Section 3 - Investment Information

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Investment Policy

The Public School Employees' Retirement Board of Trustees (the Board) are 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.pa.gov, 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;
- Asset-Liability studies 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.

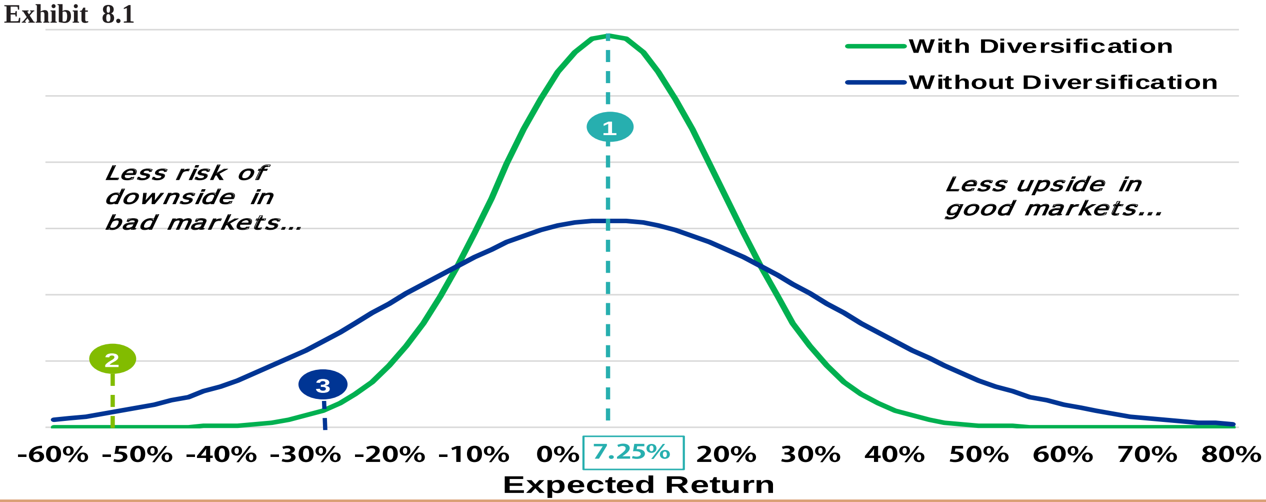
Given its long-term investment horizon, PSERS accepts prudent investment risk in exchange for acceptable levels of additional incremental return. PSERS diversifies across investment categories, each having different characteristics across all market environments.

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 22.5%, 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%.

Effects of Diversification on a Normal Distribution

Exhibit 8.1

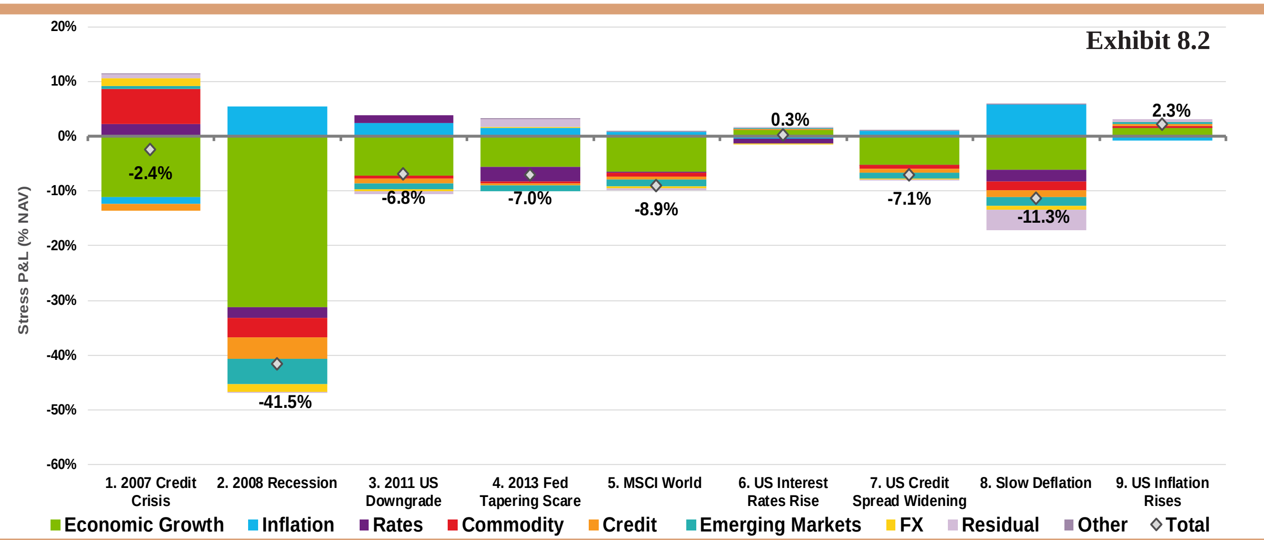


Investment Risk Management
(continued)

One way that PSERS assesses the amount of diversification in the portfolio is through stress testing. This testing process 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, 2017, 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 2016, 2017 survey results under the 20-year forecast indicate a slight decrease in return assumptions across most asset classes. 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.

Equities

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

- Global equity assumptions have slightly decreased across most markets as valuations have increased in recent years

Equity market returns over the past three 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.

Fixed Income

Nominal government bond returns are a function of long-term expectations for inflation and government yields. Corporate bond returns are a function of expected inflation, government yields and expectations for credit spreads, defaults and downgrades. The majority of the decrease in corporate bond return assumptions can be explained by falling yields and flattening of yield curves.

Real Estate

Like equities, real estate assumptions have increased to their 2013 levels due to strong supply/demand fundamentals in the asset class.

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, 2016 and 2017:

Table 8.1 — **PSERS Capital Market Assumptions (CMAs)**

Average Expected Geometric Returns (2013 - 2017)

Asset Class	2013 Survey	2014 Survey	2015 Survey	2016 Survey	2017 Survey
U.S. Equity - Large Cap	7.6%	7.4%	7.1%	7.9%	7.8%
U.S. Equity - Small Cap	8.1%	7.7%	7.3%	8.2%	8.4%
Non-U.S. Equity - Developed	8.0%	7.8%	7.5%	8.0%	7.6%
Non-U.S. Equity - Emerging	9.1%	8.9%	8.7%	9.1%	8.7%
U.S. Fixed Income - Core	3.4%	4.0%	3.7%	4.6%	4.4%
U.S. Fixed Income - Long Duration Corp.	4.2%	4.9%	4.0%	4.9%	4.8%
U.S. Fixed Income - High Yield	5.9%	6.0%	6.0%	6.8%	6.2%
Non-U.S. Fixed Income - Developed	3.0%	3.5%	2.7%	3.7%	3.5%
Non-U.S. Fixed Income - Emerging	5.4%	5.9%	6.0%	6.4%	6.2%
Treasuries (Cash Equivalents)	2.2%	2.7%	2.4%	3.2%	3.2%
TIPS (Inflation-Protected)	2.6%	3.5%	3.1%	3.9%	4.0%
Real Estate	6.8%	6.5%	6.3%	6.8%	6.7%
Hedge Funds	6.4%	6.3%	5.8%	6.2%	6.0%
Commodities	5.1%	4.9%	4.4%	4.8%	5.0%
Infrastructure	7.1%	7.8%	7.1%	7.1%	7.1%
Private Equity	10.1%	9.8%	9.5%	10.3%	10.1%
Inflation	2.5%	2.4%	2.2%	2.3%	2.4%

Capital Market Assumptions
(continued)

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. This, along with historically low interest rates, has resulted in lower expected alpha opportunities for hedge funds generally.

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 - 2017)				
Asset Class	**2013 Survey**	**2014 Survey**	**2015 Survey**	**2016 Survey**	**2017 Survey**
U.S. Equity - Large Cap	18.1%	17.5%	17.1%	16.9%	16.6%
U.S. Equity - Small Cap	22.5%	21.1%	21.0%	21.0%	20.2%
Non-U.S. Equity - Developed	20.5%	19.8%	19.6%	19.5%	18.9%
Non-U.S. Equity - Emerging	27.5%	26.4%	26.6%	26.4%	25.4%
U.S. Fixed Income - Core	5.3%	5.4%	5.6%	6.0%	5.5%
U.S. Fixed Income - Long Duration Corp.	11.8%	11.3%	10.8%	10.5%	10.4%
U.S. Fixed Income - High Yield	12.3%	11.5%	11.2%	11.0%	10.6%
Non-U.S. Fixed Income - Developed	8.2%	7.6%	7.4%	7.6%	7.4%
Non-U.S. Fixed Income - Emerging	12.4%	10.9%	11.7%	11.6%	11.8%
Treasuries (Cash Equivalents)	1.8%	2.3%	2.8%	2.8%	3.0%
TIPS (Inflation-Protected)	5.9%	6.3%	6.3%	6.5%	6.3%
Real Estate	12.4%	13.1%	13.6%	14.7%	14.5%
Hedge Funds	9.4%	9.0%	8.3%	8.4%	8.0%
Commodities	18.5%	18.0%	18.0%	18.5%	17.9%
Infrastructure	15.2%	13.5%	13.1%	13.8%	14.6%
Private Equity	26.2%	24.8%	23.6%	23.1%	22.0%
Inflation	2.0%	2.1%	1.8%	1.8%	1.7%

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Asset Exposure

(as of June 30, 2017)

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, 2016, and was in effect on June 30, 2017:

Table 9.1 PSERS' Asset Exposure and Target Asset Allocation Plan

(as of June 30, 2017)

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	$ 3,729.6	6.1 %	7.2 %	7.4 %	
Non-U.S. Equity	6,786.2	11.1	13.1	11.6	
Total Global Public Market Equity	$ 10,515.8	17.2 %	20.3 %	19.0 %	
Private Markets	7,656.4	12.6	14.8	16.0	
Total Equity	**$ 18,172.2**	**29.8 %**	**35.1 %**	**35.0 %**	± 10%
Fixed Income*	**$ 19,199.3**	**31.5 %**	**37.0 %**	**36.0 %**	± 10%
Commodities*	$ 4,059.6	6.7 %	7.8 %	8.0 %	± 4%
Infrastructure*	3,417.5	5.6	6.6	6.0	
Real Estate*	5,956.1	9.8	11.5	12.0	
Total Real Asset Exposure	**$ 13,433.2**	**22.1 %**	**25.9 %**	**26.0 %**	± 10%
Risk Parity*	**$ 5,051.1**	**8.3 %**	**9.7 %**	**10.0 %**	± 5%
Absolute Return	**$ 5,049.3**	**8.3 %**	**9.7 %**	**10.0 %**	± 5%
Gross Asset Exposure	**$ 60,905.1**	**100.0 %**	**117.4 %**	**117.0 %**	
Financing*	**$ (9,070.9)**		**(17.4) %**	**(17.0) %**	
Net Asset Exposure	**$ 51,834.2**		**100.0 %**	**100.0 %**	

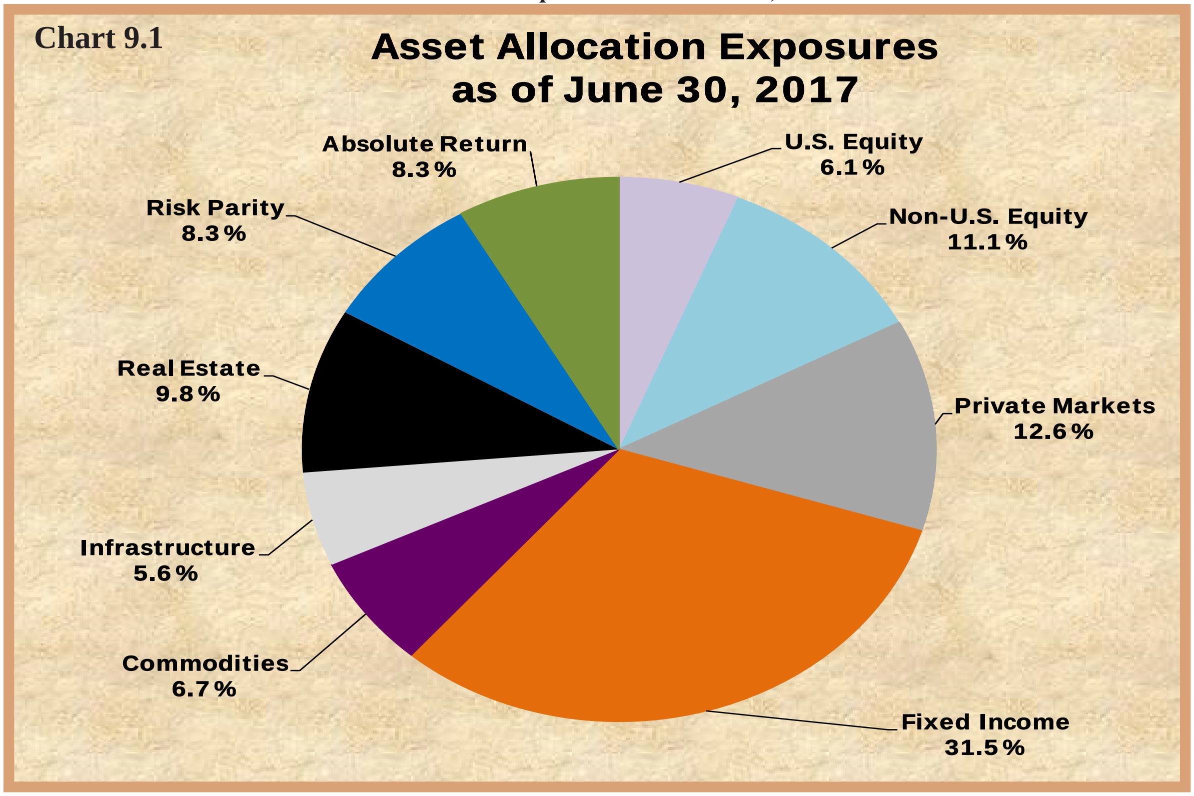
*PSERS uses financing to achieve increased economic exposure to diversifying asset classes to manage the overall portfolio risk while maintaining an allocation designed to achieve the long-term return goals of the System. Increased economic exposure is generally achieved through the use of either derivative positions or higher volatility funds. As of June 30, 2017, PSERS had total increased economic exposure of $9.1 billion related to the following asset classes: Fixed Income ($5.6 billion); Risk Parity ($0.5 billion); Infrastructure ($0.5 billion); Real Estate ($0.3 billion) and Commodities ($2.2 billion).

Note: PSERS' asset allocation was updated October 1, 2017, and is available for review at http://www.psers.pa.gov.

Asset Exposure

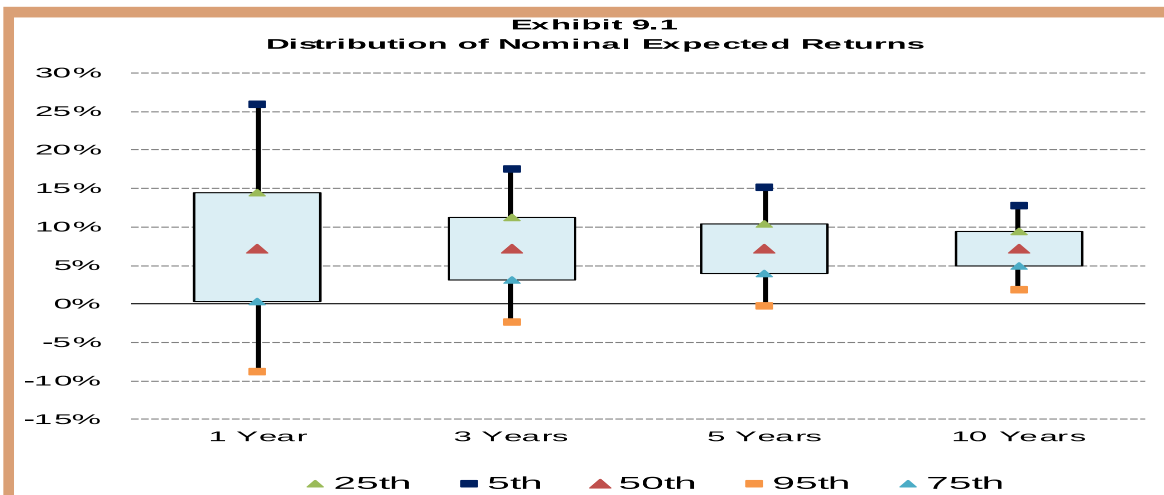
(continued)

Chart 9.1 illustrates PSERS' asset allocation exposure as of June 30, 2017:



Note: Financing represents a negative 17.4% allocation and is not reflected in Chart 9.1.

The purpose of the asset allocation is to meet the long-term 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:



Range of Returns

Percentiles	1 Year	3 Years	5 Years	10 Years
5%	25.9%	17.6%	15.1%	12.7%
25%	14.5%	11.3%	10.4%	9.4%
50%	7.1%	7.1%	7.1%	7.1%
75%	0.3%	3.1%	4.0%	4.9%
95%	-8.8%	-2.4%	-0.3%	1.8%

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 19.0% 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.

Table 9.2 reflects the more recent total returns for the past 10 years (through March 31, 2017) for PSERS' Private Equity Program, the MSCI World Net Total Return USD Index, a global equity index, and the Vanguard Global Equity Fund (VHGEX).

Table 9.2 10 Year Return Comparison

	10 Year, Net of Fee Return (March 2007 - March 2017)
PSERS' Private Equity Program	**7.74%**
MSCI World Net Total Return USD Index	**4.21%**
Vanguard Global Equity Fund (VHGEX)	**3.85%**

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.

Private Market Investments
(continued)

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 36.0% of assets to Fixed Income, 9.0% of which is designated to Investment Grade, 9.0% of which is designated to Credit-Related, 15.0% 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 Basket 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 2.0% 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 10.0% is designated for Private Real Estate and 2.0% 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.

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 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, 2017, the System generated a total net of fee return of 10.14%. This return was above the Total Fund Policy Index return of 6.39% by 375 basis points. Annualized total net of fee returns for the three-, five-, and ten-year periods ended June 30, 2017 were 4.76%, 7.35%, and 3.80%, respectively. The three-, five- and ten-year returns ended June 30, 2017, exceeded the Total Fund Policy Index returns by 127, 188, and 100 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, 2017			
	1 Year	3 Years	5 Years	10 Years
PSERS Total Portfolio	**10.14**	**4.76**	**7.35**	**3.80**
Total Fund Policy Index	6.39	3.49	5.47	2.80
Median Public Defined Benefit Plan (DBP) Fund Universe (Aon Hewitt Database)	11.73	5.04	8.58	5.20
PSERS U.S. Equity Portfolios	**19.32**	**9.68**	**15.04**	**7.15**
U.S. Equity Policy Index (1)	18.43	9.14	14.59	7.21
PSERS Non-U.S. Equity Portfolios	**22.57**	**7.12**	**10.97**	**3.96**
Non-U.S. Equity Policy Index (2)	22.32	5.60	10.19	2.96
PSERS Fixed Income Portfolios (10)	**5.22**	**4.51**	**5.17**	**7.36**
Fixed Income Policy Index (3)	3.09	2.69	2.83	6.10
PSERS Commodity Portfolios (10)	**-3.48**	**-8.02**	**-4.62**	**-3.42**
Commodity Policy Index (4)	-6.41	-10.45	-6.49	-5.08
PSERS Absolute Return Portfolios	**9.00**	**3.16**	**4.09**	**4.99**
Absolute Return Policy Index (5)	4.53	4.10	5.45	6.67
PSERS Risk Parity Portfolios (11)	**7.17**	**2.05**	**N/A**	**N/A**
Risk Parity Policy Index (6)	5.81	3.33	N/A	N/A
PSERS Master Limited Partnership (MLP) Portfolios	**4.19**	**-8.71**	**7.23**	**N/A**
Standard & Poor's MLP Index	3.23	-11.25	2.48	5.99
PSERS Infrastructure Portfolios	**10.86**	**N/A**	**N/A**	**N/A**
Infrastructure Policy Index*	10.15	N/A	N/A	N/A
PSERS Real Estate (7) (10)	**8.38**	**10.36**	**11.18**	**0.66**
Blended Real Estate Index (8)	2.92	7.38	8.59	5.20
PSERS Alternative Investments (7)	**14.36**	**6.68**	**8.89**	**7.74**
Burgiss Median Return, Vintage Year Weighted (9)	3.00	3.50	4.33	3.02

***FTSE Developed Core Infrastructure 50/50 (Hedged to USD) Index (Net) effective October 1, 2015.**
This represents a blend of three broad sectors: 50% Utilities, 30% Transportation (with rails capped at 7.5%) and 20% mix of other sectors including pipelines, satellites, and communication towers.

Other Footnotes to the Total Portfolio are available on page 85 of PSERS Comprehensive Annual Financial Report.

Performance
(continued)

The past fiscal year was a strong year for the System with a net of fee return of 10.14%. The following asset classes generated solid returns this past fiscal year:

- Public Equities, as represented by the MSCI ACWI IMI with USA Gross Index (net), were up 20.85%. Returns in global equities were driven by the prospects of US reflationary policies, subsided political risk within continental Europe, and strong corporate and economic fundamentals.
- High Yield, as represented by the Bloomberg Barclays U.S. Corporate High Yield Index, was up 12.70%. Returns were supported by investors reaching for higher yields as the interest rate environment remains low.
- Infrastructure, as represented by the FTSE Developed Core Infrastructure 50/50 100% Hedged Index-Net, was up 10.15%. Returns in infrastructure were supported by improving economic momentum, favorable global interest rate backdrop as well as the anticipation of favorable Trump administration infrastructure spending.

Significant detractors from performance this past fiscal year included:

- U.S. Long Treasuries, as represented by the Bloomberg Barclays U.S. Treasury Long Index, were down 7.22%. Returns in long-term treasuries were driven by rising interest rates.
- Commodities, as represented by the Bloomberg Commodity Index, were down 6.50% led by a fall in oil prices. Crude oil futures fell from $49.44 a barrel on June 30, 2016, to $46.36 a barrel on June 30, 2017. Prices continued to fall 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 public equities, which were up over 20%. Public equities are also one of the most volatile asset classes as illustrated by its return last year of -4.97%. 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. PSERS employs diversification across a wide variety of public and private markets. Exposure to private equity, private real estate, and absolute return strategies all provided return enhancement and diversification benefits in 2017. Diversification into asset classes such as U.S. Long Treasuries and commodities 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 1.68 for the 5 year period ending June 30, 2017, a top 38th percentile score.

The fiscal year continued a recent trend of strong performance while volatility remained near historic lows, with the VIX dipping into single digits in early May. Global equities advanced steadily higher throughout the 12-month period to June 2017 with the MSCI AC World index returning 19.2% in local currency terms. The strong equity performance came despite uncertainties created by increasing political risks. The UK economy proved to be resilient after the surprise Brexit vote in the EU referendum and economic conditions improved across many regions. A surprise Donald Trump win in the US presidential election further boosted optimism in the US economy towards the end of the year. Equity markets were driven higher with prospects of greater reflationary policies pursued by the new US administration and solid economic releases, particularly in the Eurozone, and strong corporate earnings growth on a global basis.

Major central bank policy diverged over the period with the US Federal Reserve (Fed) raising the target federal funds rate in three successive quarters starting at the end of 2016 and reaching 1.00-1.25% in June 2017. In contrast, monetary policy eased in other major countries as the Bank of England (BoE), the European Central Bank (ECB) and the Bank of Japan (BoJ) pursued greater monetary easing, utilizing a combination of lower policy rates and extended quantitative easing (QE). Commodity prices were fairly directionless over the 12 months. The Organization of the Petroleum Exporting Countries' (OPEC) production cuts, announced in late 2016, were later extended to March 2018. However, US crude oil inventories remained stubbornly high which has capped the price of Brent crude oil.

While it has been a challenging return environment as evidenced by the System's three-, five-, and ten-year returns, since the first quarter after the Great Recession, PSERS' annualized net of fee return has been 9.28%, comfortably above the actuarial assumed rate of return of 7.25%. With

Performance
(continued)

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 public equities, high yield, and infrastructure did this past fiscal year, and some to not do as well, such as U.S. Long Treasuries 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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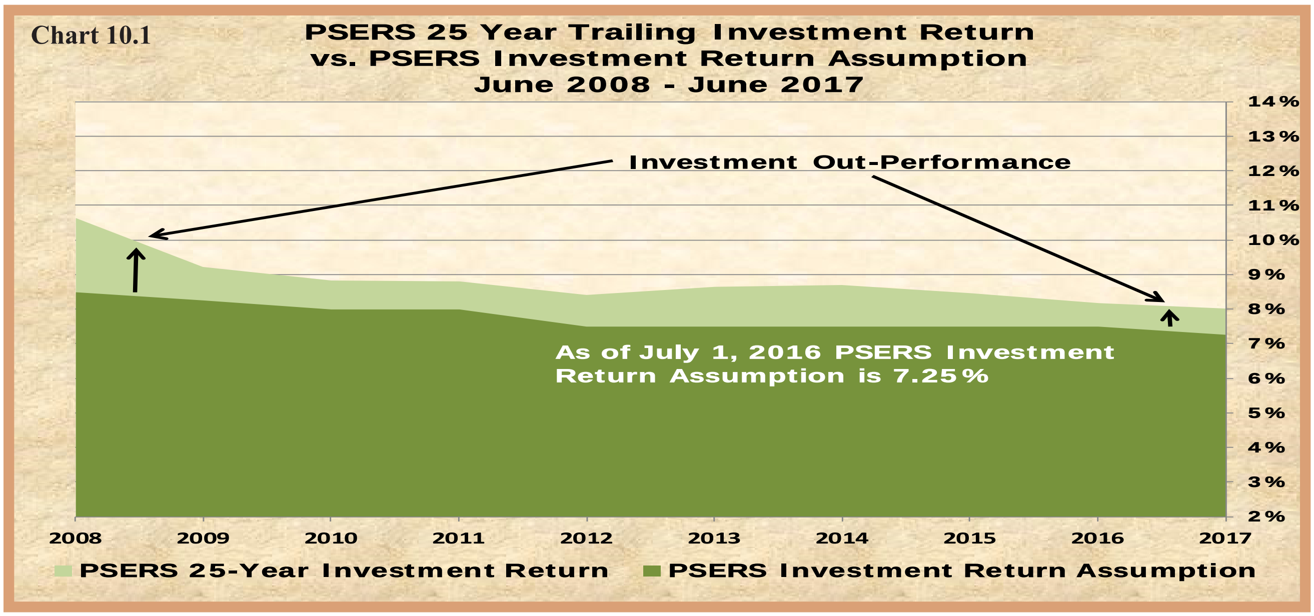
Performance (continued)

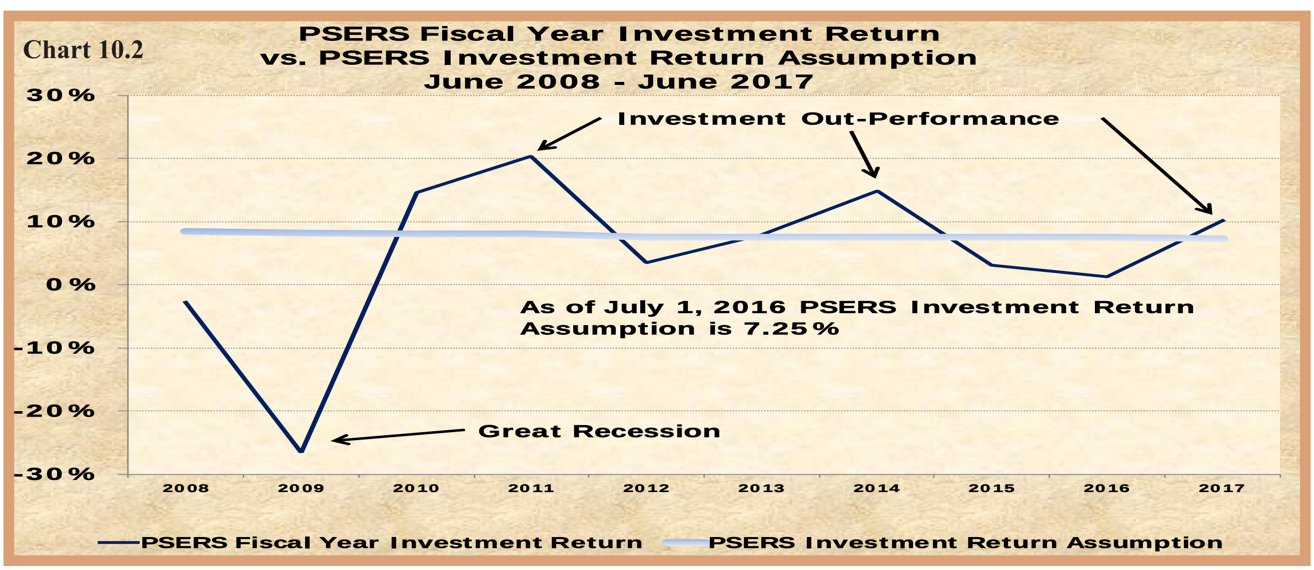
Long Term Investment Performance Consistently Outperforms

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 PSERS' Fiscal Year Investment Return 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.



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 Great Recession period from December 2007 through June 2009 which resulted in the largest decrease in stock market performance since the Great Depression.



Performance (continued)

Table 10.2 demonstrates that over the past 18 fiscal years, on average, every dollar PSERS has spent in investment fees and expenses has resulted in investment earnings of $2.37 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*
2017	$ 474	1.78 %	$ 814	$ 2.72
2016	416	(1.81)%	(868)	(1.09)
2015	455	0.00 %	(14)	0.97
2014	482	0.58 %	254	1.53
2013	558	1.14 %	525	1.94
2012	481	1.78 %	849	2.77
2011	515	3.74 %	1,585	4.08
2010	522	4.28 %	1,754	4.36
2009	478	(5.22)%	(3,131)	(5.55)
2008	399	(0.98)%	(618)	(0.55)
2007	314	4.36 %	2,360	8.52
2006	211	3.26 %	1,635	8.75
2005	193	2.36 %	1,090	6.65
2004	191	3.51 %	1,388	8.27
2003	179	(0.43)%	(141)	(0.21)
2002	163	0.57 %	319	2.96
2001	144	2.13 %	1,200	9.33
2000	125	1.85 %	934	8.47
Total	**$ 6,300**		**$ 9,938**	**$ 2.37**

*Dollar amounts in millions.

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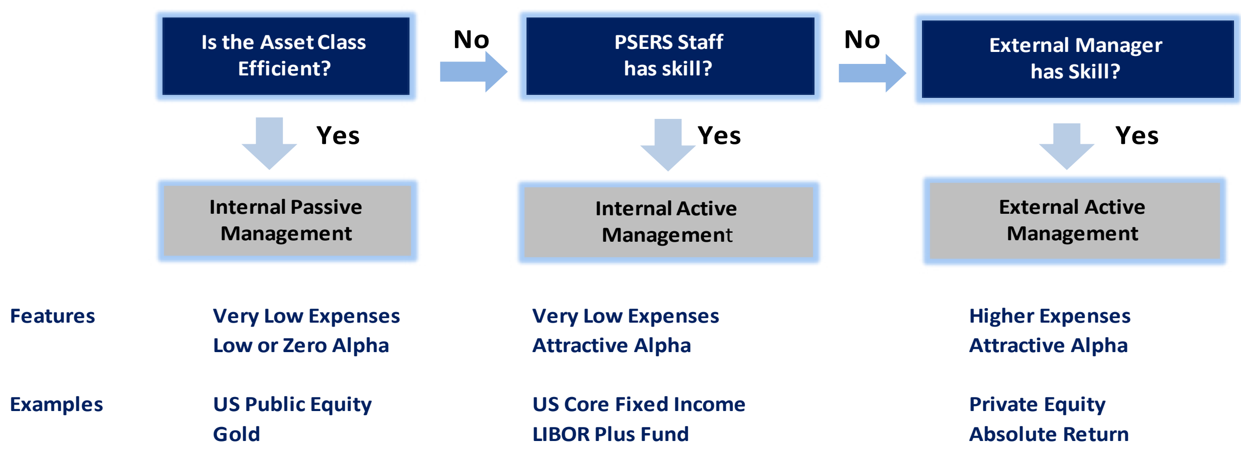
Managing Investment Fees and Expenses

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 18 fiscal years, PSERS has earned $10.0 billion in additional investment returns above the Board-approved Policy Index, net of fees.

Chart 11.2

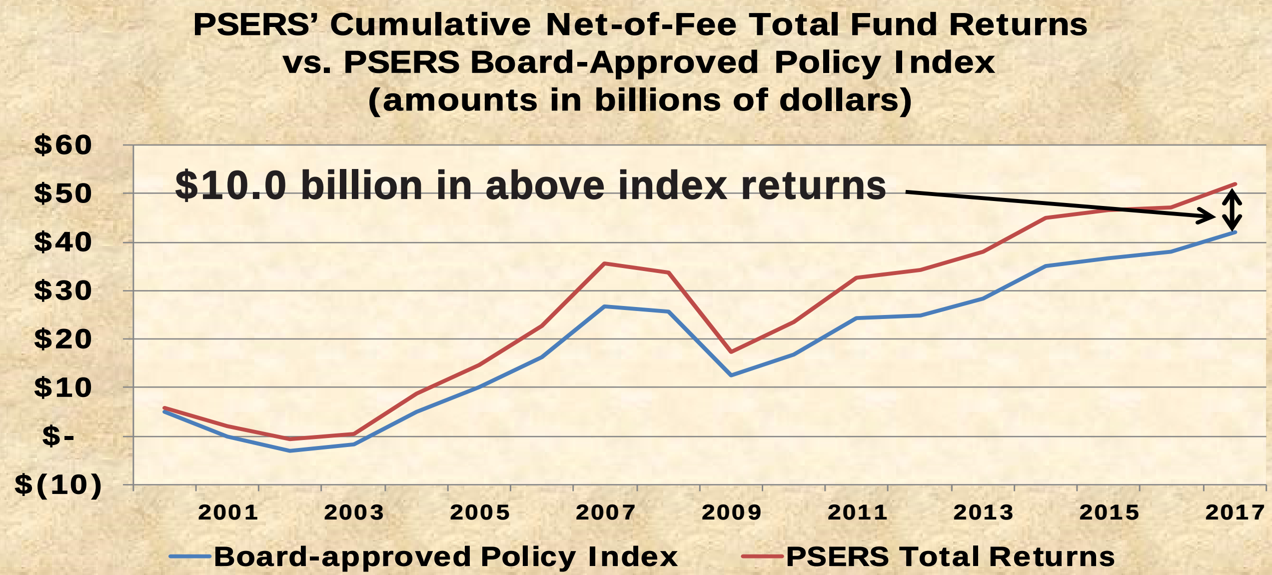
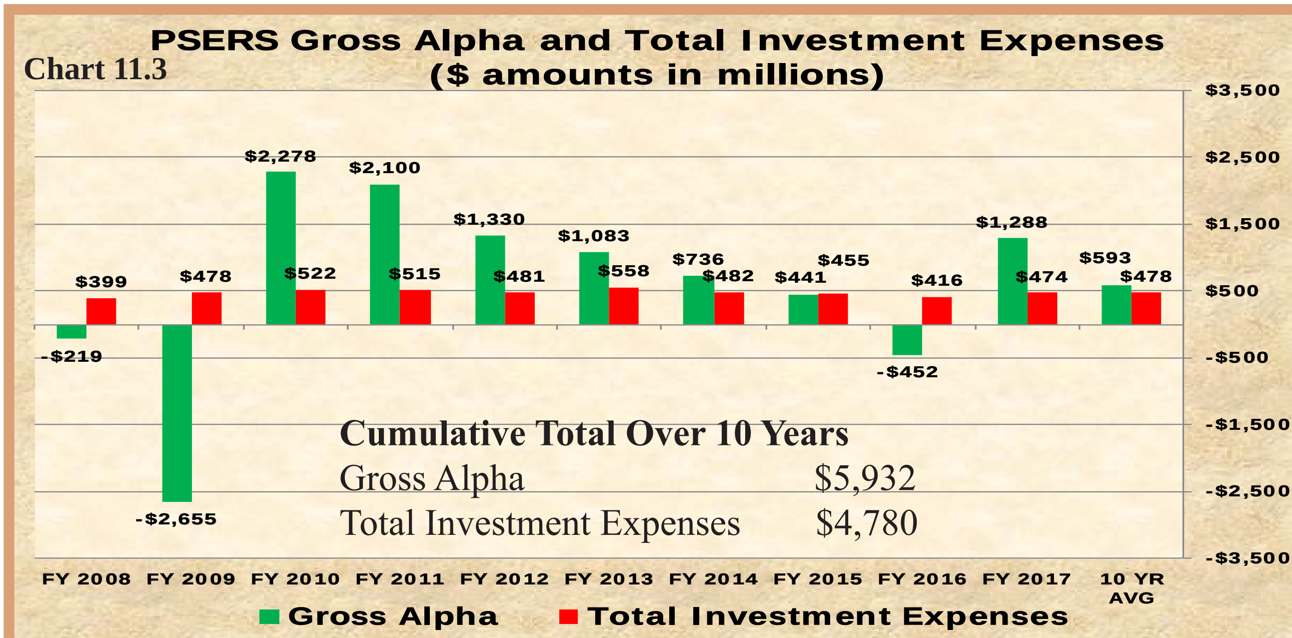


Chart 11.3 shows that PSERS has earned $1,288 in gross alpha during fiscal year 2017, or $2.72 of gross alpha for every $1 of total investment expenses. Over the last ten years PSERS has earned $5,932 million in gross alpha, or $1.24 in gross alpha for every $1 spent on total investment expenses.

Chart 11.3



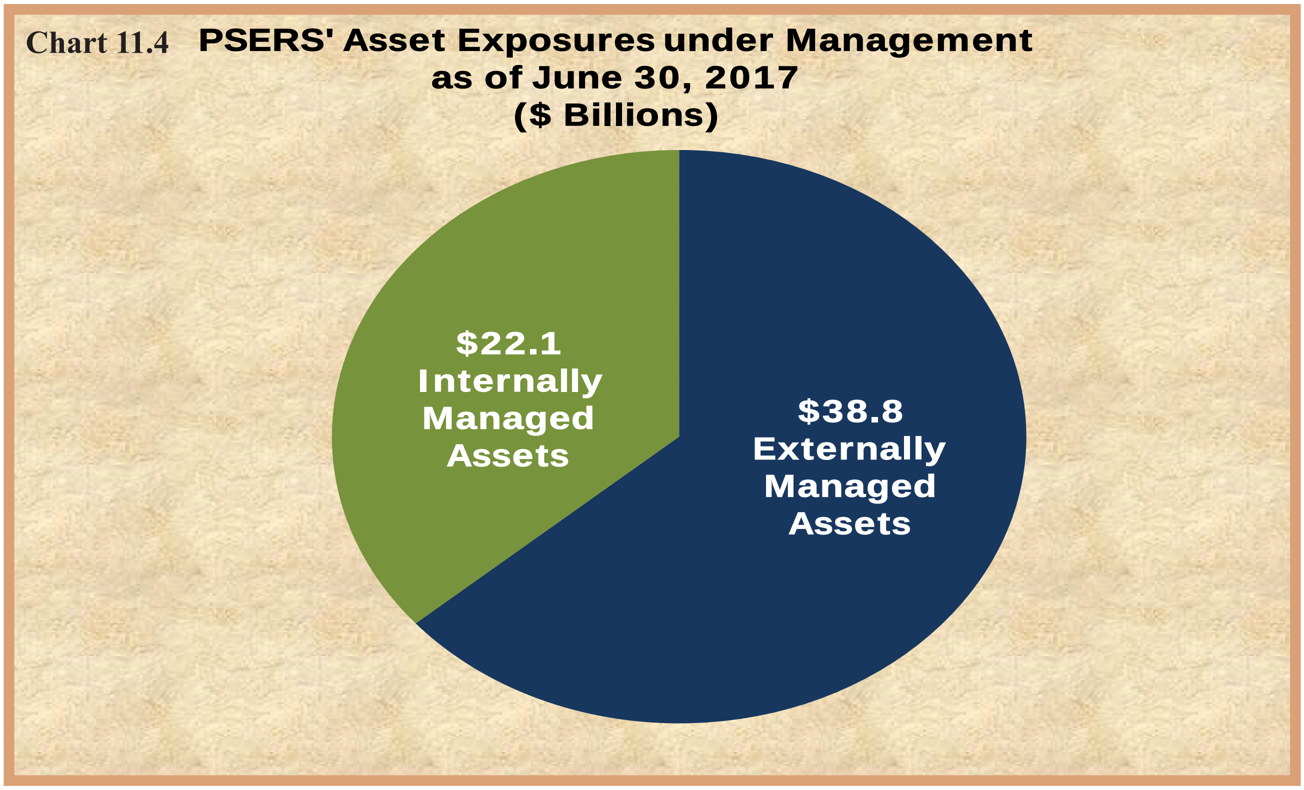
Gross Alpha is excess earnings (without regard for investment expenses) above the earnings of the relevant benchmark index.

Key Decision: Internal vs. External Investment Management

PSERS generally prefers to assign investment management responsibilities to internal professionals rather than to external investment management companies when certain conditions are present (see Chart 11.1). For example, it must be clear that internal professionals can achieve risk-adjusted returns that are at least equal to what might be earned by external investment managers in equivalent strategies, and PSERS' professionals must simultaneously have the operational capacity to take on the additional work. When assets are assigned to PSERS' professionals, the total costs (e.g., 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 11.4 displays the distribution of PSERS managed assets as of June 30, 2017.



Note: Financing represents a negative $9.1 billion allocation exposure and is not reflected in Chart 11.3.

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

PSERS' Investment staff managed 19 portfolios internally, with a total estimated net asset value of over $22 billion on June 30, 2017, resulting in significant fee savings. For the entire fiscal year, PSERS incurred costs of just under $13 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 $39 million in additional fees:

Table 11.1

Account	*Asset Class*	*Market Value as of 6/30/17* (000s)*	*Estimated Annual Fee %*	*Estimated Cost to Manage Externally (000s)*
PSERS - S&P 500 Index	U.S. Equities	$2,767,860	0.01%	$277
PSERS - S&P 400 Index	U.S. Equities	479,769	0.03%	144
PSERS - S&P 600 Index	U.S. Equities	468,466	0.04%	187
Misc. PSERS Equity Accounts	U.S. Equities	13,446	0.00%	-
	U.S. Equities Total	**3,729,541**		**6,108**
PSERS ACWI ex. U.S. Index	Non U.S. Equities	3,041,602	0.08%	2,433
	Non U.S. Equities Total	**3,041,602**		**2,433**
Private Markets Co-Investments	Private Markets	482,313	1.00%	4,823
PA Investment Fund - Private Equity.	Private Makets	4,602	1.00%	46
	Private Markets Total	**486,915**		**4,869**
Special Situations Internal	Fixed Income	13,823	1.00%	138
PSERS Active Aggregate	Fixed Income	1,235,757	0.21%	2,595
PSERS TIPS Portfolio	Fixed Income	1,900,433	0.13%	2,471
PSERS Long Treasuries	Fixed Income	1,520,361	0.18%	2,737
	Fixed Income Total	**4,670,374**		**7,941**
PSERS Infrastructure Index	Infrastructure	992,668	0.47%	4,666
	Infrastructure Total	**992,668**		**4,666**
PSERS Commodity Beta	Commodities	1,631,156	0.15%	2,447
PSERS Gold Fund	Commodities	1,700,000	0.15%	2,550
	Commodities Total	**3,331,156**		**4,997**
PSERS S&P MLP Index	MLP	476,238	0.50%	2,381
	MLP Total	**476,238**		**2,381**
PSERS REIT Index	Real Estate	688,139	0.08%	551
Real Estate Co-Investments	Real Estate	121,858	1.00%	1,219
	Real Estate Total	**809,997**		**1,769**
PSERS Risk Parity	Risk Parity	2,575,580	0.30%	7,727
	Risk Parity Total	**2,575,580**		**7,727**
PSERS Cash Management	Cash Management	2,025,802	0.01%	2,026
	Cash Management Total	**2,025,802**		**2,026**
	Grand Total	**$22,139,873**		**$39,416**

**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.

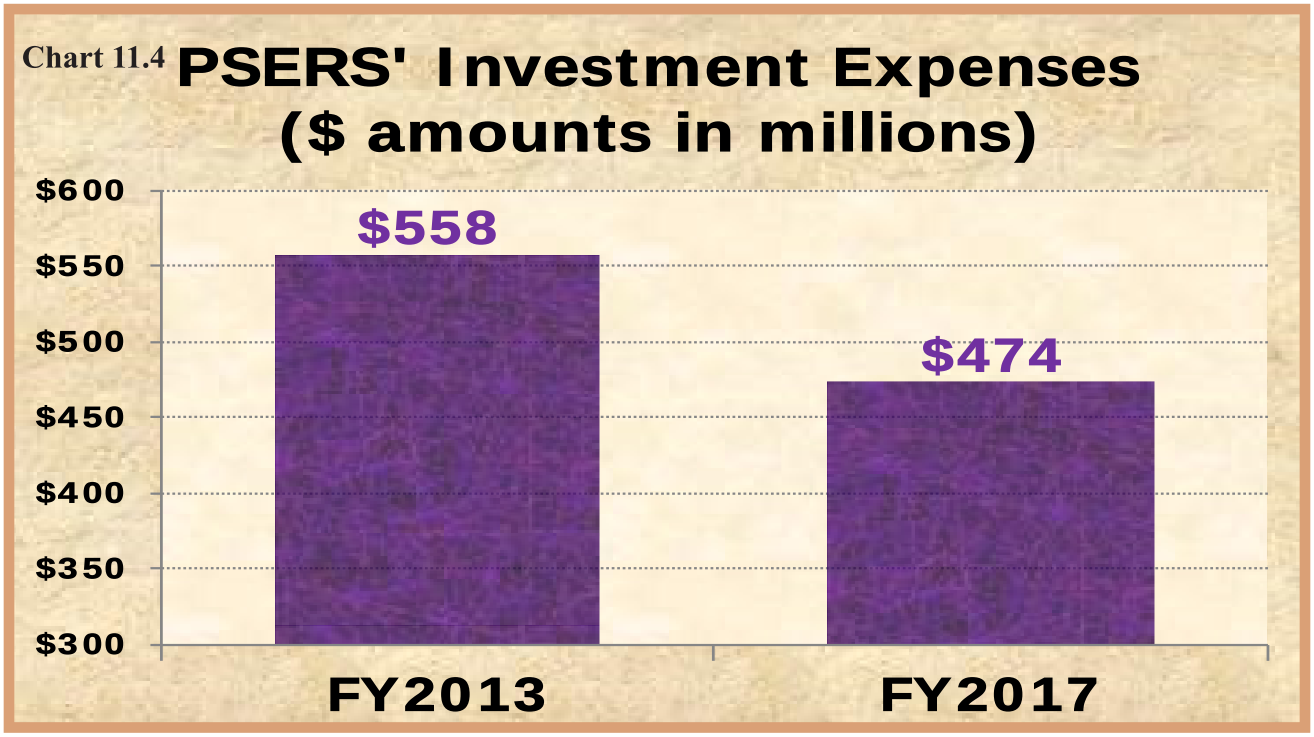
PSERS regularly measures the performance of active strategies relative to alternative passive strategies. In cases where PSERS is not receiving investment earnings from its active strategies in excess of alternative passive strategies, when all investment fees are taken into account, capital is redeployed 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, 2017. "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.

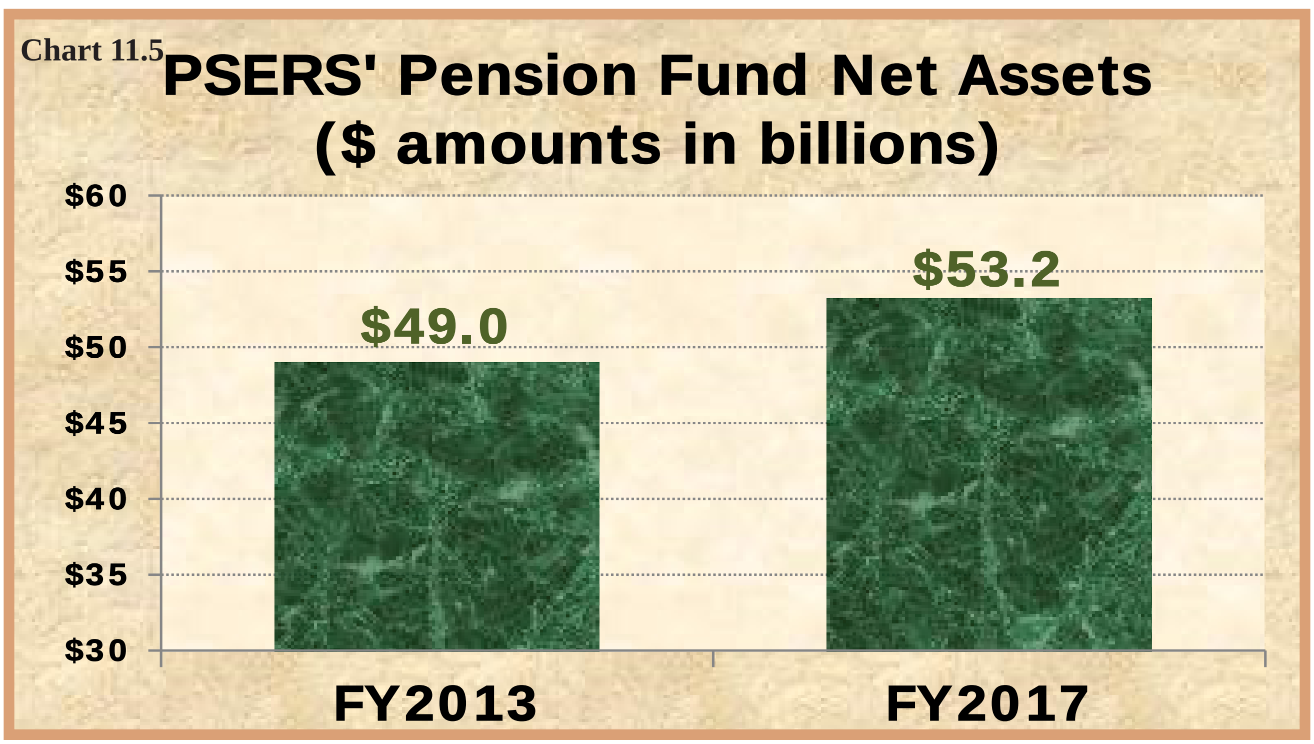
Table 11.2 Summary of Investment Advisory Fees
Fiscal Year Ended June 30, 2017
(Dollar Amounts in Thousands)

	Base Fees	Performance Fees	Total Fees	Basis Points
External Management				
U.S. Equity	$ 1,494	$ 1,490	$ 2,984	90
Non - U.S. Equity	19,771	5,392	25,163	28
Fixed Income	87,464	21,061	108,525	91
Real Estate	50,609	-	50,609	99
Alternative Investments	102,714	-	102,714	100
Absolute Return	78,202	50,784	128,986	264
Commodities	4,132	-	4,132	57
Master Limited Partnerships	8,295	238	8,533	44
Risk Parity	19,632	3,466	23,098	87
Total External Management	**$ 372,313**	**$ 82,431**	**$ 454,744**	97
Total Internal Management			**12,787**	6
Total Investment Management			**467,531**	69
Custodian Fees			2,476	
Consultant and Legal Fees			4,484	
Total Other Expenses			**6,960**	
Total Investment Expenses			**$ 474,491**	70

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 $558 million in Fiscal Year 2013 to $474 million in Fiscal Year 2017.** 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.



FY2017 fees are lower than FY2013 fees despite the fact that, as illustrated in Chart 11.5, PSERS now manages $4 billion more in net assets.



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, 2017 (Dollar Amounts in Thousands)	
Manager	**Total Fees**
U.S. Equity	
Radcliffe Capital Management, L.P.	$ 2,984
Total - U.S. Equity	**2,984**
Non - U.S. Equity	
Acadian Asset Management, LLC	960
Baillie Gifford Overseas Ltd.	6,525
BlackRock Financial Management, Inc.	3,433
BlackRock Institutional Trust Company, N.A.	2,281
Fidelity Institutional Asset Management LLC	1,138
Marathon Asset Management Limited	3,153
Oberweis Asset Management, Inc.	1,487
Pareto Investment Management, Ltd.	1,057
QS Investors, LLC	610
Wasatch Advisors, Inc.	4,519
Total - Non - U.S. Equity	**25,163**
Fixed Income	
AllianceBernstein L.P.	420
Apollo European Principal Finance Fund II(Dollar A), L.P.	1,907
Avenue Energy Opportunities Fund, L.P.	1,931
Avenue Europe Special Situations Fund III (U.S.), L.P.	979
Bain Capital Credit Managed Account (PSERS), L.P.	1,687
Bain Capital Distressed and Special Situations 2013 (A), L.P.	1,013
Bain Capital Distressed and Special Situations 2016 (A), L.P.	814
Bain Capital Middle Market Credit 2010, L.P.	281
Bain Capital Middle Market Credit 2014, LP	1,505
BlackRock Financial Management, Inc.	11,342
Bridgewater Associates, LP	21,719
Brigade Capital Management, LLC	16,777
Capula Investment Management, LLP	975
Cargill Financial Services Corporation	2,891
Carlyle Energy Mezzanine Opportunities Fund II, L.P.	3,121
Carlyle Energy Mezzanine Opportunities Fund-Q, L.P.	1,305
Cerberus Levered Loan Opportunities Fund I, L.P.	274
Cerberus Levered Loan Opportunities Fund II, L.P.	2,760
Cerberus PSERS Levered Loan Opportunities Fund, L.P.	4,533

Table 11.3

Investment Fees by Manager
Fiscal Year Ended June 30, 2017
(Dollar Amounts in Thousands)
(continued)

Manager	Total Fees
Fixed Income (continued)	
Galton Onshore Mortgage Recovery Fund III, L.P.	$ 1,377
Hayfin SOF II USD Co-Invest, L.P.	12
Hayfin SOF II USD, L.P.	339
Hayfin Special Opportunities Credit Fund (Parallel), L.P.	2,341
ICG Europe Fund V, L.P.	1,583
ICG Europe Fund VI, L.P.	1,059
International Infrastructure Finance Company, L.P.	1,343
Latitude Management Real Estate Capital IV, Inc.	124
LBC Credit Partners II, L.P.	674
LBC Credit Partners III, L.P.	3,638
LBC-PSERS Credit Fund, L.P.	842
Mariner Investment Group, LLC	1,672
Oaktree Loan Fund 2X, LP	27
Pacific Investment Management Company (PIMCO)	1,633
Park Square - PSERS Credit Opportunities Fund, L.P.	1,601
Penn Mutual Asset Management, LLC	13
Pugh Capital Management, Inc.	197
PSERS TAO Partners Parallel Fund, L.P.	2,974
Radcliffe Capital Management, L.P.	1,851
Sankaty Credit Opportunities IV, L.P.	1,459
SEI Investments Company	686
Templeton Investment Counsel, LLC	1,669
TOP NPL (A), L.P.	21
TPG Opportunities Partners II (A), L.P.	305
TPG Opportunities Partners III (A), L.P.	2,261
Varde Scratch and Dent Feeder I-A, L.P. (The)	349
Varde Scratch and Dent Fund, L.P. (The)	2,241
Total - Fixed Income	**108,525**
Real Estate-Direct Ownership	
Charter Oak Advisors, Inc.	1,207
GF Management, Inc.	131
Grosvenor Investment Management U.S., Inc.	50
L & B Realty Advisors, L.L.P.	104
Subtotal - Real Estate-Direct Ownership	**1,492**
Real Estate-Partnerships/Funds	
AG Core Plus Realty Fund III, L.P.	457
AG Core Plus Realty Fund IV, L.P.	531

Table 11.3 **Investment Fees by Manager**

Fiscal Year Ended June 30, 2017

(Dollar Amounts in Thousands)

(continued)

Manager	Total Fees
Real Estate-Partnerships/Funds (continued)	
Almanac Realty Securities V, L.P.	$ 314
Almanac Realty Securities VI, L.P.	312
Almanac Realty Securities VII, L.P.	1,360
Apollo Real Estate Finance Corporation	189
Ares European Real Estate Fund III, L.P.	310
Ares European Real Estate Fund IV, L.P.	1,493
Ares U.S. Real Estate Fund VII L.P.	583
Ares U.S. Real Estate Fund VIII, L.P.	1,075
Avenue Real Estate Fund Parallel, L.P.	872
Bell Institutional Fund IV, LLC	694
Bell Institutional Fund V, LLC	956
Bell Institutional Fund VI, L.P.	415
BlackRock Asia Property Fund III, L.P.	107
BlackRock Europe Property Fund III, L.P.	86
Blackstone Real Estate Debt Strategies II, L.P.	922
Blackstone Real Estate Debt Strategies III, L.P.	219
Blackstone Real Estate Partners Europe III, L.P.	1,357
Blackstone Real Estate Partners Europe IV, L.P.	1,374
Blackstone Real Estate Partners VI.TE.1, L.P.	1,312
Blackstone Real Estate Partners VII.TE.2, L.P.	2,585
Blackstone Real Estate Partners VIII, L.P.	3,750
BPG Co-Investment Partnership L.P.	11
Brookfield Strategic Real Estate Partners II, L.P.	2,293
Brookfield Strategic Real Estate Partners, L.P.	1,524
Cabot Industrial Value Fund IV, L.P.	1,125
Carlyle Real Estate Fund IV L.P.	242
Carlyle Real Estate Fund V L.P.	333
Carlyle Real Estate Fund VI L.P.	364
Carlyle Real Estate Fund VII L.P.	997
DRA Growth and Income Fund IX, LLC	297
DRA Growth and Income Fund VI, L.P.	524
DRA Growth and Income Fund VII, L.P.	1,541
DRA Growth and Income Fund VIII, L.P.	2,384
Exeter Core Industrial Club Fund II, L.P.	173
Exeter Industrial Value Fund II, L.P.	94
Exeter Industrial Value Fund III, L.P.	770
Fortress Investment Fund IV, L.P.	452

Table 11.3	Investment Fees by Manager
	Fiscal Year Ended June 30, 2017
	(Dollar Amounts in Thousands)
	(continued)

Manager	Total Fees
Real Estate-Partnerships/Funds (continued)	
Fortress Investment Fund V (Fund A), L.P.	$ 1,646
GCM Grosvenor Customized Infrastructure Strategies II, L.P.	58
International Infrastructure Finance Company II, L.P.	140
JPMCB Strategic Property Fund	135
Latitude Management Real Estate Capital III, Inc.	897
Legg Mason Real Estate Capital II, Inc.	220
LEM Multifamily Senior Equity Fund IV, L.P.	633
LEM RE High Yield Debt & Preferred Equity Fund III, L.P.	773
LEM Real Estate Mezzanine Fund II, L.P.	99
Pramerica Real Estate Capital VI, L.P.	325
PRISA	964
RCG Longview Debt Fund IV, L.P.	140
RCG Longview Debt Fund V, L.P.	1,017
RCG Longview Debt Fund VI, L.P.	460
RCG Longview Equity Fund, L.P.	367
Senior Housing Partnership Equity Fund IV, L.P.	649
Senior Housing Partnership Fund V, L.P.	1,097
Silverpeak Legacy/PSERS, L.P.	82
Stockbridge Real Estate Fund II, L.P.	395
Stockbridge Real Estate Fund III, L.P.	801
Stockbridge Real Estate Fund, L.P.	2,247
Strategic Partners Fund IV RE, L.P.	78
UBS Trumbull Property Fund	963
Subtotal - Real Estate-Partnerships/Funds	**48,583**
Real Estate-Farmland	
Prudential Agricultural Group	534
Subtotal - Real Estate-Farmland	**534**
Total Real Estate	**50,609**
Private Equity	
Actis Emerging Markets 3, L.P.	1,883
Actis Global 4 L.P.	1,794
Apax Europe VII, L.P.	1
Bain Capital Asia Fund II, L.P.	1,474
Bain Capital Asia Fund III, L.P.	2,592
Bain Capital XI, L.P.	1,370

Table 11.3

Investment Fees by Manager
Fiscal Year Ended June 30, 2017
(Dollar Amounts in Thousands)
(continued)

Manager	Total Fees
Private Equity (continued)	
Baring Asia Private Equity Fund III, L.P.	$ 561
Baring Asia Private Equity Fund IV, L.P.	2,903
Baring Asia Private Equity Fund V, L.P.	3,413
Barings Asia Private Equity Fund VI, L.P.	1,495
Blue Point Capital Partners II (B), L.P.	153
Blue Point Capital Partners III (B), L.P.	363
Bridgepoint Europe IV, L.P.	1,748
Bridgepoint Europe V, L.P.	2,128
Capital International Private Equity Fund V, L.P.	678
Capital International Private Equity Fund VI, L.P.	508
Catterton Growth Partners II , L.P.	1,040
Catterton Growth Partners III, L.P.	2,000
Catterton Growth Partners, L.P.	675
Catterton Partners V, L.P.	306
Catterton Partners VI, L.P.	1,239
Catterton Partners VII, L.P.	1,425
Catterton VIII, L.P.	94
Cinven Fund (Fourth), L.P. (The)	193
Cinven Fund (Fifth), L.P. (The)	1,003
Cinven Fund (Sixth), L.P. (The)	106
Coller International Partners VI, L.P.	1,031
Coller International Partners VII, L.P.	1,497
Crestview Partners II (PF), L.P.	1,600
Crestview Partners III, L.P.	1,465
Crestview Partners, L.P.	250
CVC Capital Partners Asia III Pacific, L.P.	574
CVC European Equity Partners V (A), L.P.	730
DCPF VI Oil and Gas Co-Investment Fund, L.P.	154
Denham Commodity Partners Fund VI, L.P.	1,098
Energy & Mineral Group Fund III, L.P.	1,223
Equistone Partners Europe Fund V E, L.P.	1,243
Evergreen Pacific Partners II, L.P.	481
First Reserve Fund XI, L.P.	114
First Reserve Fund XII, L.P.	1,274
GoldPoint Partners Co-Investment V, L.P.	500
HgCapital 7, L.P.	1,669
HGGC Fund II, L.P.	761
Incline Equity Partners III, L.P.	277

Table 11.3 **Investment Fees by Manager**

Fiscal Year Ended June 30, 2017

(Dollar Amounts in Thousands)

(continued)

Manager	Total Fees
Private Equity (continued)	
Irving Place Capital Partners III, L.P.	$ 464
Landmark Equity Partners XIII, L.P.	319
Landmark Equity Partners XIV, L.P.	1,500
Milestone Partners II, L.P.	39
Milestone Partners III, L.P.	331
Milestone Partners IV, L.P.	705
New Mountain Partners III, L.P.	666
New Mountain Partners IV, L.P.	1,134
New York Life Capital Partners III, L.P.	431
New York Life Capital Partners IV, L.P.	360
NGP Natural Resources X, L.P.	958
NGP Natural Resources XI, L.P.	1,320
North Haven PE Asia Fund IV, L.P. (Morgan Stanley)	1,478
Odyssey Investment Partners Fund V, L.P.	1,971
Orchid Asia V, L.P.	276
Orchid Asia VI, L.P.	1,464
PAI Europe IV, L.P.	752
PAI Europe V, L.P.	1,059
PAI Europe VI, L.P.	1,563
Palladium Equity Partners IV, L.P.	1,137
Partners Group Secondary 2008, L.P.	1,108
Partners Group Secondary 2011, L.P.	1,371
Partners Group Secondary 2015 (USD) A, L.P.	1,371
Permira IV, L.P.	93
StepStone International Investors III, L.P.	636
Strategic Partners III-B, L.P.	500
Strategic Partners IV, L.P.	253
Strategic Partners V, L.P.	612
Strategic Partners VI, L.P.	981
Strategic Partners Fund VII, L.P.	1,250
Trilantic Capital Partners IV, L.P.	151
Trilantic Capital Partners V, L.P.	1,420
Subtotal - Private Equity	**74,760**

Table 11.3 **Investment Fees by Manager**
Fiscal Year Ended June 30, 2017
(Dollar Amounts in Thousands)
(continued)

Manager		Total Fees
Special Situations		
Apollo Investment Fund VIII, L.P.	$	1,173
Avenue Special Situations Fund VI, L.P.		134
Cerberus Institutional Partners, L.P. (Series Three)		19
Cerberus Institutional Partners, L.P. (Series Four)		733
Cerberus Institutional Partners V, L.P.		1,697
Cerberus Institutional Partners VI, L.P.		2,599
Clearlake Capital Partners IV, L.P.		858
GSC Recovery III, L.P.		270
NYLIM Mezzanine Partners Parallel Fund II, L.P.		30
OCM Opportunities Fund VII, L.P.		225
OCM Opportunities Fund VII-B, L.P.		384
Searchlight Capital II, L.P.		1,378
Venor Special Situations Fund II, L.P.		681
Versa Capital Fund I, L.P.		399
Versa Capital Fund II, L.P.		1,811
Windjammer Senior Equity Fund IV, L.P.		1,008
Subtotal - Special Situations		**13,399**
Venture Capital		
Aisling Capital III, L.P.		577
Aisling Capital IV, L.P.		784
Co-Investment Fund II, L.P. (The)		1,313
LLR Equity Partners II, L.P.		20
LLR Equity Partners III, L.P.		1,593
LLR Equity Partners IV, L.P.		3,178
Psilos Group Partners III, L.P.		252
Quaker BioVentures II, L.P.		890
SCP Private Equity Partners II, L.P.		422
Starvest Partners II, L.P.		372
Strategic Partners III-VC, L.P.		145
Strategic Partners IV VC, L.P.		188
Summit Partners Growth Equity Fund VIII, L.P.		1,043
Tenaya Capital V-P, LP		779
Tenaya Capital VI, L.P.		1,000
Tenaya Capital VII, L.P.		2,000
Subtotal - Venture Capital		**14,555**
Total Alternative Investments	**$**	**102,714**

Table 11.3 **Investment Fees by Manager**

Fiscal Year Ended June 30, 2017

(Dollar Amounts in Thousands)

(continued)

Manager	Total Fees
Absolute Return	
Aeolus Capital Management Ltd.	$ 6,437
BlackRock Financial Management, Inc.	1,411
Brevan Howard Asset Management, LLP	590
Bridgewater Associates, Inc.	21,317
Brigade Capital Management, LLC	11,356
Capula Global Relative Value Fund	14,272
Capula Tail Risk Fund	7,033
Caspian Select Credit International, Ltd.	2,748
Caspian Keystone Focused Fund, Ltd.	187
Garda Asset Management, LLC	13,274
Independence Reinsurance Partners GP, LLC	1,388
Nephila Capital Ltd.	3,674
Oceanwood Capital Management, LLP	4,295
One William Street Capital Management, L.P.	9,796
Pacific Investment Management Company (PIMCO)	24,147
Perry Partners, L.P.	1,058
Sciens Aviation Special Opportunities Investment Fund II, L.P.	1,723
Sciens Aviation Special Opportunities Investment Fund III, L.P.	2,525
Two Sigma Investments, L.P.	124
Venor Capital Offshore, Ltd.	1,631
Total - Absolute Return	**128,986**
Commodities	
Gresham Investment Management, LLC	944
Wellington Management Company, L.L.P.	3,188
Total - Commodities	**4,132**
Master Limited Partnerships	
Harvest Fund Advisors, LLC	3,807
Salient Capital Advisors, LLC	3,034
Stein Roe Investment Counsel D/B/A Atlantic Trust	1,692
Total - Master Limited Partnerships	**8,533**

Table 11.3 **Investment Fees by Manager**

Fiscal Year Ended June 30, 2017

(Dollar Amounts in Thousands)

(continued)

Manager	Total Fees	
Risk Parity		
AQR Capital Management, LLC	$ 673	
BlackRock Institutional Trust Company, N.A.	1,978	
Bridgewater All Weather Fund @15%, Ltd.	2,694	
Bridgewater Optimal Portfolios, Ltd.	9,651	
D.E. Shaw Investment Management, L.L.C.	8,102	
Total - Risk Parity	**23,098**	
Total External Management	**454,744**	
Total Internal Management	**12,787**	*
Total Investment Management	**$ 467,531**	

*Internal Management expenses include salaries and fringe benefits of $8,455 and operating expenses of $4,332.

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 FY2018-19 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 whenever possible.

- 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, 2017)

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 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 2017, investment management fees paid to external firms managing PSERS' assets from offices located in Pennsylvania amounted to $ 30.8 million, or 6.8% of the total external investment manager fees.

Table 12.1 lists the asset exposures managed internally by PSERS, as of June 30, 2017.

Table 12.1

Pennsylvania-Based Asset Exposures Managed Internally

(as of June 30, 2017)

Asset Class	Market Value (in millions)	Percentage of Total
U.S. Equity	$ 3,729.6	16.8 %
Non-U.S. Equity	3,041.6	13.7
Private Markets	486.9	2.2
Fixed Income	6.696.2	30.2
Master Limited Partnerships	476.2	2.2
Commodities	3,331.2	15.1
Infrastructure	992.7	4.5
Real Estate	810.0	3.7
Risk Parity	2,575.6	11.6
Totals	**$ 22,140.0**	**100.0** %

Commitment to Pennsylvania Financial Services Firms
(continued)

Chart 12.1 displays the distribution of exposures managed internally as of June 30, 2017.

Chart 12.1

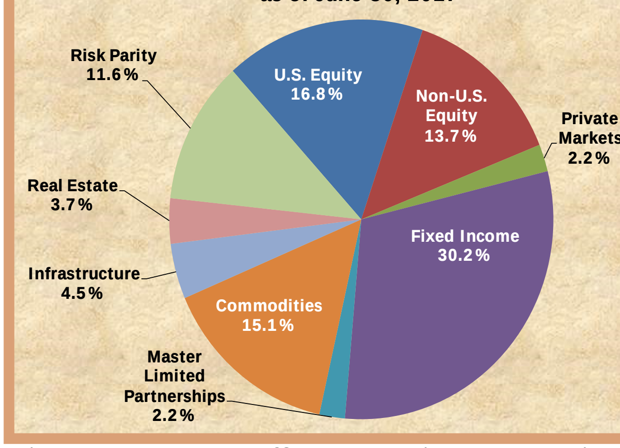


Table 12.2 is a list of assets managed by external managers with headquarters or offices located in Pennsylvania, as of June 30, 2017.

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

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

Investments in Pennsylvania-Based Companies

(as of June 30, 2017)

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 $16.9 billion to 129 partnerships. From the program inception to June 30, 2017, PSERS has committed capital to 16 partnerships headquartered in Pennsylvania.

Venture Capital

PSERS' Venture Capital program has committed $3.1 billion to 59 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, 2017, PSERS has committed capital to 30 partnerships headquartered in Pennsylvania.

Private Equity

PSERS' Private Equity program has committed $20.4 billion to 153 partnerships. From the program inception to June 30, 2017, PSERS has committed capital to 8 partnerships headquartered in Pennsylvania.

Special Situations

PSERS' Special Situations program has committed $5.4 billion to 35 partnerships. From the program inception to June 30, 2017, 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' former Private Market Consultant, is already a Limited Partner. PSERS has set aside $250 million to be committed to this program. As of June 30, 2017, PSERS has invested $42.8 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, 2017 ($'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	$ 151.0	$ 151.0	*	$ *
Fixed Income	64.0	64.0	*	*
Private Real Estate	65.3	1,469.0	370	8.8
Private Markets:				
Venture Capital	123.2	804.0	1,895	74.2
Private Equity	1,431.6	22,993.5	36,221	1,105.4
Special Situations	331.8	11,584.1	13,419	78.1
Total	**$ 2,166.9**	**$ 37,065.6**	**51,905**	**$ 1,266.5**

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