



# Investment Performance Analysis

## Ohio Retirement Study Council

Period Ended: December 31, 2023



## INDEX GLOSSARY

**S&P 500:** The **S&P 500 Index (Cap Wtd)** is a commonly recognized, market-capitalization weighted index of 500 widely held equity securities designed to measure broad US equity performance.

**R 3000:** The **Russell 3000 Index** is a market-capitalization weighted index of 3,000 widely held equity securities designed to measure performance of the entire U.S. stock market.

**Wilshire 5000:** The **Wilshire 5000 Index** is a market-capitalization weighted index of more than 6,700 widely held equity securities designed to measure performance of the entire U.S. stock market.

**MSCI ACW Ex US:** The **MSCI ACW (All Country World) Ex US Index** is designed to measure equity market performance in global developed and emerging markets, excluding the US. The 22 underlying developed countries are: *Australia, Austria, Belgium, Canada, Denmark, Finland, France, Germany, Hong Kong, Ireland, Israel, Italy, Japan, Netherlands, New Zealand, Norway, Portugal, Singapore, Spain, Sweden, Switzerland, and the United Kingdom*. The 23 emerging market countries are: *Brazil, Chile, China, Colombia, Czech Republic, Egypt, Greece, Hungary, India, Indonesia, Korea, Malaysia, Mexico, Peru, Philippines, Poland, Russia, Qatar, South Africa, Taiwan, Thailand, Turkey, and United Arab Emirates*.

**MSCI ACW Ex US Investable Mkt:** The **MSCI ACW Ex US Investable Mkt Index** is designed to measure equity performance across 22 of 23 Developed Markets (DM) countries (excluding the United States) and 24 Emerging Markets (EM) countries. With 6,174 constituents, the index covers approximately 99% of the global equity opportunity set outside the US.

**MSCI EAFE:** The **MSCI EAFE (Europe, Australasia, Far East) Index** is designed to measure equity market performance of 21 developed countries, excluding the US & Canada: *Australia, Austria, Belgium, Denmark, Finland, France, Germany, Hong Kong, Ireland, Israel, Italy, Japan, Netherlands, New Zealand, Norway, Portugal, Singapore, Spain, Sweden, Switzerland, and the United Kingdom*.

**MSCI World Ex US:** The **MSCI World Index Ex US Index** is designed to measure the equity market performance of developed markets. The MSCI World Index consists of the following 22 developed market country indexes: *Australia, Austria, Belgium, Canada, Denmark, Finland, France, Germany, Hong Kong, Ireland, Israel, Italy, Japan, Netherlands, New Zealand, Norway, Portugal, Singapore, Spain, Sweden, Switzerland, and the United Kingdom*.

**MSCI Emerging Markets:** The **MSCI Emerging Markets Index** is designed to measure equity market performance of emerging markets. The MSCI Emerging Markets Index consists of the following 24 emerging market country indexes: *Brazil, Chile, China, Colombia, Czech Republic, Egypt, Greece, Hungary, India, Indonesia, Korea, Malaysia, Mexico, Pakistan, Peru, Philippines, Poland, Qatar, Russia, South Africa, Taiwan, Thailand, Turkey\* and United Arab Emirates*.

**Bloomberg US Agg Bond:** The **Bloomberg US Aggregate Bond Index** covers the US dollar-denominated, investment-grade, fixed-rate, taxable bond market of SEC-registered securities: US Treasury and agency bonds, domestic corporate debt, and mortgage-backed securities.

**Bloomberg US Universal:** The **Bloomberg US Universal Index** covers US dollar-denominated, taxable bonds that are rated either investment grade or high-yield.

**Bloomberg US Trsy:** The **Bloomberg US Treasury Index** measures US dollar-denominated, fixed-rate, nominal debt issued by the US Treasury.

**Bloomberg US Trsy: US TIPS:** The **Bloomberg US Treasury: US TIPS Index** is an unmanaged index that consists of inflation-protected securities issued by the U.S. Treasury.

**Bloomberg Mortgage:** The **Bloomberg US Mortgage Backed Securities (MBS) Index** tracks agency mortgage backed pass-through securities (both fixed-rate and hybrid ARM) guaranteed by Ginnie Mae (GNMA), Fannie Mae (FNMA), and Freddie Mac (FHLMC).

**Bloomberg CMBS:** The **U.S. Bloomberg CMBS Investment Grade Index** measures the market of conduit and fusion CMBS deals with a minimum current deal size of \$300mn.

**Bloomberg US High Yield:** The **Bloomberg US Corporate High Yield Bond Index** measures the USD-denominated, high yield, fixed-rate corporate bond market. Securities are classified as high yield if the middle rating of Moody's, Fitch and S&P is Ba1/BB+/BB+ or below.

**Bloomberg Global High Yield:** The **Bloomberg Global High-Yield Index** provides a broad-based measure of the global high-yield fixed income markets.

**CS High Yield Dev Countries Only:** The **Credit Suisse High Yield Dev Countries Only Index** tracks the performance of noninvestment-grade corporate bonds from developed countries.

**CS Leveraged Loan:** The **Credit Suisse Leveraged Loan Index** is an index designed to mirror the investable universe of the \$US-denominated leveraged loan market.

**JPMorgan GBI-EM Gbl Dvf'd:** The **JPMorgan GBI-EM Global Diversified Total Return Index (Unhedged)** is a global emerging markets index that consists of regularly traded, liquid fixed-rate, domestic currency government bonds.

**JPMorgan Emerging Markets Bond Global:** The **JPMorgan Emerging Markets Bond Global Index** is a global emerging markets index that consists of regularly traded, liquid fixed-rate, US dollar-denominated government bonds.

**NCREIF ODCE:** The **NCREIF ODCE (Open End Diversified Core) Index** is an index of investment returns reporting on both a historical and current basis the results of 16 open-end commingled funds pursuing a core investment strategy, some of which have performance histories dating back to the 1970s. The NCREIF ODCE Index is capitalization-weighted and performance is time-weighted.

**NCREIF Property:** The **NCREIF Property Index** prepared by the National Council of Real Estate Investment Fiduciaries is a quarterly time series composite return measure for over 6,000 individual commercial real estate properties acquired in the private market for investment purposes. Total performance represents returns from appreciation and income, and includes multi-family, office, retail, and industrial properties.

**NCREIF Timberland:** The **NCREIF Timberland Index** is a quarterly time series composite return measure of investment performance of a large pool of individual U.S. timber properties acquired in the private market for investment purposes only.

**NCREIF Farmland:** The **NCREIF Farmland Index** is a quarterly time series composite return measure of investment performance of a large pool of individual farmland properties acquired in the private market for investment purposes only.

**HFRI FOF Composite:** The **HFRI FOF (Fund of Funds) Composite Index** is an equal-weighted index that contains over 400 constituent hedge fund of funds, both domestic and offshore.

**Burgiss All Private Equity:** The **Burgiss All Private Equity Benchmark** is a composite of nearly 1400 private equity funds derived from the holdings of over 200 institutional investors.

**Alerian MLP:** The **Alerian MLP Index** is a market-capitalization weighted index of the 50 most prominent energy Master Limited Partnerships.

**S&P Goldman Sachs Commodity:** The **S&P Goldman Sachs Commodity Index** is a composite index of commodity sector returns representing an unleveraged, long-only investment in commodity futures that is broadly diversified across the spectrum of commodities. Components are weighted by their respective world production quantities.

**3 Month LIBOR Rate:** The **3 Month LIBOR Rate Index** is the rate of interest at which banks offer to lend money to one another in the wholesale money markets in London.

**S&P Risk Parity Index – 8% Target Volatility:** The **S&P Risk Parity Index – 8% Target Volatility Index** seeks to measure the performance of a multi-asset risk parity strategy that allocates risk equally among U.S. dollar-denominated equity, fixed income, and commodities futures contracts, while targeting a volatility level of 8%.

**S&P GSCI Gold:** The **S&P GSCI Gold Index** provides investors with a reliable and publicly available benchmark tracking the COMEX gold future.

**FTSE Dev Core 50/50 Infrastructure:** The **FTSE Dev Core 50/50 Infrastructure Index** is a market-capitalization-weighted index of worldwide infrastructure and infrastructure-related securities.

# Capital Markets Review



**Fourth Quarter Economic Environment**

In Q4, most risk assets rebounded from subdued conditions in the previous quarter to finish the year with significant positive returns—a stark turnaround compared to performance in 2022. For instance, the MSCI All Country World Index, a broad measure of the global stock market, returned 22.2% in 2023 compared to returns of -18.4% in 2022. Fixed income markets also ended the year firmly in positive territory. Despite the positive market performance, some recent indicators of economic activity have provided investors reason for caution. For example, commodity prices and energy stocks broadly declined amidst slowing inflation. The manufacturing Purchasing Managers' Index (PMI) remained in contractionary territory throughout the year. However, other economic indicators were more positive, with the services PMI remaining in expansionary territory and corporate earnings proving more resilient than expected. The labor market remained healthy as the unemployment rate finished the year at 3.7%. The Dec. Consumer Price Index (CPI) report showed a higher than expected uptick in monthly inflation and annual inflation of 3.4%. The annual level represents a significant drop compared to the CPI measure of 6.5% in Dec. 2022. The Federal Open Market Committee (FOMC) anticipates further progress in bringing inflation down to target levels, with the current forecast for their preferred inflation measure, the PCE Price Index, projecting a decline to 2.4% by the end of 2024.

**Key Economic Indicators**



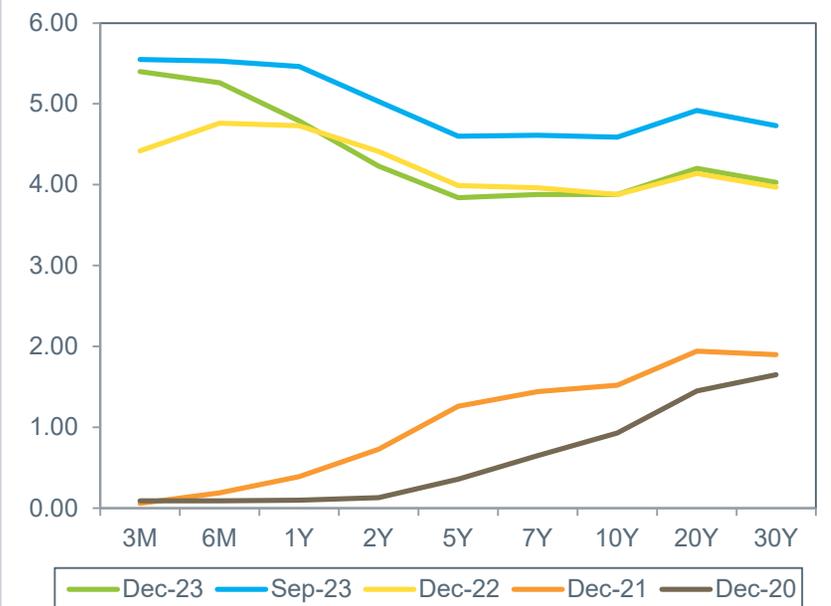
**Economic Indicators**

	Dec-23	Sep-23	Dec-22	Dec-20	20 Yr
Federal Funds Rate (%)	5.33	—	5.33	4.33	0.09
Breakeven Infl. - 5 Yr (%)	2.14	▼	2.25	2.38	1.97
Breakeven Infl. - 10 Yr (%)	2.17	▼	2.34	2.30	1.99
CPI YoY (Headline) (%)	3.4	▼	3.7	6.5	1.4
Unemployment Rate (%)	3.7	▼	3.8	3.5	6.7
Real GDP YoY (%)	3.1	▲	2.9	0.9	-1.5
PMI - Manufacturing	47.2	▼	49.0	48.4	60.5
USD Total Wtd Idx	118.77	▼	122.77	121.40	111.33
WTI Crude Oil per Barrel (\$)	71.7	▼	90.8	80.3	48.5
Gold Spot per Oz (\$)	2,068	▲	1,872	1,824	1,898

**Market Performance (%)**

	QTD	CYTD	1 Yr	5 Yr	10 Yr
S&P 500 (Cap Wtd)	11.69	26.29	26.29	15.69	12.03
Russell 2000	14.03	16.93	16.93	9.97	7.16
MSCI EAFE (Net)	10.42	18.24	18.24	8.16	4.28
MSCI EAFE SC (Net)	11.14	13.16	13.16	6.58	4.80
MSCI Emg Mkts (Net)	7.86	9.83	9.83	3.68	2.66
Bloomberg US Agg Bond	6.82	5.53	5.53	1.10	1.81
ICE BofAML 3 Mo US T-Bill	1.37	5.02	5.02	1.88	1.25
NCREIF ODCE (Gross)	-4.83	-12.02	-12.02	4.25	7.29
FTSE NAREIT Eq REIT (TR)	16.22	13.73	13.73	7.39	7.65
HFRI FOF Comp	3.41	6.35	6.35	5.14	3.25
Bloomberg Cmdbt (TR)	-4.63	-7.91	-7.91	7.23	-1.11

**Treasury Yield Curve (%)**



Fourth Quarter Review

**Broad Market**

Following negative returns in Q3, US equity ended the year on a high note, with the Russell 3000 returning 12.1% in Q4 and 26.0% for the calendar year. Performance was driven by a group of the largest, growth-oriented companies commonly referred to as the "Magnificent 7." Stocks in the high beta, growth, and quality factor groups performed best in 2023, according to data from S&P Global. However, value and momentum factors also provided significant absolute returns during the year.

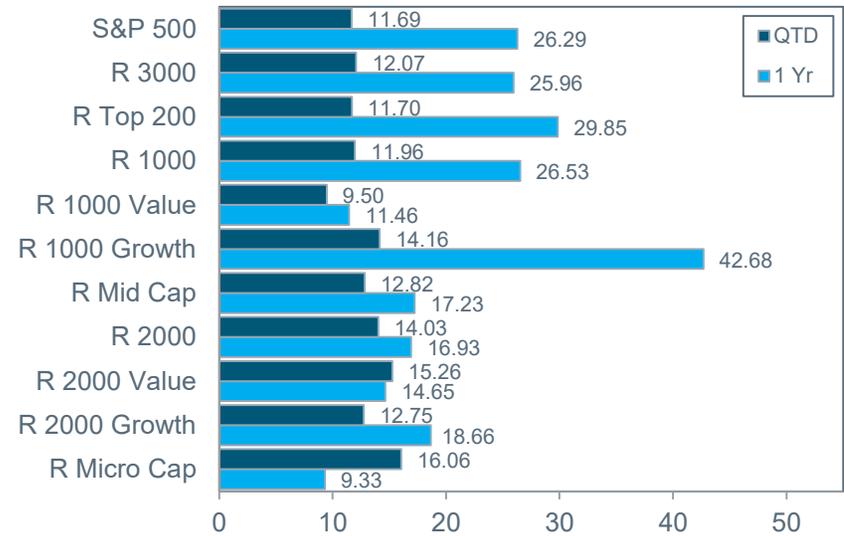
**Market Cap**

Although small cap stocks fared better than large cap stocks in Q4, they finished the year with a lower calendar year return of 16.9% versus 26.5% for large cap stocks, as measured by the Russell 2000 and Russell 1000, respectively.

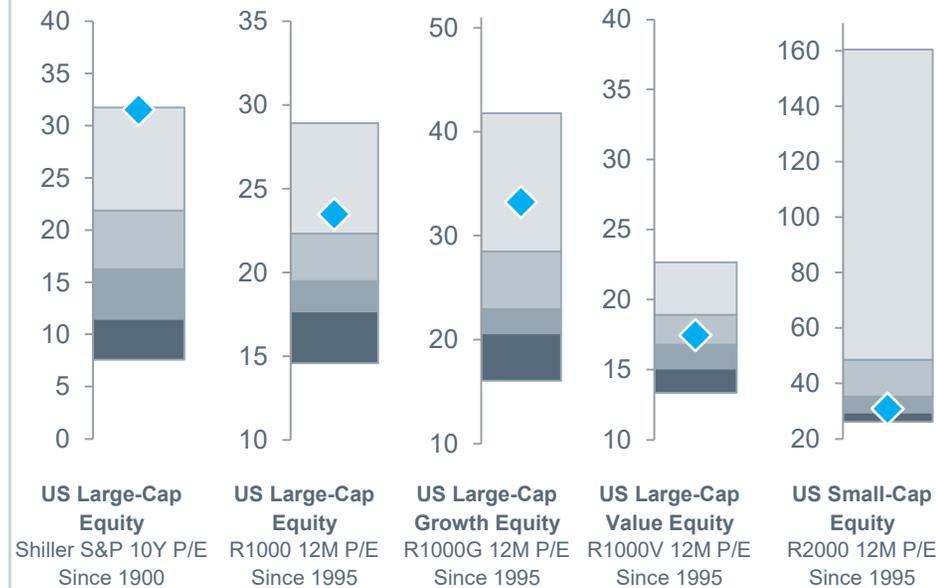
**Style and Sector**

Across active managers, median peer group performance suggests that many strategies did not outperform their respective benchmarks for Q4 and the calendar year. Given the strong returns delivered by growth indexes, growth-oriented managers generally had lower rates of success. In contrast, value-oriented managers were relatively more effective in providing excess returns compared to their benchmarks.

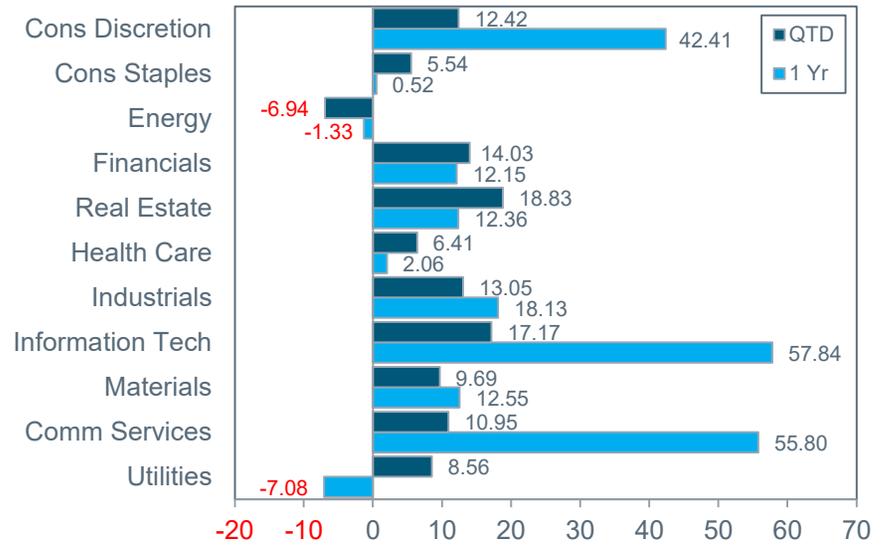
Style and Capitalization Market Performance (%)



Valuations



S&P 500 Index Sector Performance (%)



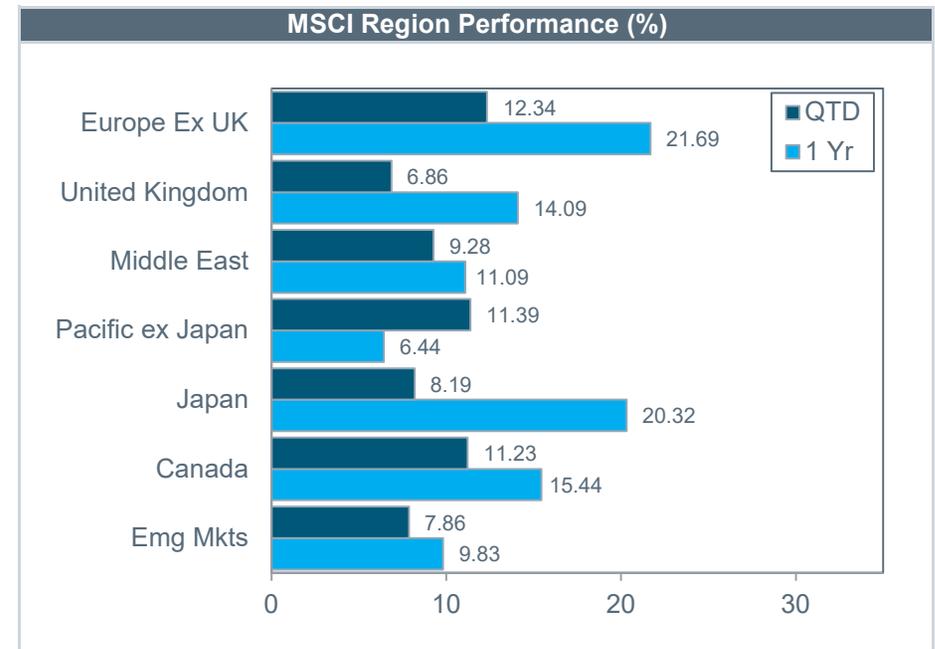
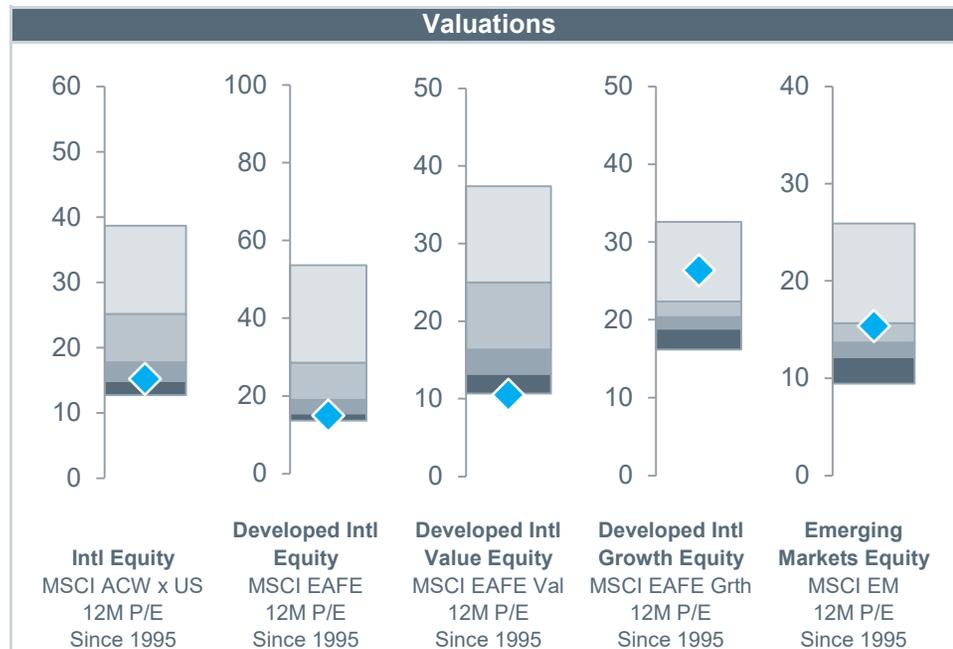
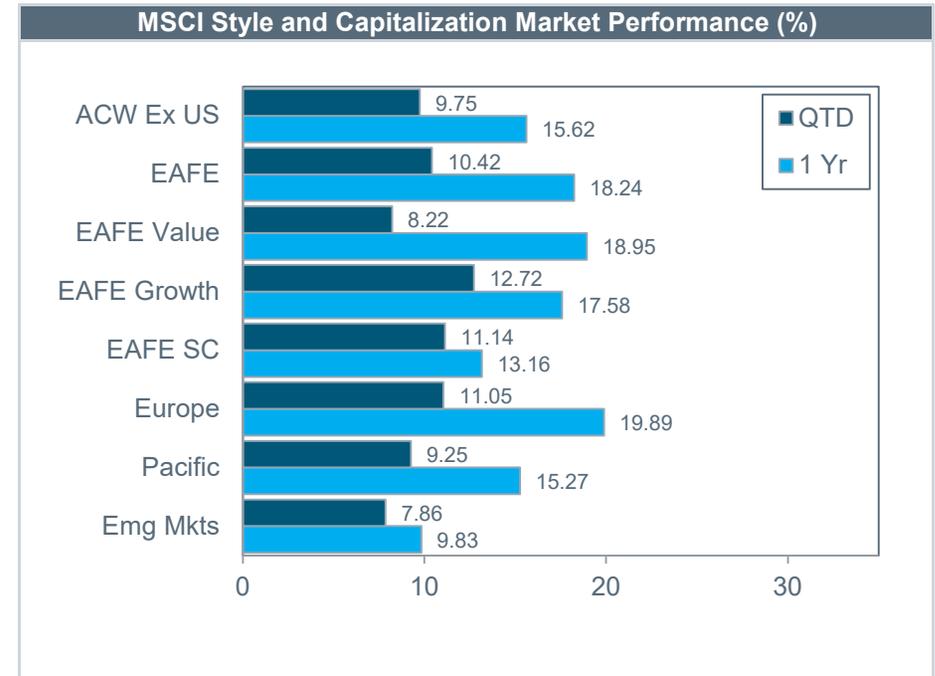
Valuation data courtesy of Bloomberg Professional Service and Robert J. Shiller, Irrational Exuberance, Second Edition. P/E metrics shown represent the 5th through 95th percentiles to minimize the effect of outliers.

### Fourth Quarter Review

**Developed Markets**  
 Developed international markets trailed their US counterparts in Q4. Growth stocks outperformed value stocks during the quarter; however, value outpaced growth for the calendar year.

**Emerging Markets**  
 Emerging market equities lagged developed markets in Q4. Value stocks outperformed their growth counterparts, and small-cap outperformed large-cap. Within China, despite a reported uptick in economic growth for Q3 and continued governmental stimulus, the MSCI China Index remained in negative territory in Q4 as investor sentiment remain muted. The majority of active emerging market managers outperformed their benchmarks for the quarter and the calendar year.

**Market Cap & Style**  
 All developed market sectors delivered positive absolute performance during the quarter except for energy, which had a negative return in Q4 in spite of initially rallying following the start of the Israel/ Hamas war in October. Despite continued pledges of production cuts by OPEC, weak results were driven by waning global demand, moderating inflation, and a mild European winter. The European Central Bank and Bank of England have both pushed back against near-term rate cuts as the Eurozone continues to see persistently high price and wage growth.



Valuation data courtesy of Bloomberg Professional Service.  
 P/E metrics shown represent the 5th through 95th percentiles to minimize the effect of outliers.  
 All returns are shown net of foreign taxes on dividends.



**Fourth Quarter Review**

**Broad Market**

The fixed income market surged in Q4, fueled by moderating economic data, cooling inflation, and investor expectations for more accommodative FOMC policy, along with an increased likelihood of a soft landing for the US economy. The Bloomberg US Aggregate Bond Index gained 6.8% in Q4 and 5.5% for the calendar year. The US 10-year Treasury yield fell 71 basis points during the quarter to end the year at 3.9%, matching its yield at the start of year. Longer duration assets responded to the rate environment and the potential for rate cuts in 2024 with sharply positive results in Q4.

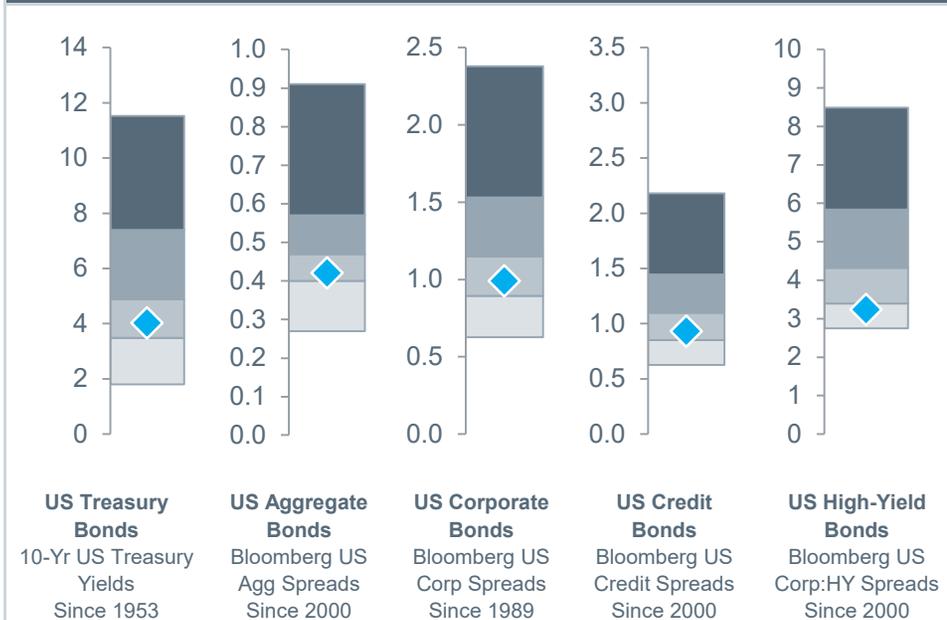
**Credit Market**

Across plus sectors, spreads tightened and risk assets rallied amid falling rates. The Bloomberg US Corporate Investment Grade Index returned 8.5% in Q4 and 8.5% for the calendar year, while the Bloomberg US Corporate High Yield Index returned 7.2% in Q4 and 13.5% for the calendar year.

**Emerging Market Debt**

Emerging market debt experienced a robust rally in Q4. The JPMorgan EMBI Global Diversified Index, which follows hard currency emerging markets, returned 9.2% in Q4 and 11.1% for the calendar year. The JPMorgan GBI-EM Global Diversified Index, reflecting local currency emerging markets, gained 8.1% in Q4 and 12.7% for the calendar year.

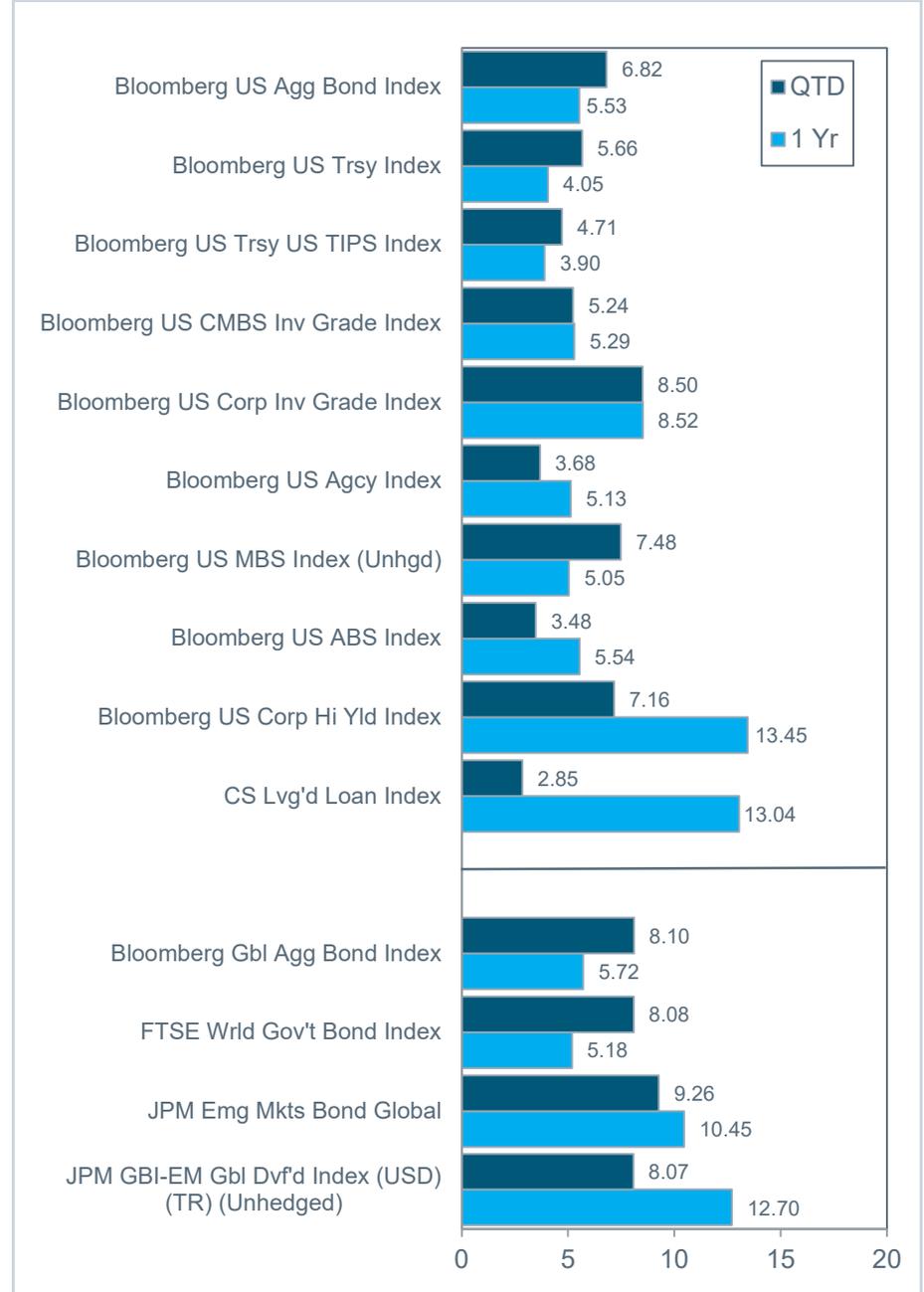
**Valuations**



Valuation data courtesy of Bloomberg Professional Service.

Valuations shown represent the 5th through 95th percentiles to minimize the effect of outliers.

**Fixed Income Performance (%)**



**Fourth Quarter Review - Absolute Return**

**General Market - Hedge Funds**

In Q4, results were more mixed amidst a broad market rally. Credit Arbitrage, Equity Activist, and Directional Quant peer groups indicated the highest returns while most other strategy groups posted modest single-digit gains. Due to the combination of rising equity markets and a reasonable short selling environment supported by elevated rates, both long-biased and market neutral Long/Short Equity managers generated strong market capture despite generally limited exposure to the "Magnificent 7" stocks. Income-oriented strategies provided attractive returns for the first time in years, as managers took advantage of elevated interest rates. Additionally, rates volatility created opportunity for relative value trading.

**General Market - Global Tactical Asset Allocation (GTAA)**

Global Tactical Asset Allocation (GTAA) strategies that RVK follows closely posted significant gains in Q4. However, nearly all active managers underperformed a US-centric 60/40 blend of equity and fixed income both in Q4 and for the calendar year. The top-performing long-biased GTAA strategies in Q4 featured higher allocations to US equities and exposure to the technology sector. Underperforming managers tended to have larger emerging markets exposure and significant value tilts.

**Fourth Quarter Review - Real Assets**

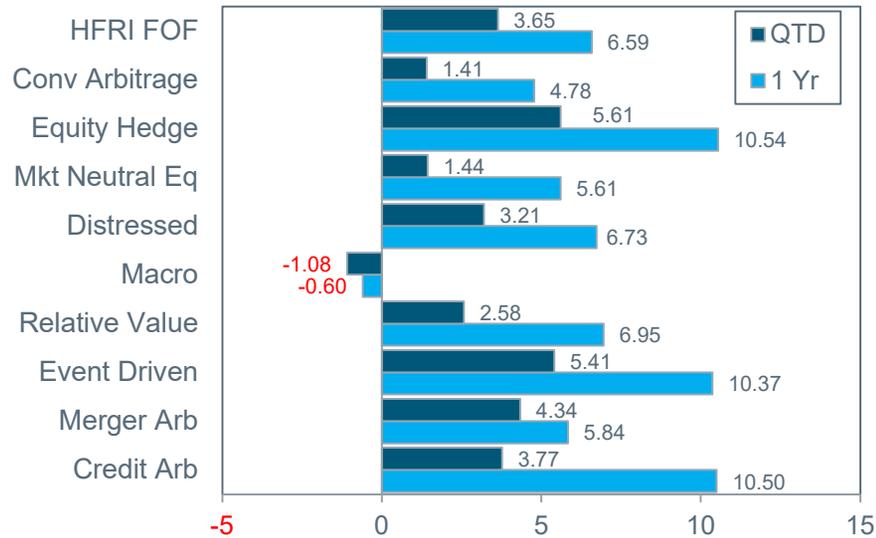
**General Market - Diversified Inflation Strategies (DIS)**

Diversified Inflation Strategy managers tracked closely by RVK reported positive performance. Managers that had larger exposures to listed infrastructure and real estate equities outperformed peers most significantly, while those with larger exposure to the energy and agriculture commodity sector tended to underperform peers.

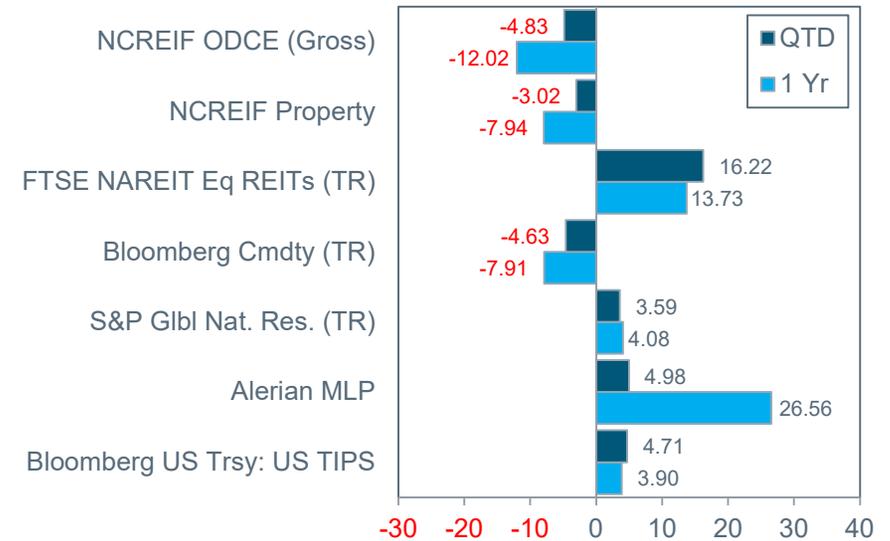
**General Market - Real Estate**

In Q4, core private real estate generated a negative return of -4.8% (on a preliminary and gross of fee basis), as reported by the NFI-ODCE Index, with the total return comprising of 1.0% from income and -5.8% from price appreciation. The income return improved slightly on a percentage basis from the prior quarter, but continues to trend at the lower end of historical levels due to elevated borrowing costs and expenses. Publicly traded real estate outperformed private market counterparts, delivering returns of 17.6% in Q4 as measured by the FTSE/NAREIT All REITs Index. Private real estate markets continued to experience similar trends as the prior five quarters. Significant headwinds persisted due to lingering disruptions in capital markets from 2022.

**HFRI Hedge Fund Performance (%)**



**Real Asset Performance (%)**



Annual Asset Class Performance

As of December 31, 2023

	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	CYTD
Best	78.51	27.94	22.49	20.00	38.82	30.14	15.02	21.31	37.28	8.35	31.49	19.96	43.24	16.09	26.29
	58.21	26.85	15.99	18.23	32.39	19.31	9.59	17.13	33.01	1.87	26.00	18.40	28.71	7.47	18.24
	46.78	22.04	13.56	18.06	29.30	13.69	3.20	11.96	25.03	0.01	25.53	18.31	27.11	1.46	16.93
	31.78	18.88	8.29	17.32	22.78	12.50	1.38	11.77	21.83	-1.26	24.96	16.12	22.17	-5.31	13.73
	28.01	16.83	7.84	16.35	13.94	5.97	0.55	11.19	14.65	-2.08	22.01	12.34	14.82	-11.19	13.45
	27.17	16.36	4.98	16.00	8.96	4.89	0.05	8.77	10.71	-4.02	19.59	10.99	11.26	-11.85	13.16
	26.46	15.12	2.11	15.81	7.44	3.64	-0.27	8.52	7.77	-4.38	18.42	10.88	10.10	-13.01	9.83
	18.91	15.06	0.10	10.94	2.47	3.37	-0.81	6.67	7.62	-4.62	14.32	7.82	6.17	-14.45	7.13
	11.47	10.16	-4.18	8.78	0.07	2.45	-1.44	4.68	7.50	-4.68	8.72	7.51	5.96	-18.11	6.59
	11.41	7.75	-5.72	6.98	-2.02	0.04	-3.30	2.65	5.23	-11.01	8.43	7.11	5.28	-20.09	5.53
	5.93	6.54	-12.14	4.79	-2.60	-2.19	-4.41	2.18	3.54	-11.25	8.39	1.19	0.05	-20.44	5.02
	1.92	6.31	-13.32	4.21	-8.61	-4.90	-4.47	1.00	3.01	-13.79	7.69	0.67	-1.55	-21.39	3.90
	0.21	5.70	-15.94	0.11	-8.83	-4.95	-14.92	0.51	1.70	-14.57	5.34	-3.12	-2.52	-24.37	-7.91
Worst	-29.76	0.13	-18.42	-1.06	-9.52	-17.01	-24.66	0.33	0.86	-17.89	2.28	-8.00	-2.54	-27.09	-12.02
	S&P 500 - US Large Cap	R 2000 - US Small Cap	MSCI EAFE (Net) - Int'l Dev.	MSCI EAFE SC (Net) - Int'l SC	MSCI EM (Net) - Int'l Emg Mkts	Bloombrg US Agg Bond - FI	Bloombrg US Corp Hi Yield - FI	Bloombrg US Trsry US TIPS - FI	Bloombrg US Gov Credit Lng - FI	NCREIF ODCE (Gross) - Real Estate	FTSE NAREIT Eq REITs Index (TR)	HFRI FOF Comp Index - ARS	Bloombrg Cmdty (TR) - Commod.	ICE BofAML 3 Mo T-Bill - Cash Equiv	

NCREIF ODCE (Gross) performance is reported quarterly; performance is shown N/A in interim-quarter months.



# Performance Report - All Systems



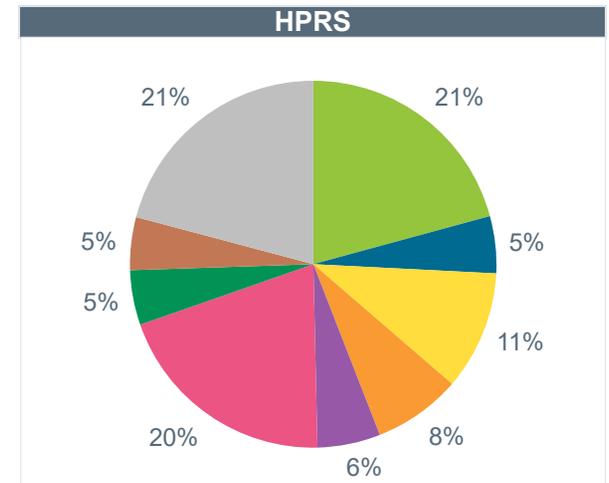
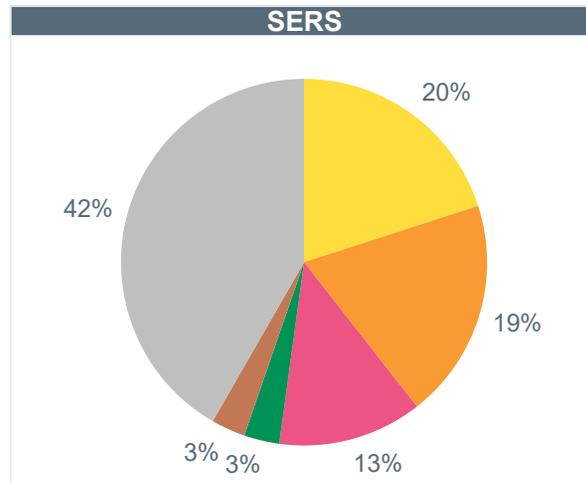
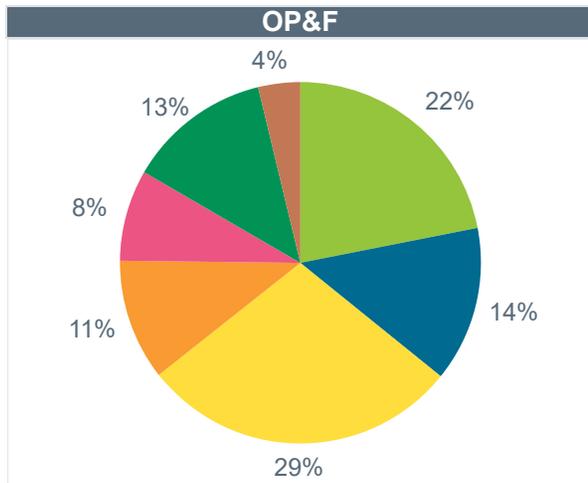
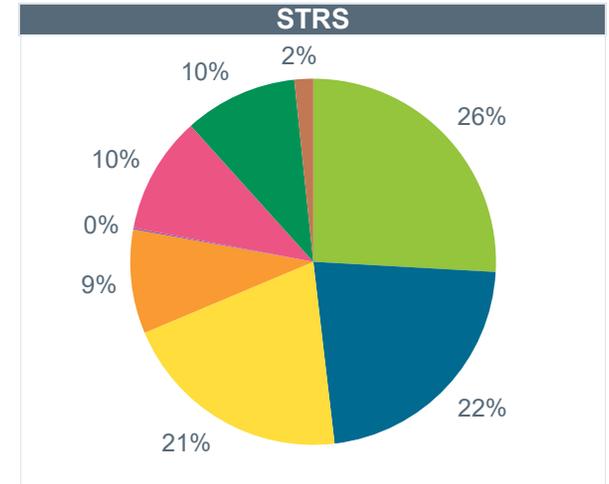
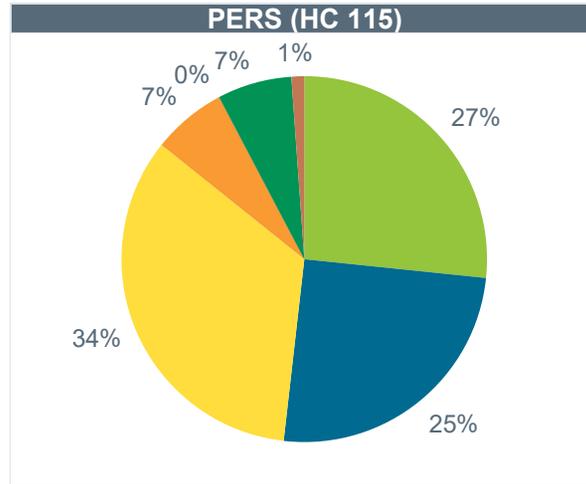
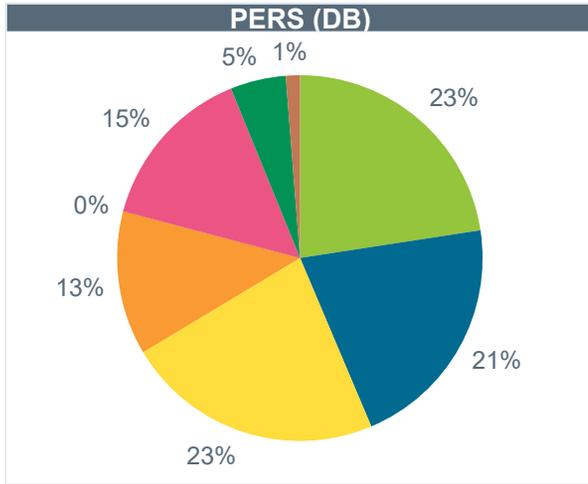
Asset Allocation & Performance - Gross of Fees											
	Market Value (\$000)	Trailing Performance (%)						Calendar Year Performance (%)			
		2 Quarters	1 Year	3 Years	5 Years	7 Years	10 Years	2022	2021	2020	2019
<b>PERS (DB)</b>	<b>98,955,861</b>	<b>4.65</b>	<b>11.42</b>	<b>4.23</b>	<b>8.29</b>	<b>7.80</b>	<b>7.07</b>	<b>-11.95</b>	<b>15.43</b>	<b>12.11</b>	<b>17.31</b>
PERS (DB) Total Fund Benchmark		4.15	10.46	4.09	8.07	7.37	6.61	-11.44	15.28	11.65	17.06
Difference		0.50	0.96	0.14	0.22	0.43	0.46	-0.51	0.15	0.46	0.25
Rank		49	55	63	61	50	40	66	52	48	48
<b>PERS (HC 115)</b>	<b>12,755,152</b>	<b>5.74</b>	<b>13.97</b>	<b>3.26</b>	<b>7.88</b>	<b>6.82</b>	<b>5.84</b>	<b>-15.51</b>	<b>14.34</b>	<b>10.96</b>	<b>19.59</b>
PERS (HC 115) Total Fund Benchmark		5.80	13.65	2.97	7.46	6.37	5.51	-15.56	13.76	10.13	19.20
Difference		-0.06	0.32	0.29	0.42	0.45	0.33	0.05	0.58	0.83	0.39
Rank		8	13	84	79	83	84	95	64	63	16
<b>STRS</b>	<b>91,630,550</b>	<b>4.20</b>	<b>11.64</b>	<b>6.43</b>	<b>9.89</b>	<b>8.97</b>	<b>8.12</b>	<b>-9.52</b>	<b>19.36</b>	<b>12.26</b>	<b>18.39</b>
STRS Total Fund Benchmark		4.51	12.39	5.53	9.24	8.39	7.65	-10.90	17.36	11.92	18.27
Difference		-0.31	-0.75	0.90	0.65	0.58	0.47	1.38	2.00	0.34	0.12
Rank		72	50	20	15	12	7	37	12	45	28
<b>OP&amp;F</b>	<b>17,640,574</b>	<b>4.20</b>	<b>9.52</b>	<b>6.39</b>	<b>9.05</b>	<b>8.16</b>	<b>7.55</b>	<b>-8.73</b>	<b>20.48</b>	<b>9.09</b>	<b>17.39</b>
OP&F Total Fund Benchmark		4.21	10.30	4.68	8.05	6.96	6.45	-10.57	16.29	9.86	16.85
Difference		-0.01	-0.78	1.71	1.00	1.20	1.10	1.84	4.19	-0.77	0.54
Rank		72	85	20	40	39	22	32	10	85	47
<b>SERS</b>	<b>18,238,239</b>	<b>4.33</b>	<b>10.66</b>	<b>7.45</b>	<b>10.53</b>	<b>9.70</b>	<b>8.56</b>	<b>-4.89</b>	<b>17.88</b>	<b>12.99</b>	<b>17.69</b>
SERS Total Fund Benchmark		3.28	10.00	5.12	8.50	7.73	6.91	-7.91	14.66	11.55	16.04
Difference		1.05	0.66	2.33	2.03	1.97	1.65	3.02	3.22	1.44	1.65
Rank		66	72	11	4	3	3	10	23	35	40
<b>HPRS</b>	<b>1,075,677</b>	<b>5.49</b>	<b>14.43</b>	<b>6.81</b>	<b>11.10</b>	<b>9.25</b>	<b>7.87</b>	<b>-8.92</b>	<b>16.92</b>	<b>16.86</b>	<b>18.85</b>
HPRS Total Fund Benchmark		5.47	13.99	6.47	9.99	8.60	7.45	-9.21	16.63	13.16	17.85
Difference		0.02	0.44	0.34	1.11	0.65	0.42	0.29	0.29	3.70	1.00
Rank		13	7	17	2	6	12	34	36	3	23
<i>All Public Plans &gt; \$1B-Total Fund Median</i>		<i>4.64</i>	<i>11.62</i>	<i>4.54</i>	<i>8.57</i>	<i>7.78</i>	<i>6.85</i>	<i>-10.84</i>	<i>15.52</i>	<i>11.97</i>	<i>17.28</i>

OPERS health care plan is not a pension plan and therefore has significantly different characteristics including a shorter focus asset allocation with more liquidity than the pension plans. For purposes of this study, the OPERS health care plan has been included in the results. The results for OPERS health care plan is reflected in the PERS 115 trust subsequent to October 2014 and in the PERS HC results prior to October 2014.

Asset Allocation & Performance - Net of Fees											
	Market Value (\$000)	Trailing Performance (%)						Calendar Year Performance (%)			
		2 Quarters	1 Year	3 Years	5 Years	7 Years	10 Years	2022	2021	2020	2019
<b>PERS (DB)</b>	<b>98,955,861</b>	<b>4.55</b>	<b>11.26</b>	<b>4.13</b>	<b>8.19</b>	<b>7.69</b>	<b>6.92</b>	<b>-12.03</b>	<b>15.34</b>	<b>12.02</b>	<b>17.23</b>
PERS (DB) Total Fund Benchmark		4.15	10.46	4.09	8.07	7.37	6.61	-11.44	15.28	11.65	17.06
Difference		0.40	0.80	0.04	0.12	0.32	0.31	-0.59	0.06	0.37	0.17
<b>PERS (HC 115)</b>	<b>12,755,152</b>	<b>5.74</b>	<b>13.97</b>	<b>3.26</b>	<b>7.88</b>	<b>6.82</b>	<b>5.80</b>	<b>-15.51</b>	<b>14.34</b>	<b>10.96</b>	<b>19.59</b>
PERS (HC 115) Total Fund Benchmark		5.80	13.65	2.97	7.46	6.37	5.51	-15.56	13.76	10.13	19.20
Difference		-0.06	0.32	0.29	0.42	0.45	0.29	0.05	0.58	0.83	0.39
<b>STRS</b>	<b>91,630,550</b>	<b>4.14</b>	<b>11.51</b>	<b>6.31</b>	<b>9.77</b>	<b>8.84</b>	<b>7.99</b>	<b>-9.64</b>	<b>19.24</b>	<b>12.14</b>	<b>18.27</b>
STRS Total Fund Benchmark		4.51	12.39	5.53	9.24	8.39	7.65	-10.90	17.36	11.92	18.27
Difference		-0.37	-0.88	0.78	0.53	0.45	0.34	1.26	1.88	0.22	0.00
<b>OP&amp;F</b>	<b>17,640,574</b>	<b>3.97</b>	<b>9.04</b>	<b>5.73</b>	<b>8.40</b>	<b>7.52</b>	<b>6.92</b>	<b>-9.38</b>	<b>19.63</b>	<b>8.51</b>	<b>16.71</b>
OP&F Total Fund Benchmark		4.21	10.30	4.68	8.05	6.96	6.45	-10.57	16.29	9.86	16.85
Difference		-0.24	-1.26	1.05	0.35	0.56	0.47	1.19	3.34	-1.35	-0.14
<b>SERS</b>	<b>18,238,239</b>	<b>3.94</b>	<b>9.89</b>	<b>6.71</b>	<b>9.82</b>	<b>8.99</b>	<b>7.87</b>	<b>-5.60</b>	<b>17.13</b>	<b>12.40</b>	<b>16.96</b>
SERS Total Fund Benchmark		3.28	10.00	5.12	8.50	7.73	6.91	-7.91	14.66	11.55	16.04
Difference		0.66	-0.11	1.59	1.32	1.26	0.96	2.31	2.47	0.85	0.92
<b>HPRS</b>	<b>1,075,677</b>	<b>5.24</b>	<b>13.80</b>	<b>6.25</b>	<b>10.57</b>	<b>8.71</b>	<b>7.35</b>	<b>-9.38</b>	<b>16.31</b>	<b>16.38</b>	<b>18.43</b>
HPRS Total Fund Benchmark		5.47	13.99	6.47	9.99	8.60	7.45	-9.21	16.63	13.16	17.85
Difference		-0.23	-0.19	-0.22	0.58	0.11	-0.10	-0.17	-0.32	3.22	0.58

Performance shown is net of all investment management costs. PERS (DB): 3 Year performance reduced 0.37%, 5 Year performance reduced 0.23%, 7 Year performance reduced 0.16% and 10 Year performance reduced 0.12% due to change in distribution methodology in private equity and real estate portfolios.

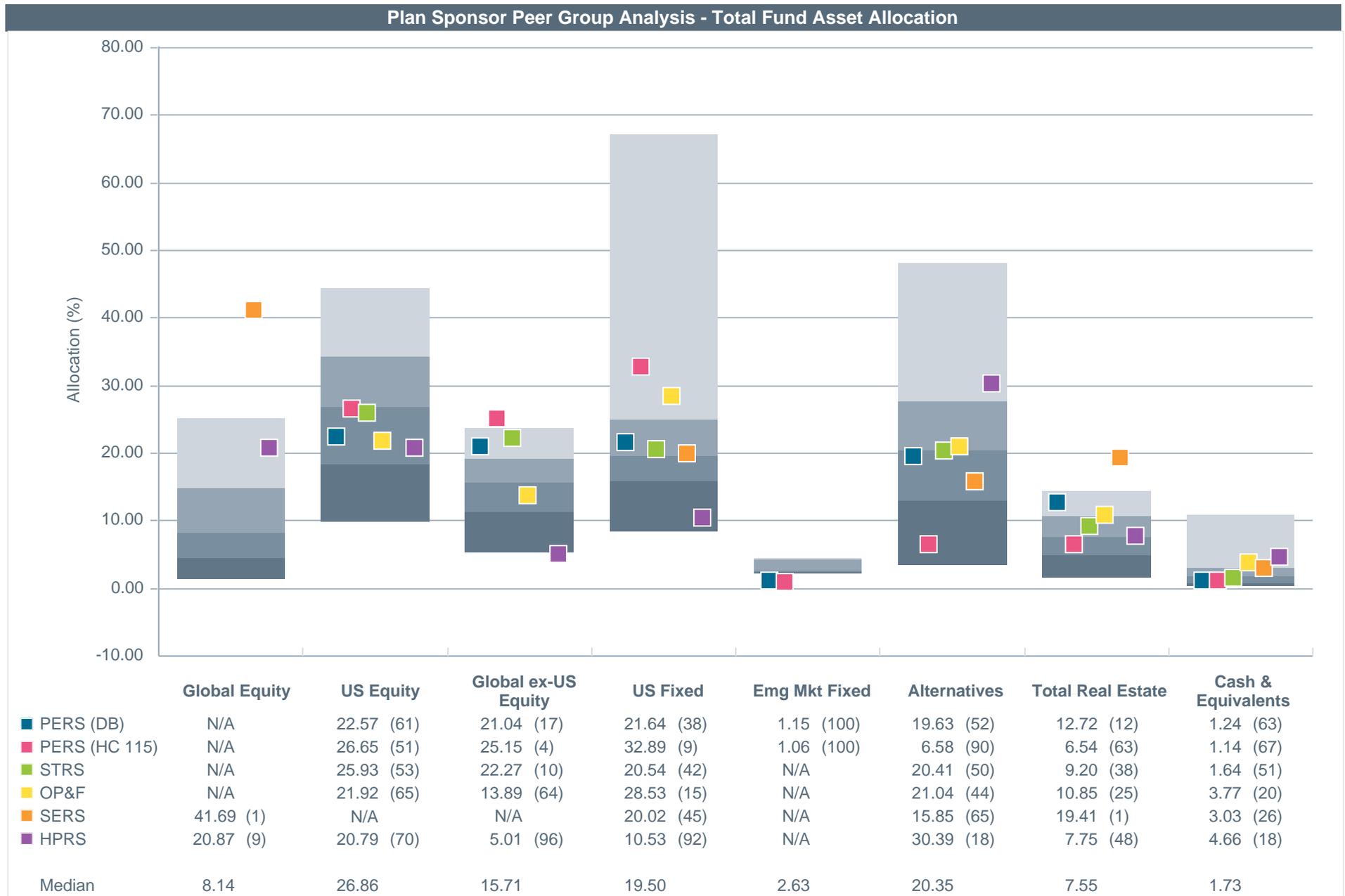
Ohio Retirement Study Council  
Current Asset Allocation by Asset Class



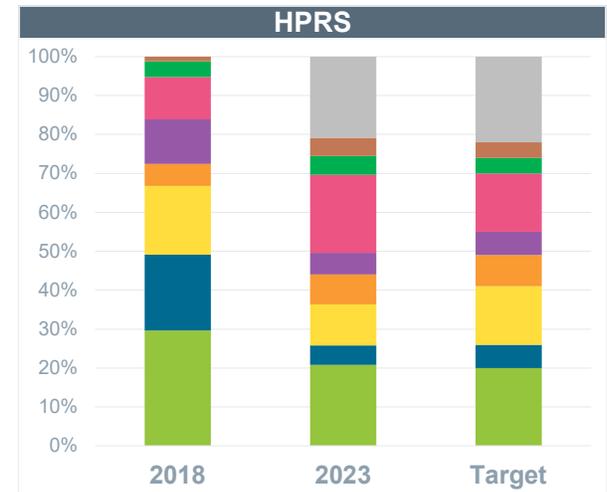
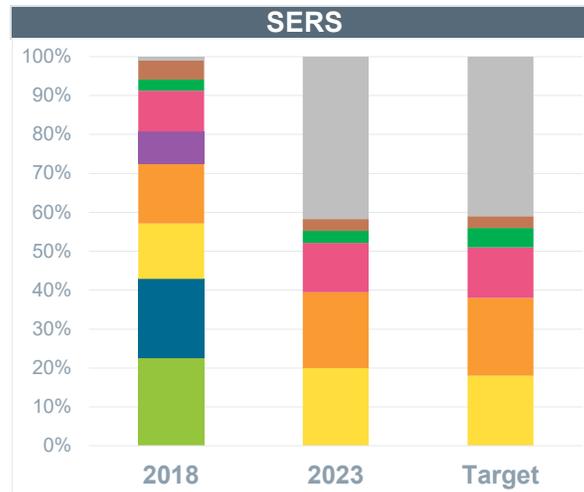
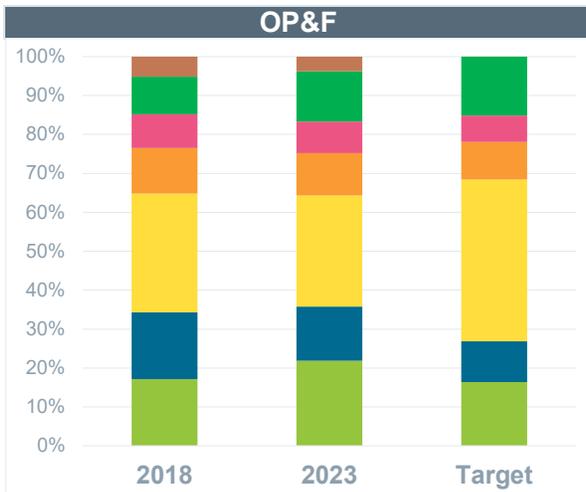
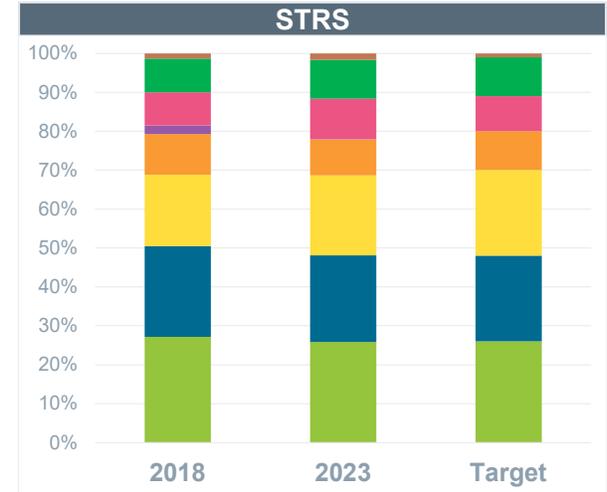
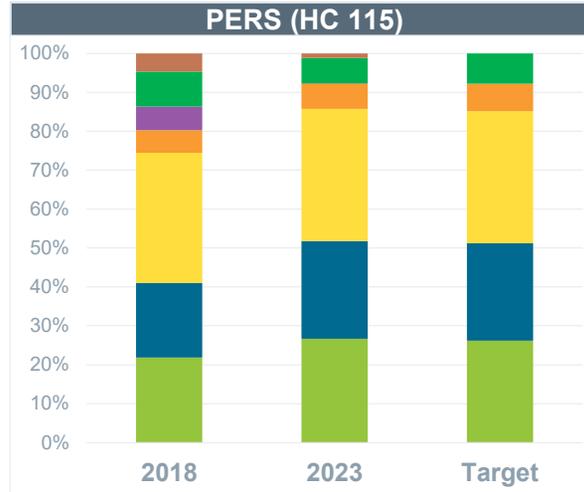
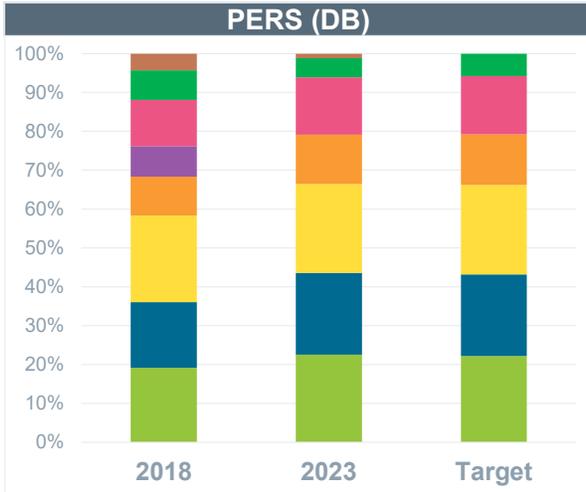
- US Equity
- International Equity
- Fixed Income
- Real Estate
- Global Equity
- Hedge Funds
- Private Equity
- Other Alternatives
- Cash Equivalents

Allocations shown may not sum up to 100% exactly due to rounding. Cash Equivalents for PERS (DB) and PERS (HC 115) consists of cash, rebalancing, and additional annuity.





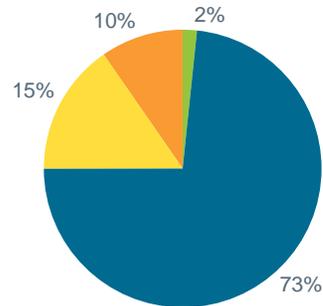
Allocations shown may not add up to 100% due to rounding. US Fixed Income may include allocations to Intl. Fixed Income not explicitly broken out by the plans. Parentheses contain percentile ranks. Cash Equivalents for PERS (DB) consists of cash, rebalancing, and additional annuity. Cash Equivalents for PERS (HC 115) consists of cash and rebalancing.



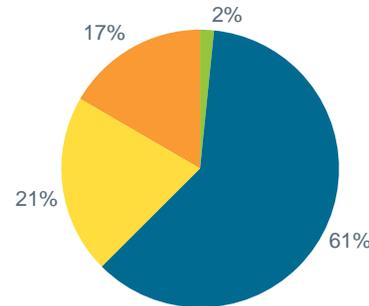
Summary

- **Alpha:** Aims to continually provide a return in excess of the portfolio benchmark return for a given level of risk and are intended to provide diversification (primarily with the Capital Appreciation and Capital Preservation components).  
(Includes: Hedge Funds, Global Tactical Asset Allocation (GTAA), and Risk Parity)
- **Capital Appreciation:** Seeks high level of capital gains through increased risk-return trade-off.  
(Includes: Public & Private Equities, High Yield, Emerging Markets Debt, MLPs, Timber, Non-Core Real Estate, Opportunistic Investments, and Securitized Debt)
- **Capital Preservation:** Conservative strategy designed to avoid risk of loss of principal.  
(Includes: Core Fixed Income and Cash Equivalents)
- **Inflation:** Provide returns that will keep pace with normal inflationary movements in the long-term market. Designed not to lose value in an inflationary environment.  
(Includes: TIPS, Commodities, Real Return, Floating Rate Debt, REITs, and Core Real Estate)

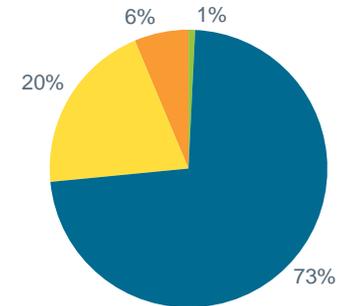
PERS (DB)



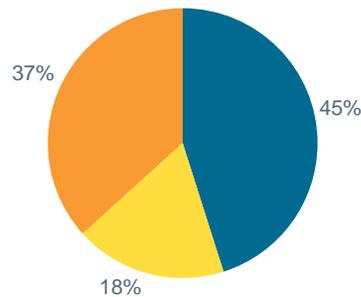
PERS (HC 115)



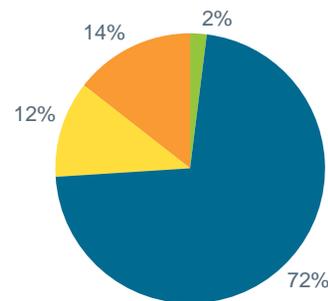
STRS



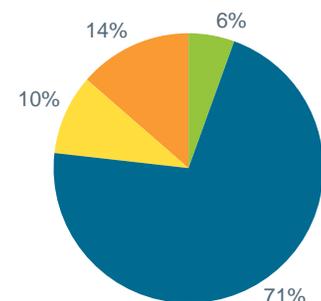
OP&F



SERS



HPRS



Asset Allocation by Thematic Category percentages are provided by the Plans. Allocations are based on dedicated composite allocations and not underlying investment manager exposures; as such, thematic allocations are approximations. OP&F does not have any dedicated exposure to Alpha strategies, but does have alpha exposure embedded within other asset class buckets. Allocations shown may not sum up to exactly 100% due to rounding. Please see the Glossary for additional information regarding thematic descriptions.

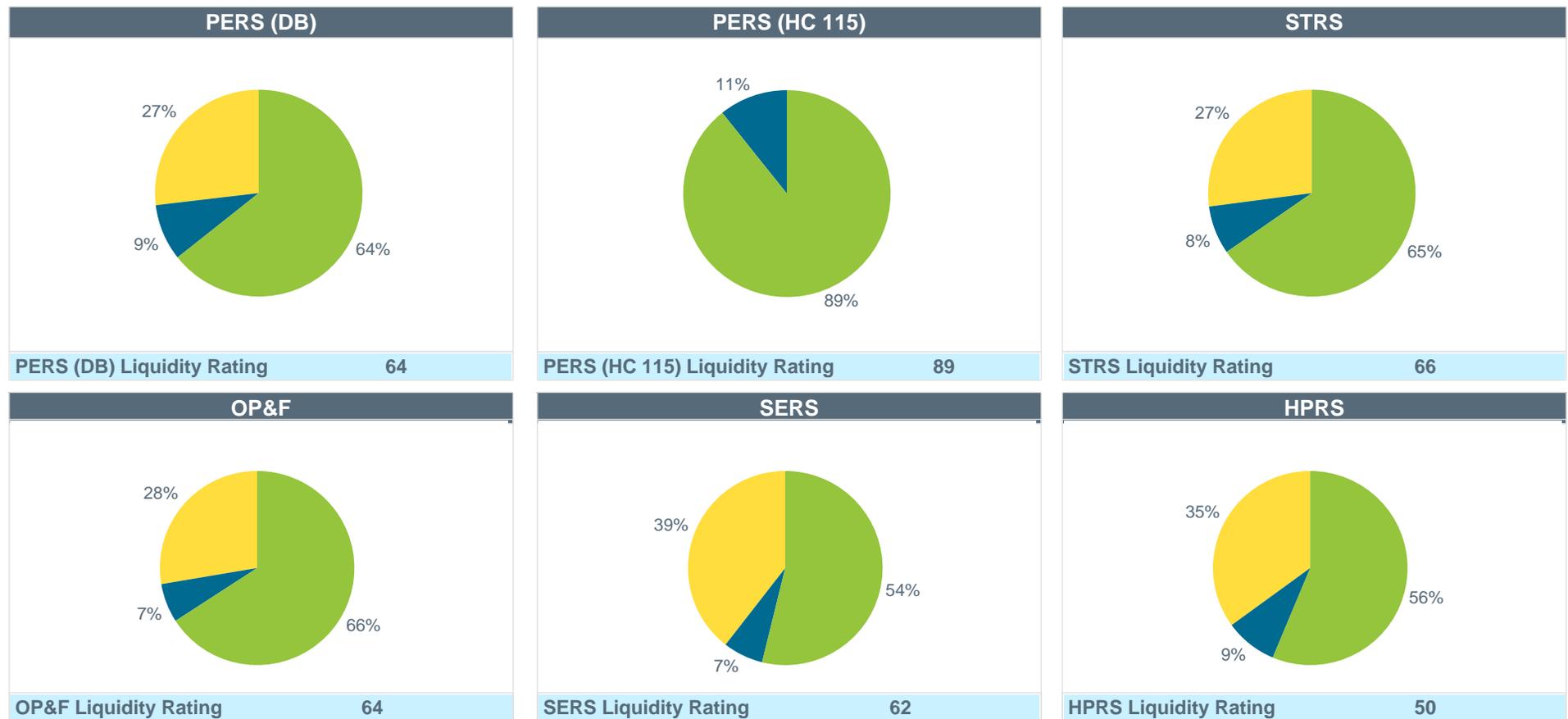
Summary

**RVK Liquidity Rating** - A qualitative method developed and calculated by RVK for determining the relative amount of liquidity in a portfolio.

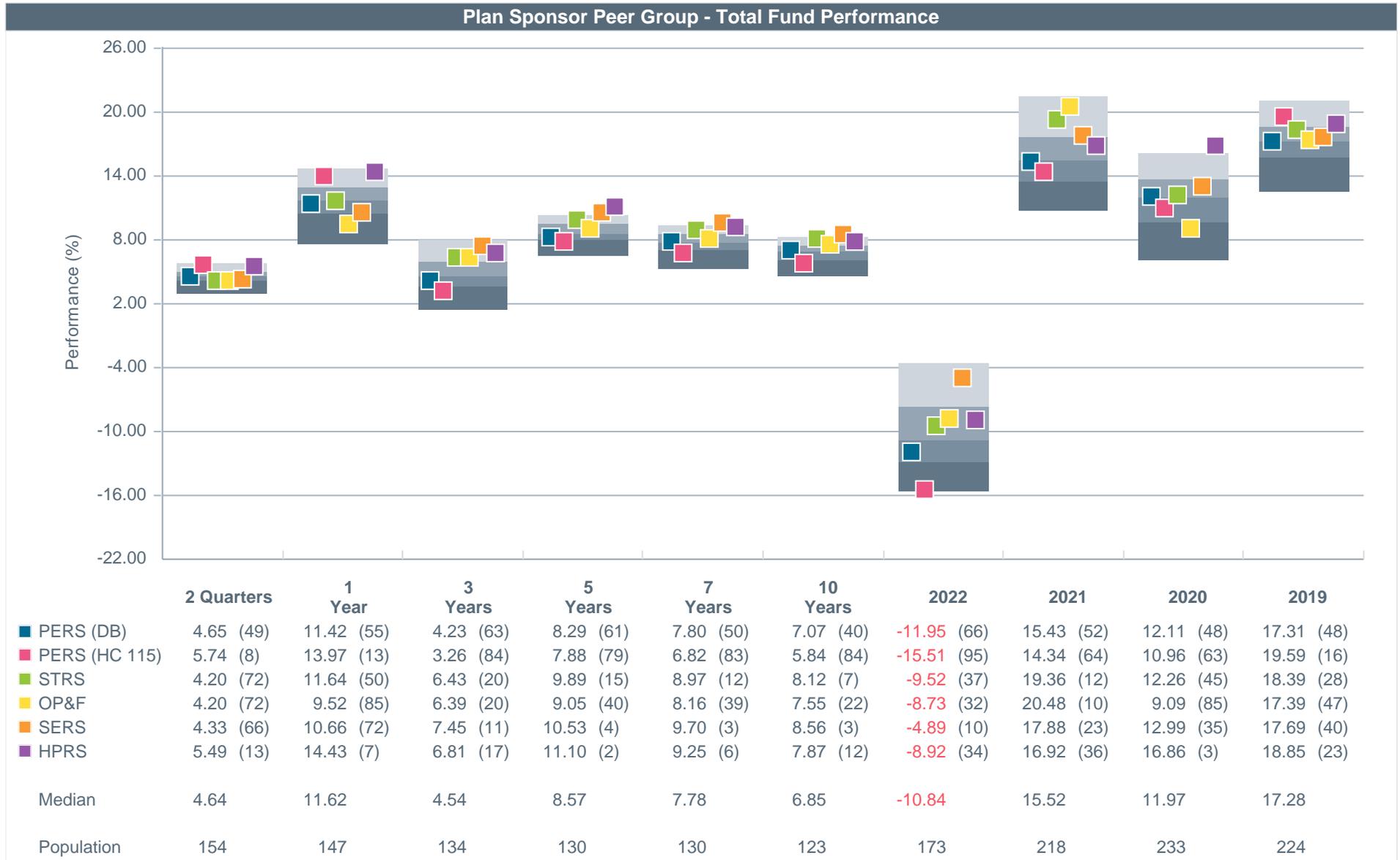
**Liquid Investments:** Publicly traded assets, largely exchanged traded with significant trading volume for the overall asset classes. Takes a relatively small discount or time required to raise cash, but generally expected to clear at quoted bid prices within several trading days.

**Less Liquid Investments:** Smaller trading volume, non-exchange traded, or vehicle-based liquidity constraints. Moderate to significant discount to raise cash, expected to see fewer purchase-oriented bids, or time required to receive cash is significantly greater than several trading days.

**Not Liquid Investments:** Private appraisal-based transactions, vehicle-based liquidity constraints, or privately held assets. Extreme discount to raise cash or 6-12+ months required to receive cash.

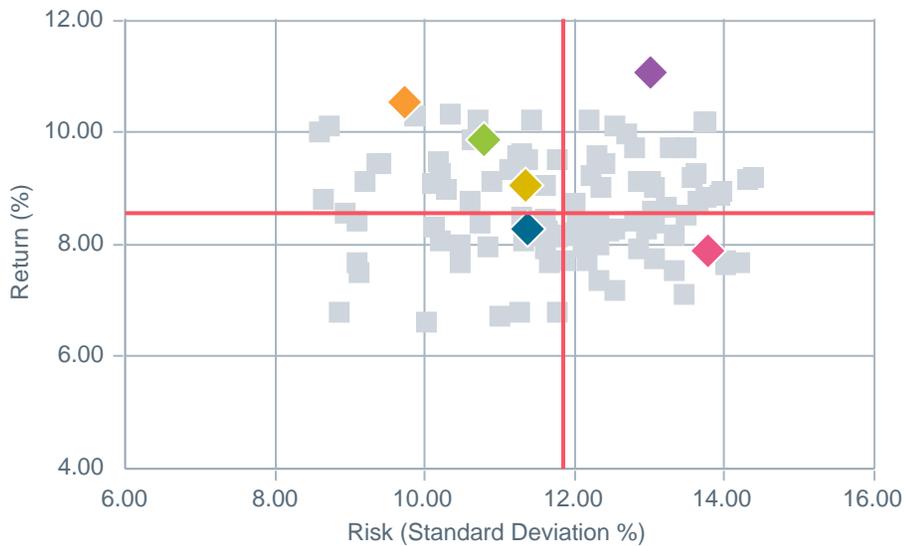


Asset Allocation by Liquidity percentages are provided by the Plans. Allocations are based on dedicated composite allocations and not underlying investment manager exposures; as such, liquidity allocations are approximations. Allocations shown may not sum up to exactly 100% due to rounding. The RVK Liquidity Rating is calculated by RVK using beginning of quarter investment weights applied to each corresponding asset class liquidity rating. Please see the glossary for additional information regarding liquidity and custom index descriptions.



Performance shown is gross of fees. Parentheses contain percentile ranks. PERS (DB): 3 Year performance reduced 0.37%, 5 Year performance reduced 0.23%, 7 Year performance reduced 0.16% and 10 Year performance reduced 0.12% due to change in distribution methodology in private equity and real estate portfolios.

Plan Sponsor Peer Group Scattergram - 5 Years



	Return	Standard Deviation
◆ PERS (DB)	8.29	11.37
◆ PERS (HC 115)	7.88	13.77
◆ STRS	9.89	10.78
◆ OP&F	9.05	11.35
◆ SERS	10.53	9.73
◆ HPRS	11.10	13.00
— Median	8.57	11.85

Sharpe Ratio - 5 Year

PERS (DB)	0.60
PERS (HC 115)	0.49
STRS	0.76
OP&F	0.66
SERS	0.88
HPRS	0.74
<i>All Public Plans &gt; \$1B-Total Fund Median</i>	<i>0.59</i>

Plan Sponsor Peer Group Scattergram - 10 Years



	Return	Standard Deviation
◆ PERS (DB)	7.07	8.86
◆ PERS (HC 115)	5.84	10.72
◆ STRS	8.12	8.62
◆ OP&F	7.55	8.97
◆ SERS	8.56	7.87
◆ HPRS	7.87	10.30
— Median	6.85	9.46

Sharpe Ratio - 10 Year

PERS (DB)	0.68
PERS (HC 115)	0.47
STRS	0.81
OP&F	0.72
SERS	0.92
HPRS	0.67
<i>All Public Plans &gt; \$1B-Total Fund Median</i>	<i>0.60</i>

Performance shown is gross of fees.

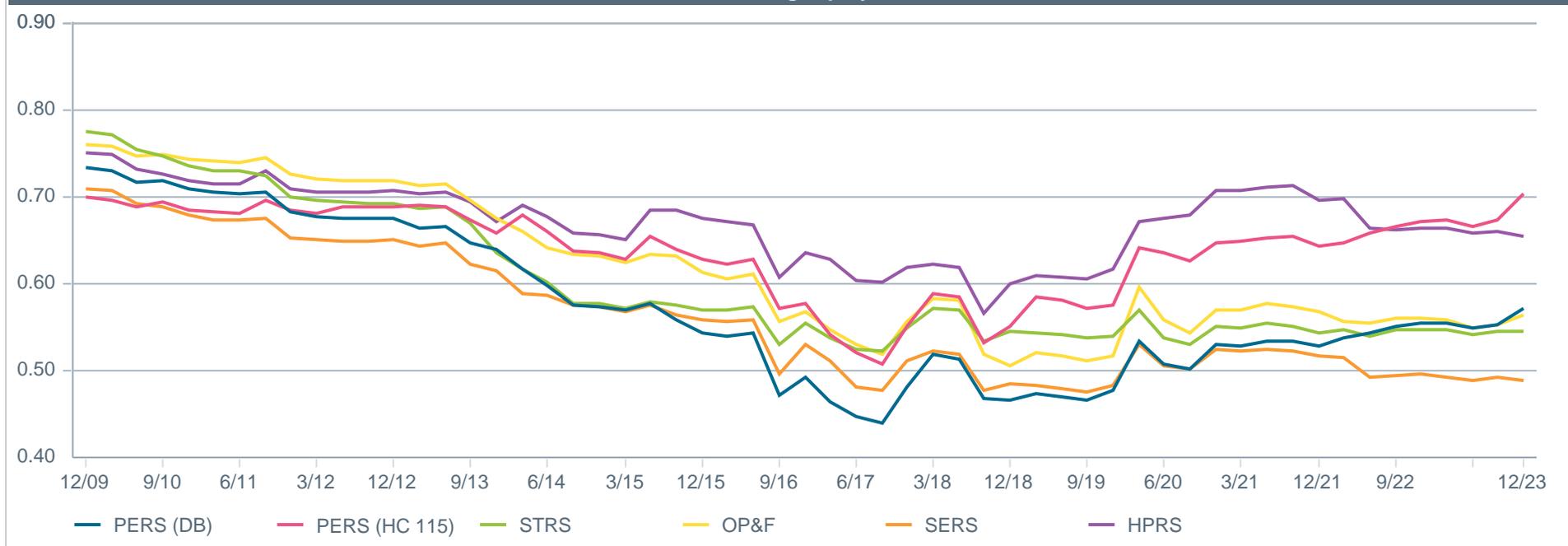
Summary

Beta is a measure of the sensitivity of a portfolio to the movements of the U.S. equity market as represented by the S&P 500 Index (Cap Wtd). Beta measures a portfolio's non-diversifiable or systematic risk. As an example, a Beta of 0.70 indicates that a portfolio captures roughly 70% of the S&P 500 Index return. If the S&P 500 Index returns 10%, the portfolio would be expected to return 7%.

Equity Beta

	3 Years	5 Years	7 Years	10 Years
PERS (DB)	0.58	0.57	0.55	0.55
PERS (HC 115)	0.71	0.70	0.67	0.67
STRS	0.52	0.54	0.54	0.54
OP&F	0.50	0.56	0.55	0.55
SERS	0.42	0.49	0.49	0.49
HPRS	0.54	0.65	0.65	0.65
S&P 500 Index (Cap Wtd)	1.00	1.00	1.00	1.00

5 Year Rolling Equity Beta

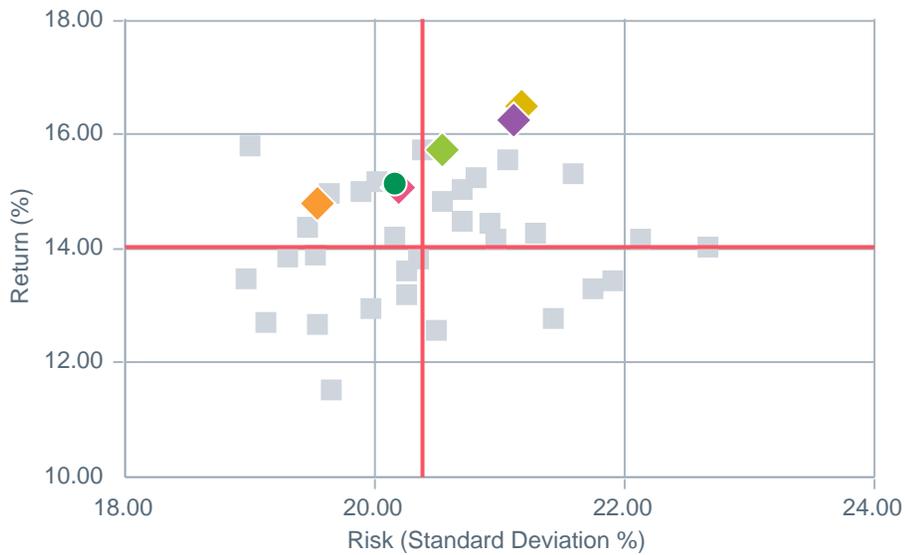


Performance shown is gross of fees and is calculated using quarterly periodicity.

Performance										
	Trailing Performance (%)						Calendar Year Performance (%)			
	2 Quarters	1 Year	3 Years	5 Years	7 Years	10 Years	2022	2021	2020	2019
<b>US Equity</b>										
<b>PERS (DB)</b>	<b>8.44</b>	<b>25.95</b>	<b>8.83</b>	<b>15.07</b>	<b>12.81</b>	<b>11.31</b>	<b>-18.97</b>	<b>26.30</b>	<b>19.69</b>	<b>30.76</b>
Russell 3000 Index	8.43	25.96	8.54	15.16	12.81	11.48	-19.21	25.66	20.89	31.02
Difference	0.01	-0.01	0.29	-0.09	0.00	-0.17	0.24	0.64	-1.20	-0.26
Rank	27	21	25	22	18	19	61	34	43	35
<b>PERS (HC 115)</b>	<b>8.44</b>	<b>25.95</b>	<b>8.83</b>	<b>15.07</b>	<b>12.81</b>	<b>11.30</b>	<b>-18.97</b>	<b>26.30</b>	<b>19.69</b>	<b>30.76</b>
Russell 3000 Index	8.43	25.96	8.54	15.16	12.81	11.48	-19.21	25.66	20.89	31.02
Difference	0.01	-0.01	0.29	-0.09	0.00	-0.18	0.24	0.64	-1.20	-0.26
Rank	27	21	25	22	18	20	61	34	43	35
<b>STRS</b>	<b>8.52</b>	<b>25.25</b>	<b>8.45</b>	<b>15.75</b>	<b>13.32</b>	<b>11.65</b>	<b>-19.50</b>	<b>26.53</b>	<b>23.00</b>	<b>32.43</b>
Russell 3000 Index	8.43	25.96	8.54	15.16	12.81	11.48	-19.21	25.66	20.89	31.02
Difference	0.09	-0.71	-0.09	0.59	0.51	0.17	-0.29	0.87	2.11	1.41
Rank	25	23	33	10	8	10	75	32	16	6
<b>OP&amp;F</b>	<b>6.63</b>	<b>23.13</b>	<b>9.87</b>	<b>16.50</b>	<b>14.24</b>	<b>12.64</b>	<b>-17.23</b>	<b>30.14</b>	<b>22.79</b>	<b>31.77</b>
Wilshire 5000 Index	8.42	26.14	8.97	15.42	12.96	11.68	-19.04	26.70	20.82	31.02
Difference	-1.79	-3.01	0.90	1.08	1.28	0.96	1.81	3.44	1.97	0.75
Rank	89	49	16	1	1	1	38	5	17	18
<b>SERS</b>	<b>7.99</b>	<b>23.13</b>	<b>7.82</b>	<b>14.81</b>	<b>12.56</b>	<b>11.09</b>	<b>-18.51</b>	<b>24.90</b>	<b>21.87</b>	<b>30.60</b>
Russell 3000 Index	8.43	25.96	8.54	15.16	12.81	11.48	-19.21	25.66	20.89	31.02
Difference	-0.44	-2.83	-0.72	-0.35	-0.25	-0.39	0.70	-0.76	0.98	-0.42
Rank	41	49	48	29	25	25	59	43	22	37
<b>HPRS</b>	<b>8.43</b>	<b>25.38</b>	<b>9.73</b>	<b>16.25</b>	<b>13.15</b>	<b>11.72</b>	<b>-17.27</b>	<b>27.38</b>	<b>23.28</b>	<b>30.36</b>
Russell 3000 Index	8.43	25.96	8.54	15.16	12.81	11.48	-19.21	25.66	20.89	31.02
Difference	0.00	-0.58	1.19	1.09	0.34	0.24	1.94	1.72	2.39	-0.66
Rank	27	22	17	1	9	6	38	26	11	41
<i>All Public Plans &gt; \$1B-US Equity Segment Median</i>	<i>7.80</i>	<i>23.03</i>	<i>7.77</i>	<i>14.03</i>	<i>11.91</i>	<i>10.37</i>	<i>-17.92</i>	<i>24.35</i>	<i>18.92</i>	<i>30.14</i>

Performance shown is gross of fees. Ranks are shown against All Public Plans >\$1B-US Equity Segment.

Plan Sponsor Peer Group Scattergram - 5 Years

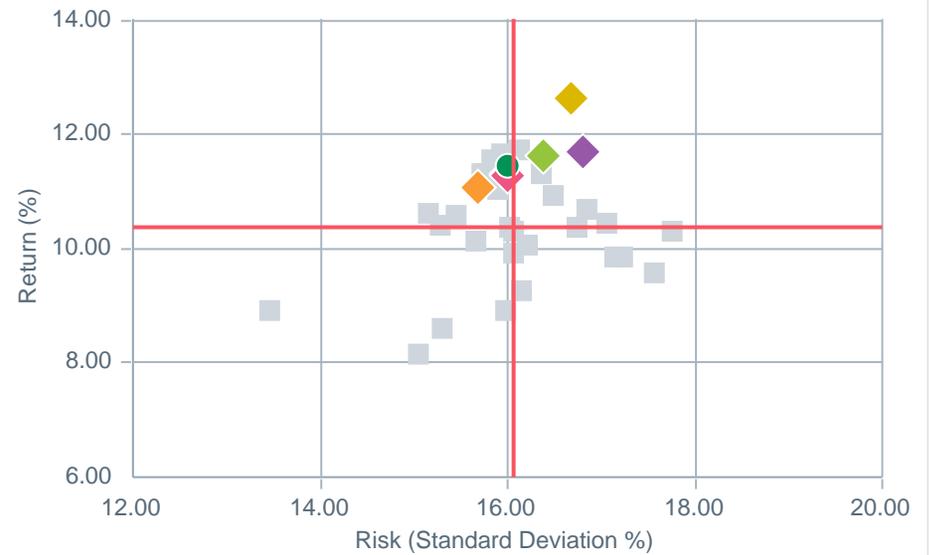


	Return	Standard Deviation
◆ PERS (DB)	15.07	20.19
◆ PERS (HC 115)	15.07	20.19
◆ STRS	15.75	20.55
◆ OP&F	16.50	21.17
◆ SERS	14.81	19.55
◆ HPRS	16.25	21.12
● Russell 3000 Index	15.16	20.16
— Median	14.03	20.39

Sharpe Ratio - 5 Years

PERS (DB)	0.72
PERS (HC 115)	0.72
STRS	0.74
OP&F	0.75
SERS	0.72
HPRS	0.74
Russell 3000 Index	0.72
All Public Plans > \$1B-US Equity Segment Median	0.66

Plan Sponsor Peer Group Scattergram - 10 Years



	Return	Standard Deviation
◆ PERS (DB)	11.31	16.01
◆ PERS (HC 115)	11.30	16.00
◆ STRS	11.65	16.39
◆ OP&F	12.64	16.67
◆ SERS	11.09	15.69
◆ HPRS	11.72	16.80
● Russell 3000 Index	11.48	16.00
— Median	10.37	16.06

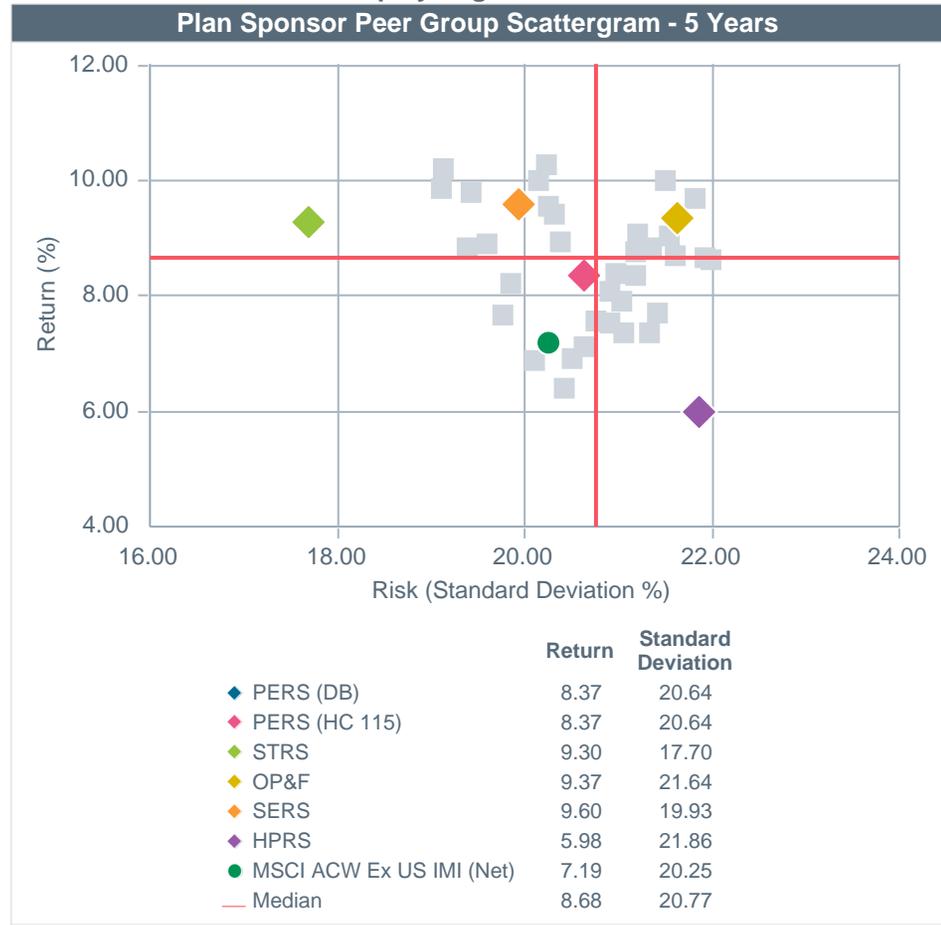
Sharpe Ratio - 10 Years

PERS (DB)	0.68
PERS (HC 115)	0.68
STRS	0.69
OP&F	0.73
SERS	0.68
HPRS	0.68
Russell 3000 Index	0.69
All Public Plans > \$1B-US Equity Segment Median	0.62

Performance shown is gross of fees.

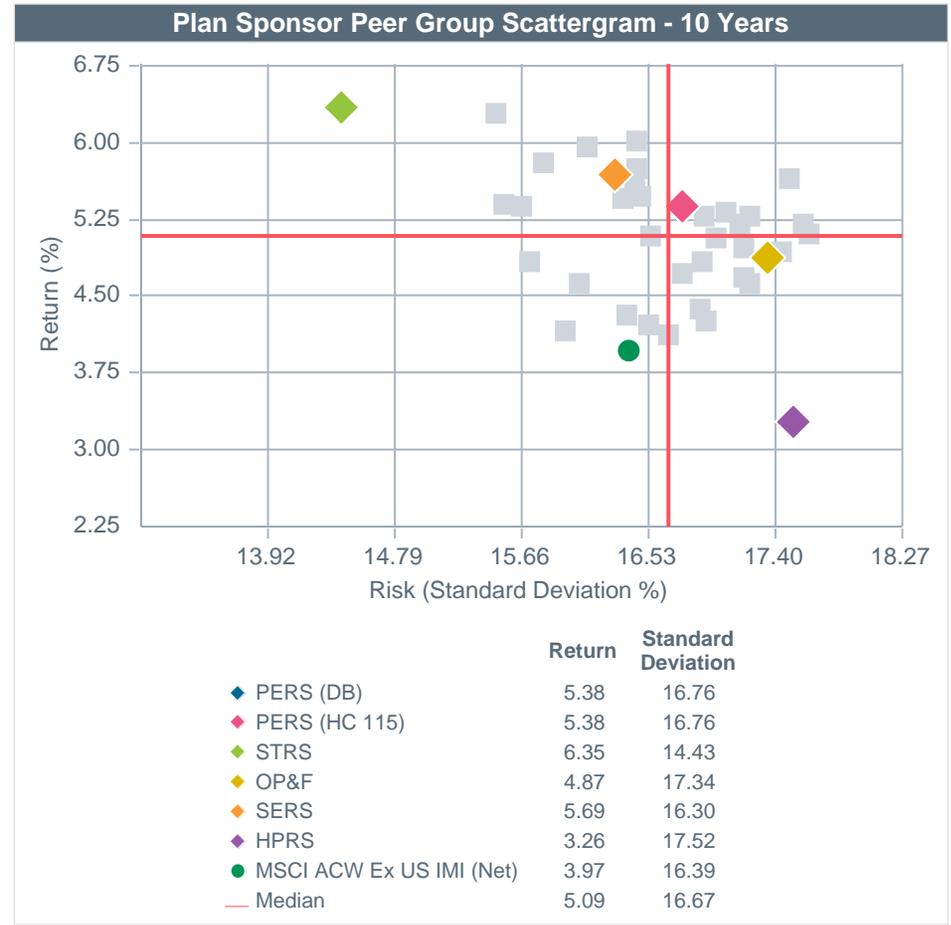
Performance										
	Trailing Performance (%)						Calendar Year Performance (%)			
	2 Quarters	1 Year	3 Years	5 Years	7 Years	10 Years	2022	2021	2020	2019
<b>International Equity</b>										
<b>PERS (DB)</b>	<b>6.34</b>	<b>17.50</b>	<b>1.85</b>	<b>8.37</b>	<b>7.77</b>	<b>5.38</b>	<b>-17.51</b>	<b>9.00</b>	<b>14.81</b>	<b>23.21</b>
PERS (DB) International Equity Custom Benchmark	5.91	15.12	1.08	6.95	6.38	3.97	-16.85	7.89	11.90	21.09
Difference	0.43	2.38	0.77	1.42	1.39	1.41	-0.66	1.11	2.91	2.12
Rank	22	38	56	60	54	33	53	62	39	61
<b>PERS (HC 115)</b>	<b>6.34</b>	<b>17.50</b>	<b>1.85</b>	<b>8.37</b>	<b>7.77</b>	<b>5.38</b>	<b>-17.51</b>	<b>9.00</b>	<b>14.81</b>	<b>23.21</b>
PERS (HC 115) International Equity Custom Benchmark	5.91	15.12	1.08	6.95	6.38	3.97	-16.85	7.89	11.90	21.09
Difference	0.43	2.38	0.77	1.42	1.39	1.41	-0.66	1.11	2.91	2.12
Rank	22	38	56	60	54	33	53	62	39	61
<b>STRS</b>	<b>4.93</b>	<b>16.83</b>	<b>6.33</b>	<b>9.30</b>	<b>7.95</b>	<b>6.35</b>	<b>-9.11</b>	<b>13.20</b>	<b>6.78</b>	<b>21.54</b>
STRS International Equity Custom Benchmark	5.62	16.93	5.10	8.94	7.56	5.61	-11.64	12.36	7.88	22.51
Difference	-0.69	-0.10	1.23	0.36	0.39	0.74	2.53	0.84	-1.10	-0.97
Rank	68	54	4	28	40	3	1	19	97	85
<b>OP&amp;F</b>	<b>6.40</b>	<b>19.82</b>	<b>4.11</b>	<b>9.37</b>	<b>7.61</b>	<b>4.87</b>	<b>-15.75</b>	<b>11.79</b>	<b>12.43</b>	<b>23.37</b>
MSCI ACW Ex US IM Index (USD) (Net)	5.98	15.62	1.53	7.19	6.38	3.97	-16.58	8.53	11.12	21.63
Difference	0.42	4.20	2.58	2.18	1.23	0.90	0.83	3.26	1.31	1.74
Rank	22	10	25	28	56	65	35	31	54	59
<b>SERS</b>	<b>6.41</b>	<b>18.60</b>	<b>3.32</b>	<b>9.60</b>	<b>8.37</b>	<b>5.69</b>	<b>-16.03</b>	<b>10.76</b>	<b>15.29</b>	<b>24.36</b>
SERS International Equity Custom Benchmark	6.24	18.17	2.23	7.51	6.63	4.04	-15.87	7.46	10.65	21.51
Difference	0.17	0.43	1.09	2.09	1.74	1.65	-0.16	3.30	4.64	2.85
Rank	22	22	33	24	21	17	37	45	34	42
<b>HPRS International Equity</b>	<b>3.44</b>	<b>13.08</b>	<b>-3.63</b>	<b>5.98</b>	<b>5.60</b>	<b>3.26</b>	<b>-22.31</b>	<b>1.89</b>	<b>19.02</b>	<b>25.47</b>
HPRS International Equity Custom Benchmark	5.58	11.02	-3.50	3.96	4.08	2.37	-20.33	1.59	11.12	21.63
Difference	-2.14	2.06	-0.13	2.02	1.52	0.89	-1.98	0.30	7.90	3.84
Rank	92	95	100	99	100	100	96	100	12	26
<b>HPRS Global Equity</b>	<b>8.16</b>	<b>24.61</b>	<b>N/A</b>	<b>N/A</b>	<b>N/A</b>	<b>N/A</b>	<b>-22.67</b>	<b>N/A</b>	<b>N/A</b>	<b>N/A</b>
HPRS Global Equity Custom Benchmark	7.26	22.20	N/A	N/A	N/A	N/A	-18.36	N/A	N/A	N/A
Difference	0.90	2.41	N/A	N/A	N/A	N/A	-4.31	N/A	N/A	N/A
<i>All Public Plans &gt; \$1B-Intl. Equity Segment Median</i>	<i>5.42</i>	<i>17.02</i>	<i>2.15</i>	<i>8.68</i>	<i>7.83</i>	<i>5.09</i>	<i>-17.26</i>	<i>9.61</i>	<i>12.76</i>	<i>23.71</i>

Performance shown is gross of fees. Ranks are shown against All Public Plans >\$1B-Intl. Equity Segment. HPRS International Equity Portfolio consists of emerging markets and international small cap holdings. HPRS Global Equity consists of domestic equity and broad international equity holdings.



### Sharpe Ratio - 5 Years

PERS (DB)	0.41
PERS (HC 115)	0.41
STRS	0.49
OP&F	0.45
SERS	0.47
HPRS	0.29
MSCI ACW Ex US IMI (Net)	0.36
<i>All Public Plans &gt; \$1B-Intl. Equity Segment Median</i>	0.42



### Sharpe Ratio - 10 Years

PERS (DB)	0.33
PERS (HC 115)	0.33
STRS	0.42
OP&F	0.29
SERS	0.35
HPRS	0.20
MSCI ACW Ex US IMI (Net)	0.25
<i>All Public Plans &gt; \$1B-Intl. Equity Segment Median</i>	0.31

Performance shown is gross of fees.

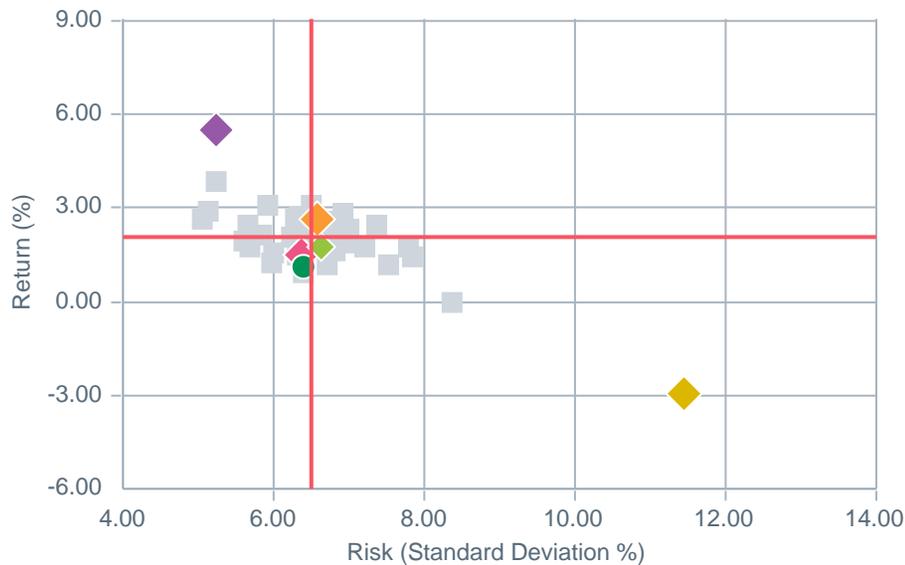
Performance										
	Trailing Performance (%)						Calendar Year Performance (%)			
	2 Quarters	1 Year	3 Years	5 Years	7 Years	10 Years	2022	2021	2020	2019
<b>Fixed Income</b>										
<b>PERS (DB) Core Fixed Income</b>	<b>3.12</b>	<b>5.29</b>	<b>-3.17</b>	<b>1.49</b>	<b>1.59</b>	<b>2.11</b>	<b>-12.93</b>	<b>-0.98</b>	<b>9.09</b>	<b>8.72</b>
PERS (DB) Core Fixed Income Custom Benchmark	3.37	5.53	-3.31	1.10	1.29	1.81	-13.01	-1.54	7.51	8.72
Difference	-0.25	-0.24	0.14	0.39	0.30	0.30	0.08	0.56	1.58	0.00
Rank	60	67	71	75	77	77	66	85	41	68
<b>PERS (HC 115) Core Fixed Income</b>	<b>3.12</b>	<b>5.29</b>	<b>-3.17</b>	<b>1.49</b>	<b>1.59</b>	<b>2.11</b>	<b>-12.93</b>	<b>-0.98</b>	<b>9.09</b>	<b>8.72</b>
PERS (HC 115) Core Fixed Income Custom Benchmark	3.37	5.53	-3.31	1.10	1.29	1.82	-13.01	-1.54	7.51	8.72
Difference	-0.25	-0.24	0.14	0.39	0.30	0.29	0.08	0.56	1.58	0.00
Rank	60	67	71	75	77	77	66	85	41	68
<b>STRS Core Fixed Income</b>	<b>3.87</b>	<b>6.32</b>	<b>-2.63</b>	<b>1.75</b>	<b>1.83</b>	<b>2.31</b>	<b>-12.51</b>	<b>-0.76</b>	<b>8.12</b>	<b>9.28</b>
Bloomberg US Universal index	3.76	6.17	-2.97	1.44	1.57	2.08	-12.99	-1.10	7.58	9.29
Difference	0.11	0.15	0.34	0.31	0.26	0.23	0.48	0.34	0.54	-0.01
Rank	33	34	60	63	66	66	57	82	64	52
<b>OP&amp;F Core Fixed Income</b>	<b>3.22</b>	<b>4.72</b>	<b>-3.43</b>	<b>-2.92</b>	<b>-1.34</b>	<b>0.03</b>	<b>-26.89</b>	<b>-2.97</b>	<b>7.35</b>	<b>8.13</b>
Bloomberg US Agg Bond Index + Leverage Factor	3.64	5.25	-9.36	-2.62	-1.39	-0.08	-26.84	-3.30	8.16	8.71
Difference	-0.42	-0.53	-0.07	-0.30	0.05	0.11	-0.05	0.33	-0.81	-0.58
Rank	55	77	99	99	99	98	100	97	80	78
<b>SERS</b>	<b>4.22</b>	<b>7.39</b>	<b>-2.13</b>	<b>2.65</b>	<b>2.56</b>	<b>2.82</b>	<b>-12.21</b>	<b>-0.56</b>	<b>10.59</b>	<b>9.95</b>
Bloomberg US Agg Bond Index	3.37	5.53	-3.31	1.10	1.29	1.81	-13.01	-1.55	7.51	8.72
Difference	0.85	1.86	1.18	1.55	1.27	1.01	0.80	0.99	3.08	1.23
Rank	22	17	44	21	25	29	50	75	18	29
<b>HPRS</b>	<b>5.44</b>	<b>10.96</b>	<b>3.35</b>	<b>5.50</b>	<b>5.05</b>	<b>4.61</b>	<b>-3.97</b>	<b>3.59</b>	<b>8.30</b>	<b>9.33</b>
HPRS Fixed Income Custom Benchmark	5.17	10.05	0.75	3.18	2.86	2.97	-8.46	1.51	5.95	7.94
Difference	0.27	0.91	2.60	2.32	2.19	1.64	4.49	2.08	2.35	1.39
Rank	7	3	1	1	1	1	2	2	61	48
<i>All Public Plans &gt; \$1B-US Fixed Income Segment Median</i>	<i>3.30</i>	<i>5.62</i>	<i>-2.40</i>	<i>2.05</i>	<i>2.10</i>	<i>2.49</i>	<i>-12.28</i>	<i>0.15</i>	<i>8.60</i>	<i>9.30</i>

Performance shown is gross of fees. Ranks are shown against All Public Plans >\$1B-US Fixed Income Segment. PERS (DB), PERS (HC), and OP&F performance for Total Fixed Income is unavailable, so Core Fixed Income is shown for illustrative purposes.

Risk & Return - Fixed Income

All Public Plans > \$1B-US Fixed Income Segment

Plan Sponsor Peer Group Scattergram - 5 Years

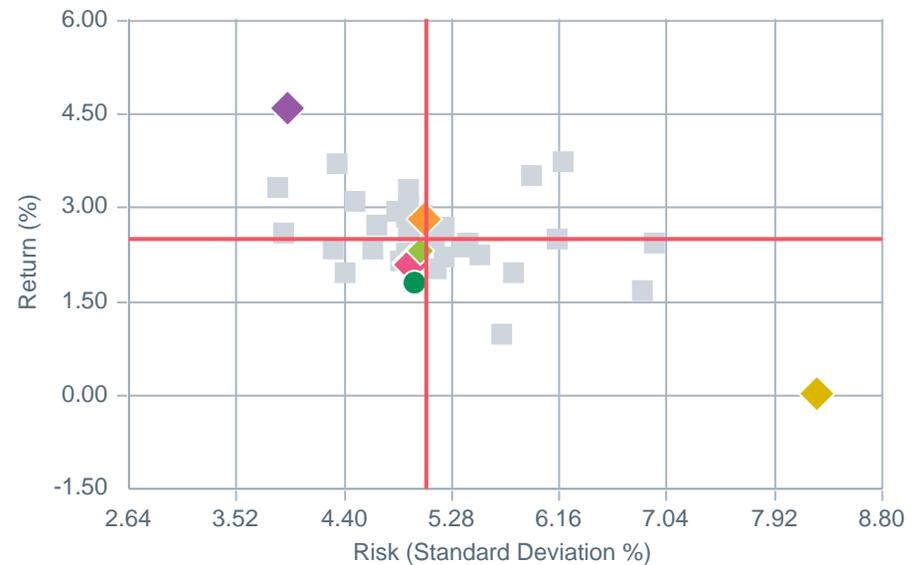


	Return	Standard Deviation
◆ PERS (DB) Core Fixed Income	1.49	6.36
◆ PERS (HC 115) Core Fixed Income	1.49	6.36
◆ STRS Core Fixed Income	1.75	6.63
◆ OP&F Core Fixed Income	-2.92	11.44
◆ SERS	2.65	6.57
◆ HPRS	5.50	5.24
● Bloomberg US Agg Bond Index	1.10	6.40
— Median	2.05	6.50

Sharpe Ratio - 5 Years

PERS (DB) Core Fixed Income	-0.03
PERS (HC 115) Core Fixed Income	-0.03
STRS Core Fixed Income	0.01
OP&F Core Fixed Income	-0.37
SERS	0.15
HPRS	0.71
Bloomberg US Agg Bond Index	-0.09
All Public Plans > \$1B-US Fixed Income Segment Median	0.06

Plan Sponsor Peer Group Scattergram - 10 Years



	Return	Standard Deviation
◆ PERS (DB) Core Fixed Income	2.11	4.94
◆ PERS (HC 115) Core Fixed Income	2.11	4.94
◆ STRS Core Fixed Income	2.31	5.03
◆ OP&F Core Fixed Income	0.03	8.27
◆ SERS	2.82	5.06
◆ HPRS	4.61	3.93
● Bloomberg US Agg Bond Index	1.81	4.97
— Median	2.49	5.07

Sharpe Ratio - 10 Years

PERS (DB) Core Fixed Income	0.20
PERS (HC 115) Core Fixed Income	0.20
STRS Core Fixed Income	0.24
OP&F Core Fixed Income	-0.11
SERS	0.33
HPRS	0.87
Bloomberg US Agg Bond Index	0.14
All Public Plans > \$1B-US Fixed Income Segment Median	0.27

Performance shown is gross of fees.

	Performance									
	Trailing Performance (%)						Calendar Year Performance (%)			
	2 Quarters	1 Year	3 Years	5 Years	7 Years	10 Years	2022	2021	2020	2019
<b>Additional Fixed Income</b>										
<b>PERS (DB) US Treasury</b>	<b>2.49</b>	<b>3.84</b>	<b>-3.87</b>	<b>0.51</b>	<b>0.82</b>	<b>N/A</b>	<b>-12.47</b>	<b>-2.27</b>	<b>8.08</b>	<b>6.84</b>
Bloomberg US Trsy Index	2.43	4.05	-3.82	0.53	0.83	N/A	-12.46	-2.32	8.00	6.86
Difference	0.06	-0.21	-0.05	-0.02	-0.01	N/A	-0.01	0.05	0.08	-0.02
<b>PERS (DB) EMD</b>	<b>8.38</b>	<b>17.02</b>	<b>-1.18</b>	<b>2.92</b>	<b>3.08</b>	<b>2.32</b>	<b>-13.50</b>	<b>-4.65</b>	<b>5.36</b>	<b>13.55</b>
PERS (DB) EMD Custom Benchmark	5.48	11.60	-3.12	1.58	2.01	1.61	-14.07	-5.18	4.32	14.01
Difference	2.90	5.42	1.94	1.34	1.07	0.71	0.57	0.53	1.04	-0.46
<b>PERS (DB) High Yield</b>	<b>7.16</b>	<b>12.68</b>	<b>2.01</b>	<b>5.53</b>	<b>4.65</b>	<b>4.63</b>	<b>-10.41</b>	<b>5.16</b>	<b>7.42</b>	<b>14.76</b>
Bloomberg U.S. High Yield Index	7.66	13.45	1.98	5.37	4.57	4.60	-11.19	5.28	7.11	14.32
Difference	-0.50	-0.77	0.03	0.16	0.08	0.03	0.78	-0.12	0.31	0.44
<b>PERS (DB) Securitized Debt</b>	<b>5.01</b>	<b>7.38</b>	<b>-0.66</b>	<b>3.30</b>	<b>3.88</b>	<b>4.83</b>	<b>-13.23</b>	<b>5.20</b>	<b>7.40</b>	<b>11.70</b>
Bloomberg CMBS Index + 2%	3.39	-0.43	-3.33	0.24	1.37	2.37	-13.17	4.50	1.18	10.70
Difference	1.62	7.81	2.67	3.06	2.51	2.46	-0.06	0.70	6.22	1.00
<b>PERS (DB) TIPS</b>	<b>2.01</b>	<b>3.91</b>	<b>-0.98</b>	<b>3.14</b>	<b>2.46</b>	<b>2.41</b>	<b>-11.82</b>	<b>5.96</b>	<b>10.89</b>	<b>8.42</b>
Bloomberg U.S. TIPS Index	1.99	3.90	-1.00	3.15	2.49	2.42	-11.85	5.96	10.99	8.43
Difference	0.02	0.01	0.02	-0.01	-0.03	-0.01	0.03	0.00	-0.10	-0.01
<b>PERS (DB) Investment Grade Credit</b>	<b>4.71</b>	<b>N/A</b>	<b>N/A</b>	<b>N/A</b>	<b>N/A</b>	<b>N/A</b>	<b>N/A</b>	<b>N/A</b>	<b>N/A</b>	<b>N/A</b>
Bloomberg US Corporate Investment Grade Credit Index	5.15	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Difference	-0.44	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
<b>PERS (HC 115) EMD</b>	<b>8.38</b>	<b>17.02</b>	<b>-1.18</b>	<b>2.92</b>	<b>3.08</b>	<b>2.33</b>	<b>-13.50</b>	<b>-4.65</b>	<b>5.36</b>	<b>13.55</b>
PERS (HC 115) EMD Custom Benchmark	5.48	11.60	-3.12	1.58	2.01	1.61	-14.07	-5.18	4.32	14.01
Difference	2.90	5.42	1.94	1.34	1.07	0.72	0.57	0.53	1.04	-0.46

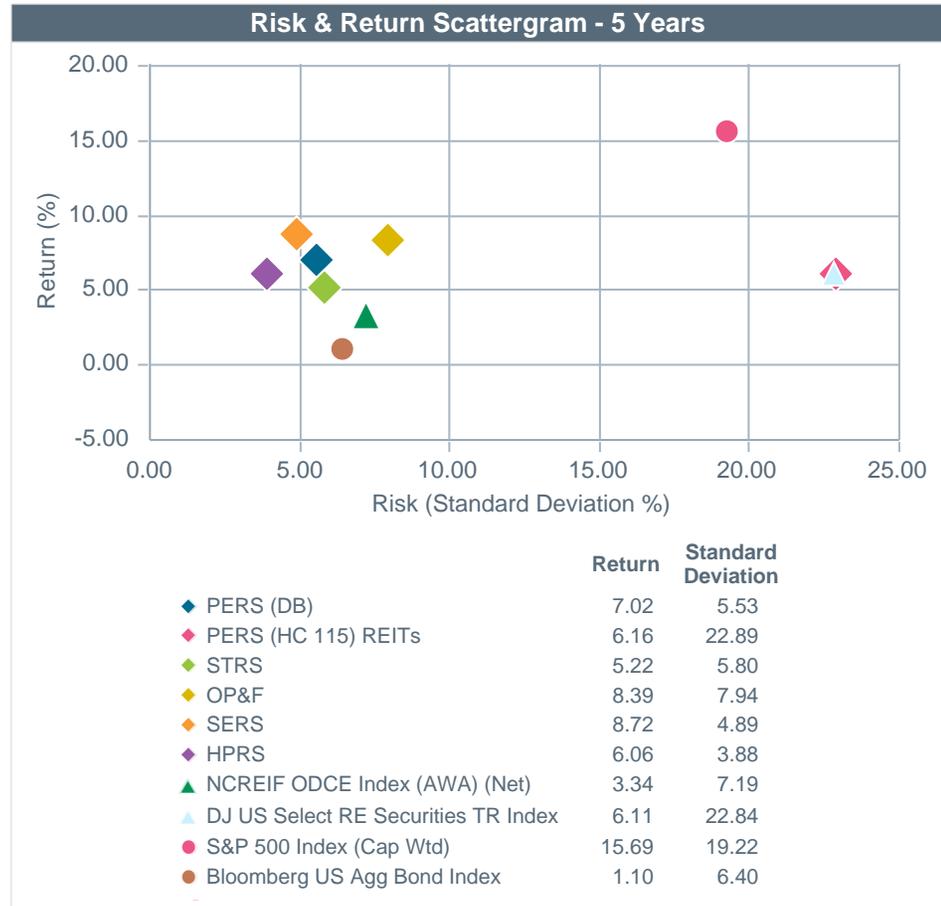
Performance shown is gross of fees.

	Trailing Performance (%)						Calendar Year Performance (%)			
	2 Quarters	1 Year	3 Years	5 Years	7 Years	10 Years	2022	2021	2020	2019
<b>Additional Fixed Income</b>										
<b>PERS (HC 115) High Yield</b>	7.16	12.68	2.01	5.53	4.65	4.63	-10.41	5.16	7.42	14.76
Bloomberg Barclays U.S. High Yield Index	7.66	13.45	1.98	5.37	4.57	4.60	-11.19	5.28	7.11	14.32
Difference	-0.50	-0.77	0.03	0.16	0.08	0.03	0.78	-0.12	0.31	0.44
<b>PERS (HC 115) Securitized Debt</b>	5.01	7.38	-0.66	3.30	3.88	4.83	-13.23	5.20	7.40	11.70
Bloomberg CMBS Index + 2%	3.39	-0.43	-3.33	0.24	1.37	2.37	-13.17	4.50	1.18	10.70
Difference	1.62	7.81	2.67	3.06	2.51	2.46	-0.06	0.70	6.22	1.00
<b>PERS (HC 115) TIPS</b>	2.01	3.91	-0.98	3.14	2.46	2.41	-11.82	5.96	10.89	8.42
Bloomberg U.S. Tips Index	1.99	3.90	-1.00	3.15	2.49	2.42	-11.85	5.96	10.99	8.43
Difference	0.02	0.01	0.02	-0.01	-0.03	-0.01	0.03	0.00	-0.10	-0.01
<b>PERS (HC 115) Investment Grade Credit</b>	4.71	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Bloomberg US Corporate Investment Grade Credit Index	5.15	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Difference	-0.44	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
<b>STRS Liquid Treasury Portfolio</b>	3.17	4.32	-1.81	1.08	N/A	N/A	-7.71	-1.67	5.90	5.24
Bloomberg US Intermediate Treasury Index	3.15	4.28	-1.86	1.02	N/A	N/A	-7.77	-1.72	5.78	5.22
Difference	0.02	0.04	0.05	0.06	N/A	N/A	0.06	0.05	0.12	0.02
<b>OP&amp;F High Yield</b>	7.35	12.24	2.27	5.31	4.71	4.72	-9.57	5.39	6.71	13.49
CS Developed Countries High Yield	7.64	13.47	1.99	5.19	4.41	4.46	-11.25	5.34	6.08	14.41
Difference	-0.29	-1.23	0.28	0.12	0.30	0.26	1.68	0.05	0.63	-0.92
<b>OP&amp;F Private Credit Fixed Income</b>	9.82	17.38	12.54	9.17	9.35	N/A	4.87	15.80	-1.54	10.47
S&P LTSA Levered Loan Index + 2%	7.78	15.31	8.21	6.57	N/A	N/A	-0.63	10.58	3.09	5.26
Difference	2.04	2.07	4.33	2.60	N/A	N/A	5.50	5.22	-4.63	5.21
<b>OP&amp;F US TIPS</b>	-0.36	-0.05	-3.10	4.80	3.79	6.32	-21.16	15.47	20.11	15.70
Bridgewater Custom US TIPS Index	0.77	2.14	-5.34	3.78	2.20	4.66	-25.71	11.81	23.25	15.12
Difference	-1.13	-2.19	2.24	1.02	1.59	1.66	4.55	3.66	-3.14	0.58
<b>SERS Private Credit</b>	6.20	12.25	11.72	N/A	N/A	N/A	6.80	16.30	N/A	N/A
3 Month LIBOR Rate + 4.5%	4.82	9.60	6.74	N/A	N/A	N/A	6.00	4.67	N/A	N/A
Difference	1.38	2.65	4.98	N/A	N/A	N/A	0.80	11.63	N/A	N/A

Performance shown is gross of fees.

Performance										
	Trailing Performance (%)						Calendar Year Performance (%)			
	2 Quarters	1 Year	3 Years	5 Years	7 Years	10 Years	2022	2021	2020	2019
<b>Real Estate</b>										
<b>PERS (DB)</b>	<b>-2.17</b>	<b>-5.78</b>	<b>8.28</b>	<b>7.02</b>	<b>7.01</b>	<b>9.65</b>	<b>15.07</b>	<b>17.08</b>	<b>2.55</b>	<b>7.86</b>
PERS (DB) Real Estate Custom Benchmark	-4.51	-12.03	7.05	5.58	6.28	8.04	21.81	14.49	1.37	5.49
Difference	2.34	6.25	1.23	1.44	0.73	1.61	-6.74	2.59	1.18	2.37
<b>PERS (DB) REITs</b>	<b>7.76</b>	<b>14.04</b>	<b>N/A</b>	<b>N/A</b>	<b>N/A</b>	<b>N/A</b>	<b>N/A</b>	<b>N/A</b>	<b>N/A</b>	<b>N/A</b>
PERS (DB) REITs Benchmark	7.77	14.03	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Difference	-0.01	0.01	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
<b>PERS (HC 115) REITs</b>	<b>7.76</b>	<b>14.04</b>	<b>7.28</b>	<b>6.16</b>	<b>4.29</b>	<b>7.00</b>	<b>-25.86</b>	<b>46.02</b>	<b>-11.40</b>	<b>23.23</b>
DJ US Select Real Estate Securities TR Index	7.77	14.03	7.16	6.11	4.24	6.98	-26.03	45.91	-11.20	23.10
Difference	-0.01	0.01	0.12	0.05	0.05	0.02	0.17	0.11	-0.20	0.13
<b>STRS</b>	<b>-4.75</b>	<b>-7.32</b>	<b>5.68</b>	<b>5.22</b>	<b>5.55</b>	<b>7.68</b>	<b>5.56</b>	<b>20.64</b>	<b>-1.27</b>	<b>10.65</b>
STRS Real Estate Custom Benchmark	-2.36	-4.72	5.26	5.16	5.37	7.17	0.85	21.38	0.89	9.31
Difference	-2.39	-2.60	0.42	0.06	0.18	0.51	4.71	-0.74	-2.16	1.34
<b>OP&amp;F</b>	<b>-4.03</b>	<b>-10.80</b>	<b>11.17</b>	<b>8.39</b>	<b>9.40</b>	<b>11.39</b>	<b>23.99</b>	<b>24.21</b>	<b>0.11</b>	<b>8.76</b>
NCREIF ODCE Index (AWA) (Net) (1 Qtr Lag)	-4.93	-12.88	6.19	4.72	5.43	7.19	20.96	13.64	0.52	4.64
Difference	0.90	2.08	4.98	3.67	3.97	4.20	3.03	10.57	-0.41	4.12
<b>SERS</b>	<b>-1.30</b>	<b>-4.14</b>	<b>10.22</b>	<b>8.72</b>	<b>9.32</b>	<b>10.34</b>	<b>17.90</b>	<b>18.47</b>	<b>3.30</b>	<b>9.84</b>
SERS Global Real Assets Custom Benchmark	-3.32	-8.39	6.04	5.26	5.76	7.40	16.08	12.15	2.00	6.24
Difference	2.02	4.25	4.18	3.46	3.56	2.94	1.82	6.32	1.30	3.60
<b>HPRS</b>	<b>-2.96</b>	<b>-4.47</b>	<b>5.53</b>	<b>6.06</b>	<b>7.99</b>	<b>9.13</b>	<b>7.64</b>	<b>14.28</b>	<b>3.32</b>	<b>10.52</b>
HPRS Real Estate Custom Benchmark (Net)	-3.51	-5.67	4.09	4.76	6.34	7.80	5.90	12.91	2.11	9.55
Difference	0.55	1.20	1.44	1.30	1.65	1.33	1.74	1.37	1.21	0.97
<b>NCREIF ODCE Index (AWA) (Net)</b>	<b>-7.00</b>	<b>-12.73</b>	<b>4.01</b>	<b>3.34</b>	<b>4.38</b>	<b>6.33</b>	<b>6.55</b>	<b>21.02</b>	<b>0.34</b>	<b>4.39</b>

Performance shown may be net or gross of fees depending on underlying investments. Prior to 2008, HPRS's real estate portfolio consisted of two buildings. Since then, HPRS has shifted its focus to externally managed funds. PERS (DB): 3 Year performance reduced 1.22%, 5 Year performance reduced 0.73%, 7 Year performance reduced 0.51% and 10 Year performance reduced 0.37% due to change in distribution methodology in private equity and real estate portfolios.



### Sharpe Ratio - 5 Years

PERS (DB)	0.84
PERS (HC 115) REITs	0.30
STRS	0.53
OP&F	0.77
SERS	1.21
HPRS	0.90
NCREIF ODCE Index (AWA) (Net)	0.21
S&P 500 Index (Cap Wtd)	0.77
Bloomberg US Agg Bond Index	-0.09



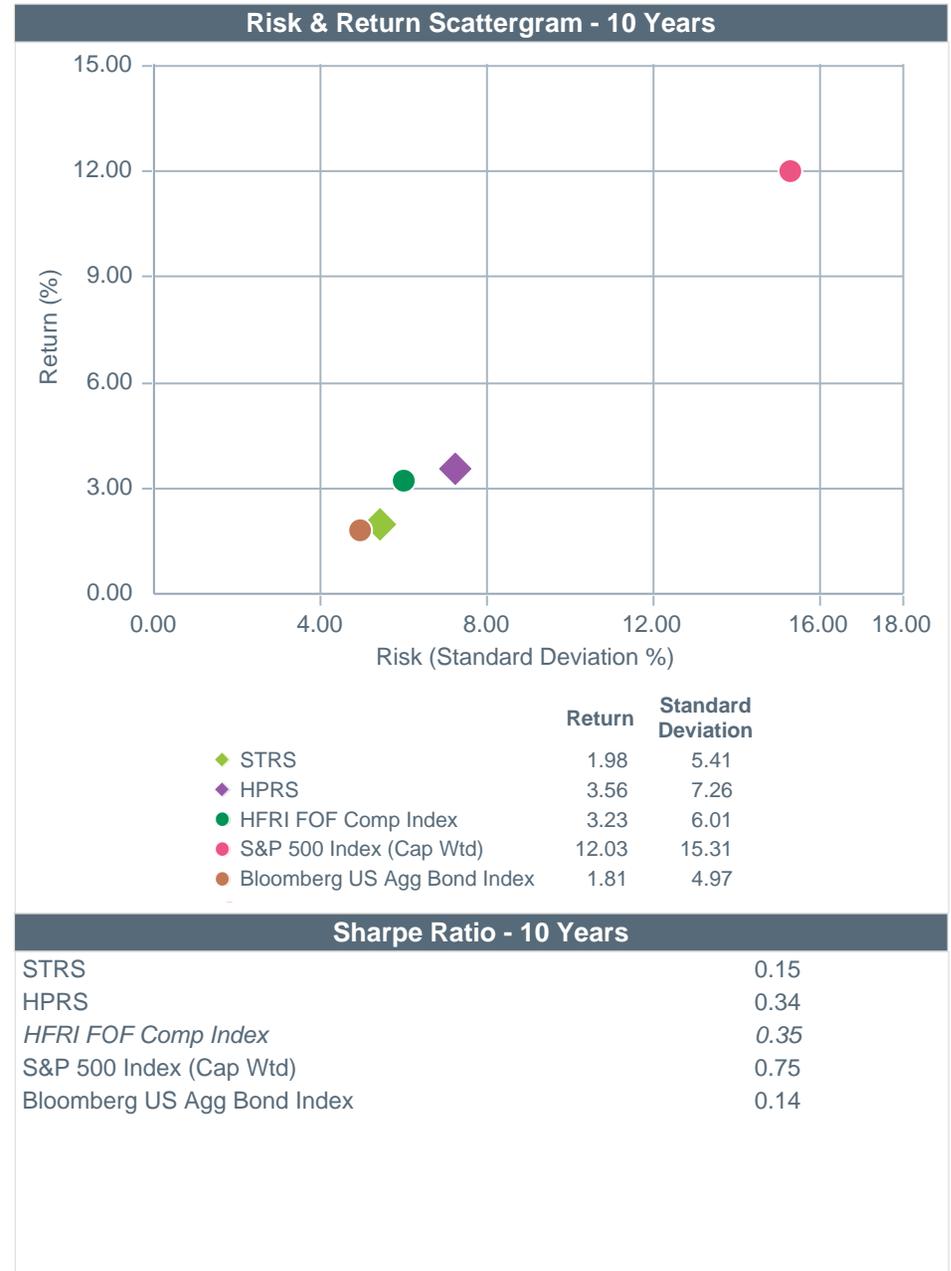
### Sharpe Ratio - 10 Years

PERS (DB)	1.55
PERS (HC 115) REITs	0.40
STRS	1.21
OP&F	1.53
SERS	2.09
HPRS	1.76
NCREIF ODCE Index (AWA) (Net)	0.85
S&P 500 Index (Cap Wtd)	0.75
Bloomberg US Agg Bond Index	0.14

Performance shown may be net or gross of fees depending on underlying investments.

Performance										
	Trailing Performance (%)						Calendar Year Performance (%)			
	2 Quarters	1 Year	3 Years	5 Years	7 Years	10 Years	2022	2021	2020	2019
<b>Hedge Funds</b>										
<b>STRS</b>	<b>-0.57</b>	<b>-1.78</b>	<b>2.09</b>	<b>1.52</b>	<b>1.96</b>	<b>1.98</b>	<b>6.05</b>	<b>2.14</b>	<b>-2.47</b>	<b>3.91</b>
HFRI FOF Comp Index	3.70	6.07	2.17	5.09	4.11	3.23	-5.31	6.17	10.88	8.39
Difference	-4.27	-7.85	-0.08	-3.57	-2.15	-1.25	11.36	-4.03	-13.35	-4.48
<b>HPRS</b>	<b>5.35</b>	<b>7.78</b>	<b>2.82</b>	<b>6.46</b>	<b>4.49</b>	<b>3.56</b>	<b>-6.68</b>	<b>8.09</b>	<b>12.02</b>	<b>12.31</b>
HFRI FOF Comp Index	3.70	6.07	2.17	5.09	4.11	3.23	-5.31	6.17	10.88	8.39
Difference	1.65	1.71	0.65	1.37	0.38	0.33	-1.37	1.92	1.14	3.92

Performance shown is net of fees. PERS (DB) has no Hedge Fund target allocation and remaining assets are liquidating.



Performance shown is net of fees. PERS (DB) has no Hedge Fund target allocation and remaining assets are liquidating.

Performance										
	2 Quarters	1 Year	3 Years	5 Years	7 Years	10 Years	2022	2021	2020	2019
<b>Private Equity</b>										
<b>PERS (DB)</b>	<b>3.62</b>	<b>6.93</b>	<b>13.82</b>	<b>13.63</b>	<b>14.73</b>	<b>13.33</b>	<b>-4.79</b>	<b>44.84</b>	<b>16.38</b>	<b>10.39</b>
PERS (DB) Private Equity Custom Benchmark	1.86	5.27	15.76	13.77	14.14	12.85	-1.25	49.22	13.78	8.02
Difference	1.76	1.66	-1.94	-0.14	0.59	0.48	-3.54	-4.38	2.60	2.37
<b>STRS</b>	<b>0.40</b>	<b>0.77</b>	<b>13.09</b>	<b>15.65</b>	<b>16.76</b>	<b>15.23</b>	<b>-6.49</b>	<b>53.50</b>	<b>25.49</b>	<b>13.97</b>
STRS Private Equity Benchmark	0.99	3.67	N/A	N/A	N/A	N/A	-5.40	N/A	N/A	N/A
Difference	-0.59	-2.90	N/A	N/A	N/A	N/A	-1.09	N/A	N/A	N/A
<b>OP&amp;F</b>	<b>3.22</b>	<b>7.68</b>	<b>14.44</b>	<b>15.81</b>	<b>16.69</b>	<b>15.52</b>	<b>-9.91</b>	<b>54.51</b>	<b>22.30</b>	<b>13.65</b>
OP&F Private Equity Custom Benchmark	3.22	7.68	14.44	15.81	16.69	15.52	-9.91	54.51	22.30	13.65
Difference	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
<b>SERS</b>	<b>3.60</b>	<b>8.12</b>	<b>19.86</b>	<b>17.59</b>	<b>18.24</b>	<b>17.63</b>	<b>7.57</b>	<b>48.06</b>	<b>15.77</b>	<b>12.76</b>
Burgiss All Private Equity Benchmark	-1.36	3.77	14.12	12.49	12.94	12.25	-0.81	44.38	12.16	8.08
Difference	4.96	4.35	5.74	5.10	5.30	5.38	8.38	3.68	3.61	4.68
<b>HPRS</b>	<b>2.85</b>	<b>6.22</b>	<b>15.32</b>	<b>15.10</b>	<b>13.21</b>	<b>11.85</b>	<b>5.76</b>	<b>36.53</b>	<b>20.12</b>	<b>9.66</b>
HPRS Private Equity Custom Benchmark	2.85	6.22	15.32	15.10	13.79	14.05	5.76	36.53	20.12	9.66
Difference	0.00	0.00	0.00	0.00	-0.58	-2.20	0.00	0.00	0.00	0.00

Performance shown is net of fees. HPRS's private equity portfolio did not begin in earnest until after 2008. Therefore longer period trailing returns relative to the benchmark may not be relevant. The STRS Private Equity Benchmark is the quarterly Cambridge Associates Private Equity and Venture Capital Index, one quarter lagged to be consistent with external fund reporting, effective July 1, 2021. PERS (DB): 3 Year performance reduced 2.29%, 5 Year performance reduced 1.37%, 7 Year performance reduced 0.98% and 10 Year performance reduced 0.68% due to change in distribution methodology in private equity and real estate portfolios.

Performance										
	Trailing Performance (%)						Calendar Year Performance (%)			
	2 Quarters	1 Year	3 Years	5 Years	7 Years	10 Years	2022	2021	2020	2019
<b>Other Alternatives</b>										
<b>PERS (DB) Commodities</b>	<b>0.15</b>	<b>-7.54</b>	<b>13.64</b>	<b>6.13</b>	<b>3.09</b>	<b>-4.44</b>	<b>15.88</b>	<b>36.99</b>	<b>-21.96</b>	<b>17.54</b>
S&P Goldman Sachs Commodity Index (TR)	-0.14	-7.91	13.14	5.38	2.45	-5.09	16.09	35.46	-23.72	17.63
Difference	0.29	0.37	0.50	0.75	0.64	0.65	-0.21	1.53	1.76	-0.09
<b>PERS (DB) Risk Parity</b>	<b>4.17</b>	<b>8.53</b>	<b>-5.16</b>	<b>3.33</b>	<b>3.33</b>	<b>3.62</b>	<b>-29.78</b>	<b>11.94</b>	<b>5.96</b>	<b>30.30</b>
PERS (DB) Risk Parity Custom Benchmark	5.22	9.27	-5.26	3.06	2.22	3.33	-30.25	11.56	5.25	29.93
Difference	-1.05	-0.74	0.10	0.27	1.11	0.29	0.47	0.38	0.71	0.37
<b>PERS (DB) Opportunistic</b>	<b>5.77</b>	<b>15.21</b>	<b>3.25</b>	<b>N/A</b>	<b>N/A</b>	<b>N/A</b>	<b>-14.38</b>	<b>11.59</b>	<b>N/A</b>	<b>N/A</b>
PERS (DB) Opportunistic Benchmark	8.42	16.76	3.73	N/A	N/A	N/A	-15.14	12.63	N/A	N/A
Difference	-2.65	-1.55	-0.48	N/A	N/A	N/A	0.76	-1.04	N/A	N/A
<b>PERS (HC 115) Commodities</b>	<b>0.15</b>	<b>-7.54</b>	<b>13.64</b>	<b>6.13</b>	<b>3.09</b>	<b>-4.37</b>	<b>15.88</b>	<b>36.99</b>	<b>-21.96</b>	<b>17.54</b>
S&P Goldman Sachs Commodity Index (TR)	-0.14	-7.91	13.14	5.38	2.45	-5.09	16.09	35.46	-23.72	17.63
Difference	0.29	0.37	0.50	0.75	0.64	0.72	-0.21	1.53	1.76	-0.09
<b>PERS (HC 115) Risk Parity</b>	<b>4.17</b>	<b>8.53</b>	<b>-5.16</b>	<b>3.33</b>	<b>3.33</b>	<b>3.63</b>	<b>-29.78</b>	<b>11.94</b>	<b>5.96</b>	<b>30.30</b>
PERS (HC 115) Risk Parity Custom Benchmark	5.22	9.27	-5.26	3.06	2.22	3.33	-30.25	11.56	5.25	29.93
Difference	-1.05	-0.74	0.10	0.27	1.11	0.30	0.47	0.38	0.71	0.37
<b>PERS (HC 115) Opportunistic</b>	<b>5.77</b>	<b>15.21</b>	<b>3.25</b>	<b>N/A</b>	<b>N/A</b>	<b>N/A</b>	<b>-14.38</b>	<b>11.59</b>	<b>N/A</b>	<b>N/A</b>
PERS (HC 115) Opportunistic Benchmark	8.42	16.76	3.73	N/A	N/A	N/A	-15.14	12.63	N/A	N/A
Difference	-2.65	-1.55	-0.48	N/A	N/A	N/A	0.76	-1.04	N/A	N/A

Performance shown may be net or gross of fees depending on underlying investments.

	Trailing Performance (%)						Calendar Year Performance (%)			
	2 Quarters	1 Year	3 Years	5 Years	7 Years	10 Years	2022	2021	2020	2019
<b>Other Alternatives</b>										
<b>STRS Opportunistic/Diversified Investments</b>	4.97	10.89	12.76	8.37	7.50	6.61	4.55	23.68	-1.60	5.93
STRS Opportunistic/Diversified Blended Benchmark	3.09	9.13	N/A	N/A	N/A	N/A	0.40	N/A	N/A	N/A
Difference	1.88	1.76	N/A	N/A	N/A	N/A	4.15	N/A	N/A	N/A
<b>OP&amp;F Real Assets</b>	2.28	5.03	7.62	5.63	5.96	5.13	10.03	7.85	-0.28	5.80
OP&F Real Assets Custom Benchmark	-3.02	5.12	6.07	5.00	5.10	6.28	3.34	9.84	-2.27	9.46
Difference	5.30	-0.09	1.55	0.63	0.86	-1.15	6.69	-1.99	1.99	-3.66
<b>OP&amp;F MLPs</b>	11.39	19.03	29.87	12.93	6.28	4.31	30.50	41.02	-26.09	13.46
Alerian MLP Index	9.10	14.02	24.25	11.49	5.04	1.66	21.53	38.43	-23.37	17.21
Difference	2.29	5.01	5.62	1.44	1.24	2.65	8.97	2.59	-2.72	-3.75
<b>OP&amp;F Gold</b>	4.33	7.34	0.30	N/A	N/A	N/A	-2.45	-3.62	N/A	N/A
S&P GSCI Gold Index Minus the Cost of Financing	4.24	7.25	-0.17	N/A	N/A	N/A	-2.97	-4.41	N/A	N/A
Difference	0.09	0.09	0.47	N/A	N/A	N/A	0.52	0.79	N/A	N/A
<b>SERS Opportunistic &amp; Tactical Portfolio</b>	3.86	7.82	9.17	6.74	7.62	6.59	-1.12	22.04	0.96	5.47
SERS Opportunistic Custom Benchmark	4.12	7.53	-1.31	2.28	3.29	3.81	-11.01	0.46	0.36	16.04
Difference	-0.26	0.29	10.48	4.46	4.33	2.78	9.89	21.58	0.60	-10.57
<b>HPRS Real Assets</b>	10.97	19.76	24.68	16.53	9.77	N/A	24.62	29.85	-1.80	12.89
HPRS Real Assets Custom Benchmark (Net)	10.84	19.06	24.08	16.12	11.11	N/A	24.23	29.17	-1.80	12.54
Difference	0.13	0.70	0.60	0.41	-1.34	N/A	0.39	0.68	0.00	0.35

Performance shown may be net or gross of fees depending on underlying investments. The OP&F Gold composite was inceptioned during the second half of 2020. Beginning with the Dec. 2021 report, STRS will report Opportunistic/Diversified Investments (which includes Hedge Funds). Effective July 1, 2021, the STRS Opportunistic/diversified blended benchmark consists of the actual Opportunistic Investments Portfolio weight multiplied by the Cambridge Associates Private Credit Index one quarter lagged to be consistent with external fund reporting plus the actual weight of the Diversified Investments Portfolio multiplied by the HFRI Fund of Funds Composite Index, which is a monthly index where subsequent revisions will be reflected in the following period.

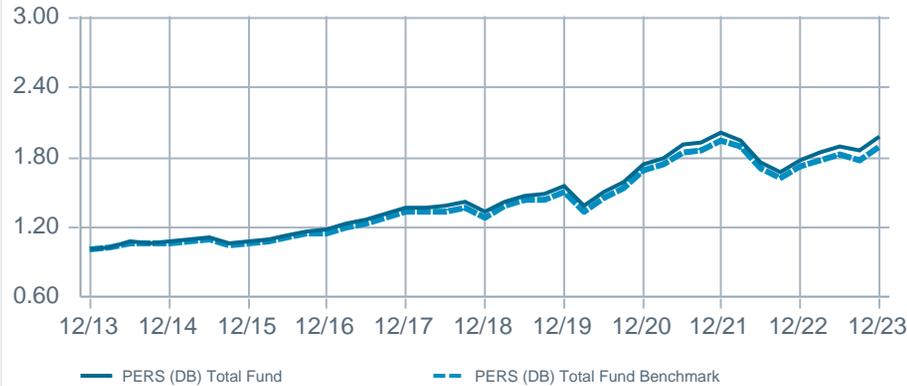
# Plan Specific Pages



**Summary**

- PERS (DB) has generated an annualized 0.22% of alpha over the trailing 5-year period and 0.46% over the trailing 10-year period.
- Relative to a 60 Equity/40 Bond portfolio, the plan has exhibited similar up-market capture and smaller down-market capture characteristics over the past 10 years.

**Growth of \$1 - 10 Years**



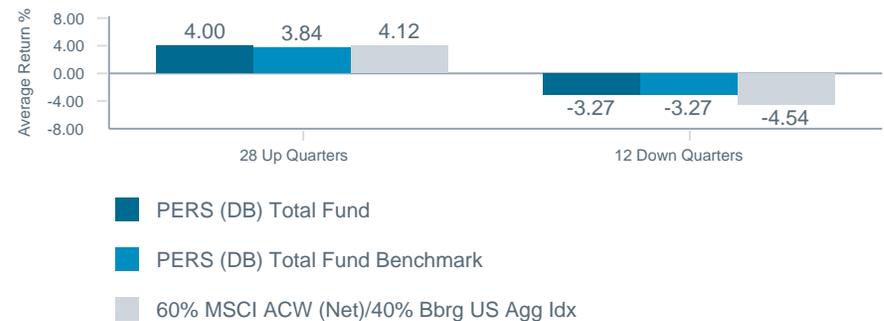
**MPT Stats**

	5 Years	10 Years
Maximum Return	10.35	10.35
Minimum Return	-11.66	-11.66
Standard Deviation	11.37	8.86
vs. PERS (DB) Total Fund Benchmark		
Info Ratio	0.23	0.53
Tracking Error	1.02	0.86
Alpha	0.14	0.39
vs. S&P 500 Index (Cap Wtd)		
Beta	0.57	0.55
vs. ICE BofAML 3 Mo US T-Bill Index		
Sharpe Ratio	0.60	0.68

**Asset Allocation vs. Targets**

	Market Value (\$)	Allocation (%)	Target (%)
US Equity	22,338,900,048	22.57	22.60
International Equity	20,819,325,702	21.04	21.00
Core Fixed Income	9,736,107,118	9.84	10.00
U.S. Treasury	2,284,482,890	2.31	3.00
High Yield	3,129,837,876	3.16	3.00
Global High Yield	3,521	0.00	0.00
EMD	1,140,541,740	1.15	1.00
Securitized Debt	1,441,218,094	1.46	1.00
TIPS	2,848,368,775	2.88	3.00
Investment Grade Credit	1,973,548,501	1.99	2.00
Real Estate	12,007,631,308	12.13	12.00
REITs	584,230,181	0.59	1.00
Hedge Funds	5,414,871	0.01	0.00
Opportunistic	1,385,915,573	1.40	1.40
Commodities	1,830,142,912	1.85	2.00
Private Equity	14,571,313,517	14.73	15.00
Risk Parity	1,628,688,823	1.65	2.00
Cash Equivalents	1,215,202,370	1.23	0.00
Additional Annuity	14,986,715	0.02	0.00
Other Pension Assets	331	0.00	0.00
Rebalancing	-	-	0.00
TAA	507	0.00	0.00
Total Fund	98,955,861,373	100.00	100.00

**Up/Down Markets - 10 Years**



Performance shown is gross of fees. Calculations are based on quarterly periodicity. Allocations shown may not sum up to 100% exactly due to rounding.

**Summary**

- PERS HC was formed in 2005, segregating HC from the DB assets. PERS HC 115 was formed October 2014 to hold all HC assets of PERS, and has a performance inception date of January 2015.
- OPERS health care plan is not a pension plan and therefore has significantly different characteristics including a shorter focus asset allocation with more liquidity than the pension plans. For purposes of this study, the OPERS health care plan has been included in the results. The results for OPERS HC plan were reflected in the PERS HC since 2005 through October 2014, and then transferred to and renamed PERS HC 115 at that time.

**Growth of \$1 - 10 Years**



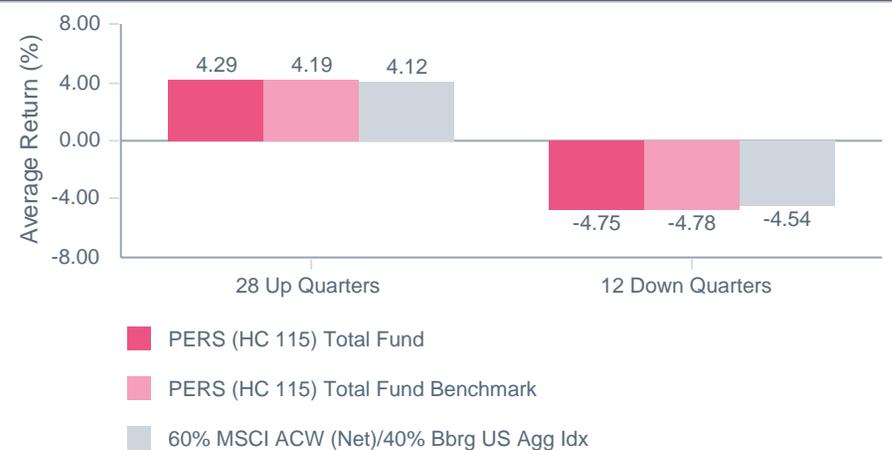
**MPT Stats**

	<b>10 Years</b>
Maximum Return	12.24
Standard Deviation	10.72
Minimum Return	-14.63
vs. PERS (HC 115) Total Fund Benchmark	
Info Ratio	0.81
Tracking Error	0.39
Alpha	0.34
vs. S&P 500 Index (Cap Wtd)	
Beta	0.71
vs. ICE BofAML 3 Mo US T-Bill Index	
Sharpe Ratio	1.02

**Asset Allocation vs. Targets**

	Market Value (\$)	Allocation (%)	Target (%)
US Equity	3,398,699,633	26.65	26.60
International Equity	3,208,148,308	25.15	25.00
Core Fixed Income	2,028,013,390	15.90	16.00
EMD	135,245,974	1.06	1.00
High Yield	509,310,456	3.99	4.00
Securitized Debt	332,667,004	2.61	2.00
TIPS	838,220,193	6.57	7.00
Global High Yield	17,665	0.00	0.00
REITs	833,735,719	6.54	7.00
Hedge Funds	907,509	0.01	0.00
Opportunistic	187,138,760	1.47	1.40
Commodities	448,357,261	3.52	4.00
Risk Parity	202,695,795	1.59	2.00
Cash Equivalents	144,843,797	1.14	0.00
U.S. Treasury	236,226,342	1.85	2.00
Rebalancing	-	0.00	0.00
Investment Grade Credit	250,923,861	1.97	2.00
TAA	82	0.00	0.00
Total Fund	12,755,151,749	100.00	100.00

**Up/Down Markets - 10 Years**



Performance shown is gross of fees. Calculations are based on quarterly periodicity. Allocations shown may not sum up to 100% exactly due to rounding.

**Summary**

- STRS has generated 0.65% of alpha over the trailing 5-year period and 0.47% of alpha over the trailing 10-year period.
- Relative to a 60 Equity/40 Bond portfolio, the plan has exhibited larger up-market capture and smaller down-market capture characteristics over the past 10 years.

**Growth of \$1 - 10 Years**



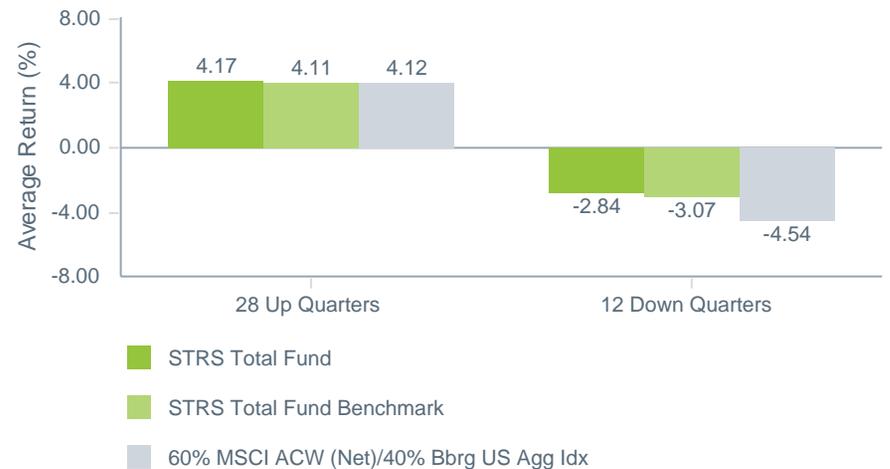
**MPT Stats**

	5 Years	10 Years
Maximum Return	10.00	10.00
Minimum Return	-11.51	-11.51
Standard Deviation	10.78	8.62
vs. STRS Total Fund Benchmark		
Info Ratio	0.96	0.86
Tracking Error	0.62	0.51
Alpha	0.71	0.48
vs. S&P 500 Index (Cap Wtd)		
Beta	0.54	0.54
vs. ICE BofAML 3 Mo US T-Bill Index		
Sharpe Ratio	0.76	0.81

**Asset Allocation vs. Targets**

	Market Value (\$)	Allocation (%)	Target (%)
US Equity	23,755,327,111	25.93	26.00
International Equity	20,407,118,512	22.27	22.00
Fixed Income	18,824,361,796	20.54	22.00
Real Estate	8,433,929,576	9.20	10.00
Opportunistic (Incl. Hedge Funds)	9,186,511,104	10.03	10.00
Private Equity	9,516,460,356	10.39	9.00
Cash Equivalents	1,506,841,073	1.64	1.00
<b>Total Fund</b>	<b>91,630,549,529</b>	<b>100.00</b>	<b>100.00</b>

**Up/Down Markets - 10 Years**

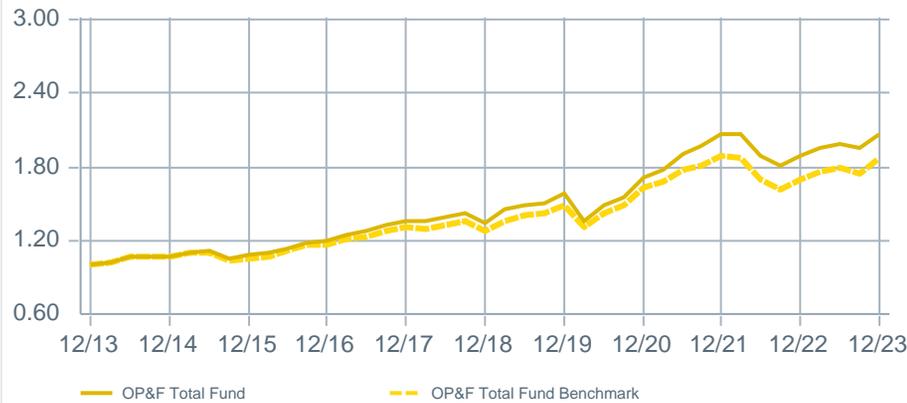


Performance shown is gross of fees. Calculations are based on quarterly periodicity. Allocations shown may not sum up to 100% exactly due to rounding.

**Summary**

- OP&F has generated 1.00% of alpha over the trailing 5-year period and 1.10% of alpha over the trailing 10-year period.
- Relative to a 60 Equity/40 Bond portfolio, the plan has exhibited similar up-market and smaller down-market capture characteristics over the past 10 years.

**Growth of \$1 - 10 Years**



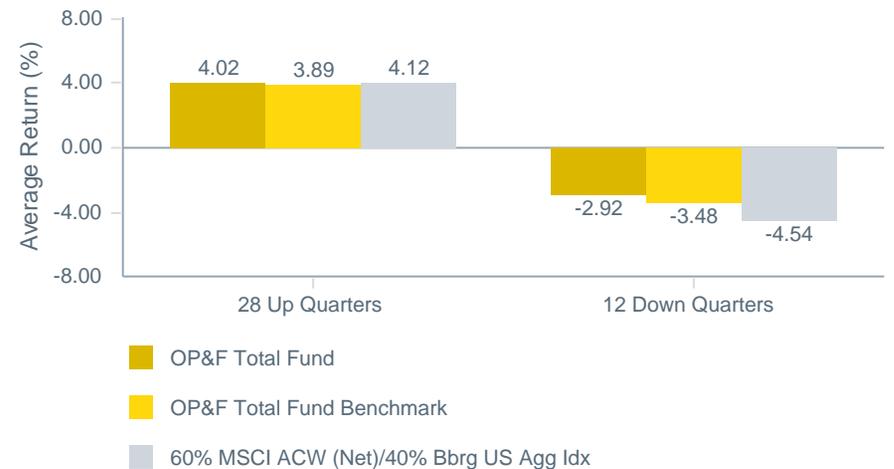
**MPT Stats**

	5 Years	10 Years
Maximum Return	10.66	10.66
Minimum Return	-13.55	-13.55
Standard Deviation	11.35	8.97
vs. OP&F Total Fund Benchmark		
Info Ratio	0.55	0.74
Tracking Error	1.74	1.41
Alpha	0.99	1.11
vs. S&P 500 Index (Cap Wtd)		
Beta	0.56	0.55
vs. ICE BofAML 3 Mo US T-Bill Index		
Sharpe Ratio	0.66	0.72

**Asset Allocation vs. Targets**

	Market Value (\$)	Allocation (%)	Target (%)
US Equity	3,866,703,902	21.92	16.44
International Equity	2,450,891,840	13.89	10.40
High Yield Fixed Income	1,396,302,667	7.92	6.40
US TIPS	1,399,014,400	7.93	12.00
Core Fixed Income	1,720,572,090	9.75	20.00
Private Credit	517,161,730	2.93	3.20
Real Estate	1,913,477,128	10.85	9.60
Private Markets	1,439,267,397	8.16	6.80
MLPs	996,717,717	5.65	4.00
Real Assets	1,064,541,225	6.03	5.00
Gold	128,224,186	0.73	4.56
Cash Equivalents	664,358,698	3.77	0.00
OP&F Commodities	83,340,978	0.47	1.60
<b>Total Fund</b>	<b>17,640,573,958</b>	<b>100.00</b>	<b>100.00</b>

**Up/Down Markets - 10 Years**

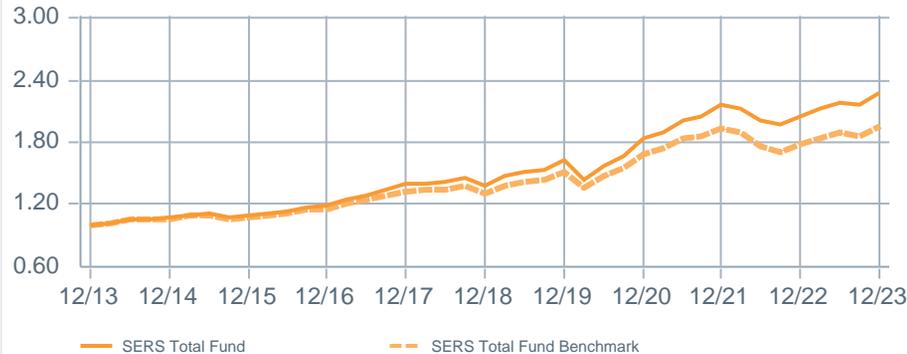


Performance shown is gross of fees. Calculations are based on quarterly periodicity. Allocations shown may not sum up to 100% exactly due to rounding. OP&F's target allocations are based on notional value, and have been scaled to 100% for this report.

**Summary**

- SERS has generated 2.03% of alpha over the trailing 5-year period and 1.65% of alpha over the trailing 10-year period.
- Relative to a 60 Equity/40 Bond portfolio, SERS has exhibited similar up-market capture and smaller down-market capture characteristics over the past 10 years.

**Growth of \$1 - 10 Years**



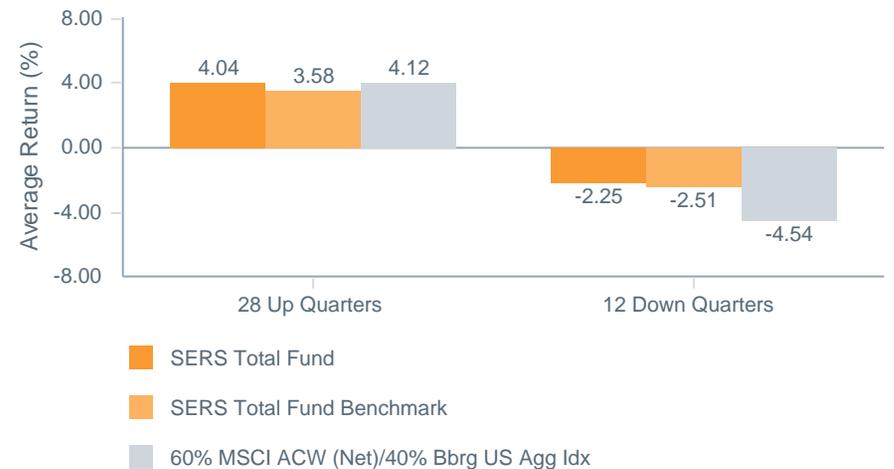
**MPT Stats**

	5 Years	10 Years
Maximum Return	9.94	9.94
Minimum Return	-11.00	-11.00
Standard Deviation	9.73	7.87
vs. SERS Total Fund Benchmark		
Info Ratio	1.52	1.50
Tracking Error	1.27	1.06
Alpha	1.72	1.28
vs. S&P 500 Index (Cap Wtd)		
Beta	0.49	0.49
vs. ICE BofAML 3 Mo US T-Bill Index		
Sharpe Ratio	0.88	0.92

**Asset Allocation vs. Targets**

	Market Value (\$)	Allocation (%)	Target (%)
Global Equity	7,603,250,651	41.69	41.00
Fixed Income	2,511,073,019	13.77	18.00
Private Credit	1,140,689,589	6.25	5.00
Real Estate	3,540,093,010	19.41	20.00
Opportunistic Investments	570,118,861	3.13	0.00
Private Equity	2,321,140,691	12.73	13.00
Cash Equivalents	551,873,277	3.03	3.00
Total Fund	18,238,239,099	100.00	100.00

**Up/Down Markets - 10 Years**

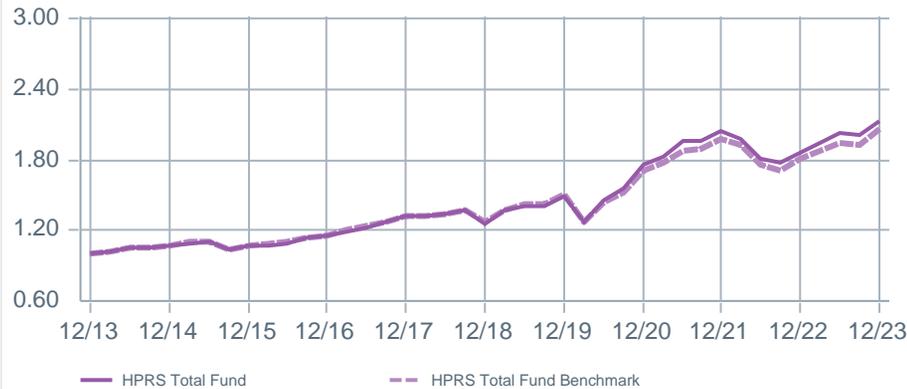


Performance shown is gross of fees. Calculations are based on quarterly periodicity. Allocations shown may not sum up to 100% exactly due to rounding.

**Summary**

- HPRS has generated 1.11% of alpha over the trailing 5-year period and 0.42% of alpha over the trailing 10-year period.
- Relative to a 60 Equity/40 Bond portfolio, the total portfolio has exhibited larger up-market and smaller down-market capture characteristics over the past 10 years.

**Growth of \$1 - 10 Years**



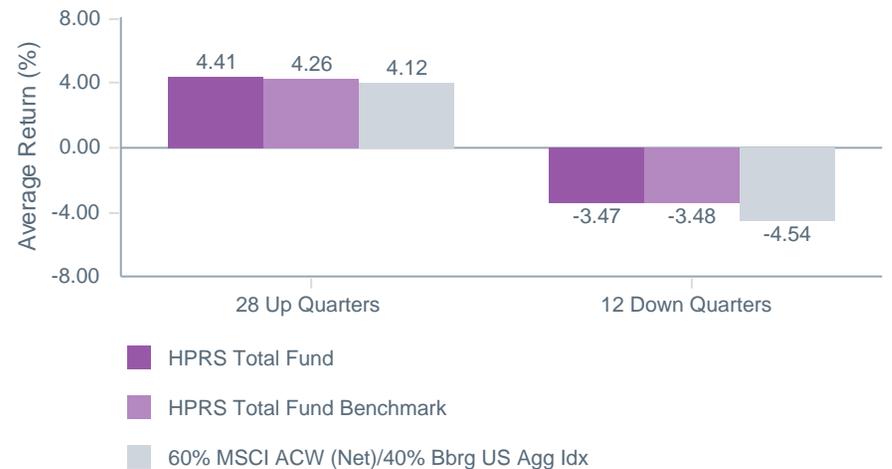
**MPT Stats**

	5 Years	10 Years
Maximum Return	13.60	13.60
Minimum Return	-14.84	-14.84
Standard Deviation	13.00	10.30
vs. HPRS Total Fund Benchmark		
Info Ratio	0.91	0.40
Tracking Error	1.18	1.09
Alpha	0.74	0.11
vs. S&P 500 Index (Cap Wtd)		
Beta	0.65	0.65
vs. ICE BofAML 3 Mo US T-Bill Index		
Sharpe Ratio	0.74	0.67

**Asset Allocation vs. Targets**

	Market Value (\$)	Allocation (%)	Target (%)
US Equity	223,597,629	20.79	20.00
International Equity	53,917,827	5.01	6.00
Global Equity	224,505,519	20.87	22.00
Fixed Income	113,216,856	10.53	15.00
Real Estate	83,377,291	7.75	8.00
Hedge Funds	59,610,728	5.54	6.00
Private Equity	215,473,949	20.03	15.00
Real Assets	51,815,055	4.82	4.00
Cash Equivalents	50,162,436	4.66	4.00
Total Fund	1,075,677,290	100.00	100.00

**Up/Down Markets - 10 Years**



Performance shown is gross of fees. Calculations are based on quarterly periodicity. Allocations shown may not sum up to 100% exactly due to rounding.

	Market Value (\$) (\$000)	Trailing Performance (%)						Calendar Year Performance (%)			
		2 Quarters	1 Year	3 Years	5 Years	7 Years	10 Years	2022	2021	2020	2019
<b>HPRS</b>	<b>1,075,677</b>	<b>5.49</b>	<b>14.43</b>	<b>6.81</b>	<b>11.10</b>	<b>9.25</b>	<b>7.87</b>	<b>-8.92</b>	<b>16.92</b>	<b>16.86</b>	<b>18.85</b>
HPRS Total Fund Benchmark		5.47	13.99	6.47	9.99	8.60	7.45	-9.21	16.63	13.16	17.85
Difference		0.02	0.44	0.34	1.11	0.65	0.42	0.29	0.29	3.70	1.00
<i>All Public Plans &gt; \$1B-TF Median</i>		4.64	11.62	4.54	8.57	7.78	6.85	-10.84	15.52	11.97	17.28
Rank		13	7	17	2	6	12	34	36	3	23
Population		154	147	134	130	130	123	173	218	233	224
<i>All Public Plans \$250M to \$1B-TF Median</i>		4.84	12.29	3.63	8.63	7.42	6.60	-13.23	14.05	13.08	18.73
Rank		27	21	2	1	2	4	5	14	10	46
Population		90	85	77	76	74	71	110	134	145	152

Performance shown is gross of fees but is net of embedded fees on externally managed real estate and alternative investments.

## Appendix

### Performance Related Comments

- Performance shown is gross of fees unless otherwise noted and is annualized for periods greater than one year.
- Peer group ranks are measured in percentiles.
- Total Fund performance shown is net of embedded fees on externally managed real estate and alternative investments.
- All quarterly market value and performance data, including custom benchmark performance, is provided by the individual Plans.
- In 2005, the 401(h) Health Care Trust portfolio assets were segregated from the pension portfolio and invested with a more conservative asset-allocation. In 2014, the 115 Health Care Trust portfolio was created as another funding vehicle for post-employment health care forp members in the Traditional Pension Plan and Combined Plan. Assets were segregated into the 115 Health Care Trust beginning September 2014, with the initial health care disbursements from the trust commencing late 2015 for January 2016 premium reimbursements. Favorable rulings from the Internal Revenue Service received March 2016 allowed OPERS to consolidate health care assets from the VEBA Trust and the 401(h) Health Care Trust into the 115 Health Care Trust.

### Asset Class Fee Comparison – as of 12/31/2023

(annualized fees shown in basis points)								
	Domestic Equity	Global Equity	International Equity	Fixed Income	Real Estate	Private Equity	Hedge Funds	Other Alternatives
<span style="color: blue;">■</span> PERS (DB)	2	-	24	4	71	51	-	45
<span style="color: red;">■</span> PERS (HC 115)	0	-	4	1	-	-	-	6
<span style="color: green;">■</span> STRS	11	-	22	5	42	78	92	68
<span style="color: yellow;">■</span> OP&F	52	-	41	46	53	67	-	87
<span style="color: orange;">■</span> SERS	20	-	40	28	82	104	-	106
<span style="color: purple;">■</span> HPRS	8	50	85	78	131	152	93	125

- Fees for Private Equity are based on committed capital, with the exception of SERS and OP&F, which is based on AUM.
- PERS (DB) and PERS (HC 115) Other Alternatives include Risk Parity, Opportunistic, and Commodities.
- PERS (DB) and PERS (HC 115) expenses for Real Estate, Other Alternatives, and Private Equity include net management fees and partnership expenses. Fees are estimated and are for externally managed accounts or portfolios.
- PERS (DB) and PERS (HC 115) are in the process of liquidating all Hedge Funds
- PERS (HC 115) Domestic Equity fee is 0.3 bps.
- STRS Other Alternatives fees include Opportunistic/Diversified Investments excluding Hedge Fund exposure.
- OP&F Fixed income fee is the weighted average of Core Fixed Income, High Yield, Private Credit Fixed Income, and US TIPS. Core Fixed income and US TIPS fees are on the notional value of the portfolio.
- OP&F Other Alternatives fees include Real Assets, MLPs, Gold and Commodities.
- SERS Other Alternatives fees include Opportunistic and Tactical Portfolio.
- HPRS Other Alternatives fees include Real Assets.

## Appendix

### Percentage of Assets Managed by External Managers – as of 12/31/2023

Percentage of Assets Managed by External Managers - As of 12/31/2023								
	Total Fund	Domestic Equity	International Equity	Fixed Income	Real Estate	Private Equity	Hedge Funds	Other Alternatives
<span style="color: blue;">■</span> PERS (DB)	49%	4%	80%	15%	95%	100%	100%	31%
<span style="color: red;">■</span> PERS (HC 115)	27%	4%	80%	12%	-	-	100%	23%
<span style="color: green;">■</span> STRS	35%	6%	49%	9%	21%	100%	100%	82%
<span style="color: yellow;">■</span> OP&F	100%	100%	100%	100%	100%	100%	-	100%
<span style="color: orange;">■</span> SERS	97%	100%	100%	100%	100%	100%	100%	100%
<span style="color: purple;">■</span> HPRS	100%	100%	100%	100%	100%	100%	100%	100%

- PERS (DB) and PERS (HC 115) Other Alternatives include Risk Parity, Opportunistic, and Commodities.
- STRS Other Alternatives include Opportunistic/Diversified Investments (includes Hedge Fund exposure).
- OP&F Other Alternatives include Real Assets, MLPs, Gold, and Commodities.
- OP&F's Cash is 100% externally managed.
- SERS Other Alternatives include Opportunistic Investments and Tactical Portfolio.
- SERS has one internally-managed Cash mandate.
- HPRS Other Alternatives include Real Assets.

### Percentage of Actively Managed Assets – as of 12/31/2023

Percentage of Assets Actively Managed - As of 12/31/2023								
	Total Fund	Domestic Equity	International Equity	Fixed Income	Real Estate	Private Equity	Hedge Funds	Other Alternatives
<span style="color: blue;">■</span> PERS (DB)	75%	18%	83%	87%	100%	100%	100%	100%
<span style="color: red;">■</span> PERS (HC 115)	67%	18%	83%	81%	100%	-	100%	100%
<span style="color: green;">■</span> STRS	90%	63%	100%	100%	100%	100%	100%	100%
<span style="color: yellow;">■</span> OP&F	85%	80%	100%	80%	100%	100%	-	100%
<span style="color: orange;">■</span> SERS	83%	27%	93%	100%	99%	100%	100%	100%
<span style="color: purple;">■</span> HPRS	83%	19%	100%	100%	100%	100%	100%	100%

- PERS (DB) and PERS (HC 115) Other Alternatives include Risk Parity, Opportunistic, and Commodities.
- STRS Other Alternatives include Opportunistic/Diversified Investments (includes Hedge Fund exposure).
- OP&F Other Alternatives include Real Assets, MLPs, Gold, and Commodities.
- SERS Other Alternatives include Opportunistic Investments and Tactical Portfolio.
- SERS has one internally-managed Cash mandate.
- HPRS Other Alternatives include Real Assets.

## Custom Benchmark Glossary

### PERS (DB) Total Fund Custom Benchmark:

- 22.6% Russell 3000 Index
- 21.0% PERS (DB) International Equity Custom Benchmark
- 10.0% PERS (DB) Core Fixed Income Custom Benchmark
- 3.0% Bloomberg U.S. Treasury Index
- 3.0% Bloomberg U.S. High Yield Index
- 1.0% PERS (DB) EMD Custom Benchmark
- 1.0% PERS (DB) Securitized Debt Custom Benchmark
- 3.0% Bloomberg U.S. TIPS Index
- 2.0% Bloomberg U.S. Corporate Bond Index
- 12.0% PERS (DB) Real Estate Custom Benchmark
- 1.0% Dow Jones U.S. Select Real Estate Securities TR Index
- 15.0% PERS (DB) Private Equity Custom Benchmark
- 1.4% PERS (DB) Opportunistic Custom Benchmark
- 2.0% Commodities Custom Benchmark
- 2.0% PERS (DB) Risk Parity Custom Benchmark

### PERS (HC 115) Total Fund Custom Benchmark:

- 26.6% Russell 3000 Index
- 25.0% PERS (HC 115) International Equity Custom Benchmark
- 16.0% PERS (HC 115) Core Fixed Income Custom Benchmark
- 1.0% PERS (HC 115) EMD Custom Benchmark
- 4.0% Bloomberg U.S. High Yield Index
- 2.0% PERS (HC 115) Securitized Debt Custom Benchmark
- 7.0% Bloomberg U.S. TIPS Index
- 7.0% Dow Jones U.S. Select Real Estate Securities TR Index
- 1.4% PERS (HC 115) Opportunistic Custom Benchmark
- 4.0% Commodities Custom Benchmark
- 2.0% PERS (HC 115) Risk Parity Custom Benchmark
- 2.0% Bloomberg U.S. Treasury Index
- 2.0% Bloomberg U.S. Corporate Bond Index

### STRS Total Fund Custom Benchmark:

- 26.0% Russell 3000 Index
- 22.0% MSCI World Ex US Index (50% Hedged)/ MSCI Emg Mkts Index
- 22.0% STRS Fixed Income Blended Benchmark
- 10.0% STRS Real Estate Custom Benchmark
- 19.0% Alternative Investment Blended Benchmark
- 1.0% ICE BofA US 3-Month Treasury Bill Index

### OP&F Total Fund Custom Benchmark:

- 16.44% Wilshire 5000 Index
- 10.4% MSCI ACW Ex US IMI Index (Net)
- 20.0% Bloomberg US Aggregate Bond Index + Leverage Factor
- 6.4% CS High Yield Dev. Countries Only Index
- 12.0% Bridgewater Custom US TIPS Index
- 3.2% S&P LTSA Levered Loan Index + 2%
- 9.6% NCREIF ODCE (Net) (1 Quarter Lag)
- 5.0% OP&F Real Assets Custom Index
- 4.0% Alerian MLP Index
- 6.8% OP&F Private Equity Custom Benchmark
- 1.6% Bloomberg Commodity TR Index
- 4.56% S&P GSCI Gold Index Minus the Cost of Financing

\*OP&F's target allocations are based on notional value, and have been scaled to 100% for this report.

### SERS Total Fund Custom Benchmark:

- 41.0% MSCI All Country World Net Total Return Index (USD)
- 18.0% Bloomberg Barclays US Aggregate Bond Index
- 20.0% NCREIF Property Index (1 Quarter Lag)
- 5.0% 90 Day T-Bill + 4.5%
- 13.0% Burgiss All Private Equity (1 Quarter Lag)
- 3.0% FTSE 30 Day T-Bill Index

### HPRS Total Fund Custom Benchmark:

- 20.0% Russell 3000 Index
- 6.0% HPRS International Equity Custom Benchmark
- 22.0% HPRS Global Equity Custom Benchmark
- 15.0% HPRS Fixed Income Custom Benchmark
- 8.0% HPRS Total Real Estate Composite (Net)
- 6.0% HFRI FOF Composite Index
- 15.0% HPRS Total Private Equity Custom Composite
- 4.0% HPRS Real Assets Composite (Net)
- 4.0% BofA Merrill Lynch 91-Day T-Bill

## Custom Benchmark Glossary

### **PERS (DB) International Equity Custom Benchmark:**

- 55% MSCI World Ex US Standard Index
- 10% MSCI World Ex US Small Cap Index
- 31% MSCI Emerging Markets Standard Index
- 4% MSCI Emerging Markets Small Cap Index

### **PERS (DB) Core Fixed Income Custom Benchmark:**

- Bloomberg US Aggregate Bond Index
- From 2012-2014: Barclays Capital 75% U.S. Aggregate ex Govt/25% U.S. Govt Index

### **PERS (DB) EMD Custom Benchmark:**

- 50% JP Morgan Emerging Markets Bond Index Global
- 50% JP Morgan Government Bond Index-Emerging Markets Global Diversified

### **PERS (DB) Securitized Debt Custom Benchmark:**

- 50% Bloomberg Non-Agency Investment Grade CMBS: BBB Total Return Index (Unhedged) (USD)
- 50% Bloomberg Non-Agency CMBS Agg Eligible Total Return Index Value (Unhedged) (USD)
- Prior to 2018: Non-Agency CMBS component of the U.S. Aggregate Index plus 160 annualized basis points

### **PERS (DB) Real Estate Custom Benchmark:**

- NFI-ODCE Index (Net) + 0.85% (1 Quarter Lag)
- Prior to 2013: NCREIF Property Index (1 Quarter Lag)

### **PERS (DB) Private Equity Custom Benchmark:**

- State Street Private Equity Index (1 Quarter Lag)
- Prior to 2015: 60% Russell 3000 Index, 40% MSCI ACWI Ex US IMI plus 300 basis points (1 Quarter Lag)
- Prior to 2013: Russell 3000 Index + 300 bps (1 Quarter Lag)

### **PERS (DB) Hedge Funds Custom Benchmark:**

- 65% HFRI Event Driven (Total) Index
- 35% HFRI Relative (Total) Index

### **PERS (DB) Opportunistic Custom Benchmark:**

- Russell 2000 Index
- Bloomberg Gold Subindex Total Return
- Prior to Q4 2023:S&P Risk Parity 10% Target Volatility Index
- Russell 2000 Index
- Bloomberg Gold Subindex Total Return

### **PERS (DB) Risk Parity Custom Benchmark:**

- HFR Risk Parity Institutional Custom Index
- S&P Risk Parity 10% Target Volatility Index
- Prior to Q4 2023: HFR Risk Parity Institutional Custom Index

### **PERS (DB) Commodity Custom Benchmark:**

- Goldman Sachs Commodity Index

### **PERS (HC 115) International Equity Custom Benchmark:**

- 55% MSCI World Ex US Standard Index
- 10% MSCI World Ex US Small Cap Index
- 31% MSCI Emerging Markets Standard Index
- 4% MSCI Emerging Markets Small Cap Index

### **PERS (HC 115) Core Fixed Income Custom Benchmark:**

- Bloomberg US Aggregate Bond Index
- From 2012-2014: Barclays Capital 75% U.S. Aggregate ex Govt/25% U.S. Govt Index

### **PERS (HC 115) EMD Custom Benchmark:**

- 50% JP Morgan Emerging Markets Bond Global Index
- 50% JP Morgan Government Bond Index-Emerging Markets Global Diversified

### **PERS (HC 115) Securitized Debt Custom Benchmark:**

- 50% Bloomberg Non-Agency Investment Grade CMBS: BBB Total Return Index (Unhedged) (USD)
- 50% Bloomberg Non-Agency CMBS Agg Eligible Total Return Index Value (Unhedged) (USD)
- Prior to 2018: Non-Agency CMBS component of the U.S. Aggregate Index plus 160 annualized basis points

### **PERS (HC 115) Hedge Funds Custom Benchmark:**

- 65% HFRI Event Driven (Total) Index
- 35% HFRI Relative (Total) Index

### **PERS (HC 115) Opportunistic Custom Benchmark:**

- Russell 2000 Index
- Bloomberg Gold Subindex Total Return
- Prior to Q4 2023:S&P Risk Parity 10% Target Volatility Index
- Russell 2000 Index
- Bloomberg Gold Subindex Total Return

### **PERS (HC 115) Risk Parity Custom Benchmark:**

- HFR Risk Parity Institutional Custom Index

## Custom Benchmark Glossary

### **PERS (HC 115) Commodity Custom Benchmark:**

- Goldman Sachs Commodity Index

### **STRS International Equity Custom Benchmark:**

- 80% MSCI EAFE Index
- 20% MSCI Emerging Markets Index

### **STRS Real Estate Custom Benchmark:**

- 85% NCREIF Property Index
- 15% FTSE NAREIT Equity REITs Index

### **STRS Private Equity Benchmark:**

- The Private Equity Benchmark is the quarterly Cambridge Associates Private Equity and Venture Capital Index, one quarter lagged to be consistent with external fund reporting, effective July 1, 2021.

### **STRS Opportunistic/Diversified Blended Benchmark:**

- Effective July 1, 2021, the Opportunistic/diversified blended benchmark consists of the actual Opportunistic Investments Portfolio weight multiplied by the Cambridge Associates Private Credit Index one quarter lagged to be consistent with external fund reporting plus the actual weight of the Diversified Investments Portfolio multiplied by the HFRI Fund of Funds Composite Index, which is a monthly index where subsequent revisions will be reflected in the following period.

### **OP&F Real Assets Custom Benchmark:**

- 45% FTSE Dev Core 50/50 Infrastructure Index
- 35% NCREIF Timberland Index
- 20% NCREIF Farmland Index (1 Quarter Lag)

### **OP&F Private Equity Custom Benchmark:**

- Actual net of fee return of the Private Equity Composite

### **SERS International Equity Custom Benchmark:**

- MSCI ACW Ex US Index (USD) (Net)
- Prior to 2014Q1: MSCI ACWI ex-US (Net) Index (dev. markets 50% hedged)
- Prior to 2013Q3: MSCI ACWI ex-US (Gross) Index (dev. markets 50% hedged)

### **SERS Opportunistic Custom Benchmark:**

- Bloomberg US Aggregate Bond Index + 2%
- Prior to 2020Q1: SERS Total Fund Custom Benchmark

### **HPRS International Equity Custom Benchmark:**

- 67% MSCI Emerging Markets
- 33% MSCI EAFE Small Cap

### **HPRS Fixed Income Custom Benchmark:**

- 40% Bloomberg Aggregate Bond Index
- 60% Credit Suisse Leveraged Loans

### **HPRS Total Private Equity Custom Benchmark:**

- Private Equity Composite Performance
- Prior to 2017Q1: Wilshire 5000 + 3% (1 Quarter Lag)
- Prior to 2010Q3: CPI + 5%

## Glossary

**Alpha** - A measure of the difference between a portfolio's actual returns and its expected performance, given its level of risk as measured by beta. It is a measure of the portfolio's historical performance not explained by movements of the market.

**Benchmark** - A standard against which the performance of a fund or investment manager can be measured.

**Beta** - A measure of the sensitivity of a portfolio to the movements in the market. A beta of 1.0 indicates the same level of stock market risk as the S&P 500 Index (Cap Wtd), unless otherwise noted. Lower betas indicate lower stock market risk. Beta is a measure of a portfolio's non-diversifiable or systematic risk.

### Capital Markets Review -

**Breakeven Inflation** - Measures the expected inflation rate at each stated maturity by taking the difference between the real yield of the inflation-linked maturity curve and the yield of the closest nominal Treasury maturity.

**Consumer Confidence** - Measures domestic consumer confidence as defined by the degree of optimism on the state of the economy that consumers express through saving and spending.

**Consumer Price Index (CPI)** - Measures the change in the price level of consumer goods and services.

Option-Adjusted Spread - Measures the flat spread of an index or bond to the Treasury yield curve after removing the effect of any embedded options.

**Purchasing Managers Index (PMI)** - Measures economic activity by surveying purchasing managers on a monthly basis as to whether business conditions have improved, worsened, or stayed the same.

**US Dollar Total Weighted Index** - Measures the value of the US Dollar relative to a basket of other world currencies. It is calculated as the weighted geometric mean of the dollar's value versus the EUR, GBP, CAD, SEK, CHF, and JPY.

**VIX** - Measures the implied volatility of S&P 500 Index options by looking at the market's expectation of the S&P 500 Index volatility over the next 30 day period. Commonly referred to as the "fear index" or the "fear gauge."

**Downside Risk** - A measure similar to standard deviation, but focuses only on the negative returns of the fund or investment. The higher the factor, the riskier the fund or investment.

**Correlation** - A statistical measure of the relationship between asset class returns. A value of 1.00 is a perfect correlation; that is, the asset classes always move in the same direction. A value of -1.00 indicates a perfect negative correlation, in which the asset classes always move in opposite directions of each other. A value of 0 indicates there is no relationship between the direction of returns of the two asset classes. Correlation calculations only consider the direction of changes relative to two variables and not the magnitude of those changes.

**Down Market Capture** - Down market by definition is negative benchmark return and down market capture represents the ratio in % terms of the average portfolios return over the benchmark during the down market period. The lower the value of the down market capture the better the product's performance.

**Excess Return** - Arithmetic difference between the fund or investment return and the risk-free return (or other specified market index) over a specified time period, shown on an annualized basis.

**Indices** - All indices and related information are considered intellectual property and are licensed by each index provider. The indices may not be copied, used or distributed without the index provider's prior written approval. Index providers make no warranties and bear no liability with respect to the indices, any related data, their quality, accuracy, suitability and/or completeness.

**Information Ratio** - Measured by dividing the active rate of return by the tracking error. The higher the information ratio, the more value-added contribution relative to the market benchmark.

**Maximum Return** - The maximum quarterly return earned over the specified time period.

**Minimum Return** - The minimum quarterly return earned over the specified time period.

## Glossary

### Peer Groups -

**Plan Sponsor Peer Groups** - RVK utilizes the Mellon Analytical Solutions Trust Universe along with the Investment Metrics Plan Sponsor Universe. The combined Mellon Analytical Solutions Trust Universe and Investment Metrics Plan Sponsor Universe is used for comparison of total fund composite results and utilizes actual client returns compiled from consultant and custodial data. The Plan Sponsor Peer Group database includes performance and other quantitative data for over 2,100 plans which include corporate, endowment, foundation, public, and Taft Hartley plans. Plan Sponsor Peer Groups are gross of fees.

**Percentile Rankings** - Percentile rank compares an individual fund's performance with those of other funds within a defined peer group of managers possessing a similar investment style. Percentile rank identifies the percentage of a fund's peer group that has a higher return (or other comparative measurement) than the fund being ranked. Conversely, 100 minus the individual fund's ranking will identify the percentage of funds within the peer group that have a lower return than the fund being ranked.

1 - Highest Statistical Value                      100 - Lowest Statistical Value

*Example: American Funds AMCP;R-4 (RAFEX) is ranked in the 4th percentile within the IM US Equity Large-Cap Growth Funds (MF) Peer Group for the Sharpe Ratio. Within the IM US Equity Large-Cap Growth Funds peer group, 4% of the other funds performed better than American Funds AMCP;R-4 (RAFEX), while 96% of the funds performed worse.*

**Performance Methodology** - RVK calculates performance beginning with the first full month following inception. Since inception performance may vary from manager reported performance due to RVK using the first full month of returns as the inception date. Performance for both managers and composites is annualized for periods greater than one year.

**Return** - Compounded rate of return for the period.

**%Return** - The time-weighted rate of return of a portfolio for a given period.

**RVK Liquidity Rating** - A qualitative method for determining the relative amount of liquidity in a portfolio. The characteristics considered when determining relative liquidity include trading volume, gates for redemption, leverage, nature of transactions, and pricing mechanisms. The RVK Liquidity Rating is calculated using beginning of month investment weights applied to each corresponding asset class liquidity rating.

<u>Asset Class</u>	<u>RVK Liquidity Rating</u>	<u>Asset Class</u>	<u>RVK Liquidity Rating</u>
<u>Liquid Investments</u>		<u>Less Liquid Investments</u>	
T-Bills and Treasuries	100	Fixed Income Plus Sector	50
Cash Equivalents	98	Bank Loans	50
TIPS	95	Emerging Markets Debt	50
US Large Cap Equity	95	Hedge Funds	35
Diversified Real Return	93	Hedge Funds of Funds	35
Non-US Large Cap Equity	90	<u>Not Liquid Investments</u>	
Global Tactical Asset Allocation	88	Core Real Estate	25
US Small Cap Equity	85	Core Plus Real Estate	15
REITs	85	Plus Only Real Estate	5
Non-US Small Cap Equity	85	Private Equity	5
Emerging Markets Equity	85		
Core Fixed Income	85		
Core Plus Fixed Income	80		

**Sharpe Ratio** - Represents the excess rate of return over the risk-free return (i.e., BofA ML 3 Mo US T-Bill Index unless specified otherwise), divided by the standard deviation of the excess return. The result is the absolute rate of return per unit of risk. The higher the value, the better the portfolio's historical risk-adjusted performance.

**Standard Deviation** - A statistical measure of the range of a portfolio's performance and is a commonly used proxy for overall investment risk. The variability of a return around its average return over a specified time period.

## Glossary

**Thematic Classification** - Represents dedicated manager allocations; as such, thematic allocations are approximations. RVK categorizes the following asset classes as Alpha, Capital Appreciation, Capital Preservation, and Inflation:

### Alpha

Absolute Return Strategies  
Currency Overlay  
GTAA (Global Tactical Asset Allocation)

### Capital Appreciation

Public Equity  
Private Equity  
Preferred Securities  
High Yield  
Convertible Fixed Income  
TALF Funds  
Distressed Debt  
Emerging Market Fixed Income  
MLPs  
Value Added Real Estate  
Opportunistic Real Estate

### Capital Preservation

Core Fixed Income  
CMBS Fixed Income  
Asset Backed Fixed Income  
Domestic Core Plus Fixed Income  
Mortgage Backed Fixed Income  
International Developed Fixed Income  
Cash Equivalents  
Stable Value

### Inflation

TIPS  
Bank Loans  
Core Real Estate  
Real Return  
Inflation Hedges  
REITs  
Commodities

**Tracking Error** - A measure of the standard deviation of a portfolio's performance relative to the performance of an appropriate market benchmark.

**Unit Value** - The dollar value of a portfolio, assuming an initial nominal investment of \$1.00, growing at the compounded rate of %Return for a given period.

**Up Market Capture** - Up market by definition is positive benchmark return and up market capture represents the ratio in % terms of the average portfolios return over the benchmark during the up market period. The higher the value of the up market capture the better the product's performance.

PORTLAND

BOISE

CHICAGO

NEW YORK

**Disclaimer of Warranties and Limitation of Liability** - This document was prepared by RVK, Inc. (RVK) and may include information and data from some or all of the following sources: client staff; custodian banks; investment managers; specialty investment consultants; actuaries; plan administrators/record-keepers; index providers; as well as other third-party sources as directed by the client or as we believe necessary or appropriate. RVK has taken reasonable care to ensure the accuracy of the information or data, but makes no warranties and disclaims responsibility for the accuracy or completeness of information or data provided or methodologies employed by any external source. This document is provided for the client's internal use only and does not constitute a recommendation by RVK or an offer of, or a solicitation for, any particular security and it is not intended to convey any guarantees as to the future performance of the investment products, asset classes, or capital markets.

