RVK Portland Office
1211 SW 5th Avenue
Suite 900
Portland, Oregon 97204
www.RVKinc.com

RVK

# Executive Summary:

## June 30, 2016
## Investment Performance

Ohio Retirement Study Council

# Memorandum

| | |
|---|---|
| To | Ohio Retirement Study Council |
| From | RVK, Inc. |
| Subject | Executive Summary: June 30, 2016 Investment Performance |
| Date | October 13, 2016 |


**PORTLAND OFFICE**
1211 SW 5th Avenue
Suite 900
Portland, Oregon 97204
MAIN 503.221.4200

**CHICAGO OFFICE**
30 N LaSalle Street
Suite 3900
Chicago, Illinois 60602
MAIN 312.445.3100

**NEW YORK OFFICE**
1 Penn Plaza
Suite 2128
New York, New York 10119
MAIN 646.805.7075


Outlined below please find a summary of significant observations, key attributes, and performance metrics of Ohio's six[1] public retirement plans for the period ended June 30, 2016. The purpose of this analysis is to facilitate an objective "apples-to-apples" comparison of the six plans relative to each other, similar benchmarks, and peer group data consisting of similarly sized public pension plans.

While much of the discussion in this summary focuses on results from the trailing two quarter period, we strongly encourage the Council to place significant weight on long-term results to better assess the management of the State's various pension plan assets. Though the six investment programs share many similarities, it is important to be aware of the crucial differences that may affect performance when reviewing this analysis. Each plan has unique long-term investment objectives and therefore distinct asset allocations in order to meet these objectives. Investment execution approaches also vary as it relates to active/passive and internal/external management.

The full results of our analysis are contained within our Investment Performance Analysis Report and we hope this Executive Summary will help in your review of that data. The information received by RVK, to the best of our knowledge, is complete and appropriate.

### Total Fund Returns and Risk

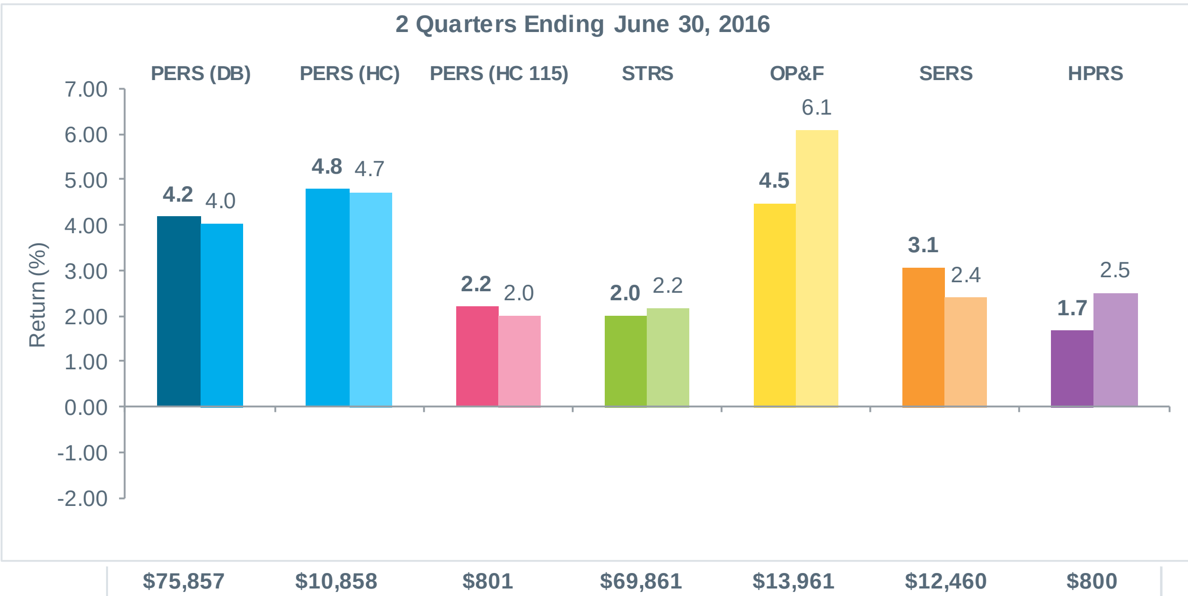
Returns for the Ohio plans ranged from 1.7% to 4.8% for the first half of the 2016 calendar year as the period was characterized by a rally across commodities, a stable US dollar, and a flight to safety on the back of the UK's referendum vote to leave the European Union. In the US, market expectations for a June interest rate hike collapsed after disappointing May payroll numbers were released. After raising the Federal Funds target rate by 25 basis points during its December 2015 meeting, the rate was held constant during the period.

[1]Ohio PERS funded a new Plan during October 2014 (PERS (HC 115)). PERS (HC 115) is excluded from some sections of the Executive Summary Memo due to limited performance history. Additional details regarding PERS (HC 115) can be found in the full performance report.

The dispersion in results among the State's retirement plans is driven by differences in asset allocation, asset class structure and investment manager selection, though it is not possible with the data available to RVK for us to weight each factor.

During the first half of 2016, four of seven plans outperformed their custom total fund benchmarks. Each plan will have different investment objectives and goals and the "Total Fund Benchmarks" will reflect this. Total Fund over/under performance can come from differences in actual allocations or investment manager results.

**Figure 1: Total Fund Performance** (dark shade) **vs. Total Fund Benchmarks** (light shade)



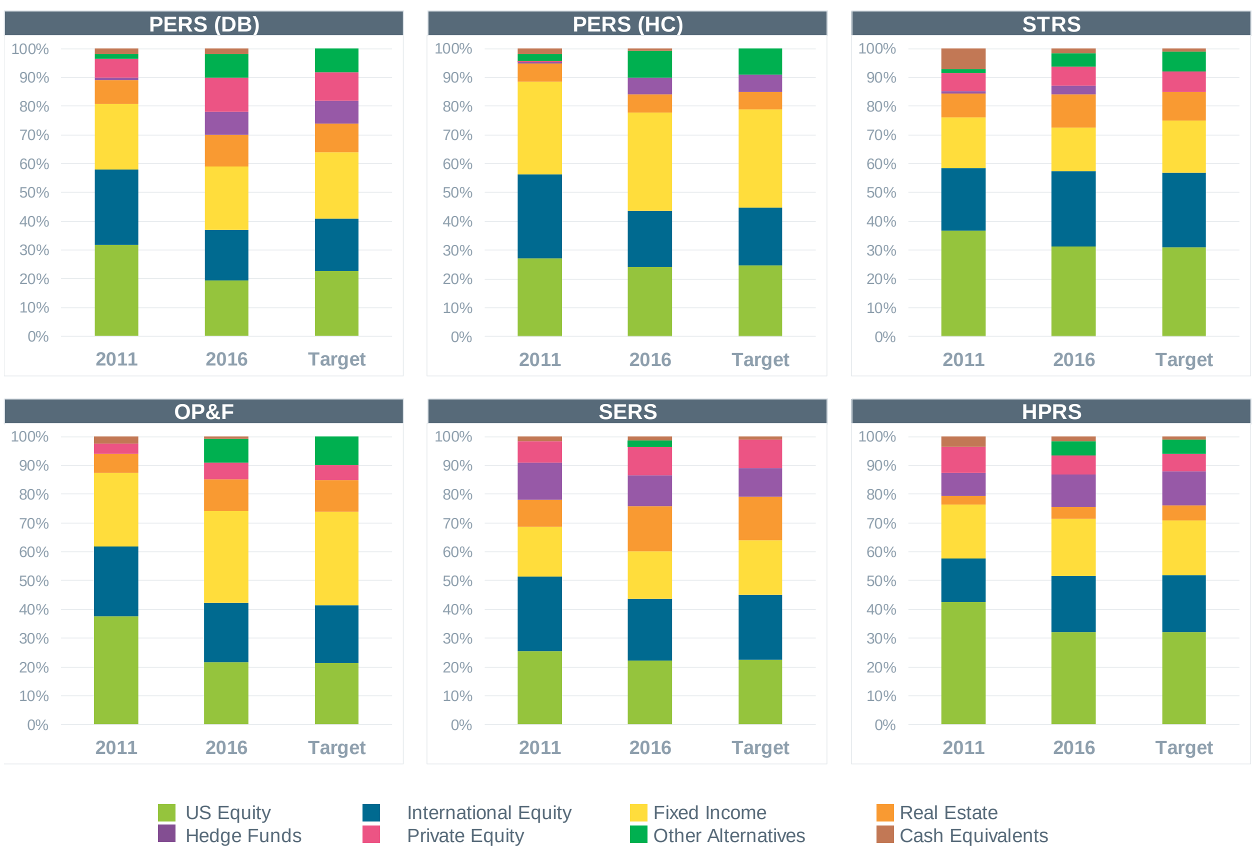

- Total Fund Benchmark is a target allocation index based on the targeted asset class percentages and appropriate asset class indexes for each individual plan
- Market values shown are in millions ($000,000)
- PERS (DB): Public Employees Retirement System Defined Benefit Pension Plan
- PERS (HC): Public Employees Retirement System Health Care Plan
- PERS (HC 115) has adopted a more conservative asset allocation policy (effective Oct 1, 2015) versus the other two OPERS Funds, due to its distinct time horizon, and emphasis on capital preservation.
- STRS: State Teachers Retirement System
- OP&F: Ohio Police & Fire Pension Fund
- SERS: School Employees Retirement System
- HPRS: Highway Patrol Retirement System

## Asset Allocation

Overall, the six plans all exhibit characteristics of increasingly diversified, institutional quality portfolios. Exposures to public equities (capital appreciation or "growth" assets) make up the largest component for each plan. Within equities, allocations to US equity investments have generally declined over the past ten years while allocations to alternatives, particularly hedge funds and private equity, have increased. The charts in Figure 2 show a 5-year asset allocation "lookback" for each plan and how they have moved to today's portfolio and target.

HPRS currently has the largest allocation to US equity at 32% while PERS (DB) has the smallest domestic equity allocation at 20%. PERS (HC) has the largest fixed income allocation at 34%. The average total allocation to hedge funds, private equity, and other alternatives among the six plans is 20%. Relative to peers, five of six plans have higher strategic exposures to international equities and four of six plans have lower strategic exposures to US equities. Four of six plans also have higher allocations to real estate relative to the median All Public Plan > $1B.

**Figure 2: Asset Allocation Changes (5 Years)**



The table below highlights recent target allocation changes since our last report.

**Figure 3: Changes to Target Allocations Since 12/31/2015**

| | Domestic Equity | International Equity | Fixed Income | Real Estate | Hedge Funds | Private Equity | Other Alternatives | Cash Equivalents |
|---|---|---|---|---|---|---|---|---|
| PERS (DB) | 0.30% | -0.30% | --- | --- | --- | --- | --- | --- |
| PERS (HC) | 0.30% | -0.30% | --- | --- | --- | --- | --- | --- |
| PERS (HC 115) | 0.10% | -0.10% | --- | --- | --- | --- | --- | --- |
| STRS | --- | --- | --- | --- | --- | --- | --- | --- |
| OP&F | -1.40% | -1.00% | 1.10% | 0.30% | --- | 0.15% | 0.85% | --- |
| SERS | --- | --- | --- | 3.00% | -3.00% | --- | --- | --- |
| HPRS | -3.00% | --- | -3.50% | --- | -0.50% | 1.00% | 5.00% | 1.00% |

Detailed asset allocation targets as of 06/30/2016 can be found in the full Investment Performance Analysis.

Other Alternatives of OP&F include Master Limited Partnerships (+0.35%) and Timber (+0.50%).

Other Alternatives of HPRS includes Real Assets (+5.00%)

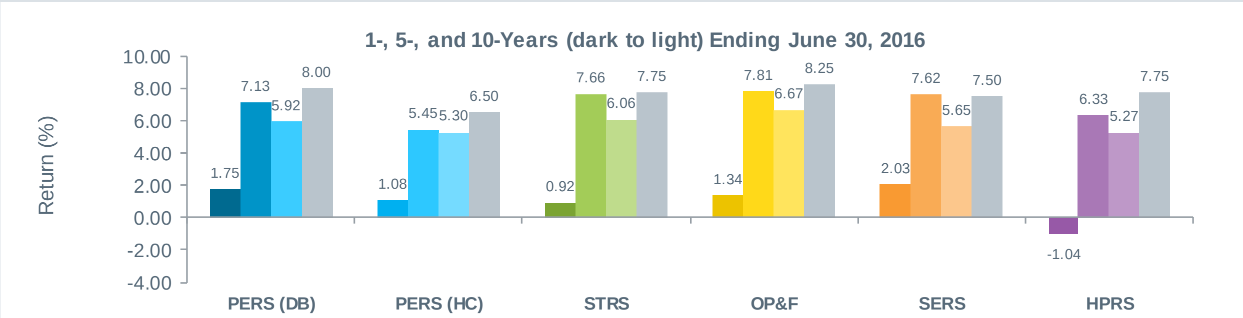
The table below highlights calendar year performance for key asset classes.

**Figure 4: Annual Asset Class Performance**

| Index (Asset Class) | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | CYTD | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| S&P 500 (US Large Cap) | 55.8 | 25.6 | 34.0 | 32.2 | 39.4 | 5.2 | 78.5 | 26.9 | 16.0 | 18.2 | 38.8 | 13.7 | 15.0 | 13.2 | Highest Annual Return |
| Russell 2000 (US Small Cap) | 47.3 | 20.2 | 21.4 | 26.3 | 16.2 | -10.0 | 31.8 | 18.9 | 7.8 | 17.3 | 32.4 | 12.5 | 1.4 | 6.4 | |
| MSCI EAFE (Int'l Developed) | 38.6 | 18.3 | 21.4 | 18.4 | 16.0 | -21.4 | 27.2 | 16.8 | 2.1 | 16.3 | 22.8 | 6.0 | 0.6 | 5.3 | |
| MSCI EM (Int'l Emg Markets) | 28.7 | 13.1 | 13.5 | 16.3 | 11.2 | -33.8 | 26.5 | 16.4 | -4.2 | 16.0 | 13.9 | 4.9 | -0.3 | 4.4 | |
| Barclays US Agg Bond (Fixed Income) | 23.9 | 10.9 | 7.5 | 15.8 | 10.3 | -35.6 | 18.9 | 15.1 | -5.7 | 10.9 | 9.0 | 3.4 | -0.8 | 3.8 | |
| NCREIF ODCE (Real Estate) | 11.6 | 9.1 | 4.9 | 10.4 | 7.0 | -37.0 | 11.5 | 7.8 | -12.1 | 4.8 | -2.0 | -2.2 | -4.4 | 2.2 | |
| HFRI FOF (Absolute Return) | 9.3 | 6.9 | 4.6 | 4.3 | 5.5 | -43.4 | 5.9 | 6.5 | -13.3 | 4.2 | -2.6 | -4.9 | -14.9 | -2.9 | |
| Bloomberg Cmdty (Commodities) | 4.1 | 4.3 | 2.4 | 2.1 | -1.6 | -53.3 | -29.8 | 5.7 | -18.4 | -1.1 | -9.5 | -17.0 | -24.7 | -4.4 | Lowest Annual Return |

Over the trailing 10-year periods, all plans have underperformed their current actuarial assumed rate of return as shown by Figure 5.

**Figure 5: Fund Performance vs. Actuarial Rate of Return (Gray)**




[2]PERS (HC 115)'s actuarial assumed rate of return is the same as PERS (HC) (6.50%).

Over the past ten years, the median actuarial rate of return for public funds within the RVK universe has declined (see Figure 6). Actuarial rates for four of the six Ohio plans are above the RVK universe median. Figure 7 shows the dispersion of actuarial rates of return around the median of 7.50%.

**Figure 6: Historical Actuarial Rates of Return**

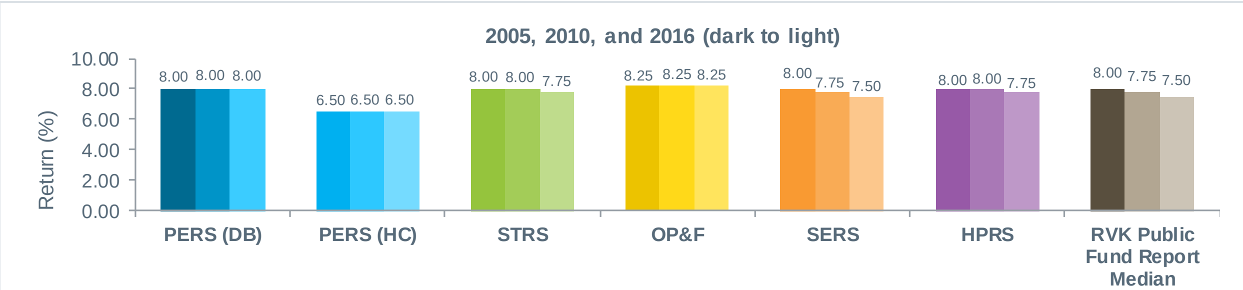
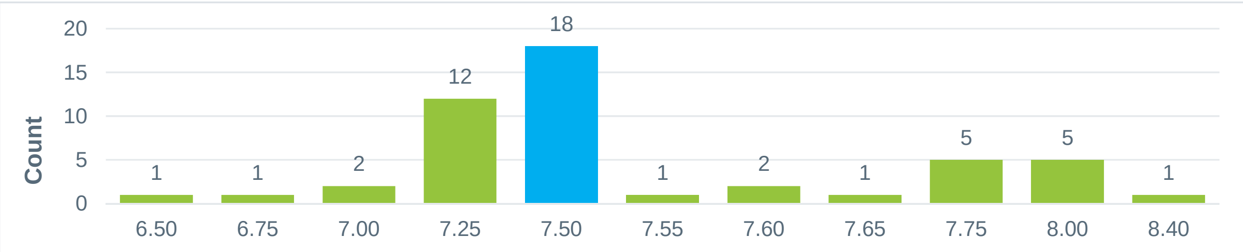


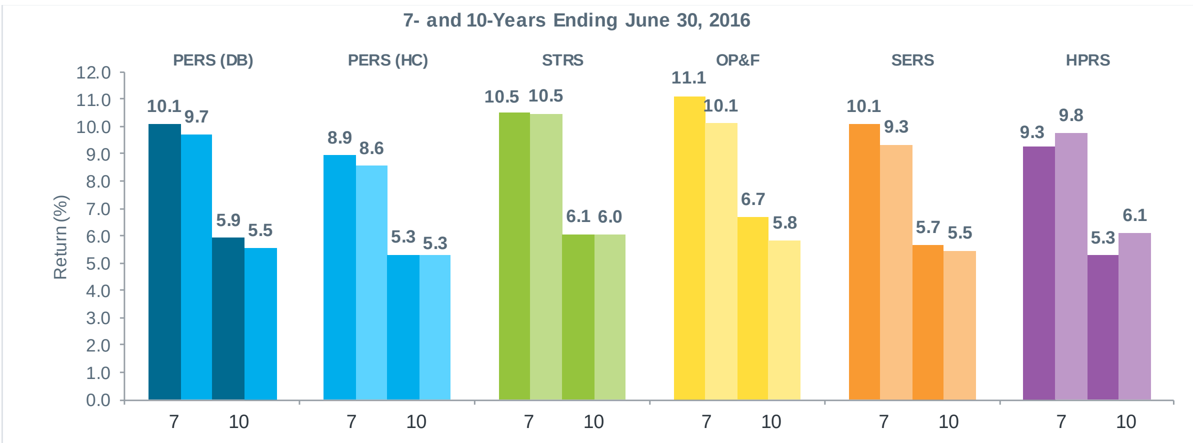

**Figure 7: RVK Public Fund Report Survey Actuarial Rates of Return – As of 06/30/2015**




RVK prepares a proprietary Public Fund Report with over 70 participating public funds across the U.S., including Ohio PERS and Ohio STRS. Participating public funds are surveyed semi-annually.

Longer-term performance relative to their custom benchmarks remains strong as five of six plans have outperformed over the last trailing 7 and 10-year periods (see Figure 8).

### Figure 8: Long-Term Fund Performance (dark shade) vs. Total Fund Benchmarks (light shade)




Plan sponsor peer group benchmarking is another way to compare performance results of Ohio's retirement plans, however there can be a wide range in investment objectives and different benefit plan structures. For example the PERS Health Care Fund's objective of capital preservation leads to a larger allocation to fixed income. Relative to peers, five of the six plans outperformed the All Public Plans > $1B median over the trailing 3-year period and three plans also outperformed the median peer over the trailing 10-year period (see Figure 9).

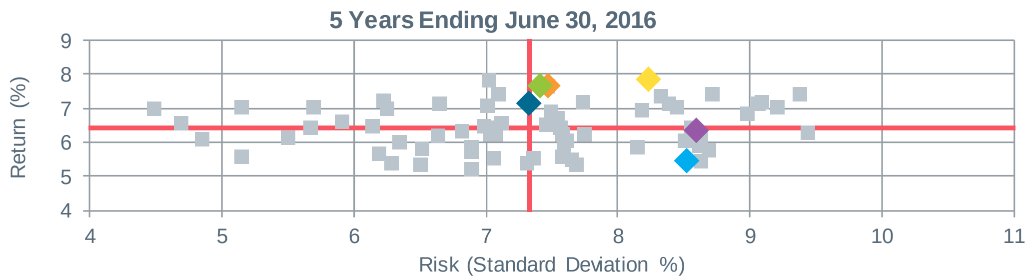
When reviewing a peer group of plan sponsors with assets greater than $10B, ranks generally improve over the 7 and 10-year periods for all plans (may not be an appropriate asset level cutoff for all plans, for example HPRS has $800m in plan assets).

### Figure 9: Fund Performance vs. Public Plans

| | Market Value | 2 Quarters | | | 1 Year | | | 3 Years | | | 5 Years | | | 7 Years | | | 10 Years | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Return | Rank | | Return | Rank | | Return | Rank | | Return | Rank | | Return | Rank | | Return | Rank | |
| | ($000,000) | % | > $1B | > $10B | % | > $1B | > $10B | % | > $1B | > $10B | % | > $1B | > $10B | % | > $1B | > $10B | % | > $1B | > $10B |
| **PERS (DB)** | 75,857 | 4.2 | (12) | (14) | 1.8 | (17) | (28) | 7.3 | (20) | (20) | 7.1 | (19) | (14) | 10.1 | (23) | (12) | 5.9 | (32) | (26) |
| **PERS (HC)** | 10,858 | 4.8 | (7) | (6) | 1.1 | (30) | (48) | 5.5 | (87) | (85) | 5.5 | (87) | (88) | 8.9 | (77) | (71) | 5.3 | (71) | (79) |
| **STRS** | 69,861 | 2.0 | (82) | (88) | 0.9 | (35) | (55) | 7.5 | (10) | (10) | 7.7 | (6) | (3) | 10.5 | (12) | (2) | 6.1 | (23) | (14) |
| **OP&F** | 13,960 | 4.5 | (9) | (7) | 1.3 | (23) | (41) | 7.7 | (9) | (7) | 7.8 | (4) | (1) | 11.1 | (2) | (1) | 6.7 | (3) | (2) |
| **SERS** | 12,460 | 3.1 | (43) | (44) | 2.0 | (12) | (17) | 8.0 | (3) | (1) | 7.6 | (6) | (4) | 10.1 | (23) | (12) | 5.7 | (53) | (51) |
| **HPRS** | 800 | 1.7 | (91) | (95) | -1.0 | (84) | (91) | 6.7 | (44) | (46) | 6.3 | (51) | (55) | 9.3 | (55) | (42) | 5.3 | (71) | (81) |
| > $1B Peer Median | | 2.9 | | | 0.2 | | | 6.4 | | | 6.4 | | | 9.5 | | | 5.7 | | |
| > $10B Peer Median | | 2.9 | | | 1.0 | | | 6.5 | | | 6.4 | | | 9.1 | | | 5.7 | | |

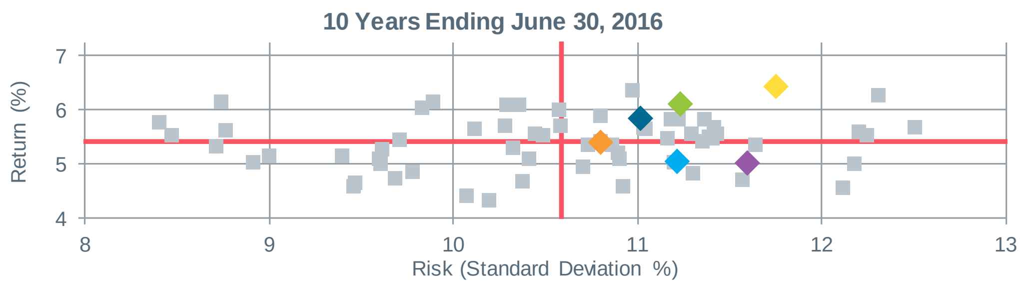
While additional analysis is needed to fully understand the risk posture of each plan, the risk and return charts shown below suggest four of the six plans have generated more return for each unit of risk exposure (as measured by standard deviation) than the median peer. All six plans to varying degrees have exhibited more asset risk relative to peers over the trailing 10-year period (see Figure 10). Peers may have different risk/return results for a variety of reasons, including but not limited to: objectives and goals, target allocations, time of allocation changes, investment restrictions, asset class exposures, or investment management execution.

**Figure 10: All Public Plans > $1B Risk and Return**




| | Return | Standard Dev. | Sharpe Ratio |
|---|---|---|---|
| PERS (DB) | 7.1 | 7.3 | 1.0 |
| PERS (HC) | 5.4 | 8.5 | 0.7 |
| STRS | 7.7 | 7.4 | 1.0 |
| OP&F | 7.8 | 8.2 | 1.0 |
| SERS | 7.6 | 7.5 | 1.0 |
| HPRS | 6.3 | 8.6 | 0.8 |
| Median | 6.4 | 7.3 | 0.9 |

[3]Grey boxes on scatterplot charts represent members of the peer universe.




| | Return | Standard Dev. | Sharpe Ratio |
|---|---|---|---|
| PERS (DB) | 5.9 | 11.0 | 0.5 |
| PERS (HC) | 5.3 | 11.2 | 0.4 |
| STRS | 6.1 | 11.4 | 0.5 |
| OP&F | 6.7 | 11.8 | 0.5 |
| SERS | 5.7 | 10.8 | 0.5 |
| HPRS | 5.3 | 11.6 | 0.4 |
| Median | 5.7 | 10.6 | 0.5 |

[3]Grey boxes on scatterplot charts represent members of the peer universe.

## Asset Class Returns and Risk

The following section includes information on all "major" asset classes. Broad market benchmarks are included for illustrative purposes. Additional details, including system-specific benchmark performance, are available within our Investment Performance Analysis.

### Traditional Asset Classes:

Traditional asset classes typically make up a portfolio's core allocation and include investments in stocks and bonds, with characteristics of capital appreciation (growth) from stocks and capital preservation (safety) from bonds. Depending on the type of investment, real estate may fall within traditional or alternative categories and exposures can have income, inflation protection, and/or capital appreciation characteristics.

### US Equity

The US equity portfolios for all six plans underperformed their benchmark during the first half of 2016 (OP&F was benchmarked to the Wilshire 5000 which returned 3.98%). OP&F outperformed the peer median over the same period (see Figure 11), as well as all other trailing periods. Absolute performance over the 3, 5 and 7 year periods has been strong for all plans.

**Figure 11: US Equity Performance**

| | 2 Quarters | | 1 Year | | 3 Years | | 5 Years | | 7 Years | | 10 Years | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | % Return | Rank | % Return | Rank | % Return | Rank | % Return | Rank | % Return | Rank | % Return | Rank |
| **PERS (DB)** | 3.4 | (53) | 1.8 | (26) | 10.8 | (31) | 11.4 | (26) | 14.8 | (57) | 7.2 | (59) |
| **PERS (HC)** | 3.4 | (53) | 1.8 | (26) | 10.8 | (31) | 11.4 | (26) | 14.8 | (57) | 7.2 | (59) |
| **STRS** | 2.0 | (80) | 0.4 | (57) | 10.3 | (54) | 10.8 | (56) | 14.3 | (68) | 6.9 | (69) |
| **OP&F** | 3.8 | (41) | 1.9 | (24) | 11.2 | (16) | 11.2 | (37) | 15.6 | (16) | 8.0 | (11) |
| **SERS** | 3.3 | (58) | 2.1 | (23) | 11.4 | (12) | 11.7 | (21) | 15.4 | (18) | 7.2 | (56) |
| **HPRS** | 3.1 | (64) | 1.0 | (42) | 10.7 | (35) | 11.0 | (46) | 15.4 | (18) | 7.6 | (29) |
| R 3000 Index | 3.6 | | 2.1 | | 11.1 | | 11.6 | | 15.0 | | 7.4 | |
| Peer Median | 3.4 | | 0.6 | | 10.3 | | 10.9 | | 14.8 | | 7.3 | |

[4]OP&F is benchmarked to the Wilshire 5000

### International Equity

The international equity portfolios for four of the six plans outperformed their respective benchmarks during the first half of 2016. PERS (DB) and PERS (HC) earned the highest absolute performance during the period with a return of 0.9% (see Figure 12). All funds outperformed their respective benchmarks over longer-term trailing periods.

**Figure 12: International Equity Performance**

| | 2 Quarters | | 1 Year | | 3 Years | | 5 Years | | 7 Years | | 10 Years | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | % Return | Rank | % Return | Rank | % Return | Rank | % Return | Rank | % Return | Rank | % Return | Rank |
| **PERS (DB)** | 0.9 | (25) | -7.5 | (24) | 3.0 | (48) | 1.7 | (59) | 6.6 | (67) | 2.7 | (52) |
| **PERS (HC)** | 0.9 | (25) | -7.5 | (24) | 3.0 | (48) | 1.7 | (59) | 6.6 | (67) | 2.7 | (52) |
| **STRS** | -1.2 | (67) | -7.1 | (20) | 4.6 | (7) | 3.6 | (10) | 7.7 | (26) | 3.7 | (17) |
| **OP&F** | -2.5 | (86) | -9.1 | (65) | 2.4 | (61) | 1.9 | (53) | 7.6 | (31) | 3.5 | (25) |
| **SERS** | -0.1 | (41) | -8.1 | (40) | 2.3 | (63) | 2.0 | (51) | 7.0 | (51) | 3.1 | (39) |
| **HPRS** | -1.6 | (75) | -9.3 | (66) | 2.0 | (76) | 0.8 | (82) | 5.9 | (86) | 2.2 | (85) |
| MSCI ACW Ex US IMI | -0.9 | | -9.6 | | 1.7 | | 0.4 | | 5.8 | | 2.2 | |
| Peer Median | -0.5 | | -8.5 | | 2.8 | | 2.0 | | 7.0 | | 2.8 | |

[5]MSCI ACW Ex US IMI may not be the direct benchmark for all the applicable systems international equity exposure, but it is included as a broad benchmark for illustrative purposes.

## Fixed Income

Domestic fixed income markets ended the first half of 2016 up 5.3%, as measured by the Barclays US Aggregate Bond Index. During the period, SERS was the only plan that outperformed its respective benchmark and the peer median. All plans outperformed the broad market index over the 7-year trailing period, as shown by Figure 13. SERS's fixed income composite returned 6.2% versus 5.1% for the Barclays US Aggregate Bond Index, the highest absolute and relative return earned among the six plans during the trailing 10-year period.

### Figure 13: Fixed Income Performance

| | 2 Quarters | | 1 Year | | 3 Years | | 5 Years | | 7 Years | | 10 Years | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | % Return | Rank | % Return | Rank | % Return | Rank | % Return | Rank | % Return | Rank | % Return | Rank |
| **PERS (DB) Core FI** | 5.0 | (72) | 5.9 | (30) | 4.4 | (47) | 4.2 | (58) | 5.2 | (66) | 4.8 | (84) |
| **PERS (HC) Core FI** | 5.0 | (72) | 5.9 | (30) | 4.4 | (47) | 4.2 | (58) | 5.2 | (66) | 4.8 | (84) |
| **STRS** | 5.6 | (56) | 5.6 | (35) | 4.1 | (58) | 4.1 | (60) | 5.5 | (59) | 5.8 | (37) |
| **OP&F Core FI** | 3.5 | (92) | 3.7 | (83) | 3.3 | (80) | 3.6 | (83) | 5.3 | (63) | 5.4 | (54) |
| **SERS** | 5.8 | (47) | 5.4 | (46) | 4.3 | (50) | 4.6 | (43) | 6.7 | (24) | 6.2 | (27) |
| **HPRS** | 4.8 | (78) | 4.1 | (77) | 3.5 | (78) | 3.8 | (78) | 5.2 | (66) | 5.4 | (55) |
| B US Agg Bond Index | 5.3 | | 6.0 | | 4.1 | | 3.8 | | 4.6 | | 5.1 | |
| Peer Median | 5.7 | | 5.3 | | 4.2 | | 4.3 | | 6.0 | | 5.4 | |

[6]Barclays US Agg Bond Index may not be the direct benchmark for all the applicable systems fixed income exposure, but it is included as a broad benchmark for illustrative purposes.

## Real Estate

Of the five plans with exposure to core and value-added real estate, returns ranged from 2.6% to 7.8% during the first half of 2016. PERS (HC)'s REITs (real estate investment trusts) composite earned 10.8%. Over the trailing 10-year period, returns ranged from 2.7% to 9.6% per annum (see Figure 14).

### Figure 14: Real Estate Performance

| Core and Value-Added Real Estate | | | | | | | |
|---|---|---|---|---|---|---|---|
| | 2 Quarters | 1 Year | 3 Years | 5 Years | 7 Years | 10 Years | 10 Years |
| | % Return | % Return | % Return | % Return | % Return | % Return | Standard Deviation |
| **PERS (DB)** | 5.8 | 14.4 | 16.7 | 15.1 | 10.8 | 8.4 | 7.1 |
| **STRS** | 6.9 | 13.5 | 13.8 | 13.3 | 12.5 | 9.6 | 9.3 |
| **OP&F** | 7.8 | 16.4 | 17.4 | 15.9 | 10.3 | 7.4 | 10.1 |
| **SERS** | 6.6 | 13.5 | 14.2 | 12.4 | 10.1 | 4.7 | 9.7 |
| **HPRS** | 2.6 | 3.8 | 12.2 | 9.6 | 6.7 | 2.7 | 10.5 |
| NCREIF ODCE Index (Net) (AWA) | 3.9 | 10.8 | 12.0 | 11.7 | 9.9 | 5.2 | 8.6 |
| **REITs** | | | | | | | |
| **PERS (HC) REITs** | 10.8 | 22.6 | 13.5 | 12.3 | 21.0 | 7.0 | 26.6 |
| DJ US Sel RE Securities | 10.8 | 22.7 | 13.5 | 12.2 | 20.8 | 6.8 | 26.6 |

[7]NCREIF ODCE Index (Net) (AWA) may not be the direct benchmark for all the applicable systems real estate exposure, but it is included as a broad benchmark for illustrative purposes.

## Alternative Asset Classes

Alternative investments are typically added to a portfolio to provide further diversification of assets, enabling investors to reduce expected portfolio volatility without sacrificing return potential.  Exposures may include hedge funds, private equity, private real estate, commodities, and opportunistic exposures to equity or fixed income segments/securities. As compared to traditional asset classes, alternative investments can be less transparent (although this is improving), less liquid (potential fund lock-up periods or staged withdrawals), and more expensive (although costs are generally decreasing).  Investment managers rely on manager skill, extensive research, and sourcing of opportunities to add value, all which lead to unique characteristics and higher costs.

As with any investment, alternative investments are also subject to a variety of risks, including, but not limited to: operational, complexity, leverage, liquidity, concentration, volatility, headline, fraud, and regulatory.  A thorough and ongoing due diligence process is needed to mitigate these risks.  Figure 15 shows the correlation between broad market benchmarks for alternatives (private real estate, REITs, hedge funds, private equity) and traditional asset classes (public equities and fixed income).

**Figure 15: Alternative Asset Class Index Correlation**

| | NCREIF ODCE Index | DJ US Select RE Secr Index | HFRI FOF Comp Index | Cambridge US PE Index (Qtr Lag) |
|---|---|---|---|---|
| S&P 500 Index (Cap Wtd) | 0.19 | 0.70 | 0.73 | 0.14 |
| Russell 2000 Index | 0.15 | 0.74 | 0.71 | 0.09 |
| MSCI EAFE Index | 0.14 | 0.66 | 0.82 | 0.19 |
| MSCI Emg Mkts Index | 0.03 | 0.57 | 0.82 | 0.05 |
| Barclays US Agg Bond Index | -0.18 | 0.00 | -0.27 | -0.14 |
| NCREIF ODCE Index | 1.00 | 0.21 | 0.20 | 0.59 |
| DJ US Select RE Secr Index | 0.21 | 1.00 | 0.50 | 0.28 |
| HFRI FOF Comp Index | 0.20 | 0.50 | 1.00 | 0.21 |
| Cambridge US PE Index (Qtr Lag) | 0.59 | 0.28 | 0.21 | 1.00 |

[8]Correlations are based on 15 years of performance ending June 30, 2016.

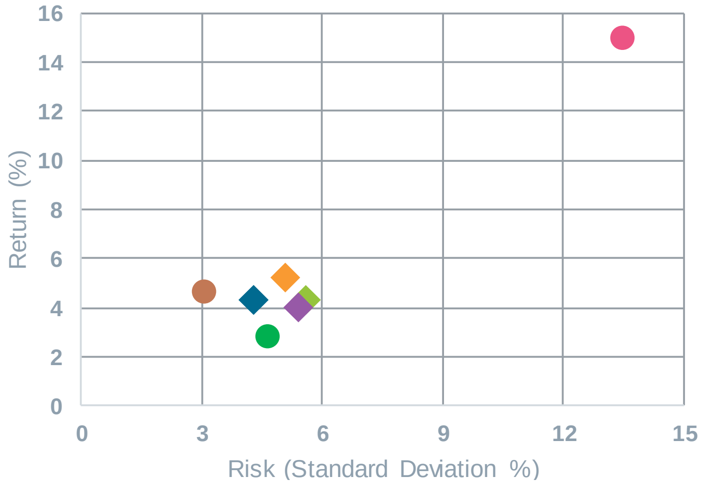
### Hedge Funds

Hedge Fund exposures are typically intended to provide attractive risk-adjusted returns and diversification benefits to a portfolio over the long-term.  These attributes are often obtained via investments that rely on manager skill rather than specific asset class exposures, and allow for flexibility of allocations and tools.

Composite returns during the first half of 2016 ranged from -3.6% to -1.0% among the five plans with dedicated hedge fund composites.  Over the trailing 7-year period the hedge fund allocations for all five plans outperformed their respective benchmarks and the HFRI FOF Comp Index.

## Figure 16: Hedge Funds Performance

**7 Years Ending June 30, 2016**




| | Return | Standard Dev. |
|---|---|---|
| PERS (DB) | 4.3 | 4.3 |
| PERS (HC) | 4.3 | 4.3 |
| STRS | 4.3 | 5.6 |
| SERS | 5.2 | 5.1 |
| HPRS | 4.0 | 5.4 |
| HFRI FOF Comp | 2.7 | 4.7 |
| S&P 500 | 14.9 | 13.5 |
| Barclays US Agg | 4.6 | 3.1 |

## Private Equity

Private Equity investments typically attempt to achieve returns above public market returns while providing some diversification benefits. Private equity investments provide a way to access companies, industries, and strategies not easily available to public markets and allows skilled managers to effect meaningful change to businesses, thus improving value.

Five of the six plans have dedicated exposure to private equity. Over the trailing 7-year period, the time-weighted returns for these allocations have ranged from 5.5% to 15.6% per annum. Three of the four plans with available history have outperformed their respective benchmarks over the trailing 10-year period. Although we prefer to measure private equity performance using since inception money-weighted returns (IRR), we have included time-weighted performance in our full Investment Performance Analysis for illustrative purposes.

## Figure 17: Private Equity Performance

| | 10 Years Ending June 30, 2016 | | | | |
|---|---|---|---|---|---|
| Plan | PERS (DB) | STRS | OP&F | SERS | HPRS |
| % Return | 11.4 | 10.5 | 10.2 | 11.2 | N/A |
| Benchmark % Return | 8.8 | 9.8 | 10.3 | 9.2 | N/A |

[9]HPRS's private equity portfolio did not begin in earnest until after 2008. Therefore longer period trailing returns may not be relevant.

## Additional Investments

We have included additional asset class composites which are not shared across the majority of the six plans within our Investment Performance Analysis.

## Considerations

After careful analysis, we put forth the following considerations for the Ohio Retirement Study Council:

1. Be mindful of target asset allocation for each fund and the goals they are attempting to achieve. Currently all the funds are diversified across multiple asset classes and exhibit characteristics of prudent investor diversification.

   ➔ The determination of a fund's asset allocation is the single most important investment decision and is a major determinant of long-term return and the volatility risk of asset values. Creating a diversified portfolio of asset classes enables the investor to achieve a potential higher rate of return while minimizing volatility of the portfolio. A fund following a smoother, less volatile path compounds value at a faster rate.

   ➔ Don't assume that all of the plans should have the same asset allocation. Differences in their liabilities, funding status, the risk tolerance of their fiduciaries and other factors will likely produced legitimate differences in their respective asset allocations.

2. Monitor the change in asset allocation over time.

   ➔ Target allocations should be formally reviewed (by the Board) every few years with potentially more frequent informal reviews (by Staff). From each review there can be multiple reasons for adopting new targets (with generally gradual shifts) – from a rare occurrence of the overarching goal of the investment program changing to potential consideration of significant, longer-term economic or market changes to the possibility of opportunities to improve the risk/return tradeoff.

3. While this and subsequent reports we deliver to the council will focus on recent information in return and risk taken at each of the funds, we strongly encourage you to once again focus on the 3 and 5-year risk and return results to better gauge the stewardship of the State's pension assets.

All performance shown is gross of fees, with the exception of externally managed real estate, hedge fund, and private equity investments. Total Fund performance shown is gross of fees but is net of embedded fees on externally managed real estate and alternative investments.