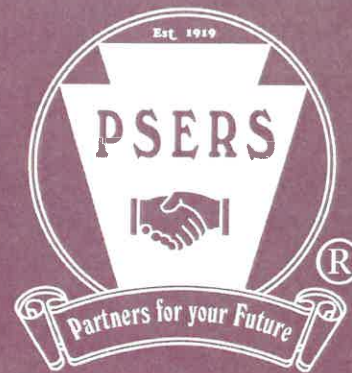


Investment Staff CREDENTIALS



PSERS Investment Staff Certifications

Investment management is a dynamic profession that continuously adapts to new technologies and evolving professional standards. PSERS Investment Professionals demonstrate their commitment to continuing education through completion of recognized investment industry designation programs.

- 13 Chartered Financial Analysts (CFA)
- 7 Certified Public Accountants (CPA)
- 4 Chartered Alternative Investment Analysts (CAIA)
- 2 Financial Risk Managers (FRM)
- 2 Certified Treasury Professionals (CTP)
- 1 Certified Property Manager (CPM)
- 1 Chartered Global Management Accountant (CGMA)
- 1 Professional Risk Manager (PRM)

PSERS Investment Professionals work closely with consultants to develop investment strategy and policies.



PSERS Investment Staff Education

44 Bachelor's Degrees

16 Master's Degrees (MBA)

1 Juris Doctor

1 Associate Degree



ASSET ALLOCATION



Determining an appropriate asset allocation is the most important investment decision the PSERS Board makes.

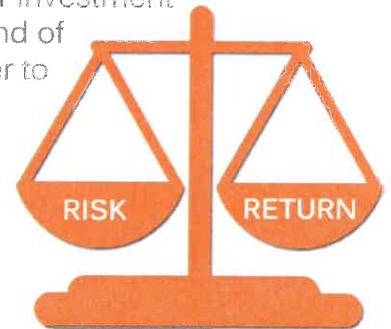
"All investments involve risk. We manage risk rather than returns."

Why is diversification across multiple asset classes important?

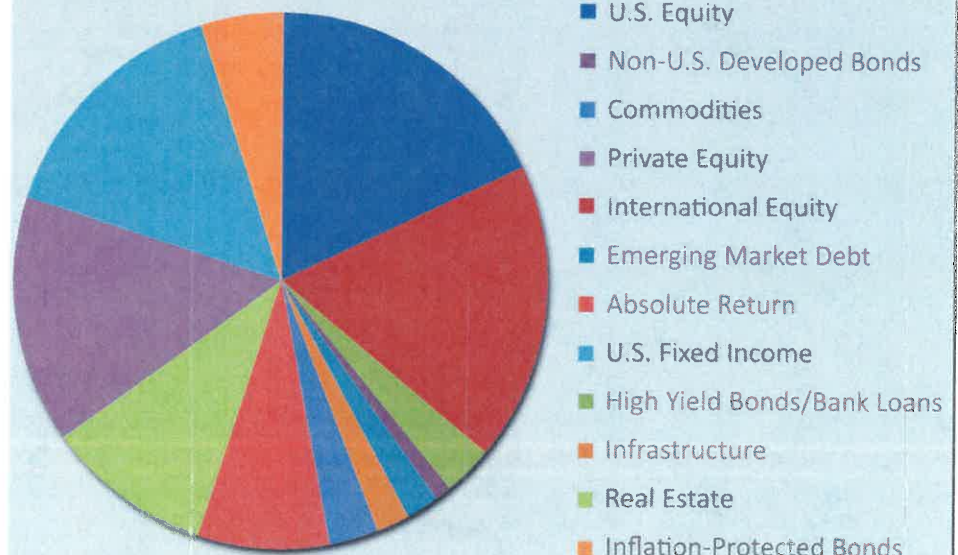
The asset allocation process involves dividing investment dollars among asset categories that do not all respond to the same market forces in the same way at the same time. Though there are no guarantees, ideally, if your investments in one category are performing poorly, you will have assets in another category that are performing well. Any gains in the latter may offset the losses in the former, minimizing the overall effect on your portfolio. A portfolio that is invested in a mix of asset classes, rather than just one or two, will tend to produce higher returns with lower risk.

What is Asset Allocation?

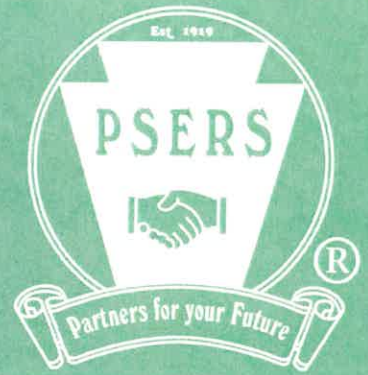
- Asset allocation refers to the implementation of an investment strategy that seeks to balance reward (investment return) and risk (volatility of returns) by mixing various assets based on an investor's risk profile and return goal.
- Stocks, bonds, and cash or cash alternatives are the three most common broad components of an asset allocation strategy.
- Institutional portfolios often use other investment strategies which are a subset or blend of these three broad categories in order to enhance return and reduce risk.



PSERS Asset Allocation



Total Plan BENCHMARK



PSERS Total Plan Benchmark is a weighted combination of individual asset class benchmarks, reflecting the diversification of PSERS' asset allocation.

What is a Total Plan Benchmark?

A Total Plan Benchmark is used to measure the performance, risk, and effectiveness of the implementation of a plan's asset allocation. The Total Plan Benchmark typically consists of a weighted combination of the benchmarks of underlying asset classes. It is a representation of the asset allocation as if it were invested in a passive implementation of the component asset classes.



Why do we use a Total Plan Benchmark?

Without benchmarks, it is very difficult to interpret a portfolio's performance. Different asset classes (such as stocks and bonds) will respond to the same market forces very differently during the same investment period. Because of these differences, it is important to measure the performance of a reference portfolio for the asset allocation in order to correctly interpret the Total Plan performance.

Good Characteristics of Benchmarks

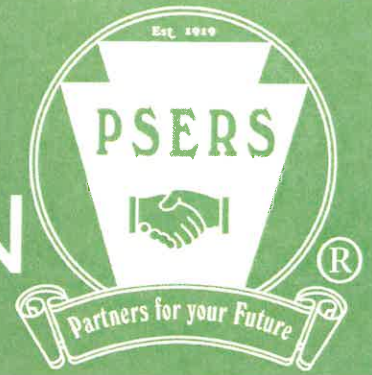
Benchmarks share several characteristics including*:

- **Specified in advance** of investing
- **Appropriate** - provides broad market coverage
- **Measurable** - returns readily calculable on a reasonably frequent basis
- **Unambiguous** – benchmark construction and weights of securities are clearly defined
- **Reflective** of investment style employed
- **Accountable** – accepts accountability for performance consistent with the benchmark
- **Investable** – investor can “purchase” or replicate the benchmark portfolio passively

* As per CFA Institute's SAMURAI characteristics. The criteria commonly referenced as industry standard is based on research conducted by Jeffrey Bailey and others. Mr. Bailey published an initial paper titled "Are Manager Universes Acceptable Performance".

**The criteria listed above are more easily fulfilled for publicly traded, more liquid asset classes. Good benchmarks exist for private markets but they are more challenging to identify. Benchmarks? in the May-June, 1992, edition of the Financial Analysts Journal.

Traditional Asset Classes MANAGER SELECTION



PSERS seeks to build long-term partnerships with managers that are expected to deliver superior, net-of-fee, risk-adjusted returns while enhancing PSERS' overall portfolio efficiency.

Manager Selection Process

PSERS manager selection process begins with recognition that a manager's historical investment performance is meaningless without knowing the context of the environment, the risks taken, and the exposure profile. Some of the steps in this process include:

- Document Review
- Manager Interviews
- Public Information Review and Reference Calls

PSERS views manager selection and diligence as a collaborative effort. PSERS' external consultants conduct parallel diligence, conferring with PSERS upon completion to arrive at a joint recommendation. This collaborative process improves the likelihood that material flaws will be discovered, addressed, and factored into decision making.

Important Manager Attributes

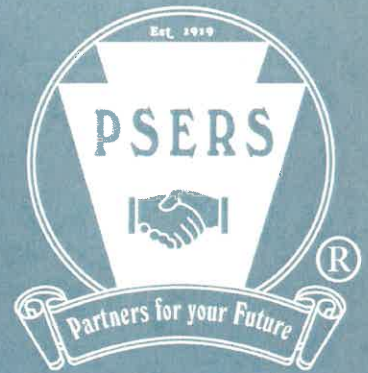
PSERS regularly seeks the assistance of skilled external specialists in Traditional Asset Classes (i.e., liquid, publicly-traded asset classes) to provide perspective and execute unique strategies in areas where PSERS Investment Professionals lack the resources, specific skills, or technical expertise to do so internally themselves.

Successful manager selection is challenging because it requires developing a forward-looking view on the investment decision making skills of individuals and organizations. PSERS Investment Professionals and external consultants apply a rigorous process to evaluate each targeted manager's reflection of attributes including:

- ✓ **Demonstrated, repeatable patterns of success:** PSERS Investment Professionals, in conjunction with external consultants, spend time to understand why the particular firm or individual would be expected to persistently outperform both peers and the broad markets and focus on:
 - o Ability to profit from economies of scale (or dis-economies of scale).
 - o Ability to assemble proprietary data sources and superior analytics.
- ✓ **Alignment of interests:** PSERS Investment Professionals seek out managers whose individual success is highly dependent upon achieving success for the PSERS portfolio. PSERS looks for:
 - o Organizational structures where the key decision makers have substantial ownership of the firm and meaningful personal investments in the products they manage.
 - o Remuneration structures that reward for investment performance rather than asset gathering.
 - o Compensation that ensures investment professionals are motivated by portfolio-level returns, not the contribution of individual silos.
- ✓ **Good business partners:** PSERS Investment Professionals seek to leverage the expertise and insights of selected managers across the entire portfolio. Good business partners have open dialogue and must have a self-awareness that reduces the likelihood of style drift or excessive risk taking.



PRIVATE EQUITY



Why does PSERS invest in Private Equity?

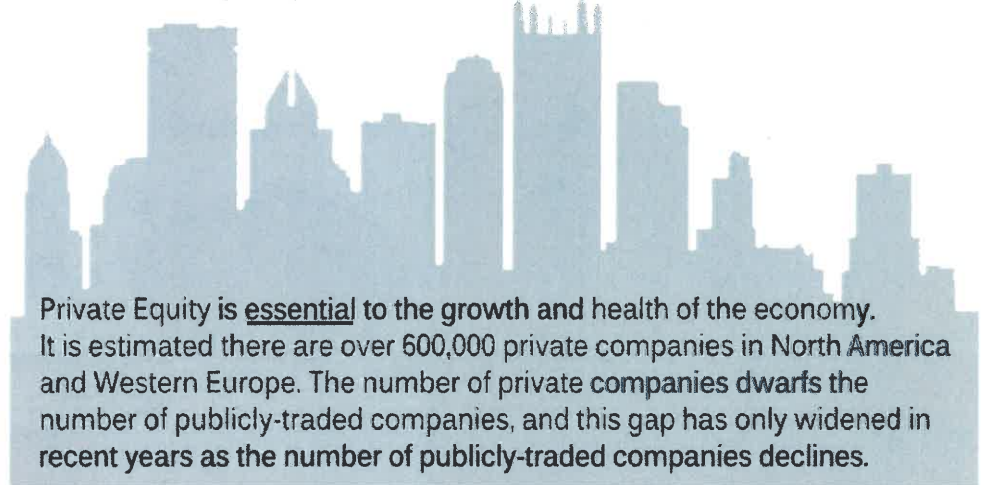
One of PSERS' primary objectives is to prudently invest the assets of the Fund. As a large, mature pension plan, PSERS supports this mission by diversifying the Fund's assets in many different asset classes (or "buckets"), which includes private equity funds.

The three primary benefits of investing in the private equity asset class are:

- 1) **Diversification** - PSERS Private Markets Program is very diversified with thousands of investments. Private Equity offers exposure to companies not accessible through traditional public markets.
- 2) **Returns**- Studies show that a private equity allocation can offer investors good absolute returns. Looking at historical returns in private markets, PSERS has achieved a net total return of 11.4% from inception, dating back to 1985, earning over \$13 billion for the Fund.
- 3) **Long-term investment horizon versus public equity (stocks)** - Private markets managers typically have a 3 to 5-year time horizon for their investments to mature and begin to show profits. Public stocks must report earnings on a quarterly basis which can lead to focusing on short-term goals rather than a long-term horizon.

What is Private Equity?

- Public companies are companies that have their stocks traded on open stock market exchanges.
- Private equity are investments in private companies that do not have access to public capital or have chosen not to list their securities in the public markets.
- Most institutional investors, like corporate and public pension funds, college and university endowments and other long-term investors, provide the capital for private equity funds to function.
- This capital can be used to fund new technology, make acquisitions, expand working capital for a company, improve an underperforming or undermanaged company, or bolster and solidify a company's balance sheet.
- Most of our members have no access to this critical asset class, other than their "look through" exposure as PSERS members.



Private Equity Performance

PSERS has made nearly all of its \$30+ billion of Private Equity commitments during the 20 years ending December 31, 2017. The resulting performance comparison, annualized over the 20 years, expressed as a dollar weighted internal rate of return (IRR), is 11.4% for PSERS' Private Equity portfolio and 7.54% for the custom public market equivalent index. **This performance is AFTER the payment of all fees, expense and profit sharing.** These results strongly support PSERS' conviction that Private Equity deserves its place in PSERS overall portfolio, as it has strongly outperformed the public equity market alternative.

PRIVATE EQUITY (CONT.)



Fees, Expenses, and Profit Sharing

During the life of a private equity fund, the General Partner (GP) receives payments as compensation for managing the fund. Private equity's fee structure is typically referred to as "2 & 20". This refers to a management fee of 2% and a profit share, also called carried interest, of 20%. PSERS negotiates discounts whenever possible. PSERS has been able to negotiate an average management fee and profit share of 1.6% and 18%, respectively, across over \$30 billion of commitments made from 1985 through 2017.

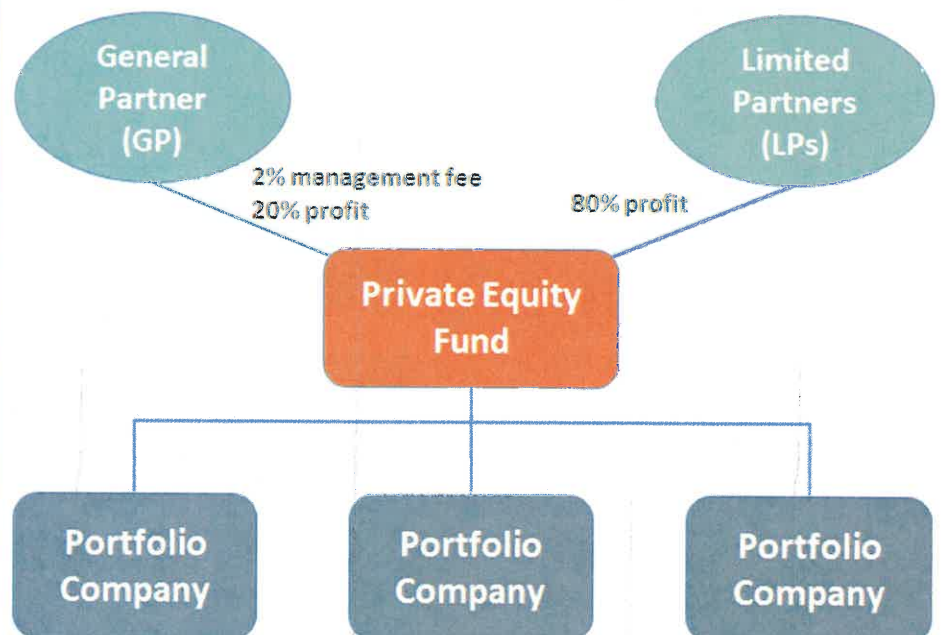
Management fees are typically paid quarterly. The GP is reimbursed by the Limited Partners (LPs) for expenses related to operating a fund such as accounting, audit, and legal expenses.

The profit share (combined interests) earned by the GP is paid from the profits the GP generates from the sale of the investments. Importantly, the GP receives its profit share only after the LPs have received (i) all the dollars they put into the fund to make investments and pay management fees and expenses and (ii) a preferred return (typically an ~8% annual rate of return) on all those dollars. For some funds, the profit share is received by the GP after the sale of each investment, with periodic reconciliations, and for other funds the GP receives it at the end of the life of the fund based on all sales.

Typical Private Equity Structure

A General Partner (GP) creates a fund in the limited partnership structure, puts some of its own capital in the fund, then seeks out Limited Partners (LPs) to commit the rest of the capital to the fund. The LPs usually make up over 90% of the capital committed to the fund. The GP often requires up to one year to accumulate the amount of total capital from LPs to reach the GP's target size for the fund. The limited partnership typically has a contractual life of 10 years and the GP spends the first 5 years of the fund finding and making investments. When the GP makes an investment, it calls the pro rata share of the required capital from each LP to pay for the investment. The GP also contributes its pro rata share. The GP can also call capital periodically from LPs for fund fees and expenses. The GP then spends the next 5 years selling (or harvesting) the investments it made during the first 5 years. As investments are sold the proceeds are distributed pro rata to the LPs. The life of the fund can be extended beyond 10 years if more time is necessary to sell the final investments.

How Private Equity Structures Work



STRESS TESTING



“PSERS has gone above and beyond the recommendations of the Blue Ribbon Panel by conducting an annual asset-liability study with its investment consultant and actuary.”

What is Stress Testing?

Stress testing is an exercise designed to analyze a wide variety of economic scenarios, both good and bad, normal and abnormal, in order to understand how the pension plan may be impacted under each of those scenarios. Understanding in particular how both investments (assets) and benefits owed (liability) might be impacted by negative scenarios allows for better, pro-active, long-term management of the pension plan.



PSERS' annual asset-liability study utilizes

5,000

unique economic scenarios

PSERS Conducts a Detailed Asset-Liability Study Every Year

The Society of Actuaries commissioned the Blue Ribbon Panel in April 2013 to address growing concerns about the financial health of public sector pension plans. In contrast to the Blue Ribbon Panel which focused on three investment return scenarios, **PSERS' annual asset-liability study generates 5,000 unique economic scenarios over a 30-year horizon** with each individual scenario exhibiting a non-uniform pattern of results. The robustness of PSERS' asset-liability study allows for a deeper understanding of potential pension risks and provides PSERS with more data to leverage in selecting the optimal asset allocation strategy for the pension plan.

Investment Fee TRANSPARENCY



PSERS is one of the most transparent large public pension funds in the nation.



PSERS is one of the few public pension funds in the country to report carried interest.



Fee Reporting

Many pension funds report little or no management fees for alternative investments because they are considered part of the cost of the investment and are netted against performance rather than shown separately.

PSERS, however, obtains management fee information from its limited partnerships, and collective trust fund investments as well, even if it is not specifically disclosed in the fund's standard reports. This information is then used to report all relevant management fees in PSERS' financial statements. In addition, PSERS reports all other investment expenses, including staff compensation and overhead, consultant, legal, and bank expenses incurred.

PSERS has fully embraced the Institutional Limited Partners Association (ILPA) investment fee reporting standards and has made the ILPA reporting template a mandatory term for all private manager contracts approved by the Board since May 2016.

PSERS:

- ✓ Aggressively negotiates fees.
- ✓ Works to structure fee arrangements that align interests of the investment manager with those of PSERS.
- ✓ Expanded efforts to reduce base fees going forward in exchange for profit-sharing fees, thus creating greater incentives for exceptional performance.

PSERS Base Fee and Profit-Sharing

Investment managers can be compensated in two ways, first through an annual base fee, and secondly, assuming the manager has outperformed investors' expectations, the manager earns a share of the profits.

Profit share is not automatic; it is only paid when the manager generates profits that exceed a specified return level known as the hurdle rate. If the hurdle rate of return is not exceeded, the investment manager does not receive any profit share.

