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Pension Funding and State Government Finances:  
Back in the Black or Trouble Ahead?

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In this paper we investigate the interaction of state pension systems with state finances.<sup>2</sup> State pensions systems are predominately defined benefit plans. Unlike our pay-as-you-go Social Security system, the state systems are intended to operate on a prefunded basis. However, the pro-cyclicality of state revenues and investment returns means that states may need to make large contributions to their plans when they are least able to do so. Consequently, not all plans are fully funded each year. The purpose of this paper is to clarify the close connection between state revenues and state pension solvency. The next section explains the link between investment returns and state revenues using evidence from the last 17 years. Section 3 presents estimates of the effects of pension characteristics, participant demographics, and state revenues on state pension funding ratios using a sample of 85 state public pension plans. In Section 4 we address issues to consider in a movement from DB to DC plans in the public sector. We clarify the differences

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<sup>2</sup> This work builds on an earlier by Giertz: "The Impact of Pension Funding on State Government Finances," State Fiscal Crises: Causes Consequences, & Solutions, Urban Institute and Northwestern University, April 3, 2003 reprinted in *State Tax Notes*, August 18, 2003.

between these two plan types from the point of view of participants and state budgets.

There is a brief concluding section.

## 2. State revenues and pension plan funding

State (and local) public pensions are predominately of the defined benefit form. Under defined benefit arrangements, employee and employer contributions plus the investment returns on these contributions are intended to cover the cost of benefit payments. Benefits are typically related to years of service and some measure of final salary level. In a fully funded system, the accumulated assets at any point should be sufficient to meet the benefits earned by participants up to that time if the actuarial assumptions of the plans are realized. In practice, many state pension systems are not fully funded because of insufficient contributions by governments in the past, the *ad hoc* expansion of benefits, and less often, the failure to meet actuarial assumptions. In fact, underfunded pension systems constitute a hybrid of prefunded and pay-as-you-go arrangements. In most states, underfunded plans either explicitly (through constitutional or statutory guarantees) or implicitly are the obligation of state government.<sup>3</sup>

State finances are directly affected by the annual required pension payments made by governments for their employees. But their finances are indirectly impacted to a much larger degree by changes in the asset values of the investment portfolios of their pension systems. Chart 1, which shows the magnitude of annual pension funds from various sources, demonstrates both the size and volatility of investment returns since 1993. Over the period 1993 to 2004, investment returns were in total 3.3 times larger than employer contributions and 5.8 times larger than employee contributions. However, investment returns have been subject to large year to year variations.

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<sup>3</sup> This is discussed in more detail in Giertz (2003).

Stock market movements over this period included an unprecedented run-up of asset values in the 1990s, a precipitous decline at the end of the stock market bubble in early 2000, and a strong recovery starting in 2003. This volatility in the equity markets coincided with a similar cycle in state government income tax receipts from capital gains realizations. The late 1990s was a period of substantial revenue growth for state governments (as well as for the federal government). From 1995 to 2000, state tax revenues grew at an annual rate of 6.2 percent and income tax receipts grew at a 7.5 percent rate. This was followed in fiscal years 2002 to 2004 by the most significant decline in state revenues since at least the Great Depression. Both the revenue increases and declines were more pronounced than predicted because of the difficulty in forecasting capital gains. More recently, revenues have begun to expand again at a strong pace (but more modest than the 1990s) bolstered again with capital gains.

Giertz (2003) notes changes in pension assets have a huge, but often little-noticed impact on state finances. Giertz demonstrates that the relatively high levels of pension funding in the late 1990s were an artifact of the strong assets markets. These high investment returns allowed some states to reduce or eliminate their annual contributions to pension funds --just as some companies reduced their contributions to their fully-funded pension funds.

Giertz demonstrates that changes in asset values are of significant size compared to state revenues. This is clearly indicated in Charts 2 and 3 that show the magnitude of pension asset changes as a percent of total state tax revenues and individual income tax revenues. The charts show not only the size, but also the volatility of pension asset changes. Note that in four of the 12 years, the increase in pension assets exceeds state income tax collections. But there are also two years (2001 and 2002) where the change is negative and one year (2003) where it is close to zero.

Quantitatively, the changes in pension assets are among the most important sources of funding for state governments, but this impact is largely ignored by most policy makers and observers. Over the entire period, investments returns were 23 percent of total state tax revenues and 69 percent of individual income tax revenues. It should be noted, however, that while there is considerable annual volatility there is more stability over the longer term. The existence of longer term stability is a key issue that relates to both the health and structure of state pension systems. This will be discussed below.

Just as the growth of the equity market in the 1990s had a salutary impact on pension funding levels, the decline in asset values had a huge effect on the level of unfunded state pension liabilities. Charts 4 and 5 show the relative position of funding levels for state pension for selected years from 1990 to 2006. A system is said to be fully funded if the existing assets are sufficient to cover the discounted present value of the benefits earned to date by participants, i. e., the system's liabilities. The estimation of liabilities in a DB system depends on a number of key assumptions including the future growth of wages and the returns on investments. Small changes in these assumptions can have important impacts of the estimates of a system's fiscal health. We discuss these assumptions in more detail in Section 3.

Chart 4 shows that state pension funds were actually overfunded for a brief period at the end of the market expansion of the 1990s.<sup>4</sup> However, underfunding is the more typical state of affairs. Funding levels fell to the low 80 percent levels during the market decline and have since moved up to about 88 percent in 2006. Chart 5 shows the overall level of underfunding in 2005 was slightly less than \$300 billion. This is clearly a large number, but does it constitute a serious fiscal problem for the states? There is some

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<sup>4</sup> The chart deals with the combined funding and liability of all reporting state pensions systems. There is considerable variation among the state in funding levels. According the Wilshire report, 80 percent of reporting systems were funded at less than 100 percent. The overall funding ratio for all systems was 88 percent while the ratio for underfunded systems was 79 percent.

disagreement about whether a 100 percent funding ratio is necessary for state governments. Unlike private pension funds, state governments have an infinite life expectancy along with the power to tax. If they choose (possibly unwisely), states can operate their systems on a partial pay-as-you-go arrangement with little danger of default. This may be an expensive method of funding compared to prefunding arrangements, but it is clearly possible.

The total underfunded state pension amount is estimated at \$284 billion by Standard and Poor's in 2006. This amounts to 2.1 percent of GDP, 44 percent of annual state tax revenues, and \$960 on a per capita basis. For the state of Illinois, which has among the most poorly funded state pension systems, its unfunded liability of \$40.7 billion is 7.3 percent of state GDP and 154 percent of annual state tax collections. For comparison purposes, the estimate of unfunded benefits for retirees for two federal programs (Medicare and Social Security) is a staggering \$65.9 trillion (Gokhale and Smetters, 2005). This is 5 times annual GDP and nearly \$300,000 on a per capita basis. While this state-federal comparison of liability may not be directly comparable, this puts the state liability in perspective. Giertz (2003) concludes that even in states with substantial underfunding, pension financing is more a question of will than capacity. Pension funding clearly constitutes a serious problem for many states, but it is a manageable problem.

Volatility of investment returns may appear to be an acute problem for states, but the long term nature of the pension obligation means that, over longer periods, states are able to realize their actuarial investment assumptions. Chart 6 provides information for actual returns of public pensions systems between 1990 and 2006 (both state and local) compared to the 8 percent return that is often used in actuarial assumptions. There is indeed a substantial amount of annual variation. During this 17 year period, there were two years of negative returns, and two others that, while positive, fell 5 percentage points below

the expected 8 percent return level. On the upside, there were four years when returns exceeded 15 percent. Year-to-year volatility need not create a major problem over the longer term. Chart 7 shows the hypothetical growth of \$100 over the 17 year period with actual rates of return and with the assumed rates of 8.0 and 8.5 percent. The chart suggests that actual rates of returns of public pension systems have been sufficient to meet the assumed 8 and 8.5 percent returns used to calculate pension system liabilities and required contributions. Of course, this result not would necessarily hold for certain sub-periods. The required contribution is the amount that must be paid each year to cover the increase in liabilities that the pension system is responsible for because of increased earnings and years of service.

The well-known caveat that: “Past performance is not necessarily indicative of future results” is in order here. While there is no guarantee that past measured returns will continue in the future, it appears that states do not have to necessarily immunize the pension liability if they are willing to experience volatility in their annual contributions. In the next section, we estimate the influence of annual state tax revenue on the funding status of a sample of public pension plans.

### 3. Empirical estimates of the determinants of plan funding ratios

In this section, we examine the relationship between plan funding ratios and state tax revenues from 2000 to 2006 using a sample of 85 public pension plans. These plans are surveyed every two years by the Wisconsin Retirement Research Committee staff or the Legislative Council staff.<sup>5</sup> We use data from the 2000, 2002, and 2004 surveys. These

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<sup>5</sup> Bi-annual survey data since 1982 can be found at <http://sss.legis.state.wi.us/lc>.

data are supplemented at the state level with Census data.<sup>6</sup> Summary statistics are provided in Table 1. [Remainder to be added.]

#### 4. Defined benefit vs. defined contribution plans in the public sector

In the private sector, defined contribution plans have come to dominate defined benefit plans in recent years (REFERENCE). A handful of states have moved some public sector employees to DC plans by closing their DB plans to new hires and offering existing employees the choice (Papke 2004, 2007). While the debate focuses primarily on the generosity of the two plan types, the major issue in the DB vs. DC choice is the assignment of risk between the state and its employees. Both proponents and opponents of a proposed switch to a DC plan often assume it will be less generous than the existing DB plan. For this reason, DC plans are often opposed by employees and unions while they are pushed by proponents of fiscal discipline.

But just as a switch to private accounts for Social Security would not solve the funding of legacy debt, a shift from DB to DC public plans will not address past underfunded liabilities. Even with a new and less generous DC plan, state governments are still liable for past underfunding. While a new DC plan could be less generous in order to reduce future benefits, similar cost saving could be realized from a less generous new DB plan that applies to future benefits.

The debate can also often be confused by details of plan arrangements. Opponents of DC plans often argue that they are inferior because they would not provide medical benefits, disability coverage, and survivor benefits. In principle, however, there is no reason why these benefits could not be provided as part of a DC plan through supplementary insurance arrangements. Some argue that DC plans are flawed because they

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<sup>6</sup> Census data are from State and Local Government Retirement Systems for 2000, 2002, and 2004. These data are available at <http://www.census.gov/govs/retire/>.

cannot provide guaranteed lifetime income to retirees. However, voluntary or mandatory annuity options could be included as part of DC plans. Opponents also assert that DC plans would result in excessive administrative fees and transactions costs while they ignore similar costs that are imbedded in DB programs. TIAA-CREF is an example of a low-cost, efficient DC arrangement.

From the perspective of state funding, however, there are two important differences between DB and DC plans. DB plans present states with a persistent incentive problem in fully funding benefits. A moral hazard problem arises when recipients believe that, either because of explicit or implicit guarantees, pension payments to retirees will ultimately be paid regardless of funding levels. Similarly, politicians are not concerned about long term funding issues because they operate under a much shorter time horizon.<sup>7</sup> Politicians faced with the unpopular choices of raising taxes or cutting programs may decide to raise revenue through reduced pension funding, knowing that they will likely be gone from office when the pension underfunding problem become critical. Employees accept such fiscally unsound arrangements knowing their future pension benefits are protected. Future taxpayers are the real losers. Future taxpayers must make up not only the forgone contributions, but also the investment returns these contributions would have earned.

The same process can also lead to the extension of unfunded pension improvements and therefore chronic underfunding of pensions even in relatively good times. This moral hazard problem in funding is largely avoided by DC plans -- the state is required to pay its share of the pension contribution in a timely manner so it can be invested in the employees' DC accounts. Employees are less likely to accept a default on a promised payment to their

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<sup>7</sup> The moral hazard problem with private sector pensions is similar, but not identical. Private employees may expect pension promises that involve a substantial default risk if their pensions are backed by government programs such as the Pension Guarantee Trust Corporation. The private pension reforms of 2006 that mandated higher private funding levels was adopted largely to address this problem.

retirement account as opposed to a failure to contribute to a DB plan. A switch to a DC plan would address this moral hazard problem in future funding; but, as noted above, it would do nothing to address past underfunding.

A second important difference between DC and DB plans is the assignment of risk. Under a DB plan, the plan sponsor has an obligation to make the required pension payments when workers retire. If the employee and employer contributions plus the investment returns are insufficient (either because of intentional underfunding or poor investment performance), the employer must make up the difference. If contributions and investment returns exceed the amount necessary for pension payments, the employer can capture the benefits through reduced future contributions. Assuming no default risk, employees bear no risk.

With a DC plan, the only employer obligation is to make the required contributions in a timely manner. The workers' retirement benefits will be strictly a function of the combined employer-employee contributions and the investment returns. The risk is fully borne by the employee. This suggests that a movement from a DB to a DC plan with the same expected cost would result in a decrease in welfare for a risk averse employee. A risk neutral state government can smooth volatile returns. If there are differences in risk aversion between employers and employees, DB plans may be superior for both state employers and employees. Chart 9 illustrates this situation. The graph shows the tradeoff between risk and return for investors. Unlike most analyses, the return here represents the total return for a given amount of invested resources rather than rate of return. The Risk-Return frontiers give the optimal combinations of risk and total return for a given cost with Risk-Return1 representing a lower level of cost as compared to Risk-Return 2. Each Risk-Return frontier can be thought of as the combination of final portfolio values and risk that are available for a given initial investment. (In this case, the investment is the contribution

to a pension plan.) On Risk-Return 1, the amount C could be achieved with certainty while the expected value B could be achieved with the same initial cost, but with considerable risk. Movements along a given Risk-Return line are achieved by combining various assets with differing risk-return characteristics and with different correlations with other assets. The indifference curve for a representative participant demonstrates greater risk aversion as compared to the indifference curve for the pension-sponsoring government.

In this particular situation, the participant would optimize with a zero-risk at point A which is equivalent to a defined benefit arrangement. This could be achieved by investing at point A, but at considerable expense on Risk-Return2. The government could finance this pension at a much lower cost by choosing point B (on Risk-Return1) with the same total expected return, but with substantially more risk. For some reason, the government is able and willing to bear more risk than the participant. This transference of risk from the more risk averse employee to the less risk averse state employer generates real benefits. This difference in risk aversion provides a rationale for mutual gains from the provision of defined benefit plans. Participants receive a more attractive defined benefit pension at a lower cost than they could provide under similar risk-free arrangement through a defined contribution plan.

This presents an important choice in regard to the choice of plan structures. DC plans reduce the moral hazard problems, but DC plans cannot capture the possible gains from risk assignment discussed above.

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Charts

Chart 1:

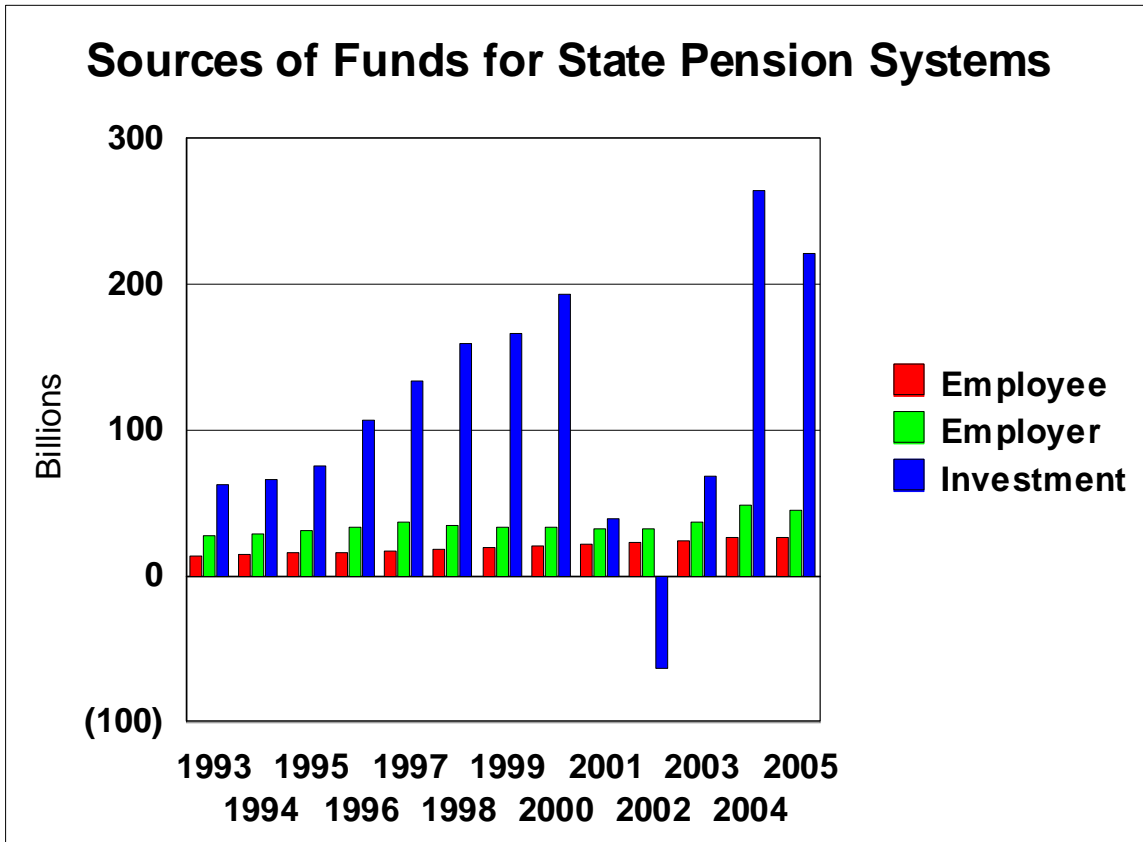


Chart 2:

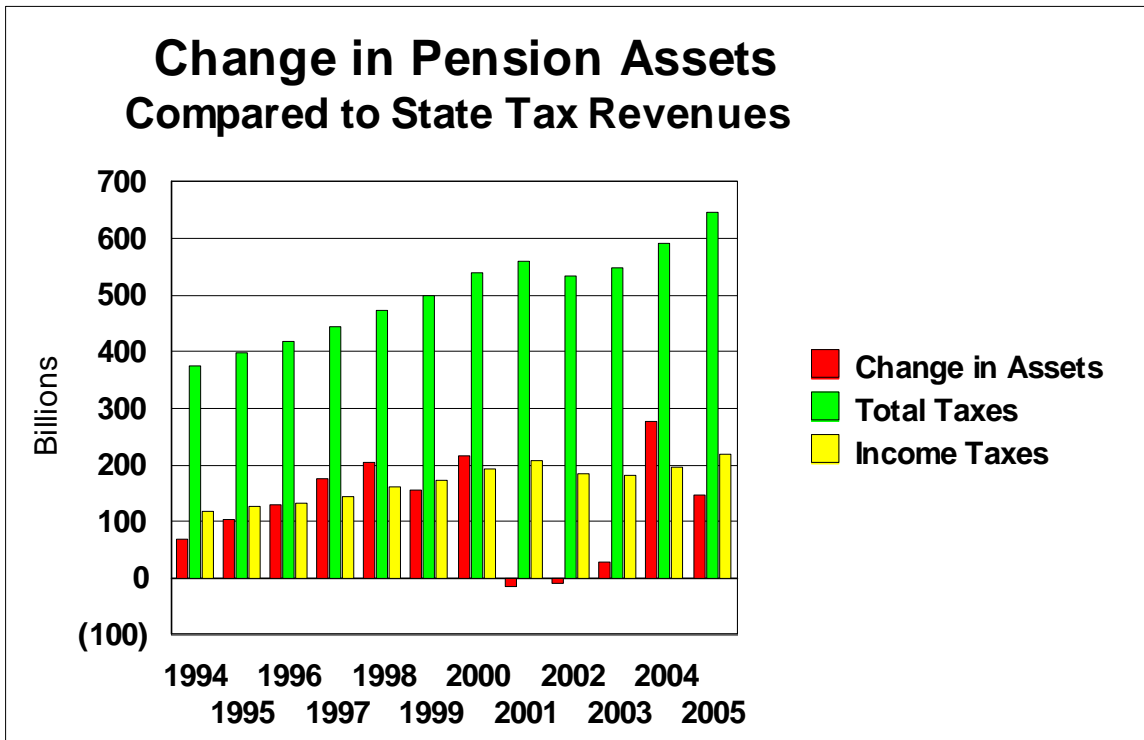


Chart 3:

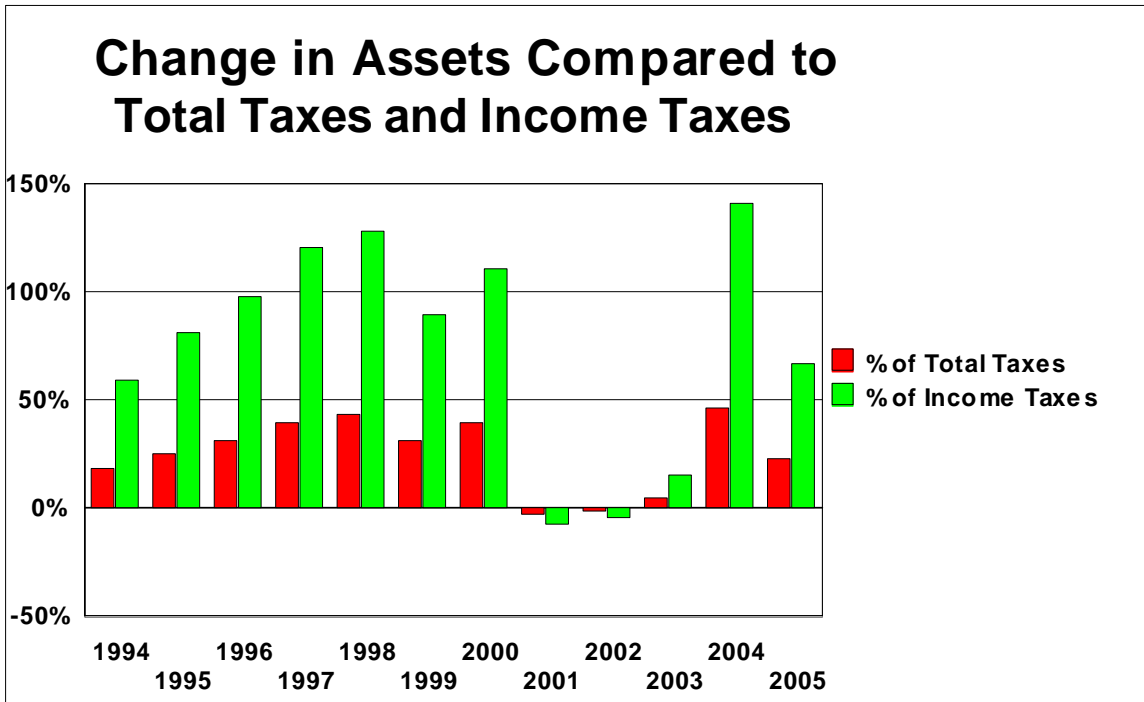


Chart 4:

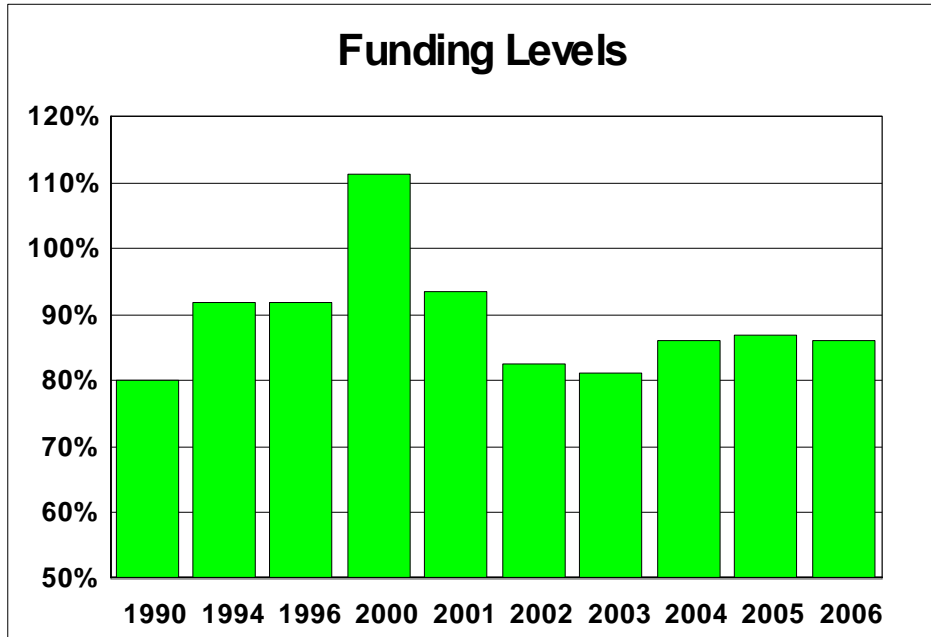


Chart 5:

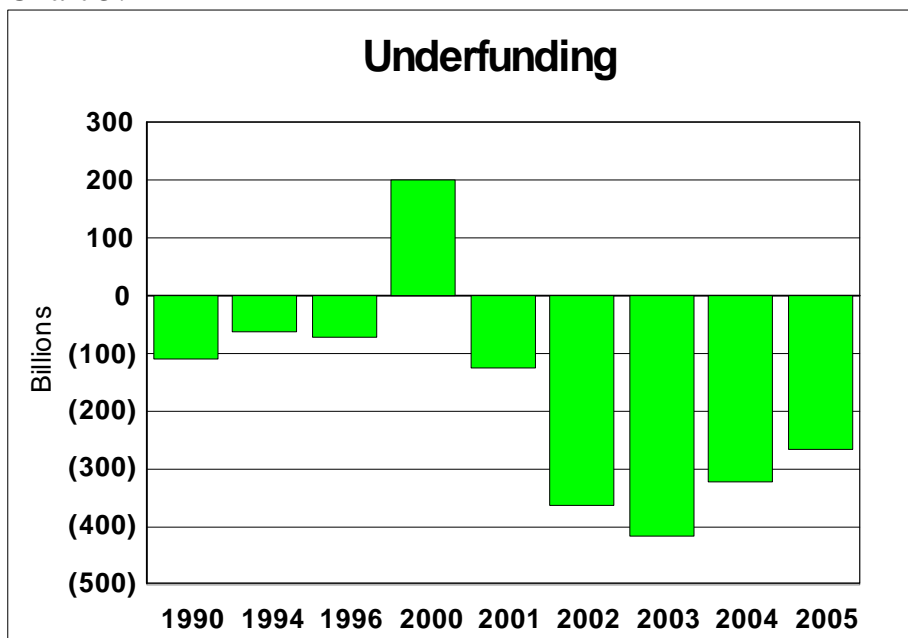


Chart 6:

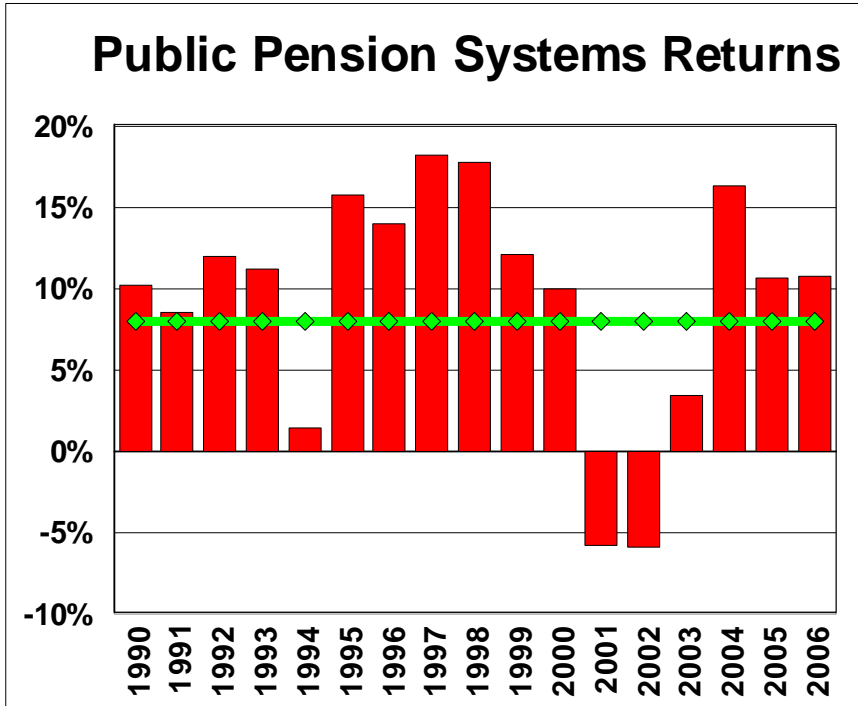


Chart 7:

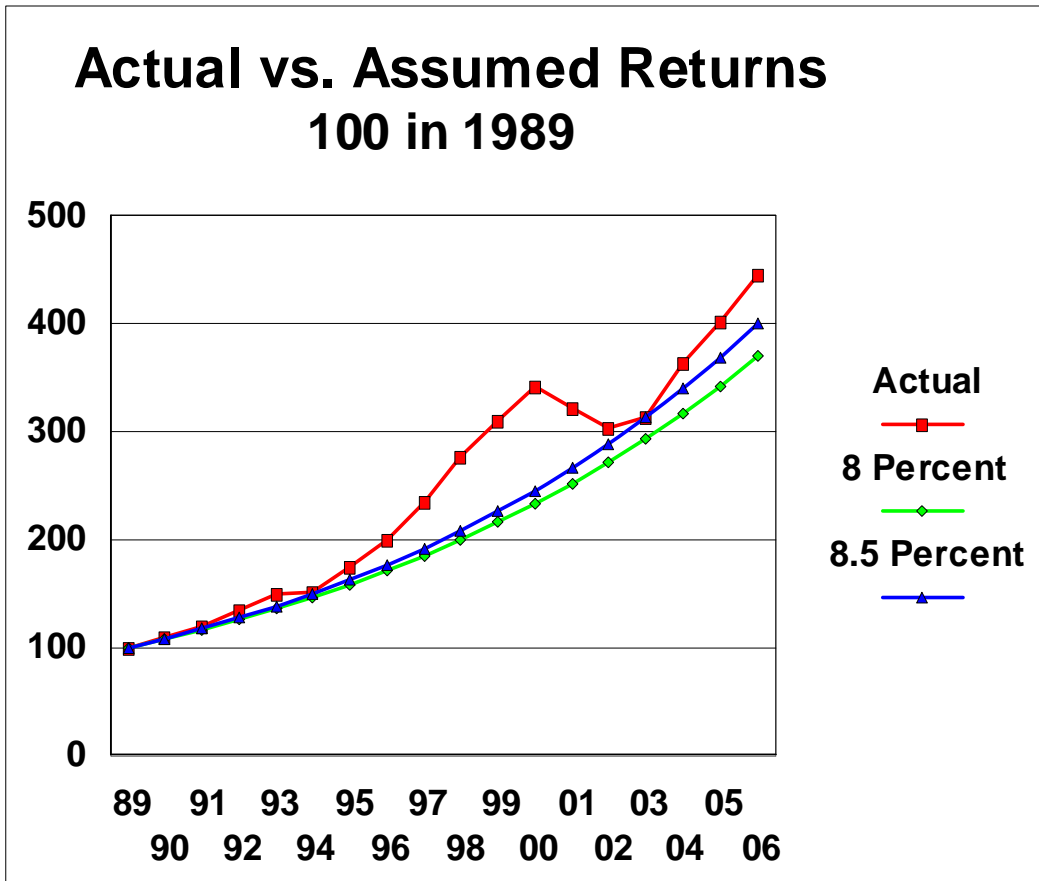


Chart 8:

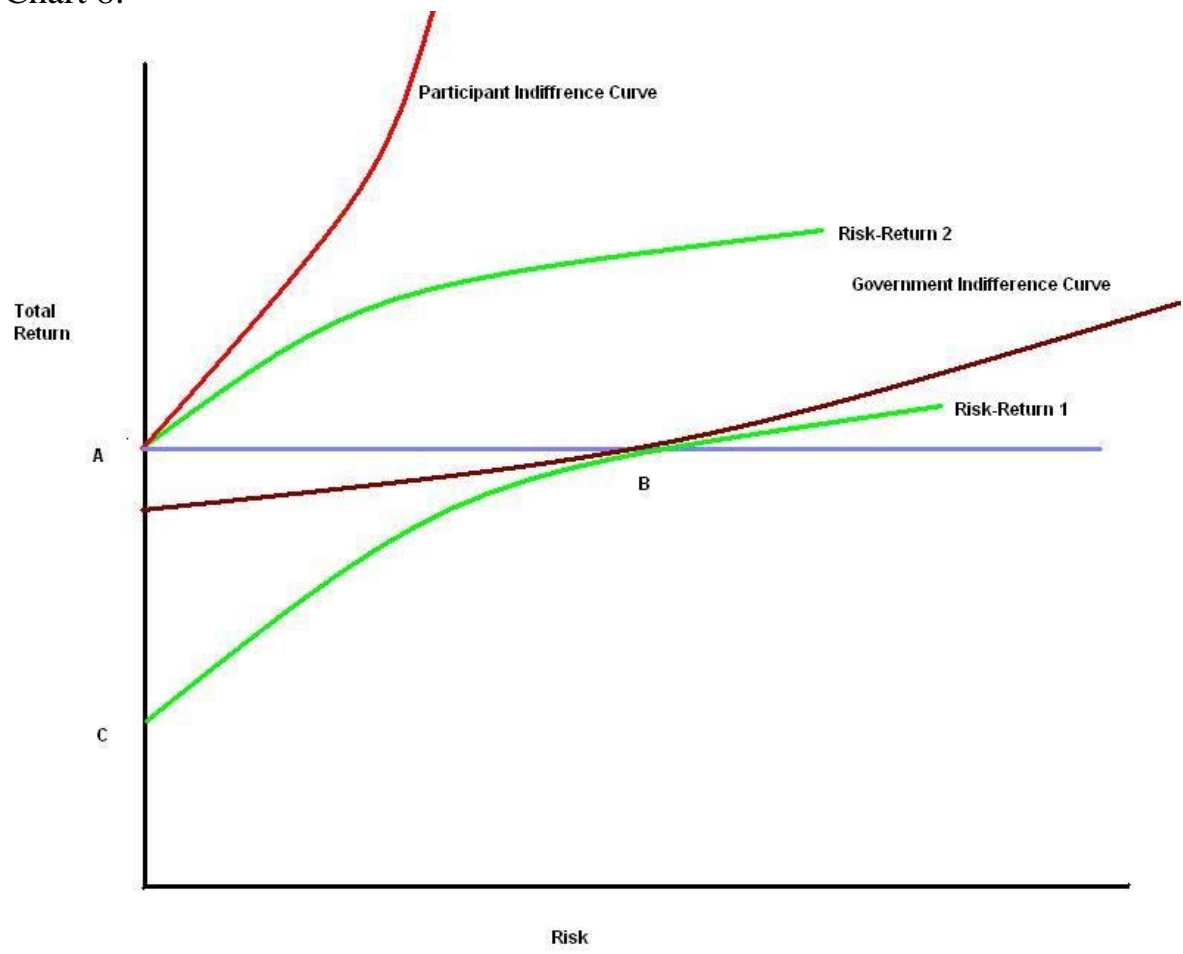


Table 1. Summary Statistics for 85 Public Pension Plans Mean (Standard deviation)			
Plan level variables	2000	2002	2004
Plan funding ratio	96.02 (18.98)	91.71 (17.19)	84.71 (15.41)
Active members	128,718 (142,130)	136,379 (149,743)	138,666 (156,686)
Beneficiaries	51,060 (56,795)	57,277 (63,798)	61,792 (67,178)
Act/Ben ratio	2.61 (0.74)	2.45 (.87)	2.22 (.68)
State fraction active	.49 (.29)		
Covers state employees?	.59 (.50)	.59 (.50)	.59 (.50)
Covers local employees?	.52 (.50)	.52 (.50)	.52 (.50)
Covers teachers?	.59 (.50)	.59 (.50)	.59 (.50)
SS coverage?	0.80 (0.40)	.80 (.40)	.8 (.4)
Early out provision?	0.51 (0.51)	.47 (.50)	.46 (.50)
Years until E.O.	28.5 (4.1)	28.4 (3.8)	28.4 (3.9)
Years until vested	6.30 (2.66)	5.9 (2.5)	5.87 (2.47)
FAS period	3.42 (.92)	3.42 (.87)	3.37 (.89)
Multiplier	1.87 (.34)	.196 (.36)	1.96 (.36)
Auto. Inflation adj?	.71 (.46)	.71 (.46)	.71 (.46)
Benefits taxed?	.56 (.50)	.56 (.50)	.49 (.50)
Interest rate assumed	8.03 (.42)	8.05 (.40)	8.00 (.39)
Wage inflation	4.50 (.81)	4.17 (.88)	3.9 (.71)
State level variables			
Number of systems	56.53 (90.89)	67.59 (154.0)	67.4 (153.5)
Total members	389,692 (389,056)	401,529 (419,871)	416,449 (440,003)
Total actives	322,447 (332,435)	330,008 (359,769)	330,995 (361,997)
Total beneficiaries	141,636 (168,957)	144,852 (166,563)	156,153 (173,571)
Total pension assets (\$ billions)	42.2 (50.3)	41.0 (51.1)	48.0 (62.4)
Fraction bonds	.16 (.11)	.17 (.09)	.16 (.10)
Fraction stocks	.35 (.18)	.35 (.14)	.37 (.16)
Total tax revenue (\$ billions)	12.5 (14.3)	12.4 (13.6)	13.6 (14.9)
State personal income tax revenue (\$ billions)	4.52 (6.86)	4.2 (6.2)	4.5 (6.5)

