



# Investment Performance Analysis

## Ohio Retirement Study Council

Period Ended: December 31, 2022



## 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.

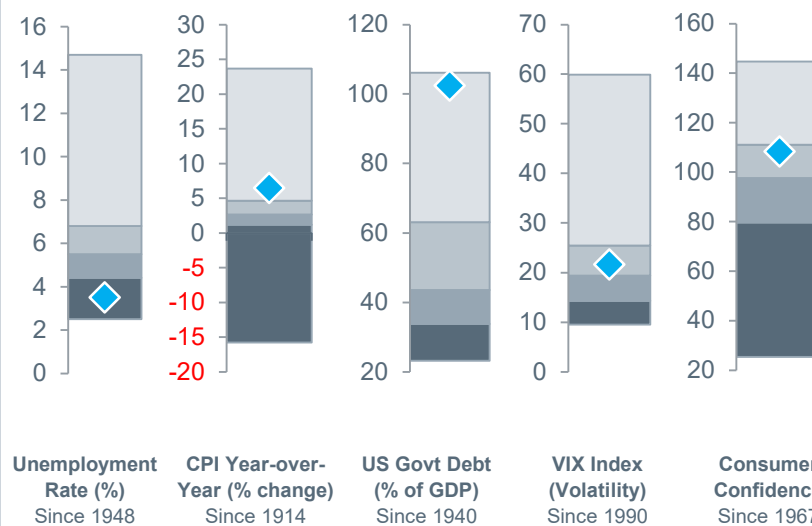
# Capital Markets Review



**Fourth Quarter Economic Environment**

In Q4, equity and fixed income markets delivered improved results while continuing to experience elevated volatility. However, positive quarterly returns came on the tail of a significantly negative year for many investors. Regarding economic conditions, the impact of tightening monetary policy and persistent inflation, combined with supply shocks and an energy crisis in Europe, are leading to increasing odds of a global recession in 2023. On a relatively positive note, recent data indicates that the inflationary environment is showing signs of abating. Notably, the US Consumer Price Index declined for a sixth straight month in December with a reading of 6.5%, the lowest level since October 2021. In December, the FOMC did slow the pace of policy rate hikes with a 50 basis point increase, following a series of four straight 75 basis point increases. Internationally, the war in Ukraine caused an energy price shock and trade tensions continue to test economic and political relationships across multiple regions. Within emerging markets, investor attention is focused on China with some pointing to signs of a softening stance toward pandemic restrictions as reason to be optimistic regarding the country's outlook. However, these views are countered with concerns over indications of social unrest and the consolidation of power around President Xi Jinping. With all this considered, global GDP growth forecasts continue to moderate with the OECD forecasting growth of 3.1% in 2022 with an expected decline to 2.2% global GDP growth in 2023.

**Key Economic Indicators**



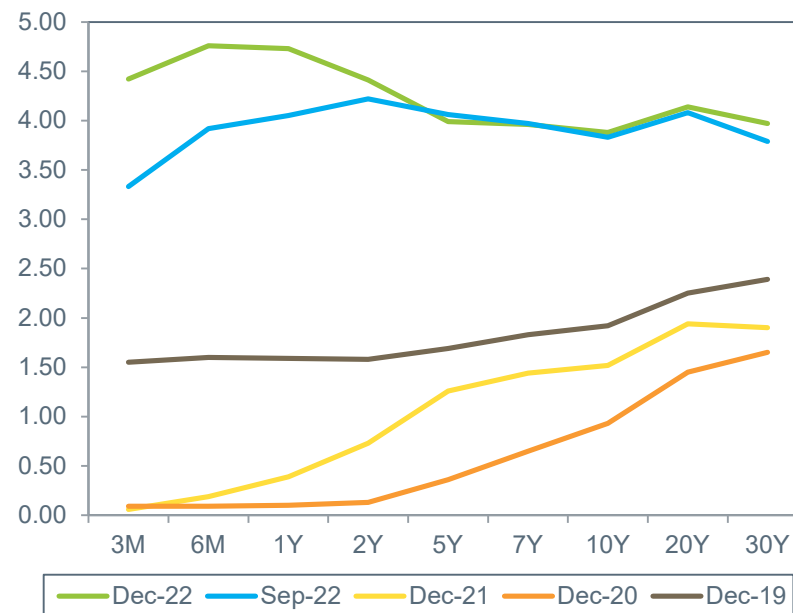
**Economic Indicators**

	Dec-22	Sep-22	Dec-21	Dec-19	20 Yr
Federal Funds Rate (%)	4.33 ▲	3.08	0.07	1.55	1.30
Breakeven Infl. - 5 Yr (%)	2.38 ▲	2.16	2.91	1.70	1.92
Breakeven Infl. - 10 Yr (%)	2.30 ▲	2.15	2.59	1.79	2.08
CPI YoY (Headline) (%)	6.5 ▼	8.2	7.0	2.3	2.5
Unemployment Rate (%)	3.5 —	3.5	3.9	3.6	6.0
Real GDP YoY (%)	1.0 ▼	1.8	5.7	2.6	2.0
PMI - Manufacturing	48.4 ▼	50.9	58.8	47.9	53.7
USD Total Wtd Idx	121.51 ▼	127.64	115.37	114.67	103.33
WTI Crude Oil per Barrel (\$)	80.3 ▲	79.5	75.2	61.1	67.9
Gold Spot per Oz (\$)	1,824 ▲	1,661	1,829	1,517	1,160

**Market Performance (%)**

	QTD	CYTD	1 Yr	5 Yr	10 Yr
S&P 500 (Cap Wtd)	7.56	-18.11	-18.11	9.42	12.56
Russell 2000	6.23	-20.44	-20.44	4.13	9.01
MSCI EAFE (Net)	17.34	-14.45	-14.45	1.54	4.67
MSCI EAFE SC (Net)	15.79	-21.39	-21.39	-0.05	6.21
MSCI Emg Mkts (Net)	9.70	-20.09	-20.09	-1.40	1.44
Bloomberg US Agg Bond	1.87	-13.01	-13.01	0.02	1.06
ICE BofAML 3 Mo US T-Bill	0.84	1.46	1.46	1.26	0.76
NCREIF ODCE (Gross)	-4.96	7.47	7.47	8.68	10.10
FTSE NAREIT Eq REIT (TR)	5.24	-24.37	-24.37	3.68	6.53
HFRI FOF Comp	1.79	-5.25	-5.25	3.02	3.51
Bloomberg Cmdty (TR)	2.22	16.09	16.09	6.44	-1.29

**Treasury Yield Curve (%)**



Fourth Quarter Review

**Broad Market**

US equity markets experienced a decrease in volatility in Q4 with short term spikes around CPI release dates and Fed meetings. Returns were positive across market cap and style groups in Q4. The reversal to growth seen in Q3 was short-lived, as value stocks led growth by a wide margin in Q4. Energy had its best year on record with the S&P 500 Energy Index gaining 65.72%.

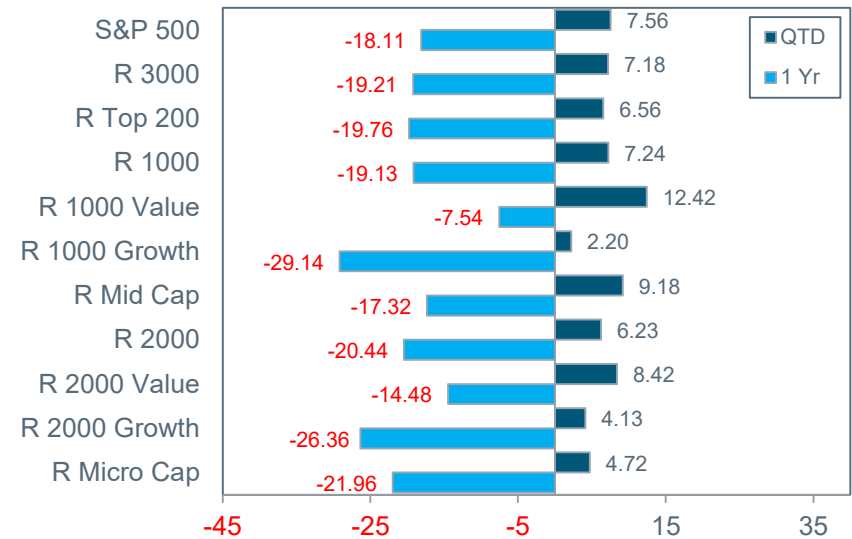
**Market Cap**

This year marks the worst performance of US equities across market cap groups since the GFC, and only the third time in the last 15 years that the Russell 3000 Index has generated negative returns.

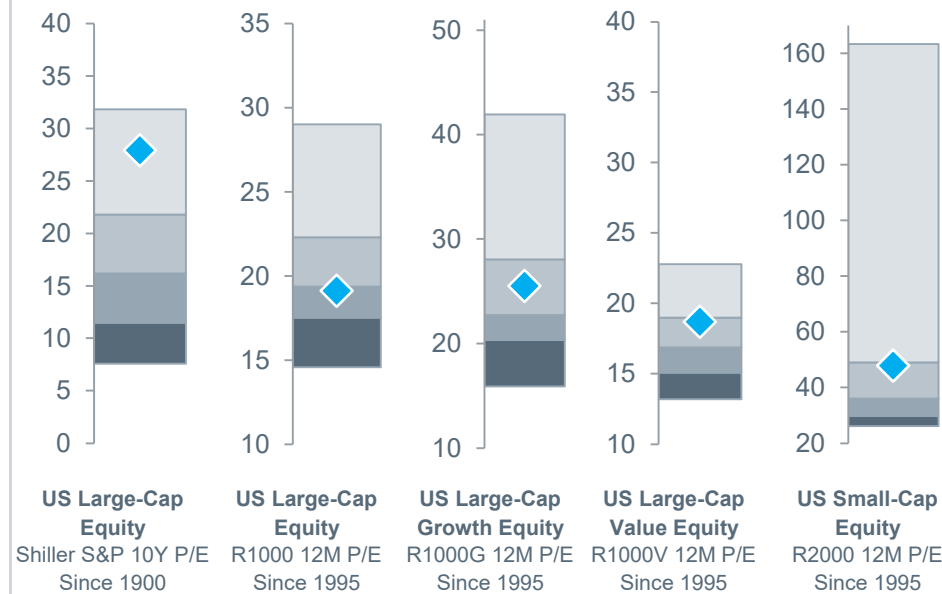
**Style and Sector**

Value-oriented managers had a higher success rate than core or growth managers in the small- and mid-cap spaces, while large-cap core and growth managers fared better than value managers. Growth managers across the market cap spectrum struggled to provide downside protection in 2022, while value and core managers were broadly successful.

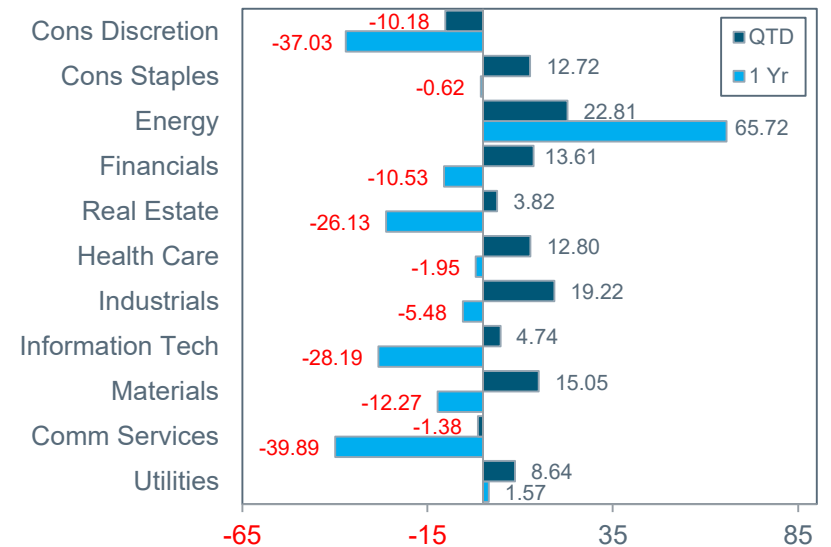
Style and Capitalization Market Performance (%)



Valuations



S&P 500 Index Sector Performance (%)



Valuation data courtesy of Bloomberg Professional Service and Robert J. Shiller, Irrational Exuberance, Second Edition (2000). P/E metrics shown represent the 5th through 95th percentiles to minimize the effect of outliers.



**Fourth Quarter Review**

**Developed Markets**

International developed markets meaningfully outperformed their domestic counterparts in Q4 with the MSCI EAFE Index realizing a 17.3% return for the period. Value stocks rebounded back into favor, outperforming growth in a reversal from the prior quarter, while large-cap continued its outperformance over small-cap stocks. Overall, market trends pointed to investors anticipating moderating inflation and easing of rate hikes despite the ongoing uncertainty led by the conflict in Ukraine and near-term recession fears.

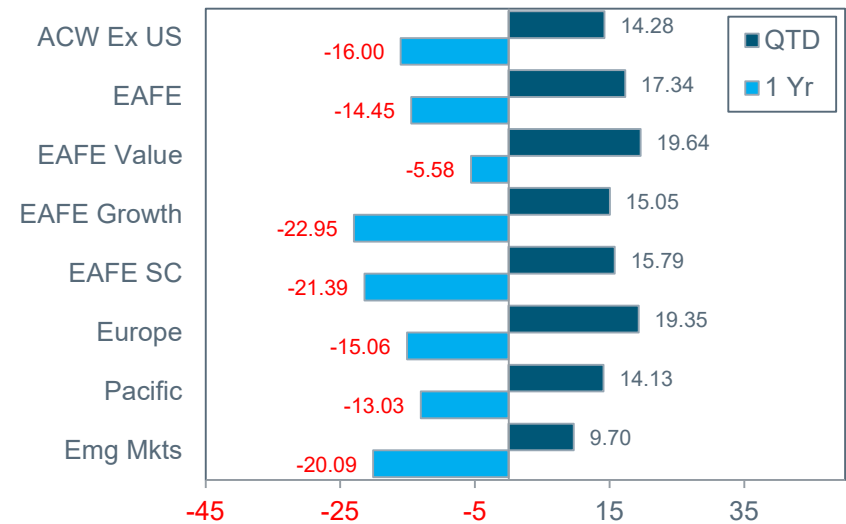
**Emerging Markets**

Emerging markets lagged behind developed during the quarter with the MSCI Emerging Markets Index finishing with a 9.7% return. Value stocks narrowly outperformed growth and large-cap beat small-cap.

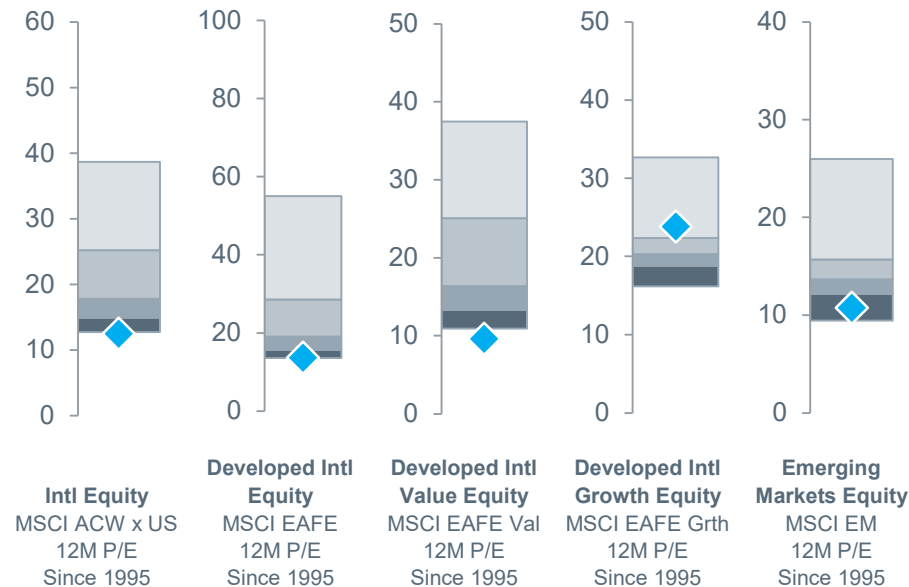
**Market Cap & Style**

The majority of active managers in emerging markets outperformed the index in Q4; however, active managers in international developed mostly underperformed.

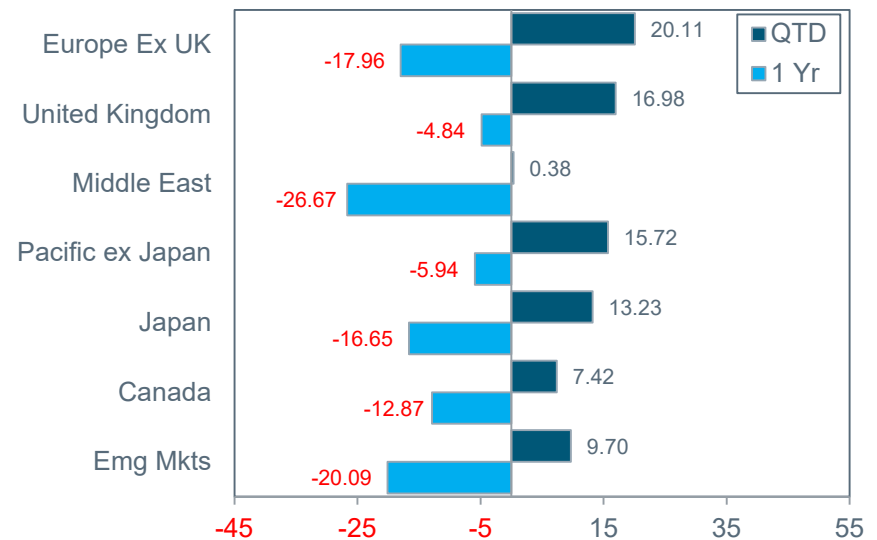
**MSCI Style and Capitalization Market Performance (%)**



**Valuations**



**MSCI Region Performance (%)**



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 Bloomberg US Aggregate Index finished Q4 with a return of 1.9%, capping off a decline of -13.0% in 2022, the most negative calendar year on record for the index. The year was defined by rising interest rates, as treasury yields rose 236 basis points from 1.5% to 3.9% as measured by the 10-year US Treasury yield. The Federal Reserve aggressively hiked the Federal Funds rate in response to persistent inflation over the course of the year.

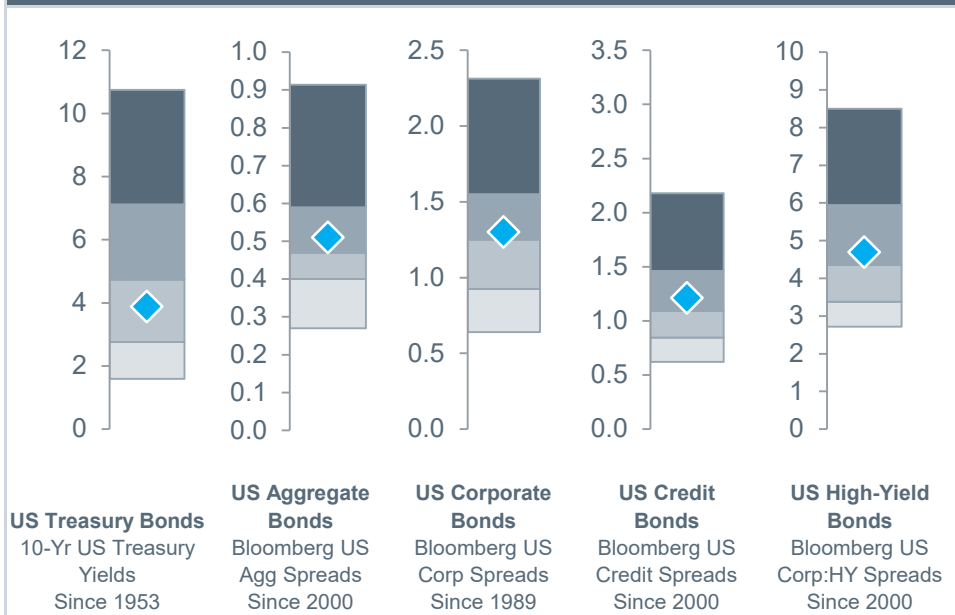
**Credit Market**

US investment grade corporate bonds rebounded in Q4 as low supply and softer Federal Reserve rhetoric bolstered credit markets. Non-investment grade corporate credit relatively outperformed investment grade over the year.

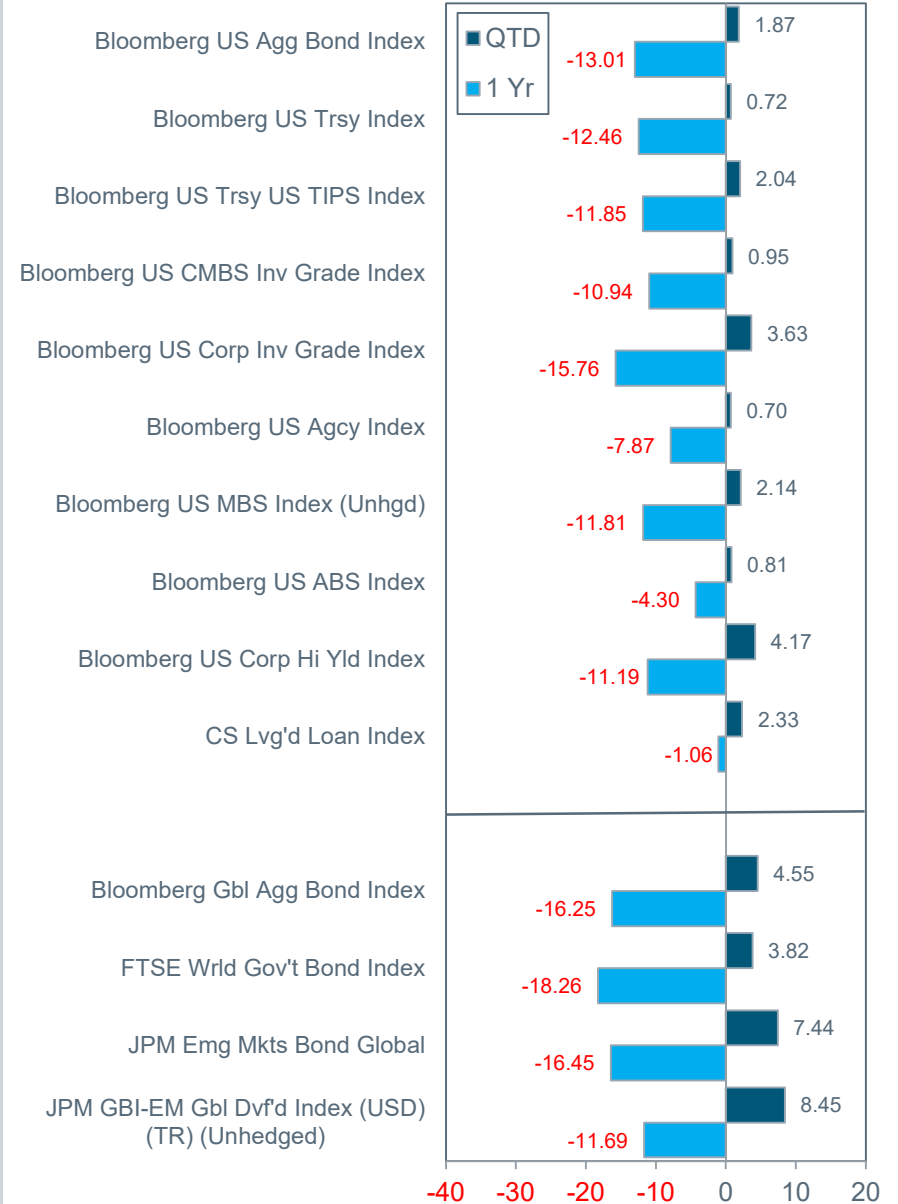
**Emerging Market Debt**

Conditions in global fixed income markets were defined by concerns over low growth, persistent inflation, rising interest rates, a strong US Dollar, and geopolitical conflict. The Bloomberg Global Aggregate Index returned 1.0% in Q4 and -11.2% in 2022, while the JPM EMBI Global Diversified returned 8.1% and -17.8% over these respective periods.

Valuations



Fixed Income Performance (%)



Valuation data courtesy of Bloomberg Professional Service. Valuations shown represent the 5th through 95th percentiles to minimize the effect of outliers.

**Fourth Quarter Review - Absolute Return**

**General Market - Hedge Funds**

Despite a highly challenging market backdrop, hedge funds broadly delivered much-needed capital preservation to institutional investors. The year also ended on a strong note given most managers were reducing leverage and overall market exposure going into Q4. The HFRI Fund-Asset-Weighted Composite Index delivered an annual return of 1.0% while its Asset-Weighted counterpart ended the year at -4.0%.

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

Global Tactical Asset Allocation (GTAA) strategies that RVK follows closely posted significant gains with moderate dispersion to close an otherwise challenging year. Given a strong quarter for non-US equity, as well as value-oriented equity within the US, nearly all active managers with significant diversification outperformed a US centric blend of 60% equity and 40% fixed income. The top performing long-biased GTAA strategies were those who have included meaningful market neutral idiosyncratic relative valuation exposures. While those who moderately underperformed peers benefitted from a value bias despite maintaining US equity and fixed income exposures.

**Fourth Quarter Review - Real Assets**

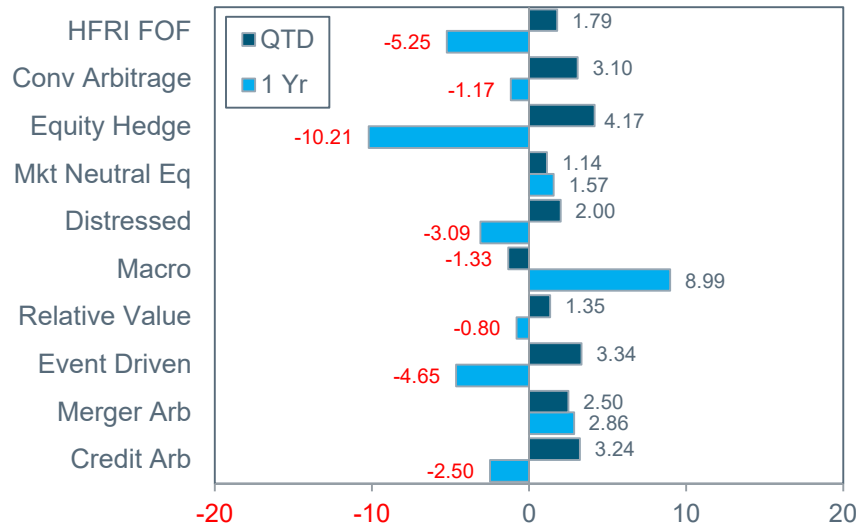
**General Market - Diversified Inflation Strategies (DIS)**

DIS managers tracked closely by RVK have outperformed a US-centric blend of 60% equity and 40% fixed income both year to date, and over the quarter. After responding positively to record inflationary pressures in Q1 of 2022, DIS posted losses in the second and third quarters that followed. Strong Q4 performance has materialized across the peer group, with those who rely on income-oriented investment processes and those who hold larger TIPS allocation lagging the group to a moderate degree.

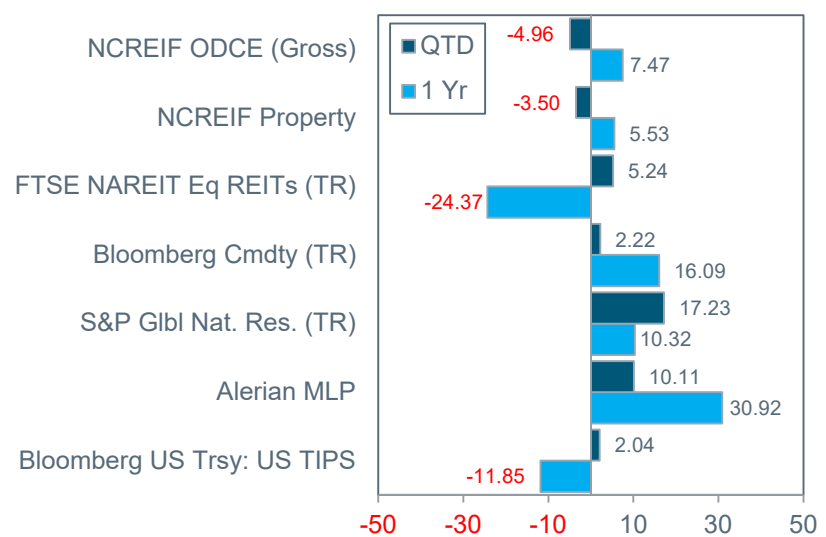
**General Market - Real Estate**

Core private real estate generated a negative return of -5.0% in Q4 (on a preliminary and gross of fee basis), as reported by the NFI-ODCE Index, with the total return comprising of 0.8% income and -5.8% price appreciation. Investors of publicly traded real estate significantly outperformed their private market counterparts by a meaningful margin. Publicly traded real estate delivered a fourth quarter total return of 4.5%, as measured by FTSE/NAREIT All REITs Index.

**HFRI Hedge Fund Performance (%)**



**Real Asset Performance (%)**



Annual Asset Class Performance

As of December 31, 2022

	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	CYTD
Best	8.44	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
	5.24	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
	2.06	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
	-2.35	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	-5.25
	-10.01	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
	-21.37	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
	-26.16	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
	-33.79	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
	-35.65	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
	-37.00	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
	-37.74	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
	-43.33	1.92	6.31	-13.32	4.21	-8.61	-4.90	-4.47	1.00	3.01	-13.73	7.69	0.67	-1.55	-21.39
	-47.01	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
Worst	-53.33	-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
	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 Trsy 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	2021	2020	2019	2018
<b>PERS (DB)</b>	<b>92,544,959</b>	<b>0.83</b>	<b>-11.95</b>	<b>4.45</b>	<b>5.35</b>	<b>7.40</b>	<b>7.38</b>	<b>15.43</b>	<b>12.11</b>	<b>17.31</b>	<b>-2.90</b>
PERS (DB) Total Fund Benchmark		0.37	-11.44	4.46	5.28	7.12	6.97	15.28	11.65	17.06	-3.08
Difference		0.46	-0.51	-0.01	0.07	0.28	0.41	0.15	0.46	0.25	0.18
Rank		58	65	66	63	54	53	52	49	49	44
<b>PERS (HC 115)</b>	<b>11,686,665</b>	<b>0.17</b>	<b>-15.51</b>	<b>2.34</b>	<b>3.85</b>	<b>5.95</b>	<b>5.61</b>	<b>14.34</b>	<b>10.96</b>	<b>19.59</b>	<b>-5.76</b>
PERS (HC 115) Total Fund Benchmark		0.12	-15.56	1.89	3.47	5.56	5.23	13.76	10.13	19.20	-5.97
Difference		0.05	0.05	0.45	0.38	0.39	0.38	0.58	0.83	0.39	0.21
Rank		79	95	93	95	93	94	64	64	16	91
<b>STRS</b>	<b>85,942,103</b>	<b>0.51</b>	<b>-8.52</b>	<b>6.63</b>	<b>7.11</b>	<b>8.48</b>	<b>8.66</b>	<b>19.36</b>	<b>12.26</b>	<b>18.39</b>	<b>-1.75</b>
STRS Total Fund Benchmark		0.07	-10.90	5.38	6.28	7.78	8.18	17.36	11.92	18.27	-2.04
Difference		0.44	1.38	1.25	0.83	0.70	0.48	2.00	0.34	0.12	0.29
Rank		70	37	16	12	9	6	12	46	28	27
<b>OP&amp;F</b>	<b>16,755,445</b>	<b>0.12</b>	<b>-8.73</b>	<b>6.25</b>	<b>6.76</b>	<b>8.39</b>	<b>8.24</b>	<b>20.48</b>	<b>9.09</b>	<b>17.39</b>	<b>-1.52</b>
OP&F Total Fund Benchmark		-0.24	-10.78	4.46	5.25	7.03	6.78	16.28	9.86	16.85	-2.99
Difference		0.36	2.05	1.79	1.51	1.36	1.46	4.20	-0.77	0.54	1.47
Rank		81	30	25	17	13	18	10	85	47	22
<b>SERS</b>	<b>17,149,132</b>	<b>1.96</b>	<b>-4.89</b>	<b>8.20</b>	<b>8.04</b>	<b>9.33</b>	<b>9.15</b>	<b>17.88</b>	<b>12.99</b>	<b>17.69</b>	<b>-1.28</b>
SERS Total Fund Benchmark		0.55	-7.91	5.61	6.01	7.31	7.42	14.66	11.55	16.04	-2.03
Difference		1.41	3.02	2.59	2.03	2.02	1.73	3.22	1.44	1.65	0.75
Rank		15	9	5	3	2	3	23	36	41	19
<b>HPRS</b>	<b>981,897</b>	<b>1.84</b>	<b>-9.59</b>	<b>7.30</b>	<b>6.98</b>	<b>8.15</b>	<b>8.26</b>	<b>16.92</b>	<b>16.86</b>	<b>18.85</b>	<b>-4.57</b>
HPRS Total Fund Benchmark		1.83	-9.61	6.06	6.32	7.61	7.67	16.63	13.16	17.85	-3.38
Difference		0.01	0.02	1.24	0.66	0.54	0.59	0.29	3.70	1.00	-1.19
Rank		18	38	12	14	26	17	36	3	23	75
<i>All Public Plans &gt; \$1B-Total Fund Median</i>		<i>0.97</i>	<i>-10.84</i>	<i>5.16</i>	<i>5.84</i>	<i>7.60</i>	<i>7.43</i>	<i>15.51</i>	<i>12.05</i>	<i>17.29</i>	<i>-3.14</i>

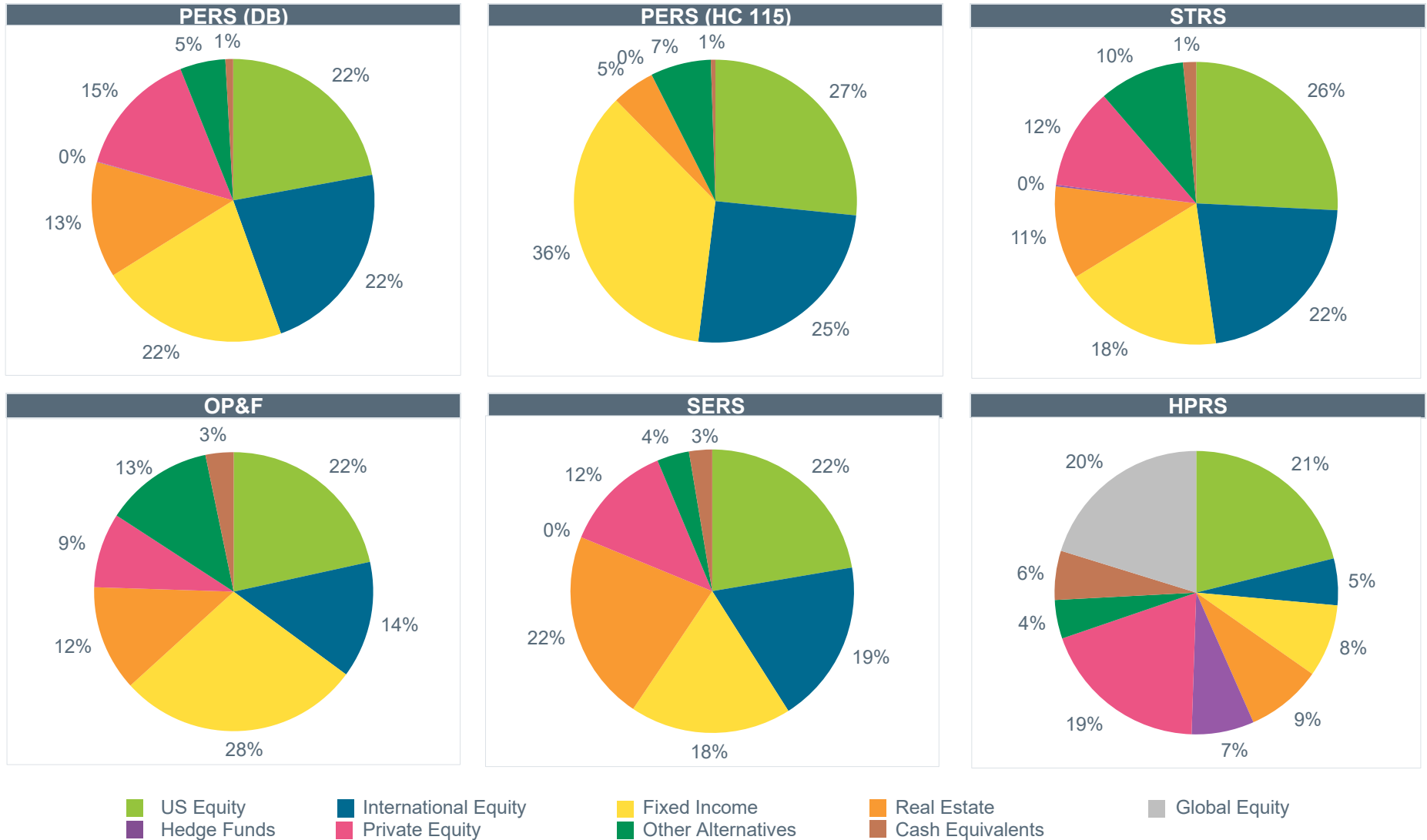
OPERS health care plan is not a pension plan and therefore has significantly different characteristics including a shorter focus asset allocation with more liquidity than the pension plans. For purposes of this study, the OPERS health care plan has been included in the results. The results for OPERS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

Performance shown is gross of fees but is net of embedded fees on externally managed real estate and alternative investments. Ranks are shown against All Public Plans >\$1B-Total Fund. PERS DB: 1 year performance was reduced by 0.94% due to change in distribution methodology used in private equity and real estate portfolios. PERS DB: 3 year performance was reduced by 0.37% due to change in distribution methodology used in private equity and real estate portfolios. PERS DB: 5 year performance was reduced by 0.22% due to change in distribution methodology used in private equity and real estate portfolios. PERS DB: 7 year performance was reduced by 0.16% due to change in distribution methodology used in private equity and real estate portfolios. PERS DB: 10 year performance was reduced by 0.11% due to change in distribution methodology used in private equity and real estate portfolios.

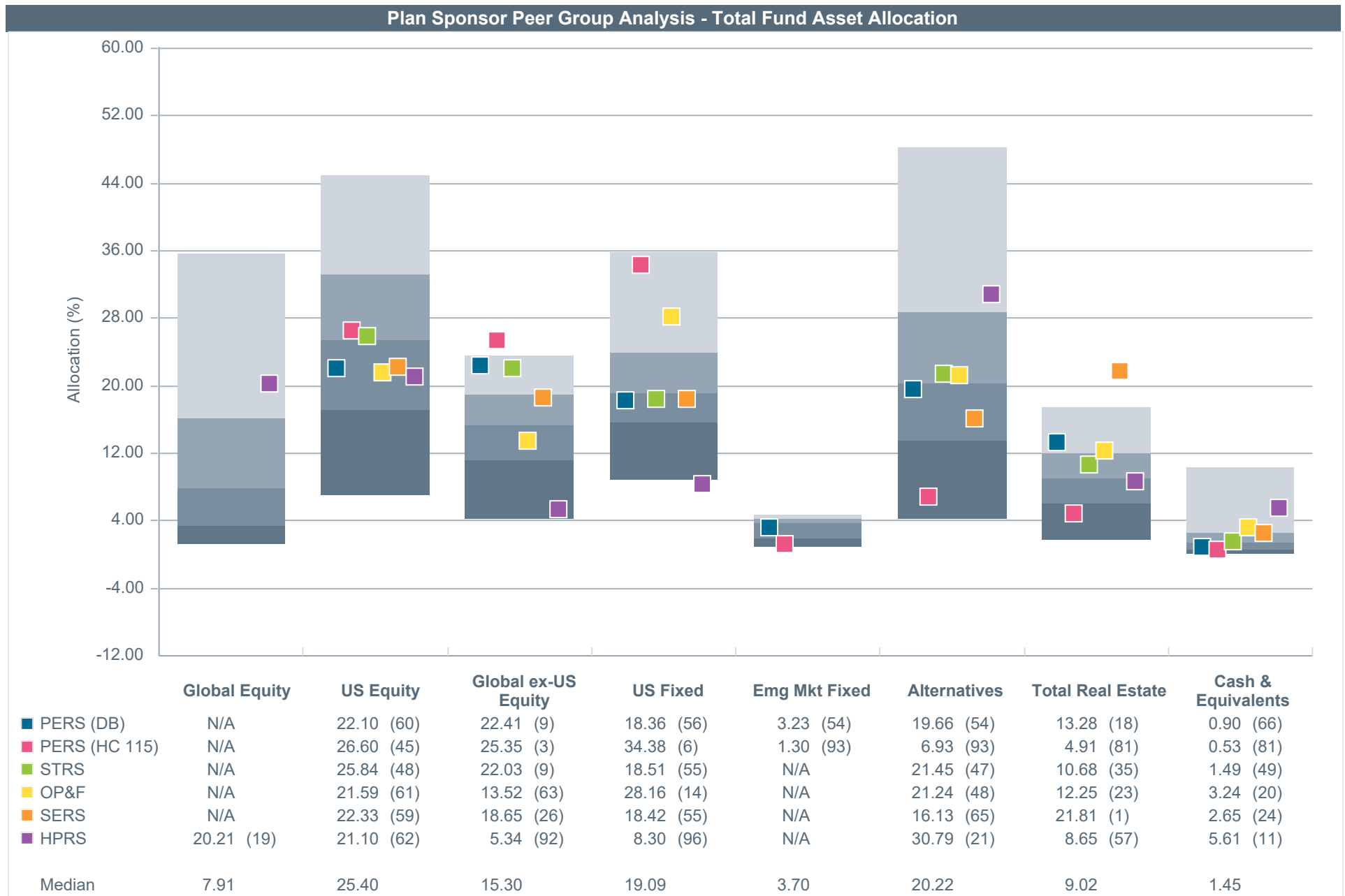
Asset Allocation & Performance - Net of Fees											
	Market Value (\$000)	Trailing Performance (%)						Calendar Year Performance (%)			
		2 Quarters	1 Year	3 Years	5 Years	7 Years	10 Years	2021	2020	2019	2018
<b>PERS (DB)</b>	<b>92,544,959</b>	<b>0.77</b>	<b>-12.03</b>	<b>4.36</b>	<b>5.27</b>	<b>7.28</b>	<b>7.22</b>	<b>15.34</b>	<b>12.02</b>	<b>17.23</b>	<b>-2.99</b>
PERS (DB) Total Fund Benchmark		0.37	-11.44	4.46	5.28	7.12	6.97	15.28	11.65	17.06	-3.08
Difference		0.40	-0.59	-0.10	-0.01	0.16	0.25	0.06	0.37	0.17	0.09
<b>PERS (HC 115)</b>	<b>11,686,665</b>	<b>0.17</b>	<b>-15.51</b>	<b>2.34</b>	<b>3.85</b>	<b>5.94</b>	<b>5.55</b>	<b>14.34</b>	<b>10.96</b>	<b>19.59</b>	<b>-5.76</b>
PERS (HC 115) Total Fund Benchmark		0.12	-15.56	1.89	3.47	5.56	5.23	13.76	10.13	19.20	-5.97
Difference		0.05	0.05	0.45	0.38	0.38	0.32	0.58	0.83	0.39	0.21
<b>STRS</b>	<b>85,942,103</b>	<b>0.44</b>	<b>-9.64</b>	<b>6.51</b>	<b>6.99</b>	<b>8.35</b>	<b>8.53</b>	<b>19.24</b>	<b>12.14</b>	<b>18.27</b>	<b>-1.89</b>
STRS Total Fund Benchmark		0.07	-10.90	5.38	6.28	7.78	8.18	17.36	11.92	18.27	-2.04
Difference		0.37	1.26	1.13	0.71	0.57	0.35	1.88	0.22	0.00	0.15
<b>OP&amp;F</b>	<b>16,755,445</b>	<b>-0.17</b>	<b>-9.38</b>	<b>5.56</b>	<b>6.08</b>	<b>7.73</b>	<b>7.62</b>	<b>19.63</b>	<b>8.51</b>	<b>16.71</b>	<b>-2.14</b>
OP&F Total Fund Benchmark		-0.24	-10.78	4.46	5.25	7.03	6.78	16.28	9.86	16.85	-2.99
Difference		0.07	1.40	1.10	0.83	0.70	0.84	3.35	-1.35	-0.14	0.85
<b>SERS</b>	<b>17,149,132</b>	<b>1.57</b>	<b>-5.60</b>	<b>7.52</b>	<b>7.35</b>	<b>8.63</b>	<b>8.46</b>	<b>17.13</b>	<b>12.40</b>	<b>16.96</b>	<b>-1.94</b>
SERS Total Fund Benchmark		0.55	-7.91	5.61	6.01	7.31	7.42	14.66	11.55	16.04	-2.03
Difference		1.02	2.31	1.91	1.34	1.32	1.04	2.47	0.85	0.92	0.09
<b>HPRS</b>	<b>981,897</b>	<b>1.67</b>	<b>-9.96</b>	<b>6.82</b>	<b>6.51</b>	<b>7.66</b>	<b>7.79</b>	<b>16.31</b>	<b>16.38</b>	<b>18.43</b>	<b>-5.02</b>
HPRS Total Fund Benchmark		1.83	-9.61	6.06	6.32	7.61	7.67	16.63	13.16	17.85	-3.38
Difference		-0.16	-0.35	0.76	0.19	0.05	0.12	-0.32	3.22	0.58	-1.64

Performance shown is net of all investment management costs. PERS DB: 1 year performance was reduced by 0.94% due to change in distribution methodology used in private equity and real estate portfolios. PERS DB: 3 year performance was reduced by 0.37% due to change in distribution methodology used in private equity and real estate portfolios. PERS DB: 5 year performance was reduced by 0.22% due to change in distribution methodology used in private equity and real estate portfolios. PERS DB: 7 year performance was reduced by 0.16% due to change in distribution methodology used in private equity and real estate portfolios. PERS DB: 10 year performance was reduced by 0.11% due to change in distribution methodology used in private equity and real estate portfolios.

Ohio Retirement Study Council  
Current Asset Allocation by Asset Class

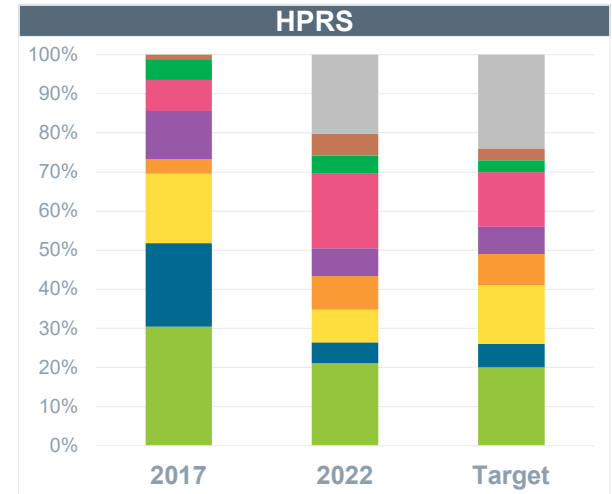
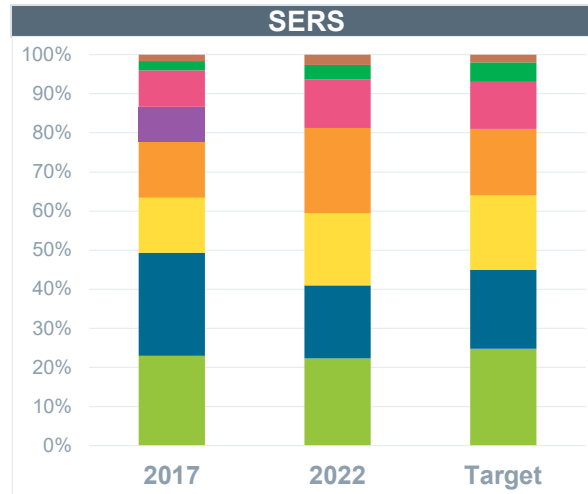
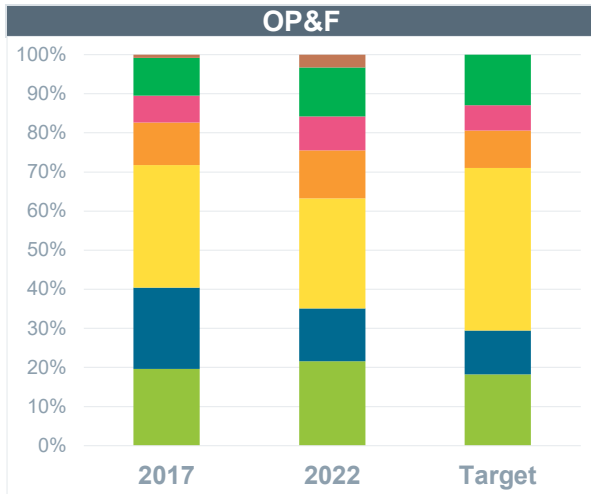
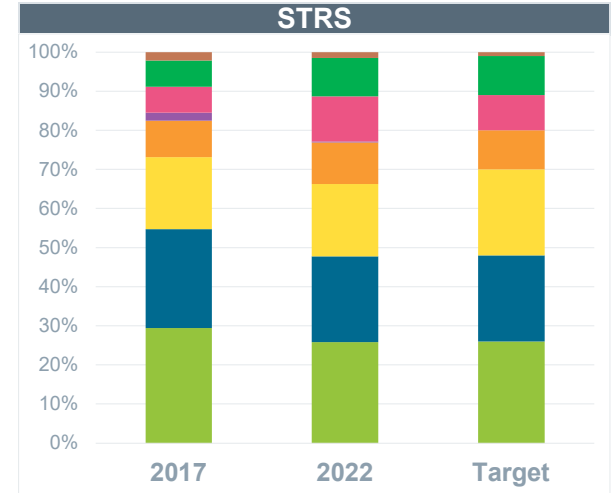
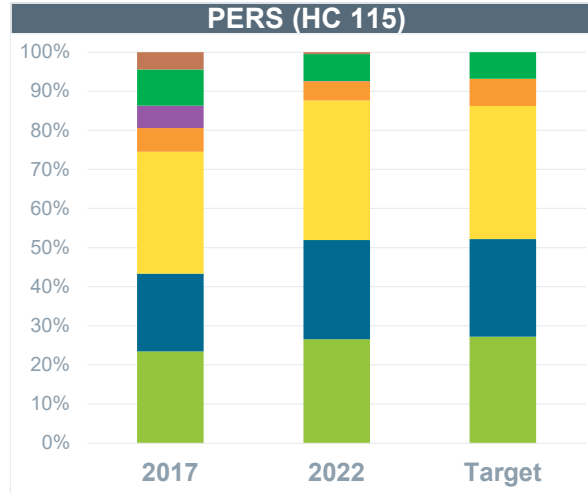
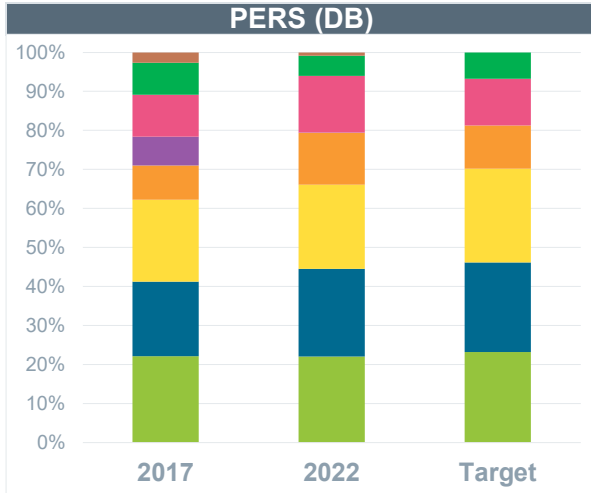


Allocations shown may not sum up to 100% exactly due to rounding. Cash Equivalents for PERS (DB) and PERS (HC 115) consists of cash, rebalancing, and additional annuity.



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.

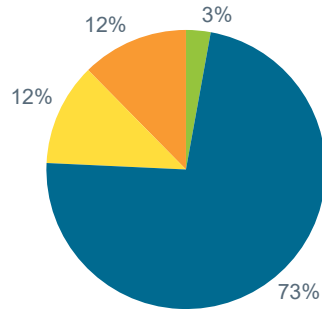




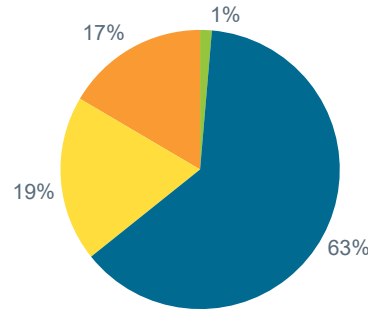
Summary

- **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)

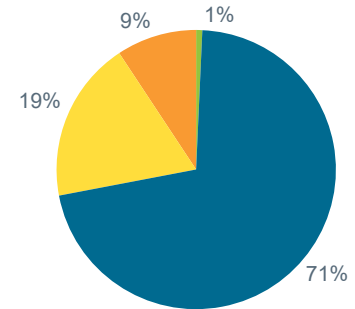
PERS (DB)



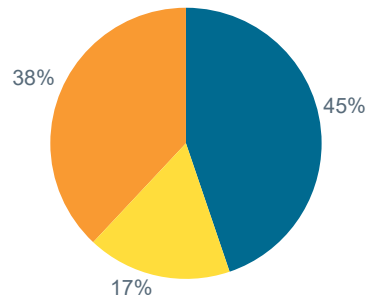
PERS (HC 115)



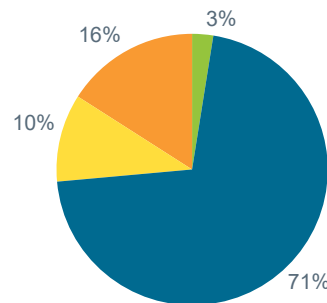
STRS



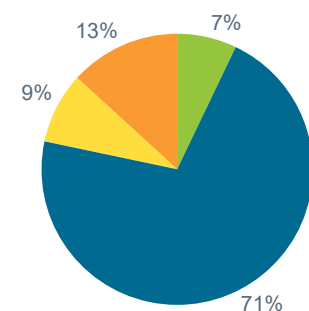
OP&F



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.

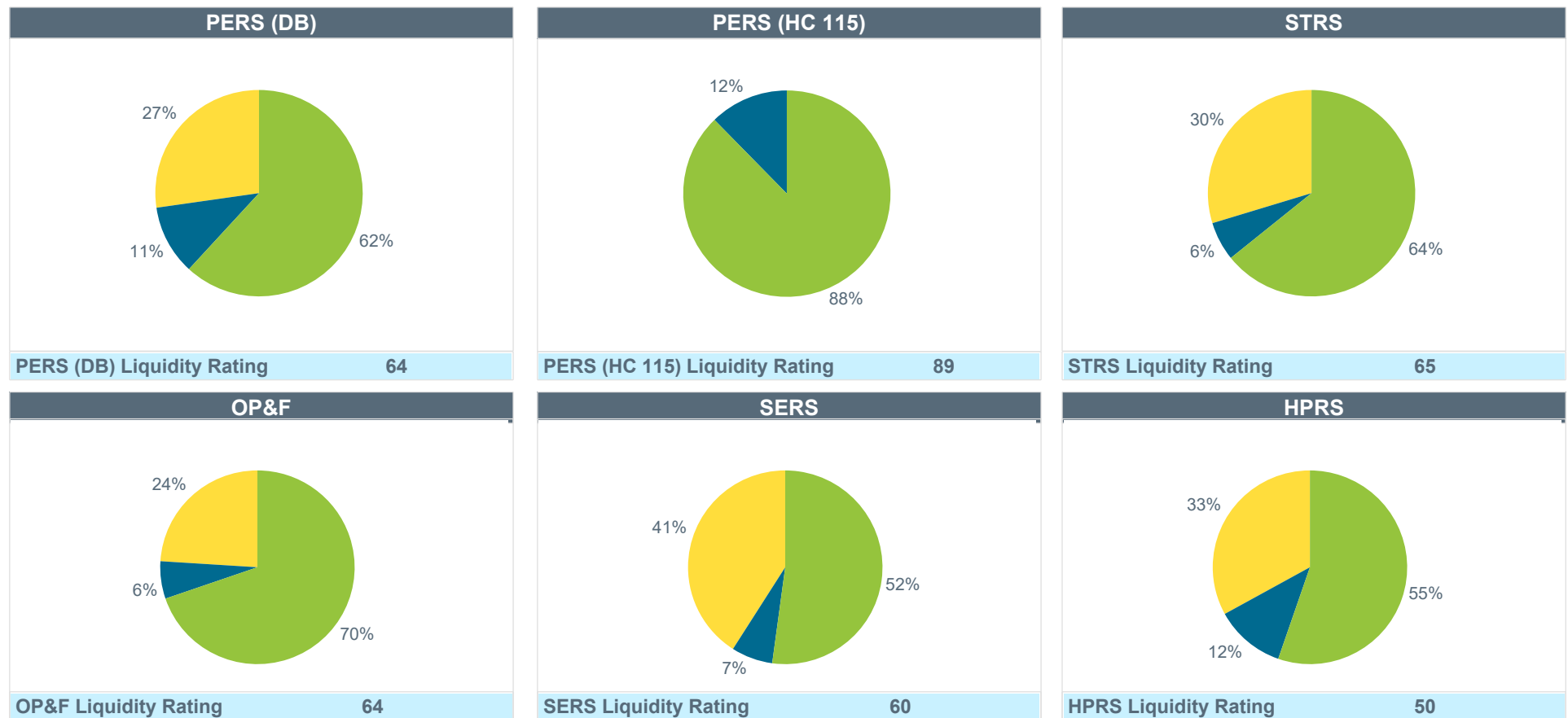
Summary

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

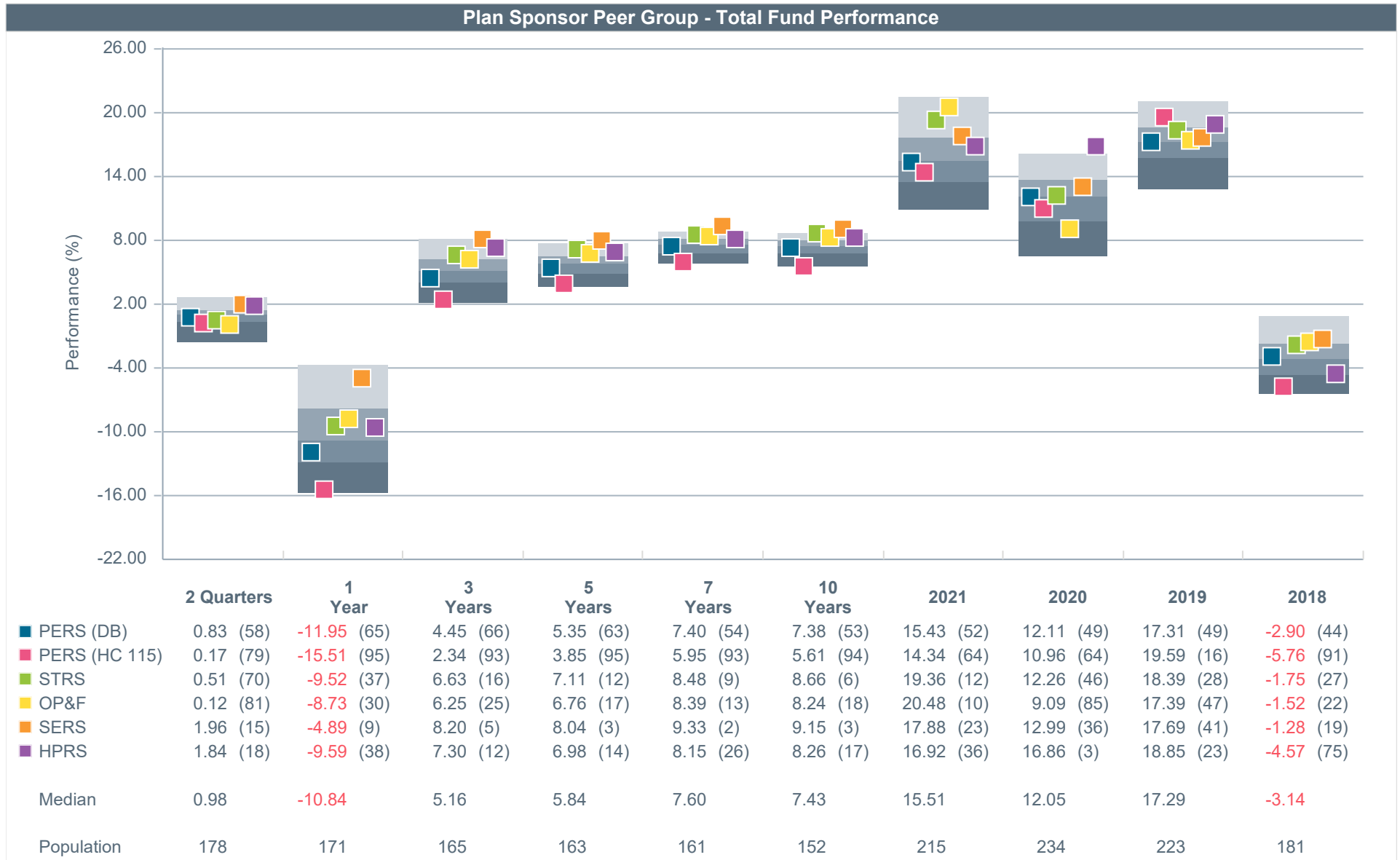
**Liquid Investments:** Publicly traded assets, largely exchanged traded with significant trading volume for the overall asset classes. Takes a relatively small discount or time required to raise cash, but generally expected to clear at quoted bid prices within several trading days.

**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.

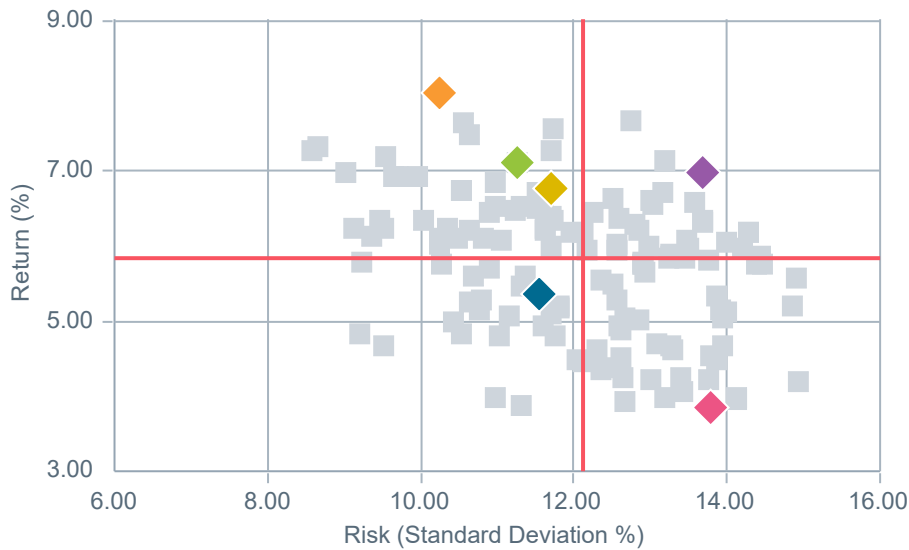


Asset Allocation by Liquidity percentages are provided by the Plans. Allocations are based on dedicated composite allocations and not underlying investment manager exposures; as such, liquidity allocations are approximations. Allocations shown may not sum up to exactly 100% due to rounding. The RVK Liquidity 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: 1 year performance was reduced by 0.94% due to change in distribution methodology used in private equity and real estate portfolios. PERS DB: 3 year performance was reduced by 0.37% due to change in distribution methodology used in private equity and real estate portfolios. PERS DB: 5 year performance was reduced by 0.22% due to change in distribution methodology used in private equity and real estate portfolios. PERS DB: 7 year performance was reduced by 0.16% due to change in distribution methodology used in private equity and real estate portfolios. PERS DB: 10 year performance was reduced by 0.11% due to change in distribution methodology used in private equity and real estate portfolios.

Plan Sponsor Peer Group Scattergram - 5 Years

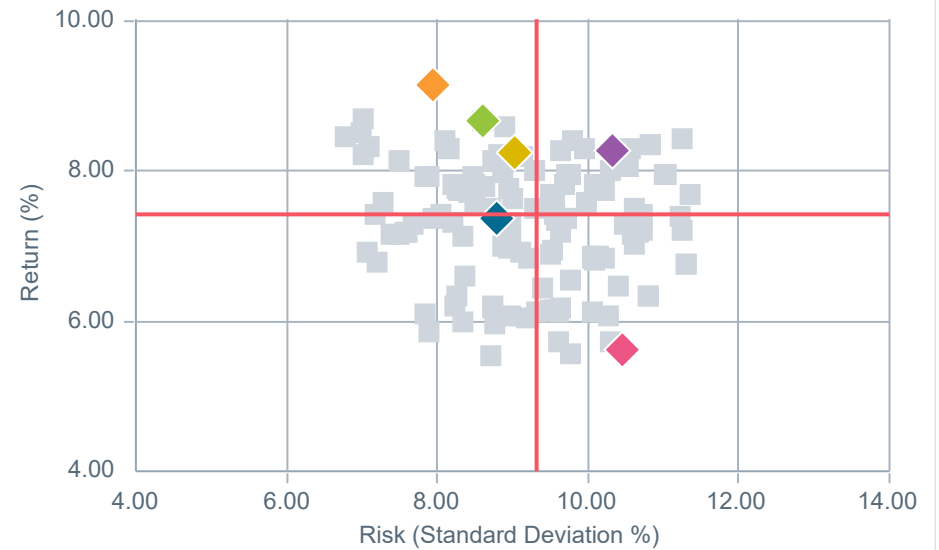


	Return	Standard Deviation
◆ PERS (DB)	5.35	11.54
◆ PERS (HC 115)	3.85	13.79
◆ STRS	7.11	11.26
◆ OP&F	6.76	11.69
◆ SERS	8.04	10.24
◆ HPRS	6.98	13.69
— Median	5.84	12.12

Sharpe Ratio - 5 Year

PERS (DB)	0.40
PERS (HC 115)	0.25
STRS	0.55
OP&F	0.51
SERS	0.68
HPRS	0.47
<i>All Public Plans &gt; \$1B-Total Fund Median</i>	0.40

Plan Sponsor Peer Group Scattergram - 10 Years



	Return	Standard Deviation
◆ PERS (DB)	7.38	8.79
◆ PERS (HC 115)	5.61	10.45
◆ STRS	8.66	8.59
◆ OP&F	8.24	9.02
◆ SERS	9.15	7.94
◆ HPRS	8.26	10.32
— Median	7.43	9.31

Sharpe Ratio - 10 Year

PERS (DB)	0.77
PERS (HC 115)	0.50
STRS	0.92
OP&F	0.84
SERS	1.04
HPRS	0.75
<i>All Public Plans &gt; \$1B-Total Fund Median</i>	0.72

Performance shown is gross of fees.

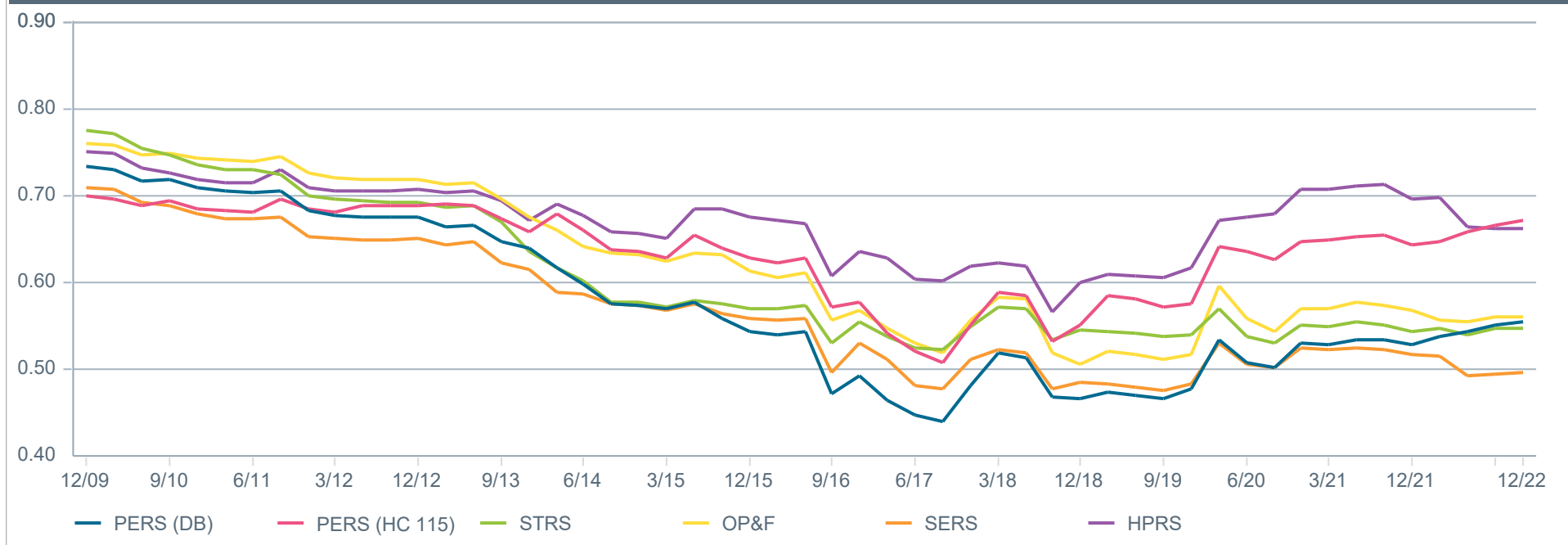
Summary

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	0.55	0.56	0.55
PERS (HC 115)	0.70	0.67	0.67	0.66
STRS	0.56	0.55	0.55	0.55
OP&F	0.58	0.56	0.56	0.56
SERS	0.51	0.50	0.50	0.50
HPRS	0.68	0.66	0.66	0.66
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.

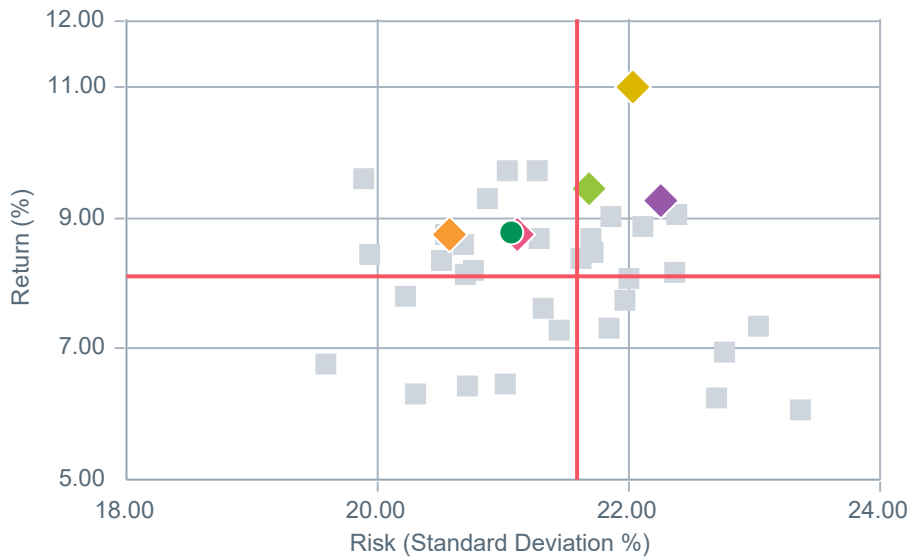
Performance										
	Trailing Performance (%)						Calendar Year Performance (%)			
	2 Quarters	1 Year	3 Years	5 Years	7 Years	10 Years	2021	2020	2019	2018
<b>US Equity</b>										
<b>PERS (DB)</b>	<b>2.50</b>	<b>-18.97</b>	<b>7.00</b>	<b>8.76</b>	<b>10.94</b>	<b>11.99</b>	<b>26.30</b>	<b>19.69</b>	<b>30.76</b>	<b>-5.00</b>
Russell 3000 Index	2.40	-19.21	7.07	8.79	11.04	12.13	25.66	20.89	31.02	-5.24
Difference	0.10	0.24	-0.07	-0.03	-0.10	-0.14	0.64	-1.20	-0.26	0.24
Rank	49	61	39	23	27	23	34	43	33	25
<b>PERS (HC 115)</b>	<b>2.50</b>	<b>-18.97</b>	<b>7.00</b>	<b>8.76</b>	<b>10.94</b>	<b>11.98</b>	<b>26.30</b>	<b>19.69</b>	<b>30.76</b>	<b>-5.00</b>
Russell 3000 Index	2.40	-19.21	7.07	8.79	11.04	12.13	25.66	20.89	31.02	-5.24
Difference	0.10	0.24	-0.07	-0.03	-0.10	-0.15	0.64	-1.20	-0.26	0.24
Rank	49	61	39	23	27	24	34	43	33	25
<b>STRS</b>	<b>3.05</b>	<b>-19.50</b>	<b>7.80</b>	<b>9.45</b>	<b>11.43</b>	<b>12.25</b>	<b>26.53</b>	<b>23.00</b>	<b>32.43</b>	<b>-5.33</b>
Russell 3000 Index	2.40	-19.21	7.07	8.79	11.04	12.13	25.66	20.89	31.02	-5.24
Difference	0.65	-0.29	0.73	0.66	0.39	0.12	0.87	2.11	1.41	-0.09
Rank	33	75	22	13	12	17	32	16	4	39
<b>OP&amp;F</b>	<b>2.07</b>	<b>-17.23</b>	<b>9.77</b>	<b>11.00</b>	<b>13.21</b>	<b>13.72</b>	<b>30.14</b>	<b>22.79</b>	<b>31.77</b>	<b>-3.30</b>
Wilshire 5000 Index	2.34	-19.04	7.41	8.99	11.26	12.28	26.70	20.82	31.02	-5.27
Difference	-0.27	1.81	2.36	2.01	1.95	1.44	3.44	1.97	0.75	1.97
Rank	72	38	3	2	1	2	5	17	16	7
<b>SERS</b>	<b>2.79</b>	<b>-18.51</b>	<b>7.45</b>	<b>8.74</b>	<b>10.94</b>	<b>12.18</b>	<b>24.90</b>	<b>21.87</b>	<b>30.60</b>	<b>-6.15</b>
Russell 3000 Index	2.40	-19.21	7.07	8.79	11.04	12.13	25.66	20.89	31.02	-5.24
Difference	0.39	0.70	0.38	-0.05	-0.10	0.05	-0.76	0.98	-0.42	-0.91
Rank	41	59	27	24	27	17	43	22	35	64
<b>HPRS</b>	<b>3.36</b>	<b>-17.30</b>	<b>9.10</b>	<b>9.27</b>	<b>11.58</b>	<b>12.59</b>	<b>27.38</b>	<b>23.28</b>	<b>30.36</b>	<b>-7.97</b>
Russell 3000 Index	2.40	-19.21	7.07	8.79	11.04	12.13	25.66	20.89	31.02	-5.24
Difference	0.96	1.91	2.03	0.48	0.54	0.46	1.72	2.39	-0.66	-2.73
Rank	23	38	4	15	9	6	26	11	39	88
<i>All Public Plans &gt; \$1B-US Equity Segment Median</i>	<i>2.34</i>	<i>-17.92</i>	<i>6.42</i>	<i>8.10</i>	<i>10.40</i>	<i>11.39</i>	<i>24.35</i>	<i>18.92</i>	<i>30.06</i>	<i>-5.86</i>

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

Risk & Return - US Equity

All Public Plans > \$1B-US Equity Segment

Plan Sponsor Peer Group Scattergram - 5 Years

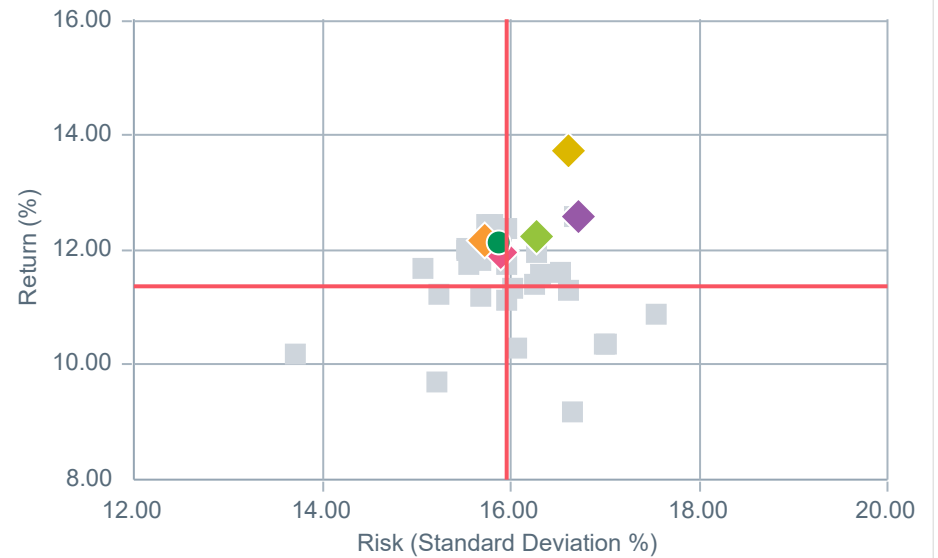


	Return	Standard Deviation
◆ PERS (DB)	8.76	21.12
◆ PERS (HC 115)	8.76	21.12
◆ STRS	9.45	21.68
◆ OP&F	11.00	22.04
◆ SERS	8.74	20.57
◆ HPRS	9.27	22.26
● Russell 3000 Index	8.79	21.06
— Median	8.10	21.59

Sharpe Ratio - 5 Years

PERS (DB)	0.45
PERS (HC 115)	0.45
STRS	0.47
OP&F	0.53
SERS	0.45
HPRS	0.46
Russell 3000 Index	0.45
All Public Plans > \$1B-US Equity Segment Median	0.42

Plan Sponsor Peer Group Scattergram - 10 Years



	Return	Standard Deviation
◆ PERS (DB)	11.99	15.89
◆ PERS (HC 115)	11.98	15.89
◆ STRS	12.25	16.27
◆ OP&F	13.72	16.62
◆ SERS	12.18	15.72
◆ HPRS	12.59	16.71
● Russell 3000 Index	12.13	15.87
— Median	11.39	15.96

Sharpe Ratio - 10 Years

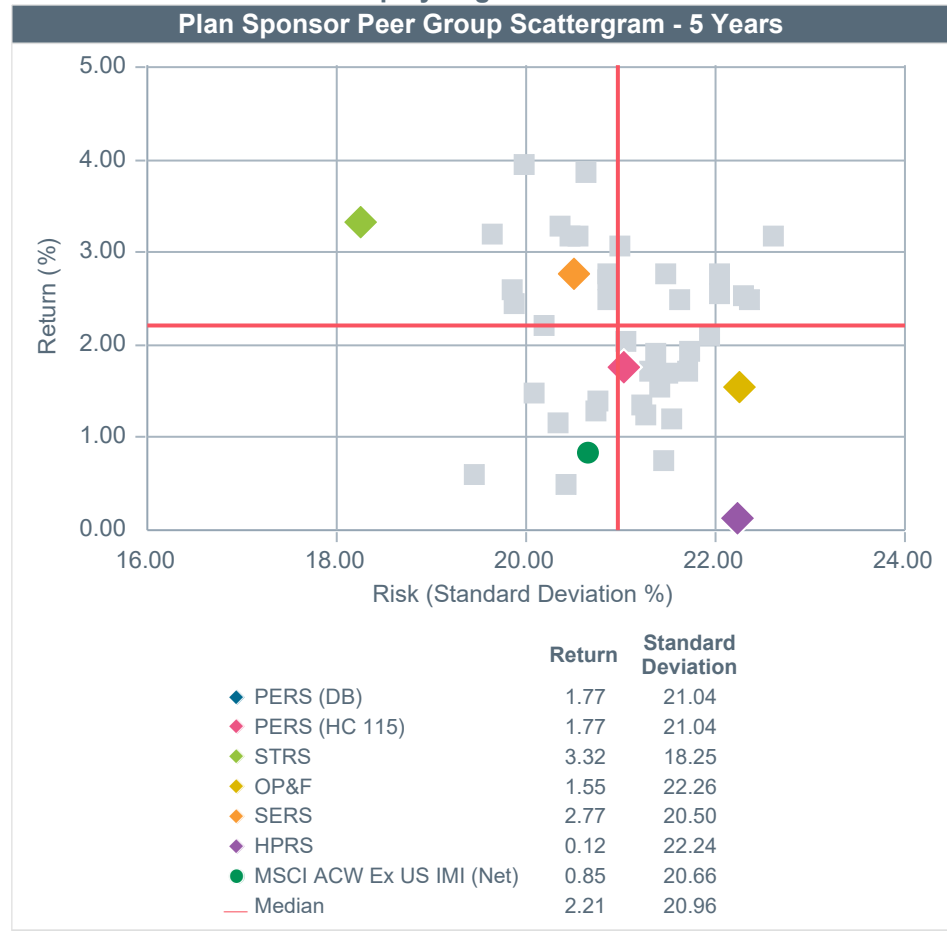
PERS (DB)	0.75
PERS (HC 115)	0.75
STRS	0.75
OP&F	0.82
SERS	0.77
HPRS	0.76
Russell 3000 Index	0.76
All Public Plans > \$1B-US Equity Segment Median	0.71

Performance shown is gross of fees.



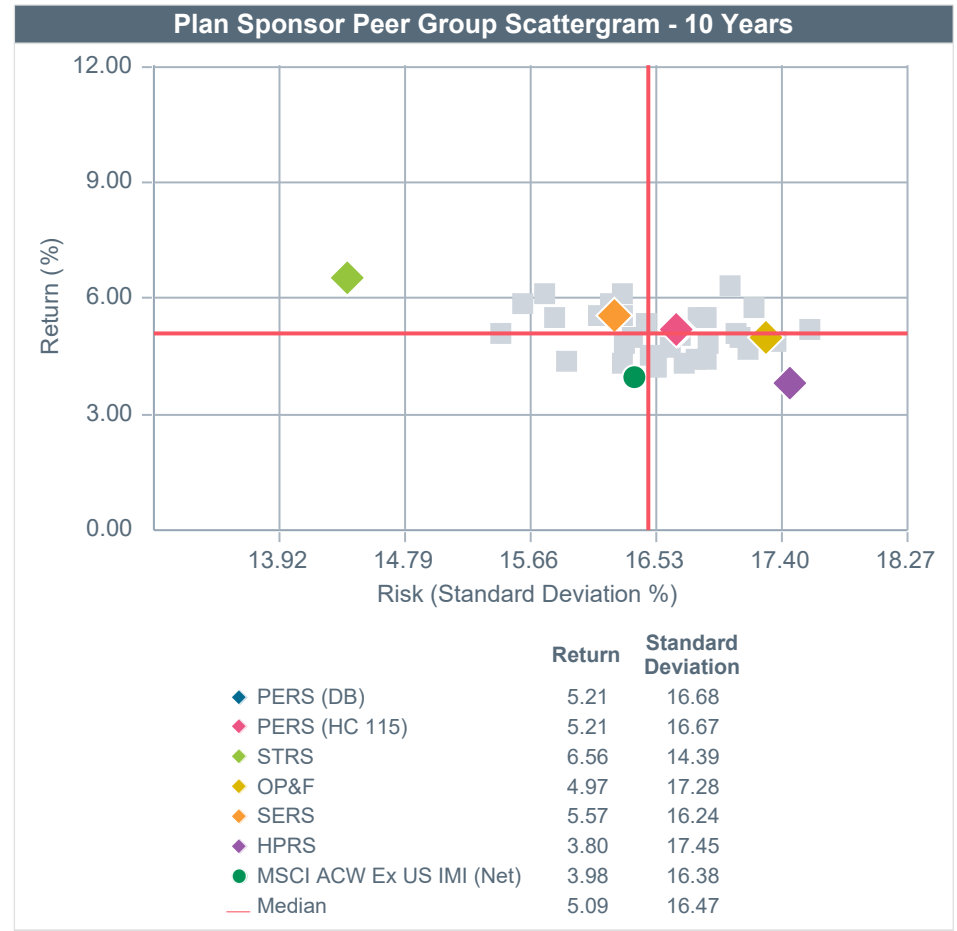
Performance										
	Trailing Performance (%)						Calendar Year Performance (%)			
	2 Quarters	1 Year	3 Years	5 Years	7 Years	10 Years	2021	2020	2019	2018
<b>International Equity</b>										
<b>PERS (DB)</b>	<b>3.34</b>	<b>-17.51</b>	<b>1.07</b>	<b>1.77</b>	<b>6.16</b>	<b>5.21</b>	<b>9.00</b>	<b>14.81</b>	<b>23.21</b>	<b>-14.17</b>
PERS (DB) International Equity Custom Benchmark	2.62	-16.85	0.13	0.72	5.07	3.77	7.89	11.90	21.09	-14.74
Difference	0.72	-0.66	0.94	1.05	1.09	1.44	1.11	2.91	2.12	0.57
Rank	57	53	48	62	34	43	62	39	61	66
<b>PERS (HC 115)</b>	<b>3.34</b>	<b>-17.51</b>	<b>1.07</b>	<b>1.77</b>	<b>6.16</b>	<b>5.21</b>	<b>9.00</b>	<b>14.81</b>	<b>23.21</b>	<b>-14.17</b>
PERS (HC 115) International Equity Custom Benchmark	2.62	-16.85	0.13	0.72	5.07	3.77	7.89	11.90	21.09	-14.74
Difference	0.72	-0.66	0.94	1.05	1.09	1.44	1.11	2.91	2.12	0.57
Rank	57	53	48	62	34	43	62	39	61	66
<b>STRS</b>	<b>4.72</b>	<b>-9.11</b>	<b>3.18</b>	<b>3.32</b>	<b>6.62</b>	<b>6.56</b>	<b>13.20</b>	<b>6.78</b>	<b>21.54</b>	<b>-11.80</b>
STRS International Equity Custom Benchmark	4.26	-11.64	2.32	2.90	6.11	5.67	12.36	7.88	22.51	-12.08
Difference	0.46	2.53	0.86	0.42	0.51	0.89	0.84	-1.10	-0.97	0.28
Rank	18	1	6	11	15	4	19	97	85	9
<b>OP&amp;F</b>	<b>4.76</b>	<b>-15.75</b>	<b>1.92</b>	<b>1.55</b>	<b>5.27</b>	<b>4.97</b>	<b>11.79</b>	<b>12.43</b>	<b>23.37</b>	<b>-17.32</b>
MSCI ACW Ex US IM Index (USD) (Net)	3.09	-16.58	0.20	0.85	4.84	3.98	8.53	11.12	21.63	-14.76
Difference	1.67	0.83	1.72	0.70	0.43	0.99	3.26	1.31	1.74	-2.56
Rank	17	35	35	69	80	64	31	54	59	100
<b>SERS</b>	<b>2.85</b>	<b>-16.03</b>	<b>2.35</b>	<b>2.77</b>	<b>6.62</b>	<b>5.57</b>	<b>10.76</b>	<b>15.29</b>	<b>24.36</b>	<b>-14.03</b>
SERS International Equity Custom Benchmark	3.04	-15.87	0.01	0.84	4.77	3.95	7.46	10.65	21.51	-14.20
Difference	-0.19	-0.16	2.34	1.93	1.85	1.62	3.30	4.64	2.85	0.17
Rank	70	37	27	32	15	28	45	34	42	61
<b>HPRS International Equity</b>	<b>2.80</b>	<b>-22.31</b>	<b>-1.97</b>	<b>0.12</b>	<b>4.01</b>	<b>3.80</b>	<b>1.89</b>	<b>19.02</b>	<b>25.47</b>	<b>-14.88</b>
HPRS International Equity Custom Benchmark	-0.45	-20.33	-3.47	-1.39	3.17	2.80	1.59	11.12	21.63	-14.76
Difference	3.25	-1.98	1.50	1.51	0.84	1.00	0.30	7.90	3.84	-0.12
Rank	70	96	99	94	100	100	100	12	26	83
<b>HPRS Global Equity</b>	<b>1.57</b>	<b>-22.67</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>
HPRS Global Equity Custom Benchmark	2.28	-18.36	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Difference	-0.71	-4.31	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
<i>All Public Plans &gt; \$1B-Intl. Equity Segment Median</i>	<i>3.54</i>	<i>-17.26</i>	<i>0.99</i>	<i>2.21</i>	<i>5.82</i>	<i>5.09</i>	<i>9.61</i>	<i>12.76</i>	<i>23.71</i>	<i>-13.59</i>

Performance shown is gross of fees. Ranks are shown against All Public Plans >\$1B-Intl. Equity Segment. In Q1 2021 HPRS added an allocation to Global Equity. 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)	0.13
PERS (HC 115)	0.13
STRS	0.20
OP&F	0.13
SERS	0.18
HPRS	0.06
MSCI ACW Ex US IMI (Net)	0.09
<i>All Public Plans &gt; \$1B-Intl. Equity Segment Median</i>	<i>0.15</i>



### Sharpe Ratio - 10 Years

PERS (DB)	0.35
PERS (HC 115)	0.35
STRS	0.46
OP&F	0.33
SERS	0.37
HPRS	0.26
MSCI ACW Ex US IMI (Net)	0.28
<i>All Public Plans &gt; \$1B-Intl. Equity Segment Median</i>	<i>0.34</i>

Performance shown is gross of fees.

Performance										
	Trailing Performance (%)						Calendar Year Performance (%)			
	2 Quarters	1 Year	3 Years	5 Years	7 Years	10 Years	2021	2020	2019	2018
<b>Fixed Income</b>										
<b>PERS (DB) Core Fixed Income</b>	<b>-3.17</b>	<b>-12.93</b>	<b>-2.02</b>	<b>0.44</b>	<b>1.22</b>	<b>1.48</b>	<b>-0.98</b>	<b>9.09</b>	<b>8.72</b>	<b>-0.06</b>
PERS (DB) Core Fixed Income Custom Benchmark	-2.97	-13.01	-2.71	0.02	0.89	1.06	-1.54	7.51	8.72	0.01
Difference	-0.20	0.08	0.69	0.42	0.33	0.42	0.56	1.58	0.00	-0.07
Rank	73	66	69	74	90	68	85	41	68	39
<b>PERS (HC 115) Core Fixed Income</b>	<b>-3.17</b>	<b>-12.93</b>	<b>-2.02</b>	<b>0.44</b>	<b>1.22</b>	<b>1.47</b>	<b>-0.98</b>	<b>9.09</b>	<b>8.72</b>	<b>-0.06</b>
PERS (HC 115) Core Fixed Income Custom Benchmark	-2.97	-13.01	-2.71	0.02	0.89	1.08	-1.54	7.51	8.72	0.01
Difference	-0.20	0.08	0.69	0.42	0.33	0.39	0.56	1.58	0.00	-0.07
Rank	73	66	69	74	90	68	85	41	68	39
<b>STRS Core Fixed Income</b>	<b>-1.82</b>	<b>-12.51</b>	<b>-2.08</b>	<b>0.48</b>	<b>1.61</b>	<b>1.58</b>	<b>-0.76</b>	<b>8.12</b>	<b>9.28</b>	<b>-0.17</b>
Bloomberg US Universal index	-2.31	-12.99	-2.54	0.18	1.26	1.33	-1.10	7.58	9.29	-0.26
Difference	0.49	0.48	0.46	0.30	0.35	0.25	0.34	0.54	-0.01	0.09
Rank	41	57	71	73	66	64	82	63	52	43
<b>OP&amp;F Core Fixed Income</b>	<b>-8.40</b>	<b>-28.89</b>	<b>-8.68</b>	<b>-3.57</b>	<b>-1.41</b>	<b>-0.54</b>	<b>-2.97</b>	<b>7.35</b>	<b>8.13</b>	<b>1.24</b>
Bloomberg US Agg Bond Index + Leverage Factor	-9.63	-28.36	-9.26	-4.07	-2.08	-1.03	-3.40	7.96	8.71	0.02
Difference	1.23	1.47	0.58	0.50	0.67	0.49	0.43	-0.61	-0.58	1.22
Rank	95	100	100	99	99	98	97	80	78	9
<b>SERS</b>	<b>-1.98</b>	<b>-12.21</b>	<b>-1.16</b>	<b>1.12</b>	<b>2.18</b>	<b>2.05</b>	<b>-0.56</b>	<b>10.59</b>	<b>9.95</b>	<b>-0.38</b>
Bloomberg US Agg Bond Index	-2.97	-13.01	-2.71	0.02	0.89	1.06	-1.55	7.51	8.72	0.01
Difference	0.99	0.80	1.55	1.10	1.29	0.99	0.99	3.08	1.23	-0.39
Rank	43	50	40	34	32	25	75	18	29	57
<b>HPRS</b>	<b>1.22</b>	<b>-4.86</b>	<b>2.20</b>	<b>3.66</b>	<b>4.27</b>	<b>3.35</b>	<b>3.59</b>	<b>8.30</b>	<b>9.33</b>	<b>2.56</b>
HPRS Fixed Income Custom Benchmark	0.90	-8.46	-0.52	1.36	1.93	1.78	1.51	5.95	7.94	0.68
Difference	0.32	3.60	2.72	2.30	2.34	1.57	2.08	2.35	1.39	1.88
Rank	2	5	1	1	1	3	4	59	48	4
<i>All Public Plans &gt; \$1B-US Fixed Income Segment Median</i>	<i>-2.26</i>	<i>-12.28</i>	<i>-1.37</i>	<i>0.90</i>	<i>1.92</i>	<i>1.71</i>	<i>0.15</i>	<i>8.58</i>	<i>9.30</i>	<i>-0.27</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.

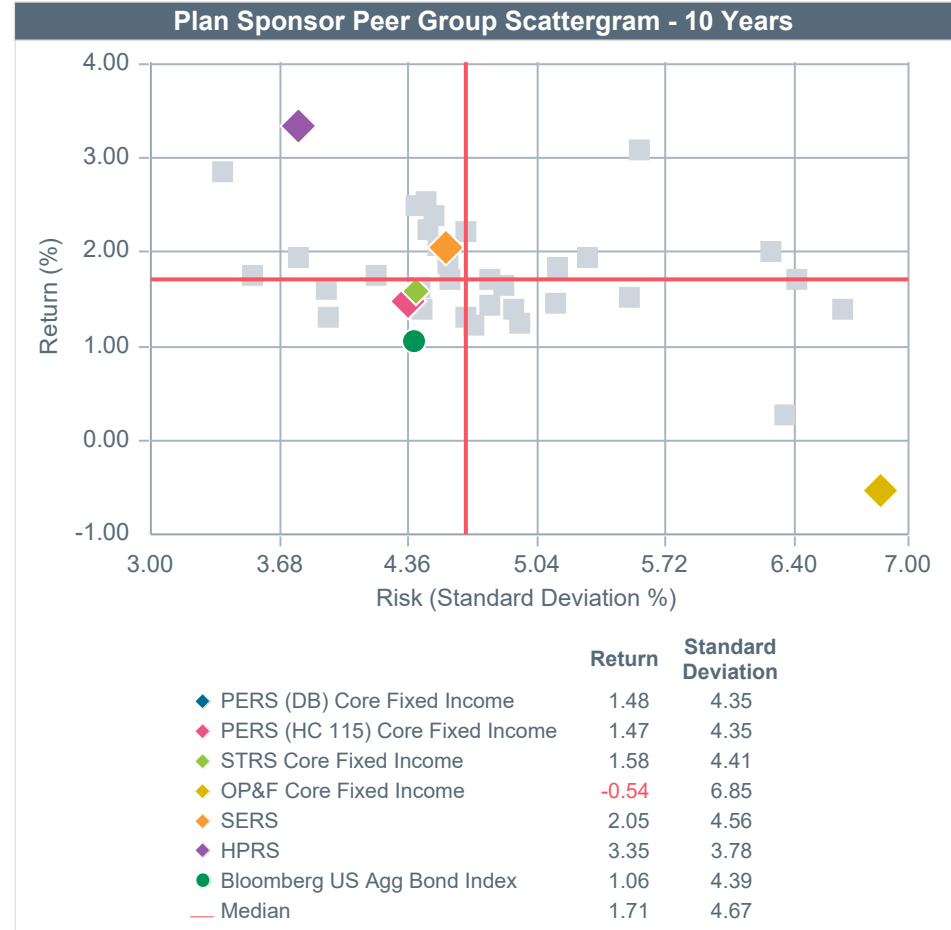
Risk & Return - Fixed Income

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



### Sharpe Ratio - 5 Years

PERS (DB) Core Fixed Income	-0.13
PERS (HC 115) Core Fixed Income	-0.13
STRS Core Fixed Income	-0.11
OP&F Core Fixed Income	-0.48
SERS	0.00
HPRS	0.50
Bloomberg US Agg Bond Index	-0.21
All Public Plans > \$1B-US Fixed Income Segment Median	-0.04



### Sharpe Ratio - 10 Years

PERS (DB) Core Fixed Income	0.19
PERS (HC 115) Core Fixed Income	0.19
STRS Core Fixed Income	0.21
OP&F Core Fixed Income	-0.15
SERS	0.30
HPRS	0.69
Bloomberg US Agg Bond Index	0.09
All Public Plans > \$1B-US Fixed Income Segment Median	0.23

Performance shown is gross of fees.

Performance										
	Trailing Performance (%)						Calendar Year Performance (%)			
	2 Quarters	1 Year	3 Years	5 Years	7 Years	10 Years	2021	2020	2019	2018
<b>Additional Fixed Income</b>										
<b>PERS (DB) US Treasury</b>	<b>-3.78</b>	<b>-12.47</b>	<b>-2.58</b>	<b>-0.08</b>	<b>0.42</b>	<b>N/A</b>	<b>-2.27</b>	<b>8.08</b>	<b>6.84</b>	<b>0.84</b>
Bloomberg US Trsy Index	-3.66	-12.46	-2.62	-0.10	0.41	N/A	-2.32	8.00	6.86	0.86
Difference	-0.12	-0.01	0.04	0.02	0.01	N/A	0.05	0.08	-0.02	-0.02
<b>PERS (DB) EMD</b>	<b>5.17</b>	<b>-13.50</b>	<b>-4.57</b>	<b>-1.42</b>	<b>2.30</b>	<b>0.06</b>	<b>-4.65</b>	<b>5.36</b>	<b>13.55</b>	<b>-5.63</b>
PERS (DB) EMD Custom Benchmark	3.15	-14.07	-5.27	-1.71	1.82	-0.30	-5.18	4.32	14.01	-5.33
Difference	2.02	0.57	0.70	0.29	0.48	0.36	0.53	1.04	-0.46	-0.30
<b>PERS (DB) High Yield</b>	<b>3.64</b>	<b>-10.41</b>	<b>0.40</b>	<b>2.61</b>	<b>4.88</b>	<b>4.18</b>	<b>5.16</b>	<b>7.42</b>	<b>14.76</b>	<b>-2.06</b>
Bloomberg U.S. High Yield Index	3.50	-11.19	0.05	2.31	5.05	4.03	5.28	7.11	14.32	-2.08
Difference	0.14	0.78	0.35	0.30	-0.17	0.15	-0.12	0.31	0.44	0.02
<b>PERS (DB) Securitized Debt</b>	<b>-3.98</b>	<b>-13.23</b>	<b>-0.66</b>	<b>2.48</b>	<b>2.71</b>	<b>6.11</b>	<b>5.20</b>	<b>7.40</b>	<b>11.70</b>	<b>3.21</b>
Bloomberg CMBS Index + 2%	-4.38	-13.17	-2.81	0.88	2.26	2.64	4.50	1.18	10.70	2.79
Difference	0.40	-0.06	2.15	1.60	0.45	3.47	0.70	6.22	1.00	0.42
<b>PERS (DB) TIPS</b>	<b>-3.20</b>	<b>-11.82</b>	<b>1.19</b>	<b>2.09</b>	<b>2.57</b>	<b>N/A</b>	<b>5.96</b>	<b>10.89</b>	<b>8.42</b>	<b>-1.26</b>
Bloomberg U.S. TIPS Index	-3.21	-11.85	1.21	2.11	2.60	N/A	5.96	10.99	8.43	-1.26
Difference	0.01	0.03	-0.02	-0.02	-0.03	N/A	0.00	-0.10	-0.01	0.00
<b>PERS (HC 115) EMD</b>	<b>5.17</b>	<b>-13.50</b>	<b>-4.57</b>	<b>-1.42</b>	<b>2.30</b>	<b>0.07</b>	<b>-4.65</b>	<b>5.36</b>	<b>13.55</b>	<b>-5.63</b>
PERS (HC 115) EMD Custom Benchmark	3.15	-14.07	-5.27	-1.71	1.82	-0.30	-5.18	4.32	14.01	-5.33
Difference	2.02	0.57	0.70	0.29	0.48	0.37	0.53	1.04	-0.46	-0.30

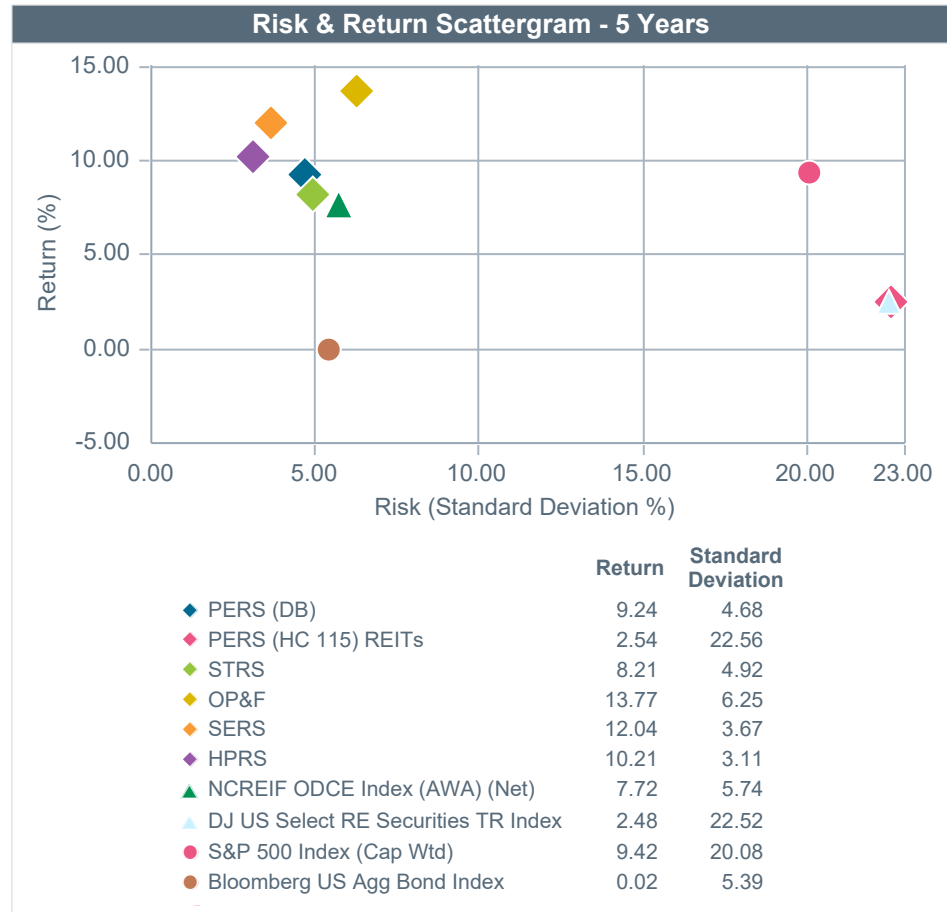
Performance shown is gross of fees.

	Trailing Performance (%)						Calendar Year Performance (%)			
	2 Quarters	1 Year	3 Years	5 Years	7 Years	10 Years	2021	2020	2019	2018
<b>Additional Fixed Income</b>										
PERS (HC 115) High Yield	3.64	-10.41	0.40	2.61	4.88	4.18	5.16	7.42	14.76	-2.06
Bloomberg Barclays U.S. High Yield Index	3.50	-11.19	0.05	2.31	5.05	4.03	5.28	7.11	14.32	-2.08
Difference	0.14	0.78	0.35	0.30	-0.17	0.15	-0.12	0.31	0.44	0.02
PERS (HC 115) Securitized Debt	-3.98	-13.23	-0.66	2.48	2.71	6.11	5.20	7.40	11.70	3.21
Bloomberg CMBS Index + 2%	-4.38	-13.17	-2.81	0.88	2.26	2.64	4.50	1.18	10.70	2.79
Difference	0.40	-0.06	2.15	1.60	0.45	3.47	0.70	6.22	1.00	0.42
PERS (HC 115) TIPS	-3.20	-11.82	1.19	2.09	2.57	1.11	5.96	10.89	8.42	-1.26
Bloomberg U.S. Tips Index	-3.21	-11.85	1.21	2.11	2.60	1.12	5.96	10.99	8.43	-1.26
Difference	0.01	0.03	-0.02	-0.02	-0.03	-0.01	0.00	-0.10	-0.01	0.00
STRS Liquid Treasury Portfolio	-2.04	-7.71	-1.32	0.52	N/A	N/A	-1.67	5.90	5.24	1.47
Bloomberg US Intermediate Treasury Index	-2.09	-7.77	-1.39	0.46	N/A	N/A	-1.72	5.78	5.22	1.41
Difference	0.05	0.06	0.07	0.06	N/A	N/A	0.05	0.12	0.02	0.06
OP&F High Yield	3.85	-9.57	0.56	2.81	4.78	4.13	5.39	6.71	13.49	-0.48
CS Developed Countries High Yield	3.25	-11.25	-0.28	2.09	4.99	3.89	5.34	6.08	14.41	-2.26
Difference	0.60	1.68	0.84	0.72	-0.21	0.24	0.05	0.63	-0.92	1.78
OP&F Private Credit Fixed Income	-0.09	4.87	6.14	7.27	7.11	N/A	15.80	-1.54	10.47	7.51
S&P LTSA Levered Loan Index + 2%	-2.24	-0.63	4.24	5.05	N/A	N/A	10.58	3.09	5.26	7.30
Difference	2.15	5.50	1.90	2.22	N/A	N/A	5.22	-4.63	5.21	0.21
OP&F US TIPS	-12.43	-21.16	3.02	4.76	6.38	5.14	15.47	20.11	15.70	-0.26
Bridgewater Custom US TIPS Index	-8.60	-25.71	0.78	2.27	4.18	2.98	11.81	23.25	15.12	-5.04
Difference	-3.83	4.55	2.24	2.49	2.20	2.16	3.66	-3.14	0.58	4.78
SERS Private Credit	1.85	6.80	N/A	N/A	N/A	N/A	16.30	N/A	N/A	N/A
3 Month LIBOR Rate + 4.5%	3.52	6.00	N/A	N/A	N/A	N/A	4.67	N/A	N/A	N/A
Difference	-1.67	0.80	N/A	N/A	N/A	N/A	11.63	N/A	N/A	N/A

Performance shown is gross of fees. The STRS Liquid Treasury Portfolio was incepted June 2017.

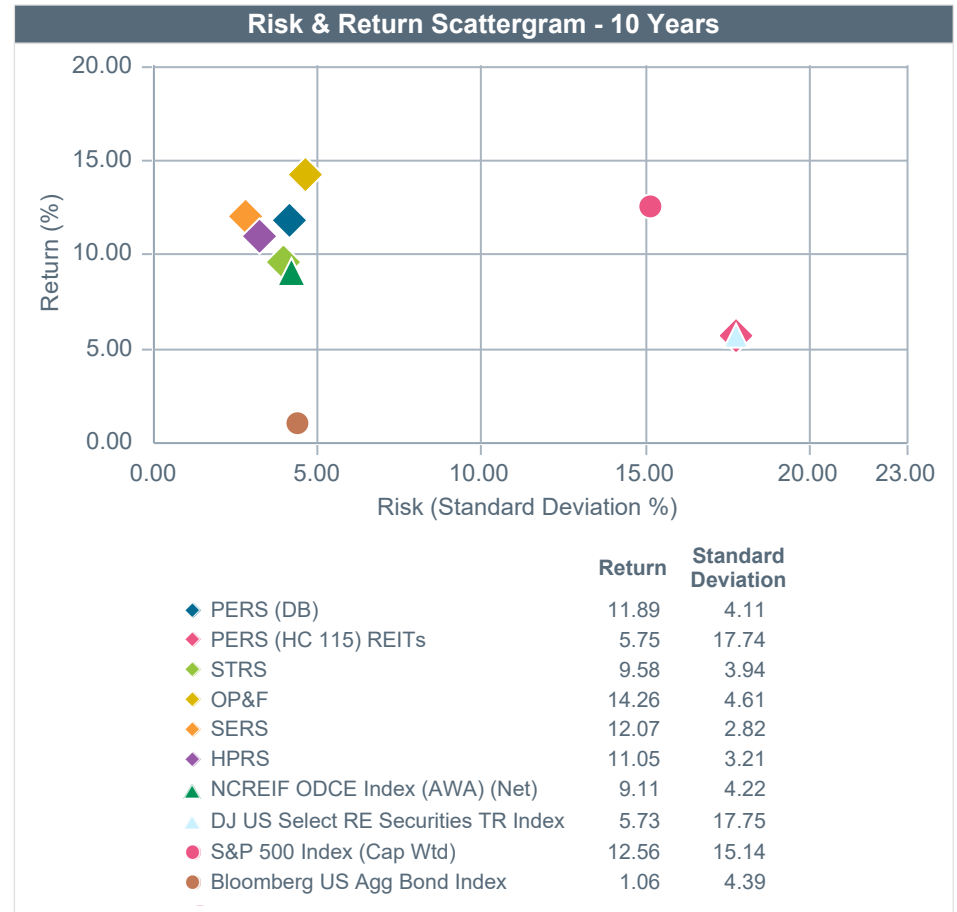
Performance										
	Trailing Performance (%)						Calendar Year Performance (%)			
	2 Quarters	1 Year	3 Years	5 Years	7 Years	10 Years	2021	2020	2019	2018
<b>Real Estate</b>										
<b>PERS (DB)</b>	<b>4.22</b>	<b>15.07</b>	<b>11.38</b>	<b>9.24</b>	<b>9.69</b>	<b>11.89</b>	<b>17.08</b>	<b>2.55</b>	<b>7.86</b>	<b>4.37</b>
PERS (DB) Real Estate Custom Benchmark	5.23	21.81	12.23	10.12	9.72	10.76	14.49	1.37	5.49	8.56
Difference	-1.01	-6.74	-0.85	-0.88	-0.03	1.13	2.59	1.18	2.37	-4.19
<b>PERS (DB) REITs</b>	<b>-5.96</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>
PERS (DB) REITs Benchmark	-6.20	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Difference	0.24	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
<b>PERS (HC 115) REITs</b>	<b>-5.96</b>	<b>-25.86</b>	<b>-1.38</b>	<b>2.54</b>	<b>3.31</b>	<b>5.75</b>	<b>46.02</b>	<b>-11.40</b>	<b>23.23</b>	<b>-4.10</b>
DJ US Select Real Estate Securities TR Index	-6.20	-26.03	-1.41	2.48	3.25	5.73	45.91	-11.20	23.10	-4.22
Difference	0.24	0.17	0.03	0.06	0.06	0.02	0.11	-0.20	0.13	0.12
<b>STRS</b>	<b>-2.36</b>	<b>5.56</b>	<b>7.93</b>	<b>8.21</b>	<b>8.12</b>	<b>9.58</b>	<b>20.64</b>	<b>-1.27</b>	<b>10.65</b>	<b>6.65</b>
STRS Real Estate Custom Benchmark	-3.17	0.85	7.29	7.24	7.29	8.69	21.38	0.89	9.31	5.09
Difference	0.81	4.71	0.64	0.97	0.83	0.89	-0.74	-2.16	1.34	1.56
<b>OP&amp;F</b>	<b>3.56</b>	<b>23.99</b>	<b>15.53</b>	<b>13.77</b>	<b>13.18</b>	<b>14.26</b>	<b>24.21</b>	<b>0.11</b>	<b>8.76</b>	<b>13.69</b>
NCREIF ODCE Index (AWA) (Net) (1 Qtr Lag)	4.87	20.96	11.38	9.26	8.87	9.91	13.64	0.52	4.64	7.71
Difference	-1.31	3.03	4.15	4.51	4.31	4.35	10.57	-0.41	4.12	5.98
<b>SERS</b>	<b>5.19</b>	<b>17.90</b>	<b>13.00</b>	<b>12.04</b>	<b>11.53</b>	<b>12.07</b>	<b>18.47</b>	<b>3.30</b>	<b>9.84</b>	<b>11.41</b>
SERS Global Real Assets Custom Benchmark	3.82	16.08	9.91	8.62	8.46	9.48	12.15	2.00	6.24	7.16
Difference	1.37	1.82	3.09	3.42	3.07	2.59	6.32	1.30	3.60	4.25
<b>HPRS</b>	<b>0.62</b>	<b>7.64</b>	<b>8.32</b>	<b>10.21</b>	<b>9.87</b>	<b>11.05</b>	<b>14.28</b>	<b>3.32</b>	<b>10.52</b>	<b>15.75</b>
HPRS Real Estate Custom Benchmark (Net)	-0.12	5.90	6.88	8.80	8.59	9.57	12.91	2.11	9.55	14.00
Difference	0.74	1.74	1.44	1.41	1.28	1.48	1.37	1.21	0.97	1.75
<b>NCREIF ODCE Index (AWA) (Net)</b>	<b>-4.87</b>	<b>6.55</b>	<b>8.97</b>	<b>7.72</b>	<b>7.57</b>	<b>9.11</b>	<b>21.02</b>	<b>0.34</b>	<b>4.39</b>	<b>7.36</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: 1 year performance was reduced by 3.94% due to change in distribution methodology in real estate portfolios. PERS DB: 3 year performance was reduced by 1.26% due to change in distribution methodology in real estate portfolios. PERS DB: 5 year performance was reduced by 0.74% due to change in distribution methodology in real estate portfolios. PERS DB: 7 year performance was reduced by 0.53% due to change in distribution methodology in real estate portfolios. PERS DB: 10 year performance was reduced by 0.38% due to change in distribution methodology in real estate portfolios.



### Sharpe Ratio - 5 Years

PERS (DB)	1.61
PERS (HC 115) REITs	0.18
STRS	1.31
OP&F	1.87
SERS	2.67
HPRS	2.62
NCREIF ODCE Index (AWA) (Net)	1.06
S&P 500 Index (Cap Wtd)	0.49
Bloomberg US Agg Bond Index	-0.21



### Sharpe Ratio - 10 Years

PERS (DB)	2.50
PERS (HC 115) REITs	0.37
STRS	2.05
OP&F	2.69
SERS	3.63
HPRS	2.95
NCREIF ODCE Index (AWA) (Net)	1.80
S&P 500 Index (Cap Wtd)	0.82
Bloomberg US Agg Bond Index	0.09

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	2021	2020	2019	2018
<b>Hedge Funds</b>										
<b>PERS (DB)</b>	<b>1.18</b>	<b>3.63</b>	<b>5.64</b>	<b>4.56</b>	<b>4.77</b>	<b>4.55</b>	<b>9.78</b>	<b>3.63</b>	<b>7.66</b>	<b>-1.51</b>
PERS (DB) Hedge Funds Custom Benchmark	2.30	-3.38	4.29	3.56	4.51	3.92	10.71	6.04	8.49	-3.19
Difference	-1.12	7.01	1.35	1.00	0.26	0.63	-0.93	-2.41	-0.83	1.68
<b>PERS (HC 115)</b>	<b>1.18</b>	<b>3.63</b>	<b>5.64</b>	<b>4.56</b>	<b>4.77</b>	<b>4.55</b>	<b>9.78</b>	<b>3.63</b>	<b>7.66</b>	<b>-1.51</b>
PERS (HC 115) Hedge Funds Custom Benchmark	2.30	-3.38	4.29	3.56	4.51	3.92	10.71	6.04	8.49	-3.19
Difference	-1.12	7.01	1.35	1.00	0.26	0.63	-0.93	-2.41	-0.83	1.68
<b>STRS</b>	<b>1.01</b>	<b>6.05</b>	<b>1.85</b>	<b>2.01</b>	<b>2.71</b>	<b>3.28</b>	<b>2.14</b>	<b>-2.47</b>	<b>3.91</b>	<b>0.64</b>
HFRI FOF Comp Index	1.37	-5.31	3.69	3.01	3.31	3.50	6.17	10.88	8.39	-4.02
Difference	-0.36	11.36	-1.84	-1.00	-0.60	-0.22	-4.03	-13.35	-4.48	4.66
<b>HPRS</b>	<b>1.62</b>	<b>-6.68</b>	<b>4.16</b>	<b>3.60</b>	<b>3.33</b>	<b>3.72</b>	<b>8.09</b>	<b>12.02</b>	<b>12.31</b>	<b>-5.96</b>
HFRI FOF Comp Index	1.37	-5.31	3.69	3.01	3.31	3.50	6.17	10.88	8.39	-4.02
Difference	0.25	-1.37	0.47	0.59	0.02	0.22	1.92	1.14	3.92	-1.94

Performance shown is net of fees. SERS Hedge Funds strategy was closed during Q3 2021. 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	2021	2020	2019	2018
<b>Private Equity</b>										
<b>PERS (DB)</b>	<b>-2.67</b>	<b>-4.79</b>	<b>17.08</b>	<b>15.39</b>	<b>14.70</b>	<b>14.28</b>	<b>44.84</b>	<b>16.38</b>	<b>10.39</b>	<b>15.48</b>
PERS (DB) Private Equity Custom Benchmark	-6.01	-1.25	18.80	15.80	14.63	14.61	49.22	13.78	8.02	15.00
Difference	3.34	-3.54	-1.72	-0.41	0.07	-0.33	-4.38	2.60	2.37	0.48
<b>STRS</b>	<b>-8.89</b>	<b>-6.49</b>	<b>21.67</b>	<b>19.73</b>	<b>17.73</b>	<b>17.26</b>	<b>53.50</b>	<b>25.49</b>	<b>13.97</b>	<b>19.85</b>
STRS Private Equity Benchmark	-8.12	-5.40	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Difference	-0.77	-1.09	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
<b>OP&amp;F</b>	<b>-5.68</b>	<b>-9.91</b>	<b>19.40</b>	<b>18.31</b>	<b>16.87</b>	<b>15.93</b>	<b>54.51</b>	<b>22.30</b>	<b>13.65</b>	<b>19.82</b>
OP&F Private Equity Custom Benchmark	-5.68	-9.91	19.40	18.31	16.87	15.93	54.51	22.30	13.65	19.82
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>-1.75</b>	<b>7.57</b>	<b>22.62</b>	<b>19.72</b>	<b>18.90</b>	<b>18.60</b>	<b>48.06</b>	<b>15.77</b>	<b>12.76</b>	<b>18.27</b>
Burgiss All Private Equity Benchmark	-8.77	-0.81	17.11	15.04	13.75	14.12	44.38	12.16	8.08	16.05
Difference	7.02	8.38	5.51	4.68	5.15	4.48	3.68	3.61	4.68	2.22
<b>HPRS</b>	<b>-0.47</b>	<b>2.65</b>	<b>18.96</b>	<b>14.97</b>	<b>13.80</b>	<b>12.46</b>	<b>36.53</b>	<b>20.12</b>	<b>9.66</b>	<b>8.80</b>
HPRS Private Equity Custom Benchmark	-0.47	2.65	18.96	14.97	14.38	15.63	36.53	20.12	9.66	8.80
Difference	0.00	0.00	0.00	0.00	-0.58	-3.17	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: 1 year performance was reduced by 5.86% due to change in distribution methodology in private equity portfolios. PERS DB: 3 year performance was reduced by 2.35% due to change in distribution methodology in private equity portfolios. PERS DB: 5 year performance was reduced by 1.39% due to change in distribution methodology in private equity portfolios. PERS DB: 7 year performance was reduced by 0.98% due to change in distribution methodology in private equity portfolios. PERS DB: 10 year performance was reduced by 0.68% due to change in distribution methodology used in private equity portfolios.

**Private Equity as of June 30, 2021**

	<b>2 Quarters</b>	<b>1 Year</b>	<b>3 Year</b>	<b>5 Year</b>	<b>7 Year</b>	<b>10 Year</b>	<b>2020</b>	<b>2019</b>	<b>2018</b>	<b>2017</b>
STRS	27.86	64.49	25.96	22.47	18.28	17.30	25.49	13.97	19.85	19.35
STRS Private Equity Custom Benchmark *	15.67	45.56	19.90	19.05	15.08	16.06	22.08	32.30	-4.29	22.32
Difference	12.19	18.93	6.06	3.42	3.20	1.24	3.41	-18.33	24.14	-2.97

\* Through June 30, 2021, the STRS Private Equity Custom Benchmark is calculated monthly and is the Russell 3000 Index +100 basis points. Prior to July 1, 2012, the STRS Private Equity Custom Benchmark was 300 basis points above the Russell 3000 Index.

Performance										
	Trailing Performance (%)						Calendar Year Performance (%)			
	2 Quarters	1 Year	3 Years	5 Years	7 Years	10 Years	2021	2020	2019	2018
<b>Other Alternatives</b>										
<b>PERS (DB) Commodities</b>	<b>-2.09</b>	<b>15.88</b>	<b>7.40</b>	<b>4.70</b>	<b>5.95</b>	<b>N/A</b>	<b>36.99</b>	<b>-21.96</b>	<b>17.54</b>	<b>-13.59</b>
S&P Goldman Sachs Commodity Index (TR)	-1.98	16.09	6.25	3.99	5.27	N/A	35.46	-23.72	17.63	-13.82
Difference	-0.11	-0.21	1.15	0.71	0.68	N/A	1.53	1.76	-0.09	0.23
<b>PERS (DB) Risk Parity</b>	<b>-7.75</b>	<b>-29.78</b>	<b>-5.91</b>	<b>-0.45</b>	<b>4.25</b>	<b>N/A</b>	<b>11.94</b>	<b>5.96</b>	<b>30.30</b>	<b>-9.93</b>
PERS (DB) Risk Parity Custom Benchmark	-7.77	-30.25	-6.44	-0.88	1.91	N/A	11.56	5.25	29.93	-10.07
Difference	0.02	0.47	0.53	0.43	2.34	N/A	0.38	0.71	0.37	0.14
<b>PERS (DB) Opportunistic</b>	<b>-2.92</b>	<b>-14.38</b>	<b>N/A</b>	<b>N/A</b>	<b>N/A</b>	<b>N/A</b>	<b>11.59</b>	<b>N/A</b>	<b>N/A</b>	<b>N/A</b>
PERS (DB) Opportunistic Benchmark	-2.07	-15.14	N/A	N/A	N/A	N/A	12.63	N/A	N/A	N/A
Difference	-0.85	0.76	N/A	N/A	N/A	N/A	-1.04	N/A	N/A	N/A
<b>PERS (HC 115) Commodities</b>	<b>-2.09</b>	<b>15.88</b>	<b>7.40</b>	<b>4.70</b>	<b>5.95</b>	<b>-3.68</b>	<b>36.99</b>	<b>-21.96</b>	<b>17.54</b>	<b>-13.59</b>
S&P Goldman Sachs Commodity Index (TR)	-1.98	16.09	6.25	3.99	5.27	-4.43	35.46	-23.72	17.63	-13.82
Difference	-0.11	-0.21	1.15	0.71	0.68	0.75	1.53	1.76	-0.09	0.23
<b>PERS (HC 115) Risk Parity</b>	<b>-7.75</b>	<b>-29.78</b>	<b>-5.91</b>	<b>-0.45</b>	<b>4.25</b>	<b>N/A</b>	<b>11.94</b>	<b>5.96</b>	<b>30.30</b>	<b>-9.93</b>
PERS (HC 115) Risk Parity Custom Benchmark	-7.77	-30.25	-6.44	-0.88	1.91	N/A	11.56	5.25	29.93	-10.07
Difference	0.02	0.47	0.53	0.43	2.34	N/A	0.38	0.71	0.37	0.14
<b>PERS (HC 115) Opportunistic</b>	<b>-2.92</b>	<b>-14.38</b>	<b>N/A</b>	<b>N/A</b>	<b>N/A</b>	<b>N/A</b>	<b>11.59</b>	<b>N/A</b>	<b>N/A</b>	<b>N/A</b>
PERS (HC 115) Opportunistic Benchmark	-2.07	-15.14	N/A	N/A	N/A	N/A	12.63	N/A	N/A	N/A
Difference	-0.85	0.76	N/A	N/A	N/A	N/A	-1.04	N/A	N/A	N/A

Performance shown may be net or gross of fees depending on underlying investments. PERS (DB) and PERS (HC115) funded new opportunistic investment portfolios in the fourth quarter of 2020.

	Trailing Performance (%)						Calendar Year Performance (%)			
	2 Quarters	1 Year	3 Years	5 Years	7 Years	10 Years	2021	2020	2019	2018
<b>Other Alternatives</b>										
<b>STRS Opportunistic/Diversified Investments</b>	<b>2.35</b>	<b>4.55</b>	<b>8.36</b>	<b>7.14</b>	<b>6.52</b>	<b>6.69</b>	<b>23.68</b>	<b>-1.80</b>	<b>5.93</b>	<b>4.74</b>
STRS Opportunistic/Diversified Blended Benchmark	-1.44	0.40	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Difference	3.79	4.15	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
<b>OP&amp;F Real Assets</b>	<b>3.24</b>	<b>10.03</b>	<b>5.77</b>	<b>6.70</b>	<b>5.52</b>	<b>4.84</b>	<b>7.85</b>	<b>-0.28</b>	<b>5.80</b>	<b>10.45</b>
OP&F Real Assets Custom Benchmark	-5.53	3.34	3.52	4.61	5.71	7.21	9.84	-2.27	9.46	3.17
Difference	8.77	6.69	2.25	2.09	-0.19	-2.37	-1.99	1.99	-3.66	7.28
<b>OP&amp;F MLPs</b>	<b>15.38</b>	<b>30.50</b>	<b>10.80</b>	<b>6.06</b>	<b>6.46</b>	<b>4.73</b>	<b>41.02</b>	<b>-26.09</b>	<b>13.46</b>	<b>-13.05</b>
Alerian MLP Index	7.32	21.53	8.84	5.76	5.59	2.81	38.43	-23.37	17.21	-12.42
Difference	8.06	8.97	1.96	0.30	0.87	1.92	2.59	-2.72	-3.75	-0.63
<b>OP&amp;F Gold</b>	<b>-0.76</b>	<b>-2.45</b>	<b>N/A</b>	<b>N/A</b>	<b>N/A</b>	<b>N/A</b>	<b>-3.62</b>	<b>N/A</b>	<b>N/A</b>	<b>N/A</b>
S&P GSCI Gold Index Minus the Cost of Financing	-0.96	-2.97	N/A	N/A	N/A	N/A	-4.41	N/A	N/A	N/A
Difference	0.20	0.52	N/A	N/A	N/A	N/A	0.79	N/A	N/A	N/A
<b>SERS Opportunistic &amp; Tactical Portfolio</b>	<b>-1.07</b>	<b>-1.12</b>	<b>6.80</b>	<b>6.24</b>	<b>8.09</b>	<b>N/A</b>	<b>22.04</b>	<b>0.96</b>	<b>5.47</b>	<b>5.33</b>
SERS Opportunistic Custom Benchmark	-2.14	-11.01	-3.55	0.40	3.22	N/A	0.46	0.36	16.04	-2.03
Difference	1.07	9.89	10.35	5.84	4.87	N/A	21.58	0.60	-10.57	7.36
<b>HPRS Real Assets</b>	<b>9.38</b>	<b>23.79</b>	<b>16.44</b>	<b>10.72</b>	<b>7.52</b>	<b>N/A</b>	<b>29.85</b>	<b>-1.80</b>	<b>12.89</b>	<b>-6.64</b>
HPRS Real Assets Custom Benchmark (Net)	9.25	23.47	16.13	11.88	9.65	N/A	29.17	-1.80	12.54	-0.53
Difference	0.13	0.32	0.31	-1.16	-2.13	N/A	0.68	0.00	0.35	-6.11

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.

**STRS Other Alternatives as of June 30, 2021**

	<b>2 Quarters</b>	<b>1 Year</b>	<b>3 Year</b>	<b>5 Year</b>	<b>7 Year</b>	<b>10 Year</b>	<b>2020</b>	<b>2019</b>	<b>2018</b>	<b>2017</b>
STRS Opportunistic Investments ex HF	13.78	25.54	6.28	7.37	5.94	7.35	-1.58	6.39	6.25	6.07
STRS Opportunistic Custom Benchmark *	14.55	42.78	17.57	16.73	12.83	13.57	19.70	29.75	-6.18	19.95
Difference	-0.77	-17.24	-11.29	-9.36	-6.89	-6.22	-21.28	-23.36	12.43	-13.88

\* Through June 30, 2021, the STRS Opportunistic Custom Benchmark is calculated monthly and is the Russell 3000 Index -100 basis points.

# Plan Specific Pages





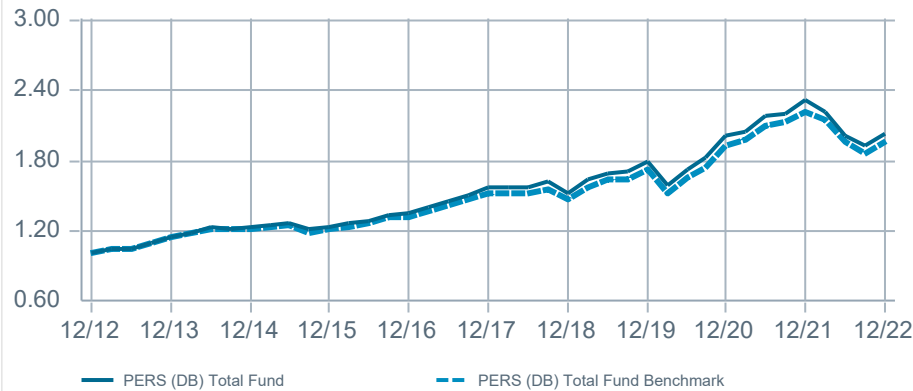
Ohio Retirement Study Council  
**Public Employees Employment Retirement System (DB)**  
**Total Fund Characteristics**

As of December 31, 2022

**Summary**

- PERS (DB) has generated an annualized 0.07% of alpha over the trailing 5-year period and 0.41% 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**



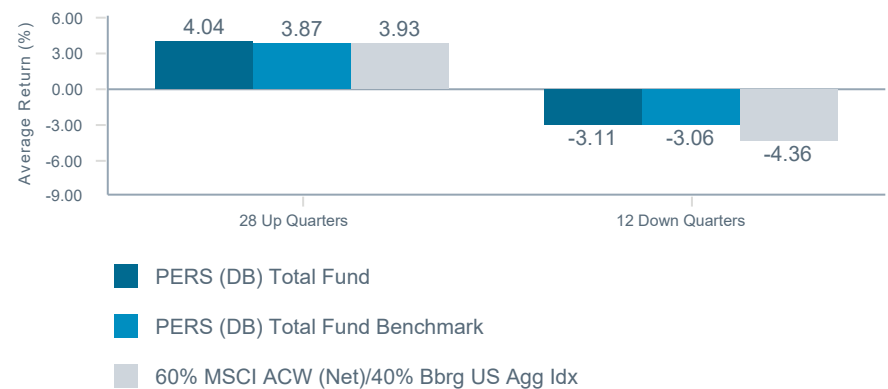
**MPT Stats**

	<b>5 Years</b>	<b>10 Years</b>
Maximum Return	10.35	10.35
Minimum Return	-11.66	-11.66
Standard Deviation	11.54	8.79
vs. PERS (DB) Total Fund Benchmark		
Info Ratio	0.09	0.47
Tracking Error	1.01	0.86
Alpha	0.03	0.32
vs. S&P 500 Index (Cap Wtd)		
Beta	0.55	0.55
vs. ICE BofAML 3 Mo US T-Bill Index		
Sharpe Ratio	0.40	0.77

**Asset Allocation vs. Targets**

	<b>Market Value (\$)</b>	<b>Allocation (%)</b>	<b>Target (%)</b>
US Equity	20,454,302,892	22.10	23.20
International Equity	20,737,769,799	22.41	23.00
Core Fixed Income	9,067,727,908	9.80	11.00
U.S. Treasury	1,563,361,355	1.69	3.00
High Yield	2,401,642,962	2.60	2.00
Global High Yield	6,215	0.00	0.00
EMD	2,992,423,534	3.23	4.00
Securitized Debt	1,184,983,853	1.28	1.00
TIPS	2,771,606,518	2.99	3.00
Real Estate	11,829,738,173	12.78	10.00
REITs	462,575,603	0.50	1.00
Hedge Funds	55,756,401	0.06	0.00
Opportunistic	896,991,110	0.97	0.80
Commodities	1,283,373,540	1.39	1.00
Private Equity	13,399,432,803	14.48	12.00
Risk Parity	2,559,845,281	2.77	5.00
Cash Equivalents	813,376,746	0.88	0.00
Additional Annuity	15,539,158	0.02	0.00
Other Pension Assets	46,164	0.00	0.00
Rebalancing	-	0.00	0.00
TAA	54,458,954	0.06	0.00
Total Fund	92,544,958,969	100.00	100.00

**Up/Down Markets - 10 Years**



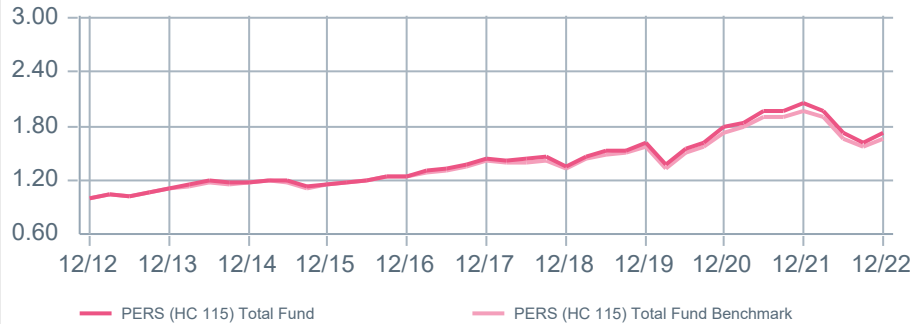
Performance shown is gross of fees. Calculations are based on quarterly periodicity. Allocations shown may not sum up to 100% exactly due to rounding.



**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**



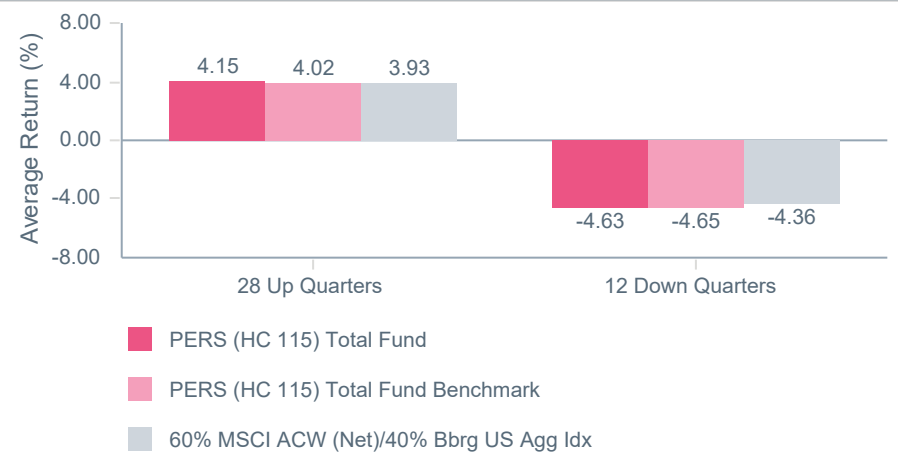
**Asset Allocation vs. Targets**

	Market Value (\$)	Allocation (%)	Target (%)
US Equity	3,108,848,300	26.60	27.20
International Equity	2,962,648,120	25.35	25.00
Core Fixed Income	1,962,007,524	16.79	17.00
EMD	152,332,878	1.30	2.00
High Yield	687,611,376	5.88	4.00
Securitized Debt	318,963,211	2.73	2.00
TIPS	826,090,841	7.07	7.00
Global High Yield	31,176	0.00	0.00
REITs	574,327,820	4.91	7.00
Hedge Funds	2,615,432	0.02	0.00
Opportunistic	123,372,564	1.06	0.80
Commodities	529,961,646	4.53	4.00
Risk Parity	153,434,288	1.31	2.00
Cash Equivalents	61,726,432	0.53	0.00
U.S. Treasury	222,693,733	1.91	2.00
Rebalancing	-	0.00	0.00
<b>Total Fund</b>	<b>11,686,665,342</b>	<b>100.00</b>	<b>100.00</b>

**MPT Stats**

	10 Years
Maximum Return	12.24
Standard Deviation	10.45
Minimum Return	-14.63
vs. PERS (HC 115) Total Fund Benchmark	
Info Ratio	0.90
Tracking Error	0.40
Alpha	0.37
vs. S&P 500 Index (Cap Wtd)	
Beta	0.79
vs. ICE BofAML 3 Mo US T-Bill Index	
Sharpe Ratio	-1.32

**Up/Down Markets - 10 Years**

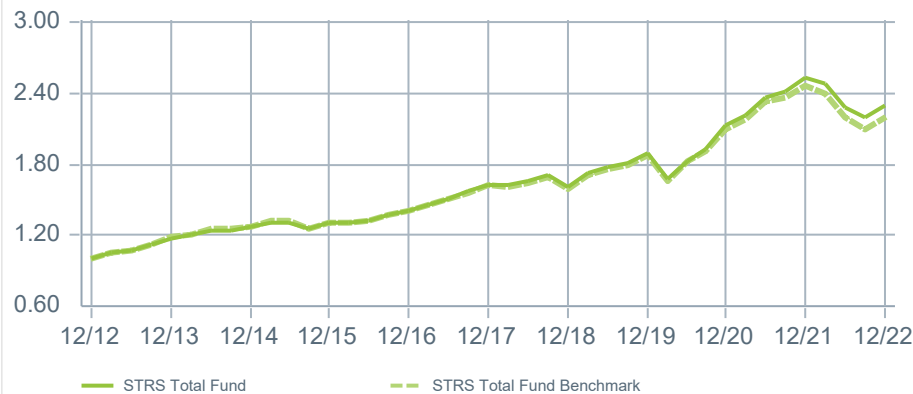


Performance shown is gross of fees. Calculations are based on quarterly periodicity. Allocations shown may not sum up to 100% exactly due to rounding.

**Summary**

- STRS has generated 0.83% of alpha over the trailing 5-year period and 0.48% 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**



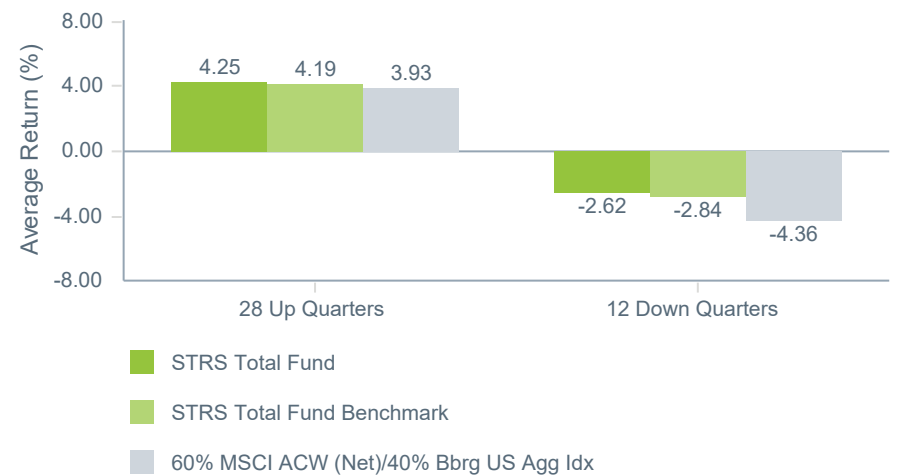
**MPT Stats**

	5 Years	10 Years
Maximum Return	10.00	10.00
Minimum Return	-11.51	-11.51
Standard Deviation	11.26	8.59
vs. STRS Total Fund Benchmark		
Info Ratio	1.50	0.92
Tracking Error	0.53	0.49
Alpha	0.80	0.50
vs. S&P 500 Index (Cap Wtd)		
Beta	0.55	0.55
vs. ICE BofAML 3 Mo US T-Bill Index		
Sharpe Ratio	0.55	0.92

**Asset Allocation vs. Targets**

	Market Value (\$)	Allocation (%)	Target (%)
US Equity	22,209,351,043	25.84	26.00
International Equity	18,935,319,488	22.03	22.00
Fixed Income	15,904,357,986	18.51	22.00
Real Estate	9,176,179,137	10.68	10.00
Opportunistic (Incl. Hedge Funds)	8,485,267,506	9.87	10.00
Private Equity	9,949,734,070	11.58	9.00
Cash Equivalents	1,281,893,835	1.49	1.00
Total Fund	85,942,103,065	100.00	100.00

**Up/Down Markets - 10 Years**

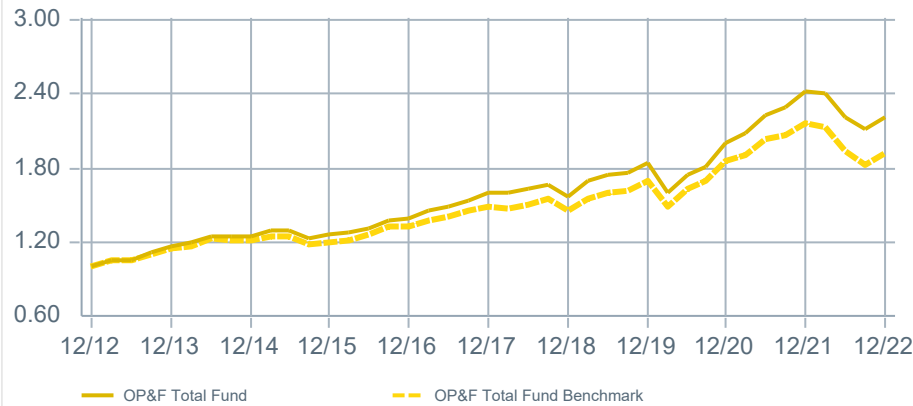


Performance shown is gross of fees. Calculations are based on quarterly periodicity. Allocations shown may not sum up to 100% exactly due to rounding.

**Summary**

- OP&F has generated 1.56% of alpha over the trailing 5-year period and 1.48% of alpha over the trailing 10-year period.
- Relative to a 60 Equity/40 Bond portfolio, the plan has exhibited larger up-market and smaller down-market capture characteristics over the past 10 years.

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



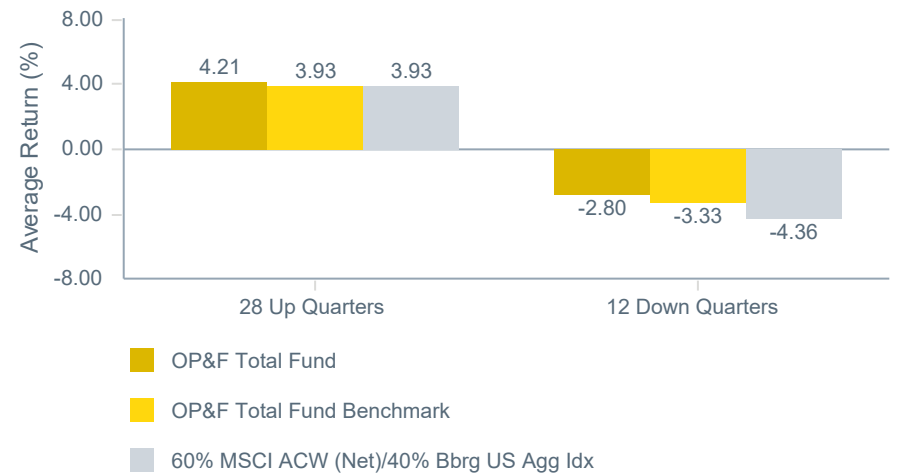
**MPT Stats**

	5 Years	10 Years
Maximum Return	10.66	10.66
Minimum Return	-13.55	-13.55
Standard Deviation	11.69	9.02
vs. OP&F Total Fund Benchmark		
Info Ratio	0.93	1.07
Tracking Error	1.58	1.31
Alpha	1.41	1.35
vs. S&P 500 Index (Cap Wtd)		
Beta	0.56	0.56
vs. ICE BofAML 3 Mo US T-Bill Index		
Sharpe Ratio	0.51	0.84

**Asset Allocation vs. Targets**

	Market Value (\$)	Allocation (%)	Target (%)
US Equity	3,616,922,784	21.59	18.24
International Equity	2,265,186,175	13.52	11.20
High Yield Fixed Income	1,271,093,693	7.59	6.80
US TIPS	1,399,818,782	8.35	13.60
Core Fixed Income	1,563,779,516	9.33	18.40
Private Credit	483,320,836	2.88	2.80
Real Estate	2,052,660,980	12.25	9.60
Private Markets	1,452,353,505	8.67	6.40
MLPs	1,094,214,204	6.53	4.00
Real Assets	872,934,506	5.21	4.00
Gold	139,858,889	0.83	4.96
Cash Equivalents	543,300,823	3.24	0.00
Total Fund	16,755,444,692	100.00	100.00

**Up/Down Markets - 10 Years**

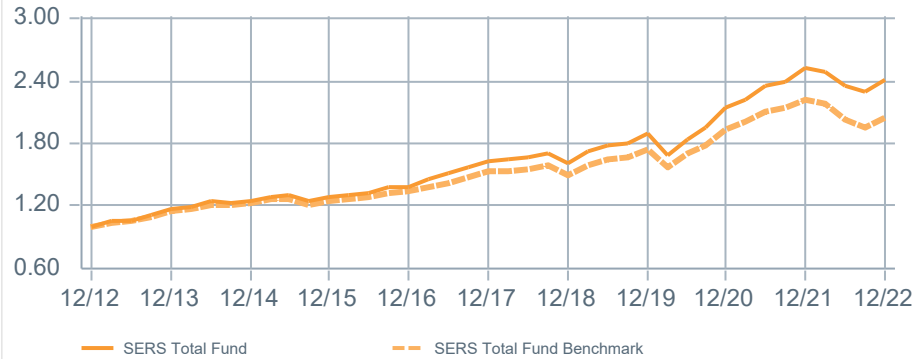


Performance shown is gross of fees. Calculations are based on quarterly periodicity. Allocations shown may not sum up to 100% exactly due to rounding. OP&F's target allocations are based on notional value, and have been scaled to 100% for this report.

**Summary**

- SERS has generated 2.03% of alpha over the trailing 5-year period and 1.73% of alpha over the trailing 10-year period.
- Relative to a 60 Equity/40 Bond portfolio, SERS has exhibited larger up-market capture and smaller down-market capture characteristics over the past 10 years.

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



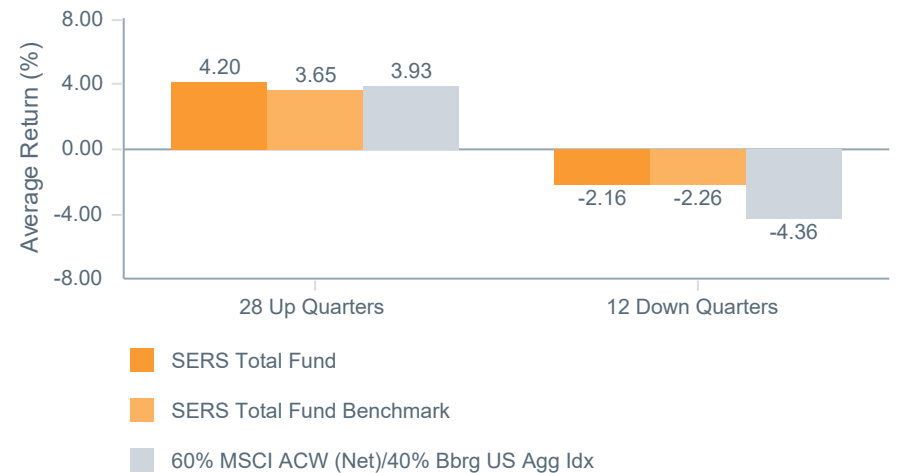
**MPT Stats**

	5 Years	10 Years
Maximum Return	9.94	9.94
Minimum Return	-11.00	-11.00
Standard Deviation	10.24	7.94
vs. SERS Total Fund Benchmark		
Info Ratio	1.58	1.49
Tracking Error	1.25	1.12
Alpha	1.67	1.22
vs. S&P 500 Index (Cap Wtd)		
Beta	0.50	0.50
vs. ICE BofAML 3 Mo US T-Bill Index		
Sharpe Ratio	0.68	1.04

**Asset Allocation vs. Targets**

	Market Value (\$)	Allocation (%)	Target (%)
US Equity	3,829,217,664	22.33	24.75
International Equity	3,199,072,776	18.65	20.25
Fixed Income	2,169,731,212	12.65	19.00
Private Credit	989,481,094	5.77	5.00
Real Estate	3,740,977,094	21.81	17.00
Opportunistic Investments	627,832,574	3.66	0.00
Private Equity	2,138,981,918	12.47	12.00
Cash Equivalents	453,837,356	2.65	2.00
Total Fund	17,149,131,687	100.00	100.00

**Up/Down Markets - 10 Years**

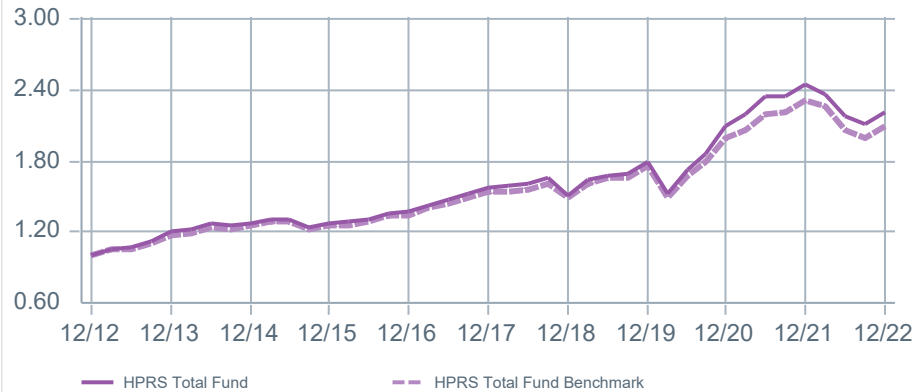


Performance shown is gross of fees. Calculations are based on quarterly periodicity. Allocations shown may not sum up to 100% exactly due to rounding.

**Summary**

- HPRS has generated .66% of alpha over the trailing 5-year period and .59% 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**



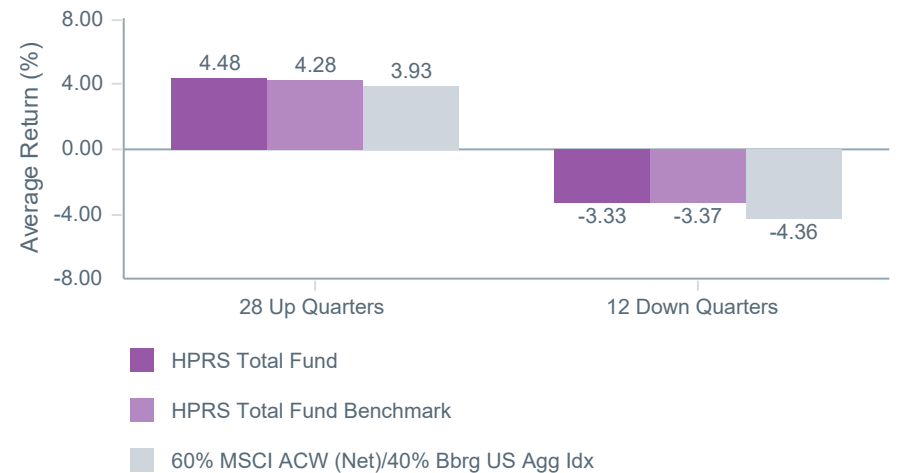
**MPT Stats**

	5 Years	10 Years
Maximum Return	13.60	13.60
Minimum Return	-14.84	-14.84
Standard Deviation	13.69	10.32
vs. HPRS Total Fund Benchmark		
Info Ratio	0.51	0.53
Tracking Error	1.39	1.15
Alpha	0.40	0.24
vs. S&P 500 Index (Cap Wtd)		
Beta	0.66	0.66
vs. ICE BofAML 3 Mo US T-Bill Index		
Sharpe Ratio	0.47	0.75

**Asset Allocation vs. Targets**

	Market Value (\$)	Allocation (%)	Target (%)
US Equity	207,227,529	21.10	20.00
International Equity	52,394,945	5.34	6.00
Global Equity	198,408,784	20.21	24.00
Fixed Income	81,459,590	8.30	15.00
Real Estate	84,970,659	8.65	8.00
Hedge Funds	69,942,188	7.12	7.00
Private Equity	188,930,993	19.24	14.00
Real Assets	43,451,255	4.43	3.00
Cash Equivalents	55,111,125	5.61	3.00
<b>Total Fund</b>	<b>981,897,068</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.

Ohio Retirement Study Council  
**HPRS Total Fund Performance vs. Peers**

As of December 31, 2022

	Market Value (\$000)	Trailing Performance (%)						Calendar Year Performance (%)			
		2 Quarters	1 Year	3 Years	5 Years	7 Years	10 Years	2021	2020	2019	2018
<b>HPRS</b>	<b>981,897</b>	<b>1.84</b>	<b>-9.59</b>	<b>7.30</b>	<b>6.98</b>	<b>8.15</b>	<b>8.26</b>	<b>16.92</b>	<b>16.86</b>	<b>18.85</b>	<b>-4.57</b>
HPRS Total Fund Benchmark		1.83	-9.61	6.06	6.32	7.61	7.67	16.63	13.16	17.85	-3.38
Difference		0.01	0.02	1.24	0.66	0.54	0.59	0.29	3.70	1.00	-1.19
<i>All Public Plans &gt; \$1B-TF Median</i>		0.98	-10.84	5.16	5.84	7.60	7.43	15.51	12.05	17.29	-3.14
Rank		18	38	12	14	26	17	36	3	23	75
Population		178	171	165	163	161	152	215	234	223	181
<i>All Public Plans \$250M to \$1B-TF Median</i>		1.07	-13.04	3.98	5.11	7.04	7.23	14.11	13.05	18.71	-4.45
Rank		20	10	1	3	7	9	15	10	45	55
Population		110	108	105	103	101	96	132	145	151	108

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 for 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 12/31/2022

(annualized fees shown in basis points)								
	Domestic Equity	Global Equity	International Equity	Fixed Income	Real Estate	Private Equity	Hedge Funds	Other Alternatives
<b>PERS (DB)</b>	2	-	23	6	105	50	-	44
<b>PERS (HC 115)</b>	0	-	3	1	-	-	-	2
<b>STRS</b>	12	-	20	5	44	82	56	60
<b>OP&amp;F</b>	46	-	39	50	59	86	-	87
<b>SERS</b>	9	26	44	57	81	105	-	108
<b>HPRS</b>	14	49	85	72	130	127	91	123

- 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, 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, and Gold.
- 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 12/31/2022

Percentage of Assets Managed by External Managers - As of 12/31/2022								
	Total Fund	Domestic Equity	International Equity	Fixed Income	Real Estate	Private Equity	Hedge Funds	Other Alternatives
<span style="color: blue;">■</span> PERS (DB)	53%	4%	75%	24%	96%	100%	100%	62%
<span style="color: magenta;">■</span> PERS (HC 115)	27%	4%	75%	16%	-	-	100%	26%
<span style="color: green;">■</span> STRS	35%	6%	48%	10%	14%	100%	100%	83%
<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, and Gold.
- 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 12/31/2022

Percentage of Assets Actively Managed - As of 12/31/2022								
	Total Fund	Domestic Equity	International Equity	Fixed Income	Real Estate	Private Equity	Hedge Funds	Other Alternatives
<span style="color: blue;">■</span> PERS (DB)	72%	14%	83%	86%	96%	100%	100%	73%
<span style="color: magenta;">■</span> PERS (HC 115)	56%	14%	83%	80%	-	-	100%	34%
<span style="color: green;">■</span> STRS	89%	65%	100%	100%	92%	100%	100%	100%
<span style="color: yellow;">■</span> OP&F	81%	71%	100%	80%	100%	100%	-	100%
<span style="color: orange;">■</span> SERS	81%	28%	86%	100%	99%	100%	100%	100%
<span style="color: purple;">■</span> HPRS	79%	21%	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, and Gold.
- 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:

- 23.2% Russell 3000 Index
- 23.0% PERS (DB) International Equity Custom Benchmark
- 11.0% PERS (DB) Core Fixed Income Custom Benchmark
- 3.0% Bloomberg U.S. Treasury Index
- 2.0% Bloomberg U.S. High Yield Index
- 4.0% PERS (DB) EMD Custom Benchmark
- 1.0% PERS (DB) Securitized Debt Custom Benchmark
- 3.0% Bloomberg U.S. TIPS Index
- 10.0% PERS (DB) Real Estate Custom Benchmark
- 1.0% Dow Jones U.S. Select Real Estate Securities TR Index
- 12.0% PERS (DB) Private Equity Custom Benchmark
- 0.8% PERS (DB) Opportunistic Custom Benchmark
- 1.0% Commodities Custom Benchmark
- 5.0% PERS (DB) Risk Parity Custom Benchmark

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

- 27.2% Russell 3000 Index
- 25.0% PERS (HC 115) International Equity Custom Benchmark
- 17.0% PERS (HC 115) Core Fixed Income Custom Benchmark
- 2.0% 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
- 0.8% 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

### 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:

- 18.24% Wilshire 5000 Index
- 11.2% MSCI ACW Ex US IMI Index (Net)
- 18.4% Bloomberg US Aggregate Bond Index + Leverage Factor
- 6.8% CS High Yield Dev. Countries Only Index
- 13.6% Bridgewater Custom US TIPS Index
- 2.8% S&P LTSA Levered Loan Index + 2%
- 9.6% NCREIF ODCE (Net) (1 Quarter Lag)
- 4.0% OP&F Real Assets Custom Index
- 4.0% Alerian MLP Index
- 6.4% OP&F Private Equity Custom Benchmark
- 4.96% 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:

- 24.75% Russell 3000 Index
- 20.25% SERS International Equity Custom Benchmark
- 19.0% Bloomberg US Aggregate Bond Index
- 17.0% NCREIF Property Index (1 Quarter Lag)
- 5.0% 3 Month LIBOR Rate + 4.5%
- 12.0% Burgiss All Private Equity (1 Quarter Lag)
- 2.0% Citigroup 30 Day T-Bill Index

### HPRS Total Fund Custom Benchmark:

- 20.0% Russell 3000 Index
- 6.0% HPRS International Equity Custom Benchmark
- 24.0% HPRS Global Equity Custom Benchmark
- 15.0% HPRS Fixed Income Custom Benchmark
- 8.0% HPRS Total Real Estate Composite (Net)
- 7.0% HFRI FOF Composite Index
- 14.0% HPRS Total Private Equity Custom Composite
- 3.0% HPRS Real Assets Composite (Net)
- 3.0% 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

### **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)

### **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:**

- The market weight of underlying portfolio benchmarks

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

- HFR Risk Parity Institutional Custom 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

### **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)

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

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

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

- The market weight of underlying portfolio benchmarks

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

- HFR Risk Parity Institutional Custom 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.

## Custom Benchmark Glossary

### 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
- 45% Credit Suisse Leveraged Loans
- 15% JP Morgan EMBI Global Diversified

### 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

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