, and asset management, simply invite intervention and manipulation of pension plan rules for temporary gain by career politicians.

Much of the worsening in standard GASB measures of funding ratios during the first decade of the 21st century can be traced to relatively heavy exposures of pension plan assets to risky stock market and real estate investments. Stock market and housing sector asset price volatility led to steep losses during 2001–02, and again during the recent recession of 2008–09. Notwithstanding asset market volatility, and controlling for other features of pension plans such as state and local political, economic, and budget conditions; organization of plan boards; and so on, some of the blame for pension plan underfunding can be assigned to inadequate contributions overall—especially by the poorly funded plans. The results suggest that pension authorities in small-government states exhibit greater fiscal responsibility in funding employee pensions and that generally well-off states with fewer federal dollars in total state spending make more timely and adequate contributions into their employee pension funds.

Finally, because state and local governments are sovereign entities and cannot simply shut down, restricting pension liability calculations to those accrued from past employee services appears inadequate for assisting policymakers. Rather, future accruing contributions and liabilities under current pension rules should also be included in evaluating pension plan conditions. Doing so under the assumption that state demographic changes and contributions per worker and benefits per retiree would eventually stabilize (asymptotically converge to rates estimated using historical trends), total state and local government liabilities are evaluated to be much larger—on the order of $10.1 trillion in present value as of 2009—primarily because of growing retiree populations and declining worker populations among the pension plan participants. However, the calculations show that some states with rapidly growing worker populations and/or with a history of conservative benefit award growth would improve their pension funding ratios over time (for instance, Arizona, North Carolina, and Texas), while other states with histories of generous pension benefit awards or slow projected growth in worker populations (Georgia, Iowa, and Montana) would continue to struggle to improve their poor pension funding conditions during coming decades.

Much of the worsening in standard Government Accounting Standards Board measures of funding ratios from 2000–2009 can be traced to relatively heavy exposures of pension plan assets to risky stock market and real estate investments.

Notes

The author thanks Andrew Biggs and Peter Van Doren for comments on earlier drafts and Sophia Cinel and Angela Erickson for excellent research assistance.

1. Estimates, including the pension cost component, are as reported by the Bureau of Labor Statistics for the second quarter of 2011. The same pattern is observed in total compensation, with employer costs being $40.40 per hour worked in the state and local government sector versus $28.13 in private industry.

2. New regulations to be enforced beginning in 2013 would introduce greater uniformity in accounting methods used by state and local pension boards. These include using a uniform method for calculating pension liabilities and providing the sensitivity of the liability to small changes in the discount rate applied to future pension payments.

3. Note that such a comparison of pension plan funding conditions across time remains largely valid and useful as long as each state and local government pension plan board consistently adopts the same methodology for disclosing actuarial and financial measures.

4. Note that the 80 percent "adequate funding" standard may be too lenient if the plan is holding risky assets. The data underlying Figure 1 includes the 124 largest state and local govern-

ment retirement plans covering regular employees, state teachers, and fire and police personnel.

5. Actuarial assets equal the "market-related" value of plan assets plus investment gains and losses averaged over the past several years (between three and seven, but usually five). Actuarial liabilities are the discounted values of expected flows of future pension benefits through a fixed time horizon, which is usually 30 years. Expected future benefit flows take account of employees' age distributions, retirement probabilities at various ages, expected mortality rates, and more.

6. For each state, the reported actuarial funding ratio is a size-weighted average across all of its major employee defined benefit plans. It equals the sum of actuarial assets across all plans divided by the sum of actuarial liabilities across the same plans.

7. Data for 2010 is not available for all states at the time of this writing. However, the results for this year are unlikely to materially alter the general conclusions for the first decade of the twenty-first century as a whole, as described in the main text.

8. Individual pension plans within states may have suffered steeper setbacks on their funding ratios.

9. For instance, if asset values decline in a given year, a plan that employs five-year smoothing to calculate the actuarial value of its assets must recognize one-fifth of the current market value change. It could change the smoothing time span, but only within GASB specified limits (between three and seven years).

10. According to data from the Bureau of Labor Statistics, average employer costs of providing defined benefit and defined contribution pension plans have grown at twice the rate for the state and local government sector (1.63 percent per year) compared with the private sector (0.88 percent per year).

11. GASB rules on accounting standards and methods have been seriously criticized by financial economists, especially the board's allowance of discounting future state pension benefit obligations at the actuarial rate of return expected on pension plan investments. Expected returns on plan investments are also affected by the return-smoothing period used under GASB rules for calculating actuarial asset values. There may be incentive effects of GASB's liability discounting regulations on plan investments and return expectations of pension plan boards. These issues and the implications of using alternative and more appropriate discount rate assumptions are discussed in a later section. See Robert Novy-Marx and Joshua Rauh, "Public Pension Promises: How Big Are They and What Are They Worth?" *Journal of Finance* 66, no. 4 (August 2011): 1211–49.

12. Total contributions include employer, employee, and net "other" contributions, where the last category includes items such as reimbursements of past excess contributions, buy-back/buy-in contributions, gifts, endowments, and so on. However, these amounts are relatively small, volatile, and not a part of formal contributions policy as are annual employee and employer pension contributions. However, the results of Table 4 are not materially affected if the total contributions are calculated by including or excluding other contributions.

13. Taking first differences from the previous year means that the differenced variables span years 2002–09. The explanatory (control) variables include year and state dummies; indicators of the type of plan (general employee, teacher, or police and fire department); whether members are covered under the federal Social Security program; the type of jurisdiction (state or local); whether pension plan is closed to new employees; the type of cost-of-living adjustments (ad-hoc, automatic, investment based, linked to the consumer price index); whether deferred retirement option is allowed; whether lump-sum benefits are allowed; whether period-certain option is allowed; whether the plan is governed by an independent board; the number of board members; whether board is advised by an investment council; whether the state legislature was dominated by Republicans, Democrats, or was split; the change in the equity plus real estate share in the pension plan's asset portfolio; the change in the size of plan membership workers plus beneficiaries; the change in the plan's funding ratio from the previous year; the change in the ratio of market to actuarial values of plan assets; the change in net investment income from the previous year; the change in the base payrolls of plan participants from the previous year; the change in benefit payments and other costs from the previous year; the change in state budget revenues from the previous year; the change in state budget expenditures from the previous year; the change in the state's budget stabilization (rainy-day) fund from the previous year; the change in the balance between state revenues and expenditures from the previous year; and the variable of interest (the change in the plan's annual required contribution from the previous year).

14. These coefficients are sufficiently precisely estimated to make them statistically different

from 1.0.

15. The 15 states with the smallest ratios of state government employment to state population include: Pennsylvania, Rhode Island, Florida, Nevada, Massachusetts, Arizona, Michigan, Illinois, Tennessee, Georgia, California, Indiana, Ohio, Maryland, and New Hampshire. The alternative metric of measuring state size by the ratio of annual state government expenditures to gross state product or annual state revenues to gross state product do not generate economically meaningful estimates of the response of total pension contributions to changes in the annual required contribution. This may be because, in many states, expenditures on personnel wages and benefits may be only a small part of total expenditures, and the variation of spending on items unrelated to state and local government employment costs may be quite large.

16. GASB has recently issued an exposure draft with proposed amendments to the existing Statement 25. The new proposal would discount future benefits and other costs of state and local government defined benefit pension plans "using a single rate that would reflect (1) a long-term expected rate of return on plan investments to the extent that plan net position is projected to be sufficient to pay benefits and the net position projected to remain after each benefit payment can be invested long-term, and (2) a tax-exempt, high-quality municipal bond index rate to the extent that the conditions in (1) are not met." See "Financial Reporting for Pension Plans: An Amendment of GASB Statement No. 25," http://gasb.org/jsp/GASB/Page/GASBSectionPage&cid=1175804830991. These ad-hoc modifications continue to diverge from the criterion for selecting appropriate discount rates as described in the text.

17. Municipal bankruptcies in cities, counties, and towns have numbered just 253 since 1980, much fewer than the thousands of corporate bankruptcies each year. Recent and prominent examples of municipal defaults are that of Jefferson County, Alabama (November 2011); Harrisburg, Pennsylvania (October 2011); Central Falls, Rhode Island (August, 2011); and Boise, Idaho (March 2011). Vallejo, California was just cleared to emerge from a three-year bankruptcy after restructuring its workforce and revising pension and retiree health plans.

18. Novy-Marx and Rauh.

19. Ibid. Note that Treasury securities' prices include a premium for inflation that is absent in pensions because they are protected against inflation. They also include an allowance for liquidity, also absent in pension benefits that are very illiquid. However, the size of these two offsetting adjustments is unknown, making Treasury prices and yields only a rough approximation of those inherent in defined benefit pension benefits.

20. Novy-Marx and Rauh. The definition of assets was adjusted slightly to map the 116 pension plans used in the Novy-Marx and Rauh study into those applicable to the 124 plans used in this study based on the state Comprehensive Annual Financial Reports. However, the results reported in Figures 7.4 and 7.5 are only slightly different from those of Novy-Marx and Rauh.

21. See previous note.

22. Lacking the ability to print money during times of large and growing pension and health care expenditures and slow-growing or declining revenues, the continuation of basic state and local government public service provision would require drawing down rainy-day funds or temporarily suspending restrictions against deficit financing. However, without timely budget consolidation measures, state debt could be downgraded and borrowing costs may increase markedly, making deficit financing difficult. Expanded federal financial support of state and local governments in dire financial straits has not been contemplated by federal lawmakers. However, given the bailouts of private sector financial firms during the recent recession, that possibility cannot be rejected.

23. Pension plan data availability on retiree benefits are too sparse to allow calculations for years earlier than 2004.

24. The yield curve is estimated using current yields on 1-year through 30-year Treasury securities, with intermediate-year values estimated using a 4th-order polynomial regression of yields on the year index. Yields beyond year 30 (year 2040 and later) are based on those predicted by this regression.

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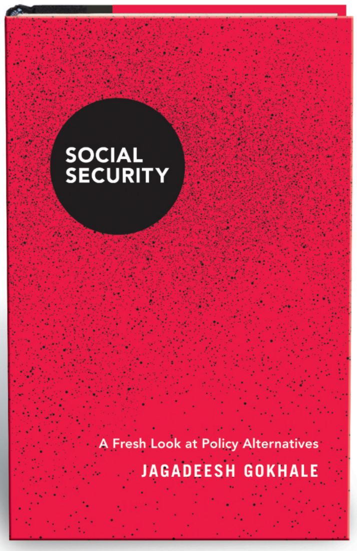
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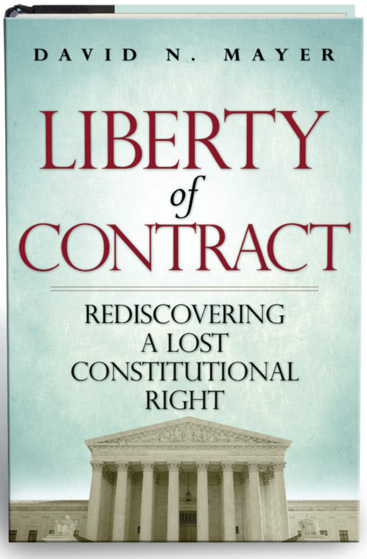
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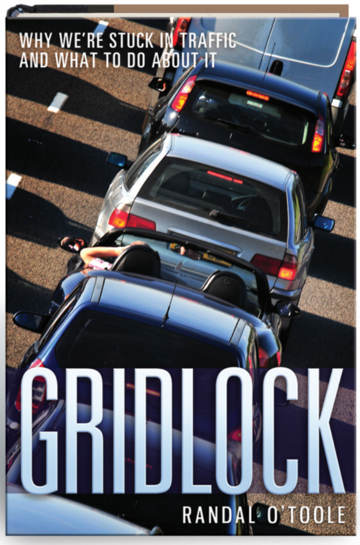
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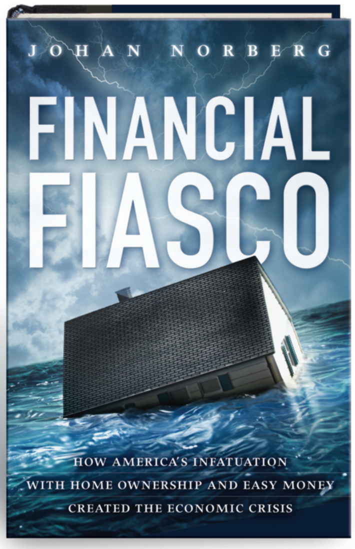
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