
# Section 3 - Investment Information

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## Investment Policy

The Public School Employees' Retirement Board of Trustees (the Board) is responsible for, among other things, the formulation of an Investment Policy for the Public School Employees' Retirement System (the System). As articulated in the Public School Employees' Retirement Code 24 Pa. C.S. §8521(a), the Board and PSERS' staff delegated with investment authority must act in a manner consistent with the Prudent Investor Standard, which requires "the exercise of that degree of judgment, skill and care under the circumstances then prevailing which persons of prudence, discretion and intelligence who are familiar with such matters exercise in the management of their own affairs not in regard to speculation, but in regard to the permanent disposition of the fund, considering the probable income to be derived therefrom as well as the probable safety of their capital." The Prudent Investor Standard recognizes modern portfolio theory and guides investment and management decisions respecting individual assets so that the trade-offs between risk and return for each asset are considered in the context of an overall investment strategy.

The System's Investment Policy Statement, Objectives, and Guidelines (the Policy), which is available at www.psers.state.pa.us, reflects the many implications of the Prudent Investor Standard. The Board reviews the Policy regularly, and makes changes as necessary. The Policy establishes clear criteria for the management of the assets by or on behalf of the Board. For example:

- The Board, PSERS' staff, investment consultants, and investment managers are assigned appropriate responsibilities and made to understand clearly the objectives and policies of the Board and the System;
- Allocation plans are prepared to guide the investment of the System's assets;
- Guidelines are established for each investment category so that asset quality, diversification, and return can be monitored;
- Investment managers are given guidance and limitations on the investment of the System's assets; and,
- The Board has created a meaningful basis for evaluating the investment performance of individual investment managers, as well as for evaluating overall success in meeting its objectives.

## General Return and Risk Objectives

The System seeks to provide benefits to its members through a carefully planned and well-executed investment program, and the Policy identifies the following general return and risk objectives and constraints for its investments:

**Return Objectives**

- The assets of the System shall be invested to maximize the returns for the level of risk taken; and
- The System shall strive to achieve a return that exceeds the Policy Index.

**Risk Objectives**

- The assets of the System shall be diversified to minimize the risk of losses within any one asset class, investment type, industry or sector distribution, maturity date, or geographic location; and
- The System's assets shall be invested so that the probability of investment losses (as measured by the Policy Index) in excess of 15% in any one year is no greater than 2.5% (or two standard deviations below the expected return).

**Constraints**

- The System shall maintain adequate liquidity to meet required benefit payments to the System's beneficiaries;
- The System's assets shall be invested in a manner that is consistent with the System's long-term investment horizon; and,
- As a tax-exempt investor, the System's assets may be invested without distinction between returns generated from income and returns generated from capital gains.

## Investment Risk Management

PSERS recognizes that risk management is an essential component of a prudent investment program. The implementation of a well-defined risk management framework improves the likelihood that the System is compensated adequately for the risks taken, and helps to avoid unexpected and unintended risks. Therefore, PSERS pursues a disciplined and advanced risk management approach. Through investment policies and guidelines, PSERS defines the amount of investment risk to be taken by the System, and how it is to be measured and monitored.

PSERS has created a practical framework that enables the System to implement risk-focused investment strategies, and transparently monitor active portfolio risks and returns relative to budgets and/or specific objectives. PSERS has identified over 100 specific investment risks for modeling and analysis, and categorizes those risks into the following broad classes:

- Market
- Fund and Portfolio
- Operational
- Liquidity, Leverage and Finance
- Legal
- Organizational

PSERS' team manages these broad classes of risk consistent with its long-term investment objectives.

Investment risk reflects the possibility that the future value of investments will deviate from targeted return objectives. This deviation often occurs as a result of changes in perception of market conditions, whether those changes are caused by factors specific to individual investments, classes of investments or factors affecting all investments simultaneously.

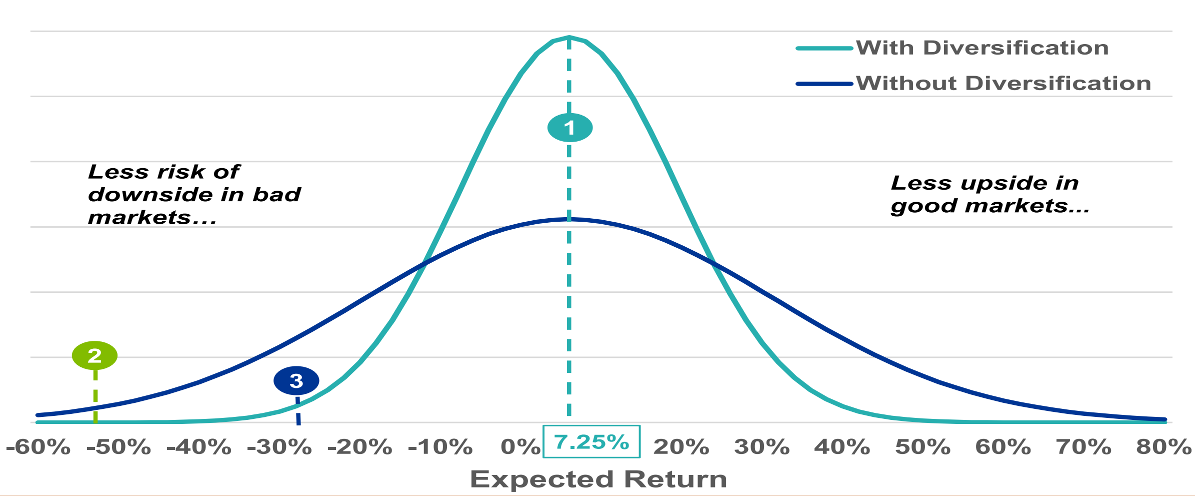
The goal of investment risk management is to find the appropriate balance between expected returns and the risks taken to generate those returns. An entirely risk-free investment portfolio that has a high probability of meeting all investment goals does not exist. Therefore, PSERS does not attempt to eliminate all risk but instead seeks to limit the possibility of permanent loss. Risk itself is neither good nor bad, but it is necessary that the System expose itself to some appropriate level of risk if it is to generate the investment returns required to maintain stable and cost-effective contribution rates. In positioning for future developments, PSERS cannot know with complete certainty how markets or particular investment strategies will perform, but can understand the future as a range of probabilities, some desirable and some not, and can position its current investments to guard against undesirable outcomes and to make desirable outcomes more likely.

Given its long-term investment horizon, PSERS accepts prudent investment risk in exchange for acceptable levels of additional incremental return. PSERS diversifies across investment categories, each having different characteristics across all market environments.

The benefit of a diversified portfolio is that it reduces the probability of outsized outcomes relative to return objectives. Diversification is the only "free lunch" in finance; excess volatility is damaging to PSERS' portfolio, while diversification is beneficial.

**Exhibit 8.1 illustrates two distributions with the same expected return. The distribution shown in blue assumes a portfolio risk of 22.1%, which reflects 100% correlations between risk factors, while the green distribution reflects the risk of PSERS' portfolio which benefits from diversification. In the event of a negative two standard deviation move, the undiversified portfolio would experience losses more than double what the diversified portfolio would experience. In a normal distribution, the chance of a two standard deviation decline is approximately 2.3%.**

**Exhibit 8.1** Effects of Diversification on a Normal Distribution

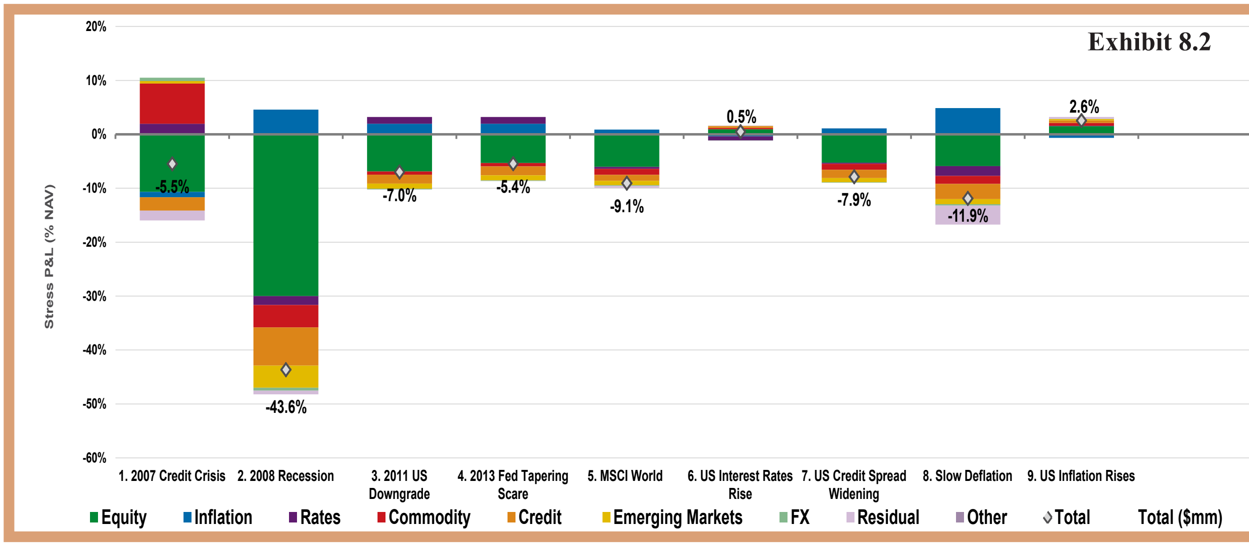


# Investment Risk Management
**(continued)**

One way that PSERS assesses the amount of diversification in the portfolio is through stress testing. This is a process that quantifies anticipated portfolio losses under various calamitous market events. There are two types of stress tests: historical (meaningful actual past market events) and hypothetical (scenarios designed to reflect potentially calamitous market events).

**Exhibit 8.2 below depicts several historical and hypothetical stress scenarios of PSERS' allocation as of June 30, 2016, and the impact of each as related to a series of common economic factors. Strategically, the exposures to each risk factor are driven by PSERS' asset allocation decisions, which could be tactically adjusted to the extent that a market event is likely, using stress scenarios to assist in these tactical decisions.**

Exhibit 8.2



## Capital Market Assumptions

Capital Market Assumptions (CMAs) are estimates of expected returns and risks for a given set of asset classes, and expectations of the relationship (correlations) between these asset classes over long periods of time. They are issued periodically by investment consultants, asset managers, and investment banks. Inflation, real short-term interest rates, and economic data frequently provide the foundation used by CMAs for expected returns across global asset classes. These are the primary building blocks for developing equity and fixed income returns expectations, which in turn are used in setting expectations for alternative asset class returns. PSERS collects and evaluates this information when considering its long-term actuarial rates of return assumptions and in setting its Asset Allocation Policy.

Compared to 2015, 2016 survey results under the 20-year forecast indicate an increase in return assumptions across most asset classes. Even with the increase, CMAs are forecasting slower growth and lower asset returns over the coming decade than has been experienced in past decades. Select asset classes are detailed in Table 8.1.

**Fixed Income**

Nominal government bond returns are a function of long-term expectations for inflation and government yields:

- Government bond yields rose in 2016 by 0.15-0.30%

Corporate bond returns are a function of expected inflation, government yields and expectations for credit spreads, defaults and downgrades. The majority of increase in corporate bond return assumptions can be explained by the increase in expectations for government bond yields and inflation as defaults, downgrades and spreads have been relatively stable.

**Equities**

Equity return assumptions are driven by market valuations, earnings growth expectations and assumed dividend payouts:

- Global equity assumptions have increased across all markets between 0.4% and 0.9% and are largely back to their 2013 levels

Equity market returns over the past two years have been driven by rising valuations rather than profits. A growing number of market participants worry that equities look expensive and there is an expectation for these market valuations to decline towards historical levels. With

**Table 8.1 summarizes the average expected capital market 20 year geometric return assumptions of 20 to 30 surveyed independent investment advisors in 2013, 2014, 2015 and 2016:**

| Table 8.1 | PSERS Capital Market Assumptions (CMAs) | | | |
|---|---|---|---|---|
| | Average Expected Geometric Returns (2013 - 2016) | | | |
| **Asset Class** | **2013 Survey** | **2014 Survey** | **2015 Survey** | **2016 Survey** |
| U.S. Equity - Large Cap | 7.6% | 7.4% | 7.1% | 7.9% |
| U.S. Equity - Small Cap | 8.1% | 7.7% | 7.3% | 8.2% |
| Non-U.S. Equity - Developed | 8.0% | 7.8% | 7.5% | 8.0% |
| Non-U.S. Equity - Emerging | 9.1% | 8.9% | 8.7% | 9.1% |
| U.S. Fixed Income - Core | 3.4% | 4.0% | 3.7% | 4.6% |
| U.S. Fixed Income - Long Duration Corp. | 4.2% | 4.9% | 4.0% | 4.9% |
| U.S. Fixed Income - High Yield | 5.9% | 6.0% | 6.0% | 6.8% |
| Non-U.S. Fixed Income - Developed | 3.0% | 3.5% | 2.7% | 3.7% |
| Non-U.S. Fixed Income - Emerging | 5.4% | 5.9% | 6.0% | 6.4% |
| Treasuries (Cash Equivalents) | 2.2% | 2.7% | 2.4% | 3.2% |
| TIPS (Inflation-Protected) | 2.6% | 3.5% | 3.1% | 3.9% |
| Real Estate | 6.8% | 6.5% | 6.3% | 6.8% |
| Hedge Funds | 6.4% | 6.3% | 5.8% | 6.2% |
| Commodities | 5.1% | 4.9% | 4.4% | 4.8% |
| Infrastructure | 7.1% | 7.8% | 7.1% | 7.1% |
| Private Equity | 10.1% | 9.8% | 9.5% | 10.3% |
| Inflation | 2.5% | 2.4% | 2.2% | 2.3% |

## Capital Market Assumptions
**(continued)**

that said, future return assumptions have been raised slightly, reflecting changes in the basis of government bond expectations.

**Real Estate**

Like equities, real estate assumptions have increased to their 2013 level due to an increase in the expected return on cash equivalents.

- Expected returns across the global real estate markets have increased by 0.5% over the past year back to 2013 assumptions

**Hedge Funds**

Recent structural changes within the hedge fund industry include a) improved information availability, b) lower leverage utilized, c) changing objectives, and d) dramatic increases in market players. However, while this has resulted in lower expected alpha opportunities for hedge funds generally, expected returns for 2016 have increased by 0.4% due to the increase in expected returns of cash equivalents.

An alternative approach to asset allocation that is sometimes suggested to pension plans is to establish a stereotypical 60% equity/40% fixed income policy that remains static over time. Tables 8.1 and 8.2 illustrate one reason why such an approach would not be prudent. Because PSERS can select from a broad array of asset allocation alternatives, we can analyze alternative allocation strategies using asset classes with varying expected returns and expected risk in order to formulate an optimal asset allocation policy most likely to achieve the investment return and investment risk goals established by the Board. In recent years, lower risk projections have afforded PSERS valuable flexibility in identifying different combinations of asset allocations that can achieve our current long-term goal of 7.25% at acceptable levels of risk even as return assumptions have fallen. Furthermore, PSERS applies leverage opportunistically in implementing its asset allocation policy, providing an additional mechanism to increase expected volatility in order to target higher expected return when warranted. A stereotypical 60%/40% strategy would have precluded such flexibility and exposed the system to artificial and harmful limits on our ability to manage the Fund.

**The CMA surveys also included forecasts for 20 year average expected risk (Table 8.2). The numbers below reflect the expected standard deviation in % around the expected return.**

| Table 8.2 | PSERS Capital Market Assumptions (CMAs) Average Expected Risk (2013 - 2016) | | | |
|---|---|---|---|---|
| **Asset Class** | **2013 Survey** | **2014 Survey** | **2015 Survey** | **2016 Survey** |
| U.S. Equity - Large Cap | 18.1% | 17.5% | 17.1% | 16.9% |
| U.S. Equity - Small Cap | 22.5% | 21.1% | 21.0% | 21.0% |
| Non-U.S. Equity - Developed | 20.5% | 19.8% | 19.6% | 19.5% |
| Non-U.S. Equity - Emerging | 27.5% | 26.4% | 26.6% | 26.4% |
| U.S. Fixed Income - Core | 5.3% | 5.4% | 5.6% | 6.0% |
| U.S. Fixed Income - Long Duration Corp. | 11.8% | 11.3% | 10.8% | 10.5% |
| U.S. Fixed Income - High Yield | 12.3% | 11.5% | 11.2% | 11.0% |
| Non-U.S. Fixed Income - Developed | 8.2% | 7.6% | 7.4% | 7.6% |
| Non-U.S. Fixed Income - Emerging | 12.4% | 10.9% | 11.7% | 11.6% |
| Treasuries (Cash Equivalents) | 1.8% | 2.3% | 2.8% | 2.8% |
| TIPS (Inflation-Protected) | 5.9% | 6.3% | 6.3% | 6.5% |
| Real Estate | 12.4% | 13.1% | 13.6% | 14.7% |
| Hedge Funds | 9.4% | 9.0% | 8.3% | 8.4% |
| Commodities | 18.5% | 18.0% | 18.0% | 18.5% |
| Infrastructure | 15.2% | 13.5% | 13.1% | 13.8% |
| Private Equity | 26.2% | 24.8% | 23.6% | 23.1% |
| Inflation | 2.0% | 2.1% | 1.8% | 1.8% |

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## Asset Exposure
**(as of June 30, 2016)**

While the Board can choose to modify its asset allocation at any time it determines that changes are warranted (for example, due to changing liquidity circumstances or opportunities in the marketplace), the Board maintains a disciplined and thorough process to establish a new asset allocation policy annually. This process begins following the Board's review and acceptance of the actuary's annual report, as described in Tab 5. PSERS' staff and general investment consultant collaborate to analyze potential asset allocations (using actuarial as well as capital market return assumptions) in order to identify those potential asset allocations that meet the long-term return and risk objectives of the Fund. The Board is then presented with alternative asset allocations with detailed analysis of probable long-term return and risk characteristics from which it will select a new Asset Allocation Policy for further implementation by staff.

**Table 9.1 represents PSERS' asset exposure and target allocation plan that became effective October 1, 2015, and was in effect on June 30, 2016:**

**Table 9.1 PSERS' Asset Exposure and Target Asset Allocation Plan**

**(as of June 30, 2016)**

| Asset Class | Market Value (in millions) | Percentage of Gross Asset Exposure | Percentage of Net Asset Exposure | Target Allocation % | Target Allocation Range |
|---|---|---|---|---|---|
| Global Public Market Equity: | | | | | |
| U.S. Equity | $ 3,790.3 | 6.8 % | 7.8 % | 8.4 % | |
| Non-U.S. Equity | 6,370.9 | 11.4 | 13.1 | 13.1 | |
| Total Global Public Market Equity | $ 10,161.2 | 18.2 % | 20.9 % | 21.5 % | |
| Private Markets | 7,647.1 | 13.7 | 15.7 | 16.0 | |
| **Total Equity** | **$ 17,808.3** | **31.9 %** | **36.6 %** | **37.5 %** | ± 10% |
| Fixed Income* | **$ 16,177.1** | **28.9 %** | **33.2 %** | **31.5 %** | ± 10% |
| Master Limited Partnerships | $ 2,299.2 | 4.1 % | 4.7 % | 4.0 % | |
| Commodities* | 3,872.6 | 6.9 | 7.9 | 8.0 | |
| Infrastructure* | 504.7 | 0.9 | 1.0 | 1.0 | |
| Real Estate* | 5,709.7 | 10.2 | 11.7 | 12.0 | |
| **Total Real Asset Exposure** | **$ 12,386.2** | **22.1 %** | **25.3 %** | **25.0 %** | ± 10% |
| Risk Parity* | **$ 4,941.4** | **8.8 %** | **10.1 %** | **10.0 %** | ± 5% |
| Absolute Return | **$ 4,608.1** | **8.2 %** | **9.5 %** | **10.0 %** | ± 4% |
| **Gross Asset Exposure** | **$ 55,921.1** | **100.0 %** | **114.8 %** | **114.0 %** | |
| **Financing*** | **$ (7,201.3)** | | **(14.8) %** | **(14.0) %** | |
| **Net Asset Exposure** | **$ 48,719.8** | | **100.0 %** | **100.0 %** | |

*PSERS uses financing to achieve increased economic exposure to diversifying asset classes to manage the overall portfolio risk while maintaining an allocation designed to achieve the long-term return goals of the System. Increased economic exposure is generally achieved through the use of either derivative positions or higher volatility funds. As of June 30, 2016, PSERS had total increased economic exposure of $7.2 billion related to the following asset classes: Fixed Income ($4.0 billion); Risk Parity ($0.6 billion); Infrastructure ($0.2 billion); Real Estate ($0.2 billion) and Commodities ($2.2 billion).

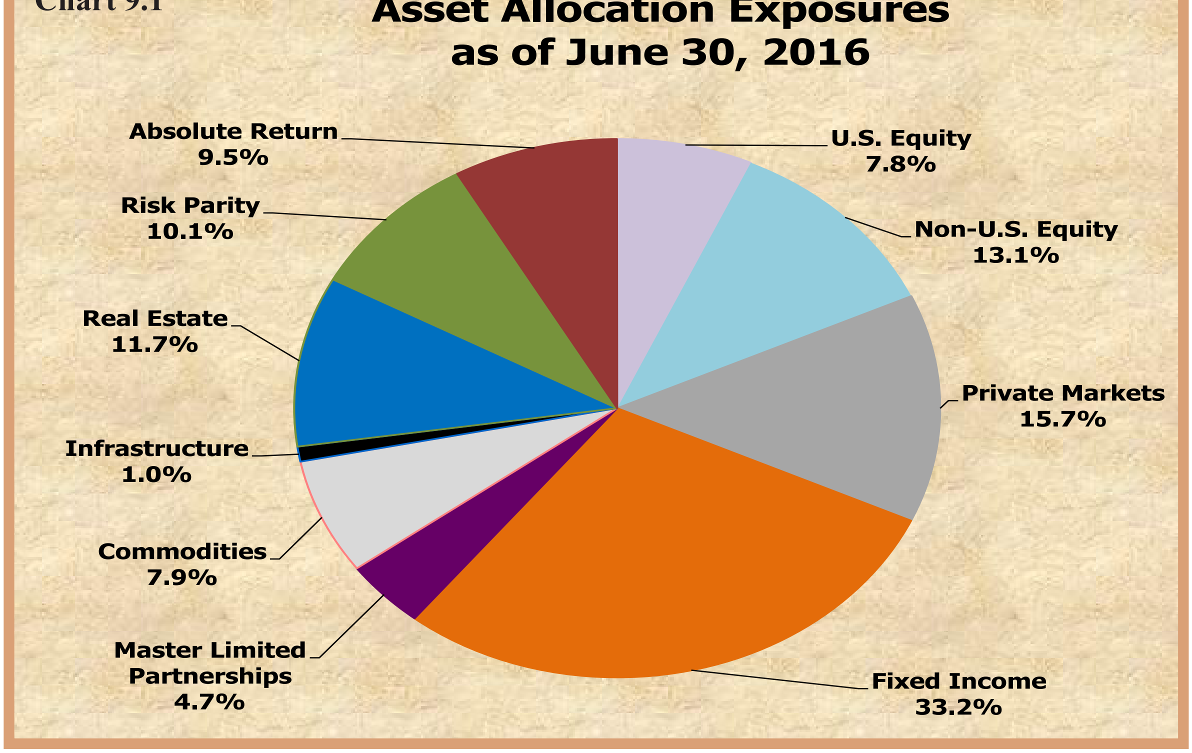
**Note**: PSERS' asset allocation was updated October 1, 2016, and is available for review at http://www.psers.state.pa.us.

## Asset Exposure

**(continued)**

**Chart 9.1 illustrates PSERS' asset allocation exposure as of June 30, 2016:**

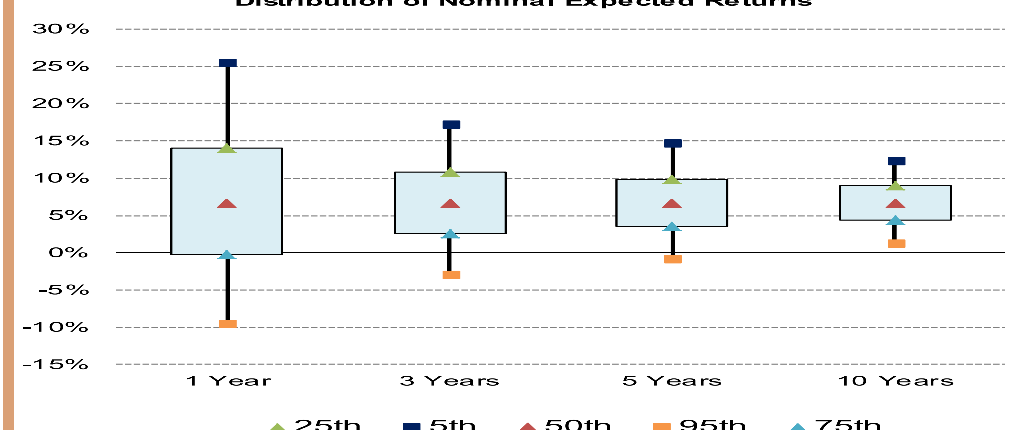
Chart 9.1




**Note:** Financing represents a negative 14.8% allocation and is not reflected in Chart 9.1.

**The purpose of the asset allocation is to meet the long-term financial needs and investment objectives of the System. PSERS considers the expected range of returns for 1, 3, 5, and 10 year periods of various alternative asset allocations (as seen in Exhibit 9.1) to select the optimal asset allocation annually. While the range of returns can be high for any single year, volatility will decrease and converge around a median return over time. This is demonstrated in Exhibit 9.1 below, which depicts expected future returns for PSERS' current asset allocation:**

Exhibit 9.1
Distribution of Nominal Expected Returns




Range of Returns

| Percentiles | 1 Year | 3 Years | 5 Years | 10 Years |
|---|---|---|---|---|
| 5% | 25.6% | 17.2% | 14.7% | 12.3% |
| 25% | 14.0% | 10.9% | 9.9% | 8.9% |
| 50% | 6.6% | 6.6% | 6.6% | 6.6% |
| 75% | -0.3% | 2.6% | 3.5% | 4.4% |
| 95% | -9.4% | -3.0% | -0.9% | 1.3% |

Source: Aon Hewitt's 30-year capital market assumptions.

## Public Market Global Equity Investments

Public Market Global Equity includes both U.S. Equity and Non-U.S. Equity investments. PSERS' investment plan diversifies equity investments and balances equity management styles. Equities are utilized by the Fund primarily because their expected large return premiums versus inflation will, if realized, help preserve and enhance the real value of the Fund over long periods of time. Equities tend to perform well when economic growth is stronger than expected or inflation is lower than expected. The Public Market Global Equity Exposure asset class is managed on a total return basis.

Equity investments consist almost entirely of publicly-traded securities listed on major world-wide stock exchanges or derivatives such as swaps or listed futures that replicate the performance of equity indexes such as the S&P 500 Index. Swaps and futures are employed by PSERS' to equitize cash.

PSERS' Asset Allocation targets an eventual allocation of 21.5% of assets to Global Public Market Equity. PSERS contracts with external investment managers and also uses internal portfolio managers to manage Public Market Equity portfolios.

## Private Market Investments

Private Market investments provide the opportunity to negotiate and set a price between the owner of a business and the buyer/investor in a private fashion. There exists a very large private economy of companies with various needs (for example, operating expertise, capital to grow their businesses, and an exit out of family businesses). In public equity markets, thousands of buyers and sellers set prices of securities issued by companies every day, however no such mechanism exists in the private markets. Thus, private markets provide fertile grounds for investing.

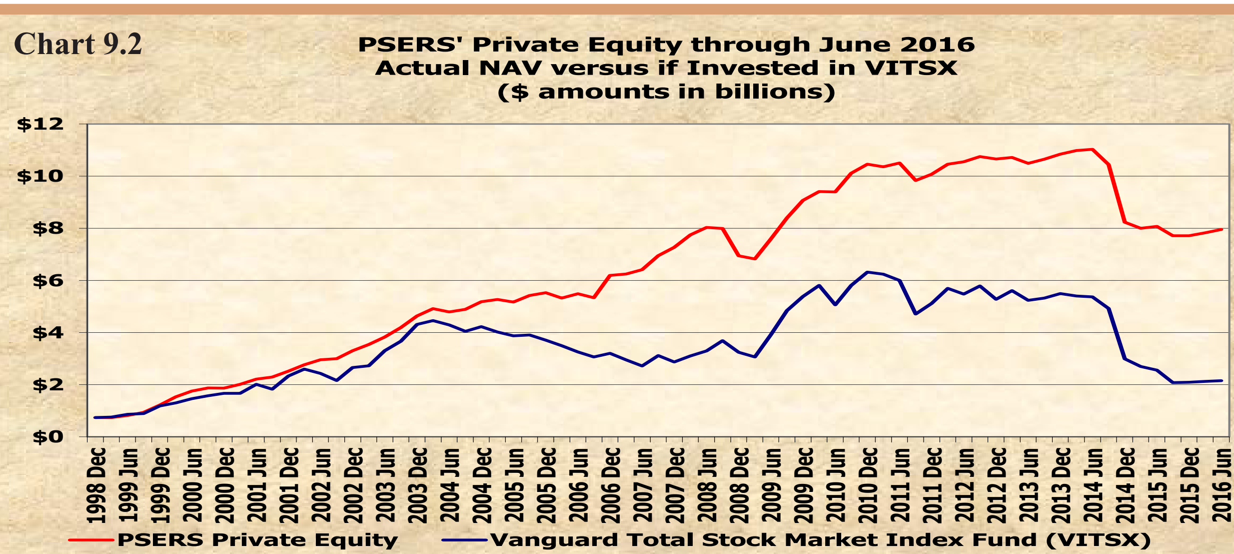
For the Private Markets investment program, PSERS' long-term investment objective is to achieve a risk-adjusted total return, net of fees, that exceeds market returns for similar investments. The primary vehicle used to invest funds in this asset class is the limited partnership. Individual management groups selected by PSERS form these partnerships for the purpose of investing in and managing private equity and unlisted-subordinated debt positions on behalf of PSERS and other limited partners. PSERS' Asset Allocation currently targets an allocation of 16.0% to Private Market investments.

As an example of PSERS' private markets success, PSERS has modeled, in Chart 9.2, what its returns would have been if, instead of investing in Private Equity, the cash flows into/out of Private Equity investments were made into/out of a very low cost mutual fund that seeks to replicate the U.S. equity market. PSERS chose the Vanguard Total Stock Market Index Fund (VITSX) due to its low cost (currently 0.03%) and its success at closely matching the returns of the overall U.S. stock market. Private Market Investment sub-asset classes include:

**Private Equity** involves investments in private companies which normally do not have technology risk associated with traditional venture capital investments. It has evolved to include the financing of more mature, profitable companies that do not have access to, or qualify for, public equity and debt funding.

**Chart 9.2 tracks the performance of PSERS Private Equity program versus the performance of the Vanguard Total Stock Market Index Fund from December 1998 through June 2016. PSERS has been able to generate almost $6 billion in incremental value, net of all fees and costs, versus the passive, low cost index approach to equity investing.**

Chart 9.2



## Private Market Investments
**(continued)**

**Table 9.2 reflects the more recent total returns for the past 10 years (through June 30, 2016) for PSERS' Private Equity Program, the Vanguard Total Stock Market Index Fund (VITSX), the PSERS' Internally-Managed S&P 500 Index Fund (PSERS 500) and the Vanguard 500 Index Fund Admiral Shares (VFIAX) (VITSX, VFIAX, and PSERS 500 with dividends re-invested):**

**Table 9.2 10 Year Return Comparison**

| | 10 Year, Net of Fee Return (June 2006 - June 2016) |
|---|---|
| PSERS' Private Equity Program | **9.63%** |
| Vanguard Total Stock Market Index (VITSX) | **7.59%** |
| PSERS' Internally-Managed S&P 500 Index Fund | **7.81%** |
| Vanguard 500 Index Fund Admiral Shares (VFIAX) | **7.41%** |

**Venture Capital** is considered the financing of young, relatively small, rapidly growing companies. In traditional venture capital investments, companies have a 5-10 year investment horizon and develop technology for a particular market, such as pharmaceuticals, software, medical products, etc.

**Private Debt** involves investments in the secured and/or unsecured debt obligations of private and/or public companies. This debt is typically acquired through directly negotiated or competitively bid transactions. Owners of these debt instruments typically take either an active or passive role in the management of the firm.

**PSERS Private Market Internal Co-Investment Program** consists of co-investments made alongside of General Partners with whom PSERS has a strong relationship. These relationships aid in the generation of deal flow for investments and also serve as additional due diligence for the evaluation of General Partners. The investments have the potential for higher returns as they have low or no fees and no profit sharing. This program also provides PSERS with the ability to buy secondary interests in funds from other Limited Partners usually at a discount to net asset value.

## Fixed Income Investments

Fixed Income investments include a wide variety of bonds and similar securities which allow PSERS to diversify Fixed Income investments and balance Fixed Income management styles. PSERS contracts with external investment managers and also uses internal portfolio managers to manage Fixed Income portfolios.

Fixed Income securities are used for a variety of purposes as follows:

*Nominal bonds* are used for their ability to serve as a hedge against disinflation and/or deflation, their general ability to produce current income in the form of periodic interest payments, and their ability to provide sufficient liquidity to meet the Fund's obligations to pay member benefits and support other investment commitments. Nominal bonds tend to do well when growth is weaker than expected or when inflation is lower than expected;

*Inflation-linked bonds* are used for their ability to serve as a hedge against inflation, their general ability to produce current income in the form of periodic interest payments, and their ability to provide sufficient liquidity to meet the Fund's obligations to pay member benefits and support other investment commitments. Inflation-linked bonds tend to do well when growth is weaker than expected or when inflation is higher than expected; and

*High yield securities and emerging market bonds* are used for their ability to generate high current income in the form of periodic interest payments as well as offering greater total return opportunities than high grade debt. High yield securities and emerging market bonds tend to do well when growth is stronger than expected.

PSERS' Asset Allocation targets an eventual allocation of 31.5% of assets to Fixed Income, 8.5% of which is designated to Investment Grade, 8.0% of which is designated to Credit-Related, 12.0% of which is designated to TIPS strategies, and 3.0% designated to Cash.

## Master Limited Partnerships

Master Limited Partnership (MLP) securities, which are publicly traded on a securities exchange, avoid federal and state income taxes by meeting specific qualifications of the IRS related to the production, processing or transportation of oil, natural gas, and coal. MLP securities are utilized by the System due to their low correlation to stock and bond returns, attractive growth characteristics, and their ability to produce current income in the form of periodic distributions. MLP securities tend to do well when economic growth is stronger than expected and when inflation is higher than expected. PSERS contracts with external investment managers and also uses internal portfolio managers to manage MLP portfolios.

PSERS' Asset Allocation currently targets an allocation of 4.0% of assets to MLP investments and consists of both actively managed and passively managed portfolios.

## Commodity Investments

Commodity investments such as gold, oil and wheat, are utilized by the Fund for diversification within the portfolio and to act as a hedge against unanticipated inflation. The prices of commodities are determined primarily by near-term events in global supply and demand conditions and are positively related with both the level of inflation and the changes in the rate of inflation. However, stock and bond valuations are based on longer-term expectations and react negatively to inflation. Therefore, commodity returns have had a historically negative correlation to stock and bond returns since commodities tend to do very well in periods of rising inflation. As such, commodities, when combined with stocks and bonds, lower the risk of a portfolio. PSERS contracts with external investment managers and also uses internal portfolio managers to manage Commodity portfolios.

PSERS' Asset Allocation currently targets an allocation of 8.0% of assets to Commodity investments which includes a 5.0% target allocation to a Diversified Commodity Bucket and a 3.0% asset allocation to Gold. Gold is particularly useful as a contra-currency to provide protection against the debasement of fiat currencies in periods of monetary inflation.

## Infrastructure Investments

Infrastucture investments target stable, defensive investments primarily within the energy, power, water, and transportation sectors. The program plays a strategic role within the System by providing steady returns and cash yields, defensive growth, inflation protection, capital preservation and diversification benefits. Historically, Infrastructure investments have performed better in environments of falling growth and falling inflation. PSERS contracts with external investment managers and also uses internal portfolio managers to manage Infrastructure portfolios.

PSERS' Asset Allocation currently targets an allocation of 1.0% of assets in Infrastructure investments.

## Real Estate Investments

Real Estate investments provide PSERS exposure to real property directly or indirectly through global publicly-traded real estate securities (PTRES), direct investments, commingled fund investments, limited partnerships, and direct private placements. This is done in a prudent manner to create a diversified real estate portfolio of high quality investments which will enhance PSERS' overall long-term investment performance, diversify the asset base, and reduce the volatility of the total investment portfolio returns. Real Estate investments tend to perform well in periods of stronger than expected growth and lower than expected inflation.

The real estate program is designed to create the highest possible risk-adjusted returns in a controlled, coordinated, and comprehensive manner. Recognizing that real estate market conditions and PSERS' objectives for real estate may change over time, the program is reviewed periodically and updated as needed. The existing target allocation is 12.0% of total assets, of which 11.0% is designated for Private Real Estate and 1.0% for PTRES.

PSERS seeks to diversify its real estate portfolio by investing in a mix of Opportunistic (30%), Value Added (50%) and Core (20%) real estate investments.

***Opportunistic*** real estate investing is the financing, acquisition or investment in real estate assets, real estate companies, portfolios of real estate assets, and private and public Real Estate Investment Trusts (REIT's) that do not have access to traditional public equity or debt financing. Opportunistic real estate consists of investment strategies that seek to exploit market inefficiencies with an emphasis on total return. Opportunistic investments require specialized expertise and the flexibility to respond quickly to market imbalances or changing market conditions. Investments may include non-traditional property types and/or assets that involve development, re-development, or leasing risks.

## Real Estate Investments (continued)

***Value Added*** real estate investing typically focuses on both income growth and appreciation potential, where opportunities created by dislocations and inefficiencies between and within segments of the real estate capital markets are capitalized upon to enhance returns. Investments can include high-yield equity and debt investments and undervalued or impaired properties in need of repositioning, re-development, or leasing.

***Core*** real estate investing is the financing, acquisition or investment in real estate assets, real estate companies, portfolios of real estate assets, and private REITs that are broadly diversified by property type and location, focused primarily on completed, well-leased properties with modest levels of leasing risk, using relatively low leverage, and investing mainly in institutional property types and qualities allowing for relative ease of resale.

**PSERS Real Estate Internal Co-Investment Program** consists of co-investments made alongside of General Partners with whom PSERS has a strong relationship. These relationships aid in the generation of deal flow for investments and also serve as additional due diligence for the evaluation of General Partners. The investments have the potential for higher returns as they have low or no fees and no profit sharing. This program also provides PSERS with the ability to buy secondary interests in funds from other Limited Partners usually at a discount to net asset value.

## Risk Parity Investments

Risk Parity investments are designed to generate investment returns through a more diversified allocation by endeavoring to balance market risk factor exposures as opposed to capital exposures. PSERS' Risk Parity investment managers each have proprietary methods to define and measure the risk factors upon which they manage their portfolios. Inclusion of this asset class is expected to reduce the portfolio's overall risk exposure over long-term horizons because it is designed to be more resistant to market downturns than traditional investment strategies, and further enhances the System's diversification due to the risk-balancing portfolio construction. Risk Parity portfolios are designed to perform consistently well in periods of rising or falling growth or inflation. PSERS contracts with external investment managers and also uses internal portfolio managers to manage Risk Parity portfolios.

PSERS' Asset Allocation currently targets an allocation of 10.0% of assets to Risk Parity investments. The Risk Parity investments are targeted to be 100% actively managed.

## Absolute Return Investments

Absolute Return investments, sometimes referred to as hedge funds, are used by the Fund primarily to generate returns that are uncorrelated to the equities, fixed income, and commodities asset classes and to diversify the overall Fund. As such, returns are driven more by manager skill than changes in economic growth and inflation which affects other financial assets. PSERS contracts with external investment managers to manage Absolute Return portfolios.

Absolute Return investments are made in a variety of unique, non-directional investment strategies, including global macro, relative value, event driven, capital structure arbitrage, reinsurance, volatility and other opportunistic strategies. The Fund diversifies this program by manager and style.

PSERS' Asset Allocation currently targets an allocation of 10.0% of assets in Absolute Return investments.

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## Performance

PSERS' general investment consultant calculates the total investment return of the System as well as the performance of each external investment management firm and each internal investment manager retained by the Board to invest the System's assets. Performance is calculated using a time-weighted return methodology. For the one-year period ended June 30, 2016, the System generated a total net of fee return of 1.29%. This return fell below the Total Fund Policy Index return of 2.00% by 71 basis points. Annualized total net of fee returns for the three-, five-, and ten-year periods ended June 30, 2016 were 6.24%, 6.01%, and 4.94%, respectively. The three-, five- and ten-year returns ended June 30, 2016, exceeded the Total Fund Policy Index returns by 105, 150, and 102 basis points, respectively.

**Table 10.1 provides the System's total time-weighted investment returns for each major asset class and the total portfolio, including, where applicable and available, respective benchmark indexes used by asset class and median performance by asset class:**

| Table 10.1 | Annualized Total Returns (%) Net of Fees Ended June 30, 2016 | | | |
|---|---|---|---|---|
| | 1 Year | 3 Years | 5 Years | 10 Years |
| **PSERS Total Portfolio** | **1.29** | **6.24** | **6.01** | **4.94** |
| Total Fund Policy Index | 2.00 | 5.19 | 4.51 | 3.92 |
| Median Public Defined Benefit Plan (DBP) Fund Universe (Aon Hewitt Database) | 0.26 | 6.36 | 6.27 | 5.49 |
| **PSERS U.S. Equity Portfolios** | **3.79** | **11.47** | **11.83** | **7.23** |
| U.S. Equity Policy Index (1) | 2.25 | 11.18 | 11.61 | 7.39 |
| **PSERS Non-U.S. Equity Portfolios** | **-8.25** | **5.76** | **3.59** | **4.68** |
| Non-U.S. Equity Policy Index (2) | -9.38 | 5.25 | 2.50 | 3.50 |
| **PSERS Fixed Income Portfolios** (10) | **6.42** | **6.02** | **5.98** | **7.40** |
| Fixed Income Policy Index (3) | 6.32 | 3.82 | 3.60 | 6.34 |
| **PSERS Commodity Portfolios** (10) | **-1.34** | **-4.01** | **-6.66** | **N/A** |
| Commodity Policy Index (4) | -4.58 | -6.01 | -8.13 | N/A |
| **PSERS Absolute Return Portfolios** | **-3.43** | **2.43** | **2.88** | **5.12** |
| Absolute Return Policy Index (5) | 4.01 | 5.08 | 6.04 | 7.02 |
| **PSERS Risk Parity Portfolios** (11) | **0.01** | **5.40** | **N/A** | **N/A** |
| Risk Parity Policy Index (6) | 5.13 | 6.69 | N/A | N/A |
| **PSERS Master Limited Partnership (MLP) Portfolios** | **-18.75** | **-0.24** | **9.13** | **N/A** |
| Standard & Poor's MLP Index | -18.93 | -5.44 | 3.36 | N/A |
| **PSERS Real Estate (7) (10)** | **8.86** | **13.03** | **11.09** | **2.51** |
| Blended Real Estate Index (8) | 5.71 | 10.41 | 10.14 | 6.76 |
| **PSERS Alternative Investments (7)** | **3.44** | **6.65** | **7.93** | **9.63** |
| Burgiss Median, Vintage Year Weighted Index (9) | 2.11 | 4.63 | 4.54 | 4.06 |

***Footnotes to the Total Portfolio are available on page 75 of PSERS Consolidated Annual Financial Report.***

## Performance
### (continued)

The past fiscal year was a challenging year for the System with a net of fee return of 1.29%. The following asset classes generated solid returns this past fiscal year:

- U.S. Long Treasuries, as represented by the Barclays Capital U.S. Treasury Long Index, were up 19.30%. Returns in long-term treasuries were driven by falling interest rates and increased demand for safe haven assets, especially from foreign investors who were looking for assets with positive yields;

- Gold, as represented by the Bloomberg Gold Index, was up 12.23%. Gold represents a safe haven asset that has benefited from global uncertainty and ultra-low and negative interest rates in many global markets; and

- Real Estate, as represented by a blended benchmark consisting of the National Council of Real Estate Investment Fiduciaries (NCREIF) – Open End Diversified Core Equity (ODCE) Index and Burgiss Private iQ (for Value-Added Real Estate and Opportunistic Real Estate), was up 5.71%, as fundamentals were strong and capitalization rates fell driving real estate prices higher.

Significant detractors from performance this past fiscal year included:

- Master Limited Partnerships (MLPs), as represented by the Standard & Poor's MLP Index, were down 18.93% driven by falling oil prices and reduced expectations for ongoing growth; and

- Commodities, as represented by the Bloomberg Commodity Index, were down 13.34% led by a fall in oil prices. Crude oil futures fell from $59.47 a barrel on June 30, 2015, to $48.33 a barrel on June 30, 2016. Prices fell due to a large supply glut driven by increasing shale production in the U.S and slow global growth.

As noted, the best performing asset class this past fiscal year was U.S. long-term treasury bonds, which were up over 19%. Coming into the fiscal year, the 30-year U.S. Treasury bond yielded 3.12%, meaning that if an investor had purchased that bond on June 30, 2015, and held that bond to maturity, the investor's total annualized return would be 3.12%. Not many investors with return targets of 7.0%+ were holding a lot of long U.S. Treasuries due to their low absolute yields. However, yields fell during the fiscal year as the Fed backed away from expectations of multiple interest rate hikes which caused bond prices to rise and yields to fall. By June 30, 2016, the yield on the 30-year Treasury bond had fallen 0.83% to 2.29%, generating a total return for the year significantly higher than 3.12%. This illustrates the importance of diversification. Many investment professionals discuss diversification using terms such as standard deviation, correlation, and co-variance. However, at its most basic level, diversification is insurance against bad outcomes. The System diversifies simply because it doesn't know how actual events in the future will transpire relative to what is priced into the market. Diversification is a very humble approach to investing. If an investor knew with certainty which asset class would perform best the next month, quarter, or year, the investor would simply invest in that one asset class. However, without such perfect foresight, the downside risk of such a strategy could be devastating. Diversification into asset classes such as non-U.S. equities, commodities and MLPs resulted in a drag on overall performance during this past fiscal year.

In analyzing performance, PSERS' Board, general investment consultant and staff pay particular attention to the Sharpe ratio, which tells an investor what portion of a portfolio's performance is associated with risk taking. The Sharpe ratio measures a portfolio's added value relative to its total risk; the higher a portfolio's Sharpe ratio, the better its risk-adjusted return. PSERS' Sharpe ratio, as calculated by the general investment consultant, was 1.64 for the 5 year period ending September 30, 2016, a top 20th percentile score.

The fiscal year was a tale of two halves. The first seven and a half months (July 1, 2015 to February 11, 2016) were weak, marked by a Fed rate hike in December, expectations of multiple interest rate hikes in 2016, and risk assets falling in price. The MSCI All Country World Index, a global equity index, fell by 16.6% during this period, only to rebound 13.0% from the middle of February to June 30, 2016, for a total return of negative 3.1% for the fiscal year. Commodities fell by 27.9% during the first seven and a half months, but rebounded 20.3% during the remainder of the year for a total return of negative 13.3%. U.S. long-term treasuries were up 14.0% during the first half and continued to rise another 4.6% during the second half for a total return of 19.3%. Prior to February 11, 2016, the market was pricing in multiple Fed interest rate hikes for 2016. What changed on February 11, 2016? Fed Chair Janet Yellen gave her semi-annual testimony to Congress which was interpreted by the market as very dovish remarks, meaning the pace and number of interest rate increases priced into the market were too aggressive. This meant that the discount rate used to value assets was now too high and a falling discount rate generally translates into higher asset values. In addition, given the expectation that interest rates would remain lower for longer periods of time, the prospects for economic growth improved which also needed to be priced into markets. Finally, the United Kingdom (U.K.) held a non-binding referendum on June 23, 2016, to determine if the U.K. would remain in or leave the European Union (EU),

## Performance
### (continued)

where the U.K. had been a member since being admitted in 1973. The long-term impacts of the "Brexit" vote have yet to be determined, however many global markets reacted strongly immediately after the vote.

While it has been a challenging return environment as evidenced by the System's one-, three-, five-, and ten-year returns, since the first quarter after the Great Recession, PSERS' annualized net of fee return has been 9.16%, comfortably above the actuarial assumed rate of return of 7.25%. With cash rates below 1%, the System needs to take prudent risks to achieve its long-term goal of a 7.25% return. An important concept to remember from the last sentence is "long-term". The System has built a diversified allocation to allow it to collect risk premiums over the long-term. In the short-term, no one knows what will happen and the System can go through periods of time of sub-7.25% annual returns. The System continues to believe the best way to achieve its long-term objectives is to maintain a very diversified portfolio which includes all asset classes available to it, such as equities, fixed income, real assets, risk parity and absolute return. In any given year, the System expects some assets to perform well, such as U.S. long-term treasuries, real estate, and gold did this past fiscal year, and some to not do as well, such as non-U.S. equities, MLPs and commodities did this past fiscal year. However, over the long run, the System expects each of its asset classes to generate a positive return commensurate with the risks taken. The future is uncertain, but PSERS believes it is well positioned to accomplish its objectives.

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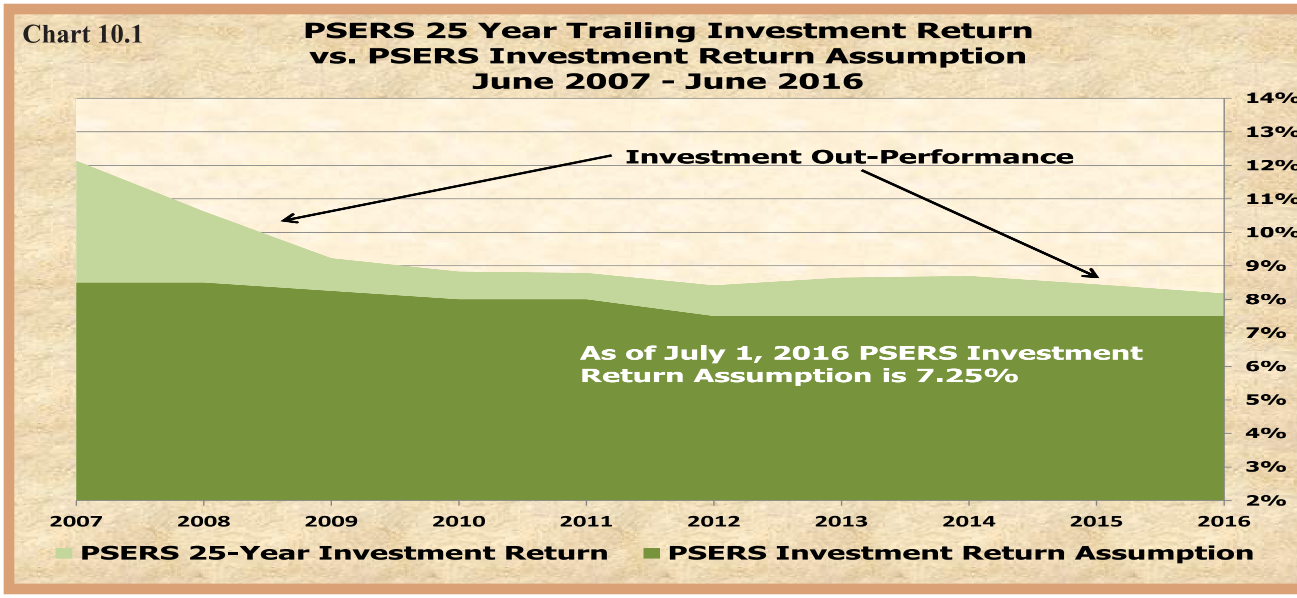
## Performance (continued)

## Long Term Investment Performance Consistently Outperforms

The assets of the System are invested to maximize the returns for the level of risk taken. Chart 10.1 shows PSERS' 25 Year Trailing Investment Return for each of the past 10 fiscal years and Chart 10.2 depicts PSER'S Fiscal Year Investment Returns, versus PSERS' Investment Return Assumption for the past 10 fiscal years.

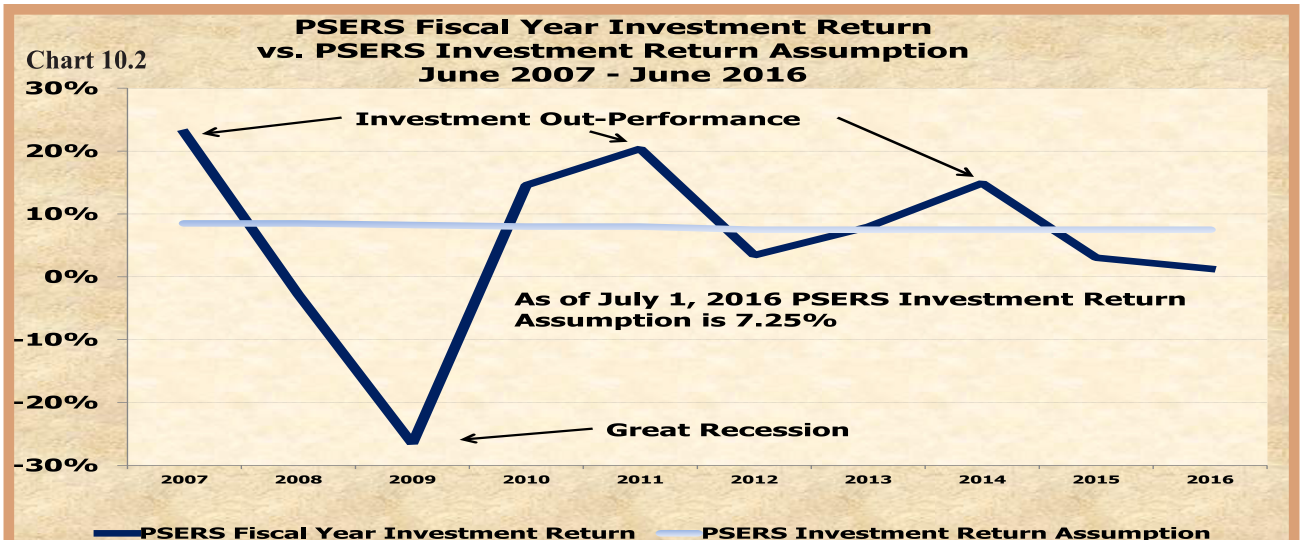
**As shown in Chart 10.1, the 25 year trailing investment return has exceeded the investment return assumption over the last ten years including the Great Recession.**

Chart 10.1




**As depicted in chart 10.2, PSERS' one-year investment return has remained above the investment return assumption for five of the past ten fiscal years. The notable exception is the period of the Great Recession from December 2007 through June 2009 which resulted in the largest decrease in stock market performance since the Great Depression.**

Chart 10.2



## Performance (continued)

**Table 10.2 demonstrates that over the past 17 fiscal years, on average, every dollar PSERS has spent in investment fees and expenses has resulted in investment earnings of $3.05 above the Policy Benchmark's dollar returns.**

### Table 10.2 PSERS' Investment Earnings over Policy Benchmark
### Fiscal Years Ended June 30
### (Dollar Amounts in Millions)

| *Fiscal Year* | *Total Investment Expenses** | *PSERS' Net Return over Policy Benchmark (AFTER Payment of all Expenses)* | *PSERS' Investment Earnings over Policy Benchmark Net of Total Investment Expenses** | *$1 of Investment Expenses Translates into $$$ in Excess Earnings* |
|---|---|---|---|---|
| 2016 | $ 416 | (0.71)% | $ (339) | $ 0.19 |
| 2015 | 455 | 1.02% | 497 | 2.09 |
| 2014 | 482 | 2.74% | 1,519 | 4.15 |
| 2013 | 558 | 2.28% | 1,243 | 3.23 |
| 2012 | 481 | 1.45% | 900 | 2.87 |
| 2011 | 515 | 2.81% | 1,573 | 4.05 |
| 2010 | 522 | 3.72% | 1,754 | 4.36 |
| 2009 | 478 | (5.87)% | (3,131) | (5.55) |
| 2008 | 399 | (0.98)% | (618) | (0.55) |
| 2007 | 314 | 7.45% | 2,360 | 8.52 |
| 2006 | 211 | 3.30% | 1,635 | 8.75 |
| 2005 | 193 | 2.33% | 1,090 | 6.65 |
| 2004 | 191 | 3.33% | 1,388 | 8.27 |
| 2003 | 179 | (0.42)% | (141) | (0.21) |
| 2002 | 163 | 0.57% | 319 | 2.96 |
| 2001 | 144 | 2.27% | 1,200 | 9.33 |
| 2000 | 125 | 1.85% | 934 | 8.47 |
| **Total** | **$ 5,826** | | **$ 12,183** | **$ 3.05** |

*Dollar amounts in millions.

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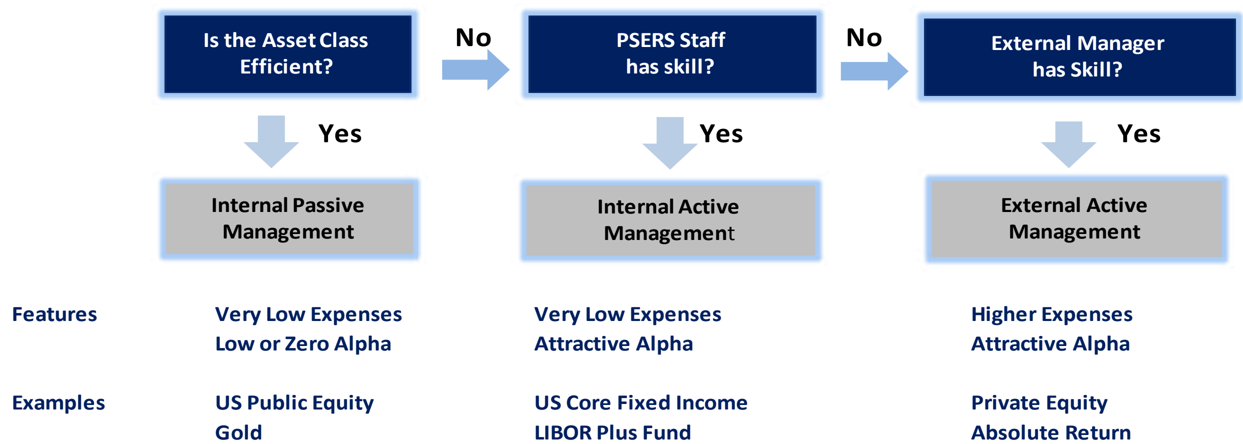
# Managing Investment Fees and Expenses

PSERS' Board annually establishes an Asset Allocation Policy (as more fully described in Tab 9) with input from staff and the general investment consultant, and works on an ongoing basis to implement the Policy through identification of attractive investment strategies and well-qualified investment managers. A fundamental part of this implementation process is making key decisions with regard to use of active or passive strategies implemented by internal staff or external investment managers, as depicted in Chart 11.1.

Chart 11.1



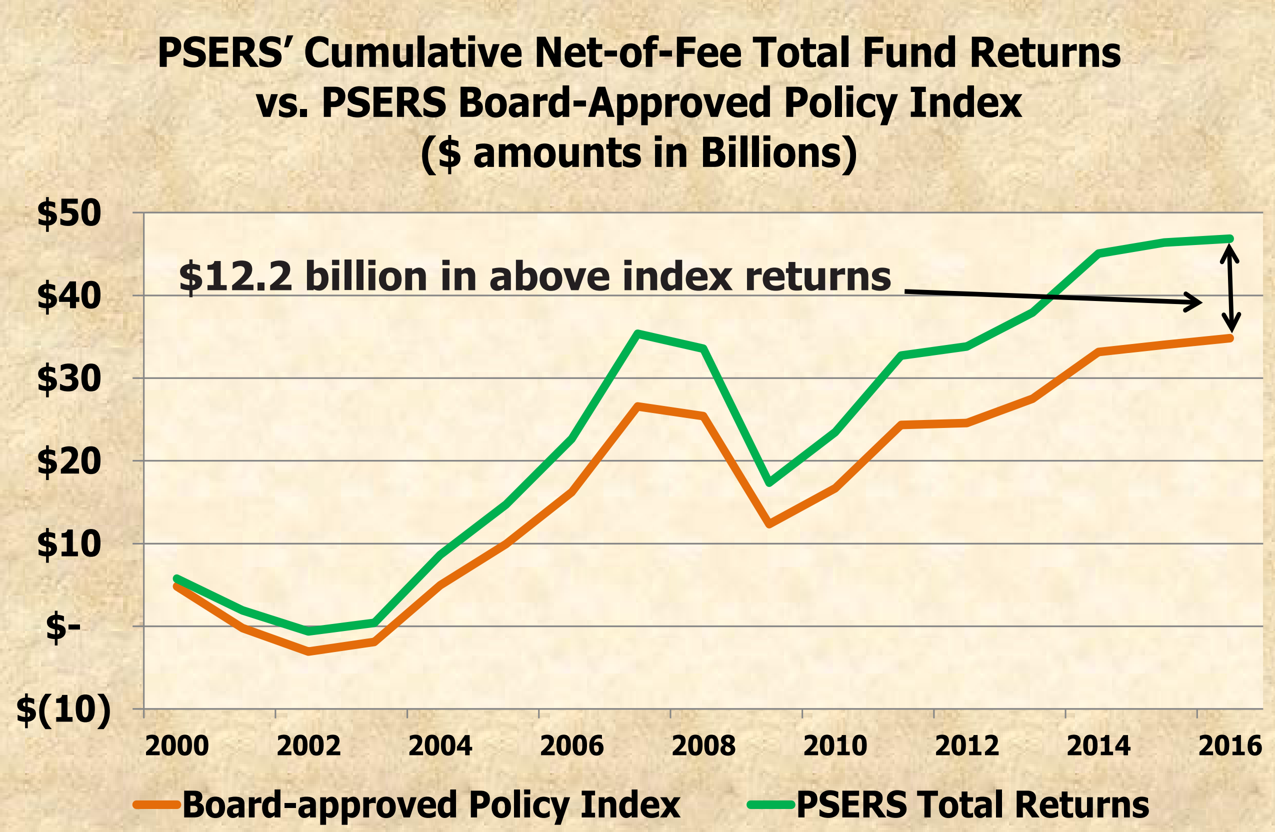

Management of investment fees and expenses is integrated into the process of making these key decisions, so analysis of these costs must also occur within this context. If one assumes that, under PSERS' Asset Allocation Policy, all of PSERS' investments could be made in a passive manner resulting in negligible fees and expenses while earning investment returns equal to the Policy Benchmark, then one can also assume that all of PSERS' actual investment fees and expenses are incurred with the goal of earning investment returns that exceed the Policy Benchmark (of course, as the prudent investor realizes, not all investments can be made in passive strategies, not all passive strategies have low fees, and not all passive strategies deliver the market returns targeted). These assumptions allow PSERS to analyze how much excess investment return above the Policy Benchmark the System has been able to generate over time for the level of fees and expenses actually paid.

PSERS' ability to select a prudent combination of both internal and external managers, and both active and passive strategies, has generated and continues to generate significant excess risk-adjusted, net of fee returns relative to the Policy Benchmarks.

# Managing Investment Fees and Expenses
**(continued)**

**Chart 11.2 below demonstrates that over the past 17 fiscal years, PSERS has earned $12.2 billion in additional investment returns above the Board-approved Policy Index, net of fees.**

Chart 11.2



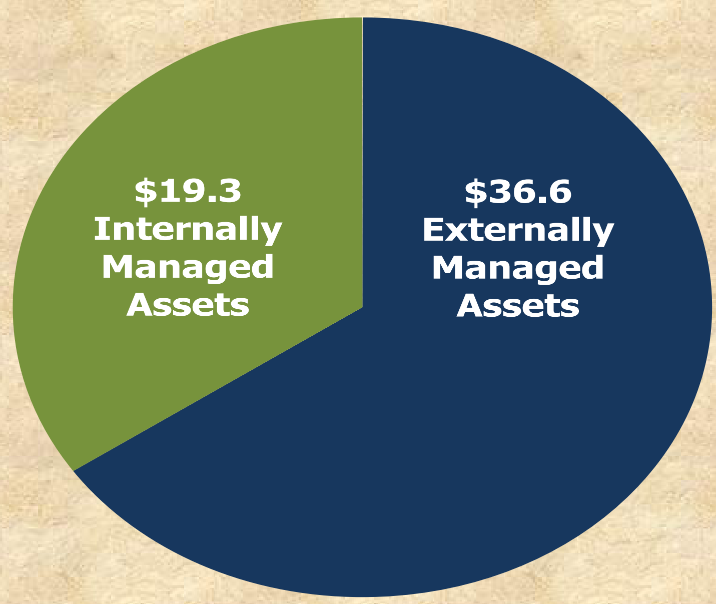
## Key Decision: Internal vs. External Investment Management

PSERS generally prefers to assign investment management responsibilities to internal staff rather than to external investment management companies when certain conditions are present (see chart 11.1). For example, it must be clear that staff can achieve risk-adjusted returns that are at least equal to what might be earned by external investment managers in equivalent strategies, and PSERS' staff must simultaneously have the operational capacity to take on the additional work. When assets are assigned to PSERS' staff, the total costs (e.g., staff salary and benefits, computers and office supplies) are much lower than using even the largest "very low fee" index mutual fund companies charge, giving PSERS a significant advantage.

When PSERS does select external investment managers, the decision is based in part on the fees the System has negotiated and in part on the likelihood the manager will meet or exceed the performance expected. Fee negotiations begin with the expectation that the contract with the investment manager will have a "Most Favored Nations" clause guaranteeing that PSERS' fees will be at least as low as other clients with a similar investment amount, and the System then negotiates fees lower from that point wherever possible.

**Chart 11.3 displays the distribution of PSERS managed assets as of June 30, 2016.**

Chart 11.3 **PSERS' Asset Exposures under Management as of June 30, 2016 ($ Billions)**




**Note:** Financing represents a negative $7.2 billion allocation exposure and is not reflected in Chart 11.3.

## Key Decision: Internal vs. External Investment Management (continued)

PSERS' Investment staff managed 20 portfolios internally, with a total estimated net asset value of over $19 billion on June 30, 2016, resulting in significant fee savings. For the entire fiscal year, PSERS incurred costs of just under $10 million to manage these portfolios internally, as well as oversee all of the external managers, manage the asset allocation, oversee risk, and perform other tasks in managing the overall investment program.

**As shown in Table 11.1 below, managing these assets externally would have cost PSERS over $30 million in additional fees:**

**Table 11.1**

| *Account* | *Asset Class* | *Market Value as of 6/30/16* (000s)* | *Estimated Annual Fee %* | *Estimated Cost to Manage Externally (000s)* |
|---|---|---|---|---|
| PSERS - S&P 500 Index | U.S. Equities | $2,842,316 | 0.01% | 284 |
| PSERS - S&P 400 Index | U.S. Equities | 485,271 | 0.03% | 146 |
| PSERS - S&P 600 Index | U.S. Equities | 460,738 | 0.04% | 184 |
| Misc. PSERS Equity Accounts | U.S. Equities | 2,000 | 0.00% | - |
| | **U.S. Equities Total** | **3,790,325** | | **614** |
| PSERS ACWI ex. U.S. Index | Non U.S. Equities | 3,165,531 | 0.08% | 2,532 |
| | **Non U.S. Equities Total** | **3,165,531** | | **2,532** |
| Private Markets Co-Investments | Private Markets | 366,037 | 1.00% | 3,660 |
| PA Investment Fund - Private Equity. | Private Makets | 4,602 | 1.00% | 46 |
| | **Private Markets Total** | **370,639** | | **3,706** |
| Private Debt Internal | Fixed Income | 16,437 | 1.00% | 164 |
| PSERS Active Aggregate | Fixed Income | 1,224,766 | 0.21% | 2,572 |
| PSERS TIPS Portfolio | Fixed Income | 943,607 | 0.13% | 1,227 |
| PSERS Long Treasuries | Fixed Income | 1,335,864 | 0.18% | 2,405 |
| | **Fixed Income Total** | **3,520,674** | | **6,368** |
| PSERS Infrastructure Index | Infrastructure | 506,862 | 0.47% | 2,382 |
| | **Infrastructure Total** | **506,862** | | **2,382** |
| PSERS Commodity Beta | Commodities | 1,687,853 | 0.15% | 2,532 |
| PSERS Gold Fund | Commodities | 1,450,000 | 0.15% | 2,175 |
| | **Commodities Total** | **3,137,853** | | **4,707** |
| PSERS S&P MLP Index | MLP | 460,538 | 0.50% | 2,303 |
| | **MLP Total** | **460,538** | | **2,303** |
| PSERS REIT Index | Real Estate | 412,985 | 0.08% | 330 |
| Real Estate Co-Investments | Real Estate | 121,231 | 1.00% | 1,212 |
| | **Real Estate Total** | **534,216** | | **1,543** |
| PSERS Risk Parity | Risk Parity | 2,008,965 | 0.30% | 6,027 |
| | **Risk Parity Total** | **2,008,965** | | **6,027** |
| PSERS Cash Management | Cash Management | 1,793,382 | 0.01% | 179 |
| | **Cash Management Total** | **1,793,382** | | **179** |
| | **Grand Total** | **$19,288,988** | | **$30,361** |

**Market values include cash and derivatives exposure*

## Key Decision: Active vs. Passive Investment Management

Passive investment strategies form the basis that the Fund uses to attain market exposure in many public market asset classes. The advantage of passive strategies, such as indexing, is that they are generally very inexpensive to implement. If solely using passive strategies, however, performance will be limited to general market performance with little or no potential for excess earnings.

PSERS evaluates and selects active managers on a case by case basis with strong emphasis on understanding the manager's sustainable investment edge. If the investment staff and consultants have conviction that the manager's process will generate attractive and potentially uncorrelated risk-adjusted net of fee returns in excess of the most competitive passive benchmarks, the active manager will be considered. Active strategies are also used by PSERS in asset classes where passive strategies are not available, such as Private Equity.

In selecting active managers, PSERS strives to hire managers that meet the following criteria:

- have a unique insight or process;
- have the ability to add long-term excess returns above passive alternatives, net of fees;
- have adequate capacity to execute the strategy;
- add diversification to PSERS' existing investment structure;
- do not exhibit style drift; and
- exhibit a high level of ethical behavior.

The advantage of active strategies is that they endeavor to generate net of fee returns in excess of the passive alternatives, if available, and/or provide diversification benefits which help manage total portfolio risk. The disadvantages of active strategies include being more expensive to implement than passive strategies and the risk that they may underperform passive strategies.

PSERS regularly measures the performance of active strategies relative to alternative passive strategies. In cases where PSERS is not receiving investment earnings from its active strategies in excess of alternative passive strategies, when all investment fees are taken into account, capital is redeployed either to other active strategies or to passive strategies. If PSERS determines that the active managers are not meeting expectations as a group, the Fund would endeavor to exit active strategies altogether and move to a purely passive implementation.

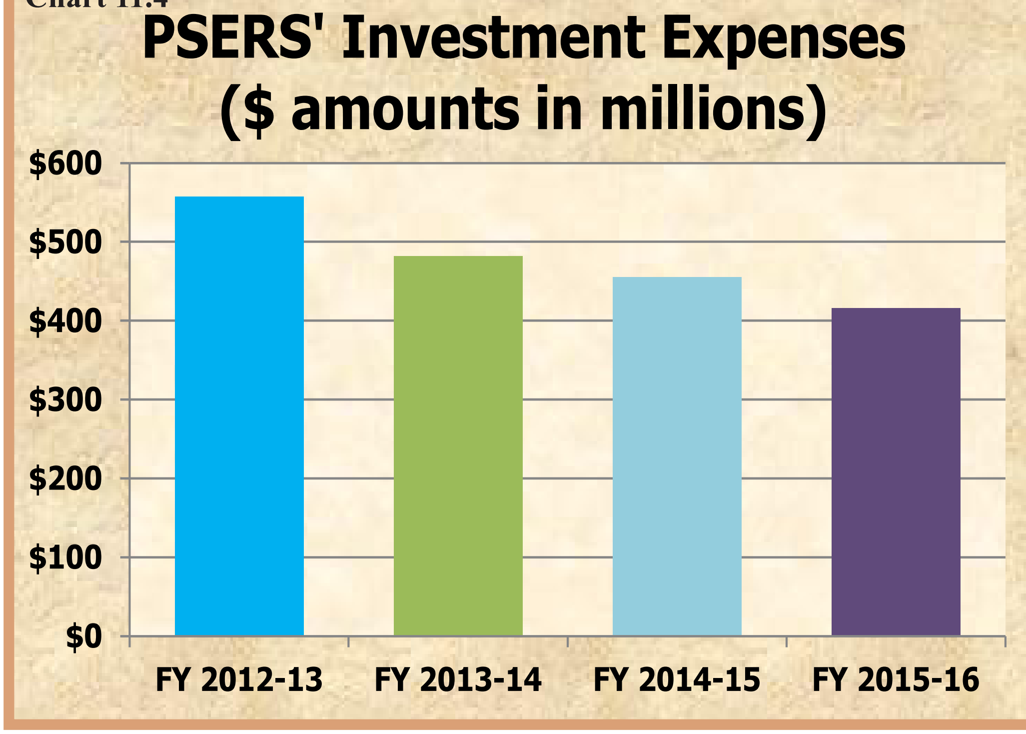
**Table 11.2 summarizes total investment expenses for the fiscal year ended June 30, 2016.** "Total External Management" includes all fees paid to external investment managers as either a base fee or a share of profits earned (performance fee). "Total Internal Management" includes all staff salaries related to PSERS' Investment Office as well as costs needed to support their work (e.g., vendor services, hardware and software, office supplies). "Total Other Expenses" include fees paid to the custodian bank, consultants, and legal services providers.

**Table 11.2 Summary of Investment Advisory Fees**
**Fiscal Year Ended June 30, 2016**
**(Dollar Amounts in Thousands)**

| | Base Fees | Performance Fees | Total Fees | Basis Points |
|---|---|---|---|---|
| **External Management** | | | | |
| U.S. Equity | $ 1,461 | $ 1,736 | $ 3,197 | 102 |
| Non - U.S. Equity | 18,455 | 5,831 | 24,286 | 28 |
| Fixed Income | 77,901 | 3,895 | 81,796 | 75 |
| Real Estate | 52,006 | - | 52,006 | 94 |
| Alternative Investments | 99,492 | - | 99,492 | 91 |
| Absolute Return | 80,209 | 24,055 | 104,264 | 221 |
| Commodities | 4,304 | (272) | 4,032 | 53 |
| Master Limited Partnerships | 6,956 | 1,377 | 8,333 | 53 |
| Risk Parity | 18,428 | - | 18,428 | 60 |
| **Total External Management** | **$ 359,212** | **$ 36,622** | **$ 395,834** | 85 |
| **Total Internal Management** | | | **9,669** | 6 |
| **Total Investment Management** | | | **405,503** | 63 |
| Custodian Fees | | | 2,331 | |
| Consultant and Legal Fees | | | 7,948 | |
| **Total Other Expenses** | | | **10,279** | |
| **Total Investment Expenses** | | | **$ 415,782** | 65 |

Increasing the number and size of portfolios managed internally has been a core initiative in reducing PSERS' Total Investment Expenses in recent years. **As Chart 11.4 illustrates, Total External Management fees have decreased from $538 million in Fiscal Year 2013 to $396 million in Fiscal Year 2016.** It is worth noting that these decreases have occurred while Total Internal Management and Total Other Expenses have remained flat. As discussed elsewhere, PSERS is hopeful that it will be permitted to increase its investment professional complement in order to maintain and even expand these savings.

Chart 11.4



External management fees are treated as a reduction of the investment revenue of the Fund rather than as a budgeted administrative expense.

**Table 11.3**

## Investment Fees by Manager
## Fiscal Year Ended June 30, 2016
### (Dollar Amounts in Thousands)

| Manager | Total Fees |
|---|---|
| **U.S. Equity** | |
| AH Lisanti Capital Growth, LLC | $ (26) |
| AllianceBernstein LP | 79 |
| Radcliffe Capital Management, L.P. | 3,144 |
| **Total - U.S. Equity** | **3,197** |
| | |
| **Non - U.S. Equity** | |
| Acadian Asset Management, LLC | 859 |
| Baillie Gifford Overseas Ltd. | 2,949 |
| Batterymarch Financial Management, Inc. | 557 |
| BlackRock Financial Management, Inc. | 6,400 |
| BlackRock Institutional Trust Company, N.A. | 2,855 |
| Marathon Asset Management Limited | 2,955 |
| Oberweis Asset Management, Inc. | 1,401 |
| Pareto Investment Management, Ltd. | 954 |
| Pyramis Global Advisors Trust Company | 1,061 |
| Wasatch Advisors, Inc. | 4,295 |
| **Total - Non - U.S. Equity** | **24,286** |
| | |
| **Fixed Income** | |
| AllianceBernstein L.P. | 729 |
| Apollo European Principal Finance Fund II(Dollar A), L.P. | 2,567 |
| Avenue Energy Opportunities Fund, L.P. | 1,185 |
| Avenue Europe Special Situations Fund III (U.S.), L.P. | 375 |
| Bain Capital Credit Managed Account (PSERS), L.P. | 1,631 |
| Bain Capital Distressed and Special Situations 2013 (A), L.P. | 2,614 |
| Bain Capital Distressed and Special Situations 2016 (A), L.P. | 92 |
| Bain Capital Middle Market Credit 2010, L.P. | 507 |
| Bain Capital Middle Market Credit 2014, LP | 1,143 |
| BlackRock Financial Management, Inc. | 6,147 |
| Bridgewater Associates, LP | 16,871 |
| Brigade Capital Management, LLC | 978 |
| Cargill Financial Services Corporation | 6,472 |
| Carlyle Energy Mezzanine Opportunities Fund II, L.P. | 1,555 |
| Carlyle Energy Mezzanine Opportunities Fund-Q, L.P. | 1,282 |
| Cerberus Levered Loan Opportunities Fund I, L.P. | 587 |

( ) Represents reversal of amount accrued in prior fiscal year.

**Table 11.3** **Investment Fees by Manager**

**Fiscal Year Ended June 30, 2016**

**(Dollar Amounts in Thousands)**

**(continued)**

| Manager | Total Fees |
|---|---|
| **Fixed Income (continued)** | |
| Cerberus Levered Loan Opportunities Fund II, L.P. | $ 3,481 |
| Cerberus PSERS Levered Loan Opportunities Fund, L.P. | 1,390 |
| Galton Onshore Mortgage Recovery Fund III, L.P. | 790 |
| Hayfin Credit Opp Fund, L.P. | 2,745 |
| ICG Europe Fund V, L.P. | 1,886 |
| ICG Europe Fund VI, L.P. | 1,851 |
| International Infrastructure Finance Company, L.P. | 1,500 |
| LBC Credit Partners II, L.P. | 916 |
| LBC Credit Partners III, L.P. | 3,207 |
| Mariner Investment Group, LLC | 571 |
| Oaktree Loan Fund 2X, LP | 51 |
| Pacific Investment Management Company (PIMCO) | 4,641 |
| Park Square - PSERS Credit Opportunities Fund, L.P. | 861 |
| Piedmont Investment Advisors, LLC | 43 |
| Pugh Capital Management, Inc. | 183 |
| PSERS TAO Partners Parallel Fund, L.P. | 1,608 |
| Radcliffe Capital Management, L.P. | 2,016 |
| Sankaty Credit Opportunities IV, L.P. | 1,725 |
| SEI Investments Company | 640 |
| Stone Harbor Investment Partners, L.P. | 672 |
| Templeton Investment Counsel, LLC | 1,713 |
| TOP NPL (A), L.P. | 79 |
| TPG Opportunities Partners II (A), L.P. | 484 |
| TPG Opportunities Partners III (A), L.P. | 2,239 |
| Varde Scratch and Dent Fund, L.P., The | 1,769 |
| **Total - Fixed Income** | **81,796** |
| | |
| **Real Estate-Direct Ownership** | |
| Charter Oak Advisors, Inc. | 1,084 |
| GF Management, Inc. | 131 |
| Grosvenor Investment Management U.S., Inc. | 12 |
| L & B Realty Advisors, L.L.P. | 87 |
| **Subtotal - Real Estate-Direct Ownership** | **1,314** |
| | |
| **Real Estate-Partnerships/Funds** | |
| AG Core Plus Realty Fund III, L.P. | 626 |
| AG Core Plus Realty Fund IV, L.P. | 179 |

**Table 11.3** **Investment Fees by Manager**

**Fiscal Year Ended June 30, 2016**

**(Dollar Amounts in Thousands)**

**(continued)**

| Manager | Total Fees |
|---|---|
| **Real Estate-Partnerships/Funds (continued)** | |
| Almanac Realty Securities V, L.P. | $ 563 |
| Almanac Realty Securities VI, L.P. | 236 |
| Almanac Realty Securities VII, L.P. | 1,355 |
| Apollo European Real Estate Fund III, L.P. | 345 |
| Apollo European Real Estate Fund IV, L.P. | 1,253 |
| Apollo Real Estate Finance Corporation | 100 |
| Apollo Value Enhancement Fund VII, L.P. | 1,047 |
| Apollo Value Enhancement Fund VIII, L.P. | 901 |
| Avenue Real Estate Fund Parallel, L.P. | 1,138 |
| Beacon Capital Strategic Partners V, L.P. | 201 |
| Bell Institutional Fund IV, LLC | 660 |
| Bell Institutional Fund V, LLC | 645 |
| BlackRock Asia Property Fund III, L.P. | 490 |
| BlackRock Europe Property Fund III, L.P. | 485 |
| Blackstone Real Estate Debt Strategies II, L.P. | 1,142 |
| Blackstone Real Estate Partners Europe III, L.P. | 1,514 |
| Blackstone Real Estate Partners Europe IV, L.P. | 1,500 |
| Blackstone Real Estate Partners VI.TE.1, L.P. | 1,671 |
| Blackstone Real Estate Partners VII.TE.1, L.P. | 2,788 |
| Blackstone Real Estate Partners VIII, L.P. | 3,333 |
| Brookfield Strategic Real Estate Partners, L.P. | 2,250 |
| Brookfield Strategic Real Estate Partners II, L.P. | 172 |
| Cabot Industrial Value Fund IV, L.P. | 1,151 |
| Carlyle Realty Partners IV, L.P. | 796 |
| Carlyle Realty Partners V, L.P. | 849 |
| Carlyle Realty Partners VI, L.P. | 509 |
| Carlyle Realty Partners VII, L.P. | 905 |
| DRA Growth and Income Fund VI, L.P. | 598 |
| DRA Growth and Income Fund VII, L.P. | 1,639 |
| DRA Growth and Income Fund VIII, L.P. | 1,114 |
| Exeter Core Industrial Club Fund II, L.P. | 12 |
| Exeter Industrial Value Fund II, L.P. | 493 |
| Exeter Industrial Value Fund III, L.P. | 786 |
| Fillmore West Fund, L.P. | 2 |
| Fortress Investment Fund IV, L.P. | 573 |
| Fortress Investment Fund V (Fund A), L.P. | 2,271 |
| JPMCB Strategic Property Fund | 265 |

**Table 11.3** **Investment Fees by Manager**

**Fiscal Year Ended June 30, 2016**

**(Dollar Amounts in Thousands)**

**(continued)**

| Manager | Total Fees |
|---|---|
| **Real Estate-Partnerships/Funds (continued)** | |
| Latitude Management Real Estate Capital III, Inc. | $ 848 |
| Legg Mason Real Estate Capital II, Inc. | 592 |
| LEM RE High Yield Debt & Preferred Equity Fund III, L.P. | 562 |
| LEM Real Estate Mezzanine Fund II, L.P. | 140 |
| Madison Marquette Retail Enhancement Fund, L.P. | (400) |
| Paladin Realty Latin America Investors III, L.P. | 385 |
| Paramount Group Real Estate Fund VII, L.P. | 629 |
| Peabody Global Real Estate Partners, L.P. | 12 |
| Pramerica Real Estate Capital VI, L.P. | 148 |
| PRISA | 745 |
| RCG Longview Debt Fund IV, L.P. | 189 |
| RCG Longview Debt Fund V, L.P. | 941 |
| RCG Longview Equity Fund, L.P. | 298 |
| Senior Housing Partnership Fund IV, L.P. | 716 |
| Senior Housing Partnership Fund V, L.P. | 1,117 |
| Silverpeak Legacy Pension Partners II, L.P. | 306 |
| Silverpeak Legacy Pension Partners III, L.P. | 499 |
| Silverpeak/PSERS Real Estate, L.P. | 77 |
| Stockbridge Real Estate Fund, L.P. | 1,952 |
| Stockbridge Real Estate Fund II, L.P. | 627 |
| Stockbridge Real Estate Fund III, L.P. | 2,280 |
| Strategic Partners Fund II RE, L.P. | 53 |
| Strategic Partners Fund IV RE, L.P. | 219 |
| UBS (US) Trumbull Property Fund, L.P. | 960 |
| **Subtotal - Real Estate-Partnerships/Funds** | **50,452** |
| | |
| **Real Estate-Farmland** | |
| Prudential Agricultural Group | 240 |
| **Subtotal - Real Estate-Farmland** | **240** |
| | |
| **Total Real Estate** | **52,006** |
| | |
| **Private Equity** | |
| ABS Capital Partners II, L.P. | 1 |
| Actis Emerging Markets 3, L.P. | 2,282 |
| Actis Global 4 L.P. | 1,798 |
| Bain Capital Asia Fund III, L.P. | 573 |

( ) Represents reversal of amount accrued in prior fiscal year.

**Table 11.3** **Investment Fees by Manager**

**Fiscal Year Ended June 30, 2016**

**(Dollar Amounts in Thousands)**

**(continued)**

| Manager | Total Fees |
|---|---|
| **Private Equity (continued)** | |
| Bain Capital XI, L.P. | $ 750 |
| Baring Asia Private Equity Fund III, L.P. | 633 |
| Baring Asia Private Equity Fund IV, L.P. | 2,978 |
| Baring Asia Private Equity Fund V, L.P. | 3,349 |
| Barings Asia Private Equity Fund VI, L.P. | 1,453 |
| Blue Point Capital Partners III (B), L.P. | 574 |
| Bridgepoint Europe III-A, L.P. | 23 |
| Bridgepoint Europe IV, L.P. | 2,237 |
| Bridgepoint Europe V, L.P. | 915 |
| Capital International Private Equity Fund V, L.P. | 820 |
| Capital International Private Equity Fund VI, L.P. | 1,189 |
| Catterton Growth Partners, L.P. | 840 |
| Catterton Growth Partners II , L.P. | 1,195 |
| Catterton Growth Partners III, L.P. | 698 |
| Catterton Partners V, L.P. | 379 |
| Catterton Partners VI, L.P. | 1,131 |
| Catterton Partners VII, L.P. | 1,757 |
| Cinven Fund (Fourth), L.P. (The) | 833 |
| Cinven Fund (Fifth), L.P. (The) | 764 |
| Coller International Partners VI, L.P. | 1,286 |
| Crestview Capital Partners, L.P. | 283 |
| Crestview Partners II (PF), L.P. | 1,352 |
| CVC Capital Partners Asia III Pacific, L.P. | 708 |
| CVC European Equity Partners V (A), L.P. | 720 |
| DCPF VI Oil and Gas Co-Investment Fund, L.P. | 55 |
| Denham Commodity Partners Fund VI, L.P. | 1,264 |
| Energy & Mineral Group Fund III, L.P. | 1,235 |
| Equistone Partners Europe Fund V E, L.P. | 1,127 |
| Evergreen Pacific Partners II, L.P. | 272 |
| First Reserve Fund XI, L.P. | 753 |
| First Reserve Fund XII, L.P. | 1,445 |
| GoldPoint Partners Co-Investment V, L.P. | 500 |
| HgCapital 7, L.P. | 1,888 |
| HGGC Fund II, L.P. | 439 |
| Incline Equity Partners III, L.P. | 589 |
| Irving Place Capital Partners III, L.P. | 446 |
| Landmark Equity Partners XIII, L.P. | 399 |

**Table 11.3**

# Investment Fees by Manager
## Fiscal Year Ended June 30, 2016
### (Dollar Amounts in Thousands)
(continued)

| Manager | Total Fees |
|---|---|
| **Private Equity (continued)** | |
| Landmark Equity Partners XIV, L.P. | $ 1,490 |
| Milestone Partners II, L.P. | 154 |
| Milestone Partners III, L.P. | 93 |
| Milestone Partners IV, L.P. | 820 |
| New Mountain Partners III, L.P. | 1,386 |
| New Mountain Partners IV, L.P. | 1,210 |
| New York Life Capital Partners III, L.P. | 609 |
| New York Life Capital Partners IV, L.P. | 467 |
| NGP Natural Resources X, L.P. | 1,207 |
| NGP Natural Resources XI, L.P. | 759 |
| North Haven PE Asia Fund IV, L.P. | 1,495 |
| Odyssey Investment Partners Fund V, L.P. | 1,980 |
| Orchid Asia V, L.P. | 405 |
| Orchid Asia VI, L.P. | 1,500 |
| PAI Europe IV, L.P. | 752 |
| PAI Europe V, L.P. | 1,059 |
| PAI Europe VI, L.P. | 1,585 |
| Palladium Equity Partners IV, L.P. | 859 |
| Partners Group Secondary 2008, L.P. | 1,383 |
| Partners Group Secondary 2011, L.P. | 1,766 |
| Partners Group Secondary 2015 (USD) A, L.P. | 744 |
| Permira IV, L.P. | 498 |
| PNC Equity Partners II, L.P. | 44 |
| StepStone International Investors III, L.P. | 636 |
| Strategic Partners II, L.P. | 381 |
| Strategic Partners III-B, L.P. | 500 |
| Strategic Partners IV, L.P. | 346 |
| Strategic Partners V, L.P. | 860 |
| Strategic Partners VI, L.P. | 1,125 |
| Trilantic Capital Partners IV, L.P. | 211 |
| Trilantic Capital Partners V, L.P. | 1,193 |
| **Subtotal - Private Equity** | **69,450** |
| | |
| **Private Debt** | |
| Apollo Investment Fund VIII, L.P. | 1,749 |
| Avenue Asia Special Situations Fund IV, L.P. | 1,047 |
| Avenue Special Situations Fund VI, L.P. | 193 |

## Table 11.3 Investment Fees by Manager
## Fiscal Year Ended June 30, 2016
### (Dollar Amounts in Thousands)
(continued)

| Manager | | Total Fees |
|---|---|---|
| **Private Debt (continued)** | | |
| Cerberus Institutional Partners, L.P. (Series Three) | $ | 80 |
| Cerberus Institutional Partners, L.P. (Series Four) | | 1,058 |
| Cerberus Institutional Partners V, L.P. | | 2,215 |
| Cerberus Institutional Partners VI, L.P. | | 2,069 |
| Clearlake Capital Partners IV, L.P. | | 748 |
| Coller International Partners VII, L.P. | | 648 |
| Gleacher Mezzanine Fund II, L.P. | | 38 |
| GSC Recovery III, L.P. | | 270 |
| NYLIM Mezzanine Partners Parallel Fund II, L.P. | | 97 |
| OCM Opportunities Fund VII, L.P. | | 270 |
| OCM Opportunities Fund VII-B, L.P. | | 456 |
| Searchlight Capital II, L.P. | | 634 |
| Venor Special Situations Fund II, L.P. | | 352 |
| Versa Capital Fund, L.P. | | 718 |
| Versa Capital Fund II, L.P. | | 434 |
| Versa Capital Fund III, L.P. | | 951 |
| Windjammer Senior Equity Fund IV, L.P. | | 1,219 |
| **Subtotal - Private Debt** | | **15,246** |
| | | |
| **Venture Capital** | | |
| Aisling Capital II, L.P. | | 262 |
| Aisling Capital III, L.P. | | 399 |
| Aisling Capital IV, L.P. | | 145 |
| Co-Investment Fund II, L.P. (The) | | 1,334 |
| KBL Partnership, L.P. | | 114 |
| LLR Equity Partners II, L.P. | | 179 |
| LLR Equity Partners III, L.P. | | 1,969 |
| LLR Equity Partners IV, L.P. | | 3,500 |
| Psilos Group Partners III, L.P. | | 252 |
| Quaker BioVentures II, L.P. | | 989 |
| SCP Private Equity Partners II, L.P. | | 422 |
| Starvest Partners II, L.P. | | 397 |
| Strategic Partners III-VC, L.P. | | 181 |
| Strategic Partners IV VC, L.P. | | 230 |
| Summit Partners Growth Equity Fund VIII, L.P. | | 750 |

**Table 11.3** **Investment Fees by Manager**

**Fiscal Year Ended June 30, 2016**

**(Dollar Amounts in Thousands)**

**(continued)**

| Manager | Total Fees |
|---|---|
| **Venture Capital (continued)** | |
| Tenaya Capital V-P, LP | $ 787 |
| Tenaya Capital VI, L.P. | 1,000 |
| Tenaya Capital VII, L.P. | 1,886 |
| **Subtotal - Venture Capital** | **14,796** |
| | |
| **Total Alternative Investments** | **99,492** |
| | |
| **Absolute Return** | |
| Aeolus Capital Management Ltd. | 9,125 |
| BlackRock Financial Management, Inc. | 18,176 |
| Brevan Howard Asset Management LLP | 3,695 |
| Bridgewater Associates, Inc. | 21,053 |
| Brigade Capital Management, LLC | 3,458 |
| Capula Global Relative Value Fund | 5,836 |
| Capula Tail Risk Fund | 7,639 |
| Caspian Select Credit International, Ltd. | 8,459 |
| Garda Asset Management LLC | 6,739 |
| Independence Reinsurance Partners GP, LLC | 889 |
| Nephila Capital Ltd. | 3,598 |
| Oceanwood Capital Management L.L.P. | (2,148) |
| One William Street Capital Management, L.P. | 2,113 |
| Pacific Investment Management Company (PIMCO) | 8,863 |
| Perry Partners, L.P. | 2,131 |
| Sciens Aviation Spec Opp Inv Fund II | 2,085 |
| Sciens Aviation Spec Opp Inv Fund III | 2,553 |
| **Total - Absolute Return** | **104,264** |
| | |
| **Commodities** | |
| Gresham Investment Management, LLC | 609 |
| Wellington Management Company, L.L.P. | 3,423 |
| **Total - Commodities** | **4,032** |

( ) Represents reversal of amount accrued in prior fiscal year.

**Table 11.3** **Investment Fees by Manager**

**Fiscal Year Ended June 30, 2016**

**(Dollar Amounts in Thousands)**

**(continued)**

| Manager | Total Fees |
|---|---|
| **Master Limited Partnerships** | |
| Harvest Fund Advisors, LLC | $ 3,273 |
| Salient Capital Advisors, LLC | 2,476 |
| Stein Roe Investment Counsel D/B/A Atlantic Trust | 2,584 |
| **Total - Master Limited Partnerships** | **8,333** |
| **Risk Parity** | |
| AQR Capital Management, LLC | 1,841 |
| BlackRock Institutional Trust Company, N.A. | 2,076 |
| Bridgewater All Weather Fund @15%, Ltd. | 4,109 |
| Bridgewater Optimal Portfolios, Ltd. | 3,889 |
| D. E. Shaw & Co., L.P. | 6,513 |
| **Total - Risk Parity** | **18,428** |
| **Total External Management** | **395,834** |
| **Total Internal Management** | **9,669** * |
| **Total Investment Management** | **$ 405,503** |

*Internal Management expenses include salaries and fringe benefits of $6,719 and operating expenses of $2,950.

## Investment Fees and Expenses Initiatives

PSERS continues to pursue several avenues intended to maintain a reasonable cost structure. These initiatives include:

- Identifying opportunities to invest more assets internally. PSERS' current staffing levels are too low to significantly increase internal asset management, but we continue to work with the Administration to look for ways to reduce investment fees by increasing internal investment staff. PSERS continues to believe this is in the best interests of both the Fund and the Commonwealth and, therefore, has included additional positions in the FY2017-18 budget request.

- For external managers making traditional investments, reduce base fees and create better alignment of interests by moving to a lower base fee coupled with a profit share.

- For external managers making traditional and absolute return investments, enter into arrangements for netting of profit shares for managers with multiple PSERS mandates.

- For external managers making non-traditional investments, continue to grow co-investments (which have lower fees and profit shares).

- For external managers making non-traditional investments, move away from paying on committed capital and towards paying on invested capital.

- For external managers, re-underwriting all fee arrangements to ensure that the fee arrangements are fair and equitable.

## Commitment to Pennsylvania Financial Services Firms

**(as of June 30, 2016)**

The members of the Board and Staff are fiduciaries and must act in the interests of the members of the System and for the exclusive benefit of the System's members. In creating the investment program, the Board hires both external investment managers and internal investment managers. The Board has determined that it is in the best interest of the System to manage assets internally when (1) the System's staff has the proven ability and capacity to manage portfolios internally at least as well as the external investment managers, and (2) the cost of investing those assets is no greater than the cost that would have been incurred to have those assets externally managed. The Board will also consider the diversification benefits that may be achieved by allocating assets to external portfolio managers even when conditions (1) and (2) are met.

The Board evaluates external managers based on a variety of factors, including: (1) a unique insight or process; (2) the ability to add long-term excess returns above passive alternatives, net of fees; (3) adequate capacity to execute the strategy; (4) adding diversification to our existing investment structure; (5) not exhibiting style drift, and; (6) exhibiting a high level of ethical behavior. In selecting external managers, PSERS will show preference to Pennsylvania-based potential managers that demonstrate similar strengths to alternative managers without a Pennsylvania nexus.

PSERS has shown a strong commitment to Pennsylvania's financial services industry by having assets managed by firms based in Pennsylvania or by firms with offices in Pennsylvania. In FY 2016, investment management fees paid to external firms managing PSERS' assets from offices located in Pennsylvania amounted to $ 27.6 million, or 7.0% of the total external investment manager fees.

**Table 12.1 lists the asset exposures managed internally by PSERS, as of June 30, 2016.**

Table 12.1

**Pennsylvania-Based Asset Exposures Managed Internally**

**(as of June 30, 2016)**

| Asset Class | Market Value (in millions) | Percentage of Total |
|---|---|---|
| U.S. Equity | $ 3,790.3 | 19.7 % |
| Non-U.S. Equity | 3,165.5 | 16.4 |
| Private Markets | 370.6 | 1.9 |
| Fixed Income | 5,314.1 | 27.6 |
| Master Limited Partnerships | 460.5 | 2.4 |
| Commodities | 3,137.9 | 16.3 |
| Infrastructure | 506.9 | 2.6 |
| Real Estate | 534.2 | 2.7 |
| Risk Parity | 2,009.0 | 10.4 |
| **Totals** | **$ 19,289.0** | **100.0 %** |

## Commitment to Pennsylvania Financial Services Firms
**(continued)**

**Chart 12.1 displays the distribution of exposures managed internally as of June 30, 2016.**

Chart 12.1

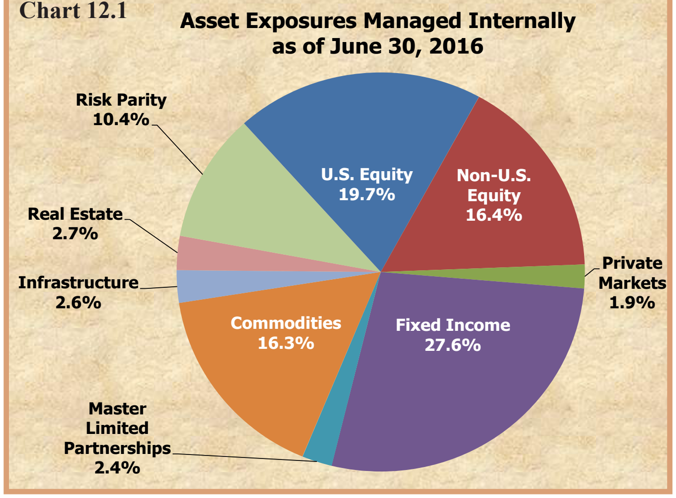



**Table 12.2 is a list of assets managed by external managers with headquarters or offices located in Pennsylvania, as of June 30, 2016.**

**Table 12.2** ***Pennsylvania-Based External Managers***

| | |
|---|---|
| Fixed Income: | Venture Capital: |
| International Infrastructure Finance Company Fund, L.P. | Adams Capital Management, L.P. |
| LBC Credit Partners II, LP | Co-Investment 2000 Fund, L.P. |
| LBC Credit Partners III, LP | Co-Investment Fund II, L.P. |
| Mariner - International Infrastructure Finance Company Fund L.P. | Cross Atlantic Technology Fund, L.P. |
| Radcliffe Capital Management | Cross Atlantic Technology Fund II, L.P. |
| SEI Investments Company | LLR Equity Partners, L.P. |
| | LLR Equity Partners II, L.P. |
| Master Limited Partnership: | LLR Equity Partners III, L.P. |
| Harvest Fund Advisors, LLC | LLR Equity Partners IV, L.P. |
| | NEPA Venture Fund II |
| Real Estate: | Novitas Capital, L.P. |
| BPG Co-Investment Fund | Novitas Capital II, L.P. |
| Charter Oak Advisors, Inc. | Quaker Bio-Ventures, L.P. |
| Exeter Core Industrial Club Fund II, L.P. | Quaker Bio-Ventures II, L.P. |
| Exeter Industrial Value Fund II, L.P. | SCP Private Equity Partners I, L.P. |
| Exeter Industrial Value Fund III, L.P. | SCP Private Equity Partners II, L.P. |
| GF Management, Inc. | TDH III, L.P. |
| LEM Real Estate Mezzanine Fund II, L.P. | |
| LEM RE High Yield Debt & Preferred Equity Fund III, LP | |
| | |
| Private Equity and Debt: | |
| Incline Equity Fund III, L.P. | |
| Milestone Partners II, L.P. | |
| Milestone Partners III, L.P. | |
| Milestone Partners IV, L.P. | |
| PNC Equity Partners, L.P. | |
| PNC Equity Partners II, L.P. | |
| Versa Capital Fund I, L.P. | |
| Versa Capital Fund II, L.P. | |
| Versa Capital Fund III, L.P. | |

## Investments in Pennsylvania-Based Companies

**(as of June 30, 2016)**

Where investment characteristics including yield, risk, and liquidity are equivalent, the Board's policy favors investments that have a positive impact on the economy of Pennsylvania. The Board, in managing the investment portfolio, will also be cognizant of concentration risk to any one region, including Pennsylvania. The Fund will continue to seek investments in Pennsylvania-based companies when the investment characteristics are equivalent to other favorable investments, subject to diversification considerations.

**U.S. Equities**

PSERS invests in the stock of Pennsylvania-based companies through the various U.S. Equity portfolios managed by external and internal portfolio managers. PSERS has always had investments in large national firms located in Pennsylvania.

**Fixed Income Securities**

PSERS invests in the debt of Pennsylvania-based companies through the various Fixed Income portfolios managed by external and internal portfolio managers. PSERS has always had investments in large national firms located in Pennsylvania.

**Private Real Estate**

PSERS has investments in limited partnerships that have invested in Pennsylvania real estate properties. PSERS Real Estate program has committed $16.3 billion to 124 partnerships. From the program inception to June 30, 2016, PSERS has committed capital to 16 partnerships headquartered in Pennsylvania.

**Venture Capital**

PSERS' Venture Capital program has committed $2.9 billion to 58 partnerships. In addition to the current geographically diverse scope of venture capital investments, a historical objective of this program has been to target partnerships that demonstrate an ability to invest in Pennsylvania-based companies. Selected partnerships offer diversification according to geographic region and financing stage within Pennsylvania. From the program inception to June 30, 2016, PSERS has committed capital to 29 partnerships headquartered in Pennsylvania.

**Private Equity**

PSERS' Private Equity program has committed $19.4 billion to 146 partnerships. From the program inception to June 30, 2016, PSERS has committed capital to 7 partnerships headquartered in Pennsylvania.

**Private Debt**

PSERS' Private Debt program has committed $5.1 billion to 34 partnerships. From the program inception to June 30, 2016, PSERS has committed capital to 3 partnerships headquartered in Pennsylvania.

**Private Markets and Real Estate Pennsylvania In-House Co-Investment Program**

PSERS seeks to make co-investments in assets located in Pennsylvania from funds where PSERS or Portfolio Advisors, PSERS Private Market Consultant, is already a Limited Partner. PSERS has set aside $250 million to be committed to this program. As of June 30, 2016, PSERS has invested $21.6 million in the Private Markets and Real Estate Pennsylvania In-House Co-Investment Program. The number of employees, payroll and market value are included within their respective asset class.

**Table 12.3 displays Pennsylvania-based investments and other statistics at June 30, 2016 ($'s in millions):**

Table 12.3 **Statistics of Pennsylvania-Based Investments**

| *Asset Class* | *Total PA Market Value (PSERS' Portion)* | *Total PA Market Value (Total Invested)* | *# of People Employed* | *Payroll* |
|---|---|---|---|---|
| U.S. Equities | $ 248.0 | $ 248.0 | * | $ * |
| Fixed Income | 55.0 | 55.0 | * | * |
| Private Real Estate | 81.4 | 2,219.4 | 391 | 8.0 |
| Private Markets: | | | | |
| Venture Capital | 113.8 | 358.5 | 2,615 | 77.9 |
| Private Equity | 1,127.9 | 16,364.4 | 24,033 | 584.4 |
| Private Debt | 255.2 | 2,294.1 | 11,726 | 160.5 |
| **Total** | **$ 1,881.3** | **$ 21,539.4** | **38,765** | **$ 830.8** |

* Statistics for publicly traded companies not included due to the difficulty in obtaining the information.