Economic Consequences of Pension Accounting Rules

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December, 2012

We thank Keith Brainard at NASRA's Public Fund Survey for kindly providing the pension data from 2001-2009.

Abstract

A growing stream of accounting research suggests that managers use the data reported in an entities financial reports to make real investment decisions. Most of this research focuses on decisions made in the private sector. We extend this idea to the public sector, investigating whether the employment decisions made by governmental entities are influenced by the accounting choices they make for pension obligations. These research questions are particularly important as there is currently an increased focus on the fiscal health of governmental entities, and in particular, a focus on the extent to which pensions (and the accounting for pensions) are contributing to the declining fiscal performance of governmental entities. In this paper, we first provide evidence that, depending on the discounting approach we use, states net pension obligations are understated by $200 billion to $1 trillion. We then provide evidence that the larger the understatement of pension deficits the more likely the state governments is to hire additional workers, incur larger expenditures, and grant more generous retirement packages. Thus, the state's accounting decisions to understate pension obligations lead to over investment in employees, potentially leading to future fiscal problems. Jointly these results should be of interest to both accounting academics and policymakers. First, our paper adds to the accounting literature on whether the financial reporting choices influence real business decisions. Second, our paper highlights one of the potential problems with reporting pension obligations using relatively low discount rates. This choice leads to states investing more in employees.

1. Introduction

With the financial crisis in 2007 and 2008, the subsequent recession, and the resulting loss of jobs, there has been a heightened interest in the financial outlook of governmental entities. In particular, the federal government, states, and numerous municipalities have either experienced a reduction in tax revenue, increases in expenditures through entitlement programs, or a loss of returns from the financial assets they own, due to a poorly performing economy and low interest rates. Jointly these problems have led to burgeoning deficits and an increased focus on the liabilities of these governmental entities.

Perhaps the most controversial liability faced by state governments is their obligation to finance the retirement of its employees. In contrast to the private sector which offer defined contribution plans to their workers, state and local governments still offer defined benefit plans to the majority of their workers.[1] These defined benefit programs are typically quite generous and are also typically not fully funded resulting in significant governmental pension obligations. While some have argued that public sector pensions threaten our children's welfare[2], others have argued that pensions are not a significant contributor to the current fiscal problems faced by states.[3] The disagreement over the contribution of pensions to state's current fiscal crisis stems, at least in part, from the rules (and choices) that governmental entities use to measure the values of these liabilities, and the assets used to fund these liabilities.

Conceptually, the value of a pension liability is equal to the present value of the future pension payments due to plan participants. The controversy over the value of these liabilities

[1] According to a 2011 report by the Bureau of Labor Statistics (BLS), defined benefit retirement plans were available to 87% of state government employees and 83% of local government employees. The report further finds that "nearly all government workers who had access to a defined benefit retirement plan participated."

[2] See for example root at http://www.foxnews.com/opinion/2012/06/05/why-wisconsin-governor-scott-walker-will-win-big-on-tuesday/

[3] See for example http://www.cft.org/member-benefits/786-why-public-employee-pensions-are-not-the-problem.html

relates to the discount rates used to determine the present value of these cash flows. In the private sector, firms use a discount rate that reflects the rate at which the pension obligations can be settled. In stark contrast, governmental entities discount these future obligations at the expected returns on the assets held in the pension trust. Thus private entities typically discount obligations at a rate close to the Aa corporate bond rate, while governmental entities use a much higher rate, which reduces the value of the pension liability.

Unlike private entities, governmental entities also have discretion over the valuation methods used for the financial reporting of pension assets. Private entities report the value of pension assets at the current market value, whereas governmental entities have the discretion to smooth valuations by amortizing gains and losses that arise from realized investment returns that differ from expected returns over future reporting periods. The GASB has not put any constraints on the techniques or the length of the periods used in the actuarial valuation of assets. Therefore, the resulting actuarial value of assets can differ substantially from the fair value of the assets, with the difference driven by the reporting choices of the state.[4]

In this paper we focus on whether the accounting choices made by state entities when calculating pension assets and liabilities influence real decisions such as employee wages and employee hiring. We focus on hiring decisions because they are both directly linked to governments' pension obligations, and because labor expenditures are a big component of public sector finances. For example, according to the 2010 data from the Bureau of Labor Statistics (BLS), over 22 million people work in governmental entities, earning $234 billion in payroll costs accounting for almost 15 percent of the civilian labor force.

[4] For example, West Virginia values the plan assets based on market value and adjusts for accrued expenses, so the actuarial value of assets is very close to the market value of assets. On the contrary, South Carolina uses an amortization period of 10 years, with the result that in 2009 the market value of assets was only 73 percent of the actuarial value of assets.

A recent paper by McNichols and Stubben (2008) highlights how the pension accounting choices being by state entities can influence hiring decisions. They provide evidence that firms that mange earnings engage in suboptimal investment decisions during the period in which they manage earnings. In particular, they find that when firms manage earnings upwards, they tend to over-invest, which suggests that the accounting decisions being made for external reporting influence real business decisions. Building on this idea, Kedia and Philippon (2009) develop a model suggesting that during periods of earnings management, managers will also make sub-optimal investment and employment decisions to mimic growth. Thus the stock market is fooled by the joint artificial accounting numbers and sub-optimal investment decisions, allowing managers to profit through stock based compensation plans.

We extend these hypotheses to the public sector, investigating whether the employment decisions made by state governments are influenced by the accounting choices made by these entities for their pension obligations. One might expect the effects of accounting distortions on the decisions made by governmental entities to be dampened, as the employees of these entities do not have performance-based compensation or, in general, other incentives to increase profits. Thus, there is likely to be a reduced emphasis on the importance of the outputs of the accounting system on business decisions. However, in this setting fiscal outcomes may be important to electoral outcomes, increasing the importance of the outputs of the accounting system. In addition, the accounting choices being made by these entities are difficult to unravel, are likely to have a relatively small impact on current period performance, and thus may affect the "real" decisions being made by these entities.

To investigate whether the understatement in pension deficits affects state hiring decisions, we obtain data on each state's defined benefit pension plans from the Boston College

Center for Retirement Research. We are able to obtain this data for the 2001 through 2009 fiscal years. For each plan, we then hand collect its valuation reports to obtain information on the demographics of both active and inactive participants. We obtain state employment and wage data from the U.S. Census Bureau Census of Government Employment, and data for various control variables from the Bureau of Economic Analysis, the U.S. Census Bureau, and the American Community Survey.

We begin our analysis by measuring the extent to which the GASB's approach to measuring pension obligations and pension assets, and the choices made by governmental entities under this approach, result in understated pension deficits. The funded position of a pension plan is determined by the difference between the pension liability and the pension assets. Therefore, understated pension deficits are due to either understated pension liabilities or overstated pension assets. To measure the extent to which pension liabilities are understated, we use the pension accounting rules developed by the FASB to calculate a baseline pension liability position.[5]. We then deduct the pension liability as reported by the state from our calculated pension liability, and suggest that the difference between the two approaches is a measure of the extent to which a state entities' pension liability is understated. To measure the extent to which pension assets are overstated, we subtract the actuarial value of the plan assets from the market value of assets and suggest this difference as the measure of asset overstatement. Finally, we calculate the net understatement of pension liabilities by adding the understatement in pension liabilities and the overstatement in pension assets.

[5] The FASB requires pension plan sponsors to use the Projected Unit Credit (PUC) actuarial cost method to allocate costs, and to discount benefit payments using a high-quality fixed income rate that matches the duration of the expected benefit payments from the plan. Unlike the FASB, most states use the Entry Age Normal (EAN) actuarial cost method, so we re-estimate the pension liabilities for each state using the PUC method. We also use three different duration matched discount rates to determine the present value of these obligations: the Aa corporate bond rate, the taxable state general obligation bond rate, and Treasury yield.

We find that the average annual pension liabilities estimated using the PUC actuarial cost method and discounted using Aa corporate bond rates is $2.7 trillion at the national level. This number increases to $2.8 trillion and $3.5 trillion if we discount the pension obligations using the state general obligation bond rates and the Treasury yields, respectively. Since the average reported pension liability under the GASB rules is $2.5 trillion, we find that using the FASB rules to calculate the pension liability increases state obligations by 8% - 40%. We also find that for 41 states, the average actuarial value of plan assets is higher than the market value of the assets, suggesting that most state sponsored pension assets are overstated. At the national level, the smoothed actuarial value of the assets is $88 billion higher than the market value of the assets.

To investigate whether understated pension deficits affect state hiring decisions, we examine whether the growth in the number of public employees and the growth in the compensation per employee are associated with the extent to which a state under reports its pension deficits. In these analyses we use a 5 year lag between the dependent variable and the estimated understatement of pension deficits. A change specification and a relatively long lag mitigate the concern of reverse causality. Control variables include population growth, changes in population density, changes in personal wealth, changes in youth population, and the size of the employee base.

When we link the understatement in pension deficits to future growth in public worker employment, we find that a per capita understatement of $1,000 is associated with a 0.4% - 0.6% increase in the growth rate of state employment in the next 5 years. This effect is economically significant because it accounts for 12% - 18% of the average employment growth rate during the sample period. We also find that the increase in state hiring results from both the understatement in pension liabilities and the overstatement in pension assets. However, we only find weak

evidence that states pay more to their employees because of the understatement in pension deficits. In addition, the increase in wages is largely attributable to the understatement in pension liabilities, and not to the overstatement in pension assets. We find that a $1,000 per capita understatement in pension deficits increases annual payroll expenditures of an average state by $60 million - $69 million.

We conclude the paper by conducting a set of supplementary analyses investigating whether understated pension deficits lead to higher spending and more generous retirement packages. State governments with understated pension deficits may not internalize the true fiscal condition of the state and therefore employ loose fiscal policies and grant generous pension packages. Consistent with these expectations, we find that the understatement in pension deficits results in an increase in total expenditures and growth in the state's pension packages. A $1,000 per capita understatement of the pension obligation is related to a $183 million - $276 million increase in total expenditures and a 0.2% increase in the growth rate of pension packages.

This paper contributes to the literature on how accounting choices affects real decisions. We extend the private sector studies (e.g., McNichols and Stubben, 2008; Biddle et al., 2009) which focus on corporate investment decisions to the public sector. In addition, we show that the accounting information available to governmental officials affects decisions on hiring, spending, and retirement plan design. Thus our paper provides additional evidence that both firms and governmental entities appear to rely on externally reported numbers when making both investment and employment decisions.

This paper also extends the literature on public pensions. The current heated debate on public pensions focuses on the appropriate discount rates a state should use to calculate its pension liability. These debates are driven by the concern that under reporting pension deficits

will result in insufficient current contributions, and hence an unfair shifting of the cost of these plans to future generations. We find that under reporting pension deficits results in significant additional costs that arise due to increased hiring and more generous compensation. Therefore, it is not only the case that the current GASB regime poses distributional fairness issues, but also that it is leading to policy choices that are increasing state level employee costs. This result should be of interest to governments and policymakers.

The paper proceeds as follows. Section 2 provides background information on financial reporting for pension obligations and develops the hypothesis. Section 3 describes our research design and Section 4 discusses the methodology for estimating pension underreporting. Section 5 presents our empirical findings and Section 6 concludes.

2. Background and Hypothesis Development

The financial reporting of public pension plans currently follows Government Accounting Board (GASB) Statement No. 25, *Financial Reporting for Defined Benefit Pension Plans and Note Disclosures for Defined Contribution Plans*, and GASB Statement No. 27, *Accounting for Pensions by State and Local Governmental Employers*. These standards recommend that the projected pension liabilities be discounted at a rate equal to the anticipated returns on the plan's current and future assets.[6] In addition, states have the discretion to amortize investment gains and losses on the assets held in the pension trust and the GASB has not put restrictions on the smoothing methods or the length of the smoothing periods.[7] As a result, state and local governments use the expected investment returns of the plan assets to calculate their

[6] GASB 25, paragraph 36c "… the investment return assumption (discount rate) should be based on an estimated long-term investment yield for the plan, with consideration given to the nature and mix of current and expected plan investment …."

[7] GASB 25, paragraph 140 "…the valuation of assets generally should reflect *some function of market value*, a term that includes both current market values and values produced by techniques that smooth the effects of short-term volatility in market values." "…, the Board has not placed constraints on the kinds of smoothing techniques or the length of smoothing periods used in the actuarial valuation of assets."

pension liabilities and typically report the funded status of the pension plan using an actuarial value of assets that amortizes investment gains and losses.

There are a number of critics of the discounting approach allowed under GASB. For example Novy-Marx and Rauh (2011), argue that the GASB approach has the potential to downwardly bias the measurement of public pension liabilities. They suggest that discounting liabilities at an expected rate of return on the assets in the plan "runs counter to the entire logic of financial economics: financial streams of payment should be discounted at a rate that reflects their risk (Modigliani and Miller (1958)), and in particular their covariance with priced risks (Treynor (1961), Sharpe (1964), Lintner (1965))."

Similarly, the methodology outlined under GASB 25 is in direct contrast to the methodology required under Statement of Financial Accounting Standards (SFAS) No. 87, *Employers' Accounting for Pensions*. SFAS 87 requires that the future benefit payments be discounted using an interest rate that reflects the rate at which the pension obligations can be settled rather than the anticipated investment return on the pension assets.[8] In seeking these rates, the rule further suggests employers to look to "rates of return on high-quality fixed-income investments currently available and expected to be available during the period to maturity of the pension benefits." In practice, companies in the U.S. typically use zero-coupon duration-matched Aa corporate bond rates to determine their pension liability for financial reporting purposes.

SFAS 87 and GASB 25 advocate two different approaches to calculating pension liabilities and pension assets in part because there are inherent differences between for-profit and

[8] SFAS 87, paragraph 44 "Assumed discount rates shall reflect the rates at which the pension benefits could be effectively settled." Additional discount rate guidance is provided by the SEC in EITF Topic No. D-36, which states: "The objective of selecting assumed discount rates is to measure the single amount that, if invested at the measurement date in a portfolio of high-quality debt instruments, would provide the necessary future cash flows to pay the benefit obligation when due. Notionally, that single amount . . . would equal the current market value of a portfolio of high-quality zero coupon bonds."

non-for-profit entities, and there are inherent differences in the role of accounting information and the financial reporting process in these organizations. The FASB's approach is designed to determine an accurate value of the pension liability and pension deficit, and the cost of disposing of the pension obligations.[9] This is consistent with their conceptual framework. Specifically, in Concept Statement No. 1, *Objectives of Financial Reporting*, the FASB states that "Financial reporting should provide information to help present and potential investors and creditors and other users in assessing the amounts, timing, and uncertainty of prospective cash receipts from dividends or interest and the proceeds from the sale, redemption, or maturity of securities or loans. Since investors' and creditors' cash flows are related to enterprise cash flows, financial reporting should provide information to help investors, creditors, and others assess the amounts, timing, and uncertainty of prospective net cash inflows to the related enterprise." By reporting the liability at an amount reflecting the expected costs of disposing of the obligations, and by reporting the current fair value of the pension assets backing those obligations, the FASB approach provides information that will help investors more accurately determine future net cash flows.

In contrast, the GASB 25 approach supports a pension liability calculation that is primarily useful in setting a reasonable contribution schedule, and allows the use of amortization schedules in the determination of pension assets that mitigate the volatility in annual contribution requirements. The GASB approach does not provide an accurate reflection of the expected resources that will be used to extinguish the liability. This choice in part reflects the GASB's view of the role of financial reporting for governmental entities. In Concepts Statement No. 1, *Objectives of Financial Reporting*, the GASB argues that "financial reports are used primarily to

[9] If the sponsor of a private pension plan wished to dispose of its pension plan, it would be required to purchase an annuity contract from a highly rated insurance company that would pay its participants the benefits owed. The cost of purchasing such a contract is approximated using the AA/Aa corporate bond rate.

compare actual financial results with the legally adopted budget; to assess financial condition and results of operations; to assist in determining compliance with finance-related laws, rules, and regulations; and to assist in evaluating efficiency and effectiveness." Thus the pension obligation reported under their rules is designed to help financial statement users evaluate whether actuarial determined funding amounts are being met, as opposed to the expected resources needed to extinguish the liability.

A white paper released by GASB in 2006 highlights the differences between the FASB and GASB, and defends their approach for valuing pension deficits. In particular, they suggest that governments do not face competition, governments have the power to tax, and they have the ability to continue operating in perpetuity. Under this concept of government permanence, the accounting standards for governmental reporting emphasize accountability to a larger extent than the accounting standards for business enterprises. FASB's Concepts Statements No. 1 indicates that the financial reporting for businesses has an investor and creditor focus. In contrast, governmental accounting focuses on assessing whether current resources were sufficient to meet current service costs or whether the burden of paying for current services was shifted to future taxpayers (this is called interperiod equity). The white paper states that "The longevity of governments, the importance of the cost-of-service information, and the desire of stakeholders to measure interperiod equity all influence the GASB's standards for defined benefit pension and OPEB plans."

A key element of the reporting rules for pensions is that the data being accumulated and reported is designed to be useful to external users. That is, the FASB designs their rules to provide data that is useful to investors and creditors, and the GASB designs their rules to provide data that is useful primarily to citizens and elected representatives, two constituencies not

identified as users of financial statements by FASB. In this paper we focus on this idea, investigating whether the reporting rules for pensions required by the GASB influence the employment decisions being made by state governments.

By allowing state governments to use a higher discount rate to determine their pension liabilities, the financial statements of governmental entities will report lower pension liabilities than would be required under FASB standards. In addition, by allowing governmental entities to amortize gains and losses on pension assets, there is a potential that the actuarial asset value is higher than the market value. The combination of understated liabilities and overstated assets leads to understated pension deficits. One potential consequence of these "under reported" deficits is that elected officials rely on financial statement data being generated by these governmental entities when making hiring decisions, and these under-reported deficits may lead to states hiring relatively more employees, paying relatively higher salaries, and providing those employees with more generous defined benefit pension plans. That is, states that have relatively large "under reported" pension deficits fail to internalize the "true-costs" of these plans, and hence make policy decisions that lead to increased governmental payments.

3. Research Design

3.1 State government employment and pension liability understatement

To study how the understatement of a state's pension deficits affects the hiring decisions of state governments, we investigate the growth in state government employment and wages. Because it can take time for relative employment and wage levels to adjust to their new equilibrium, we examine the 5 year growth in employment and wages.[10] Using a change model and a relatively long lag also mitigates the concern of reverse causality. In other words, our

[10] Using a long-term lag to allow wage and employment to adjust to their new equilibriums is common in labor economics research. For example, Poterba and Rueben (1995) use a ten year lag to study the effects of property tax limits on wages and employment of local governments.

research design makes it unlikely that the future increase in workers drives the current period understatement in pension deficits. The regression takes the form:

$$\Delta WorkForce_t = \alpha_0 + \alpha_1 UNDERSTMT\_PENDEFICIT_{t-5} + \theta \Delta Controls_t + \varepsilon_t \quad (1)$$

where ΔWorkForce is either the 5 year change in the natural logarithm of wages (ΔlnW) or the 5 year change in the natural logarithm of employment (ΔlnE). We define employment (E) as the full-time equivalent state employees and wages (W) as the annualized total payroll divided by full-time equivalent state employees.

UNDERSTMT_PENDEFICIT is the per capita understatement in pension deficits expressed in thousands. A pension plan is running deficits if its liability is greater than its assets. UNDERSTMT_PENDEFICIT is the difference between the estimated pension deficits and the reported pension deficits. We estimate the "true" pension deficits by taking the difference between the estimated pension liabilities under different discount rates and the market value of the assets. The reported pension deficit is the difference between the reported pension liabilities and the actuarial value of assets. We define a pension deficit being understated if the estimated deficit is larger than the reported deficit.

$$\begin{aligned} UNDERSTMT\_PENDEFICIT &= \text{Estimated Pension Deficits} - \text{Reported Pension Deficits} \\ &= (PENSION\_L\_EST - MVA) - (PENSION\_L\_RPT - AVA) \\ &= (PENSION\_L\_EST - PENSION\_L\_RPT) + (AVA - MVA) \\ &= \text{Understatement in Pension Liabilities} + \text{Overstatement in Pension Assets} \end{aligned} \quad (2)$$

where PENSION_L_EST is the estimated pension liabilities using alternative discount rates, MVA is the market value of pension assets, PENSION_L_RPT is the reported pension liabilities, and AVA is the actuarial value of pension assets. We are able to directly obtain PENSION_L_RPT, MVA, and AVA from states' financial reports. We generate

PENSION_L_EST using the mandated SFAS 87 approach and three different discount rates: the AA corporate rate, the taxable state general obligation bond rate[11], and the Treasury yields. We use the discount rate that matches the duration of the pension plan under each of the three alternatives. Often times, we cannot find a perfect match. When this happens, we interpolate between the two closest maturities to calculate the appropriate rate for the plan.[12]

An understatement in pension deficits happens either when the pension liabilities are understated (PENSION_L_EST > PENSION_L_RPT) or when the pension assets are overstated (AVA > MVA). An understatement in pension liabilities happens when the assumed discount rates (i.e., AA rates, general obligation bond rates, or the Treasury yields) are lower than the discount rates (i.e., anticipated investment rate of return) used by the pension plan. An overstatement in pension assets happens when amortized losses exceed amortized gains. We estimate UNDERSTMT_PENDEFICIT at the state level. If a state sponsors more than one plan, we aggregate the variable into the state level and then deflate it by the state population to determine the per capita figure. We expect states with higher levels of per capita underreported pension deficits to hire more workers and pay higher wages, and therefore expect a positive α_1.

We follow the labor economic literature (e.g., Poterba and Rueben (1995); Matsusaka (2009)) and include a set of standard control variables that may affect state-level demand for government services. ΔlnPI is the 5 year change in the natural logarithm of state personal income per capita. POP_GROWTH is the percentage population growth in the past 5 years. ΔDENSITY is the 5 year change in the population density, where population density is defined as the number

[11] Following Novy-Marx and Rauh (2011), we assume a 25% marginal personal tax rate and calculate the taxable state general obligation bond rate by dividing each state's general obligation bond rate by (1-25%). This calculation is to remove the tax exempt premium associated with the municipal bond yields.

[12] For example, Alabama ERS in fiscal year 2001 has an estimated duration of 18.5 years and the plan's actuarial valuation date is September 30. The 10 year Treasury yield on September 30, 2001 is 4.73% and the 20 year Treasury yield is 5.53%. The treasury does not have 18.5 year maturity yield. We interpolate between the 10 year maturity yield and the 20 year maturity yield to calculate the yield for 18.5 years. The interpolated yield is 5.41%.

of residents per square mile. ΔlnKID is the 5 year change in the natural logarithm of per capita population under age 18. LAG_lnE is the natural logarithm of per capita full-time equivalent state employees at *t*-5. We include this variable to control for the size of state employees, because it is likely that states with more employees are more likely to understate their pension deficits. If these states are also more likely to over hire or over pay their workers, we have an omitted variable problem. By including LAG_lnE, all our results are orthogonal to the size of state employees.

We estimate equation (1) by pooling all the data over the sample period from 2001 to 2010. Note that since we employ a 5 year lag between the change in state work force and pension underreporting, UNDERSTMT_PENDEFICIT in equation (1) is measured during 2001-2005. Since we are running a full panel, in all our analyses we cluster standard errors by state and by year to correct for possible correlations across observations of a given state and of a given year (Rogers (1993); Petersen (2009)). Appendix A lists detailed variable definitions.

3.2 Sample selection

Our sample period is from 2001 to 2010. We use multiple public data sources to construct our sample. We collect state sponsored defined benefit pension plan data from the Boston College Center for Retirement Research. These pension plan data cover the 2001 through 2009 fiscal years. We crosscheck these data using the information from the National Association of State Retirement Administrators (NASRA). When there are discrepancies between the two data sources, we verify the information using the plan's Comprehensive Annual Financial Report (CAFR). We also collect each plan's valuation reports and CAFRs to obtain the information on the early retirement provisions and demographics of both the inactive and active participants to implement our estimation procedure outlined in Section 4. We calculate the pension liabilities

using different discount rates for 106 plans. After aggregating these plans to the state level, we have 450 state-year observations (9 years data for 50 states).

We use the Citigroup Pension Discount Curve, which we download from the Society of Actuaries website, to estimate the appropriate Aa corporate bond rate.[13] We collect the state general obligation bond rate from Bloomberg. We obtained state specific general obligation bond yield curves for 20 states.[14] For the remaining 30 states, we collect their general obligation bond credit ratings from Census Bureau's Statistical Abstract of the United States and then use these credit ratings' corresponding yield curves from Bloomberg to proxy for the states' general obligation bond yield curves.[15] To ensure that we do not use forward looking data in discounting the pension liabilities, we match the actuarial valuation dates to the most recent general obligation bond yields. All the general obligation bond yields are collected either on June 30 or December 31. For plans with their actuarial valuation dates between January 1 and June 29, we use the general obligation bond yields on December 31 in the prior year. For plans with their actuarial valuation dates between June 30 and December 30, we use the general obligation bond yields on June 30 in the same year. For plans with their actuarial valuation dates on December 31, we use the general obligation bond yields on the same date.

We obtain monthly Treasury yield curves from the Board of Governors of the Federal Reserve System. The 30 year Treasury yields were discontinued between February 2002 and February 2006. For this period, we estimate the 30 year Treasury yields using the adjusting factor published by the U.S. Department of the Treasury. Similar to the state general obligation

[13] The Citigroup Pension Discount Curve uses a specific mathematically generated Aa yield curve and is designed specifically to meet the requirements of SFAS 87. More information on this yield curve is provided in Naughton (2012).

[14] The 20 states are California, Connecticut, Florida, Georgia, Illinois, Massachusetts, Maryland, Michigan, Minnesota, North Carolina, New Jersey, New York, Ohio, Pennsylvania, South Carolina, Tennessee, Texas, Virginia, Washington, and Wisconsin.

[15] Bloomberg only has general obligation bond yield curves for AAA, AA+, AA-, A+, A-, and BBB. We interpolate between the AA+ and AA- curves to obtain an AA curve, and between A+ and A- curves to arrive an A curve.

bond yields, we match each plan's actuarial valuation date to the most recently published Treasury yields prior to the valuation date.

We collect state governments' financial data from Census Bureau's Annual Survey of Governments and state employment data from the Census of Government Employment. We collect a state's personal income data from the Bureau of Economic Analysis and a state's population data from the U.S. Census Bureau. We collect the size of the state in square miles from the American Community Survey by the U.S. Census Bureau.

4. Estimation of Pension Liabilities

4.1 Overview

We use the financial reporting methodology required under SFAS 87 to estimate the pension liabilities rather than the methodology outlined under GASB 25 because the SFAS 87 approach is designed to determine the value of the pension liability, whereas the GASB 25 approach calculates a liability that is only intended for use in the determination of the pension contribution requirement. Because of this feature, GASB allows states to use the anticipated investment return on the assets in the pension trust to discount future benefit payments in order to determine the pension liability. For example, suppose a pension plan has a single payment one year from now equal to $1,155, and the pension trust is holding assets that will earn a 10% return, then the pension liability for GASB purposes is $1,050. This $1,050 represents the amount that will fund all future benefit payments assuming that the investment return is realized. It is referred to as the actuarial accrued liability, or just the accrued liability.

Actuaries and standard setters know that this approach does not provide an accurate reflection of the actual pension liability since not only is the 10% investment return not guaranteed, but it also has nothing to do with the risk and uncertainty associated with the

anticipated future pension benefits. As a result, using a 10% discount rate to value the pension liability understates what it would actually cost to dispose of the pension obligations. For this reason, SFAS 87 requires that the future benefit payments be discounted using an interest rate that reflects the rate at which the pension obligations can be settled rather than the anticipated investment return on the pension assets. As a result, the pension liability for financial reporting purposes is determined using an Aa corporate bond rate.

Using an Aa rate produces a pension liability that approximates the cost of disposing the pension obligations using an annuity contract from a highly rated insurance company. For the hypothetical firm with a single payment of $1,155 one year from now, and a 5% duration matched Aa rate, the pension liability for financial reporting purposes would be $1,100. Therefore, even though a contribution based approach indicates that only $1,050 is required to fund the future benefit promise, the liability for financial reporting purposes (which is a better reflection of the true pension liability) is actually $1,100. In our tests, we compare the actual reported pension liability (PENSION_L_RPT) with what the pension liability would be if we used the SFAS 87 methodology (PENSION_L_EST). For the example above, this would mean that we would compare the reported accrued liability of $1,050 with our estimated pension liability of $1,100, and identify that there is an underreporting of the pension liability of $50. In the next section, we explain our choice of actuarial cost method and how we apply that method to estimate the pension liabilities.

4.2 Actuarial methodology

We estimate the pension liabilities by state and year using the projected unit credit ("PUC") actuarial cost method, the mandated approach under SFAS 87. Actuarial cost methods spread out the accumulation of pension benefits between past and future service for active

employees. There are three key quantities that are common to all actuarial cost methods: (1) The present value of future benefits ("PVFB") (2) The present value of future normal cost ("PVFNC"); and (3) The pension liability. These quantities are connected by the following identity:

$$\text{Pension Liability} = \text{PVFB} - \text{PVFNC} \qquad (3)$$

Identity (3) is often called the prospective approach. The pension liability can also be expressed as the accumulation of past normal costs and this latter approach is referred to as the retrospective approach. Both the prospective approach and the retrospective approach always produce the same pension liability. The only difference is in how the calculations are completed. It is also important to note that actuarial cost methods are only relevant in the determination of the pension liability attributable to active employees. Once a benefit amount is fixed at the time an employee separates from service, all actuarial cost methods produce the same exact result.

The PUC method takes the projected benefit and spreads it out evenly over an employee's career. In other words, the cost of the expected pension benefit is allocated based on service. For example, suppose that the projected benefit at retirement is $100 for an employee who will have 10 years of service at retirement. In this case, the normal cost is the present value of $10, the proportion of the benefit that is attributable to service in the current year. The pension liability is the present value of the benefit based on service to date. For example, if the employee currently has 3 years of service, then the pension liability is equal to the present value of a $30 benefit.[16] The PUC method is well suited to accounting because it provides an accurate matching of when the service is performed and when the expense is incurred. In the above example, the employee earned $10 of expected pension benefits for his most recent year of employment, and

[16] Under the retrospective approach, the pension liability is equal to the present value of $30, which is the accumulation of past normal costs. Under the prospective approach (i.e., equation (2)), the pension liability is equal to the present value of $100 (PVFB) minus present value of $70 (PVFNC).

therefore, for financial accounting purposes it would recognize an expense that is based on the value of this $10 pension benefit.

Rather than using the PUC method, most states use the entry age normal ("EAN") method to determine the required annual payment for their pension programs. The PVFB is the same under this actuarial cost method as the PUC method. However, rather than spreading out normal cost based on service, the EAN method typically spreads out normal cost as a percentage of pay. The EAN is well suited to generating a smooth contribution pattern in relation to pay, but it does not provide an accurate matching of service and costs. Therefore, even though the EAN method is commonly used for funding purposes, the costs that it generates do not provide an accurate matching with service. Under the EAN method, the PVFB is multiplied by a ratio of the accumulation of past pay to all pay over the employee's career to determine the pension liability and by the ratio of current pay to all pay over the employee's career to determine the normal cost.

The EAN approach produces a normal cost that is higher in earlier periods and lower in later periods of an employee's career when compared with the PUC method. Because the pension liability is equal to the accumulation of past normal costs, this means that the PUC method will produce a lower pension liability than the EAN method. The two approaches will always converge at retirement when the pension benefit is fixed. Appendix B provides a summary of the accrued liability and normal cost calculations for a pension participant who reflects the median attributes of public pension plans.[17] For this participant, the accrued liability using PUC is approximately 82 percent of the accrued liability using EAN.

[17] The hypothetical pension plan provides for a retirement benefit equal to 2% of the final 3-year average salary for each year of service. The retirement benefit is payable as a single life annuity with a 3% cost of living adjustment (COLA) at age 62. The participant is currently age 47 with 12 years of service, and has an annual salary of $50,000. The actuarial assumption for the discount rate is 8% and for salary increases is 5%.

We use an aggregate rather than an individual approach to implement the PUC cost method. The difference between an aggregate method and an individual method is the unit of analysis. An individual method uses individual participant data and calculates the pension liability values for each participant. The pension liability for the entire plan is then the sum of these individual liabilities. An aggregate method, on the other hand, uses a single hypothetical participant whose characteristics reflect those of the plan as a whole. In this case, the pension liability for the entire plan is simply the pension liability for this participant. The aggregate method is very common in estimating pension liabilities for both public and private pension plans. When properly applied, the pension valuation under both the individual and aggregate approaches produces virtually identical results.

Consider a pension plan that has three participants, currently age 60, 65 and 70. The three participants are receiving monthly single life annuity benefits of $200, $100 and $50, respectively. Under an individual cost method, the pension liability is calculated separately for each participant. The appropriate present value factors using an 8% discount rate and RP-2000 mortality[18] are 117.14, 108.81 and 98.07, respectively. Therefore, the pension liabilities are $23,428, $10,881 and $4,904, resulting in a total pension liability of $39,213.

The aggregate method uses a single calculation to arrive at the total pension liability. As was the case with the individual method, we need two inputs: the amount of the benefit payment and the age of the participant. The appropriate benefit amount is simply the sum of the three individual benefit amounts, or $350. The appropriate age is a benefit-weighted average age. In other words, it is the sum product of the age times the benefit amount, divided by the total benefit amount. For the three participants above, the benefit-weighted average age is 62.9, which is approximately 2 years less than a simple average. Therefore, the pension liability is

[18] http://www.soa.org/Files/Research/Exp-Study/rp00_mortalitytables.pdf

determined by assuming there is a single participant, currently age 62.9, receiving a single life annuity benefit of $350. The present value factor for this participant determined using an 8% discount rate and RP-2000 mortality is 112.66, resulting in a pension liability of $39,431. The difference between the aggregate calculation and the individual calculation is $218, or about 0.5%.

4.3 Pension liability estimation

We estimate the pension liability separately for the active and inactive participants. For the active participants, we need three distinct groups of items for the calculation: information about the participants, information that relates to the benefit formula, and information on the specific actuarial assumptions. We collect information on the total pay, average service and average age of all the active participants to identify the attributes of the hypothetical employee for purposes of applying the aggregate PUC method. We use the benefit multiplier from the plan provisions to determine the size of the retirement benefit. We use the actuarial assumptions for the discount rate, the salary growth assumption, the retiree cost of living adjustment (COLA), and the average retirement date to determine the value of this retiree benefit. For the inactive participants we follow the same approach, except that our hypothetical inactive participant is determined using the total benefit payments (rather than total pay).

Table 1 compares the reported pension liabilities with our estimates discounted at the reported discount rates. In general, the PUC accrued liability will be approximately 80-85 percent of the EAN accrued liability for the active participants. Since the active liability only represents about half of the total reported pension liability, we expect that our total estimated liability will be approximately 90-92 percent of the total reported liabilities. Table 1 shows the results by state. There is some variation in how well our results match by state—the range is

approximately 80 to 100 percent. However, the overall average is quite close to 90 percent. These results confirm that our approach provides a reasonable estimate of the SFAS 87 pension liability.

We also calculate the duration for each plan in our sample. The duration of a pension plan is the average length of time over which benefit payments are made, and it reflects a measure of the interest sensitivity of the pension liabilities. We calculate the duration by calculating the percentage change in the estimated pension liability due to a one percentage point decrease in the discount rate. On average, the total estimate pension liability is about 17 percent higher when we decrease the discount rate by one percentage point. This means that the average duration is about 17 years, which is slightly higher than the duration that is typically used for corporate pension plans of 15 years. This is expected given that public pension plans have provisions, such as COLAs, that are not present in corporate plans and that increase the amount of future benefit payments and hence the overall duration of the pension plan. We use the duration to adjust our estimated liabilities to reflect each of the discount rates we consider in our analysis.

5. Results

5.1 Descriptive statistics

Table 2 Panel A presents the average size of each state's pension liabilities during the sample period. The total amounts are in $ billions and the per capita amount are in dollars. Column [1] shows the actuarially determined pension liabilities as reported on each plan's CAFRs. Column [2] shows the estimated pension liabilities discounted at the Aa corporate bond rates, column [3] shows the estimated pension liabilities discounted at the taxable state GO bond yields, and column [4] shows the estimated pension liabilities discounted at the Treasury yields.

Not surprisingly, as we move from column [1] to column [4], the size of the pension liabilities generally increases as the discount rate is typically reduced. During the sample period, the average discount rate used to calculate the reported pension liabilities is 8%. The average Aa corporate bond rate is 6.5%, the average taxable state GO bond rate is 6.1%, and the average Treasury yield is 4.8% (untabulated).

The national total reported pension liabilities during the sample period are on average about $2.5 trillion. This number increases to $2.7 trillion if we discount the liabilities using the Aa corporate bond rates, and to $3.5 trillion if we use the Treasury yields.[19] Among 50 states, California has the largest pension liabilities. Its average reported pension liabilities during the sample period are about $400 billion ($11,114 per capita). However, if we discount the liabilities at the risk-free Treasury yields, the amount soars to $522 billion ($14,559 per capita). California's average GDP during the sample period is $1,654 trillion. So the state's pension liabilities discounted at the Treasury yields are about 1/3 of its state GDP. The next three states that have large pension liabilities are New York, Ohio, and Texas. These states' average pension liabilities are all above $150 billion, regardless of the discount rates used to calculate the liabilities amount. Their pension liabilities discounted at the Treasury rates account for 29%, 52%, and 22% of their GDPs.

Table 2 Panel B reports the average size of each state's pension assets during the sample period. Column [1] shows the actuarial value of pension assets and column [2] shows the market

[19] Using 116 state sponsored pension plan data, Novy-Marx and Rauh (2011) report that on June 2009, the estimated total national pension liabilities are $3.2 trillion under taxable municipal bond rates and $4.4 trillion under Treasury rates. Our estimates are different from Novy-Marx and Rauh's (2011) estimates because our data have a longer time series (2001-2009) and fewer pension plans (106 plans). If we restrict our sample to year 2009, the estimated national pension liabilities under the taxable state GO bond rates are $3.5 trillion and are $4.7 trillion under the Treasury yields. These numbers are slightly larger than Novy-Marx and Rauh's (2011) because we use the PUC actuarial cost method, which is mandated by SFAS 87 and takes into account future increases in pay. In contrast, the numbers calculated by Novy-Marx and Rauh (2009) are based on the traditional unit credit method, which only takes into account current pay.

value of the assets. Of the 50 states, 41 states' actuarial value of assets is larger than the market value of the assets. New York has the largest discrepancy, where the actuarial value of the assets is $24 billion larger than the market value of the assets. New Jersey and Washington are the next two states that have large differences between actuarial value of assets and market value of assets. For New Jersey, the assets' actuarial value is $12 billion larger than its market value; and for Washington, the actuarial value is $9 billion larger than the market value.

Table 3 reports summary statistics for the main variables. We have 500 state-year observations for the full sample between 2001 and 2010. Equation (1) is estimated with a 5 year lag and thus, the sample size decreases to 247 observations for the regression analysis.[20] The average state employment is about 85,000 people or 18 per 1,000 state residents. The average salary for state employees is $44,936. During the sample period, the state employment grows about 3.3% and the workers' wage grows about 17%.[21] The understatement in pension deficits with the liabilities discounted using the AA corporate bond rates is $1,224 per capita. The understatement increases to $1,350 per capita when the liabilities are discounted using taxable state GO bond rates, and above $3,000 per capita when the liabilities are discounted using the risk-free Treasury yields.

An average state has about 6 million people, with an average personal income of $35,008. The 5 year population growth during the sample period is about 5% and the personal income growth is about 20%. The average population density is 190 people per square mile, with an increase of about 6 people per square mile every 5 years. On average a state has 24% of its population under age 18 and this proportion is decreasing during the sample period.

[20] The dependent variables are the 5 year growth in wage and full time employees between 2001 and 2010. Each state has 5 observations and we should have 250 state-year observations in the regression analysis. The 3 missing observations are for Massachusetts, Utah, and Wyoming. These states do not have the data in 2001.

[21] To be precise, the growth in state employment is about 3.4% ($e^{0.033}$-1) and the growth in state worker wage is about 18.6% ($e^{0.171}$ – 1).

Table 4 reports the Pearson correlations among the main variables. Not surprisingly, the understatement in pension deficits calculated using the three different discount rates are highly correlated with each other, with correlations ranging from 0.87 to 0.937. The growth in state employment is positively correlated with the lagged understatement in pension deficits, with correlations ranging from 0.108 to 0.134. This result is consistent with our hypothesis that incorrect accounting information may affect state governments' internal decisions. When a state government relies on understated pension deficits to make hiring decisions, it may hire too many workers. However, we do not find the understatement in pension deficits correlated with the increase in workers' compensation.

5.2 Regression results

Table 5 reports the regression results of equation (1), where the dependent variable is the 5 year growth in state employment. In column [1], we measure the understatement in pension deficits using the Aa corporate bond rates to discount the pension liabilities; in column [2], we measure the understatement using the taxable state GO rates to discount the pension liabilities; and in column [3] we use the Treasury yields to discount the pension liabilities.

For each measure of the understatement in pension deficits, we find a positive and statistically significant association between the understatement in the pension deficits and the growth rate of state workers. For example, when we take into account the state riskiness and measure the pension liabilities using the taxable state GO bond rates, the coefficient on the understatement, UNDERSTMT_PENDEFICIT, is 0.006 (*t*-statistic of 2.899). This estimate suggests that a per capita understatement in the pension deficit of $1,000 is associated with a 0.6 percent increase in the growth rate of state employment in the next 5 years. This effect is also economically significant. The average 5 year growth rate of state employment during the sample

period is 3.3% (see Table 3). So a $1,000 per capita understatement in pension deficits increases the growth in state employment by 18%.

Table 6 reports the regression results where the dependent variable is the 5 year growth in the state worker wage. The presentation format is similar to Table 5 where each column reports results using different measures of understatements in pension deficits. We only find weak results that the understatement in pension deficits may drive up employee wages. When we use the Aa corporate bond rates to discount the pension liabilities, we find that the coefficient on UNDERSTMT_PENDEFICIT is positive and significant (0.002, *t*-statistic of 1.659) This estimate suggests that a $1,000 per capita understatement in pension deficits is related to a 0.2% increase in the next 5 year growth in state worker wages. However, when we discount pension liabilities using either the taxable state GO bond rates or the Treasury yields, we do not find UNDERSTMT_PENDEFICIT is related to the growth in state worker wages.

Regarding the control variables, we find that a growing state tends to have a higher growth rate in hiring new workers and a higher growth rate in their workers' compensation. We also find a negative relation between the change population density and the growth in state worker's compensation.

So far we have documented that the understatement in pension deficits is associated with the growth in state hiring. The understatement in pension deficits may come from the understatement in pension liabilities, or the overstatement in pension assets. To have a more complete picture of how understated pension deficits affect state hiring decisions, we disaggregate the understatement in deficits into the understatement in plan liabilities (UNDERSTMT_PENL) and the overstatement in plan assets (OVERSTMT_PENA). From Table 3 we find that most of the understatement in pension deficits comes from the understatement in

pension liabilities. For example, when we discount the pension liabilities using the Aa corporate rates, the average understatement in pension deficits is $1,224 per capita, with 83% of the understatement coming from the understated pension liabilities ($1,014 per capita) and 17% coming from the overstated pension assets ($210 per capita).

We separately regress ΔlnE and ΔlnW on UNDERSTMT_PENL and OVERSTMT_PENA and report the results in Table 7. Table 7 Panel A reports the results where ΔlnE is the dependent variable. We find that both the understatement in plan liabilities and the overstatement in plan assets drive up the growth rate in state hiring. Regardless of the discount rates we use to calculate the pension liabilities, the coefficients on UNDERSTMT_PENL and OVERSTMT_PENA are all positive and significant. The coefficients are also of similar magnitudes. Panel B reports the results where the dependent variable is ΔlnW. We find that the understatement in plan liabilities is weakly associated with the growth in state worker wage. When we discount the pension liabilities using the Aa corporate rates, the coefficient on UNDERSTMT_PENL is positive and significant (0.004, *t*-statistic of 2.196). When we discount the liabilities using the state GO bond yields or the Treasury yields, the coefficient remains positive, but the significance level drops to 10% one tailed. We do not find the overstatement in pension assets associated with wage growth.

To further gauge the economic magnitude of our results, we examine the increase in total payroll expenditures due to the understatement in pension deficits. ΔPayroll is the 5 year increase in annual payroll expenditures deflated by current year population. Table 3 shows that during the sample period, the annual average payroll expenditures is over $4 billion or $797 per capita. The average 5 year increase in per capita payroll expenditures is $162.

Table 8 reports the results on the association between understatements in pension deficits and increases in payroll expenditures. Not surprisingly, we find that the understatement in pension deficits is associated with the increase in state payroll expenditures. The coefficients on UNDERSTMT_PENDEFICIT are all positive and significant at 1% level across columns. The estimates suggest that a $1,000 per capita understatement in pension deficits increases per capita payroll expenditures by around $11. Given that the average population between 2006 and 2010 is 6,071,678, the increase in total payroll due to a $1000 per capita understatement ranges from $60 million to $69 million, depending on the discount rates used to calculate the pension liabilities. Since the understatement primarily drives up the number of employees hired, the increase in payroll expenditures is more likely a result of state over hiring, not of over paying.

Taken together the results from Table 5 to Table 8, we find that understatement in pension deficits increases the growth rate in hiring state workers and increases the annual payroll expenditures. The higher growth rate is due to both an understatement in pension liabilities and an overstatement in pension assets. We also find some weak evidence that understatement in pension liabilities may drive up the state workers' compensation. Overall these results are consistent with the hypothesis that when pension deficits are understated, state governments may rely on this incorrect information in determining their hiring policies and end up with either over hiring or paying excessive compensation.

5.3 Additional analyses

We conclude our paper by conducting a set of supplemental tests on alternative policy decisions that may be related to the understatement in pension deficits. First, state governments with large understated pension deficits may not internalize the true liability burden and thus, have looser fiscal policies. These governments are more likely to incur large spending. We

examine whether the change in total expenditures is related to the understated pension deficits. We define ΔTTL_EXP as the 5 year change in the state's total expenditures deflated by current year population. During the sample period, the average annual total expenditures are $15 billion or about $2,900 per capita. The average 5 year increase in total expenditures is $667 per capita (see Table 3).

Table 9 reports the results on changes in total expenditures. We find that current year understatement in pension deficits is positively associated with the increase in total expenditures in the next 5 years. The coefficients on UNDERSTMT_PENDEFICIT are positive and statistically significant at 1% level across different discount rates. The estimates suggest that a $1,000 per capita understatement in pension deficits increases next 5 year per capita total expenditures by $30 to $45, depending on the discount rates used to calculate the pension liabilities. This effect is economically significant. Given that the average population between 2006 and 2010 is 6,071,678, the increase in total expenditures due to a $1,000 per capita understatement in pension deficits is $275 million if we discount the pension liabilities using the Aa corporate rates. This figure slightly decreases to $215 ($183) million if we discount the liabilities using the state GO bond yields (Treasury yields).

Another potential policy outcome attributable to understated pension deficits is more generous retirement packages. The generosity of a pension plan largely depends on the plan's benefit factor, which is a constant percentage of an employee's final salary times years of service.[22] The higher the benefit factor, the higher the pay replacement at retirement, and hence the more generous the pension plan. We expect that states with understated pension deficits are more likely to offer more generous retirement packages.

[22] For example, suppose a state worker has worked for 30 years and has an average wage in the last several years of service of $45,000. If the benefit factor is 2%, then this state worker will get an annual pension payment of $27,000 (= 2% * 30 * 45,000), in addition to any COLA the plan offers.

BenefitFactor is the benefit factor of the state sponsored pension plans. If the state has more than one pension plans, we take the mean values of the benefit factors. ΔlnBenefitFactor is the 5 year change in the natural logarithm of BenefitFactor. We regress ΔlnBenefitFactor on UNDERSTMT_PENDEFICIT and control for a set of plan specific variables. State employees not covered by Social Security are more likely to have more generous pension plans because these workers are not eligible for this other source of retirement income. SSCOV equals 1 if most employees are covered by Social Security. Plans for policeman and firefighters tend to be more generous because these workers' jobs are riskier and they tend to retire at a younger age. POLICE & FIRE equals 1 if policeman and firefighters are covered by the plan. If the state has closed the plan for new entrants, the benefits of the plan are less likely to grow over time. CLOSED equals 1 if the pension plan is closed to new employees. States are more likely to expand the pension benefits if the plan is well funded. OVERFUND equals 1 if the plan funded ratio is increasing over time.[23]

In addition to the above plan specific characteristics, we also control for the fiscal condition of the state. States are less likely to increase workers' pension benefits if they have fiscal difficulties. We measure the fiscal well being of a state by its debt burden. ΔDEBT is the change in debt scaled by current population. Finally, we include the population growth (POP_GROWTH) to control for the size of the state and the lagged number of employees (LAG_lnE) to control for the size of its employee base.

Table 3 shows that the average benefit factor is 2% during the sample period and its 5 year growth rate is about 0.6%. On average, 80% of the plan participants are covered by Social Security and about half of the plans cover firefighters and policeman. On average 3.8% of the

[23] For these plan specific variables, we take the mean values of the variables if a state has sponsored for more than 1 plan.

plans are closed to new participants and 17% of them experience an increasing funding over time. An average state has $2,943 debt per capita and experiences an increase in debt per capita of $939.

Table 10 reports the regression results on the growth in pension benefits. The number of observation reduces to 187 observations because we only have pension data through fiscal year 2009 and we delete 13 observations due to missing variables. We find that the understatement in pension deficits is positively associated with the growth in benefit factor. The coefficient on UNDERSTMT_PENDEFICIT is positive and significant when we discount the pension liabilities using either the Aa corporate bond rates or the Treasury yields (0.002, *t*-statistics of 1.904 and 2.038 respectively). When we discount the liabilities using the state GO bond yields, the coefficient on UNDERSTMT_PENDEFICIT is still positive, but is not significant at conventional level. The estimate on UNDERSTMT_PENDEFICIT suggests that a $1,000 per capita understatement in pension deficits is associated with a 0.2% increase in the growth of benefit factor.

6. Conclusion

This paper examines how accounting information affects governmental entities' hiring decisions. We find that GASB's funding approach leads to an understatement in public pension deficits and that this understatement leads to state governments hiring too many workers and incurring larger payroll expenditures. We also find some evidence that the understatement in pension obligations is related to higher wage growth. These results should be of interest to state officials and policymakers. In particular, in June 2012 GASB released its new rule on public pension. The new rule requires state and local governments use a single discount rate that combines both a funding approach (long-term expected rate of return on plan investments) and a

liability approach (20 year AA- or higher rated municipal bond yields). Our result suggests that not moving completely away from the contribution based approach may cause states to commit to additional expenditures.

The paper contributes to the accounting literature along a number of dimensions. First, given the heightened interest in the financial soundness of state governments, our paper is timely in that we examine public pension liabilities, perhaps the largest and most debated obligations state governments bear. Moreover, our paper adds to the growing literature on how accounting choices affect real decisions (e.g., McNichols and Stubben, 2008; Biddle et al., 2009; Kedia and Philippon, 2009). Most papers in this literature focus on for-profit entities. Our paper extends this literature to governmental entities and shows that accounting information affects state governments' employment decisions.

References

Biddle, G. C., Hilary, G., & Verdi, R. S. (2009). How does financial reporting quality related to investment efficiency? *Journal of Accounting and Economics , 48*, 112-131.

Bureau of Labor Statistics. "A snapshot of State and local government employee benefits." *BLS Program Perspectives*, Januray 2011

Collins, C., & Rettenmaier, A. J. (2010). *Unfunded Liabilities of State and Local Government Employee Retirement Benefit Plans.* Dallas: National Center for Policy Analysis.

Governmental Accounting Standards Board White Paper: "Why Governmental Accounting and financial Reproting Is – and Should Be – Different." 2006

Kedia, S., & Philippon, T. (2009). The Economics of Fraudulent Accounting. Review of Financial Studies , 22 (6), 2169-2199.

Lintner, J. (1965). The valuation of risk assets and the selection of risky investments in stock portfolios and capital budgets. *Review of Economic Statistics , 47*, 13-37.

Matsusaka, John G. "Direct democracy and public employees." *American Economic Review*, 2009: 2227-2246.

McNichols, M. F., & Stubben, S. R. (2008). Does Earnings Management Affect Firms' Investment Decisions? *The Accounting Review , 83* (6), 1571-1603.

Modigliani, F., & Miller, M. H. (1958). The cost of capital, corporation finance, and the theory of investment. *American Economic Review , 48*, 261–297.

Naughton, J. P. (2012). The Impact of Footnote Transparency on Managerial Discretion: Evidence from FAS 132 Pension Disclosure. *Working Paper, Northwestern University*

Novy-Marx, Robert, and Joshua Rauh. "Public penson promises: How big are they and what are they worth." *Journal of Finance*, 2011: 1211-1249.

Petersen, Mitchell A. "Estimating standard errors in finance panel data sets: Comparing approaches." *Review of Financial Studies* 22 (2009): 435-480.

Poterba, James M., and Kim S. Rueben. "The effect of property-tax limits on wages and employment in the local public sector." *American Economic Review*, May 1995: 384-389.

Rogers, William. "Regression standard errors in clustered samples." *Stata Technical Bulletin* 13 (1993): 19-22.

Sharpe, W. (1964). Capital asset prices: A theory of market equilibrium under conditions of risk. *Journal of Finance , 19*, 425-442.

Treynor, J. L. (1961). Toward a theory of the market value of risky assets. *Unpublisehd manuscript* .

Appendix A

CLOSED =	Dummy variable equal to 1 if the pension plan is closed for new entrants;
ΔDEBT =	5 year change in state debt deflated by current year population;
ΔDENSITY =	5 year change in the number of residents per square mile;
ΔEXP_TTL =	5 year change in total expenditures divided by current year population
LAG_lnE =	5 year lag of the natural logarithm of per capita full-time equivalent state employees;
ΔlnBenefitFactor =	5 year change in the natural logarithm of pension plan's benefit factor;
ΔlnE =	5 year change in the natural logarithm of full-time equivalent state employees;
ΔlnKID =	5 year change in the natural logarithm of per capita population under age 18;
ΔPayroll =	5 year change in annualized total payroll divided by current year population;
ΔlnPI =	5 year change in the natural logarithm of state personal income per capita;
ΔlnW =	5 year change in the natural logarithm of wages, where wages is the annualized total payroll divided by full-time equivalent state employees;
OVERFUND =	Dummy variable equal to 1 if the pension plan experiences an increase in funding over the past 5 years;
OVERSTMT_PENA =	Per capita overstatement in pension assets (in thousands);
POLICE & FIRE =	Dummy variable equal to 1 if the pension plan covers policeman and firefighters;
POP_GROWTH =	Population growth in the past 5 years.
SSCOV =	Dummy variable equal to 1 if most of the pension plan participants are covered by Social Security;
UNDERSTMT_PENDEFICIT =	Per capita understatement in pension deficits (in thousands);
UNDERSTMT_PENL =	Per capita understatement in pension liabilities estimated using the Aa corporate bond rates, the taxable state GO bond yields, or the Treasury

	yields (in thousands);

Appendix B

The following table provides a summary of the accrued liability and normal cost calculations under the Entry Age Normal ("EAN") and Projected Unit Credit ("PUC") actuarial cost methods. The hypothetical pension plan provides for a retirement benefit equal to 2% of the 3-year final average pay ("FAP") for each year of service. The retirement benefit is payable as a single life annuity with a 3% COLA at age 62. The participant is currently age 47 with 12 years of service, and has an annual salary of $50,000. The actuarial assumption for the discount rate is 8% and for salary increases is 5%.

					Entry Age Normal		Projected Unit Credit	
Age	Svc	Pay	FAP	PV Factor	Accrued Liability	Normal Cost	Accrued Liability	Normal Cost
35	0	27,842	27,842	1.6128	0	4,500	0	3,196
36	1	29,234	28,538	1.7418	4,860	4,725	3,451	3,451
37	2	30,696	29,257	1.8812	10,352	4,961	7,455	3,728
38	3	32,230	30,720	2.0317	16,539	5,209	12,077	4,026
39	4	33,842	32,256	2.1942	23,488	5,470	17,391	4,348
40	5	35,534	33,869	2.3698	31,274	5,743	23,478	4,696
41	6	37,311	35,562	2.5593	39,979	6,031	30,428	5,071
42	7	39,176	37,340	2.7641	49,691	6,332	38,339	5,477
43	8	41,135	39,207	2.9852	60,504	6,649	47,322	5,915
44	9	43,192	41,168	3.2240	72,525	6,981	57,496	6,388
45	10	45,351	43,226	3.4820	85,867	7,330	68,995	6,900
46	11	47,619	45,387	3.7605	100,653	7,697	81,966	7,451
47	12	50,000	47,657	4.0614	117,018	8,082	96,571	8,048
48	13	52,500	50,040	4.3863	135,107	8,486	112,988	8,691
49	14	55,125	52,542	4.7372	155,080	8,910	131,414	9,387
50	15	57,881	55,169	5.1161	177,110	9,355	152,065	10,138
51	16	60,775	57,927	5.5254	201,382	9,823	175,178	10,949
52	17	63,814	60,824	5.9675	228,102	10,314	201,017	11,825
53	18	67,005	63,865	6.4449	257,490	10,830	229,869	12,771
54	19	70,355	67,058	6.9604	289,785	11,372	262,051	13,792
55	20	73,873	70,411	7.5173	325,249	11,940	297,910	14,896
56	21	77,566	73,931	8.1187	364,165	12,537	337,830	16,087
57	22	81,445	77,628	8.7682	406,838	13,164	382,231	17,374
58	23	85,517	81,509	9.4696	453,602	13,822	431,573	18,764
59	24	89,793	85,585	10.2272	504,818	14,513	486,364	20,265
60	25	94,282	89,864	11.0454	560,878	15,239	547,160	21,886
61	26	98,997	94,357	11.9290	622,206	16,001	614,570	23,637
62	27	103,946	99,075	12.8833	689,264	0	689,264	0

Table 1: Summary of Reported and Estimated Pension Liabilities ($ billions)

This table compares the reported pension liability to the estimated pension liability by state for the fiscal period 2001-2009. The reported liability is the average of the reported actuarial accrued liability without any adjustments. The estimated liability is the average of the estimated pension liability under the PUC actuarial cost method, discounted using the reported discount rates.

State	Reported, No Adjustments	Estimated, Discounted at the Reported Rates	
	[1]	[2]	[2] / [1]
Alabama	33.290	33.113	0.995
Alaska	12.039	11.486	0.954
Arizona	32.373	27.130	0.838
Arkansas	16.500	13.687	0.830
California	398.696	322.166	0.808
Colorado	34.577	35.116	1.016
Connecticut	32.472	27.002	0.832
Delaware	5.538	4.709	0.850
Florida	105.126	102.906	0.979
Georgia	62.455	52.280	0.837
Hawaii	13.719	12.103	0.882
Idaho	9.061	8.398	0.927
Illinois	116.893	102.346	0.876
Indiana	27.345	23.301	0.852
Iowa	20.555	19.412	0.944
Kansas	16.532	13.689	0.828
Kentucky	34.946	33.271	0.952
Louisiana	30.108	29.680	0.986
Maine	11.786	10.261	0.871
Maryland	37.870	30.620	0.809
Massachusetts	48.235	48.190	0.999
Michigan	67.054	57.849	0.863
Minnesota	43.333	37.152	0.857
Mississippi	24.184	19.714	0.815
Missouri	44.556	37.114	0.833
Montana	7.469	6.983	0.935
Nebraska	5.970	5.198	0.871
Nevada	24.049	20.878	0.868
New Hampshire	5.965	4.896	0.821
New Jersey	101.048	94.209	0.932
New Mexico	21.893	19.192	0.877
New York	234.076	170.612	0.729
North Carolina	61.762	60.796	0.984
North Dakota	3.358	2.950	0.878
Ohio	160.347	133.327	0.831
Oklahoma	22.378	18.595	0.831
Oregon	48.019	40.560	0.845
Pennsylvania	90.463	72.650	0.803

Rhode Island	10.796	9.245	0.856
South Carolina	32.515	27.146	0.835
South Dakota	5.739	5.251	0.915
Tennessee	29.361	25.871	0.881
Texas	156.129	129.841	0.832
Utah	14.649	12.652	0.864
Vermont	2.817	2.709	0.962
Virginia	49.750	40.649	0.817
Washington	59.021	49.643	0.841
West Virginia	10.849	9.264	0.854
Wisconsin	69.878	60.987	0.873
Wyoming	5.452	4.509	0.827
Total	2,513	2,141	0.852

Table 2: Pension Liabilities Estimated Using Different Discount Rates

Panel A presents each state's average annual pension liabilities as reported and as estimated using three discount rates: Aa corporate bond rates, taxable GO bond rates, and the Treasury yields. Panel B presents each state's average annual pension assets. The total amounts are in billions and the per capita amounts are in dollars.

Panel A: Average pension liabilities by state

State	Reported		Discounted at AA Corporate Bond Rates		Discounted at Taxable GO Bond Rates		Discounted at Treasury Yields	
	[1]		[2]		[3]		[4]	
	Total	Per Capita	Total	Per Capita	Total	Per Capita	Total	Per Capita
Alabama	33.29	7,269	42.21	9,219	44.46	9,704	57.08	12,449
Alaska	12.04	17,975	14.61	21,818	15.58	23,250	18.06	26,946
Arizona	32.37	5,375	34.62	5,757	36.63	6,076	44.54	7,385
Arkansas	16.50	5,906	17.59	6,300	18.43	6,599	23.04	8,246
California	398.70	11,114	401.20	11,193	398.84	11,130	522.35	14,559
Colorado	34.58	7,374	46.85	9,962	50.61	10,744	62.43	13,238
Connecticut	32.47	9,328	35.29	10,142	37.88	10,881	43.70	12,554
Delaware	5.54	6,564	6.04	7,182	6.53	7,755	7.74	9,203
Florida	105.13	5,938	128.08	7,240	134.01	7,569	167.02	9,429
Georgia	62.46	6,805	60.57	6,603	65.09	7,081	78.38	8,527
Hawaii	13.72	10,856	15.23	12,028	16.16	12,754	19.94	15,733
Idaho	9.06	6,285	10.38	7,214	10.92	7,575	13.58	9,409
Illinois	116.89	9,193	134.07	10,547	139.45	10,968	170.46	13,403
Indiana	27.34	4,356	27.07	4,315	28.79	4,587	35.04	5,582
Iowa	20.56	6,938	22.98	7,761	24.02	8,108	29.45	9,940
Kansas	16.53	5,996	17.26	6,268	18.69	6,781	23.74	8,606
Kentucky	34.95	8,321	38.00	9,060	39.81	9,483	48.52	11,557
Louisiana	30.11	6,788	38.32	8,637	39.88	8,987	48.87	11,009
Maine	11.79	9,002	12.63	9,646	13.40	10,234	16.24	12,400
Maryland	37.87	6,797	37.10	6,660	40.31	7,234	47.35	8,497
Massachusetts	48.23	7,419	64.24	9,883	69.71	10,722	89.26	13,718
Michigan	67.05	6,677	71.85	7,152	75.74	7,541	93.78	9,340
Minnesota	43.33	8,447	49.79	9,711	53.61	10,448	63.30	12,334
Mississippi	24.18	8,333	24.87	8,571	26.34	9,073	32.20	11,088
Missouri	44.56	7,642	47.73	8,184	51.63	8,846	62.49	10,705
Montana	7.47	7,946	8.74	9,303	9.19	9,774	11.37	12,084
Nebraska	5.97	3,393	6.72	3,824	7.06	4,017	8.83	5,026
Nevada	24.05	9,931	26.94	11,131	28.31	11,672	35.59	14,661
New Hampshire	5.97	4,578	6.81	5,232	7.23	5,551	8.67	6,661
New Jersey	101.05	11,724	125.67	14,582	134.93	15,654	162.11	18,805
New Mexico	21.89	11,357	24.46	12,707	25.85	13,413	31.88	16,537
New York	234.08	12,107	213.79	11,057	224.59	11,613	279.64	14,457
North Carolina	61.76	7,031	68.46	7,814	75.87	8,643	94.60	10,751
North Dakota	3.36	5,262	3.78	5,932	3.94	6,171	4.90	7,682
Ohio	160.35	13,964	169.14	14,729	181.71	15,822	227.36	19,796
Oklahoma	22.38	6,276	22.63	6,353	24.22	6,794	29.31	8,219
Oregon	48.02	13,156	50.56	13,861	54.53	14,932	67.76	18,525
Pennsylvania	90.46	7,265	96.05	7,718	103.01	8,274	122.46	9,836
Rhode Island	10.80	10,176	12.13	11,429	12.83	12,093	15.66	14,766
South Carolina	32.52	7,536	31.25	7,250	33.86	7,842	40.21	9,314
South Dakota	5.74	7,307	6.52	8,308	6.87	8,745	8.48	10,799
Tennessee	29.36	4,868	30.95	5,129	32.48	5,375	41.05	6,794

Texas	156.13	6,767	163.59	7,088	171.61	7,422	218.38	9,429
Utah	14.65	5,641	16.33	6,297	18.09	6,967	23.39	8,977
Vermont	2.82	4,554	3.59	5,806	3.79	6,132	4.70	7,594
Virginia	49.75	6,557	49.39	6,518	53.02	6,986	64.30	8,472
Washington	59.02	9,341	65.62	10,388	67.27	10,648	86.50	13,692
West Virginia	10.85	6,002	10.80	5,976	11.49	6,357	13.79	7,628
Wisconsin	69.88	12,602	74.59	13,451	79.70	14,366	101.67	18,313
Wyoming	5.45	10,446	5.70	10,902	6.16	11,750	7.89	15,015
Total	2,513		2,693		2,834		3,529	

Panel B: Average pension assets by state

State	Actuarial Value of Assets		Market Value of Assets	
	[1]		[2]	
	Total	Per Capita	Total	Per Capita
Alabama	28.24	6,177	25.43	5,563
Alaska	8.69	13,007	9.40	14,078
Arizona	28.75	4,820	26.05	4,362
Arkansas	14.17	5,080	13.77	4,930
California	348.80	9,727	353.10	9,857
Colorado	26.72	5,716	26.21	5,608
Connecticut	12.73	3,662	19.84	5,704
Delaware	5.76	6,833	5.59	6,636
Florida	111.92	6,340	106.06	6,008
Georgia	60.07	6,563	56.61	6,197
Hawaii	9.85	7,808	9.24	7,325
Idaho	8.18	5,679	8.20	5,692
Illinois	74.58	5,868	72.03	5,669
Indiana	17.97	2,863	17.21	2,742
Iowa	18.29	6,176	18.47	6,236
Kansas	11.54	4,189	11.01	4,000
Kentucky	27.61	6,598	24.73	5,907
Louisiana	20.21	4,557	19.85	4,480
Maine	9.03	6,897	8.55	6,530
Maryland	31.92	5,741	29.90	5,372
Massachusetts	35.60	5,478	34.53	5,310
Michigan	57.14	5,690	52.06	5,182
Minnesota	38.08	7,435	34.24	6,681
Mississippi	18.20	6,276	16.60	5,726
Missouri	37.57	6,449	36.24	6,222
Montana	4.95	5,223	5.70	6,064
Nebraska	5.31	3,017	5.30	3,020
Nevada	18.61	7,712	17.51	7,254
New Hampshire	4.05	3,111	4.38	3,369
New Jersey	83.36	9,681	71.49	8,303
New Mexico	18.46	9,597	17.22	8,955
New York	234.38	12,122	210.66	10,898
North Carolina	63.96	7,291	62.53	7,139
North Dakota	2.92	4,571	2.88	4,523
Ohio	129.34	11,267	122.53	10,669
Oklahoma	13.11	3,679	12.75	3,579
Oregon	47.01	12,897	46.81	12,821
Pennsylvania	83.45	6,706	78.31	6,292
Rhode Island	6.97	6,570	6.60	6,222
South Carolina	24.62	5,726	23.56	5,492
South Dakota	5.52	7,034	6.00	7,644

Tennessee	15.57	2,583	26.95	4,473
Texas	141.22	6,134	135.93	5,902
Utah	13.49	5,208	12.93	4,991
Vermont	2.49	4,029	2.38	3,854
Virginia	43.61	5,763	41.42	5,472
Washington	54.85	8,686	45.45	7,199
West Virginia	5.51	3,048	5.43	3,002
Wisconsin	69.19	12,475	66.44	11,981
Wyoming	4.95	9,496	4.66	8,957
Total	2,159		2,071	

Table 3: Descriptive Statistics

This table presents descriptive information on the variables used in the analysis. All variables are defined in Appendix A.

	N	Mean	Median	Std Dev
Dependent variables				
Full-time equivalent employee	500	85,370	68,184	72,623
Full-time equivalent employee (per capita)	500	0.018	0.017	0.006
ΔlnE	247	0.033	0.030	0.051
Wage	500	44,936	44,267	7,649
ΔlnW	247	0.171	0.169	0.038
Total payroll expenditure ($thousands)	500	4,029,268	3,092,345	4,092,300
Total payroll expenditure (per capita)	500	797	727	306
ΔPAYROLL	247	162.036	141.844	86.724
Total expenditure ($thousands)	500	15,405,767	11,020,277	16,438,252
Total expenditure (per capita)	500	2,936	2,676	1,100
ΔEXP_TTL	247	667.107	583.619	431.114
BenefitFactor	426	0.020	0.020	0.004
ΔlnBenefitFactor	187	0.006	0	0.049
Pension variables ($thousands, per capita)				
UNDERSTMT_PENDEFICIT (AA rates)	247	1.224	1.086	1.591
UNDERSTMT_PENDEFICIT (GO bond yields)	247	1.350	1.287	1.361
UNDERSTMT_PENDEFICIT (Treasury yields)	247	3.113	2.870	1.917
UNDERSTMT_PENL (AA rates)	247	1.014	0.862	1.441
UNDERSTMT_PENL (GO bond yields)	247	1.140	0.984	1.105
UNDERSTMT_PENL (Treasury yields)	247	2.903	2.531	1.686
OVERSTMT_PENA	247	0.210	0.247	1.012
Control variables				
Population	500	5,934,066	4,229,851	6,524,626
POP_GROWTH (%)	247	4.806	3.979	3.983
Personal Income (per capita)	500	35,008	33,951	6,153
ΔlnPI	247	0.190	0.188	0.063
Population Density	500	189.867	93.048	255.594
ΔDENSITY	247	5.519	3.268	7.420
Proportion of the Population under Age 18	500	0.246	0.245	0.018
ΔlnKID	247	-0.037	-0.034	0.024
SSCOV	187	0.806	1	0.361
POLICE & FIRE	187	0.473	0.500	0.349
CLOSED	187	0.038	0	0.163
OVERFUND	187	0.171	0	0.378
Debt (per capita)	500	2,943	2,373	1,900
ΔDEBT	187	939.414	867.647	662.383

Table 4: Pearson Correlation Coefficients

This table present Pearson correlation coefficients among the main variables used in the analyses. Bold text indicates significance at the 0.10 or less level of significance. All variables are defined in Appendix A.

		[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]	[10]
[1]	ΔlnE	1	-0.096	**0.108**	**0.124**	**0.134**	-0.015	**0.329**	0.090	**0.160**	0.052
[2]	ΔlnW		1	0.079	0.019	0.050	0.054	**0.135**	**-0.215**	0.051	0.085
[3]	UNDERSTMT_PENDEFICIT (AA rates)			1	**0.891**	**0.874**	-0.073	-0.074	-0.037	**-0.135**	0.008
[4]	UNDERSTMT_PENDEFICIT (GO bond yields)				1	**0.937**	0.015	-0.084	-0.006	**-0.141**	0.047
[5]	UNDERSTMT_PENDEFICIT (Treasury yields)					1	0.047	-0.097	-0.069	**-0.188**	0.041
[6]	ΔlnPI [6]						1	**-0.110**	**-0.131**	-0.079	**0.343**
[7]	POP_GROWTH [7]							1	**0.329**	**0.574**	-0.099
[8]	ΔDENSITY [8]								1	**0.229**	-0.094
[9]	ΔlnKID [9]									1	**-0.290**
[10]	LAG_lnE										1

Table 5: Pension Deficits Understatements and Growth in State Employment

This table presents regression analysis on pension deficits understatements and increases in state employment. Pension deficits understatements are measured using the Aa corporate rates (column [1]), the state GO bond rates (column [2]), and the Treasury yields (column [3]). All variables are defined in Appendix A. *t*-statistics are in brackets and are based on heteroskedastic consistent standard errors clustered by state and year. ***, **, and * represent 1%, 5% and 10% level of significance, respectively.

	Dependent variable = ΔlnE		
	[1]	[2]	[3]
	AA rates	GO bond yields	Treasury yields
Intercept	0.066	0.065	0.065
	[1.159]	[1.129]	[1.144]
UNDERSTMT_PENDEFICIT	0.004**	0.006***	0.004***
	[2.099]	[2.899]	[3.360]
ΔlnPI	0.001	-0.007	-0.013
	[0.022]	[-0.147]	[-0.266]
POP_GROWTH (%)	0.005***	0.005***	0.004***
	[2.938]	[2.965]	[2.946]
ΔDENSITY	-0.000	-0.000	-0.000
	[-0.178]	[-0.225]	[-0.114]
ΔlnKID	0.008	0.016	0.045
	[0.036]	[0.071]	[0.203]
LAG_lnE	0.014	0.014	0.015
	[1.210]	[1.187]	[1.289]
Observations	247	247	247
Adjusted R-squared	0.113	0.117	0.121

Table 6: Pension Deficit Understatements and Growth in State Worker Compensation

This table presents regression analysis on pension deficit understatements and increases in state workers' compensation. Pension deficit understatements are measured using the Aa corporate rates (column [1]), the state GO bond rates (column [2]), and the Treasury yields (column [3]). All variables are defined in Appendix A. *t*-statistics are in brackets and are based on heteroskedastic consistent standard errors clustered by state and year. ***, **, and * represent 1%, 5% and 10% level of significance, respectively.

	Dependent variable = ΔlnW		
	[1]	[2]	[3]
	AA rates	GO bond yields	Treasury yields
Intercept	0.204***	0.206***	0.205***
	[2.960]	[2.984]	[2.984]
UNDERSTMT_PENDEFICIT	0.002*	0.001	0.001
	[1.659]	[0.492]	[0.769]
ΔlnPI	0.015	0.010	0.009
	[0.242]	[0.178]	[0.158]
POP_GROWTH (%)	0.002**	0.002**	0.002**
	[2.021]	[2.015]	[1.997]
ΔDENSITY	-0.001**	-0.001**	-0.001**
	[-2.062]	[-2.049]	[-2.040]
ΔlnKID	0.026	0.013	0.023
	[0.134]	[0.069]	[0.117]
LAG_lnE	0.010	0.010	0.010
	[0.705]	[0.692]	[0.715]
Observations	247	247	247
Adjusted R-squared	0.087	0.080	0.081

Table 7: Understatements in Pension Liabilities and Overstatements in Pension Assets

This table disaggregates the understatement in pension deficits into the understatement in pension liabilities and the overstatement in pension assets and investigates their association with state hiring. Panel A presents the analysis on growth in state employment. Panel B presents the analysis on growth in state workers' compensation. Pension liability understatements are measured using the Aa corporate rates (column [1]), the state GO bond rates (column [2]), and the Treasury yields (column [3]). All variables are defined in Appendix A. *t*-statistics are in brackets and are based on heteroskedastic consistent standard errors clustered by state and year. ***, **, and * represent 1%, 5% and 10% level of significance, respectively.

Panel A: Regression analysis on the growth in state employment

	Dependent variable = ΔlnE		
	[1]	[2]	[3]
	AA rates	GO bond yields	Treasury yields
Intercept	0.067	0.064	0.065
	[1.136]	[1.052]	[1.076]
UNDERSTMT_PENL	0.004*	0.008**	0.005***
	[1.879]	[2.238]	[2.977]
OVERSTMT_PENA	0.005**	0.005**	0.004**
	[2.144]	[2.262]	[2.353]
ΔlnPI	-0.001	-0.001	-0.010
	[-0.023]	[-0.014]	[-0.210]
POP_GROWTH (%)	0.005***	0.004***	0.004***
	[2.915]	[2.908]	[2.919]
ΔDENSITY	-0.000	-0.000	-0.000
	[-0.183]	[-0.212]	[-0.111]
ΔlnKID	0.003	0.040	0.050
	[0.013]	[0.175]	[0.218]
LAG_lnE	0.015	0.015	0.016
	[1.185]	[1.179]	[1.241]
Observations	247	247	247
Adjusted R-squared	0.109	0.117	0.118

Panel B: Regression analysis on the growth in state workers' compensation

	Dependent variable = ΔlnW		
	[1]	[2]	[3]
	AA rates	GO bond yields	Treasury yields
Intercept	0.189***	0.189***	0.192***
	[2.679]	[2.666]	[2.732]
UNDERSTMT_PENL	0.004**	0.006	0.003
	[2.196]	[1.633]	[1.380]
OVERSTMT_PENA	-0.002	-0.002	-0.003
	[-1.101]	[-1.208]	[-1.328]
ΔlnPI	0.035	0.031	0.024
	[0.538]	[0.511]	[0.405]
POP_GROWTH (%)	0.002*	0.002*	0.002*
	[1.802]	[1.798]	[1.729]
ΔDENSITY	-0.001**	-0.001**	-0.001**
	[-2.078]	[-2.112]	[-2.012]
ΔlnKID	0.066	0.080	0.076
	[0.350]	[0.421]	[0.384]
LAG_lnE	0.007	0.007	0.008
	[0.473]	[0.498]	[0.543]
Observations	247	247	247
Adjusted R-squared	0.099	0.097	0.093

Table 8: Pension Deficit Understatements and Increase in State Payroll Expenditures

This table presents regression analysis on pension deficit understatements and increases in state payroll expenditures. Pension deficit understatements are measured using the Aa corporate rates (column [1]), the state GO bond rates (column [2]), and the Treasury yields (column [3]). All variables are defined in Appendix A. *t*-statistics are in brackets and are based on heteroskedastic consistent standard errors clustered by state and year. ***, **, and * represent 1%, 5% and 10% level of significance, respectively.

	Dependent variable = ΔPayroll		
	[1]	[2]	[3]
	AA rates	GO bond yields	Treasury yields
Intercept	956.355***	955.840***	955.707***
	[6.462]	[6.379]	[6.529]
UNDERSTMT_PENDEFICIT	10.876***	11.364***	9.963***
	[3.374]	[3.574]	[5.671]
ΔlnPI	-35.463	-57.474	-69.346
	[-0.349]	[-0.631]	[-0.786]
POP_GROWTH (%)	3.684**	3.752**	3.538**
	[2.105]	[2.256]	[2.226]
ΔDENSITY	-0.030	-0.132	0.011
	[-0.031]	[-0.134]	[0.011]
ΔlnKID	-345.299	-348.749	-272.141
	[-1.270]	[-1.309]	[-0.989]
LAG_lnE	204.282***	203.595***	206.112***
	[6.739]	[6.556]	[6.892]
Observations	247	247	247
Adjusted R-squared	0.540	0.539	0.555

Table 9: Pension Deficit Understatements and Increase in State Total Expenditures

This table presents regression analysis on pension deficit understatements and increases in state total expenditures. Pension deficit understatements are measured using the Aa corporate rates (column [1]), the state GO bond rates (column [2]), and the Treasury yields (column [3]). All variables are defined in Appendix A. *t*-statistics are in brackets and are based on heteroskedastic consistent standard errors clustered by state and year. ***, **, and * represent 1%, 5% and 10% level of significance, respectively.

	Dependent variable = ΔTTL_EXP		
	[1]	[2]	[3]
	AA rates	GO bond yields	Treasury yields
Intercept	3,283.200***	3,295.259***	3,295.987***
	[5.267]	[5.196]	[5.265]
UNDERSTMT_PENDEFICIT	45.417***	35.392***	30.189***
	[2.826]	[3.244]	[3.586]
ΔlnPI	967.974**	877.098*	841.207*
	[2.144]	[1.836]	[1.846]
POP_GROWTH (%)	-2.905	-2.679	-3.334
	[-0.323]	[-0.304]	[-0.365]
ΔDENSITY	9.608*	9.252*	9.690*
	[1.830]	[1.705]	[1.822]
ΔlnKID	1,006.930	897.165	1,121.719
	[0.624]	[0.577]	[0.670]
LAG_lnE	702.365***	699.915***	707.575***
	[4.918]	[4.895]	[4.998]
Observations	247	247	247
Adjusted R-squared	0.299	0.288	0.294

Table 9: Pension Deficit Understatements and Growth in Plan Benefit Factor

This table presents regression analysis on pension deficit understatements and increases in plan's benefit factors. Pension deficit understatements are measured using the Aa corporate rates (column [1]), the state GO bond rates (column [2]), and the Treasury yields (column [3]). All variables are defined in Appendix A. *t*-statistics are in brackets and are based on heteroskedastic consistent standard errors clustered by state and year. ***, **, and * represent 1%, 5% and 10% level of significance, respectively.

	Dependent variable = ΔlnBenefit Factor		
	[1]	[2]	[3]
	AA rates	GO bond yields	Treasury yields
Intercept	0.291	0.290	0.285
	[1.517]	[1.514]	[1.516]
UNDERSTMT_PENDEFICIT	0.002*	0.002	0.002**
	[1.904]	[1.106]	[2.038]
SSCOVER	-0.003	-0.003	-0.002
	[-0.479]	[-0.457]	[-0.305]
POLICE & FIRE	0.025	0.025	0.025
	[1.244]	[1.239]	[1.226]
CLOSED	-0.042	-0.042	-0.045
	[-1.215]	[-1.236]	[-1.270]
OVERFUND	-0.005	-0.006	-0.006
	[-0.805]	[-0.814]	[-0.880]
POP_GROWTH (%)	0.000	0.000	0.000
	[0.128]	[0.119]	[0.140]
ΔDEBT	-0.000	-0.000	-0.000
	[-1.078]	[-1.064]	[-1.191]
LAG_lnE	0.071	0.071	0.071
	[1.490]	[1.493]	[1.501]
Observations	187	187	187
Adjusted R-squared	0.152	0.151	0.155