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PUBLIC PENSION GOVERNANCE
AND PERFORMANCE

Olivia S. Mitchell
Ping Lung Hsin

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ABSTRACT

This paper investigates the determinants of public sector pension plan investment and funding behavior. Its goal is to draw lessons which may be used to improve the design and governance of public pensions. Plan performance is related to characteristics of the pension systems' governance structure and authority, using a new survey of U.S. state and local public pension plan governance practices and performance outcomes.

The study suggests that most large public pension systems funded their plans satisfactorily in 1990, but some did not. Better public pension funding was associated with a pension system having in-house actuaries and when pension Board members were required to carry liability insurance. In contrast, public pension funding was lower when states experienced fiscal stress, and when employees were represented on the pension system Board. Pension funding did not appear sensitive to statutes guaranteeing benefits or funding levels, nor by the ability of states to carry budget deficits from one year to the next. The results also suggest that public pension Boards having more retiree-Trustees experienced lower investment returns, as did public sector pension plans required to devote a portion of their assets to in-state investments. Returns did not differ depending on whether a pension Board had in-house, or external money managers.

No single set of pension plan management practices can optimize plan performance for all systems across all time periods. Nevertheless, these results suggest that care must be taken when designing the regulatory and investment environment in which these plans operate.

Olivia S. Mitchell
Department of Insurance and Risk Management
The Wharton School
University of Pennsylvania
307 Colonial Penn Center
3641 Locust Walk
Philadelphia, PA 19104-6218
and NBER

Ping Lung Hsin
ILR School
Cornell University
Ives Hall
Ithaca, NY 14853

Public Pension Governance and Performance

The cost of supporting retirees has risen quickly in both developed and developing nations, and promises to become ever greater in decades to come. Policymakers seek to prepare for these costs by designing better functioning pension plan structures. An item at the top of the policy agenda is to improve public pension plan investment and funding performance. This paper examines public sector pension plans in the United States, asking why some plans appear to have been well-managed and what structural design features are associated with good pension management outcomes.

The two pension plan performance outcome measures of central interest in this paper are the yields on public pension system assets, and the public pension plans' funding status. Investment performance is important since higher yields reduce the need for additional taxes to support current and future retirees. Pension funding is important since better funded plans stand a better chance of having assets on hand to pay promised benefits. This study relates these two pension plan outcomes to a variety of features characterizing each pension system's governance structure and authority, reporting requirements, and other factors affecting the environment in which the pension funds operate. A new data set on more than 200 state and local public sector plans in the U.S. is used to examine the relationship between public sector plan performance and management practices, seeking to draw lessons which might improve the design and governance of public pensions here and in other countries.

Section I of the paper develops several hypotheses regarding public pension plans' investment performance and pension governance, while Section II examines determinants of funding patterns. Empirical analysis in Section III suggests that public plan investment performance and funding outcomes are linked to characteristics of the pension Board itself, and also to public sector mandates regarding investment and asset allocation. Section IV tests the sensitivity of the results to alternative empirical specifications. Finally, Section V draws lessons

from this research for policymakers in other countries, in the expectation that they may benefit from the experience of public pension plans in the United States.

I. The Determinants of Public Pension Investment Performance

Often referred to as "public employee retirement systems" (PERS), retirement systems established for individuals employed by state and local governments have become large and powerful institutions in the last three decades. Typically these are defined benefit pension plans, which provide workers an annual benefit accrual (usually a function of pay and years of service). This accrual converts into a retirement annuity payment when the employee attains a specified age and service under the plan. Recent surveys show that there are approximately 2,400 public pension systems in the U.S., covering about 10 million full-time public sector employees and about 3 million pension beneficiaries -- mainly employees of state and local governments, and often teachers and other school employees, police and firefighters, judges, correctional officers, and other public servants (see Table 1).[1] These plans pay relatively generous benefit levels amounting to 40% of pre-retirement pay at relatively young retirement ages; usually PERS retirement benefits are at least partially indexed to inflation.

Benefit promises which accrue under PERS plans are liabilities that the sponsor is expected to pay retirees at some future date. Practice varies as to whether public employers back up these promises by making payments to a segregated pension trust fund, which are then invested to generate eventual benefit payments. Many PERS plans have succeeded in amassing substantial funds: in the U.S., public pensions held about $730 billion at the end of the 1980's, accounting for 5% of the country's total financial assets, 13% of all domestic bonds, and almost 8% of all domestic equities (Hoffman and Mondejar 1992).

A major responsibility of those charged with managing public sector pensions is to direct the investment of these assets. Research suggests that PERS funds have been managed somewhat

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[1]Excluded from the PERS designation are national military and federal government employee plans, as well as federal Social Security old-age pensions. These plans are, for the most part, unfunded systems.

differently from those in private sector pensions. Thus until 1960, corporate equities constituted only a negligible fraction of state and local plan assets, while government securities and corporate bonds were much more heavily favored than private plans (see Table 2). This pattern of asset holdings was in part motivated by state and local government rules prohibiting pension managers from investing in what were perceived to be "risky" assets including equity, venture capital, and foreign holdings.

Though these strictures have diminished in the last decade, yields on public pension fund assets have frequently been low, with public plans earning rates of return substantially below those of other pooled funds and often below leading market indices.[2] Tables 3 and 4 demonstrate this for the period 1968-86 as well as more recently, when state and local pension plans reported annual returns averaging 11.1% while bonds rose by 15.5% and securities by 13.9%.

One explanation for why public plan investment yields are often low is that they are operated according to principles different from those adopted in the private sector. Specifically, many public pensions are managed by staff which must respond to political as well as economic incentives and pressures. A typical public system is governed by a Board of Directors comprised of eight members, on average, with three elected members, three appointed members (often by the Governor), and two serving *ex officio* (e.g. the State Treasurer, the superintendent of schools, etc). Those elected to public pension Boards are frequently active employees, which is quite uncommon in the private sector; in addition, in many cases retired workers are also included as Board members (Zorn 1991).

Because public pension Boards are often managed by political appointees and covered pension members, it is possible that the Boards select investments different from those chosen by nonpension money managers competing in the capital market. There is little direct evidence on this point in the public sector, but pension participants in the private sector appear to invest more conservatively than do professional pension managers (EBRI 1993). Hence it is hypothesized that

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[2]For a discussion of studies on this topic see Beebower and Bergstrom (1977); Berkowitz et al (1986); Brinson et al. (1986); Grinblatt and Titman (1989); Ippolito (1989); and McCarthy and Turner (1992).

better performance from public pensions could be observed when public systems manage their funds professionally, instead of relying on former or current employees.

Another way that pension governance structures might alter PERS investment yields is that Board authority varies a great deal across public pension plans, depending on laws which vary from state to state, and also depending on custom and tradition. For example, some PERS Boards have a great deal of responsibility for investment decisions, they control actuarial inflation and interest rate assumptions, and direct the system's reporting practices. In other cases, external professional money managers and actuaries manage investments and reporting, leaving day-to-day benefit payments and record-keeping functions to the Board. The latter tasks are substantial: public sector pension plans reported an average of 42,000 active members per plan and $2.8 billion in assets, with annual administrative costs totalling about 1-4% of assets.[3] Large plans can service many of these needs in-house, employing on the average one staff member per 1,000 plan participants. Smaller plans are more likely to use external actuarial, legal, and accounting firms, and frequently employ professional money managers and/or investment consultants (Zorn 1991).

When private sector pension systems manage their benefits administration and investment in-house, researchers have found substantial evidence of economies of scale in larger plans (Mitchell and Andrews 1981). It is therefore possible that larger public pension plans might also experience higher yields than would smaller plans, though these scale economies could be captured in smaller plans by hiring external professional money managers and consultants. In addition to size, investment style could lead to performance differences: for example, Top 10 performance group money managers apparently earn higher yields, though Lakonishok et al. (1991, 1992) suggest that net returns are equalized after commissions. Below the analysis controls on plan size and whether plans use investment managers in the Top 10 performance group.

In addition to management style, the literature suggests that additional factors can affect pension asset performance. For example recent studies indicate that net investment returns in the

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[3]See Mitchell, Sunden, Hsin and Reid (1993) for a discussion of administrative costs in US public pension plans, and Sunden and Mitchell (1993) for costs in the US Social Security system. Valdes Prieto (1993) compares private and public plans' adminstrative costs in four nations.

private sector are sometimes reduced when investment managers are subjected to frequent performance reviews. This is because of a principal/agent problem: money managers sometimes structure their portfolios to meet short-run objectives at the cost of long-run goals.[4] In the public sector context, PERS Boards using external money managers subject to frequent valuations might face lower net rates of return than systems using only in-house managers, particularly if they are evaluated relatively infrequently (*ceteris paribus*). Thus the empirical analysis of pension asset yields must control not only on who is managing the portfolio, but also on how often they report how they are doing.

Pension plan asset performance clearly depends on other factors in addition to the ones just described, with perhaps the most important one being the fund's portfolio mix. As noted earlier, public plans tend to hold fewer stocks than do private pensions, in part because the federal government requires private pension fiduciaries to invest in a well-diversified portfolio of assets chosen for traditional financial reasons. Furthermore, ERISA regulations governing private plans specifically require pension fiduciaries to behave according to generally accepted financial principles, a philosophy summarized as the "prudent man rule". In the public pension arena, no federal legislation controls PERS investment patterns. As a result, there are no legal constraints on those who wish to deploy public pension assets for nontraditional investment purposes, and several groups have become increasingly vocal.[5] For example, the Governor of New York argues that public pension assets be loaned advantageously to firms "conducting business" within his state. Other states have asked their pension fund managers to only invest in so-called "economically targeted" or "socially responsible" companies (defined variously as firms which do not pollute, companies headquartered in-state, etc). While these unconventional investment

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[4] This has been called "window-dressing" at year end so as not to be seen holding "losers" (Benartzi and Thaler 1992, and Lakonishok et al. 1991 and 1992).

[5] In the United States, the Employee Retirement Income Security Act of 1974 (ERISA) requires private sector pension plan assets to be managed according to prudent and conservative investment practice, and furthermore holds plan trustees personally responsible for the plan's investment practices. However ERISA does not cover PERS plans, and efforts to extend national regulation to state and local pensions have been challenged by those who believe that this would undermine states' taxing authority; see Munnell (1983).

practices have their appeal, retirees and active workers have expressed concern that their pension assets may earn low returns, and perhaps be insufficiently diversified.[6]

These differences in PERS investment practices imply that public pension plan returns may vary because of strictures placed on the plans by the political process, strictures which may not be in evidence in privately-run pension plans. As a result, empirical analysis of PERS performance must take into account the risk characteristics of the pension portfolio, whether investors operate under constraints such as ceilings on bond or stock holding, rules requiring fiduciaries to diversify their portfolios in a manner which might be deemed "prudent" by impartial financial experts, or requirements that money must be directed to "socially acceptable" ventures. If these strictures are effective, they may lower returns and/or increase risk.

II. The Determinants of Public Sector Pension Funding Practices

Federal law in the United States requires private-sector pension plan sponsors to explicitly recognize their accumulating pension liabilities, and then to set aside contributions in an orderly fashion so as to build up assets sufficient to meet benefit promises when workers retire. The rationale for full pension funding in the private sector is that sponsoring companies may go bankrupt, and unless the pension plan has received assets sufficient to cover benefit promises, retirees could face curtailed or terminated benefit payments.[7]

In the public sector, pension funding practice has been much more variable, both in the U.S. and elsewhere. This is partly because many deem the risk of government bankruptcy to be low, and thus less persuasive as a rationale for prefunding. As a result, partially-funded or completely unfunded (pay-as-you-go or PAYGO) plans have been the norm for most developed and many developing nations around the world (James 1993). At the state level in the U.S.,

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[6] See for instance Goldman, Sachs (1993), New York State Industrial Cooperation Council (1989, 1990), New York Retired Public Employees Association (1989), and Snell and Wolfe (1990).

[7] Cessation of benefits has become less likely since ERISA regulations established a government insurance agency for private sector defined benefit private pensions. On the other hand the pension insurance agency is not completely stable financially, and the risk of private pension underfunding is now borne primarily by groups other than those retirees in the underfunded plan; see Gustman and Mitchell (1992).

funding practices also vary: in some cases state laws require prefunding for accumulating pension liabilities, but in other cases they do not. (For constitutional reasons, the Federal government has not regulated state-level public pensions; see Munnell 1983).

Despite the PAYGO tradition, there are several arguments in support of substantial pension prefunding in the public sector. Funds invested earn the pension plan investment income which "can substantially reduce the employer's ultimate payment for such benefits" (Bleakney 1972: 16); this may take on special urgency given the aging of the public sector workforce over the next decades (Mitchell 1991). Also, underfunded pensions impose an implicit future liability on taxpayers, reducing states' and localities' ability to raise funds in other ways (Epple and Schipper 1981). Public sector retiree income security might also be threatened by underfunding; indeed some public employees have sought to offset the risk of underfunded pension promises by demanding higher pay (Inman 1982, 1986; Mitchell and Smith 1994 forthcoming; Smith 1981). Finally, some analysts argue that PAYGO systems decrease savings and impose politically unpalatable redistributive burdens across cohorts (James 1993).

Despite these arguments favoring prefunding of benefit promises, public sector pension plans have typically accumulated fewer assets relative to benefits than do their private sector counterparts (see Table 5). During the 1980's many public employers contributed less to their public employees' pension accounts than they were required to (according to actuarial computations), in part because public tax collections fell in American states and cities during the recession. As a result, some public pensions became (or grew more) underfunded, meaning that plan assets were insufficient to cover benefits promised to retirees. A study of 1989 data showed that state and local employer pension contributions were about 10-15% below target, and the pattern of shortfall was most persistent for systems where unemployment was higher than it had been for some time. This effect persisted even when controlling for habit persistence, holding constant past cumulative funding levels (Mitchell and Smith 1992, forthcoming 1994). Therefore a full analysis of funding must take into account the possibility that fiscal stress undermines PERS plans' financial stability.

The structure of PERS Boards can also affect pension funding. One possibility is that Board comprised of pension-covered members may meet funding requirements more promptly than one heavily weighted with political appointees.[8] Working counter to this hypothesis is the fact that pension funding is an extremely complex and difficult area, which active and retired workers may be unable to fully scrutinize. Lack of adequate technical training combines with conservatism regarding investment risk, on top of which is the fact that pension participants typically have very poor understanding of their plan's rules and features (Mitchell 1988) For this reason, having professional representatives on the PERS Board could improve funding, especially as compared to relatively nontechnical pension participants. Which effect dominates is an empirical matter.

In addition to Board composition, other PERS management practices can also influence funding outcomes directly. Specifically, some systems use in-house staff actuaries, increasing funding if these staffers are relatively free from political suasion, but decreasing it otherwise. When the PERS Board is required to authorize benefit increases, rather than simply passing on increases negotiated by state and local employees independently, this could translate into higher funding rates -- after all, authorization to provide future benefits would be required from those managing the funding process. It is also worth investigating whether funding is improved when Board members have liability insurance, which if true suggests that the private insurance market may enforce funding stringencies on PERS Boards when political tensions pull in other directions.

Another set of factors influencing funding may be the reporting requirements to which pension managers respond. While public pension accounting practice embraces some common assumptions and standards across states and localities, the remaining differences make it difficult to compare public plan investment performance and funding outcomes in some cases. This problem

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[8]Elements of this were present in the court case recently filed by California state retirees, who protested the Governor's effort to reduce state budget deficits by raising the public pension plan's assumed interest rate from 8.5% to 9.5%. Retirees contended that "manipulating the rate of return on plan investments, though within legally 'reasonable limits', can substantially reduce employer contributions to the point where a pension plan can be substantially underfunded and put at high risk." (Hemmerick 1991b: 39). When the existing PERS Board refused to implement the Governor's proposal, he then moved to dissolve the old Board and construct a new Board more receptive to his proposals.

has been recognized by many pension analysts over the years, and is slowly being remedied by the Governmental Accounting Standards Board which is devising a framework for public pension financial reporting (GASB 1992). The majority of large state and local plans now conform to GASB Statement No. 5 (GASB 1986) which specifies that public pension plans must report assets at market value, and liabilities measured according to a concept known as the Pension Benefit Obligation (PBO).[9] As a result of this increasing standardization, it is now much more likely that stock funding ratios are accurate, by which is meant that pension assets are correctly computed as a fraction of liabilities. This contrasts with practice a decade ago when most PERS plans reported assets at cost, and used a variety of different methods to compute liability measures (Schmitt et al. 1991). Despite this progress, a cross-plan analysis of funding still requires paying attention to different approaches used in reporting assets and funding.

Along the same lines, it might be expected that more frequent reporting would tend to induce standardization, so that better funding would be expected of a PERS required to report to its sponsoring employer and participating members more often. Audits and actuarial valuations are also carried out at different intervals, and the reporting standards themselves vary. These different reporting methods may simply affect data quality without altering investment and funding performance, but many fear they have more potent effects altering plan outcomes materially. These cross-plan differences should be controlled in empirical analysis, and examined to see if they influence PERS funding outcomes materially.

Other variations in pension reporting are also important, particularly in the case where flow funding measures are considered, where flow funding is defined as the ratio of <u>annual actual</u> employer contributions, to <u>annual required</u> contributions. Variations in flow funding measures are

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[9]The PBO includes five types of prospective pension liabilities as noted in Mitchell and Smith (1992): benefits pledged to currently retired employees, benefits pledged to vested terminated employees (based on past service and salary levels), benefits payable to vested active employees (based on current service and salary), benefits payable to non-vested active employees who may vest in the future, and benefits that will be earned by current workers resulting from future salary increases. The plan's PBO changes over time reflecting new expected benefit accruals; these yearly accruals are termed the plan's "normal cost." To be actuarially sound, the employer's annual contributions to the plan must be meet normal cost <u>and</u> to amortize any past unfunded pension liabilities.

due in part to laws governing pension funding practices which differ across states.[10] A related problem arising in the reporting context arises when a system uses the PBO measure to report GASB-sanctioned funding measures, but uses some other actuarial method to compute annual required employer contributions. It is possible that a plan would then appear well funded by the officially recommended PBO measure, but would be less than fully funded by the system's own accounting measure.[11] As a consequence, it is important to investigate whether differences in funding patterns are related to different methods of computing liabilities for reporting, versus for funding, purposes.

Funding differences may also result from other factors. In computing pension obligations, for instance, actuaries employ a variety of assumptions to compute promised future benefits. Unbiased estimates of the factors of central interest require that these assumptions be controlled in the empirical analysis, by including plan-specific estimates of expected future price and wage increases, assumed discount rates and retirement ages, integration of benefits with Social Security, whether benefit levels were guaranteed by law, and portability of pension accruals. Pension systems also have some leeway with regard to their past service liability amortization period, which refers to the time period over which unfunded pension promises from the past are covered from current contributions. Since it is possible that poorly funded plans strategically select an amortization period to improve the funding report, this too should be controlled on in a multivariate funding analysis.

To this list of pension funding determinants must be joined several indicators of the regulatory and fiscal environment in which PERS Board members make funding decisions. Most

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[10]As an example, fire and police pension plans in Portland, Oregon are govererned by a law which sets the public employer's annual contribution rates as a fraction of payroll, and this contribution rate is generally met. Consequently the pension financial statement indicates that the employer's actual contributions are exactly equal to required contributions, resulting in a flow funding rate of 100%. In fact, however, the system is operated on a PAYGO basis; the flow funding figure reported by this plan does not represent the actuarial figures that the accounting standards profession would prefer under its proposed reporting rules.

[11]This has apparently occurred in several instances over the last two years, where employers were able to dramatically cut their contributions after converting to new actuarial methods consistent with the PBO measure. For a discussion of recent efforts by numerous public employers to change public pension funding patterns see Durgin (1991). *Employee Benefit Plan Review* (1991), Hemmerik (1991 a and b), Price (1991), Shine (1991), and Verhovek (1990).

obviously linked the pension funding outcome is the existence of state-level legally mandated funding requirements. One would anticipate that if such law is binding, it would enhance funding in those states. A variant of this point is that states experiencing severe fiscal stress tend to reduce funding, suggesting that this too should be taken into account in multivariate analysis. Based on previous work, we include a variable indicating fiscal stress, which is the deviation of the state's unemployment rate from its long term trend (Mitchell and Smith 1994 forthcoming). It is anticipated that greater fiscal stress would reduce funding, perhaps offset if contributions are derived from a special or dedicated tax. In addition other "political economy variables" are explored including an indicator of whether a state has a balanced budget requirement, to assess whether pension underfunding serves as a "safety valve" in cases where the balanced budget rule is taken seriously. Finally, there may be differences in plan participants' ability to exact full funding rates, so it is important to control for the presence of unionized employees and teachers.

III. Empirical Analysis of Public Pension Yields and Funding

The data used for empirical analysis are obtained from a cross sectional survey of 201 pension systems conducted in 1991, covering a total of 269 separate retirement plans. The PENDAT file created from this survey was provided by the Government Finance Officers' Association (Zorn 1991). As of this writing, there is no larger, more up-to-date, and more representative survey of state and local pension plans in the country; the federal government collects no centralized information of this type (though many have suggested it should).

Respondent systems included in the PENDAT file represented 73% of state and local active pension plan participants, and 71% of state and local plan assets in 1990 (Zorn 1991). These systems represent the vast majority of the PERS-covered population, but are not necessarily representative of all plans since they are among the largest in the nation, and probably better managed and funded than many smaller plans; as a consequence, interpretation of results must bear this caveat in mind. PERS plans responding to the survey accounted for about a tenth of the estimated universe of state and local pension plans nationally.

The PENDAT datafile is quite extensive, including variables reflecting all aspects of the systems' management, investment, and funding practices as well as plan participant and benefit mixes.[12] The indicator of investment performance is used as a dependent variable for the multivariate analysis (actual investment yield rates) and two measures of pension funding -- stock and flow funding patterns.

Taking the investment outcomes first, two different approaches were chosen to measure public system's asset performance. ·Virtually all PERS report one datum for 1990 -- that year's total portfolio return (referred to below as Y1ROR). Most also reported their annualized average return over the period 1986-1990 (referred to below as Y5ROR). Both performance variables are reported in nominal dollars (the analysis therefore assumes that all plans experienced identical inflation rates). The fact that the investment yield is averaged over the 5-year span makes it impossible to compute traditional measures of pension performance variability over time; estimates of this concept must await development of panel data.

Two dependent variables were developed for the funding analysis. The concept which best captures a plan's stock funding rate in the PENDAT survey expresses pension plan assets as a fraction of the Pension Benefit Obligation, and for ease of reference this stock funding measure is termed AST_PBO. An alternative measure focuses on the plan's current funding practices, a concept captured here as FLOWFUND, or the ratio of actual to required employer contributions for the year.

Explanatory variables in the analysis are grouped into five main categories: pension Board composition, Board management practices, investment practices, reporting requirements and assumptions, and other factors which reflect regulations at the state level governing budget and

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[12]When there were missing data, this was handled in several ways. Serious reporting errors in pension statistics were rechecked with the PERS plan representatives directly. A complete list of data checks thus generated is available from the author on request. For example the stock funding ratio for Wisconsin was listed in the dataset as 1300%, which the plan representative indicated was incorrect. In the case of missing observations for some of the explanatory variables used in regression models, the variable in question was assigned a value of 0, and concurrently the missing value dummy variable was set to 1. Missing data on the dependent variable (e.g. investment performance or funding) suggested the use of sample selection models to determine whether systems which did report their funding and investment yields had better (or worse) than average outcomes; see Section IV.

funding practices. Controls are also included for plan size, type of plan and covered employees, and in some cases portfolio composition is incorporated on the grounds that plans with less risky holdings will have lower returns.

Most of these variables were directly derived from the PENDAT file, but outside sources were used in a few instances. The variable called TOP10MG indicates whether the pension system used a money manager in the Top 10 performance group as identified by Lakonishok et al (1992). The term UNEMPD represents the degree of fiscal stress experienced by the state proxied by the deviation of the unemployment rate in 1990 from the mean of the previous nine years: previous analysts suggest that this type of fiscal stress reduces funding possibilities (Mitchell and Smith 1994 forthcoming). The variable DEFPOS is also derived from outside sources, and indicates whether a state is permitted to carry over a budget deficit from one year to the next. Public pension funding may be seen as an off-budget safety-valve, relieving the pressure of having to meet state balanced budget requirements. Hence pensions may be better funded when state budget deficits can be carried through time, while underfunding may prevail more often when state budgets must be balanced, by law, at year's end.[13]

Summarizing this discussion in a multivariate framework, the following model is postulated:

(1) $Y_1 = a_0 + a_1 X_1 + a_2 X_2 + a_3 X_3 + a_4 X_4 + a_5 Z + e_1$

(2) $Y_2 = b_0 + b_1 X_1 + b_2 X_2 + b_3 X_3 + b_4 X_4 + b_5 Z + e_2$

where Y_1 represents a vector of variables reflecting public pension investment performance; Y_2 represents a vector of funding variables; X_1 - X_4 represent vectors of variables reflecting pension Board composition, Board management practices, investment practices, reporting requirements and

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[13]If there is a link between state balanced budget laws and pension funding, it probably arises when state pension contributions are allowed to fluctuate depending on state budget needs, affording politicians on off-budget method of achieving compliance with balanced budget requirements. This can happen since most state budgets typically do not include public pension systems in their regular budget reports. It is has not yet been determined whether the safety-valve argument is empirically important. Certainly balanced budget mandates are widespread: a majority of states (44) have balanced budget laws on the books, and most of these (37) require the governor to sign a balanced budget (NASBO 1992). Only 13 states permit the governor to carry over a budget deficit from one year to the next, providing flexibility which might obviate the need to use the public pension. This latter stance is deemed "most stringent" by NASBO, is represented in the DEFPOS variable developed for this study.

assumptions; and Z represents a vector of other factors including state regulations governing budget and funding practices, controls for plan size, type and in some cases portfolio composition. In this section the disturbance terms are assumed to be distributed normally with zero mean; in Section IV this assumption and others, are discussed in more detail.

Evidence on the Investment Performance of State and Local Pension Systems

In 1990, the annual investment yield reported by the 168 PERS systems was 7.7% (see the appendix Table). This compares favorably with market data showing a +6.8% return for securities that year, and with the 1990 inflation rate of 6.1%. However, not all plans performed this well -- one plan reported a -5.5% return that year, while at the other extreme a plan reported a yield of +24.5%. This range is almost certainly due to different portfolio composition patterns across the plans; in the market as a whole, the +6.8% return for securities that year was offset by an average 3.2% yield on bonds, which suggests the importance of holding constant the portfolio composition of pension plans when comparing their investment yields (see Figure 1). A narrower frequency distribution of pension yields characterizes Y5ROR, returns averaged over the period 1986-1990 (see Figure 2). Across the 128 plans reporting the figure averaged 11.6%, with the lowest return reported of -2.5% and the highest being 31%. The overall mean was lower than the annualized return on bonds for the same period of 13.5%, but exceeded the average stock return of 10.1% as well as the annualized inflation rate of 3.3%.[14]

Table 6 provides multivariate regression estimates of equation (1) above, indicating the determinants of pension plan investment yields. The findings show that the composition of the public pension Board appears to matter: specifically, yields in 1990 were about 2% lower if retiree representation on the public pension Boards increased by 10%. This may be the result of inexpert Board members becoming increasingly activist of late, an explanation buttressed by the fact that the retiree effect was negative but not statistically significant in the five-year yield

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[14]The 1-year yield reported here differs from Zorn's (1991) 6.9% figure, and the 5-year annualized yield reported here is lower than Zorn's 13.9% figure; Zorn uses the PENDAT file but excludes many plans from the analysis (39 and 53 plans, respectively).

equation. This finding is not solely attributable to more conservative investment choices made by retiree Board members, since the model controls for the overall fractions of the portfolio held in stocks and bonds.[15] Nevertheless, before concluding that retiree participation on pension Boards is necessarily deleterious, it should be noted that appointed members might also depress asset yields if they were improperly selected.

Of the several pension management practice variables used in the investment performance equations, few had a powerful effect on pension yields. One influential practice was a system's practice of permitting administrative costs to be charged to investment income (ADINVST), rather than being covered from state or local budgets directly. This reduced the 5-year average return figure at statistically significant levels, though the 1990 return was not powerfully affected. Some state and local systems used outside money managers and financial counsellors, either in concert with internal management, or exclusively. In any event, plans investing in-house or using external money managers apparently fared about the same, even if the external managers were drawn from the "Top 10" group (as identified by Lakonishok et al. 1992).[16]

Only a few of the rules regarding investment practices proved to statistically significantly affect measured outcomes. In no case was the prudent man requirement statistically linked to returns or investment variability; one explanation is that all pension Boards may *de facto* follow a variant of this policy. The data also indicated no significant effect of state-mandated limits on stockholdings on any of the investment performance variables. More serious is the negative return observed for PERS pensions required to direct a portion of their investments in-state. This policy is often recommended by those who propose to use pension funds to build a stronger job and tax base.[17] Unfortunately, plans following this policy experienced lower investment returns in 1990: the results imply that 10% more in-state investments are associated with a 1% return. This effect

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[15]More complex risk adjustments could be undertaken in a time series analysis, but cannot be undertaken in this cross-sectional dataset.

[16]The PENDAT survey does not indicate whether the systems reported net or gross investment returns, but the negative significant effect of ADINVST suggests that the figures given were net of expenses. Other analysts have suggested that higher gross yields produced by active money managers tend to be equalized after commissions (Ippolito 1989).

[17]See for example Goldman, Sachs (1993).

was not detected using the 1985-90 average return data, but should not be ignored since it may reflect recent trends which may not have been observed in earlier years.

Two factors used to quantify pension system reporting practices are included in Table 6. It will be recalled that having independent investment performance analysts and more frequent performance valuations could be predicted to either improve or depress investment yields, depending on whether more reporting is seen as beneficial, or harmful (Lakonishok et al. 1991, 1992; Benartzi and Thaler 1992). The data do not support either position, however, since neither variable iss strongly statistically significant.

Summarizing findings, some pension governance and management factors did affect yields in the major public sector plans considered here. Three findings stand out:

- •Public pension Boards having more retiree-Trustees experienced lower investment returns.
- •Returns did not differ depending on whether a pension Board had in-house, or external money managers, even if the external managers were drawn from the "Top 10" group.
- •Public plans required to devote a portion of their assets to state-specific projects earned lower returns.

Funding Patterns Among State and Local Pension Plans:

As noted earlier, many state and local pension plans follow GASB advisory rules when reporting their pension assets and liabilities. This makes it possible to place some credence in funding figures, particularly with regard to the ratio of the pension plan's assets to its promised benefit liabilities (AST_PBO). The stock funding ratio averaged 91% in 1990 (for the 220 plans reporting; see Figure 3). There is ample evidence of wide dispersion in funding practice: the minimum stock funding ratio was approximately 0 (for PAYGO plans), and 18 plans were seriously underfunded, having less than half the assets needed to meet pension obligations.[18] On the other hand, the maximum funding ratio was 3.2, and a third of the plans had sufficient assets to meet projected benefits. For this reason the average stock funding rates of more than 90% should not be taken as evidence that public plans were uniformly well-funded on an accumulated basis.

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[18]Zorn (1991) reports a slightly lower stock funding ratio (89%) but uses a much smaller sample size (30 plans) from the PENDAT survey.

In contrast to stock funding measures, annual funding statistics capture whether the employer is contributing enough each year enough to cover new benefit accruals and amortization needs from past unfunded obligations. As mentioned earlier, however, there is reason to believe these annual flow funding figures are biased upward: an employer reporting full compliance with required contribution levels may sometimes receive monies inadequate to meet eventual benefit promises. This probably explains why the average FLOWFUND ratio in 1990 was 93% (across 187 plans; see Figure 4). The range about the mean is large: at one extreme a plan reported receiving 3.4 times the amount required, while at the other extreme a plan indicated receiving -4.3 times what was required.[19] On the whole, the vast majority (137 of 187 plans) reported receiving contributions less than 100% of required, suggesting that most public sector employers' contributions did not meet required levels iri 1990.

Multivariate evidence linking public pension governance and funding patterns according to equation (2) is summarized in Table 7, where both stock and funding patterns are examined. A first hypothesis was that public pension Board composition variables are related to stock funding ratios, and there is support for this position. Specifically, the results show that having more elected members on the Board lowered PERS funding rates, with retiree-Trustees having a larger depressing effect.[20] No composition effect was found in the flow funding equation, however.

Pension management practice also proved informative in explaining funding patterns: three of the four variables used were positively related to stock funding patterns. For instance, the plans appeared better funded when a PERS had in-house actuaries, and the effect was statistically significant. Likewise, if the Board was required to authorize actuarial assumptions, stock and flow funding were higher. There was a positive significant relationship between funding levels and Board members having liability insurance: perhaps this is due to the increased oversight imposed

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[19]The large negative funding figure was reported by a teachers' plan which changed the actuarial method employed in 1990; a court case concluded in 1993 denied the legality of this change.

[20]It should be noted that fund trustees appointed by politicians may not necessarily ensure that the plan is operated for the sole benefit of the plan participant. For example, the California public employee retirement system sued the Governor of that state for proposing to replace the 13-member pension board with a newly appointed 9-member board, as well as appointing the plan's actuary who agreed to the Governor's actuarial assumptions (Melbinger 1992).

by private insurers. (On the other hand, flow funding was negatively related to liability coverage -- which may indicate reverse causality, if plans which underfunded on a flow basis were required to purchase insurance in order to induce Board members to serve.)

Pension reporting and assumptions also affected funding outcomes as expected. Pension systems differed according to the frequency and format of funding reports, and stock funding ratios were lower where longer amortization periods were selected -- indeed, it is possible that amortization periods were strategically chosen to improve the funding report. Supporting this view is the finding that plans which did not report their amortization period were even more seriously underfunded than average. Clearly it is necessary to standardize on reporting in order to obtain a clear picture of stock funding practices. Assumptions to compute promised future benefits also played a role in the empirical analysis: the model included variables indicating expected future price and wage increases, assumed discount rates and retirement ages, integration of benefits with Social Security, and portability of pension accruals. Of this set, only the portability factor proved statistically significant at conventional levels, and was negative. This is probably due to the fact that asset accruals did not always follow employees who were permitted to take benefit accruals with them when they changed jobs (usually this is limited to in-state moves). As such, it would be incorrect to conclude that labor mobility *per se* reduces stock funding ratios: rather, funding was low when systems permitted mobile workers to claim benefits with no concomitant asset accumulation backing up the promise.

Of the other factors controlled in the empirical funding analysis, very few had statistically significant effects. Somewhat surprising was the null effect of state requirements that pension plans had to be funded, requirements that benefit levels had to be guaranteed by law, and requirements that states must balance their budgets from one year to the next. Nor were funding levels different when dedicated or special taxes were earmarked for pension revenue.[21] Employee

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[21]Thus these data do not support Munnell and Ernsberger's (1989) suggestion that commingling pension funding with other government budgets may exacerbate funding problems. Those authors also suggested that more centralization might improve funding, but this hypothesis is difficult to test in practice since centralization can refer to many different aspects of plan management. Thus, for example, the actuarial assessment may be conducted

type (i.e. teachers) and unionization status also had no effect. In fact, only one other variable was found to systematically and powerfully reduce stock funding: namely, fiscal stress, measured here by the deviation of recent unemployment from the levels experienced over the last decade. The effect was substantial, suggesting that a one-point increase in a state's unemployment rate over the long-run average would depress stock funding by 6 percentage points. This effect is consistent with previous studies on public plans (Mitchell and Smith 1994, forthcoming), and suggests that economic recessions have long as well as short-term effects on public budgets through pension plan funding.

Because the stock funding data are better than the flow funding data, we emphasize those models and findings. The following conclusions may be drawn:

- •Better public pension funding was associated with a pension system having in-house actuaries and when Board members were required to carry liability insurance.
- •Public pension funding was lower when states had experienced fiscal stress, and when employees were represented on the pension system Board.
- •Funding did not appear sensitive to statutes guaranteeing benefits, or by legal funding requirements, or by the ability of states to carry budget deficits from one year to the next.

IV. Sensitivity of Results

Several sensitivity tests were conducted to judge the robustness of the results. One concern has to do with potential endogeneity of particular variables in the regression equations. For example, the performance equations included among the vector of control variables the PERS portfolio mix, because the plan's stock and bond holdings were expected to have affected the plan's investment performance. Nevertheless it could be argued that a system's 1990 return and 1990 portfolio mix are probably simultaneously determined, if one had in mind a more general structural system involving expectations over variables not available in the data set. To test this possibility, these potentially endogenous portfolio composition variables were purged from the equation and the model re-estimated. This produced estimates virtually identical to those already reported. In a similar vein, it might be asserted that the pension assumptions in equation (2) are

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centrally even though contributions are collected locally, the benefits administration may be managed centrally even though negotiation over benefits is conducted locally, and so forth.

endogenously determined by politicians setting funding targets. Hence a reduced-form equation was estimated which excluded pension assumptions from the model. Here too, coefficient estimates for the remaining variables were virtually identical to those reported here (results available on request). Hence it appears that this form of simultaneity does not exert a potent effect on the outcomes of most interest here, namely the pension governance and authority terms.

An additional question examined in some detail, but summarized here for the sake of brevity, pertained to the issue of biased reporting due to selective missing data. This was handled in two ways. First, if a pension plan had valid data on all but one (or a few) right hand side variables, the missing datum was assigned a value of 0 and a missing-value indicator was given a value of 1. This permitted maintenance of sample size due to incomplete reporting for pension assumptions, in particular. A second approach was taken if the plan lacked a report for a dependent variable, since this raised a question about whether the data were missing randomly. Specifically, it might be that that those plans who were performing less well than the market, or those who were more poorly funded than average, might not be reporting. For this reason, several models were also estimated accounting for the probability of some plans not reporting investment yields and funding ratios. In each case, a sample selection term derived from a Probit non-reporting equation (inverse Mills ratio) was incorporated in the regression equations (1 and 2). The selection controls proved to be not statistically significant in general, and other coefficient estimates were quite similar to those reported here (results available on request).

The conclusion from the sensitivity analysis is that the results reported in Tables 6 and 7 are quite robust to a reasonable range of alternative formulations. They also confirm the important role of several pension governance features in public pension plan outcomes.[22] It must be emphasized that these behavioral patterns are derived from the data at hand, however, and are not necessarily representative of those plans excluded from the PENDAT sample. Specifically, the findings are

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[22]Several other models were also examined, including one which entered the state budget deficit variable into the returns equations. The coefficient was not statistically significant and all other results were unchanged. Also examined were models where the TOP1MGR term was replaced with a term indicating whether any external money manager was used, and results were unchanged.

most applicable to relatively large state-run plans, rather than the smaller local and municipal public plans covering a few officers or other uniformed public sector workers. As a result, the data are not yet good enough to know whether these smaller plans have the same problems, and same strengths, as their larger counterparts.

V. Conclusions and Discussion

After a decade of strong growth, public pension plans in the United States are at a crossroads. A few state and local retirement systems are experiencing problems, and some retirees have experienced cuts in anticipated benefits as a result of these developments. In 1991, for instance, cost-of-living clauses in California's public pension plan were disallowed, with funds thus generated earmarked to "reduce employer contributions in fiscal year 1992-93 and subsequent fiscal years until those amounts are depleted" (cited in Melbinger 1992: 23). In the future, if public fund assets prove too meagre to meet benefit promises, retirees may face other benefit cuts.

In contrast to problems experienced in pension plans where public employers were subject to fiscal distress, many public plans have done quite well. The strong capital markets of the 1980's boosted many pension systems' investment portfolios substantially. Increased assets combined with careful money management and adequate employer contributions covered all or most of the benefits promised to current and future retirees. This research suggests that better performance from public pensions can be attained when plans manage their funds and actuarial computations professionally instead of relying on employee-Trustees, and when they do not limit their portfolios to local investments.

These conclusions should be tempered by several considerations. First, additional work is required to control on portfolio risk characteristics, which have only been partly captured in the models examined here. Second, future studies should focus more attention on public pension Board activism and its potential effects on pension plan yields as well as risk. A question which is only beginning to be asked is whether the social costs of underfunding and below-market return investments can offset their social benefits. In other words, from a public finance viewpoint,

"economically targeted" investments might be justified when the social gains to such investment outweigh the social costs, taking care to note that the costs include potential retiree insecurity if public pension underfunding leads to reductions in anticipated benefits. It would be useful to design and implement such a cost/benefit framework when evaluating public pension asset allocation and performance practices. In order to do this, time-series data must be collected which can be examined using a common reporting and accounting framework. Policymakers and researchers in the United States have begun to recognize this need, and have recommended standardization of pension data gathering, possibly under the auspices of a federal agency (Melbinger 1992; Mitchell 1991; Munnell 1983).

Because pension systems are extremely complex institutions, a single optimal package of plan practices cannot be identified which is relevant to all systems and across all time periods. Indeed, this research highlights some of the enormously complicated issues that must be confronted when seeking to establish funding norms. If near-full funding of public pension plans is deemed a worthwhile objective, it will be easier to monitor with standardization of pension reporting practices. This is particularly true of the many assumptions needed to assess a defined benefit plan's promised obligations. Obtaining this information is often a difficult task, inasmuch as rules determining pension benefit eligibility and amounts frequently differ from one group of employees to another and across cohorts. Sometimes benefit and contribution regulations have internally inconsistent objectives. For all these reasons, it is a fairly laborious task to improve reporting and disclosure patterns for public plans. The Government Accounting Standards Board in the U.S. has devoted several years to the development of a standardized framework to be used for reporting public pension plan liabilities and assets, and their work could be beneficially reviewed by those seeking improved public pension plan performance.[23]

Outside the U.S., it is even more difficult to evaluate pension funding patterns. Data are often insufficient with which to derive assumptions needed for projecting expected labor force

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[23]Fiscal analysts in other countries may profit from the experiences of public pension managers in the United States. A checklist of issues which should be considered is contained in Mitchell (1994 forthcoming).

patterns, and forecasts of economic trends are also inherently uncertain. Frequently public pension systems are not computerized, making it quite difficult to track investments and participant data. In other cases, there may be significant evasion of public pension payroll taxes, which can make projections of contribution and benefit flows politically disputatious.[24]

This discussion raises a more general question: how should public pension policies around the world be evaluated? Mandated retirement savings programs in most nations are generally subject to a plethora of government restrictions -- regarding where the funds can be invested domestically and whether pension funds can be invested abroad, about the fund's exposure to inflation and financial market risk, and related questions. Those contemplating mandating retirement savings programs must recognize that these restrictions are a means of reallocating the risks of retirement income security between the public and private sectors, which should be explicitly acknowledged in designing pension funding and investment policy. Whether the social costs of such programs offset their social benefits should be a question explicitly addressed.

A way to reframe this question is to ask why many U.S. state and local public pensions tend to be relatively well-funded, at least as compared to federal plans in many other developed nations which have employed PAYGO financing for some time. One explanation may be that underfunding in the U.S. is limited because of states' and localities' mobile populations, who respond to the additional tax burdens that underfunded plans must eventually impose. This theory has little empirical support, however, since underfunded pension promises appear to be imperfectly capitalized in property values (Epple and Shipper 1981). There is some suggestion that public sector workers require a wage premium to compensate them for their underfunded pension promises, and underfunded pensions may also affect government bond ratings (Smith 1981; Mitchell and Smith 1994 forthcoming). These and other constraints will probably become increasingly binding with more flexible international labor and capital mobility, and may further restrict governments' ability to underfund public pension plans in the future.

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[24]Mitchell (1994 forthcoming) cites examples of data and tax collection problems in developing countries.

Some analysts suggest that the myriad reporting and funding issues surrounding publicly managed pension plans can be reduced by substituting defined contribution plans in favor of defined benefit plans. In this case, an employer promises only to deposit some contribution rate into an account which then is invested, sometimes with the proviso that funds cannot be withdrawn until retirement. In the United States, deferred compensation plans of this sort have become increasingly popular since enabling tax law regarding these plans was clarified during the 1980's. All states currently offer such plans to their public sector employees, generally in the form of voluntary supplemental tax-deferred savings plans offered in addition to the conventional defined benefit pension plan. A recent study indicated participation rates of about 24% of eligible workers in the public sector. These plans are even more popular among private employees, where 57% of eligible employees participate in 401(k) defined contribution offerings. The difference in participation rates between public and private sectors is attributed to the fact that public employees must make the entire contribution themselves and the limit is currently $7,500 per year (or one-third of compensation), while in the private sector the contribution limit is higher and companies generally offer workers matching funds (EBRI 1993).

One appeal of these savings plans is that they are self-directed, so participants can frequently tailor their investment portfolios individually. In recent years, however, analysts have become concerned that employees participating in deferred pay plans tend to overconcentrate their investment portfolios in low-risk, low-return assets. As a consequence of their conservative stance, future retirees may find that their retirement income is inadequate to meet needs (EBRI 1993). This objection is linked to a broader criticism of these plans, which is that they do not necessarily generate subsistence income for retirees, inasmuch as eventual benefit amounts are linked to contributions, not need (James 1993).

The appeal of mandatory defined contribution plans has been spurred by the recent experiences of Chile's new retirement system. More than a decade ago, a replacement plan for the country's foundering PAYGO social security system was created by formulating a mandatory defined contribution plan, managed by several competing private investment houses. The Chilean

system's popularity is in substantial part due to high investment returns during the 1980's, which exceeded those of other public retirement systems in Latin America (James 1993; Mesa Lago 1989, 1991). However little is yet known about how well the Chilean plan performed relative to an internationally diversified portfolio, which is in principle the benchmark which participants would wish to employ. During the first several years of the Chilean pension plan's operation, for instance, the pension system's investment portfolio was limited almost exclusively to government bonds, and only gradually has private domestic equity been permitted. Even more recently, the Chilean defined contribution system has begun to introduce international asset holdings, though these are still limited to a fraction of the pension portfolio.[25]

In sum, policymakers all over the world confront an aging population, and look to pension plans to help meet the growing retirement needs. A key element in meeting these needs will be the improvement of pension plan investment and funding performance. While the U.S. experience cannot be generalized to all countries, it suggests that public pension performance responds to the financial and administrative environment in which these plans operate. Retirement income security for tomorrow requires designing better pension systems today.

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[25]For discussions of the Chilean experience see Baeza (1986), Baeza and Manubens (1988), Cheyre (1991), Diamond (1992 and 93), Marcel and Arenas (1992), Myers (1985), Valdes Prieto (1993), and Wallich (1993).

Figure 1.

DISTRIB. OF ANNUALIZED MARKET RETURN ON INVESTMENT

---- 1 YEAR ----

PERCENTAGE
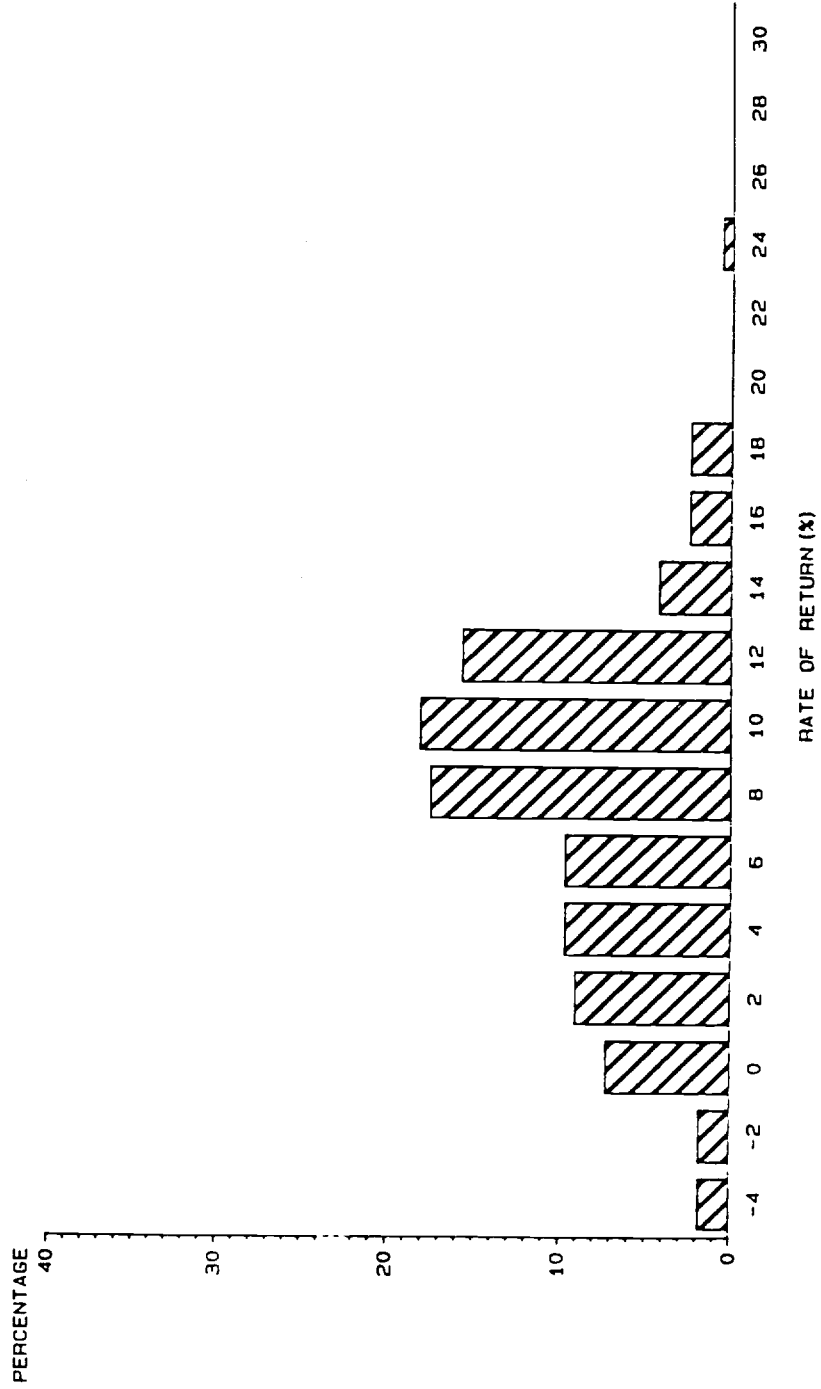
RATE OF RETURN (%)

IF RATE OF RETURN LE -4 THEN MIDPOINT=-4
IF RATE OF RETURN GT 30 THEN MIDPOINT=30

Figure 2.

DISTRIB. OF ANNUALIZED MARKET RETURN ON INVESTMENT

---- 5 YEARS ----

PERCENTAGE
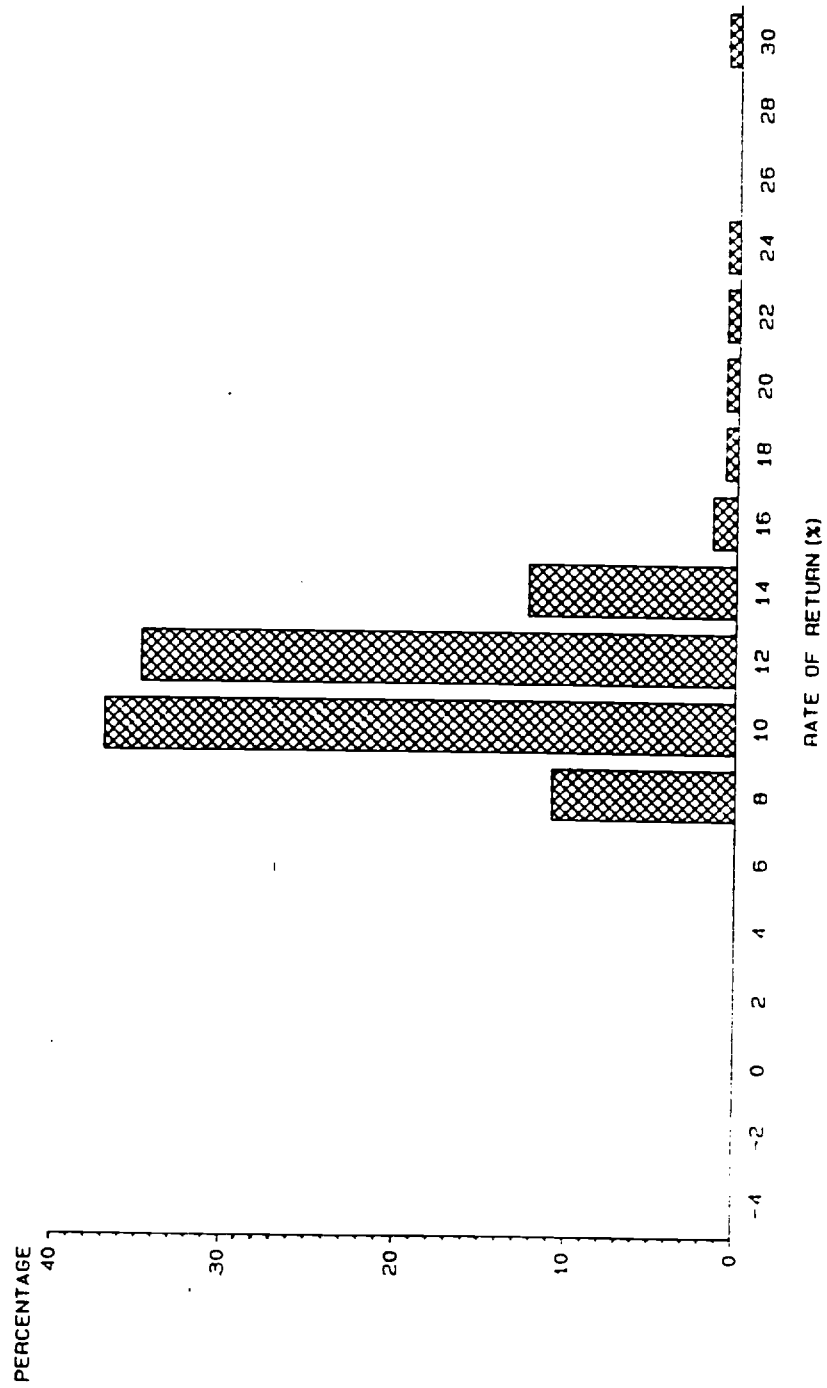
RATE OF RETURN (%)

IF RATE OF RETURN LE -4 THEN MIDPOINT=-4
IF RATE OF RETURN GT 30 THEN MIDPOINT=30

Figure 3.

DISTRIB. OF STOCK FUNDING RATIO

STOCK FUNDING RATIO (%)

IF RATIO LE -20 THEN MIDPOINT=-20
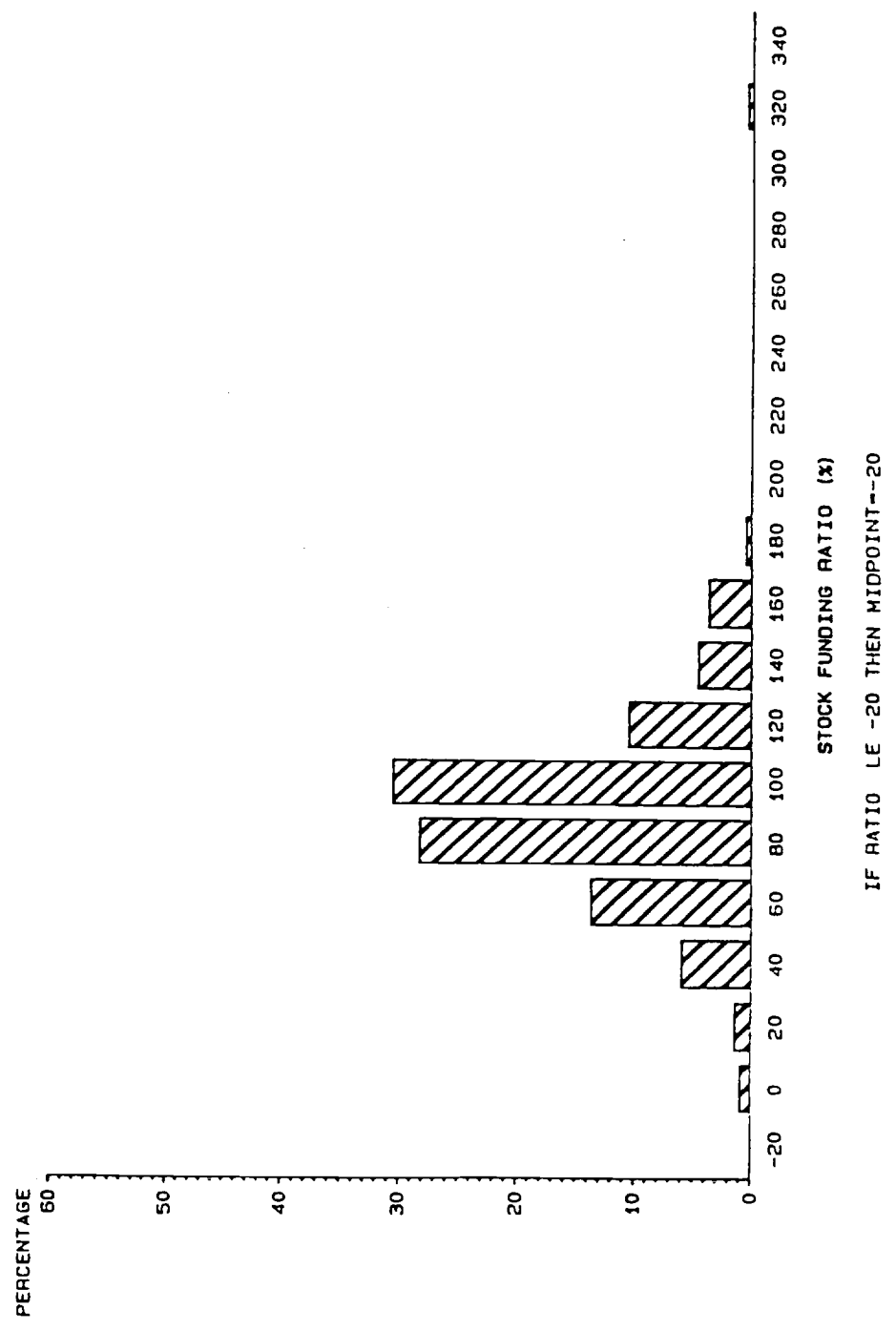
Figure 4.

DISTRIB. OF FLOW FUNDING RATIO.

PERCENTAGE

FLOW FUNDING RATIO (%)

IF RATIO LE -20 THEN MIDPOINT=-20
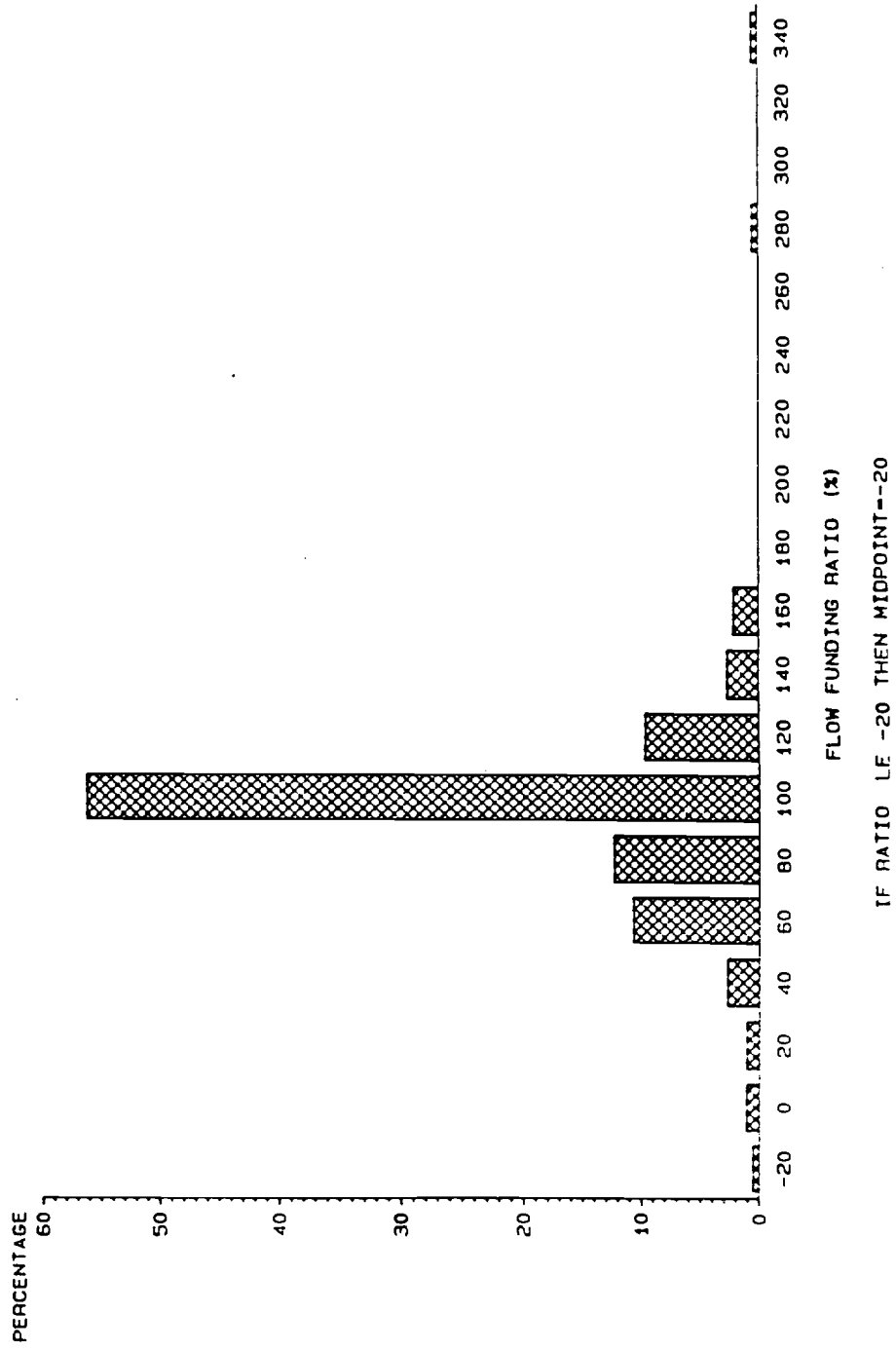
Table 1
Public Pension System Characteristics:
U.S. State and Local Pension Plans

I. U.S. Public Pension Plan Characteristics Over Time

	1980	Year 1985	1989
Number of Plans	⋅NA	2,589	2,387
Total Participants (000)	NA	15,234	16,684
Active Participants (000)	NA	10,364	11,357
Total Assets ($B current)	$162	374	629
Annual Contributions ($B current)	$21	37	44
Annual Benefits ($B current)	$11	22	33

NA: Not available
Source: Piacentini and Foley (1992).

II. Survey of U.S. Public Pension Plan Participants in 1989

	Pension Characteristic
Mean Retirement Benefit[1]	$9,318
Median Retirement Benefit[1]	$7,200
Median Public Pension as % of Pre-retirement Earnings (total)[2]	42%
Median Public Pension as % of Pre-retirement Earnings for those not receiving Social Security[3]	50%
Fraction Receiving Any Post Retirement Benefit Increases[4]	34%
Fraction of Participants Covered by Defined Benefit Plan[5]	70%

Sources:
[1] Phillips (1992), Table 14.9: 367.
[2] Phillips (1992), Table 14.13: 371.
[3] Phillips (1992), Table 14.7: 375.
[4] Phillips (1992), Table 14.20: 379.
[5] Phillips (1992), Table 14.25: 384. Fraction excludes 10% of respondents unable to identify plan type.

Table 2.
U.S. Pension Plan Portfolios:
Size and Allocation 1950-1989

	Total Assets ($B Current)	Fraction of Assets in:			
		Corporate Equities	Corporate Bonds	US Govt Securities	Other

I. State and local government pension plans

	Total Assets ($B Current)	Corporate Equities	Corporate Bonds	US Govt Securities	Other
1950	$4.9	0.0%	12.2%	51.0%	36.7%
1955	10.8	1.9	25.0	43.5	29.6
1960	19.7	3.0	36.0	29.9	31.0
1965	34.1	7.3	50.4	22.3	19.9
1970	60.3	16.7	58.2	10.9	14.1
1975	104.8	23.2	59.0	7.4	10.4
1980	198.1	22.4	47.7	20.2	9.7
1985	404.7	29.7	31.9	30.5	7.9
1989	727.4	39.9	27.3	27.2	5.5

II. Private pension plans

Noninsured:

	Total Assets ($B Current)	Corporate Equities	Corporate Bonds	US Govt Securities	Other
1950	$7.1	15.5%	39.4%	32.4%	12.7%
1955	18.3	33.3	43.2	16.4	7.1
1960	38.1	43.3	41.2	7.1	8.4
1965	74.4	54.8	30.5	4.0	10.6
1970	112.0	59.9	26.2	2.7	11.2
1975	225.0	48.0	18.6	8.0	25.4
1980	469.6	47.6	16.5	10.8	25.1
1985	848.4	46.4	14.3	12.3	27.0
1989	1,163.5	57.3	12.4	12.3	18.0

Insured:

	Total Assets ($B Current)	Corporate Equities	Corporate Bonds	US Govt Securities	Other
1950	4.8	4.2	41.7	22.9	31.2
1955	10.1	4.0	43.6	9.9	42.6
1960	16.8	4.8	43.5	6.0	45.8
1965	25.5	6.3	41.6	3.5	48.6
1970	37.5	13.6	37.6	2.4	46.4
1975	64.6	18.6	37.5	2.2	41.8
1980	152.2	16.0	39.9	3.7	40.3
1985	337.9	13.0	35.7	12.9	38.4
1989	525.8	12.3	39.8	11.6	36.3

Note: Insured plans are pension plans whose assets are held by insurance companies.
Source: Hoffman and Mondejar (1992), T. 16.9 and 10: 438-441.

Table 3
Pension Plan Investment Yields:
Historical Patterns 1968-1986

	US State & Local Pension Plan Investment Return[1]	US Large Private Pension Plan Investment Return		Canadian Large Private Pension Plan Investment Return[4]	Market Indeces		US Inflation Rate[5]
		SEI data[2]	5500 data[3]		Stocks[5]	Bonds[5]	
1968	7.75%	8.4%	–	9.4%	11.1%	2.6%	4.7%
1969	-7.94	-5.2	–	-3.2	-8.5	-8.1	6.1
1970	5.63	1.3	–	1.3	4.0	18.4	5.5
1971	14.76	17.5	–	12.5	14.3	11.0	3.4
1972	12.58	15.3	–	18.4	19.0	7.3	3.4
1973	-9.32	-15.1	–	-2.1	-14.7	1.1	8.8
1974	-13.03	-20.3	–	-12.7	-26.5	-3.1	12.2
1975	19.14	23.1	–	13.2	37.2	14.6	7.0
1976	18.03	17.2	–	12.4	23.8	18.6	4.8
1977	0.31	-2.2	1.6	8.7	-7.2	1.7	6.8
1978	3.16	5.8	6.0	13.5	6.6	-0.1	9.0
1979	6.36	13.7	10.1	15.0	18.4	-4.2	13.3
1980	11.58	20.2	21.9	18.3	32.4	-2.6	12.4
1981	3.00	2.7	5.4	1.5	-4.9	-1.0	8.9
1982	27.22	23.0	18.2	21.1	21.4	43.8	3.9
1983	12.89	15.9	9.4	20.0	22.5	4.7	3.8
1984	–	–	9.9	8.8	6.3	16.4	4.0
1985	–	–	20.0	23.5	32.2	30.9	3.8
1986	–	–	14.1	12.8	18.5	19.8	1.1

Notes:

[1] Public pension plan data from SEI Financial Services reported by Berkowitz & Logue (1986), T. AIII-3.

[2] Large U.S. private plan data from SEI Financial Services reported by McCarthy & Turner (1992) T. 12.1: 253.

[3] Large U.S. private plan data from 5500 Reports reported by McCarthy and Turner (1992) T. 12.1: 253.

[4] Large Canadian private pension plan data, SEI Financial Services reported by Pesando and Hyatt (1992) T. 1: 21.

[5] McCarthy and Turner (1992), Table 12.1: 253.

Table 4
U.S. Public Sector Pension Plan Yields:
Annual Averages 1984-1990

	State & Local Pension Plan Investment Return	Market Indeces Bonds[7]	Securities[7]	Inflation Rate[7]
Average 1984-1990:	11.13%	15.51%	13.91%	4.11%
1990	6.85[1]	-3.17	6.78	6.11
1988	3.95[2]	16.81	10.70	4.42
Average 1988-90	9.55[3]	15.04	11.24	5.06
Average 1986-90	11.98[4]	13.77	10.66	4.14
Average 1986-88	13.88[5]	13.50	10.09	3.32
Average 1984-88	12.07[6]	15.79	15.51	3.54

Notes:
[1] Zorn (1991), T. VII-7: 34; 129 plans.
[2] Zorn (1990), T. 34: B34; 108 plans.
[3] Zorn (1991), T. VII-8: 35; 85 plans.
[4] Zorn (1991), T. VII-9: 36; 85 plans.
[5] Zorn (1990), T. 35: B35; 113 plans.
[6] Zorn (1990), T. 36: B36; 85 plans.
[7] Ibbotson Associates (1992), T. 13: 34.

Table 5
U.S. Public and Private Pension Plan Funding Ratios

Ratio of Pension Plan Assets to Pension Plan Liabilities	Fraction of Plans
I. State and Local Plans[1]	
< 50%	8%
50-74	21
75-99	39
≥ 100%	33
II. Private Sector Plans[2]	
< 50%	1%
50-74	4
75-99	10
100-124	25
125-149	22
≥ 150%	38

Sources:

[1] Authors' adaptation of unpublished data from GAO.

[2] Piacentini and Foley (1992), Table 4.20: 153.

Table 6
Determinants of Investment Returns
in U.S. State and Local Pension Plans
(standard errors in parentheses)

Explanatory Variable	Dependent Variable	
	1990 Return	Five-year Av. Return
A. *Pension Board Composition*		
BDELAC	-0.01	-0.02
	(0.02)	(0.01)
BDELRT	-0.17**	-0.002
	(0.07)	(0.05)
B. *Pension Management Practices*		
ADINVST	-0.34	-1.24**
	(0.89)	(0.58)
INVINHS	0.80	0.60
	(1.36)	(0.92)
TOP10MG	-0.49	-0.32
	(1.32)	(0.86)
TOP10*EXT	-0.08	1.03
	(1.78)	(1.17)
C. *Pension Investment Practices*		
INSTATE	-0.08*	-0.02
	(0.04)	(0.02)
PRUDMAN	0.83	0.33
	(1.20)	(0.84)
STKMAX	-0.03	0.57
	(1.18)	(0.86)
D. *Pension Reporting Practices*		
INDINVPF	-1.16	-0.57
	(1.00)	(0.68)
FREQVAL	0.70	0.13
	(0.54)	(0.56)
R^2	11.3	12.4
N	158	132

Notes to Table 6: $**t \geq 1.96$, $*t \geq 1.65$ (< 1.96). Both models also include a constant term as well as controls for plan type (TCHRPLAN), plan size (ASSETS and SSETSW), and the fraction of the plan assets held in bonds and stock (BOND, STOCK). See the Appendix Table for variable descriptions and descriptive statistics.

Table 7
Funding Determinants of U.S. State and Local Pension Plans
(standard errors in parentheses)

Explanatory Variable	Dependent Variable	
	Stock Funding Ratio	Flow Funding Ratio
A. Pension Board Composition		
BDELAC	-0.20**	0.08
	(0.08)	(0.17)
BDELRT	-0.61*	0.34
	(0.35)	(0.70)
B. Pension Management Practices .		
BDBENOK	-1.34	-1.86
	(5.77)	(11.02)
BDACTOK	13.02*	30.81**
	(7.04)	(14.49)
LIABINS	13.47**	-19.19**
	(4.89)	(9.33)
ACCINHS	11.14**	-1.89
	·(5.01)	(9.16)
C. Pension Reporting Practices		
REPSOLO	4.86	-1.74
	(4.58)	(8.67)
GIVERPT	8.62	-0.35
	(8.03)	(14.38)
AMORTPER	-1.25**	-0.18
	(0.20)	(0.37)
D. Pension Assumptions		
WDOT	-4.30	1.91
	(3.80)	(7.04)
PORTABLE	-13.35**	2.20
	(5.25)	(9.82)
NEXPROR	-0.51	2.16
	(3.59)	(6.49)
INFL	-3.24	5.13
	(3.42)	(6.10)
E. Other Factors		
UNEMPD	-6.07**	0.65
	(2.08)	(3.82)
FUNDLAW	0.12	-7.49
	(4.94)	(9.22)
BENNOCUT	3.41	-10.53
	(4.75)	(9.03)
DEFPOS	7.78	-0.34
	(5.08)	(9.34)
SPECTAX	3.68	-0.98
	(6.40)	(12.36)
R^2	28.9	18.6
N	217	184

Notes to Table 7: **t ≥ 1.96, *t ≥ 1.65 (< 1.96). Both models also include a constant term as well as controls for plan type and union (TCHRPLAN, UNION), benefit differences across workers (BENTIERS), whether the plan was integrated with social security or indexed (SSINT, COLA), whether the unit credit method was employed (ACTUARUC), the plan's average retirement age (AVRETAGE), and whether the plan reported its retirement age, amortization period, wage growth, inflation, and expected rate of return assumptions (AVRETAGMS, AMORTMS, WDOTMS, INFLMS, EXPRORMS). See the Appendix Table for variable descriptions and descriptive statistics.

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Appendix: Descriptive Statistics and Variable Definitions

I. Dependent Variables	Mean	St. Dev.
YR1ROR	7.67	5.0
YR5ROR	11.68	3.0
AST_PBO	90.75	33.1
FLOWFUND	93.79	51.2

II. Explanatory Variables		
BDELAC	31.01	25.3
BDELRT	3.27	6.2
LIABINS	0.42	0.5
BDACTOK	0.83	0.4
BDBENOK	0.72	0.5
ADINVST	0.51	0.5
INVINHS	0.42	0.5
ACCINHS	0.60	0.5
TOPIOMG	0.41	0.5
TOPIO*EXT	0.18	0.4
PRUDMAN	0.85	0.4
INSTATE	1.45	10.0
STKMAX	0.83	0.4
INDINVPF	0.75	0.4
FREQVAL	1.23	0.8
REPSOLO	0.59	0.5
GIVERPT	0.90	0.3
AMORTPER	22.64	14.0
AMORTMS	0.10	0.3
ACTUARUC	0.12	0.3
COLA	0.79	0.4
WDOT	4.80	2.5
WDOTMS	0.20	0.4
PORTABLE	0.35	0.5
EXPROR	7.75	0.9
EXPRORMS	0.01	0.1
INFL	3.88	2.4
INFLMS	0.26	0.4
AVRETAGE	47.85	23.7
AVRETAGEMS	0.19	0.4
SSINT	0.09	0.3
FUNDLAW	0.58	0.5
DEFPOS	0.35	0.5
TCHRPLAN	0.12	0.3
ASSETS	3252.28	6637.4
ASSETSQ (*10-6)	54.35	212.2
BOND	33.16	28.1
STOCK	36.09	17.3
BENNOCUT	0.52	0.5
BENTIERS	0.28	0.5
ISUNION	0.69	0.5
SPECTAX	0.14	0.3
UNEMPD90	-1.72	1.2

Variable Definitions

Note: Variables qualitative (0,1) unless specified. All variables derived from PENDAT file (see Zorn 1991) unless otherwise indicated.

Dependent Variables

YR1ROR	Annual (1990) rate of return reported in survey (%).
YR5ROR:	Average annualized rate of return 1986-90 reported in survey (%).
AST_PBO:	Reported pension system assets / PBO measure of cumulative plan liabilities (%).
FLOWFUND:	Annual actual / required employer plan contributions (%).

Explanatory Variables

A. Pension Board Composition

BDELAC:	Fraction of pension Board elected by active employees (%).
BDELRT:	Fraction of pension Board elected by retired employees (%).
LIABINS:	Board covered by liability insurance.
BDACTOK:	Board required to authorize actuarial assumptions.
BDBENOK:	Board required to authorize benefit amounts.

B. Pension Management Practices

ADINVST:	Administrative cost charged to pension investment income.
INVINHS:	Investment staff of pension portfolio partly (or fully) managed in-house.
ACCINHS:	Accounting staff needs of pension system partly (or fully) met in-house.
TOP10MG:	Investments handled by top-10 performance bracket managers (Laknonishok et al. 1992).
TOP10*EXT:	Plan investments exclusively handled by top-10 money managers.

C. Pension Investment Practices

PRUDMAN:	Pension Board required to act according to "prudent man" rule.
INSTATE:	Fraction of pension investments which must be directed in-state (%).
STKMAX:	Maximum limitation on the assets in the pension portfolio.

D. Pension Reporting Practices

INDINVPF:	Pension system obtains independent investment performance evaluations.
FREQVAL:	Frequency of independent performance evaluations.
REPSOLO:	System issues own financial report (not integrated with other budgets).
GIVERPT:	Plan participants receive annual financial report.
AMORTPER:	Amortization period for past service liabilities.
AMORTMS:	Amortization period not stated.
ACTUARUC:	Pension system uses unit credit method of computing pension liabilities.

E. Pension Assumptions

COLA:	Benefits partially (or fully) indexed after retirement.
WDOT:	Future salary growth assumption required to compute PBO.
WDOTMS:	Salary growth assumption not stated.
PORTABLE:	Employees moving within state may carry benefit accruals to new plans.
EXPROR:	Interest rate assumption used in computing PBO (%).
EXPRORMS:	Interest rate assumption not stated.
INFL:	Cost of living assumption required to compute PBO.
INFLMS:	Cost of living assumption not stated.
AVRETAGE:	Average retirement age used in computing PBO (yrs).
AVRETAGEMS:	Average retirement age not stated.
SSINT:	Plan integrated with Social Security.

F. Other Factors

FUNDLAW:	State has legal funding standard for pension system.
DEFPOS:	State law does not prohibit carryover of state budget deficit from one year to the next (National Association of State Budget Officers 1992)
TCHRPLAN:	System covers at least some teachers and other school employees.

Appendix Table (continued)

ASSETS:	Actuarial value of pension system assets, typically at market value (million $).
ASSETSQ:	Squared value of ASSETS.
BOND:	Pension system portfolio held in corporate and government bonds (%).
STOCK:	Pension system portfolio held in stock (%).
BENNOCUT:	State has law guaranteeing benefit amounts.
BENTIERS:	Benefits differ according to worker hire date.
ISUNION:	At least some employees covered by pension system unionized.
SPECTAX:	Special or dedicated tax is the source of employer contributions.
UNEMPD:	Recent (1990) level of unemployment minus long run (1981-89) average level of unemployment level in the state (US Bureau of the Census 1991).