

ARE ALTERNATIVE INVESTMENTS PRUDENT?  
PUBLIC SECTOR PENSION USE AND FIDUCIARY DUTY

Paul Rose  
Moritz College of Law  
The Ohio State University  
[rose.933@osu.edu](mailto:rose.933@osu.edu)

Jason S. Seligman  
John Glenn School of Public Affairs  
The Ohio State University  
[seligman.10@osu.edu](mailto:seligman.10@osu.edu)

Abstract:

Over the last decade, public pension systems have shifted away from equities and fixed income in favor of alternative investments. We construct panel data of legislative changes affecting pensions, merging these with fund level data from the Public Plans Database. Using these in tandem with data from Preqin we consider governance and financial performance motivations, as well as principal-agent and herding problems that may be unique to alternative investments. We find less liquid alternatives can be of value as a result of better performance and because of their relatively consistent pricing. However we also find evidence that Alternatives' relative performance has waned since 2007 while allocations have continued to grow. Further while some use is justified the *prudent person standard* is of little protection against herding risks due to its relative benchmarking schema. Given evidence that legislatures are relatively reactionary monitors we conclude that hybrid allocation rules merit consideration.

Keywords: Public Pension Plans, Investment, Political Economy, Governance

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Paul Rose & Jason S. Seligman

I. INTRODUCTION

Over the last decade, Defined Benefit (DB) public pension systems have come under greater stress. The Great Recession makes an easy culprit for pensions' problems between 2007 and 2009, but is only a partial explanation for pensions' underperformance. Pension systems have experienced two recessions, demographic shifts and generally difficult public budget circumstances. Pensions have reacted to the situation in various ways, one of the more notable has been related to investment strategies. Indeed, the systems have modified their allocation strategies over this period, generally shifting away from equities and fixed income allocations in favor of alternatives. Furthermore, the stated justification for alternatives has shifted as well, from an emphasis on relative performance (alpha) towards diversification away from systemic shocks (beta).

In this paper, we investigate motives for the employment of alternatives and the performance of these investments, considering both governance and financial performance motivations. We consider possible principal-agent and herding problems that may be unique to these portfolios, and find that the *prudent person standard* is of little protection against herding risks due to its relative benchmarking schema.

The paper proceeds as follows. In Part II, we provide background on the legal framework that helps to determine pension fund asset allocations. In Part III, we provide a discussion of the literature on pension fund allocations. In Part IV, we detail our data and methods. Our focus is on allocations using information obtained from the Public Pension Database (PPD) maintained by the Center for State and Local Government Excellence (SGLE). To ensure data quality, we compare SGLE data to similar data found in the Public Fund Survey (PFS) database. We then investigate the impact of governance changes on these measures by drawing from annual legislative changes reports produced by the National Conference of State Legislatures (NCSL). In Part V, we describe the results we draw from these data. In Part VI, we conclude.

II. BACKGROUND

The legal responsibilities of pension fund officials are rooted in the 1830 case *Harvard College v. Armory*, which held that trustees were “to observe how men of prudence, discretion and intelligence manage their affairs.” Although a flexible reading of this standard would allow for a wide range of investments, over time several factors limited the scope of prudent investment for trustees. First, the law of trusts was especially rigid in its application of fiduciary duties. Many trustees had very little upside in taking risks that might dramatically increase the value of the fund because their compensation was only based on a “fair value” for their services, and not on percentage of the fund’s principal and income.<sup>1</sup> On the other hand, losses that could be attributed to investments that were seen as riskier than what other trustees would have made creates a potential liability. Even where compensation is based on a percentage of returns, potential liability for investments creates a kind of prisoners’ dilemma for trustees. Trustees may have gained by taking on additional risk, but not knowing whether other trustees would take on such risks—which would have the effect of changing the objective definition of prudent investment—trustees would generally prefer to invest in less risky, less rewarding investments rather than risk liability.

Second (and undoubtedly impacted by observed trustee behavior), courts were reluctant to view many investments, other than government bonds and collateralized investments, as prudent. (Waitzer and Sarro 2013). The Restatement of Trusts (Second) echoed this view, essentially placing potential investments in three categories. The first are “ordinarily proper” investments, including government bonds, first mortgages on land, and corporate bonds. The second are clearly *improper* investments, including “speculative” securities, high-yield bonds, securities in “new and untried” businesses, and the purchase of land or other things for resale. Between these two categories fall many investments, such as common stock in established corporations, which may be prudent depending on the circumstances.

A third, related factor limiting the scope of investment, specific to public pension funds, was the creation of “legal lists” that set asset allocation standards for various instruments. As characterized by the U.S. Government Accountability Office, such restrictions on investment may include (i) a provision applicable to investments in alternative investments specifically, (ii) an exclusive list of permissible investments that is not likely to capture alternative investments, or (iii) a provision that restricts investments in certain categories of assets that, because of the typical structure or investment strategy of alternative investments, are likely to apply to such investments (GAO, 2008).

These combined factors had a strong inertial effect on pension investment allocations for many years. However, the advent of Modern Portfolio Theory had two important effects on fund allocations. First, it provided a theoretical basis for the idea,

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<sup>1</sup> Some states did and still do provide for such percentage-based compensation, although this is the exception to the general practice.

later adopted by courts and the Restatement itself, that an overly restrictive view of the prudent investor standard was, in fact, imprudent:

Knowledge, practices, and experience in the modern investment world have demonstrated that arbitrary restrictions on trust investments are unwarranted and often counterproductive. For example, understandable concern has existed that widely accepted theories and practices of investment management cannot properly be pursued by trustees under long-standing judicial and treatise statements of the law. Prohibitions that developed under the traditional prudent-man rule have been potential sources of unjustified liability for trustees generally and, more particularly, of inhibitions limiting the exercise of sound judgment by skilled trustees. This is particularly so for trustees whose fiduciary circumstances call for, or at least permit, investment programs that would include some high risk-and-return strategies (such as a venture-capital program) or for the use of abstractly high-risk investments or techniques (such as futures or option trading) for the purpose of reducing the risk level of the portfolio as a whole (Halbach, 2003).<sup>2</sup>

Furthermore, Modern Portfolio Theory itself also broadly supported the determination that an assessment of the prudence of the purchase of a particular asset cannot be made in isolation of the rest of the portfolio. This understanding was also taken up in the Restatement (Third) of Trusts, which notes that although “[c]ase law and prior Restatements have condemned ‘speculation’ and excessive risk without definition, as if such risk could be recognized in the abstract without regard to portfolio context and objectives,” the application of the prudent investor standard “recognizes that investments and courses of action are properly judged not in isolation but on the basis of the roles they are to play in specific trust portfolios and strategies.” (Halbach, 2003).

The shift from legal lists to the more flexible prudent person standard has been gradual, partly because of the persistence of legal lists in many states. A 2008 U.S. Government Accountability Office report, citing an official at the National Association of State Retirement Administrators, stated “blanket prohibitions on investments such as international stocks or real estate have given way to permission for a wider range of investments.”(GAO, 2008). However the report also notes that, of the pension plan officials in eleven states contacted by the GAO, officials in seven states indicated that “applicable state law imposes restrictions on the ability of public pension plans to invest in hedge funds and/or private equity.”

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<sup>2</sup> The original Restatement of Trusts was published in 1935. This was amended in 1959, 1992, 2003 and most recently 2007. The 2003 text above from Part 6, Chapter 17 is most current with respect to the Prudent Investor standard.

**Restrictions on Pension Investments in Hedge Funds  
and Private Equity Identified by Plan Officials in 11  
Selected States**

State	Hedge Funds	Private Equity
California		
Florida	X	X
Illinois	X	X
Massachusetts <sup>a</sup>	X	X
New Jersey	X	X
New York	X	X
North Carolina	X	X
Ohio		
Pennsylvania		
Texas	X	
Wisconsin		

Source: GAO analysis based on information provided by state officials.

<sup>a</sup> Restrictions identified in Massachusetts are based on administrative policy adopted by its Public Employees Retirement Administration Commission, which is generally responsible for oversight of public pension systems in the state, rather than on statute or regulation.

The fact that a state has restrictions on investment does not necessarily mean that no alternative investments can be made under state law, but merely that constitutional or statutory restrictions may limit the investment to a small percentage, such as 2.5% of total assets under management. Overall, the general trend continues toward legislative reform providing for increased investment in alternatives. Using surveys from the National Conference of State Legislatures, we have identified eight states (Georgia, Kansas, Maryland, Mississippi, New Mexico, South Carolina, Texas and West Virginia) that amended their laws between 1999–2011 to provide for increased investment in alternative investments.

The stated justifications for these changes typically make reference to an enhanced ability to prudently invest, rather than to seek higher returns. The following statement from South Carolina’s Retirement System Investment Commission is typical in this respect:

What are the benefits of alternative investment? In the long-term, a well-diversified portfolio including alternative investments, such as private equity and hedge funds,

should provide the SC Investment Commission the opportunity to achieve a high level of investment return consistent with a prudent level of portfolio risk. More precisely for the Commission, alternative investments usually offer risk reduction embodied in lower Plan volatility. Alternative investments, when properly selected, provide a portfolio with diversification which lowers its volatility and, therefore, lowers its risk. (South Carolina Investment Commission, 2013).

We refer to this explanation as a ‘beta-justification’ for alternatives investment. Another possible explanation for investment in alternatives is that, because of low funding ratios, pensions are chasing returns in an effort to “catch up.” We refer to efforts to increase returns as an ‘alpha-justification’ for alternatives investment. A primary difference between the two justifications is that aggressive alpha-seeking may be less prudent to the extent that it creates heightened risk of losses for a fund.

Besides alpha-seeking, pension fund trustees and managers may have other motivations for increased investment in alternatives that have more to do with perception than with prudent investment. Indeed, the operation of the prudent investor rule creates a regulatory irony: the prudent investor rule encourages a natural herding effect. So that to the extent allowed under state law, over time funds will tend to invest like other pension funds. Even though such investments may not be prudent in an absolute sense, they are “prudent” insofar as prudence is measured by proximity to any (evolving) archetype.

Pension fund officials may herd for several reasons. Even though plan officials are relatively well-protected from personal liability for investment decisions, they still may follow other states’ leads in alternative investments because doing so is a form of “criticism insurance” against claims made by various constituencies, including plan beneficiaries and state legislators. Additionally, plan trustees and managers often hire expert consultants, who are likely to provide common investment strategies to plan officials. In both of these respects, plan officials may defensibly claim to have relied on the prevailing wisdom on plan investment—in other words, they completed due diligence and invested prudently under the circumstances and given available information.

Another possibility, however, is cause for greater concern. Plan officials may herd with respect to alternative investments because, as a general matter, alternative investments provide a means for funds to limit information about performance; alternative investments are not as capable of being marked-to-market as are publicly-traded investments. Alternative investments tend to suppress information about performance and thus may provide a means of suppressing measured volatility. This possibility presents two layers of potentially problematic agency costs. First, alternative investments may be prone to higher agency costs as the general partner managers of such investments may provide little information on asset values to their limited partners. For example, as cited in Shadab (2014):

The most basic type of hedge fund agency cost is the manager defrauding or misreporting some aspect of the fund's returns, asset values, risk taking, or investment activities . . . Hedge fund investors may potentially be subject to higher agency costs from misreporting than investors in government-registered investment companies. This is because hedge funds are not required by regulation to disclose their valuation policies or value their assets according to guidelines established by the SEC.

Second, pension fund officials may themselves have an incentive to provide little information on asset values and performance to their beneficiaries. The limited information on alternative asset performance may thus serve funds as a further source of criticism insurance by damping the frequency and precision of mark-to-market measures.

Alternative investments may present additional risks. Just as the legal and regulatory structure of alternative investment funds limits volatility by restricting sales, the structure naturally also makes it difficult for investors to exit the investment. This trade-off is a normal feature of the asset category. In many alternative investment designs, limited partners must exit from the investments in an orderly fashion because the general partner or other limited partners may disallow sales that would pose challenges to the value of their holdings. This motivates partnerships to stall sales that would mark-to-market unfavorably, and it also motivates partners to facilitate placement at terms that support their valuations. The ability to control exit may break down in at least three scenarios:

The first arises from the development of secondary markets for unregistered securities.<sup>3</sup> As these markets evolve, they may increase competitive pressures on general partners of alternative funds to reduce the barriers to exit. Because these markets are fairly new, it is not clear how great of an effect they will have on alternative investment liquidity and volatility.

The second arises from a classic rush for the exit, based on asset managers' reputation. Even though many investments such as private equity and venture capital fund investments have a long-term lock-in period, almost all allow for withdrawals during set periods. For hedge funds, fund operating agreements generally restrict withdrawals to quarterly or semi-annual periods, and investors typically must give thirty to ninety days' notice before withdrawal. Additionally, while hedge funds may use "gate" provisions that limits how much capital can be withdrawn on a given date, a change in market fortunes or, in the case of SAC Capital (2013), a federal investigation and indictment on insider trading charges, can precipitate a rush to exit. SAC, for example, lost \$5 billion of the \$6

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<sup>3</sup> The best-known markets for such unregistered securities are SecondMarket and SharesPost.

billion in outside investment in a matter of months after federal regulators announced they were investigating the firm (Stevenson and Lattman, 2013).<sup>4</sup>

The third arises as a function of bankruptcy. Bankruptcy of, or within, alternative investment funds may also limit the general partner's ability to control volatility. In the case of a bankruptcy of a partner, creditors might attempt to force liquidation. Should the general partner be unable to place or buy back the assets in an orderly fashion, an "untimely mark-to-market" might result. Further there may be watershed events in which correlated failures in a weighted asset class, or correlated bankruptcies among general partners, make any untimely mark-to-market more likely. In such situations public pensions may find that they must endure illiquidity and book losses even while the expected longer term benefit of stable and consistent pricing is no longer afforded.

### III. LITERATURE REVIEW

A number of other studies have considered the asset allocation strategies of public pension plans. Weller and Wenger (2008) investigate whether plans "chase returns" by loading up on risk to boost returns in response to underfunding. Analyzing public plan data from 1993 to 2006, Weller and Wenger find that public plans tended to be prudent in their asset allocation, and "possibly overly so." Public plans tended to rebalance their assets regularly in response to large price changes, and held less risky assets when the plans had lower funding ratios. They also found that public plans tended to hold smaller percentages of equities as employers were required to make higher contributions, suggesting that policies regarding contributions rather than allocations may be the bigger risk to fund health.

A pair of recent studies focus on pension plan allocations to private equity funds. Morse (2012) studies the influence large investors (including pension funds and sovereign wealth funds) exert over private equity fund decisions. Despite investing as "passive" limited partners, Morse shows that limited partners often have significant influence on the sourcing of deals, adding value and exiting decisions made by private equity fund managers. He finds that large investors influence 3.6 percent of portfolio company deals and 2.3 percent of portfolio company exits, with mixed effects on returns.

Dyck and Pomorski (2013) also focus on investments in private equity firms by defined-benefit pension plans, and show that plans with substantial private equity holdings outperform investors with smaller private equity holdings by up to 7.4 percent per year. This finding, Dyck and Pomorski note, demonstrates the importance of scale in determining performance in private equity investments.

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<sup>4</sup> A typical gate provision limits redemptions to between ten to twenty-five percent of the value of the fund (Shadab 2014), even considering Cohen's private stake, SAC redemptions were well above 25 percent of fund value.

Seligman (2013a) reviews panel data on public sector pensions, historic asset return data and business cycle data to investigate factors associated with funding, asset allocations and short run returns for the period 2001–2009. He finds that higher employee and employer contributions are associated with protection from market return based asset shocks.

Dobra and Lubich (2013) study the variation in asset allocation among pension systems by analyzing whether certain governance factors influence asset allocation decisions. Their work suggests that governance appears to affect asset allocation decisions, and thereby has at least an indirect effect on investment performance. They also provide evidence that pension board composition may have an effect on portfolio risk.

Andonov, Bauer and Cremers (2013) compare U.S., Canadian and European public and corporate defined benefit pension funds. They find that that U.S. public pension funds differ from the others in terms of investment behavior. They attribute the difference to the ability of U.S. public pension funds to set their own liability discount rates; by contrast other nations' funds' are required to use rates based on high quality interest rates. U.S. funds take on more risk, which they argue “enables public pension funds in the United States to maintain high discount rates and present more favorable funding ratios to the public, despite the fact that this does not in any way alter the nature of their liabilities.” They also find that the increased risk-taking of U.S. public pension funds is associated with poorer investment performance; thus, “a major worry is that their increased risk-taking is reckless and could lead to substantial future costs to taxpayers or public entities if their more volatile risky investments fail to meet the expected rates of return.” Andonov, Bauer and Cremers thus build on earlier work by Hess (2005), Novy-Marx and Rauh (2009, 2011), Brown and Wilcox (2010) and Lucas and Zeldes (2009) on the regulatory and political factors influencing the choice of discount rates.

#### IV. DATA & METHOD

We are interested in how funds are allocating assets in alternative investment categories. This section describes the data and methods we use to analyze the issue.

##### *Data*

Pension and returns data for this paper are drawn from The Center for State and Local Government Excellence (SLGE).<sup>5</sup> Since the mid-2000's SGLE has collaborated with the Center for Retirement Research at Boston College to build a database of public plans over the past several years, the Public Pension Database (2012). Current public use data

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<sup>5</sup> Much of the primary data were initially collected by the National Association of State Retirement Administrators (NASRA) and the National Council on Teacher Retirement (NCTR).

offer annual plan statistics each year over the 2001–2011 period for a total universe of 126 defined benefit plans. Fifty-five of these plans cover police and fire personnel, sixty-one cover teachers, and seventy-eight cover general employees. These data hold the bulk of characteristics related to asset allocations and plan characteristics used in our regressions.

Because these data have sometimes been discussed as being error prone, we compare the 2011 SGLE data to Public Fund Survey (PFS) data for quality assurance purposes.<sup>6</sup> The PFS data are maintained by the National Association of State Retirement Administrators (NASRA) and co-sponsored by the National Council on Teacher Retirement (NCTR). Appendix A documents our comparison of these data sources. On average, once both data sources report on a plan, the variation in reports is quite small (two percent), with a median value of zero. The SGLE data do contain a few large discrepancies. Overall the biggest distinction between the two is the lag in complete SGLE reports. However, once SGLE obtains and cleans the data, they are comparable.<sup>7</sup>

To analyze the effect of governance changes, including changes that affect the parameters within which plan officers may prudently invest fund assets, we gather and organize data on states’ annual legislative change from reports produced by the NCSL. The NCSL reports summarize state pensions and retirement legislation. We draw data from the “Governance and Investment Policy” sections of each report over the 2001–2011 period corresponding to the SGLE data. Overall, we code 157 distinct legislative changes over this period. As well as coding the different legislative changes distinctly, we group them into five categories. Appendix B documents our grouping construction. In regressions, we employ the five-group data. The first group which pertains to alternative investments is sometimes treated differently within our analyses. This group consists of two legislative change areas: (1) changes in rules pertaining to use of alternatives and (2) limits on the use of external managers. In some specifications we break out the alternative group data into these two subgroups.

Finally we employ data from Preqin, a private firm that tracks several alternative investment categories for public pension funds and other (primarily institutional) investors. These data help us to get a better sense of the use of alternative investments and returns from these assets over the recent past.<sup>8</sup>

## *Methods*

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<sup>6</sup> The survey is sponsored by NASRA and NCTR.

<sup>7</sup> For the last year in the data, FY2011, SGLE held data on 74 out of 126 plans, as of December 17 2013. Data for earlier years are complete or nearly so—for example, for FY2010 and FY2009, the data are complete for 124 plans. This roughly 99 percent level of completion is characteristic of all years except FY2011.

<sup>8</sup> We are grateful to Preqin for their generous allowance to make use of these data which often require significant fees to access. Preqin neither suggested nor discouraged any particular use of data they granted us access to.

Regarding methods for analysis of the data, we first employ repeated cross tabs to look at whether the story of fund managers changing their rationale for use of alternatives is supported. Results of this nature are presented graphically.

Following our look at the cross tabs, we engage panel Tobit and Maximum Likelihood Estimation (MLE) regression methods. The two methods work together; the MLE’s non-censored estimation methods consider all allocations naively while the Tobit then distinguishes panel observations employing alternatives from those with no allocation in this asset class. The Tobits help us to look for any potential bias against alternatives among those not employing those assets, or, relative to that, bias towards alternatives among funds which do employ them.

In our work with the MLE estimator, we cluster the data such that variance-covariance matrix terms are allowed to be non-zero at the plan level. This procedure allows us to account for correlated differences in the interpretation of states’ rules at the plan level over time. We employ the MLE estimator to broadly consider the dynamics underlying changes to our two dependent variables of interest: (1) changes in the proportion of alternative investments held in plan portfolios and (2) legislated changes in the rules governing funds. For this latter group, we aggregate changes across all five of our categories to construct the dependent variable.

After presenting these results, we present ancillary results detailing the use of alternatives since 2011. One might generally expect funds to target the largest firms with greatest assets (and related commissions) first, and then showcase successful sales to smaller firms.<sup>9</sup> We look at the 2011-2013 period at this limited resolution to gain any possible degree of insight on adoption and use of alternatives most recently. Given the discussion of an evolving prudential standard, the concern is with regard to public pension plans allocations. Most notably, any leader-follower dynamic would tend to make sales into alternative investments easier and cheaper for sellers and more compulsory for buyers over time. Thus we are interested.

## V. RESULTS

Table 1 presents summary statistics of our data.

<Table 1 here>

For ease of reading, we separate our data into dependent and independent variables (variables listed as “dependent” are also employed as independent variables when they are not placed in the role of dependent). Our data cover up to 1,363 unique panel observations over the period of study.

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<sup>9</sup> We appreciate the comments of Lucasz Pomorski for encouraging us to address this point.

Beginning with our two dependent variables, we hold 1,325 observations reporting allocations to the alternative investment category. Over the period of study, plans hold an average alternative investment allocation of 3.62 percent, however, this allocation varies systematically and meaningfully over time.<sup>10</sup> We hold 1,363 observations of plan changes. The plans average a legislative change approximately every three years in the data. Our independent variables are next listed. We hold between 1129 and 1363 observations for each of these measures across our panel. Univariate characteristics are listed for the interested reader. Of particular note rule changes directly related to alternatives (first row) are not

We next run a series of repeated cross tabs to better document fund changes in their use of alternative investments and their investment return assumptions. We summarize this work in Figure 1 to ease interpretation of results.

<Figure 1 here>

The top panel shows strong signs of an evolution in the use of alternatives. The bottom panel documents the proportion of funds using alternatives in various proportions. At the beginning of the period of observation, relative to those holding no alternatives (red line), those employing alternatives assume greater returns. Above the dashed line which represents average assumptions across all funds, we plot average return assumptions for those allocating {any, 2, 3, 4, 5 and 6 or more} percent to the alternative category. We observe that early on, those allocating a greater proportion of assets to alternative investments systematically assume higher returns. By 2011, return assumptions converge quite a bit and decline more or less in line with trends across all funds.

There is some evidence that those funds who hold no alternative investments continue to assume lower returns. While we discourage making too much of the decline in assumed returns for those holding no alternatives in 2011, the observation is consistent with the idea that they are among the most prudent plans.<sup>11</sup> The bottom panel illustrates that over this period the percent of plans holding no alternative investments declines monotonically. As well as increases in the number of plans holding any portion of their portfolio in alternatives, there is a systematic movement towards increased use of these investments as a percent of asset holdings.

Many would like to know whether an assumption of increased returns, conditional on use of alternative investments, has merit. In order to get a better look at this question, we constructed measures of returns from alternatives relative to their share, looking for evidence of alpha in returns.

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<sup>10</sup> Our data are consistent with others, for example Seligman (2013b) found plans more than tripled their use of alternatives as a proportion of assets between 2001 and 2010.

<sup>11</sup> In 2010, the returns assumptions converged more or less entirely across all groups. The further decline in 2011 among those reporting no use of alternatives may be a “blip” as is seen in this diagram for these funds in 2007. The fact the number of funds employing no alternative investments declined from forty-eight percent to thirty-three percent of funds over this period further weakens the result for 2011.

Working with the SGLE data, the best we can say is that there is no evidence of outperformance (alpha). However these data are incomplete and may be subject to survivorship bias as noted by Xu, Liu & Loviscek (2010). While these data do categorize returns by type, in the majority of cases, observations are missing across one or more subclasses of return. For more information on returns, we turn to data from Preqin. Preqin offers data on hedge funds, private equity and real estate funds.<sup>12</sup> Table 2 offers hedge fund returns as reported by Preqin.

<Table 2 here>

These data evidence strong returns over the 2004–2013 period, measured at various time frames. Within the table, we present an annual look at June returns, annualized returns, volatility and Sharpe Ratio measures as constructed by Preqin. These data cover a period similar though not perfectly aligned with the SGLE and NCSL data periods. Volatility as measured appears to spike in the three years from 2009–2011, *at the end, and following* the Great Recession. On the surface, this evidence would appear to challenge arguments for these funds that rely on either relative outperformance, alpha, or diversification, beta. However, fair judgment requires comparison to a benchmark, such as equities returns. Figure 2 offers a comparison of higher frequency (monthly) returns data.

<Figure 2 here>

Figure 2 graphically depicts monthly returns for both the hedge funds and the S&P 500. An embedded table reports summary statistics (left) and correlations (right) between the two. Hedge funds display higher monthly returns and lower standard deviations over this time period. The two display a strong positive correlation (of roughly eighty percent). Both investment types yield economically meaningfully lower monthly returns in recession. A simple confirming regression shows both correlations to be statistically meaningful at or above the ninety-nine percent confidence interval. Consistent with visual inspection of the figure, a one-point move in hedge fund returns is associated with about a 1.6-point move in S&P 500 returns. Overall, the evidence suggests that hedge funds deliver some amount of both alpha and beta.

Moving back to Table 2 briefly, Preqin calculates a three- and a five-year Sharpe Ratio versus a two percent benchmark (Sharpe (1964) describes the estimation of this ratio when using a static benchmark—in line with the Preqin reports). The Sharpe measures declines quite notably following 2008 by either time frame. Further, the Sharpe measures have yet to recover to be appreciably above one since 2008. Thus, a standard method for joint consideration of alpha and beta versus a static two percent yield does not afford strong justification for use of hedge funds over this period.

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<sup>12</sup> Preqin also offers a very brief series on Infrastructure funds, but both the timeframe, and the number of funds included in that series are too small to be compared to returns from other asset classes over the period we study.

Prequin also offers data on Private Equity and Real Estate Fund returns over the 2000–2013 period, though these are notably less robust. Table 3 presents these data.

<Table 3 here>

These data suggest that two other important alternative investment classes outside of hedge funds have high, but volatile returns. Private equity funds outside of real estate appear to have mildly outperformed real estate funds. To give a sense of relative performance, comparing annual returns at year-end for 2008, Hedge funds do best of all, while real estate funds do worst of all. In summary, it is difficult to make a stronger case for beta via these additional categories during 2008—the period most associated with severe financial stress in recent history.

Figure 3 offers Prequin estimates of use of each class of alternative investment by public sector pension plans.

<Figure 3 here>

Over the period since 2011 (when our regression sample ends), the Prequin data report increased use of all three classes. In total over this period their portfolio share increased from 18.1 percent to 21.8 percent—a 3.7 percentage point increase. In terms of rates this represented a 20.4 percent increase in allocations, led by real estate investments.

### *Regression Results*

Moving to regression analysis, Table 4 offers results from work with a panel estimator that incorporates a variance covariance matrix clustered at the plan level. Table 4 regressors are factors that might be associated with our dependent variable: alternative investment allocation choices.

<Table 4 here>

In column 1 of this table, we regress the categorical legislative change data (NCLS) against the proportion invested in alternatives as recorded in the SGLE data. We control for plans' funded ratios, their diligence in paying Annual Required Contributions (ARC), investment return assumptions and a constant term.

We find that governance, allocation and administrative policies have statistically robust relationships with alternative investment allocations. Legislative amendments covering governance and allocations are correlated with reductions in the proportion of assets funds allocate to alternatives. A governance rule change is associated with a reduction of roughly 0.75 percentage points, while one involving investment allocation rules is associated with a 2.29 percentage point reduction. In contrast, rule changes covering the administration of plans are associated with increases in allocations of

roughly 1.04 percentage points. (All of these results are statistically significant at or above the ninety-five percent confidence interval.)

A one percent increase in the actuarial funding ratio is robustly associated with a decline in the use of alternatives of roughly 0.14 percentage points. This finding is in line with that found in Seligman (2013b) which regressed alternative investment proportions against plans' funded ratios, finding a similarly strong statistical relationship.<sup>13</sup> We find a statistically robust positive relationship between total fund assets and the use of alternatives. For every 10 billion dollars of increase in fund size, use of alternatives is estimated to increase by roughly 0.5 percentage points. Column 2 drops a seemingly unimportant variable as a check on the robustness of estimation.<sup>14</sup> Findings from Column 1 persist and the estimated magnitudes of coefficients change only slightly.

Column 3 splits the alternative investment category into its two components: The first, legislative changes to rules governing the use of alternatives, is associated with declines in the use of alternatives. These targeted legislative changes are associated with even greater impacts than those reported for allocations policies, which again persist. Rule changes directed at alternative investment are associated with a reduction in the use of alternatives of roughly 2.85 percentage points, statistically significant at the ninety-five percent confidence level. Conversely, rules limiting the use of outside managers may increase funds' use of alternative investments. Statistical evidence here is weaker, most often just passing a ninety percent confidence level threshold.<sup>15</sup> Column 4, like Column 2, drops a seemingly unimportant variable as a check on the robustness of estimation. Findings persist, again rather uniformly.

Column 5 and 6 add potentially complementary governance information from the PPD data. Results in column 5 regarding the use of alternatives from the NCSL data persist though magnitude declines to -1.89 percentage points. The finding regarding limits to the use of external managers strengthens quite a bit, to 3.67 percentage points, while statistical significance strengthens to the ninety-ninth percentile. The PPD governance data appear to reduce the contribution of the NCSL fund governance (2) and administration (4) categories originally found in columns 1 and 2. Column 6 omits the external manager governance measure to check robustness on the alternative investments rule results. Those results are statistically stable, the absolute magnitude of

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<sup>13</sup> Seligman's regressions included a much larger set of independent variables. Many of those variables were not statistically relevant, however, given that we use the same (PPD) data as Seligman, we drop consideration of these less important variables.

<sup>14</sup> Several of these sorts of specifications were run, for example, dropping the investment return assumption rather than the percentage of ARC paid. In the interest of brevity, many are omitted but all are available from the authors by request. Regarding the results, we interpret them broadly as further evidence against spurious association due to severe multicollinearity.

<sup>15</sup> This is true across several of the specifications noted in the above footnote (footnote 14) as well. A behavioral interpretation of the result would suggest that limiting the use of outside managers may encourage fund managers to substitute towards a class of investment that embeds external guidance services, but we do not make too much of this finding given other results we will discuss *infra* when we discuss results in column 7.

impact increases a bit (the coefficient now reads -1.96 percentage points) but is still below its level when the PPD governance data are omitted.

Finally, to see whether use of alternative investments is correlated with other changes in column 7, we introduce a categorical variable which is set to 1 when a fund employed a greater than zero percent allocation of the alternative category. The finding with respect to alternative investment rules holds statistically, but magnitudes now decline a bit to their lowest measured value. The interpretation is still that legislative changes reduce funds' ability or desire to invest in alternatives, now controlling for whether they hold any. The finding regarding use of external managers is no longer statistically valid across the later three specifications (5–7). Whether the plan has a separate investment council is statistically associated with a 1.4–1.6 percentage point increase in use of alternatives at between a ninety and ninety-eight percent level of confidence. Because employing a categorical variant of the dependent variable is at best suggestive, to investigate threshold dynamics more formally we next employ a Tobit. Table 5 replicates the specifications found in Table 4 employing a Tobit estimator with lower limit censored at zero.

<Table 5 here>

As illustrated in Figure 1, over time the majority of funds employ alternatives. However at the beginning of the period studied this is very much not the case. The rate of engagement of alternatives is such that overall, in all specifications with the panel Tobit routines, more than half (55-58 percent) of all plan-year observations are censored at zero.

Impacts of censoring as treated via the Tobit do change results. In columns 1 and 2 only the broad governance variable is left being statistically significant, though the broad measure regarding use of alternatives (*I*) is now weakly statistically significant (an improvement in statistical robustness when compared to Table 4). Statistically, all of the previously meaningful fund finance variables remain so. As well, the investment returns assumption is now quite statistically strong. This statistical evidence fits the data pattern previously illustrated in Figure 1. Broadly speaking, for after contending with possible censorship at the zero bound for alternative investment allocations, magnitudes roughly double while the direction of effects persists for other variable described in Table 4 with the panel Tobit. Impacts for total fund assets are a bit greater—suggesting that once engaged, funds tend to increase their use of alternates over time.<sup>16</sup>

In columns 3 and 4, legislative changes directly regarding the use of alternatives follow the pattern of persistence in level of statistical significance and direction of effect observed in Table 4 while magnitudes again roughly doubles as compared to results from

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<sup>16</sup> As a robustness check on our findings with respect to fund size, we ran a parallel set of regressions using the more contemporaneous measure market value of assets in place of the actuarially smoothed variable. Results are statistically as robust, magnitudes are a bit more sensitive to specification moving across a range of 0.76 to 0.85 percentage points increase per 10 billion dollar increase in the market value measure. All other results are consistent with those found in Table 5. These results are available upon request.

the clustered panel routine. The result limiting use of outside managers is no longer statistically valid. Column 5 drops the outside manager measure and the alternative investment rule change result holds. (Much like for column 7 but ahead of inclusion of the PPD governance data). This result may be of more interest given findings in the final two columns.

The last two columns (6 & 7) again add consideration of the governance data found in the PPD data. We find evidence that having plan participants on a plan's investment board reduces the use of alternative investments. Each additional participant on the board is now associated with reduced use by roughly 1.05 percentage points. The finding regarding fund governance (3) from our own collection of the NCSL data persists, but many others do not, suggesting a degree of redundancy across other measures in the PPD and NCSL data. For example, within the set of results for the PPD data, the result for separate investment councils found in Table 4 is no longer statistically meaningful after controlling for the censoring threshold. Nor is the result for legislative changes directly regarding the use of alternatives. Limiting the use of external managers is now weakly statistically associated with increases in alternative allocations (at a very high measured magnitude of over 8 percentage points).

Overall, across tables 4 and 5 we find consistent evidence that the use of alternates increases with total fund assets. This result is consistent with a targeting hypothesis for alternative investment marketers.

From our work in constructing the NCSL measures and our work organizing the set of regressions we present here, our sense is that it is important to consider regressions that use the NCSL data alone, as well as those in the latter columns which engage the PPD data. We also believe that results from both the clustered panel and Tobit methods should be considered to get the fullest sense of the way alternative investment allocations react to governance rule changes and other plan factors.

Interpreting results across both tables, in terms of governance, our measures suggest that legislative changes vary somewhat in tenor between funds who hold no alternative investments and those that do. We note however that results with the Tobit are likely challenged by the relatively high number of censored observations—perhaps especially in the last columns where the number of uncensored observations falls below 500—fewer than four observations per plan on average.

Perhaps the greatest value added by way of the Tobit routines is to clarify the relationship between investment return assumptions and use of alternatives, for those using alternatives. Evidence here supports the idea that once a plan employs alternatives, the proposition of alternatives in the portfolio is strongly and positively related to investment return assumptions.

Given our findings regarding rule changes, we include one more set of regressions. These consider possible financial motivators for legislative changes in governance rules. Table 6 presents these results.

<Table 6 here>

Columns 1 and 2 of Table 6 are estimated by way of our clustered panel procedure. Columns 3 and 4 employ the Tobit. Though less than twenty percent of plan-year observations observe a legislative rule change, in years when a change occurs, often more than one rule is changed in the same legislative bill or session. Controlling for this does not appear to matter too much. By either approach we find that declines in the actuarial funding ratio hold a unique and strong statistical relationship associated with increases in the likelihood of a legislative change. Dropping a possibly correlated and seemingly irrelevant variable, the investment return assumption, does not change the nature of this result in any meaningful way.

## VI. SUMMARY AND CONCLUSIONS

Our interest in this work has been to investigate the role that alternative investments might play in terms of public pension funds returns. Over the period we study, a period when the use of these investments became common among public plans, we find evidence that the rationale for their use evolved from one emphasizing superior returns to one based on damped volatility in returns.

Evidence from the PPD data set and hand coded NCSL dataset with the Tobit and clustered panel supports the idea that larger plans and plans with lower funded ratios are more inclined to employ these assets. Once a plan employs alternatives, the proportion of alternatives in the portfolio is strongly and positively related to investment return assumptions. From the Prequin data we find some evidence in support of both the superior return (alpha) and reduced volatility (beta) justifications, though this evidence is weaker following 2007—over the period of the Financial Crisis, the Great Recession and, any aftermath since that time.

That being the case, we believe that whether or not alternative investments improve returns or damp volatility in observed returns over the short run is separate from whether or not they might be increasing the systemic risk faced by plans over the longer run, in the face of large correlated shocks to financial markets in some future period. The bulk of our work in terms of describing the legal environment and the econometric analysis of plans' allocations, returns, funding adequacy and legislated changes to operating requirements targets this concern. Tables 2's Sharpe ratio measures, along with evidence from Table 3 and Figure 3 offer empirical data suggesting the trend towards increased use of these asset classes persists while their comparative performance has

been markedly diminished. This evidence is consistent with that of Figure 1, thus, both the PPD and Preqin data indicate funds' probability of use and intensity of use of this asset class has grown rather consistently since 2001, including since the Great Recession.

While generally, plans do not invest very large proportions of assets in any one of these investment classes at this time, the trend has been for plans to increase their use of these investments. The most recent evidence from Preqin now places use at over one fifth of total plan assets, on average. In light of the generally liberalized governance of plan investment requirements within a prudent investor standard, observed increased use of these investments warrant more attention. We have noted three channels by which a systemic shock might impact funds with high dependency on these investments. All three channels are based on a weakening of orderly exit provisions: the development of secondary markets for private equity, asset class specific risks and agency risks stemming from one or more bankruptcies among partners coupled with illiquidity among remaining partners to manage orderly sales of assets from claimants.

We find that legislated changes tend to reduce plans' opportunities to invest in alternatives; however, both the magnitude and statistical significance of these results is somewhat sensitive to specification design, as illustrated in Tables 4 and 5. Further we find that rule making concerning a broad set of allocation rules is associated with reduced use of alternatives in our data. We find weaker evidence in support of the argument that funds have substituted to increased use of alternatives when they are limited from employing external asset managers more directly.

We interpret these results as having both positive and negative possible implications. A positive interpretation suggests that legislatures are mindfully limiting increases based on iterated herd behavior towards increases in these investments by plans. However a competing interpretation is that in lieu of legislative vigilance, plans' use of these investments has been inclined to grow over time in ways that may be concerning given current development of private-trade platforms and/or large idiosyncratic financial market shocks. In our look at factors motivating changes in governance rules (Table 6), we find that only reductions in funding ratios systematically motivate rule changes—and that, we would suggest, may give further reason for concern because it suggests that legislatures are reactive as opposed to proactive. The finding is consistent with a as a result of a 'don't fix what isn't broke' mentality. Thus, in an era in which returns and funding are both improving, legislators may be lulled into acceptance of more liberal prudent investor-based standards. In such a case, obfuscated mark-to-market may further damp inclinations towards monitoring. Our finding that investment councils tend to increase the probability of use of these investments (Table 4) gives no further solace in this regard. Thus, in periods of long market run-ups followed by large negative shocks to returns, alternative investments, employed at much higher levels than we currently observe might trigger a systemic challenge to these funds ability to meet claims.

We suggest that state legislatures who share these concerns might enact hybrid prudence standards to protect against this sort of scenario. Given that the prudent person standard may be relatively weak protection against herding risks, and illiquidity risks under certain scenarios, maximum prudent allocation rules for this investment class are of more merit than otherwise.

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*Table 1: Summary Statistics (Full Regression Sample)*

	full data	N	Mean	Std Dev	Min	Max
<i>Dependent Variables</i>						
assets allocated to alternative investments (percent)		1325	3.622	6.343	0.000	50.420
all legislative changes to fund policies (sum by plan & year)		1363	0.328	0.877	0.000	7.000
<i>Independent Variables</i>						
1: alternate investment (number of changes in law by (plan, yr)		1363	0.019	0.137	0.000	1.000
- alternate rule change (*)		1363	0.014	0.117	0.000	1.000
- limit use of external managers (*)		1363	0.005	0.072	0.000	1.000
2: governance (*)		1363	0.101	0.301	0.000	1.000
3: allocations (*)		1363	0.040	0.195	0.000	1.000
4: administration (*)		1363	0.069	0.253	0.000	1.000
5: fund balance (*)		1363	0.030	0.171	0.000	1.000
actuarial funding ratio (percent)		1313	84.337	16.613	19.100	147.700
percent of ARC paid (*)		1343	93.956	61.641	0.000	1727.700
total fund assets (thousands of dollars)		1314	19,100,000	29,100,000	235,072	257,000,000
investment return assumption (percent)		1303	0.080	0.004	0.045	0.090
Total number of investment board members (number)		1129	9.884	3.450	1.000	20.000
number of plan participants on the board (*)		1129	5.865	3.291	0.000	16.000
Whether or not the board has a separate investment council (*)		1129	0.348	0.477	0.000	1.000

(\*): variable related to governance

Table 2: Hedge Fund Performance 2004-2013 (in percentages)

time frame	Jun-04	Jun-05	Jun-06	Jun-07	Jun-08	Jun-09	Jun-10	Jun-11	Jun-12	Jun-13	averages	sample stddev
1 Month	1.10	1.73	0.08	1.18	-1.38	1.38	-0.62	-0.88	0.48	-1.49	0.16	1.19
3 Months	-0.46	1.41	0.81	6.07	2.48	13.79	-1.85	-0.05	-2.21	0.18	2.02	4.76
6 Months	4.34	3.93	9.06	10.74	0.02	16.75	2.06	2.43	3.71	3.92	5.70	5.02
12 Months	20.95	13.97	20.43	20.85	5.74	-3.13	17.61	14.85	-0.67	10.46	12.11	8.84
2 Years	38.64	37.84	37.25	45.54	27.78	2.43	13.93	35.08	14.08	9.72	26.23	14.91
3 Years	56.35	58.00	66.00	65.87	53.89	23.78	20.47	30.86	34.18	26.02	43.54	18.14
5 Years	144.82	104.77	114.59	129.95	112.12	69.89	75.33	67.21	37.44	43.58	89.97	36.47
10 Years	565.67	528.47	490.37	474.45	418.74	315.94	259.04	258.81	216.04	204.56	373.21	137.33
Annualised - 2 Years	17.74	17.40	17.15	20.64	13.04	1.21	6.74	16.22	6.81	4.75	12.17	6.71
Annualised - 3 Years	16.06	16.47	18.41	18.37	15.45	7.37	6.40	9.38	10.30	8.01	12.62	4.77
Annualised - 5 Years	19.61	15.41	16.50	18.12	16.23	11.18	11.89	10.83	6.57	7.50	13.38	4.44
Annualised - 10 Years	20.87	20.18	19.43	19.10	17.89	15.32	13.64	13.63	12.20	11.78	16.40	3.47
Volatility - 3 Years	5.51	5.36	5.34	4.86	5.74	9.67	10.17	9.78	6.64	5.69	6.88	2.12
Volatility - 5 Years	6.90	5.49	5.54	5.06	5.42	8.34	8.54	8.30	8.85	8.45	7.09	1.56
Sharpe Ratio (2%) - 3 Years	2.55	2.70	3.07	3.37	2.34	0.56	0.43	0.75	1.25	1.06	1.81	1.11
Sharpe Ratio (2%) - 5 Years	2.55	2.44	2.62	3.18	2.63	1.10	1.16	1.06	0.52	0.65	1.79	0.98

-- notice the 2% benchmark

Data Assembled by Authors - Source Prequin based on a sample of roughly 425 funds

--June chosen to capture a mid year number that is not sensitive to year end market allocations associated with "window dressing" and in line with many fiscal year-ends.

Table 3: Private Equity and Real Estate Fund Performance

time frame	RETURNS:									
	Private Equity				Real Estate				Hedge Funds	
	1 year	3 year	5 year	10 year	1 year	3 year	5 year	10 year	1 year	
Dec 2000	10.1	14.9			11.4	3.2				
Dec 2001	-2.7	10.6			7.8	7.3				
Dec 2002	-9.1	-4.9			6.7	7.4				
Dec 2003	17.5	4.3			14.9	8.6				
Dec 2004	25.0	10.2			19.8	12.5			14.4	
Dec 2005	27.0	23.0			60.8	23.4			14.8	
Dec 2006	29.1	26.2			42.6	38.0			19.0	
Dec 2007	26.0	30.2			13.5	36.9			17.1	
Dec 2008	-27.6	11.3			-39.9	0.0			-17.0	
Dec 2009	13.8	0.3			-25.3	-18.3			34.5	
Dec 2010	18.8	0.8			4.7	-12.2			14.4	
Dec 2011	9.2	13.9			14.6	-2.6			-1.9	
Dec 2012	12.9	13.3			6.5	6.4			10.2	
Jun 2013	13.8	15.2	6.9	21.7	0.0	n/a	n/a	n/a		
average	11.5	11.9			10.6	8.5				
sample standard deviation	16.3	10.3			25.1	16.6				

Data Source: Preqin

Table 4 Panel regression analyses of factors related to the percent of plan assets devoted to alternative investments

Dependent: <i>percent of plan assets devoted to alternate investments</i>	Panel regression clustered at public plan level													
	1		2		3		4		5		6		7	
Independent Variables:	E(β)	stderror	E(β)	stderror	E(β)	stderror	E(β)	stderror	E(β)	stderror	E(β)	stderror	E(β)	stderror
State level legislative changes (NCSL data)														
1 re: fund use of alternates (broadly)	-1.642	1.101	-1.640	1.099										
alternative investment rule change					-2.845 **	1.144	-2.848 **	1.143	-1.887 **	0.948	-1.963 **	0.941	-1.609 **	0.783
limiting use of external asset managers					2.507 *	1.494	2.522 *	1.496	3.666 ***	1.095			-0.751	1.414
2 re: fund governance (broadly)	-0.749 **	0.357	-0.754 **	0.357	-0.863 **	0.354	-0.868 **	0.353	-0.506 *	0.271	-0.417	0.272	-0.643 ***	0.198
3 re: investment allocation rules (broadly)	-2.287 ***	0.801	-2.268 ***	0.802	-2.206 ***	0.804	-2.187 ***	0.805	-1.387 **	0.592	-1.415 **	0.594	-0.830 **	0.421
4 re: administration of public sector pensions	1.037 ***	0.402	1.030 **	0.402	1.056 ***	0.404	1.049 ***	0.405	0.658 *	0.339	0.626 *	0.336	0.422	0.268
5 re: other things of import for trustfund balances	0.668	0.760	0.671	0.760	0.945	0.752	0.949	0.752	0.998	0.630	0.961	0.631	0.623	0.410
Fund level governance (PPD data)									0.223	0.168	0.221	0.168	0.184	0.127
number of seats on plan's board of trustees									-0.375 *	0.215	-0.374 *	0.215	-0.258 *	0.151
number of plan participants on the board									1.567 **	0.792	1.589 **	0.798	1.464 **	0.600
plan has a separate investment council {0,1}														
Fund finances														
funded ratio (actuarial calculation)	-0.143 ***	0.026	-0.142 ***	0.026	-0.141 ***	0.027	-0.140 ***	0.026	-0.095 ***	0.023	-0.097 ***	0.023	-0.042 ***	0.013
total fund assets ( , thousands of dollars)	5.01E-08 ***	1.14E-08	4.99E-08 ***	1.14E-08	5.02E-08 ***	1.14E-08	5.00E-08 ***	1.14E-08	4.73E-08 ***	1.07E-08	4.77E-08 ***	1.08E-08	1.11E-08	6.93E-09
investment return assumption	0.774	1.1679	0.772	1.1658	0.739	1.1669	0.738	1.1648	1.544	1.20169	1.562	1.2011	0.812	0.81289
Annual Required Contributions (percent paid)	0.001	0.001			0.001	0.001					0.002	0.001	0.000	0.001
-- alternates greater than zero {0,1}													6.472 ***	0.666
constant	8.393	8.348	8.412	8.328	8.482	8.356	8.500	8.337	-2.716	8.389	-2.836	8.396	-3.631	5.879
observations	1,235		1,237		1,235		1,237		1,060		1,066		1,066	
number of plans	124		124		124		124		124		124		124	

Table 5: Panel Tobit analysis replicating the patten of regressors in Table 4

Dependent: <i>percent of plan assets devoted to alternate investments</i>	Panel Tobit estimation -- lower limit censored at zero													
	1		2		3		4		5		6		7	
Independent Variables:	E(β)	stderror	E(β)	stderror	E(β)	stderror	E(β)	stderror	E(β)	stderror	E(β)	stderror	E(β)	stderror
State level legislative changes (NCSL data)														
1 re: fund use of alternates (broadly)	-3.525 *	2.004	-3.517 *	2.003										
alternative investment rule change					-5.876 **	2.387	-5.874 **	2.386	-5.969 **	2.380	-3.257	2.167	-3.502	2.152
limiting use of external asset mangers					2.061	3.492	2.082	3.491			8.123 *	4.594		
2 re: fund governance (broadly)	-1.250	0.996	-1.247	0.995	-1.426	0.998	-1.422	0.997	-1.285	0.988	-0.431	0.976	-0.101	0.956
3 re: investment allocation rules (broadly)	-4.409 ***	1.561	-4.337 ***	1.559	-4.368 ***	1.556	-4.297 ***	1.554	-4.433 ***	1.553	-3.059 **	1.427	-3.214 **	1.427
4 re: administration of public sector pensions	1.395	0.957	1.402	0.956	1.426	0.954	1.432	0.952	1.394	0.953	0.960	0.945	0.908	0.945
5 re: other things of import for trustfund balances	1.374	1.424	1.373	1.424	1.800	1.439	1.800	1.439	1.759	1.437	1.710	1.467	1.556	1.461
Fund level governance (PPD data)														
number of seats on plan's board of trustees											0.446	0.425	0.438	0.426
number of plan participants on the board											-1.052 **	0.450	-1.048 **	0.452
plan has a separate investment council {0,1}											0.710	1.934	0.687	1.940
Fund finances														
funded ratio (actuarial calculation)	-0.346 ***	0.028	-0.344 ***	0.028	-0.340 ***	0.028	-0.338 ***	0.028	-0.342 ***	0.028	-0.245 ***	0.029	-0.247 ***	0.029
total fund assets ( \$, thousands of dollars)	1.23E-07 ***	2.74E-08	1.23E-07 ***	2.74E-08	1.22E-07 ***	2.73E-08	1.22E-07 ***	2.73E-08	1.21E-07 ***	2.54E-08	1.20E-07 ***	2.53E-08	1.20E-07 ***	2.53E-08
investment return assumption	2.486 **	1.03344	2.482 **	1.03318	2.402 **	1.02952	2.397 **	1.02925	2.435 **	1.02884	4.340 ***	1.18385	4.423 ***	1.18666
Annual Required Contributions (percent paid)	0.002	0.006			0.002	0.006			0.002	0.006				
constant	3.202	8.066	3.244	8.062	3.442	8.032	3.479	8.027	3.355	8.037	-18.149 *	9.653	-18.543 *	9.679
observations	1,235		1,237		1,235		1,237		1,235		1,066		1,060	
observations holding alternative investments	551	44.6%	552	44.6%	551	44.6%	552	44.6%	551	44.6%	444	41.7%	444	41.9%
number of plans	124		124		124		124		124		124		124	

Table 6: Panel Analyses of factors related to the number of legislative changes

Dependent Variable: <i>Number of Legislative Changes (NCSI)</i>	clustered panel				panel Tobit			
	1		2		3		4	
Regressors:	E( $\beta$ )	stderror	E( $\beta$ )	stderror	E( $\beta$ )	stderror	E( $\beta$ )	stderror
percent of plan assets devoted to alternates	-0.003	0.003	-0.003	0.003	-0.010	0.016	-0.012	0.016
funded ratio (Actuarial calculation)	-0.005 ***	0.001	-0.003 **	0.001	-0.021 ***	0.006	-0.013 **	0.007
percentage of Annual Required Contributions	0.000	0.000	0.000	0.000	-0.001	0.002	-0.001	0.002
total fund assets	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
investment return assumption	-1.870	3.158			-4.712	20.259		
constant	0.809 ***	0.263	0.524 ***	0.115	0.316	1.708	-0.714	0.578
observations	1,234		1,248		1,234		1,248	
uncensored, (percent)					229	18.6%	236	18.9%
number of plans	124		124		124		124	

Figure 1: Investment Return Assumptions & Use of Alternatives

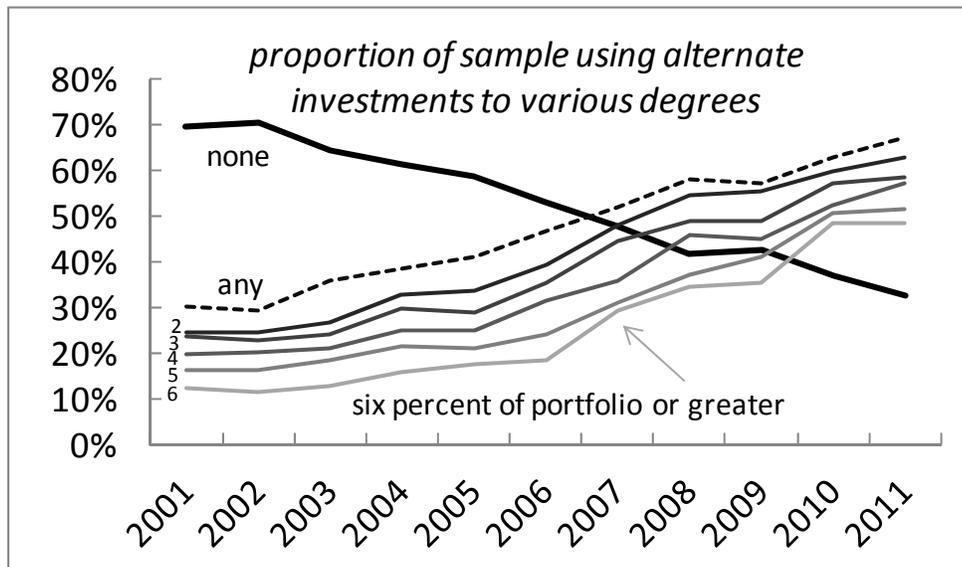
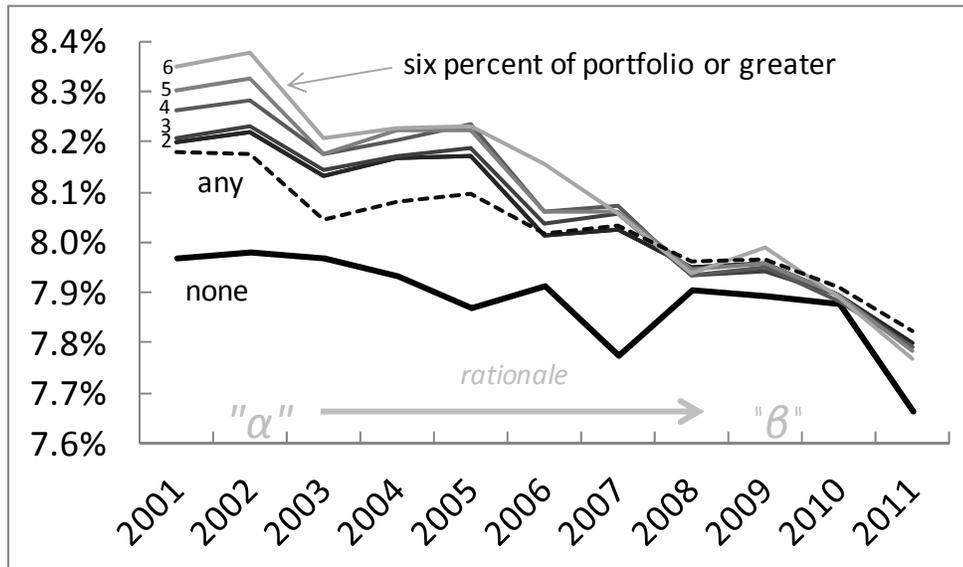
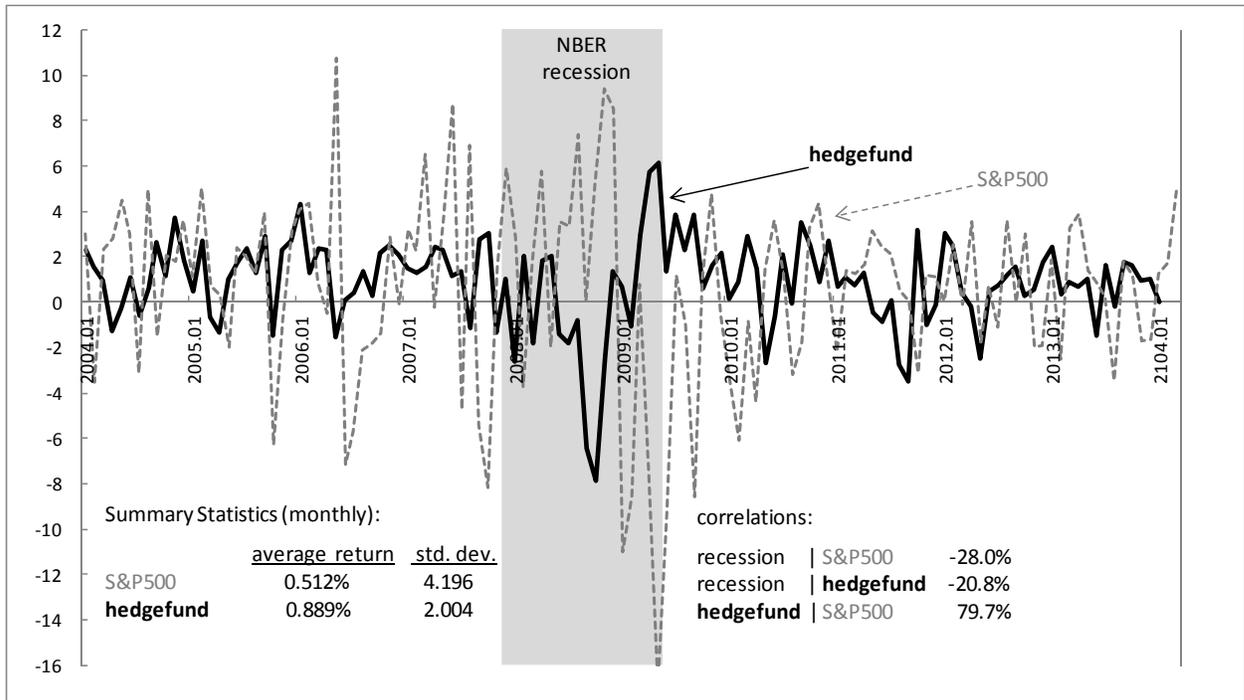
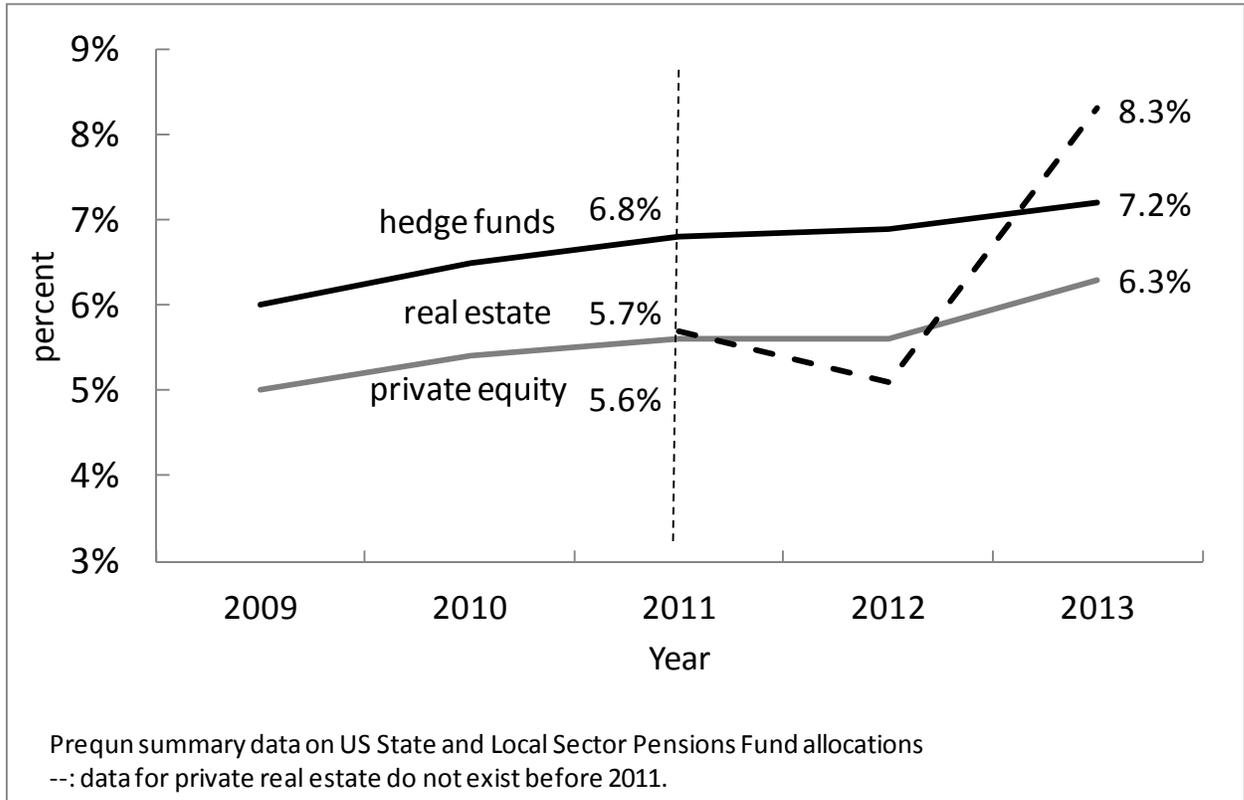


Figure 2: Hedge Fund Returns compared to S&P500  
 Monthly returns over Jan 2004 – Jan 2014 (in percent)



(Data sources: Preqin, NBER Standard & Poor's, via Yahoo! Finance)

Figure 3: Alternative Investment Allocations for Asset Subclasses (2009 – 2013)



*Appendix A: SGLE CRR data for 2011 compared to PFS data across 126 plans:*

<b>Measure</b>	<b>PFS Assets</b>	<b>SGLE Assets</b>	<b>Variation when SGLE reports</b>
<b>number of plans</b>	<b>126</b>	<b>74</b>	
<b>average</b>	<b>\$21,198,422</b>	<b>\$18,377,592</b>	<b>2%</b>
<b>max</b>	<b>\$271,389,000</b>	<b>\$164,524,117</b>	<b>29%</b>
<b>75th percentile</b>	<b>\$22,189,119</b>	<b>\$20,823,236</b>	<b>2%</b>
<b>median</b>	<b>\$10,293,750</b>	<b>\$9,801,400</b>	<b>0%</b>
<b>25th percentile</b>	<b>\$5,137,207</b>	<b>\$4,861,911</b>	<b>0%</b>
<b>min</b>	<b>\$235,072</b>	<b>\$235,072</b>	<b>0%</b>

## *Appendix B: NCSL Governance Measures as Grouped*

### Pension Fund Policy Amendments as grouped

#### 1 alternates

- Asset allocation - more alternatives
- Limits on use of external managers

#### 2 governance

- Creation of investment board
- Additions to board
- Director qualifications - investment expertise
- Board disclosures
- Investment manager requirements and other professionalization measures
- Board education
- Employee representation on board
- Prudent investor rule or other fiduciary legislation
- Conflicts of interest legislation
- Removal of commission review authority
- Ethics policy
- System independence
- Term limits
- Assets held in trust
- Adoption of UMPERSA
- Board size reduction
- Director elections
- File rule changes with supervising commission
- Limitations on board liability
- Review commission established
- Contract review process
- Best execution

#### 3 investment allocation rule (other than alternates)

- Investment restrictions (including divestment)
- Asset allocation - more foreign investments
- Preference for local broker/dealers
- Asset allocations - more in-state investment
- Asset allocation - minority investment
- ETF Investment
- Asset allocation - real estate investment
- Asset allocation - more equity

#### 4 administrative changes

- Change in reporting requirements
- Protection of beneficiary interests legislation
- Systems merger
- Administrative cost legislation
- Benefits payment administration
- Staffing adjustment

#### 5 other changes impacting trust fund balance

- Actuarial, amortization or rate stabilization changes
- Employer contributions change
- COLA
- Contribution rate change*
- State management of underfunded plans
- Facilitate issuance of POBs