

# Issue Brief

## How Do Public Pensions Invest? A Primer

By Ronnie G. Jung, CPA and Nari Rhee, PhD

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## ABOUT NIRS

The National Institute on Retirement Security is a non-profit research institute established to contribute to informed policy making by fostering a deep understanding of the value of retirement security to employees, employers, and the economy as a whole. NIRS works to fulfill this mission through research, education, and outreach programs that are national in scope.

Public defined benefit (DB) pensions leverage the advantages of pooled funds, pooled risk, a long investment horizon, and professional money management to reduce the cost of providing retirement benefits to employees over the long term. Given recent economic shocks and their impact on the status of pension funds, there is increased attention on public sector pension investment management practices. Debate about these practices can be better informed with insights into how the public pension investment process works, a process that is not widely understood.

The purpose of this primer is to provide policymakers, journalists, and stakeholders with a tool to understand how the public pension fund investment process is structured and managed. In particular, this brief focuses on how public pensions allocate assets and set expected rates of return, that is:

- How they distribute investments across stocks, bonds, and other asset classes in order to maximize returns and minimize risk.
- The principles that guide how public pension funds invest and the institutionalized practices through which plan trustees set investment policies.
- How public pensions evaluate and manage investment-related risk.
- How investment return assumptions among public pension funds compare to historical performance, and their future outlook.

The following are key highlights.

**1. Public pension funds have a clear division of labor for making investment-related decisions. Fiduciary standards apply to each key role in the investment process.**

- Nearly all public pension plans are overseen by **trustees** who bear primary fiduciary responsibility and are also subject to strict ethical standards. Trustees set investment policies with the advice and support of a number of different professionals.
- The governance structure of public pension funds makes trustees, staff, and consultants involved in the management of pension fund financial resources fiduciaries. Fiduciaries must perform their functions solely in the interest of the trust beneficiaries and must meet the highest standard of care (prudence) in executing those functions.
- Trustees are responsible for building and overseeing a professional investment staff, typically with a **Chief Investment Officer (CIO)** who leads the investment unit within the pension fund. The staff investment team advises and assists trustees in hiring investment consultants and supervising investment managers.
- **Investment consultants**, who have a deep background in finance, work with staff and the board to help develop and review investment policies.
- **Investment managers** conduct the day-to-day business of managing each asset class portfolio (e.g., domestic stocks or corporate bonds)—buying and selling securities and reporting on investment performance. This role may be filled by staff or by an outside firm, depending on the capacity of the fund and the specialized expertise required.
- **Actuaries** also play an important role in pension fund investment policy by predicting the cost of future pension benefits and working with consultants and staff to determine that the asset allocation adopted by the Board of Trustees over the long run, combined with adequate contributions, will generate sufficient income to meet pension obligations.

**2. Public pension funds have rational and systematic processes for setting asset allocation in a diversified portfolio, estimating expected investment returns, and evaluating investment performance.**

- Investment policy begins with an analysis of pension liabilities—how much money will be needed to pay for promised benefits over the long term. Each pension fund has a unique set of liabilities, liquidity needs, and expected cash flow based on benefit structure and membership demographics.
- Typically, pension trustees adopt an investment policy statement (IPS) that establishes how much investment risk will be tolerated by the fund and sets asset allocation targets, i.e., the percentage shares of the fund total investments assigned to different asset classes, also called the target asset mix. The list of investable asset classes is defined by trustees in accordance with state and local laws and regulations.
- The IPS also sets expectations for investment performance in each asset-type portfolio and the fund as a whole. Investment performance targets are tied to benchmarks—usually market indexes, such as the S&P 500 for large company stocks—against which portfolio and fund returns are evaluated.
- The fund’s expected rate of return on its investments is determined from the target asset mix based on expert consensus on the long-term returns that can be expected in each asset class in light of historical data and current capital market assumptions.
- All pension funds periodically conduct asset allocation studies and/or asset liability modeling to determine if their investment strategy as outlined in their IPS remains appropriate, or needs modification.
- Portfolio performance in each asset class is regularly evaluated against internal benchmarks on a quarterly, annual, and multi-year basis

**3. The board of trustees of each public DB pension fund determines the acceptable level of risk that is prudent for their plan given its particular circumstances. They then adopt an asset allocation that is designed to maximize returns within the established level of risk.**

- During the asset allocation process, pension trustees—with the assistance and advice of staff and consultants—carefully select asset allocations designed to minimize risk and maximize return.
- Research based on asset allocation over time shows that public pensions are patient investors, much more so than individual investors. That is, they are not unduly swayed by the ups and downs of financial markets and do not take on more risk in order to compensate for market downturns.
- Public pensions have reviewed asset allocations in light of adverse market conditions in the last decade and implemented measures intended to mitigate risk. For example, in response to the recent financial crisis, subsequent low interest environment, and future inflation concerns, pension funds reduced investment in public equities (stocks) and fixed income while they increased their positions in alternative assets and real estate. This more diversified portfolio is aimed at smoothing out the effects of market volatility. Public pension fund exposure to alternative assets, while increasing for larger plans, remains relatively low compared to endowment funds.

**4. The level of risk assumed by public pension funds, as indicated by the percentage of assets invested in equities, is consistent with other institutional investors and with many prudent individual investors.**

- The risk profile of public pension funds—currently about 60 percent in corporate equities on average—has remained fairly stable and is consistent with other institutional investors.
- Public pensions generally position themselves on the risk spectrum between corporate pensions and endowment funds. Public and private pension funds closely resembled each other in asset allocation in recent decades. However, in 2006, private pensions began “derisking” investment strategies to offset increased pension expense volatility resulting from new regulations. Endowment funds, meanwhile, tend to be invested more heavily in private equity and alternative assets.

- The average equity position among pooled public pension funds entails no more risk than is considered prudent for an individual investing over a finite career using a commonly recommended lifecycle investment strategy. In a typical lifecycle fund, the individual starts almost exclusively with equities and gradually transitions to fixed income. A mid-career worker would have 60-70 percent investment in equities. In light of this, the 60 percent average investment in equities is appropriate for pension funds that invest over a long time horizon and cover a mix of young, mid-career, and older workers.

**5. Actual investment returns for the overall fund and for the individual portfolios are evaluated over multiple periods including the short term and long term, and evidence indicates that current rate of return assumptions are realistic.**

- Returns have met or exceeded expectations over the long term, i.e., 20-30 years. Public funds have the advantage of being able to smooth the effects of bubbles and downturns, though the sheer magnitude of the 2007-2008 financial crisis and its aftermath has challenged all funds.
- In response to the current economic climate, public pension funds are incrementally adjusting their rate of return assumptions downwards. Nonetheless, independent studies indicate that the average rate of return assumption of 7.8-7.9 percent is not unrealistic, both in nominal terms, and in real (constant purchasing power) terms after controlling for inflation.
- It is important to distinguish nominal and real return assumptions because inflation impacts pension liabilities. Shortfalls in investment income due to slow economic growth, for instance, can be accompanied by reductions in liabilities resulting from slow wage growth. Nominal return assumptions among public pensions cluster tightly around a median of 7.9 percent, and real return assumptions are spread more broadly around a median of 4.5 percent.

## INTRODUCTION

Public defined benefit (DB) pensions leverage the advantages of pooled funds, pooled risk, a long investment horizon, and professional money management to reduce the cost of providing retirement benefits to employees. Traditional DB pensions provide secure lifelong monthly income to employees when they retire, in contrast to defined contribution (DC) plans like 401(k)s in which individual retirement wealth is subject to the vagaries of the financial market. Moreover, traditional DB pensions deliver a given level of retirement income for 46 percent less cost—in terms of employer and employee contributions—than would be required through defined contribution (DC) plans. This difference is largely due to a better diversified asset mix in DB pensions facilitated by a longer investment horizon, as well as lower expenses.<sup>1</sup> On average, about 61 percent of public pension benefit payments are funded through investment returns, compared to 26 percent from employer contributions and 13 percent from employee contributions (**Figure 1**).<sup>2</sup> The large share of investment returns relative to contributions helps lower public service delivery costs to taxpayers over the long term.

However, following historic declines in stock values in 2008-2009, declining interest rates, and their negative impact on the funded status of pension funds in the context of continuing financial uncertainty, there is increased attention on public pension funds' investment strategies and how they manage risk. That debate can be better informed with insights into how the public pension investment process works, a process that is not widely understood.

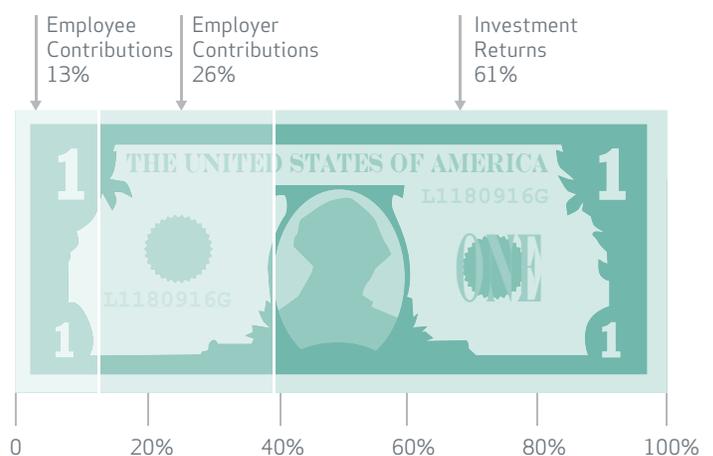
The purpose of this primer is to provide policymakers, journalists, and members of the public a tool that provides a basic understanding of how public pension funds manage investments. In particular, this brief focuses on how public pensions allocate assets (that is, distribute investments across different asset classes such as stocks, corporate bonds, and U.S. Treasury debt), set expected rates of return, and approach risk, focusing on the following questions.

- What are the principles and regulations that guide how public pension funds invest?
- What specific institutional practices do they use to set investment policies?

- How do public pensions evaluate and manage investment related risk?
- How do investment return assumptions among public pension funds compare to historical performance, and are they realistic going forward?

This primer is organized as follows. The remainder of the Introduction outlines the governance structure of public pension funds, describing the distinct roles and responsibilities of trustees, staff, and consultants in the pension investment process. Section 1 provides an overview of the formal processes by which pension trustees evaluate risk; decide how to allocate funds across different asset classes in a diversified portfolio; adopt investment return assumptions; and evaluate investment performance. Section 2 highlights research on public pension investment style and examines public pension asset allocation and investment risk exposure compared to other institutional investors. Section 3 discusses the evaluation of pension fund investment performance looking at the past, and highlights key factors to consider when evaluating rate of return assumptions in light of current capital market conditions and the distinction between nominal and real rates of return.

**Figure 1. Sources of Revenue for Public Pensions, 1982-2010**



Source: Data from U.S. Census Bureau, in NASRA 2012.

## Key Roles in Public Pension Investing

Nearly all public pension plans are overseen by **boards of trustees**. A few states designate sole trustees, rather than boards. Some states have a separate State Investment Board (SIB) that manages an array of state funds, including state pension funds. For the purposes of this paper, “board” and “trustees” refer to the entity that is responsible for investment decisions, whether it is a pension board, sole trustee, or SIB.

Trustees bear primary fiduciary responsibility on behalf of pension participants; that is, they have the legal and ethical responsibility to manage the fund for the exclusive benefit of the workers and retirees who participate in the fund. The pension governance structure extends the fiduciary role to staff, external contractors and all others involved in the management of pension fund financial resources. In performing these fiduciary functions, they must meet the highest standard of care (prudence) in executing those functions. Importantly, fiduciaries must put the interests of plan members before their own, avoiding decisions that even appear to benefit themselves or their family and friends. This applies not just to investment decisions, but other aspects of pension fund management including hiring staff and consultants.

The board sets policies for investment management and asset allocation—i.e., how much of the portfolio is allocated to stocks, bonds, real estate, and other investment classes. Trustees are advised and supported by a number of different professionals. Trustees are responsible for building and overseeing a professional investment staff, typically with a **Chief Investment Officer (CIO)**, who leads the investment unit within the pension fund. The staff investment team advises and assists the board in hiring investment consultants and supervising investment managers. For most public pension funds, the hiring of staff is generally governed by state and local agency regulations, while the process of soliciting and executing contracts with external professionals is subject to procurement procedures and public review. **Investment consultants**, who have a deep background in finance, work with staff and the board to help develop and review investment policies.

**Investment managers**, not the trustees, conduct the day-to-day business of managing each investment portfolio—buying and selling securities and reporting on investment

performance. This role may be filled by **internal investment managers** who are on the pension fund staff, or **external investment managers** from an outside firm, depending in large part on scale and specialization. External investment managers are generally paid based on portfolio size as well as performance based on exceeding a benchmark return and adherence to the risk parameters set by the board.

Large pension funds have generally found that it is cost-effective to have most of their assets managed by internal staff, and research tends to support this conclusion.<sup>3</sup> At the same time, they also rely on external money managers to handle investment classes that entail highly specialized or emergent expertise, or in which the fund is not investing at a large enough scale to warrant building internal capacity. In addition, restrictions on public sector hiring and compensation are sometimes obstacles to expanding internal capacity. (In contrast, Canadian public funds have aggressively internalized specialty investment expertise.<sup>4</sup>) Smaller funds, meanwhile, rely more heavily—sometimes exclusively—on external investment managers because these funds lack the scale and resources to do this work internally. Larger funds tend to generate higher returns than do smaller funds, in large part due to the cost savings from internal management and the ability to better diversify their holdings.<sup>5</sup>

**Actuaries** also play an important role in pension fund investment policy. An actuary is a professional whose job is to analyze the financial consequences of risk with a focus on the liability side. In the pension world, actuaries predict the cost of future pension benefits by accounting for a variety of factors such as benefit formulas, demographic factors (turnover, retirement, disability, and mortality rates), and economic factors (salary growth, investment return, and inflation). They determine the level of contributions that, combined with investment income, will be sufficient to meet the fund’s retirement benefits over the long term. Most large pension funds have in-house actuaries, although a number of large, established actuarial firms fulfill this function for many pension funds. Actuaries also play a key role during the asset allocation process and asset liability modeling work. The actuary works with the consultants and staff to make a professional determination that the asset allocation adopted by the Board of Trustees over the long run will generate sufficient income to meet the investment return assumption.

# I. OVERVIEW OF PENSION INVESTMENT PRACTICES

Before pension fiduciaries make decisions about how to invest, they must first understand their liabilities—specifically, the projected outflow of promised pension payments over time. Actuaries construct this data based on assumptions about wage growth, turnover, inflation, life expectancy, and other demographic factors. The goal of pension funds is to have sufficient contributions and investment returns to match these liabilities over a long time frame.

Public pension funds have rational and systematic processes for measuring and establishing the acceptable level of risk, setting asset allocation, estimating expected investment returns, managing investment portfolios, and evaluating portfolio performance. They prudently diversify pension assets in order to minimize risk and maximize returns (see sidebar, *Diversification and Modern Portfolio Theory*). The following is an outline of this process.

## DIVERSIFICATION AND MODERN PORTFOLIO THEORY

The principle of diversification calls for investing in a variety of assets with the goal of reducing risk. Modern Portfolio Theory holds that for a given level of expected return, the more diversified the portfolio is, the less overall risk there is to the investor.<sup>6</sup> The basis for this theory is the idea that returns on different assets do not typically move in tandem with each other, and can even move in opposite directions. Take, for instance, two large companies that have the same overall potential for stock price appreciation or depreciation. One company's stock might increase in value at the same time that the other's stock decreases in value. Thus a portfolio split between the two firms carries less overall risk than a portfolio that is 100 percent invested in either one of these firms. The same dynamic applies across asset classes with differing risk-return characteristics. For example, returns on bond generally move differently from returns on stocks, and therefore bonds have low correlation with stocks (**Table 1**).

Generally, the greater the range of assets that a portfolio is split across, the less overall risk there is, although a portfolio may not necessarily have to include all possible asset classes to achieve optimal risk/return potential. The objective of diversification is to allocate assets in such a way that yields maximum return for a given level of risk; or conversely, achieves a given return with the lowest possible risk. Such a portfolio is considered “efficient.”

Table 1. **Historical Correlations between Asset Classes, 1971-2011**

	Bonds	Large cap stocks	Small cap stocks	Foreign stocks	Real Estate	Commodities
Bonds	100%					
Large cap stocks	28%	100%				
Small cap stocks	13%	78%	100%			
Foreign stocks	8%	67%	54%	100%		
Real Estate	16%	57%	42%	42%	100%	
Commodities	-16%	-7%	-14%	0%	-4%	100%

Source: The H Group 2011, based on Ibbotson Associates and Morningstar data.

## Asset Allocation Process

Among pension fund investment policies, asset allocation policy is perhaps the most critical because differences in asset mix accounts for 40 percent of the variation in returns among diversified portfolios.<sup>7</sup> Under a given set of market conditions, asset mix accounts for nearly all of the return level.<sup>8</sup> Pension funds document their principal investment policies in an **investment policy statement (IPS)**. The IPS states how much risk the fund is willing to tolerate. It also provides guidelines for how fund investments are to be distributed across different asset classes, e.g., public equities, corporate bonds, Treasuries and other government agency debt instruments, real estate, and other types of investments. These guidelines are called **asset allocations**, described further later on in this section.

Each pension fund's IPS is updated periodically to reflect changes in market conditions and revisions in investment practices. While some components of the IPS are modified on an on-going basis, long-term target asset allocations are updated less frequently. Pension funds normally conduct **asset allocation studies** every three to five years as part of a process to determine whether the current target allocations are still appropriate, and to make changes as necessary. The process includes the following components:

**Review of Risk Tolerance.** The trustees periodically review the risk tolerance of the pension: How much volatility are they willing to tolerate? What is the maximum acceptable downside risk—that is, how much loss are they willing to risk under adverse market conditions? Trustees, with the assistance of staff and investment consultants, evaluate these dimensions of risk for the overall pension fund and for each component portfolio using a variety of statistical measures. (See sidebar, *Measuring Risk*, for an explanation of two common methods for quantifying and evaluating risk.)

**Update of Capital Market Assumptions.** These include assumptions about the risks and probable range of returns associated with each asset class; the measures of correlation/lack of correlation (correlation coefficients) between asset classes (see Table 1 above); and broader economic factors like overall economic growth, volatility, and inflation. Assumptions are based on historical data as well as financial market forecasts over a 7-15

year horizon. Pension funds obtain the capital market assumptions for each asset class from a number of different sources including their consultants, investment advisors, and other financial institutions. The trustees, the investment staff and the investment consultant will review all of the different assumptions and generally select those that reflect consensus, rather than extremes or outliers.

**Asset Allocation Modeling.** The trustees work with the staff, consultants and independent actuaries to model a number of different asset allocation and investment outcome scenarios. The asset allocation modeling process incorporates updated capital market assumptions, i.e., expected returns and volatility for each asset class as well as the correlation of returns between different asset classes. These factors are combined to estimate the risk level and probable returns of many different asset mixes.

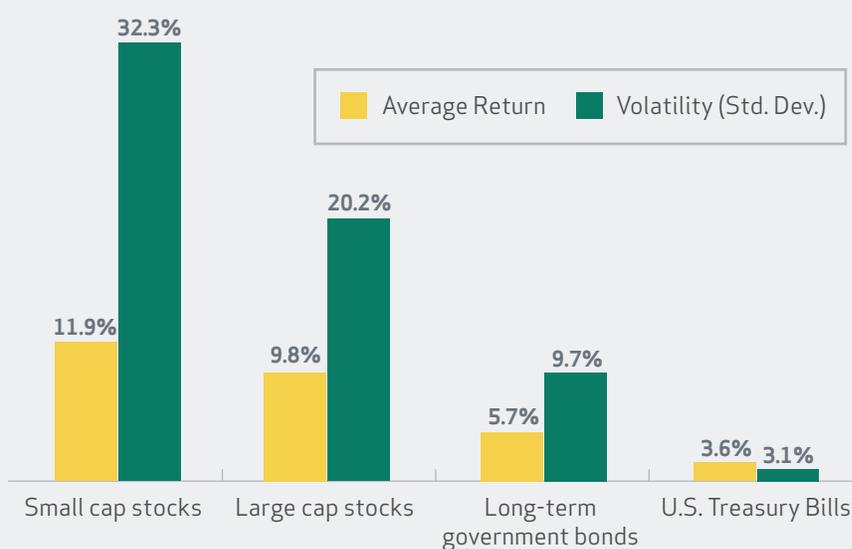
**Adopting an Optimal Asset Mix.** Based on the risk level established by the trustees and the results of the asset allocation model from above, the trustees select the optimal asset mix for the pension fund. The graphical representation of the asset mixes, or portfolios, that deliver the most reward at each level of risk forms a curved line, called the “efficient frontier.” (See sidebar, *Diversification and Modern Portfolio Theory*, for a basic explanation of efficiency.) The line is curved because the financial reward for each additional increment of risk increases at first and then becomes smaller. This graphical depiction allows the trustees to determine on an incremental basis the impact of increasing or decreasing the pension fund's exposure to risk. Normally, slight modifications to the level of risk assumed by the fund are made at this time. In some cases the trustees may decide to reduce the level of risk because the incremental reduction in return is very small. In other cases the Board may decide that the projected increase in return potential is worth a small increase in risk.

The trustees then adopt a new set of long-term asset allocation targets that specify the percentage of fund investments for each asset class. Generally, the investment staff is given an acceptable target range for each assets class so that tactical decisions can be made to address short term market conditions. Public pension funds have varying degrees of delegated authority regarding

## MEASURING RISK

A commonly used measure of volatility is the **standard deviation** of returns, derived from historical data on asset prices and investment returns.<sup>9</sup> The standard deviation is a statistical measure of variation from the average (mean). The higher the standard deviation, the more volatility there is; the lower the standard deviation, the less volatility. More risky investments such as stocks tend to generate higher average returns over the long term, but also have greater volatility as measured by standard deviation; safer investments such as Treasury bonds or bills have relatively low returns as well as low volatility (**Figure 2**). This kind of volatility measure can be generated for investment portfolios as well as particular assets.

Figure 2. Average Nominal Return and Volatility in Key Asset Classes, 1926-2011



Source: Adapted from The H Group 2011, based on data from Ibbotson Associates and Morningstar.

Another widely used measure, **Value-at-Risk (VaR)**, focuses on downside risk. VaR is an estimate of the largest potential loss in portfolio value in a given period of time, usually 12 months, within a given level of statistical probability (known as the confidence level).<sup>10</sup> The commonly used confidence level of 90 percent includes all but the bottom 5 percent and top 5 percent of probable outcomes, calculated from historical data.<sup>11</sup> The VaR is accordingly calculated as the percentage loss in value that a given investment portfolio would have incurred in the 5th percentile 12-month period on historical record. To illustrate, a VaR estimate of 7 percent at 90 percent confidence level means that we are 90 percent certain that the worst possible outcome within 12 months will be a loss in asset value of 7 percent. The VaR in public pension funds fluctuates with economic conditions and varies with portfolio composition, and the acceptable VaR varies with the risk tolerance of each pension fund.

The VaR does not account for the possibility of losses from even rarer economic events that fall outside a given confidence level, sometimes called “tail risk.” However, historical experience indicates that investors have a substantially greater probability of achieving target returns over a period of 30 years compared to 1 year (for an illustration see Table 4 in Section 3). This is because in a longer time frame, the effects of even catastrophic declines such as the 1929 stock market crash and the stagflation of the 1970s tend to be offset by periods of recovery and growth. This long horizon is central to pension investing practices.

staff discretion in setting asset allocation and risk management parameters within established guidelines. **Table 2** provides a sample set of target asset allocations that roughly illustrates how a large pension fund might be invested. In reality, the specific asset mix of each pension will be unique based on its own liabilities, cash flow, and risk tolerance. The average asset allocation and risk profile of public pension funds will be discussed in Section 2.

In addition, the IPS frequently outlines whether particular assets will be managed passively or actively. In **passive management**, the makeup of a portfolio mirrors the benchmark index as much as possible. In doing so, the portfolio will track market returns, and can be expected to earn net returns slightly less than benchmark returns due to trading costs and management fees, which the index does not include. In **active management**, the investment manager tries to outperform the market through strategic buying and selling of securities. Portfolios that exercise active management strategies are expected to generate returns, after trading fees and management expenses, approximately equal to or potentially better than the benchmark.

## Deriving the Expected Rate of Return

Based on the target asset mix chosen through the above asset modeling process, actuaries calculate the expected long-term rate of return on the overall pension fund portfolio. One commonly used method is the building block method.<sup>12</sup> Under this method, actuaries estimate the total return for the pension fund on the basis of expected returns for each component asset class, taking into account the target asset allocations, expenses, and any excess returns from active management. Underlying these investment return projections are assumptions about inflation and “real” returns on investment above inflation.

## Monitoring and Evaluation

In the IPS, each asset class or portfolio is assigned 1) an investment target range, i.e., a range of the share of pension fund assets, 2) an acceptable level of risk or volatility, often quantified in terms of standard deviation and/or Value at Risk, and 3) a benchmark index against which both the returns and the risk will be evaluated. The benchmark is usually a

**Table 2. Hypothetical Large Pension Fund Target Asset Allocation**

	Policy Target	Range
Public equities	47%	+/- 5%
U.S. stocks	28%	+/- 4%
Non-U.S. stocks	19%	+/- 4%
Private equity	8%	+/- 3%
Fixed income	24%	+/- 4%
Alternative investments	8%	+/- 2%
Real estate	8%	+/- 2%
Cash	2%	+/- 1%
Other	3%	+/- 1%
Total	100%	

commonly used securities index such as the S&P 500 for U.S. large company stocks, also called large cap stocks. Such indices provide broad measures of asset class performance by tracking the investment performance of a specific group of securities.

Investment managers are evaluated not only on how their portfolio returns compare to the benchmark, but whether their investment strategy conformed to the risk parameters prescribed in the IPS and whether they took on unnecessary risk for the returns they realized. For example, sometimes the IPS limits the extent to which investment managers deviate from benchmark indexes in their investment strategies. Tracking error is a forward looking measure of how closely a portfolio tracks the index to which it is benchmarked, specifically by quantifying the level of risk incurred in deviating from the benchmark.<sup>13</sup> Comparing excess returns to tracking error reveals whether a portfolio manager took on too much risk for the amount of reward. Another measure called the Sharpe Ratio indicates how well or poorly an investment strategy was rewarded for the level of risk taken.<sup>14</sup> If an investment manager meets or exceeds their investment return targets, but engaged in more risk than was allowed for their assigned portfolio, or more than had been actually necessary to achieve the desired return, they may be replaced or put on a watch list to be monitored to ensure that the overall risk-return profile of the fund stays within acceptable limits.

## II. UNDERSTANDING PENSION FUND INVESTMENT STRATEGIES IN CONTEXT

This section outlines the general risk profile of public pension investments compared to other institutional investors, highlights key findings from research on public pension managers' investment behavior in response to economic shocks, and presents data on the changing asset allocation and risk profile of public pension fund investments. The evidence shows that public pension funds' asset allocation and risk profile are comparable to other institutional investors, including corporate pensions and endowments, and to many prudent individual investors. Finally, research has found that public pensions are patient investors and that between 2006 and 2011 they reduced their overall investment in equities and increased their investment in alternative assets in an effort to smooth out volatility and improve overall returns through a better diversified portfolio.

### How Do Public Pensions Compare with Other Investors in Terms of Risk?

Until the 1960s, public pension funds were invested almost exclusively in bonds and Treasuries. Statutory changes in the 1970s and 1980s allowed public pension funds to adjust toward their corporate counterparts in terms of equity exposure and diversification. Public pensions and private pensions closely resembled each other in their asset allocation strategies until the mid 2000s, when they diverged.<sup>15</sup>

**Figures 3a and 3b** illustrate aggregate asset allocation in state and local retirement systems (comprised primarily of DB assets) on the one hand and private DB pensions on the other, from 1985 to 2011.<sup>16</sup> Figure 3a shows that state and local retirement systems' position in corporate equities (including both stocks and private equity) increased steadily from the 1980s to the late 1990s and peaked in 2005-2007 at 62-63 percent before declining to 59 percent by 2011. (Changes since the 2007-2008 financial crisis based on other data will be discussed in the next section.) Figure 3b shows that corporate DB pensions started out with a higher share of equities than public retirement systems, and increased their position in this asset class through 2005.

Since 2006, corporate pension funds generally have adopted "derisking" investment strategies, in part because new accounting regulations dramatically increased the volatility of private sector pension reported liabilities. Also, as many corporate plans stopped accepting new participants and limited benefit accrual to existing participants, sponsors shifted to a more bond-focused asset allocation. The combined result sharply reduced the equity share between 2006 and 2011, from 60 percent to 38 percent.

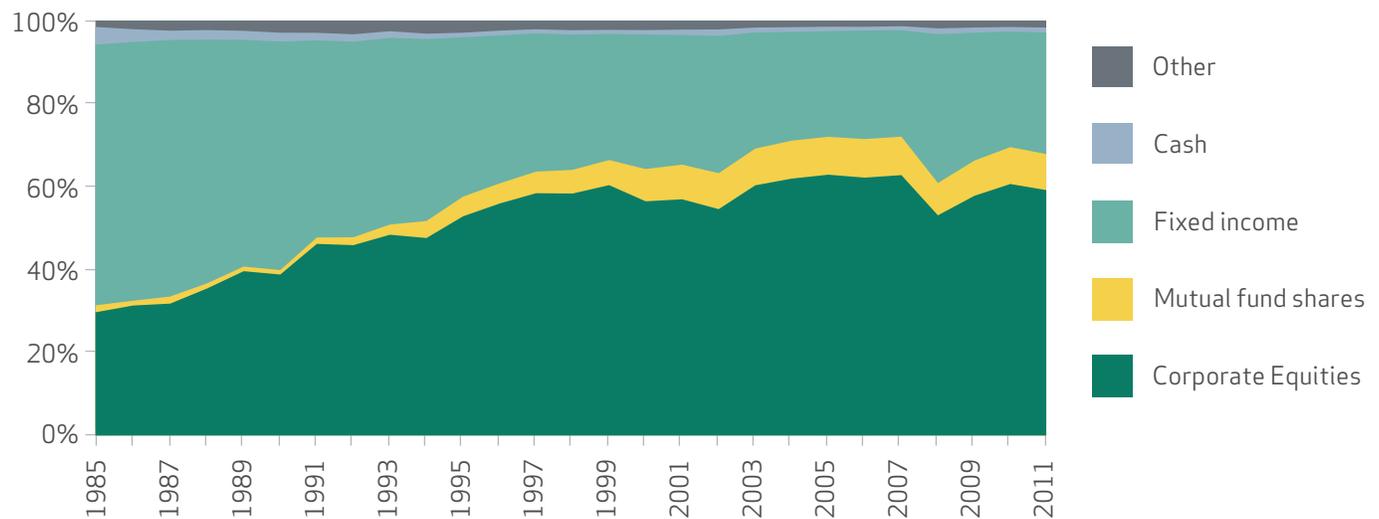
Investment in mutual funds increased during the 1990s for both groups, and also during the 2000s for corporate plans. The Federal Reserve data does not break out component asset classes for mutual funds, but it is worth noting that corporate pensions currently have 14 percent of assets in mutual funds, compared to only 9 percent for state and local retirement systems.

At the other end of the spectrum, endowment funds generally take on higher risk because they can exercise control over how much money they disburse every year, which corporate and public pensions cannot do. According to data from the 2011 NACUBO-Commonfund Study of Endowments, university and college endowment assets were invested in 31 percent equities evenly split between U.S. and non-U.S., 12 percent fixed income, 51 percent alternative strategies, and 4 percent "Other". Alternative asset class strategies consisted of 24 percent private equity, 12 percent real estate, 15 percent natural resources, 7 percent venture capital, and 38 percent "marketable alternatives" including hedge funds, absolute return strategies, and derivatives.<sup>17</sup>

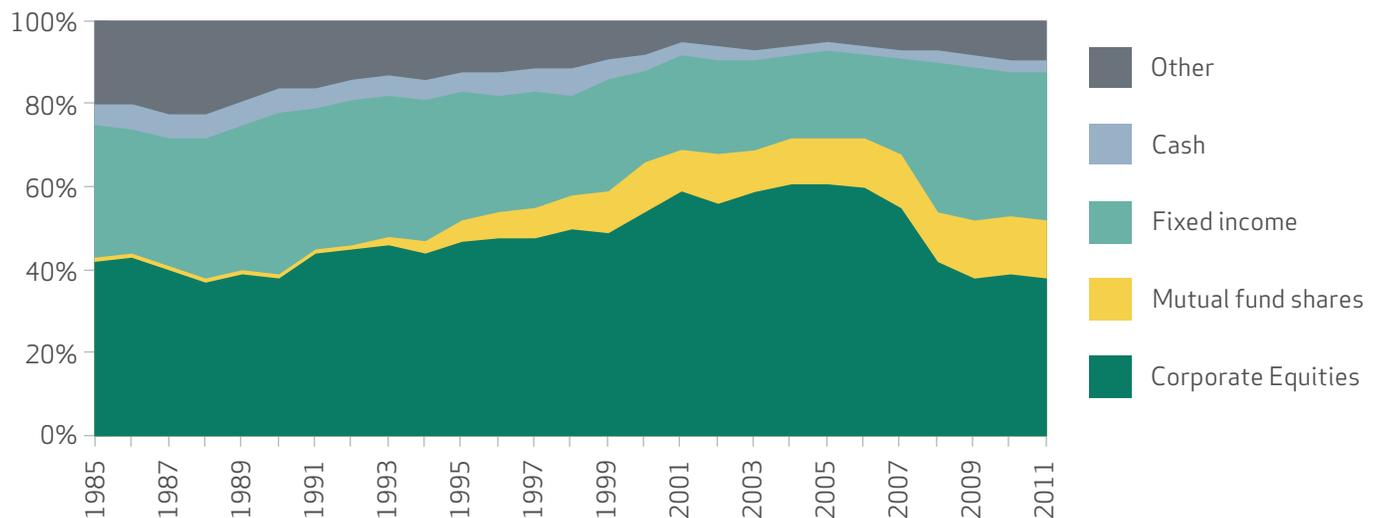
It is also useful to compare public pension asset allocation to optimal asset allocation for individual retirement savings accounts such as 401(k)s. An increasingly recommended strategy is the lifecycle model, which balances risk and reward.<sup>18</sup> In this model, stocks comprise 80-100 percent of the retirement portfolio at the beginning of a working career, depending on the risk tolerance of the individual. The share invested in stocks gradually decreases to about 40 percent of

## Figures 3a-b. Historical Asset Allocation Trends, 1985-2011

### Figure 3a. State and Local Retirement Systems



### Figure 3b. Private Sector DB Plans



Source: Federal Reserve Flow of Funds, 1985-2011

Note: "Other" is a residual category that includes security repurchase agreements and miscellaneous assets in state and local retirement systems; and security repurchase agreements, unallocated insurance contracts, contributions receivable, and other nonspecified assets in private sector DB plans.

the portfolio (with the remainder in fixed income investments including corporate bonds and Treasuries) by retirement age when the individual will cease contributing and begin drawing down their accounts.

In this model, a mid-career worker who is about 20 years away from retirement will have 60-70 percent of their portfolio invested in equities—or even more, depending on how the model is applied. Considering that pension funds have a mix of younger, mid-career, and older workers and pay out a small percentage of assets annually in benefit payments, the average 60 percent position in equities among public pension funds can be considered consistent with the risk-return balancing strategy of the lifecycle investing model. Put another way, if public pension assets were divided among members and invested in lifecycle funds, the resulting aggregate allocation to equities would probably be similar to the current average equity allocation of public pension funds.

In other words, pension plans are taking on no more risk on average than is considered prudent for individuals, who have inherently less capacity to mitigate risk due to shorter investment horizons and who do not have the capacity to diversify their portfolios to the same extent as institutional investors.

## Public Pension Investment Behavior in Response to Market Decline

While pension funds have rational and thorough processes for systematically evaluating risk, making investment decisions, and evaluating the results, concerns nonetheless have been raised in the media that public pensions, as a group, are "chasing" risk in response to market losses or otherwise investing imprudently. However, research on the issue demonstrates that, in general, public pensions are both patient and prudent in their investment style.

Public pensions, unlike many individual investors, are patient investors. Research indicates that they are not unduly swayed by the ups and downs of equity markets and do not "chase returns" by taking on more risk in order to compensate for market downturns. A study by Boivie and Almeida found

that DB pension funds, including public and private pensions, are more patient investors than DC account holders, tending to hold assets for longer periods and making asset allocation changes more gradually.<sup>19</sup>

Weller and Wenger analyzed the relationship between pension plan asset allocation and business cycle swings from 1953 to 2007. They found no evidence that public pension plans responded to underfunding by taking on more risk, i.e., by increasing the share of assets invested in stocks. Rather, plans tended to decrease the share invested in stocks when required contributions increased.<sup>20</sup> This was especially the case after the dot-com bubble burst in 2001. In fact, "larger demands on employers for additional contributions translated into flights from risk rather than a rush toward more risk."<sup>21</sup>

Recent data are consistent with the finding that public pensions do not rush toward risk in response to decreased portfolio values. In the wake of the 2007-2008 financial crisis and in light of inflation risk concerns in the current low interest environment, larger pension funds have recently adjusted their exposure to public equities to 51 percent, reduced fixed income to 25 percent, and increased their exposures to alternative assets including real estate. **Table 3** shows the change in average asset allocation among state pension plans in 2001, 2006, and 2011, calculated by Wilshire Consulting.<sup>22</sup> State retirement funds reduced overall public equity (stock market) exposure by 8.4 percentage points between 2006 and 2011. This included an 11.2 percentage point reduction in the share of assets invested in domestic public equities and an increase of 2.8 percentage points in foreign public equities. The funds also reduced the share of U.S. fixed income assets. The share of assets in the "Other" category, mostly composed of alternative investments, increased from 3.4 percent to 9.3 percent between 2006 and 2011. The use of alternative investments such as real estate, private equity, and hedge funds is aimed at smoothing out the ups and downs caused by market swings, and increasing overall returns through a more diversified portfolio. Furthermore, public pension fund exposure to these alternative assets, while increasing among larger plans, remains relatively low and is offset by lower exposure to the public equity market.

Table 3. **Change in Average Asset Allocation among State Pension Plans**

Values are percentages	2001	2006	2011	Percentage Point Change	
				2001-2011	2006-2011
<b>Public Equity</b>	<b>56.3</b>	<b>59.4</b>	<b>51.0</b>	<b>-5.3</b>	<b>-8.4</b>
U.S. public equity	43.8	42.3	31.1	-12.7	-11.2
Non-U.S. public equity	12.5	17.1	19.9	7.4	2.8
<b>Private Equity</b>	<b>3.9</b>	<b>4.4</b>	<b>8.2</b>	<b>4.3</b>	<b>3.8</b>
<b>Fixed Income</b>	<b>36.2</b>	<b>28.1</b>	<b>25.0</b>	<b>-11.2</b>	<b>-3.1</b>
U.S. Fixed	34.6	27.2	23.3	-11.3	-3.9
Non-U.S. Fixed	1.6	0.9	1.7	0.1	0.8
<b>Real Estate</b>	<b>3.4</b>	<b>4.8</b>	<b>6.4</b>	<b>3.0</b>	<b>1.6</b>
<b>Other</b>	<b>0.2</b>	<b>3.3</b>	<b>9.5</b>	<b>9.3</b>	<b>6.2</b>
<b>Total</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>		

Source: Adapted from Wilshire Consulting 2012, Exhibit 13.

Note: "Other" includes cash and alternative assets. Public equity and fixed income asset class totals are authors' calculations. Totals may not add up due to rounding.

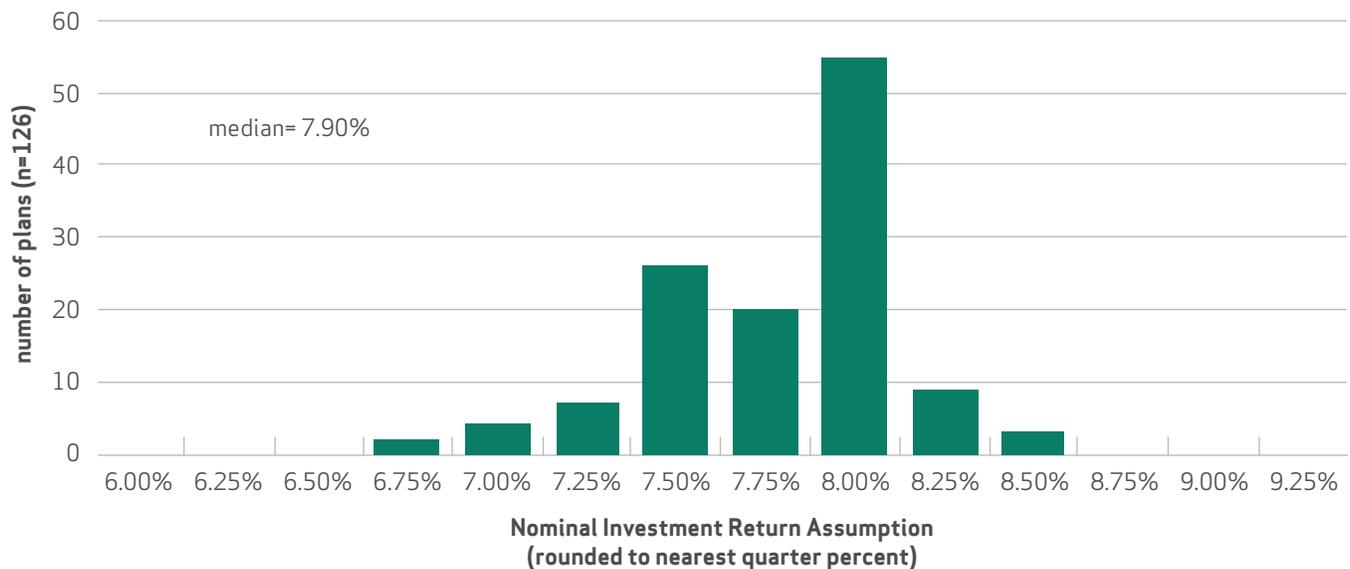
### III. EVALUATING PUBLIC PENSION INVESTMENT PERFORMANCE AND RATE OF RETURN ASSUMPTIONS

How have public pension investments performed in relation to their investment return assumptions? Are these assumptions realistic going forward? This section analyzes short- and longer-term historical data on public pension investment returns and offers a few perspectives from which to evaluate the viability of current assumptions about future long-term pension investment performance. On average, public pension funds have met or exceeded the long-term investment return assumptions over the past 20 to 25 years. Current assumptions are also in line with long-run historical experience dating back to the 1920s. Independent studies also indicate that current rate of return assumptions are not unrealistic in light of current capital market conditions. Finally, in evaluating historical performance and the likelihood of meeting investment goals in the future, it is important to understand not just nominal return assumptions before accounting for inflation, but real returns after inflation.

While the following discusses average return statistics, readers should remember two important things about evaluating investment returns in the case of individual pension funds. First, both overall and component portfolio returns for any individual pension fund should be evaluated against internal benchmarks only. This is because the asset allocation and investment goals for each pension plan are calibrated to meet each plan’s needs based on its unique membership demographics and benefit structure. Second, investment returns need to be considered over the long term because—as even the average statistics that follow demonstrate—short- and medium-term returns are very sensitive to short-term market swings, and pension plan investments are structured to meet liabilities over a very long time horizon.

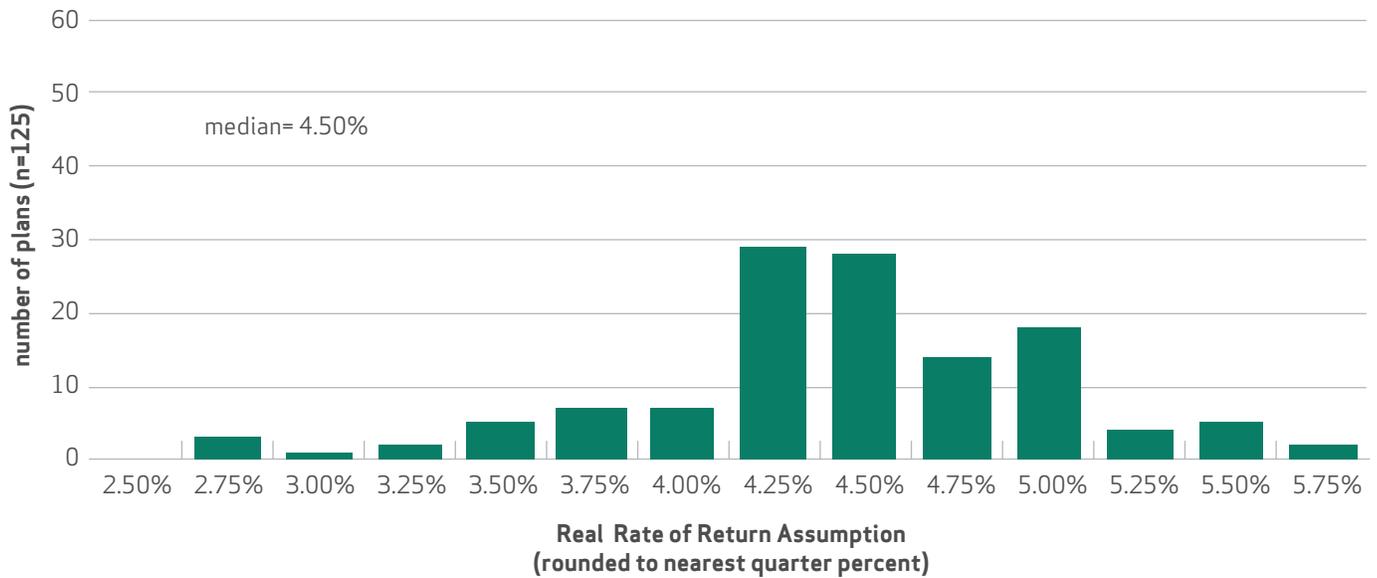
As a preface to discussion that follows, **Figure 4** and **Figure 5** illustrate the distribution of nominal and real (inflation

Figure 4. **Distribution of Nominal Investment Return Assumptions among Public Pensions**



Source: Authors' analysis based on data from NASRA/NCTR Public Fund Survey and authors' research.

Figure 5. **Distribution of Real Investment Return Assumptions among Public Pensions**



Source: Authors' analysis based on data from NASRA/NCTR Public Fund Survey and authors' research.

adjusted) return assumptions, respectively, among public pension funds drawing on the National Association of State Retirement Administrators/National Council on Teacher Retirement Public Fund Survey, augmented by authors' research.<sup>23</sup> In calculating expected investment returns, pension funds incorporate a set of assumptions about inflation and "real" returns (after subtracting the effects of inflation), which together add up to the nominal return assumptions. In Figure 5, the median nominal investment return assumption is 7.9 percent. In Figure 6, which shows the distribution of real investment return assumptions after subtracting the assumed rate of inflation from the nominal return assumption, the median real rate of return assumption is 4.5 percent, and there is a greater degree of variation among funds.

The reason that assumptions about inflation and real returns matter is that if a pension fund earns a 1 percentage point lower return than expected over a long period, and also sees a similar shortfall in wage and price growth—for instance, due to a stagnant economy—the shortfall in assets will be mitigated by lower than expected liabilities. Under most circumstances, it is the real return that matters most. In addition, when comparing investment returns over very long historical time frames, real

returns are more useful because large differences in inflation can render nominal return comparisons meaningless.

### Returns Have Met or Exceeded Expectations over the Long Term

In response to the current economic climate, public pension funds are incrementally adjusting their rate of return assumptions downwards. Nearly half the plans in the Public Fund Survey reduced their investment return assumption after fiscal year 2008, by an average of four-tenths of a percentage point. The median nominal rate of return assumption among plans in the survey decreased from 8.0 percent in fiscal year 2008 to 7.9 percent as of December 2012, while the mean decreased from 8.0 percent to 7.8 percent.

Nonetheless, public pension fund investment returns have met or exceeded expectations over the long horizon, i.e., 20-30 years. **Figure 6** shows median annualized nominal investment return data for 1-, 3-, 5-, 10-, 20-, and 25-year periods ending December 31, 2011 for public pension funds from Callan Associates.<sup>24</sup> It also includes authors' estimates of real returns for these periods after accounting for inflation.

Figure 6.

### Public Pension Median Annualized Investment Returns for Period Ended 12/31/2011



Source: Nominal return data from Callan Associates in NASRA 2012, Fig.1. Estimated real returns calculated by authors using CPI-U.

The figure shows the short-term effects of the precipitous stock market decline in 2008-9 on investment returns (only 2.0 percent nominal in the 5-year time frame), the post-crash recovery (11.4 percent nominal in the 3-year time frame), and the effects of the European debt crisis on financial markets (0.8 percent nominal in the 1-year time frame).

Importantly, the median public pension fund investment return over the 25-year time frame is 8.3 percent in nominal terms, in excess of the historic median investment return assumption of 8 percent. The median real returns over the 20- and 25-

year time frames are over 5 percent, above today's 4.5 percent median real return assumption. This is significant because public pension funds have a long investment horizon—with a flow of contributions and benefit payments that extend several decades into the future—and thus have the advantage of being able to smooth the effects of bubbles and downturns.

More recent data from Callan Associates for periods ending September 30, 2012 show significantly higher returns for public pension funds over the short and medium term: 16.7 percent for 1-year, 9.5 percent for 3-year, 2.3

percent for 5-year, and more than 7.7 percent for the 10-year time frame.<sup>25</sup> This data did not include longer time frames. However, data from the Wilshire Trust Universe Comparison Service (TUCS)—also for periods ending September 30, 2012—shows a 30-year gross return of 9.99 percent for public pensions, before expenses.<sup>26</sup> The TUCS data also show that public pension funds are on par with private pension funds (comprised by corporate, union, and nonprofit pension funds) and endowments in terms of short, medium, and long term performance.<sup>27</sup>

The contrast between performance data dated only nine months apart reflects the sensitivity of short- and medium-term averages to short-term market fluctuations and should serve as a caution to observers against reading too closely into short-term investment returns among public pension funds that invest for the long haul.

## Are Current Investment Return Assumptions Realistic?

Studies indicate that the performance of public pension investments in real terms over the past 20-30 years has not been particularly exceptional compared to historical market returns dating back to the 1920s. Accordingly, current assumptions are in line with historical experience. Furthermore, current assumptions are not out of line with forecast market conditions,

either in comparison to the projected rate of return on riskless government bonds, or in light of independently determined capital market assumptions.

## Looking Backward: Is Past Public Pension Investment Performance Exceptional?

The 25-year average real return of over 5 percent that pension funds have experienced is not just an artifact of the exceptionally rapid growth in equity prices during the 1990s, but is consistent with the average return for 30-year periods over a long historical time frame that includes the 1929 stock market crash and the Great Depression. For instance, Stubbs calculated compound annual real returns (above inflation) of a hypothetical pension portfolio for rolling periods between 1926 and 2010 based on data from Ibbotson Associates (Table 4).<sup>28</sup> The portfolio was composed of 50 percent large cap stocks, 8 percent small cap stocks, 2 percent corporate bonds, and 40 percent Treasuries evenly split between short, medium, and long term maturity buckets. While the overall equity position is similar to the average public pension fund, the hypothetical portfolio is less diversified overall; at the same time, results reflect gross returns and do not account for expenses.

Two important findings follow from Table 4. First, for rolling 30-year periods, the mean compound real return was 5.71 percent real while the worst 30-year period yielded a real

Table 4. Real Returns on a Hypothetical Pension Portfolio—58% Equity/42% Fixed Income—Rolling Periods, 1926-2010

Time Frame (Years)	Number of Periods	Compound Annual Real Returns	
		Average (Mean)	Worst Observed Outcome
1	85	6.28%	-24.60%
5	80	7.30%	-4.56%
10	75	6.59%	-1.47%
20	65	6.14%	1.24%
<b>30</b>	<b>55</b>	<b>5.71%</b>	<b>3.76%</b>
40	45	5.42%	3.91%
50	35	5.47%	4.02%

Source: Adapted from Stubbs 2012, p. 19, Table 3.

return of 3.76 percent.<sup>29</sup> While not directly comparable due to differences in asset allocation, it is nonetheless noteworthy that the historical mean real return of 5.71 percent real is significantly higher than the 4.5 percent assumed by the average pension fund. Second, outcomes are much less volatile over longer time frames than over shorter time frames, as indicated by the spread between mean and worst case returns.

Consistent with the first finding above, a study by the Callan Investment Institute emphasized the need to fully consider actuarial assumptions, including assumptions about wage and price inflation and nominal and real returns, in evaluating investment return assumptions.<sup>30</sup> After fully considering these factors and assessing historical real returns on key asset classes between 1926 and 2010, the study found that “real return assumptions for public plans are in line with historical experience.”<sup>31</sup>

### **Looking Forward: Are Current Assumptions Reasonable?**

Some contend that the 20-30 years preceding the Great Recession saw exceptional equity price growth, and that the “new normal” is an extended period of low stock market returns, low interest rates, and slow economic growth. However, economist Dean Baker notes that public pension investment assumptions are realistic under current market conditions, though they were probably too optimistic during the 1990s. He argues that return projections of 8 percent may not have been realistic at the time of the tech industry fueled stock bubble in the 1990s, when the ratio of stock prices to

earnings (dividends) were at a historic high and thus indicated that stock prices were grossly inflated. In contrast, in the current context when the price-earnings ratio has adjusted to its historical average level, long-term returns on stocks can be expected to be close to their historical norm.<sup>32</sup>

Comparing the above to projected returns on risk-free assets also offers some perspective. The Congressional Budget Office projects long-term real interest rates on risk-free Treasury bonds to be 2.7 percent.<sup>33</sup> The 4.5 percent median real return assumption among public pension funds, invested in diversified portfolios, is less than 2 percentage points higher.

Finally, Milliman, a respected actuarial consulting firm, conducted an analysis of the funded status of public pension funds that included an evaluation of the funds’ investment return assumptions. Milliman reported its own actuarially determined discount rate, which can also be understood as the expected rate of return net of expenses, drawing on their own capital market assumptions. The result was 7.55 percent nominal, close to the mean of 7.80 percent among public pension funds in their study sample (both rates are liability-weighted).<sup>34</sup> The study noted that pension funds are not being overly optimistic in their long-term investment return assumptions.

The Milliman study also reported that 33 percent of plans in the sample had a reported discount rate that was lower than the actuarially determined interest rate for the plan, noting, “this suggests that those plans have included a margin of conservatism in their interest rate assumptions.”<sup>35</sup>

## CONCLUSION

By leveraging the ability to pool risks and invest over a long time horizon, public pensions serve the public interest by delivering retirement benefits efficiently at the same time that they provide a secure and modest retirement income to public employees. The financial goal of pension funds is to have sufficient contributions and investment returns to match these liabilities over a long time frame. Each pension fund has unique needs based on plan demographics and benefit structure, and plans its investment strategy accordingly.

Trustees of public pension plans set investment policies with the advice and support of a number of different professionals. Trustees bear primary fiduciary responsibility on behalf of pension participants to manage the fund for the exclusive benefit of the workers and retirees who participate in the fund. This standard also applies to staff and consultants involved in investments.

Public pension fund investing is managed through rigorous processes that bring trustees, staff, and outside experts together to evaluate and monitor investment risks and optimize returns given the best knowledge available. Pension funds document their principal investment policies in an investment policy statement (IPS), which states how much risk the fund is willing to tolerate and provides guidelines for how fund investments are to be distributed across different asset classes, and sets benchmarks to help evaluate the

performance of each asset class portfolio and the fund as a whole. Trustees periodically review the IPS to determine if changes are necessary in investment strategy in light of current circumstances. Investment managers are evaluated not only on how their portfolio returns compare to the benchmark, but whether their investment strategy conformed to IPS and whether they took on unnecessary risk for the returns they realized.

The overall risk-return profile of public pension funds is consistent with other institutional investors—corporate pensions and endowments—that invest over the long term. Studies indicate that public pensions are patient investors, adjusting asset allocation gradually and tending to decrease rather than increase risk in response to increasing contribution requirements following major asset value declines. Large public pension funds have responded to the challenging financial environment since 2008 by decreasing their overall position in stocks and fixed income assets and increasing their investment in alternative assets in an effort to improve portfolio diversification and reduce volatility.

Finally, public pension fund investment returns have met or exceeded expectations over the long horizon, i.e., 20–30 years. Current investment return assumptions are in line with long-run historical market performance from the 1920s to the present, and are not out of line with forecast market conditions.

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	1-Yr	3-Yr	5-Yr	10-Yr	20-Yr	30-Yr
Public Pension Funds	17.06	9.37	2.44	7.61	8.02	9.99
Non-Public Pension Funds	17.25	9.33	2.53	7.74	8.61	10.85
Endowments	15.11	8.18	1.83	7.85	8.22	N/A

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