

# **U.S. State Employee Pension Systems**

~

*An Investigation into the Causes  
of Unfunded Liabilities*

Chuck Truesdell  
Capstone Project  
April 15, 2011

# Table of Contents

Executive Summary.....2

## **Background**

Introduction.....3  
How Defined Benefit Plans Operate.....4  
Evaluating Retirement Plans .....5  
Literature Review.....6

## **Data**

Data Collection.....9  
Data Analysis.....10  
Employer Contributions .....10  
Investment Results .....13  
Asset Allocation.....15

## **Evaluation**

Conclusions.....18  
Caveats and Suggestions for Further Research.....19  
Final Summary.....19

## **Appendices**

Appendix A: State Pension Plans and Summary Data .....20  
Appendix B. State Pension Plans and Individual Timeline Data – ARC Ratios.....21  
Appendix C. State Pension Plans and Individual Timeline Data – Investment Performance.....22

## **Executive Summary**

Defined benefit retirement plans for state employees have come under fire, both financially and politically, following recent market volatility and subsequent losses in pension investments. Asset losses matched with liabilities that are set years in advance translate to pressures on state policymakers and plan administrators to either find ways to improve the finances of these pension systems or transition to defined contribution plans that put the financial risk on individual employees rather than the state government. Because most states are legally and contractually obligated to pay retiree benefits regardless of the pension system's financial condition — even to the point of paying benefits out of their general funds — this looming threat could be borne not just by public service retirees, but by those who receive the benefits of public schools, social services, and other important public programs.

Defined benefit plans gain funding from three sources: employee contributions, employer (state government) contributions, and earnings on investments. While the first is largely unchangeable for current workers, the latter two come under constant scrutiny. This research seeks to investigate the role these two funding sources have played in various state pension plans' financial conditions.

Using data from the U.S. Census Bureau, the National Association of State Retirement Administrators, and the Center for Retirement Research at Boston College for Fiscal Years 2001-2008, this report evaluated three aspects of plan funding: 1) employer contributions relative to actuarial recommendations, 2) investment returns, and 3) asset allocation decisions. This was done by both simple time-trend analysis and regression analysis.

This research suggests that while there is little connection between broad asset class allocation and pension plan investment returns, and little connection between investment returns and the overall financial condition of individual pension systems, two factors may play a role in pension plan finances.

First, there is a small but distinct difference in asset allocation decisions between states that had financially sound pension systems for state retirees at the end of Fiscal Year 2008, and those that did not. Better-funded plans tended to place a larger share of their investments in cash and stocks, and a smaller amount in bonds and alternative investments. Second, states that regularly contributed the full amount recommended by plan actuaries were more likely to have financially sound pension systems.

Although these results are not conclusive, they suggest that further research in this area may prove instructive to policymakers.

## **Introduction**

A 2010 report by the Pew Center on the State revealed that the aggregate shortfall in state employee pension funds was \$1 trillion.<sup>1</sup> That represents a gap between state pension systems' assets of \$2.25 trillion and the promised benefits to state workers and retirees of \$3.35 trillion. The bill for this shortfall will not come due immediately, but will have long-term implications.

There are several ramifications of such a large shortfall. Due to state laws and other factors, states are largely unable to simply ignore their obligations. If the money to pay retirees their future benefits cannot be found in the pension funds themselves, states will be forced to pay for those benefits out of their general appropriations. This, in turn, means one of two things: either tax increases, which no public official prefers, or cuts in other areas of state government. Pension obligations for public employees represent one of the three fastest-growing cost drivers of state government, along with Medicaid and corrections.<sup>2</sup> Unless states can reduce these unfunded liabilities, it seems likely that one or all of these other areas of state government will suffer.

At this time, there is also talk at the federal level of allowing states to declare bankruptcy, which could in turn allow them to reduce or shed entirely their pension obligations. This, too, would have negative consequences for the states. As of 2008, more than 7.7 million state and local government retirees in the United States were collecting pension benefits, and 19 million more workers were on a path to someday receive benefits themselves.<sup>3</sup> In all, this accounts for nearly 1 in 11 Americans' retirement security. If these retirees were to suddenly lose all or part of their pension benefits, the loss to the states' local economies would be significant. State and local public pensions contribute more than \$350 billion in economic activity, according to the National Institute on Retirement Security.<sup>4</sup> Many of these retirees would in turn attempt to return to the workforce in some capacity, exacerbating an already high unemployment rate.

Any state that was to declare bankruptcy would also find its bonding costs increase substantially, further putting the squeeze on education, public safety, and social programs. While 49 of the 50 states have balanced budget requirements, all use bonding in some form to initiate capital projects. While unfunded pension liabilities have already helped cause some states' bond ratings to be lowered, declaring bankruptcy to eliminate those liabilities would severely drive up the cost of capital construction — a cost that would in turn be borne by taxpayers and the general public.

---

<sup>1</sup> Pew Center on the States. "The trillion dollar gap: Underfunded state retirement systems and the roads to reform." February 2010. [http://downloads.pewcenteronthestates.org/The\\_Trillion\\_Dollar\\_Gap\\_final.pdf](http://downloads.pewcenteronthestates.org/The_Trillion_Dollar_Gap_final.pdf)

<sup>2</sup> Fehr, Stephen C. "Recession could reshape state governments in lasting ways." *Stateline*. February 11, 2010.

<sup>3</sup> 2008 U.S. Census Bureau State & Local Public Retirement Systems Survey.

<sup>4</sup> Boive, Ilana and Beth Almeida. "Pensionomics: Measuring the Economic Impact of State and Local Pension Plans." February 2009. <http://www.nirsonline.org/storage/nirs/documents/Pensionomics%20Report.pdf>

## **How Defined Benefit Plans Operate**

Although there are a variety of combinations, there are two basic types of retirement plans for public employees. Defined contribution plans allow employees to choose the amount of their contribution as well as the way it is invested. When they retire, the entire amount is theirs to keep.

The risk and the reward are entirely up to the employee. The employer has relative cost certainty in this scenario, because they contribute a fixed amount to each employee's individual account. This can take the form of a fixed percentage of the employee's salary or a match of the employee's own contributions up to a set threshold. Because of the financial certainty involved and the lack of long-term risk, more private and public sector employers are shifting their pension plans to this type.

Defined benefit plans set employee contributions at a fixed level, along with the employer contribution. The major difference between the two types of plans is that all participants' contributions are merged into a single investment pool, with retirees' pension benefits based on a set formula rather than the performance of their individual investments. The formula is generally set far in advance, often when the employee is first hired. Investment decisions are made by the pension plan administrators, with the employer bearing the risk if investment returns are not enough to cover promised benefits.

In some states, a hybrid of the two types is used, with employees guaranteed a minimum retirement benefit with the ability to invest on their own for additional benefits.

Although each defined benefit plan varies in its exact details, the funding sources are the same. Employees pay in a set amount of their salaries, and employers contribute a set amount of their payrolls. These payments are in turn invested by the fund administrator with the dual purposes of growing assets over time and paying out current benefits to retirees.

As a rule, states cannot simply change the terms of their defined benefits plans for retirees or current employees. State constitutions, contract law, and legal precedents require pension benefits to be paid regardless of the total amount in the pension fund. Employees' pension benefits also cannot be reduced below the level provided on the first day of employment in most states, although they can be increased.

Twenty states made changes to their employee pension plans in 2010, ranging from increased eligibility requirements for employees to changes in the benefit calculations to increased required employee contributions.<sup>5</sup> As previously stated, however, only new hires will be affected by

---

<sup>5</sup> Snell, Ron. National Conference of State Legislatures. "State Retirement Legislation in 2010: Summary Review." <http://www.ncsl.org/LinkClick.aspx?fileticket=GzW%2bswQlcbc%3d&tabid=13399>

these changes, meaning the reduced benefits will not be drawn upon for at least a generation. These changes will result in long-term financial health, but have little immediate impact.

Instead, state governments have two main ways to positively alter their pension plans' financial conditions for the near future. With one factor in the three-part funding scheme unalterable, they must change at least one of the other two revenue streams — employer contributions and investment earnings.

This research focuses primarily on those two factors — not how they might be used to improve pension plans' financial condition, but whether they contributed to the current unfunded liability.

State governments, unlike employees, have on occasion taken the opportunity to reduce the amounts they contribute to their pension funds. During good economic times, investment returns may exceed set expectations, allowing the government to reduce its contribution while remaining above the funding ratio considered financially sound. This may be considered politically prudent when other construction projects or social services may be short-term priorities.

In economic downturns, these same infrastructure improvements and social services may be seen as more urgent, with the long-term financial picture of the pension system a lower priority.

Fund administrators' investment decisions can also be influenced by market conditions. When the market is doing well, “crowd behavior” dictates that investors move toward popular choices. These included technology stocks in the late 1990s and real estate and financial derivatives in the last decade. When the bubble bursts in these investments and returns consequently drop, decisions are made with a focus on above-average returns and the accompanying above-average risks.

### **Evaluating Retirement Plans**

Although each of the plans included in this report share a common setup, the specifics of each plan are highly varied. Each plan has different requirements for how long employees must work to ensure maximum guaranteed benefits at retirement as well as how much of their salary each employee must contribute. Likewise, each plan uses a different formula to calculate an employee's retirement benefits. While some systems may simply use an employee's final salary, others use an average of the employee's highest three years — or five years, ten years, and such. Each also has its own “retirement factor” — a specific percent of salary, set by law or policy, used in calculations for benefits.

Due to changes in retirement plans over time, each pension system may also have within it a variety of formulas used to calculate retirement benefits, based on when an employee first entered government service. It is also common for different subsets of employees to have their retirement benefits calculated using different formulas, different restrictions imposed on them in terms of required service for full pensions, and different required employee contributions. For example, it is common in many states that police officers, firefighters, and other hazardous-duty employees to pay more into their plans in exchange for fewer years required for full retirement benefits.

Additionally, each system uses different criteria in actuarially assessing its long-term finances. On the assets side of the ledger, each system has its own expected rate of return, which it uses to make investment decisions. (In turn, policymakers use these expectations to determine employee benefits going forward.)

In terms of liabilities, each system also sets its own expected rate of inflation. These expectations varied from 2.5% annual inflation to 5%, and over the 30-year horizon used to calculate pension liabilities, those small differences can make a substantial difference in the assets-to-liabilities ratio used to measure a pension plan's financial condition.

The assets-to-liabilities to ratio — “funding ratio” for short — is the traditional measure of a pension plan's financial condition. To calculate this, a plan actuary calculates the amount of benefits that are expected to be paid out over the long term. Thirty years is the industry standard for this calculation. Those long-term liabilities are then discounted by the expected rate of inflation to arrive at the plan's “current” liabilities. The plan's current assets are then compared to the current value of the liabilities to arrive at the plan's funding ratio.

Guidelines issued by the Governmental Accounting Standards Board, which sets financial reporting standards for state and local governments, currently assume that an 80% funding ratio is acceptable or “healthy” when determining the financial condition of a pension plan — that is, the plan currently has 80% of the funds necessary to pay expected benefits over the plan's set long-term horizon. This allows plan administrators and government a period of time to either boost investment returns or to increase employer contributions.

## **Literature Review**

A number of studies and research projects have been conducted on the issue of public pension sustainability, especially in the last decade due to market volatility. These studies have been both academic and practice-driven. They have also looked at the issue from a variety of viewpoints, most commonly what characteristics define higher-funded (“better”) pension plans

from lesser-funded plans and what aspects of their funding and financial mechanisms have contributed to those conditions.

One major topic of contention is whether defined-benefit plans like most state pension plans are sustainable regardless of typical characteristics.<sup>6</sup> Given certain commonly-assumed parameters, including an 8% expected rate of return, “states in aggregate will run out of funds in 2025.” States are not funded in aggregate, however — each state pension plan is guaranteed to some degree by its individual state government. Using the same assumption of an 8% annual return, 28 states will be forced to pay for employee pension plans out of the general receipts by 2025 — leaving the minority in relatively good financial shape.<sup>7</sup> If projected returns are reduced only slightly, from 8% to 6% annual return, the number of state pension plans unable to meet their immediate pension obligations in 2025 rises to 38.<sup>8</sup>

One problem in determining the future of state pension plans — beyond the impossibility of predicting the markets — is calculating liabilities. Actuaries tend to use a flat 8% discount rate when figuring future obligations, regardless of time horizon or potential future conditions.<sup>9</sup> Few states actually achieve that return on investment over the long term, undervaluing their liabilities.<sup>10</sup> As a result, even states that maintain their full employer contribution at actuarially recommended rates could at some point be underfunded.

Among the variables studied to explain the difference in states’ unfunded liabilities’ have been per capita income, managerial influence, political influence, concentration of state employees, and employer contributions.<sup>11</sup> Of the three factors deemed to be significant influences on unfunded pension liabilities, two were outside the scope of this research (state governments’ fiscal constraint and financial management practices) because they focus on state financial characteristics as a whole. The third factor, however, is related indirectly to this project: the required employer contribution. The research suggests that states that require larger employer (that is, state government) contributions tend to have larger unfunded liabilities. This is likely related not to the requirements themselves, but in the state’s decisions to not adhere to those requirements.

---

<sup>6</sup> Rauh, Joshua. “Are State Public Pensions Sustainable?”. December 31, 2009.

<sup>7</sup> Ibid.

<sup>8</sup> Ibid.

<sup>9</sup> Ibid.

<sup>10</sup> Munnell, Alicia H., Richard W. Kopcke, Jean-Pierre Aubry, and Laura Quinby. “Valuing Liabilities in State and Local Plans.” Center for Retirement Research at Boston College. June 2010.

<sup>11</sup> Cogburn, Jerrell D. and Richard C. Kearney. “Trouble Keeping Promises? An Analysis of Underfunding in State Retiree Benefits. *Public Administration Review*. Vol. 70, Issue 1. January/February 2010.

That likelihood of continuing full employer contributions — and perhaps even exceeding them in many cases to hedge the possibility of continued market underperformance — is affected by four factors that have affected employer contributions in the past.<sup>12</sup> Two of these factors are outside the scope of this research — the number of employees or retired employees on the pension systems' governing boards, and whether employees are eligible for Social Security. The other two are related to this project — funding discipline and actuarially recommended employer contributions (ARC) as a percentage of payroll. This second factor is related to Coggburn's variable of required contribution.

In both Coggburn and the just cited Munnell research, an unsurprising fact emerged: as the ARC grew for states, their likelihood of actually contributing 100% of that amount fell. This suggests that if liabilities were calculated differently, enlarging the ARC for each state, even more would fall short of 100% ARC funding in any given year.

The other factor that will be studied in my research is the effect of investment decisions by the administrators of the pension plans. These can be constrained by statute or regulation, but regardless, fund administrators are given broad leeway both in terms of categories of investments and specific investments within those categories. The biggest factor in funding ratio changes between 1988 and 2005 was the investment return of the pension plan<sup>13</sup>, but this does not account for any difference in individual investment decisions.

This report supplemented other research, however, in finding that plans that did not receive their full ARC funding in multiple years were more likely to have lower funding ratios. Rather than the more dire predictions of other reports, however, the GAO suggested that given the broad time horizon for public investment pools, state governments could slowly increase their contributions and reduce benefits in order to restore the financial soundness of their pension plans, just as they reached instability over a period of time rather than overnight.

A later GAO report<sup>14</sup> focused on the change in investment practices for state and local government pension plans. As these plans take on additional risk to boost returns and overcome their funding shortfalls, investment strategies alone will not be enough to restore complete fiscal

---

<sup>12</sup> Munnell, Alicia H., Jean-Pierre Aubry, and Laura Quinby. "Public Pension Funding in Practice." National Bureau of Economic Research. October 2010.

<sup>13</sup> United States Government Accountability Office. "State and Local Government Retiree Benefits." Report to the Committee on Finance, U.S. Senate. January 2008.

<sup>14</sup> United States Government Accountability Office. "State and Local Government Pension Plans." Report to the Ranking Member, Committee on Finance, U.S. Senate. August 2010.

soundness to most plans. In fact, the opposite is just as likely — that the riskier investments will suffer losses and exacerbate the unfunded liabilities.

On the other hand, some of these riskier investments, ranging from hedge funds to real estate and commodities, can be seen as diversifying pension plan portfolios and helping to smooth returns, enhancing predictability.

None of the reports cited here has studied whether investment category choices have significantly affected pension plan funding ratios, leaving open an avenue for future research — namely, whether there may be some best practices or most advisable asset allocation that is best at smoothing out returns and offering a more predictable revenue stream.

### **Data Collection**

Each year, the U.S. Census Bureau conducts its State & Local Public Retirement Systems Survey, collecting information on the membership, assets, revenues, and expenditures of more than 1,000 public defined benefit pension plans. Notably absent in this dataset is each plan's actuarial liabilities as well as the actuarially recommended employer contribution.

Both the National Association of State Retirement Administrators and the Center for Retirement Research at Boston College also conduct their own studies and data collection in this field. NASRA, in association with the National Council on Teacher Retirement, have conducted the Public Fund Survey each year beginning in 2001. CRR also maintains a separate database of state and local retirement system data dating back to 2001. These three databases were compared to ensure data integrity and to eliminate from the research any pension systems for which there was conflicting or insufficient data.

Beginning with a universe of 50 retirement systems for general state employees, plans were eliminated from the dataset for two reasons. First, some states during the considered time frame moved to a 401(k)-style defined contribution pension plan, which altered their assets-to-liabilities ratio outside the scope of this research. Alternatively, one state changed its plan from one in which all contributions came from the government to one in which employees also contributed, skewing later asset data.

Second, for some states the Census Bureau collates data for multiple retirement plans into a single report so that the numbers for Census data and NASRA/CRR do not match. This means that the funding ratio for those states could not be accurately calculated. Eliminating these states from the group resulted in a final dataset of 33 state pension plans.

## **Data Analysis**

The 33 plans evaluated were separated into three categories based on their funding ratios at the end of Fiscal Year 2008. (Each plan’s data was used according to the plan’s own fiscal year. Of the 33 plans, 26 ended their fiscal years on June 30, one ended on August 31, one ended on September 30, and the remaining five ended on December 31.)

“Solidly funded” state employee pension plans had a funding ratio above 95%, meaning that a single year of significantly above-average investment performance or employer contributions could return them to 100% funding or better.

“Adequately funded” plans’ funding ratios were between 80% and 95%. All these plans qualified as “healthy” under GASB standards, but must show some improvement over time in order to meet all their long-term obligations.

All states with funding ratios below 80% were grouped as “inadequately funded.” These plans did not, as of the end of FY 2008, meet GASB standards for funding and could have serious trouble meeting their long-term obligations if substantial steps are not taken to improve funding levels.

**Table 1. Description of Report’s Tiered System**

<b><u>Category</u></b>	<b><u>Solidly Funded</u></b>	<b><u>Adequately Funded</u></b>	<b><u>Inadequately Funded</u></b>
Funding ratio	>95%	80-95%	<80%
No. of States	12	11	10

There were 12 plans classified as solidly funded, 11 plans classified as adequately funded, and 10 plans classified as inadequately funded.

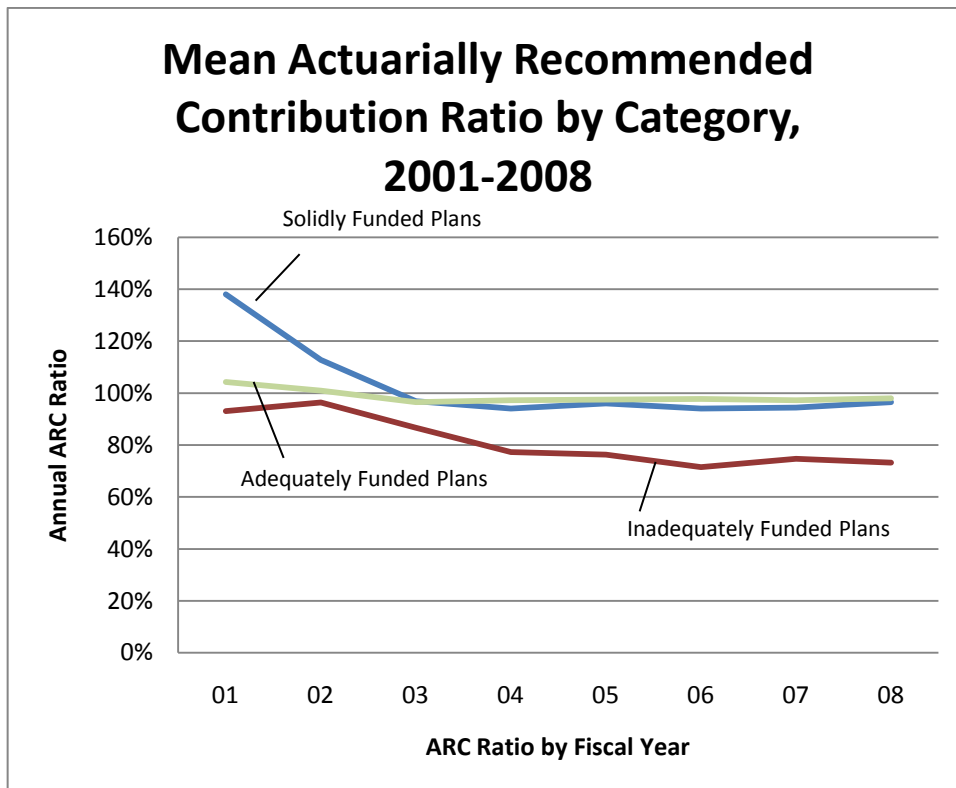
The state employee pension plans within each category were then compared to discover similarities in terms of employer contribution and asset allocation trends, and each category was in turn compared to the summary data from the other categories.

## **Employer Contributions**

For each fiscal year, plan administrators and their actuaries calculate the Actuarially Recommended Contribution, or ARC. This is the amount necessary to maintain the plan’s ability to pay benefits given such parameters as expected inflation and the expected rate of return on invested funds. As stated in its name, this is merely a recommendation by plan administrators; state policymakers can choose to fund the plan at a higher or lower amount for reason stated previously. The actual employer contribution, as decided by state policymakers, is called the ARC ratio when stated as a percentage of the ARC.

Legislators in states with solidly funded plans, on average, contributed at or near 100% of ARC each year during this study period. On average, legislators in states with adequately funded plans contributed 91% of the ARC in any given year. The two categories were fairly similar in contributions the last six years, with solidly funded plans contributing significantly more than the ARC in FY 2001 and 2002, potentially accounting for the overall difference in the two groups. Inadequately funded plans, meanwhile, never met the full ARC in any year on a mean basis.

Figure 1.



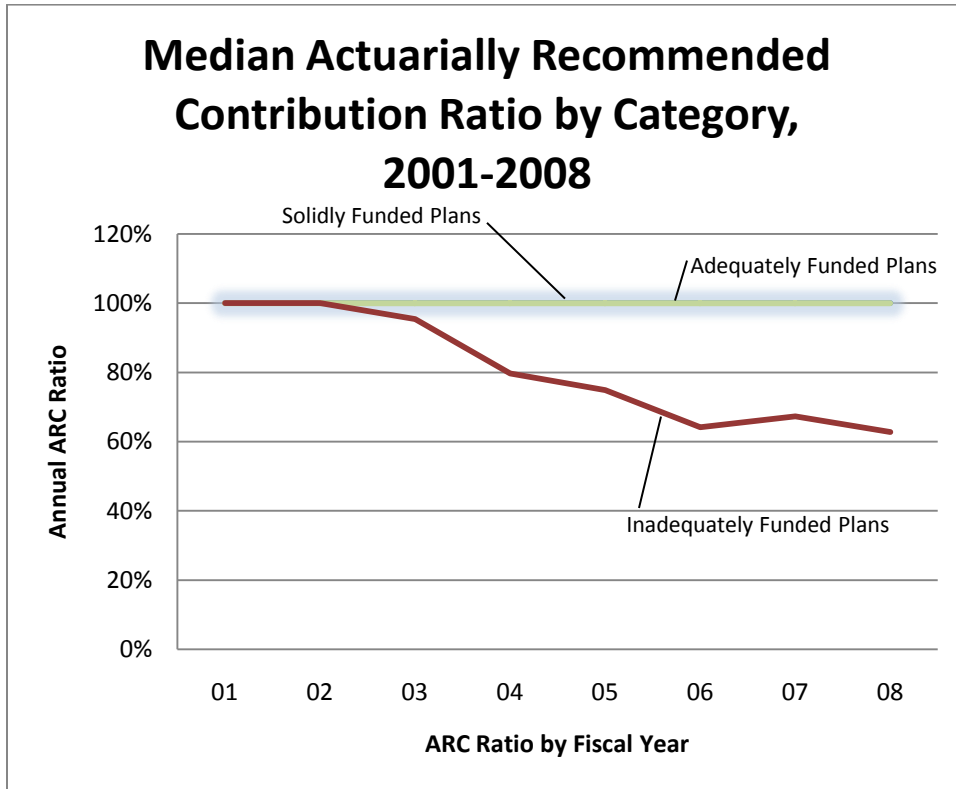
Source: Author Construction from Data Supplied by the National Association of State Retirement Administrators and the Center for Retirement Research at Boston College

Given the small sample size for each category, one state’s outsize contribution could skew these results. Indeed, in FY 2001 Wyoming contributed 483 percent of its ARC, and in FY 2002 Pennsylvania paid in 222%. Both were in the “solidly funded” category. At the other end, among inadequately funded plans, New Jersey contributed only 13% of the ARC in FY 2001 and 10% in FY 2002.

However, the median figures for each category reflect a similar trend. The median figure for both solidly funded and adequately funded plans was a full 100% ARC payment. The median

inadequately funded state, meanwhile, made its full ARC contribution in the first two years, then continued to drop thereafter. On this basis, the average annual ARC payment was 84%.

Figure 2.



Source: Author Construction from Data Supplied by the National Association of State Retirement Administrators and the Center for Retirement Research at Boston College

Looking at individual states within each category (See Appendix B), the only states within the solidly funded category that fell below 100% ARC funding in any year were Pennsylvania, Massachusetts, and Wyoming, which all had contribution spikes earlier in the time frame that offset those decreases.

Among adequately funded plans, only Virginia fell significantly below full ARC funding in any given year — 68% in FY 2003. Each state largely grouped around the 90-100% percent range, however.

Given the wider range of final funding ratios among inadequately funded plans, the variety of ARC contributions is unsurprising. Among these 10 states, only South Carolina and Alabama met their full ARC contribution in every year.

Taken together, this data suggests that there is a strong correlation between the degree to which employer contributions follow actuarial recommendations and their funding ratios as of the

end of FY 2008. The exceptions, notably South Carolina and Alabama, however, merit further investigation.

### **Investment Results**

The other area that can be changed in the short-term is a pension system's asset allocation — that is, the amount invested in various categories, including stocks, bonds, and other areas.

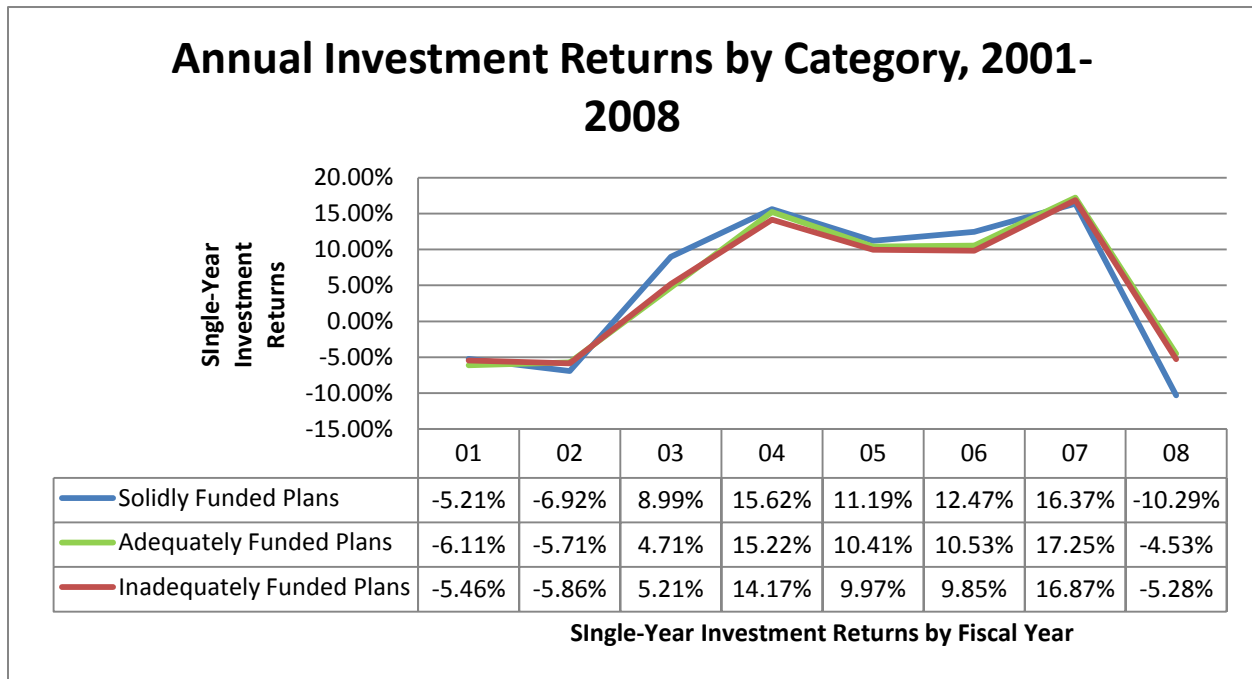
The Center for Retirement Research dataset contained information on annual investment returns for each system, as self-reported by the plans themselves, as a percentage increase on the previous year's funds minus paid benefits and expenses. For the purposes of this study, the data was compiled in two ways. First, each year's annual investment returns were added together and then divided by eight to arrive at an average annual return for the period.

For example, Kentucky's state employee pension plan saw investment returns over the eight-year study period of -5.4%, -4.3%, 4.3%, 13.6%, 9.3%, 9.7%, 15.3%, and -4.2%. The mean for these eight annual figures was 4.78%.

Second, the returns were calculated cumulatively, since heavy losses early in the study period, when the technology bubble burst, could affect the amount gained in later investments. Similarly, large gains and losses, when compared to smaller variance, can have the same average, the investment proceeds can differ greatly. Although this does not account for the portions of the fund paid out to retirees over the time frame, it can be a suitable proxy for longer-term investment performance. The previously cited numbers for Kentucky resulted in a total return for the period of 42.01%.

In comparing the three tiers against each other, there is very little difference in any single fiscal year. The largest variance among the three categories was in 2003, when solidly funded states on average outperformed adequately funded states by 4.28 percentage points, and in 2008, when they underperformed by 5.76 percentage points. Looking at the rank order of states by both average annual return and by cumulative return shows no demonstrable order or pattern to the results.

Figure 3.



Source: Author Construction from Data Supplied by the National Association of State Retirement Administrators and the Center for Retirement Research at Boston College

Notably, of the two states that were in the inadequately funded group despite maintaining high ARC ratios throughout the study period, South Carolina had relatively positive investment results, while Alabama’s were among the bottom. (See Appendix C.) Also notable was that the state with the worst investment performance by both methods of calculation, Wyoming, was a solidly funded state. In fact, of the three states with the worst investment performances in the final year — Wyoming, Pennsylvania, and Ohio — all three finished with relatively healthy pension systems.

## Asset Allocation

The Census Bureau dataset includes information on asset allocation among four broad categories during this time frame: stocks, bonds, cash and other highly liquid investments, and all alternative investments. The last category can include real estate, financial derivatives, and any other investment programs.

Three regression models were run using this dataset, using three separate investment return bases. The first two were the cumulative return over the eight-year study period for each of the 33 plans (33 total observations) and the mean annual return for each plan (33 observations). For each of these, the mean asset allocation to each of the four asset classes was used to gauge correlation.

The third model used each state's annual returns — 33 states and eight years. Data on Ohio's 2001 investment returns were unavailable, leaving a total of 263 observations. This last dataset used the reported asset allocation for each plan in each year, since the exact percentage changed over the course of the study period.

For each regression model, a dummy variable was used for the funding category to test whether states that were in the two lower-funded categories experienced investment returns that were lower or higher at a statistically significant level.

The results of these regression models suggests that only one asset class, stocks, is statistically significant in any way. In two of the three regression models (annual returns and average returns), stocks showed a slightly negative correlation with investment results at the 95% confidence interval. Even in these two scenarios, the statistical significance did not translate to true

**Table 2. Regression Analysis Models**

Annual Returns		
<u>Variable</u>	<u>Coefficient</u>	<u>P-value</u>
Cash	0.017	0.499
Stocks*	-0.033	0.030
Bonds	0.025	0.326
Adequately Funded Category	-0.047	0.942
Inadequately Funded Category	-0.501	0.448

**Adjusted R-Squared: 0.833**

**No. of Observations: 263**

\* - Significant at the 95% level

Average Returns		
<u>Variable</u>	<u>Coefficient</u>	<u>P-value</u>
Cash	0.005	0.814
Stocks*	-0.033	0.030
Bonds	-0.004	0.875
Adequately Funded Category	-0.007	0.987
Inadequately Funded Category	-0.414	0.375

**Adjusted R-Squared: .082**

**No. of Observations: 33**

\* - Significant at the 95% level

Cumulative Returns		
<u>Variable</u>	<u>Coefficient</u>	<u>P-value</u>
Cash	0.153	0.581
Stocks	-0.381	0.054
Bonds	-0.039	0.912
Adequately Funded Category	2.213	0.696
Inadequately Funded Category	-1.724	0.776

**Adjusted R-Squared: 0.023**

**No. of Observations: 33**

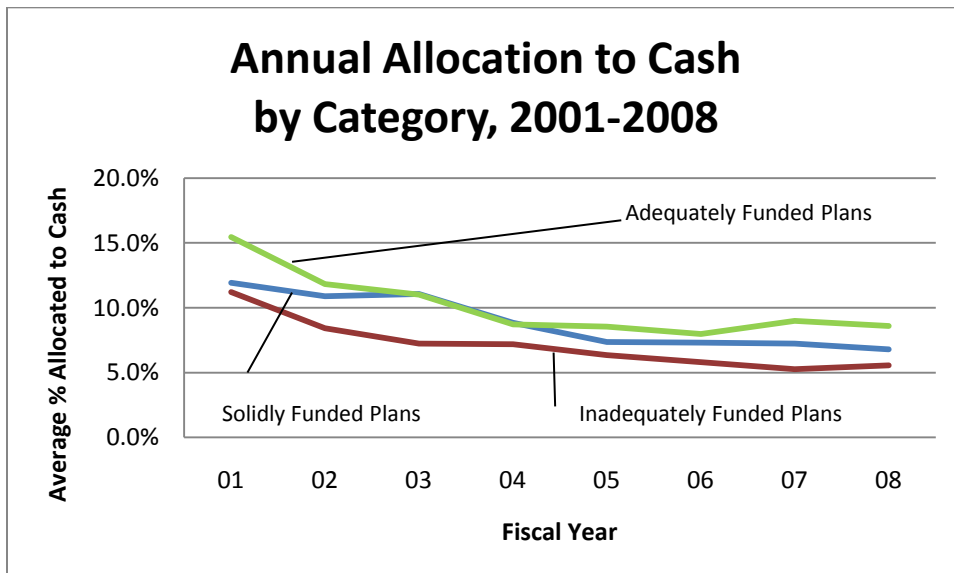
financial significance. In both models, it required an increase of 30% of the total portfolio allocated to stocks to result in a 1% decrease in investment performance.

In addition, of the three regression models, only the one that studied annual returns had a high Adjusted R-Squared value, suggesting it might be useful to use that model as a predictor of future results.

In short, this analysis suggests that broad asset classes themselves were not significant determinants of investment performance. This does not, however, eliminate the possibility that individual choices within those classes may have played a role.

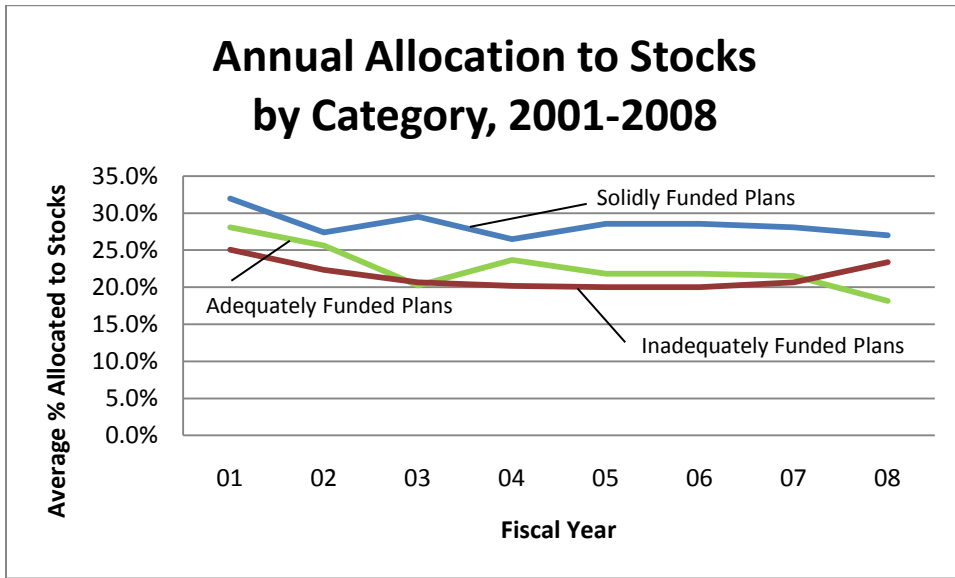
Following the regression analysis, a second, simpler form of analysis was conducted. The next set of graphs once again separates the states into the three categories, with each group's mean asset allocation by year. The resulting graphs show that on average, inadequately funded plans devoted less of their portfolio to cash and stocks throughout the cycle, regardless of market conditions, while generally allocating more to bonds and to alternative investments. Alternative investments, as stated earlier, captures a widely varied universe of assets, ranging from real estate to financial derivatives to private equity. Many of the assets in this category, however, saw a growing bubble along with the stock market climb during the middle of the decade and a notable bursting of said bubble in late 2007 and throughout 2008.

Figure 4.



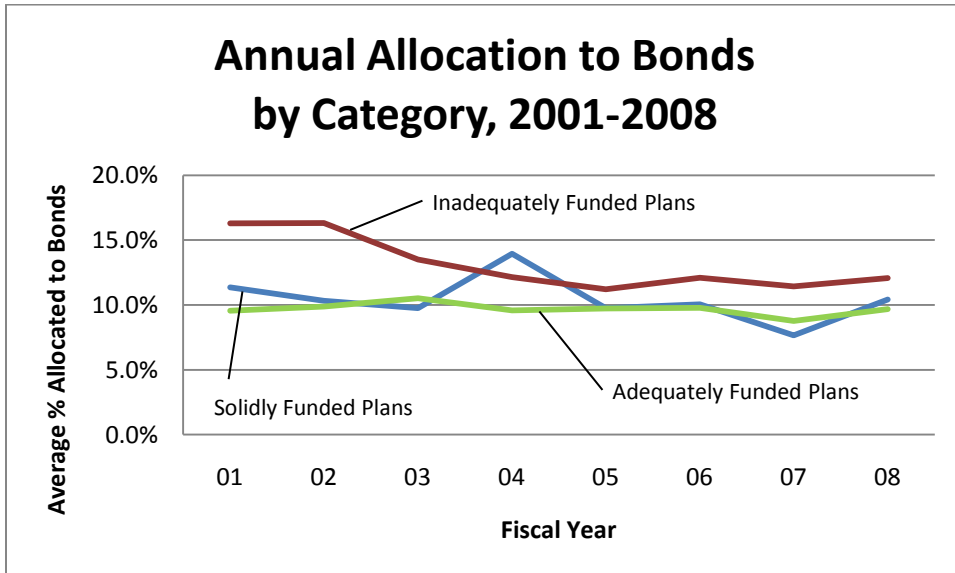
Source: Author Construction from Data Supplied by the U.S. Census Bureau State & Local Government Employee Retirement Systems Survey

Figure 5.



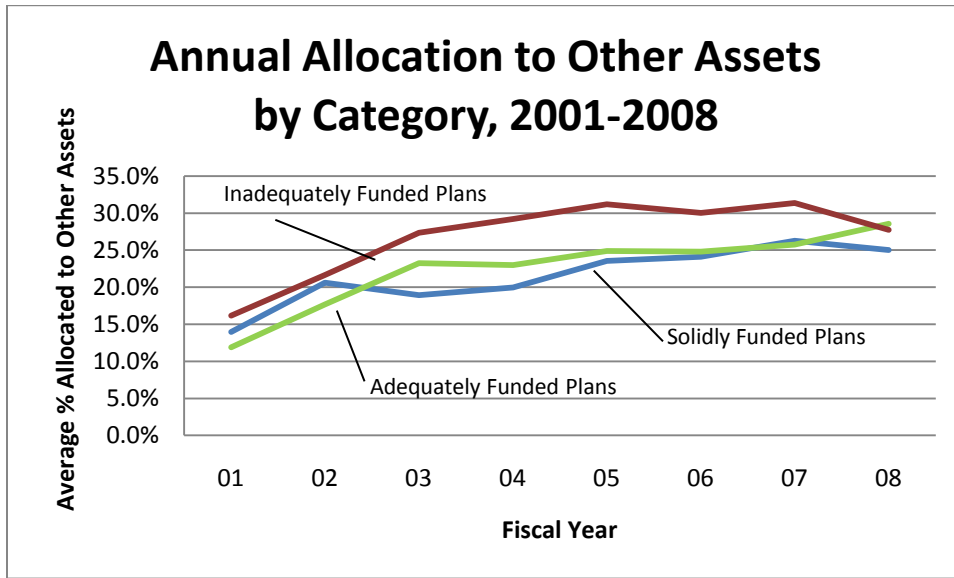
Source: Author Construction from Data Supplied by the U.S. Census Bureau State & Local Government Employee Retirement Systems Survey

Figure 6.



Source: Author Construction from Data Supplied by the U.S. Census Bureau State & Local Government Employee Retirement Systems Survey

Figure 7.



Source: Author Construction from Data Supplied by the U.S. Census Bureau State & Local Government Employee Retirement Systems Survey

## **Conclusions**

Individual state investment performance was not a significant determinant of end-of-FY 2008 financial condition under the parameters of this research. There was a wide variation within each tier in terms of investment returns, and state pension plans with high returns — and conversely low returns — were just as likely to remain in financial peril as of FY 2008 as they were to be fully funded.

A somewhat stronger indicator of financial strength was asset allocation, with a noticeable pattern emerging between inadequately funded plans on the one hand and solidly funded and adequately funded states on the other. State financial pension plans that remained in sound financial shape tended to allocate a larger share of their portfolio to cash and stocks and a lower share to bonds and alternative asset classes than state pension plans that remain in financial condition. Taken as individual states and not as groups, however, regression analysis suggests little if any relationship between asset allocation and investment performance.

The strongest correlation was between pension plan strength and employer contributions. State governments that regularly contributed 100% of the amount recommended by actuaries were much more likely to end FY 2008 in sound financial condition than states that regularly paid in less than was recommended.

These results suggest that, while states continue to investigate the possibilities of defined contribution schemes or hybrid models, those that choose to maintain defined benefit plans in the

future should begin their programs to restore financial health by increasing their employer contributions. Given that many have shortchanged their earlier contributions, they may choose to follow the models of Pennsylvania, Wyoming, and Massachusetts, which offset smaller contributions in some years with contributions above 100% in other years.

### **Caveats and Suggestions for Further Research**

The report serves to point future research in a helpful direction. The outlier of South Carolina, which regularly contributed full funding and realized some of the most impressive investment returns, suggests there may be other factors in play here.

Specifically, this report considers each state's investment returns as opposed to other states' returns, not against the state's own expectations for investment returns. States with outsized performance expectations may do well in the market relative to other states but still fall behind in terms of its own financial condition because of benefits promised to retirees and current workers based on that expected rate of return.

Second, due to data limitations and author time constraints, this report considers a consolidated eight-year time frame in which the market experienced two bubbles. A longer time frame dating back to the mid-1990s may give more evidence of long-term problems in those states whose pension plans face peril.

Third, the small sample size of 33 states may not allow for the conclusions to be generalized to other systems, including pension systems specialized for teachers, local workers, or hazardous-duty-only workers.

### **Final Summary**

As state-level policymakers from elected lawmakers to appointed plan administrators look to improve the funding level of their state employee pension plans — or maintain that funding level in states that are already at that level — the results of this research suggest that consistent employer contributions of 100% of the actuarial recommended level is the most likely path for a financially sound pension plan. For those plans that are not currently in sound condition, employer contributions of greater than 100%, when fiscally possible, are more likely to help restore financial soundness than any sort of asset allocation change.

## Appendix A. State Pension Plans and Summary Data

State Pension System	2008 Funding Ratio	Category	Avg. ARC Ratio, 2001-2008	Avg. Portfolio Allocation to Cash	Avg. Portfolio Allocation to Stocks	Avg. Portfolio Allocation to Bonds	Avg. Portfolio Allocation to Other Holdings
South Dakota	105.78%	Solid	100.0%	23.2%	37.1%	10.5%	29.2%
Florida	105.05%	Solid	101.6%	13.5%	40.8%	19.1%	26.6%
Pennsylvania	103.67%	Solid	89.0%	8.8%	13.9%	10.5%	66.8%
Wisconsin	101.76%	Solid	99.9%	9.2%	44.8%	10.3%	35.7%
New Mexico	99.61%	Solid	100.0%	21.1%	40.4%	16.4%	22.2%
Ohio	99.61%	Solid	100.0%	9.1%	45.1%	17.1%	28.7%
Wyoming	97.90%	Solid	143.3%	21.8%	56.4%	16.0%	5.8%
California	97.16%	Solid	100.0%	6.5%	40.1%	15.9%	37.6%
Delaware	96.83%	Solid	100.0%	2.9%	49.9%	19.6%	27.6%
Massachusetts	95.27%	Solid	101.1%	1.3%	11.6%	6.6%	80.6%
Iowa	95.18%	Solid	91.3%	8.3%	18.2%	12.9%	60.5%
Maine	95.03%	Solid	103.0%	14.8%	19.3%	5.0%	60.9%
Nevada	93.28%	Adequate	96.9%	13.1%	38.7%	18.3%	29.9%
Idaho	91.65%	Adequate	111.7%	8.8%	40.5%	22.6%	28.1%
Virginia	91.44%	Adequate	86.5%	9.1%	29.4%	17.1%	44.4%
Georgia	89.18%	Adequate	100.0%	44.5%	46.6%	5.2%	3.7%
Missouri	88.49%	Adequate	100.0%	26.1%	20.6%	8.5%	44.8%
Vermont	87.30%	Adequate	97.0%	8.3%	36.4%	28.3%	27.0%
Mississippi	86.19%	Adequate	98.4%	15.2%	42.6%	26.2%	16.0%
Arizona	83.97%	Adequate	100.0%	15.2%	58.3%	13.0%	13.4%
Texas	81.10%	Adequate	95.1%	27.7%	39.6%	15.5%	17.3%
Arkansas	80.81%	Adequate	100.0%	10.6%	51.7%	14.7%	23.0%
Rhode Island	80.69%	Adequate	100.0%	13.3%	16.3%	6.1%	64.3%
Minnesota	79.34%	Inadequate	91.2%	0.6%	17.7%	8.3%	73.3%
South Carolina	78.37%	Inadequate	100.0%	23.7%	17.3%	29.9%	29.0%
New Hampshire	75.01%	Inadequate	96.9%	6.8%	43.2%	18.4%	31.7%
New Jersey	73.47%	Inadequate	39.1%	2.0%	36.0%	34.0%	28.0%
Oklahoma	72.35%	Inadequate	61.2%	18.0%	30.9%	19.6%	31.5%
Kansas	71.25%	Inadequate	70.8%	15.9%	32.0%	20.1%	31.9%
Alabama	70.43%	Inadequate	100.0%	5.1%	44.6%	32.9%	17.4%
Kentucky	66.51%	Inadequate	76.2%	9.6%	55.6%	21.8%	12.9%
Louisiana	65.36%	Inadequate	99.1%	11.7%	35.7%	14.9%	37.7%
Illinois	48.38%	Inadequate	76.9%	7.3%	16.9%	4.1%	71.8%

**Source:** Author's construction based on data provided by the National Association of State Retirement Administrators and the Center for Retirement Research at Boston College.

**Appendix B. State Pension Plans and Individual Timeline Data – ARC Ratios**

<b>State Pension System</b>	<b>Category</b>	<b>2001</b>	<b>2002</b>	<b>2003</b>	<b>2004</b>	<b>2005</b>	<b>2006</b>	<b>2007</b>	<b>2008</b>	<b>AVG</b>
South Dakota	Solid	100%	100%	100%	100%	100%	100%	100%	100%	100.0%
Florida	Solid	110%	97%	98%	92%	102%	96%	111%	107%	101.6%
Pennsylvania	Solid	147%	222%	123%	100%	46%	36%	39%	40%	94.2%
Wisconsin	Solid	100%	100%	100%	100%	100%	100%	100%	100%	99.9%
New Mexico	Solid	100%	100%	100%	100%	100%	100%	100%	100%	100.0%
Ohio	Solid	100%	100%	100%	100%	100%	100%	100%	100%	100.0%
Wyoming	Solid	483%	111%	67%	67%	108%	111%	99%	100%	143.3%
California	Solid	100%	100%	100%	100%	100%	100%	100%	100%	100.0%
Delaware	Solid	100%	100%	100%	100%	100%	100%	100%	100%	100.0%
Massachusetts	Solid	116%	124%	71%	71%	106%	96%	101%	125%	101.1%
Iowa	Solid	100%	100%	99%	91%	86%	84%	83%	87%	91.3%
Maine	Solid	100%	100%	104%	109%	105%	106%	100%	100%	103.0%
Nevada	Adequate	100%	96%	89%	100%	100%	97%	97%	96%	96.9%
Idaho	Adequate	130%	133%	110%	97%	100%	105%	110%	109%	111.7%
Virginia	Adequate	100%	80%	68%	92%	85%	90%	86%	93%	86.5%
Georgia	Adequate	100%	100%	100%	100%	100%	100%	100%	100%	100.0%
Missouri	Adequate	100%	100%	100%	100%	100%	100%	100%	100%	100.0%
Vermont	Adequate	99%	98%	99%	92%	101%	97%	98%	93%	97.0%
Mississippi	Adequate	100%	100%	100%	100%	100%	100%	90%	97%	98.4%
Arizona	Adequate	100%	100%	100%	100%	100%	100%	100%	100%	100.0%
Texas	Adequate	118%	104%	97%	89%	86%	87%	89%	90%	95.1%
Arkansas	Adequate	100%	100%	100%	100%	100%	100%	100%	100%	100.0%
Rhode Island	Adequate	100%	100%	100%	100%	100%	100%	100%	100%	100.0%
Minnesota	Inadequate	131%	152%	96%	76%	81%	65%	71%	58%	91.2%
South Carolina	Inadequate	100%	100%	100%	100%	100%	100%	100%	100%	100.0%
New Hampshire	Inadequate	100%	100%	100%	100%	100%	100%	100%	75%	96.9%
New Jersey	Inadequate	13%	10%	38%	43%	40%	56%	60%	55%	39.1%
Oklahoma	Inadequate	77%	74%	59%	52%	53%	55%	58%	61%	61.2%
Kansas	Inadequate	78%	80%	79%	69%	69%	63%	64%	65%	70.8%
Alabama	Inadequate	100%	100%	100%	100%	100%	100%	100%	100%	100.0%
Kentucky	Inadequate	108%	125%	111%	55%	63%	51%	54%	43%	76.2%
Louisiana	Inadequate	101%	97%	95%	95%	99%	93%	97%	115%	99.1%
Illinois	Inadequate	124%	126%	88%	83%	59%	31%	44%	60%	76.9%

**Source:** Author's construction based on data provided by the National Association of State Retirement Administrators and the Center for Retirement Research at Boston College.

**Appendix C. State Pension Plans and Individual Timeline Data – Investment Performance**

<b>State Pension</b>		<b>2001</b>	<b>2002</b>	<b>2003</b>	<b>2004</b>	<b>2005</b>	<b>2006</b>	<b>2007</b>	<b>2008</b>	<b>AVG*</b>	<b>CUM*</b>
<b>System</b>	<b>Category</b>										
South Dakota	Solid	-2.9%	-4.9%	5.0%	16.6%	13.3%	13.1%	21.4%	-8.7%	6.62%	60.65%
Florida	Solid	-7.6%	-8.1%	2.9%	16.7%	10.2%	10.6%	18.1%	-4.4%	4.78%	40.10%
Pennsylvania	Solid	-7.9%	-10.9%	24.3%	15.1%	14.5%	16.4%	17.2%	-28.7%	5.00%	30.76%
Wisconsin	Solid	-6.3%	-5.8%	4.0%	17.2%	10.9%	12.3%	18.3%	-5.1%	5.68%	50.28%
New Mexico	Solid	-1.9%	-2.1%	3.7%	15.6%	9.9%	11.7%	18.1%	-7.4%	5.95%	54.59%
Ohio	Solid	0.0%	-10.7%	25.3%	12.5%	9.0%	14.7%	8.5%	-26.9%	4.63%	24.80%
Wyoming	Solid	-4.4%	-9.3%	21.0%	11.5%	8.2%	12.6%	7.4%	-29.6%	2.18%	7.81%
California	Solid	-7.2%	-6.1%	3.7%	16.6%	12.3%	11.8%	19.1%	-5.1%	5.64%	49.52%
Delaware	Solid	-5.1%	-6.3%	3.1%	15.9%	9.6%	12.4%	15.9%	-1.3%	5.53%	49.74%
Massachusetts	Solid	-6.6%	-6.5%	4.0%	19.4%	13.4%	15.5%	20.0%	-1.8%	7.17%	67.36%
Iowa	Solid	-4.7%	-4.9%	5.6%	13.8%	11.3%	11.1%	16.3%	-1.3%	5.88%	54.32%
Maine	Solid	-7.9%	-7.5%	5.3%	16.6%	11.8%	7.5%	16.2%	-3.1%	4.86%	41.55%
Nevada	Adequate	-1.5%	-2.7%	5.0%	12.1%	9.3%	8.8%	15.0%	-3.2%	5.35%	49.34%
Idaho	Adequate	-6.1%	-7.1%	3.7%	18.1%	10.8%	12.2%	20.0%	-4.2%	5.93%	52.72%
Virginia	Adequate	-7.4%	-7.3%	2.5%	17.9%	12.0%	12.4%	20.4%	-4.4%	5.76%	50.31%
Georgia	Adequate	-6.0%	4.0%	4.5%	9.8%	7.8%	6.2%	14.7%	-3.5%	4.69%	42.14%
Missouri	Adequate	-2.2%	-6.2%	7.0%	17.1%	12.6%	11.5%	18.7%	1.6%	7.51%	74.04%
Vermont	Adequate	-8.5%	-7.4%	4.6%	15.7%	8.9%	10.6%	16.5%	-5.9%	4.31%	35.39%
Mississippi	Adequate	-7.1%	-6.6%	3.5%	14.6%	9.8%	10.7%	18.9%	-8.2%	4.45%	36.54%
Arizona	Adequate	-6.7%	-8.2%	2.4%	17.5%	8.5%	9.8%	17.8%	-7.6%	4.19%	33.63%
Texas	Adequate	-6.9%	-7.2%	9.2%	11.7%	12.7%	8.8%	13.9%	-4.6%	4.71%	40.48%
Arkansas	Adequate	-3.8%	-5.7%	5.5%	13.4%	9.9%	12.2%	18.0%	-4.5%	5.63%	50.83%
Rhode Island	Adequate	-11.0%	-8.4%	3.9%	19.5%	12.2%	12.6%	15.8%	-5.4%	4.91%	40.15%
Minnesota	Inadequate	-7.1%	-8.2%	2.4%	16.5%	10.7%	12.3%	18.3%	-5.0%	4.99%	42.14%
South Carolina	Inadequate	7.5%	0.9%	9.0%	8.8%	7.0%	5.1%	13.4%	-2.6%	6.14%	59.87%
New Hampshire	Inadequate	-6.7%	-6.4%	2.5%	14.9%	10.1%	10.0%	16.0%	-4.6%	4.48%	37.84%
New Jersey	Inadequate	-10.4%	-9.0%	3.3%	14.1%	8.7%	9.8%	17.1%	-2.7%	3.87%	30.74%
Oklahoma	Inadequate	-5.9%	-5.1%	5.7%	14.0%	10.5%	8.0%	16.4%	-4.2%	4.93%	43.20%
Kansas	Inadequate	-7.3%	-4.7%	4.0%	15.4%	12.1%	12.3%	18.0%	-4.4%	5.68%	50.57%
Alabama	Inadequate	-6.4%	-9.3%	16.5%	10.1%	11.0%	8.4%	17.9%	-15.2%	4.12%	30.94%
Kentucky	Inadequate	-5.4%	-4.3%	4.3%	13.6%	9.3%	9.7%	15.3%	-4.2%	4.78%	42.01%
Louisiana	Inadequate	-5.8%	-5.7%	4.2%	18.0%	10.2%	11.9%	19.2%	-3.8%	6.03%	54.45%
Illinois	Inadequate	-7.1%	-6.9%	0.3%	16.4%	10.1%	11.0%	17.1%	-6.2%	4.34%	35.55%

**Source:** Author's construction based on data provided by the National Association of State Retirement Administrators and the Center for Retirement Research at Boston College.