



# Investment Performance Analysis

## Ohio Retirement Study Council

Period Ended: June 30, 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.

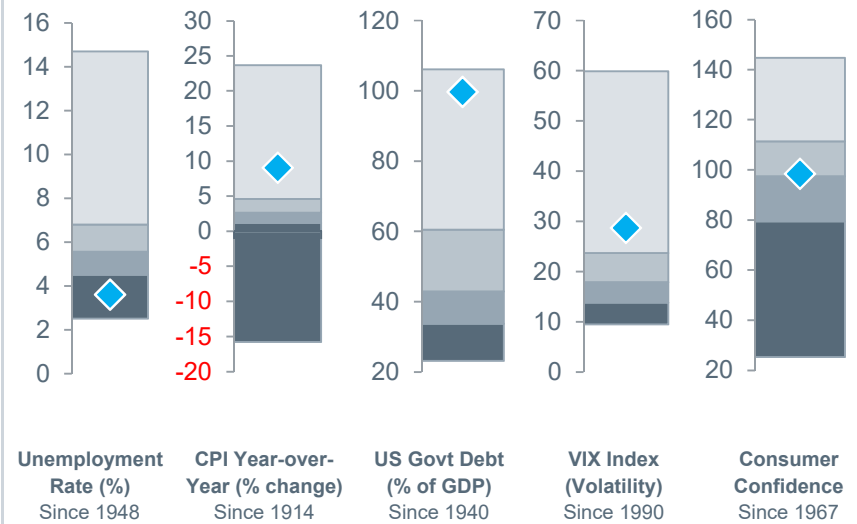
# Capital Markets Review



**Second Quarter Economic Environment**

Continued rising inflation, accelerated tightening of global monetary policy and falling economic growth estimates led to most major indices ending negative in Q2. Inflation continued to rise in the US as the Consumer Price Index (CPI) rose to 9.1% at the end of June, spurred on by supply chain disruptions tied with the war in Ukraine and China's zero-COVID policy. The OECD's June Economic Outlook report now forecasts global inflation to end the year near 9%. Central banks continued to tighten monetary policy with the Federal Open Market Committee raising the federal funds rate by 0.75% in June which followed a 0.50% increase in May. Following the June CPI release, a 1.0% increase at the FOMC meeting in July is now the most likely scenario based on probabilities implied by traders. Forecasters are increasingly citing a rising risk of a recession in the US however the data is less clear. The Atlanta Fed's GDP Nowcast indicates a modest contraction of growth in Q2, with declining residential investment and private inventory overhang as key negative effects. However, manufacturing and services Purchasing Managers' indexes (PMIs) indicate expansion. The unemployment rate ended June at 3.6% as non-farm payroll growth averaged just under 375k per month. According to the latest JOLTS survey, the US currently has roughly two job openings for every unemployed individual. The Atlanta Fed's wage tracker also lists average annual wage growth at 6.7% based on a 3-month moving average.

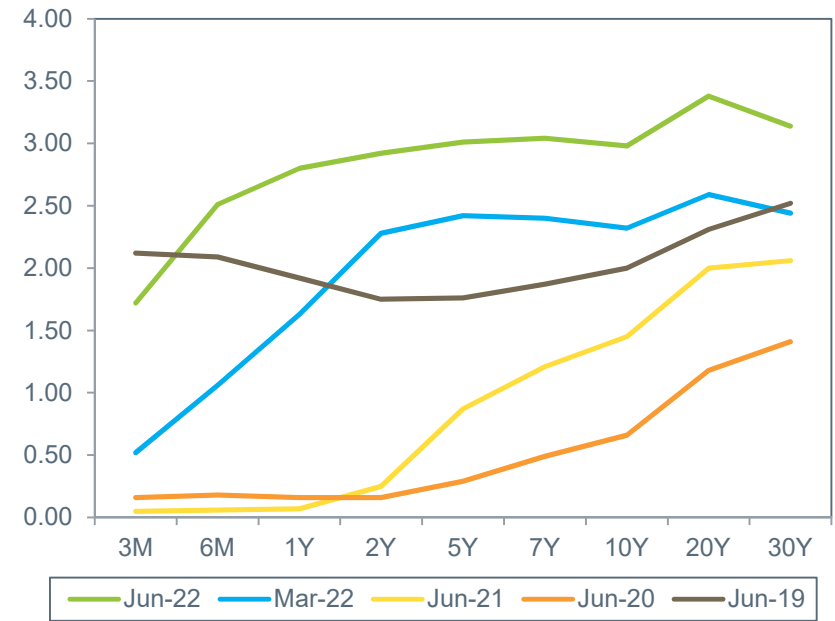
**Key Economic Indicators**



Economic Indicators	Jun-22	Mar-22	Jun-21	Jun-19	20 Yr
Federal Funds Rate (%)	1.58 ▲	0.33	0.08	2.40	1.30
Breakeven Infl. - 5 Yr (%)	2.62 ▼	3.43	2.50	1.54	1.86
Breakeven Infl. - 10 Yr (%)	2.34 ▼	2.83	2.34	1.70	2.04
CPI YoY (Headline) (%)	9.1 ▲	8.5	5.4	1.6	2.2
Unemployment Rate (%)	3.6 —	3.6	5.9	3.6	6.1
Real GDP YoY (%)	1.8 ▼	3.7	12.5	2.1	2.0
PMI - Manufacturing	53.0 ▼	57.1	60.9	51.5	53.5
USD Total Wtd Idx	121.05 ▲	115.22	112.61	114.58	103.10
WTI Crude Oil per Barrel (\$)	105.8 ▲	100.3	73.5	58.5	64.4
Gold Spot per Oz (\$)	1,807 ▼	1,937	1,770	1,410	1,086

Market Performance (%)	QTD	CYTD	1 Yr	5 Yr	10 Yr
S&P 500 (Cap Wtd)	-16.10	-19.96	-10.62	11.31	12.96
Russell 2000	-17.20	-23.43	-25.20	5.17	9.35
MSCI EAFE (Net)	-14.51	-19.57	-17.77	2.20	5.40
MSCI EAFE SC (Net)	-17.69	-24.71	-23.98	1.72	7.18
MSCI Emg Mkts (Net)	-11.45	-17.63	-25.28	2.18	3.06
Bloomberg US Agg Bond	-4.69	-10.35	-10.29	0.88	1.54
ICE BofAML 3 Mo US T-Bill	0.11	0.15	0.17	1.11	0.64
NCREIF ODCE (Gross)	4.77	12.49	29.51	10.54	11.16
FTSE NAREIT Eq REIT (TR)	-16.97	-20.20	-6.27	5.30	7.39
HFRI FOF Comp	-3.94	-6.59	-5.50	3.62	3.75
Bloomberg Cmdty (TR)	-5.66	18.44	24.27	8.39	-0.82

**Treasury Yield Curve (%)**

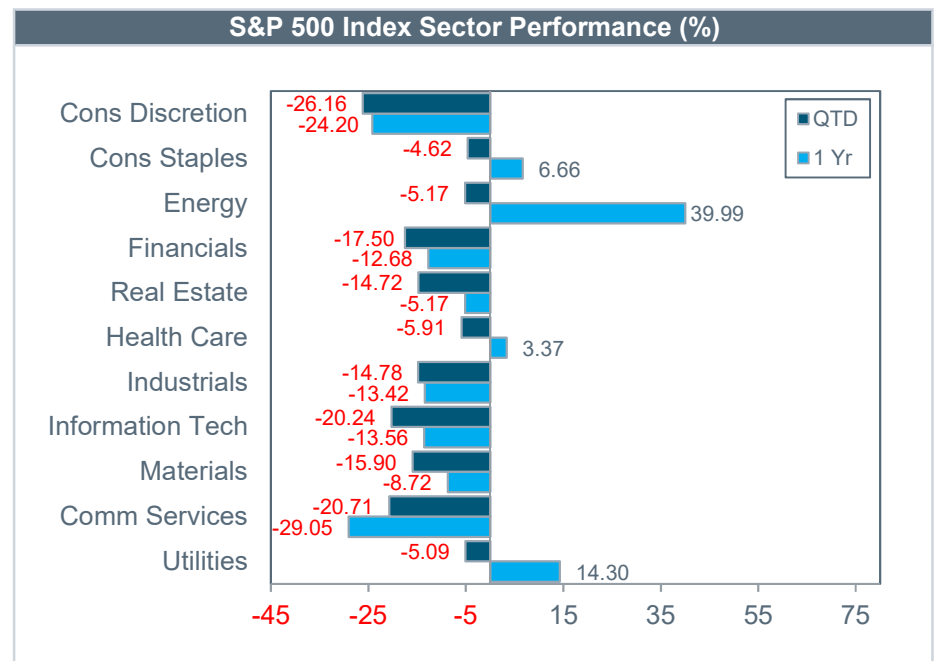
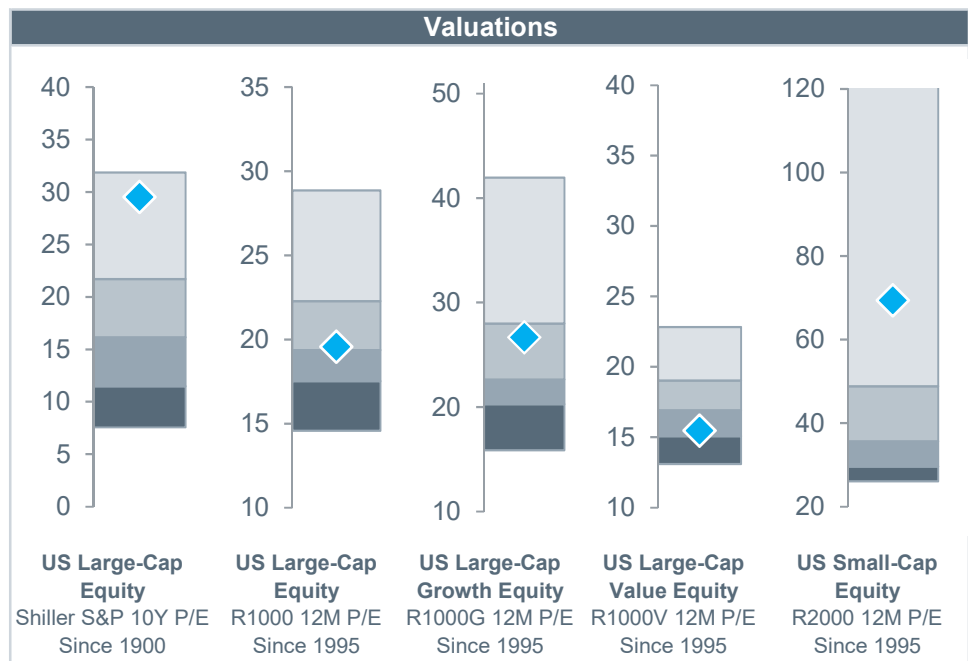
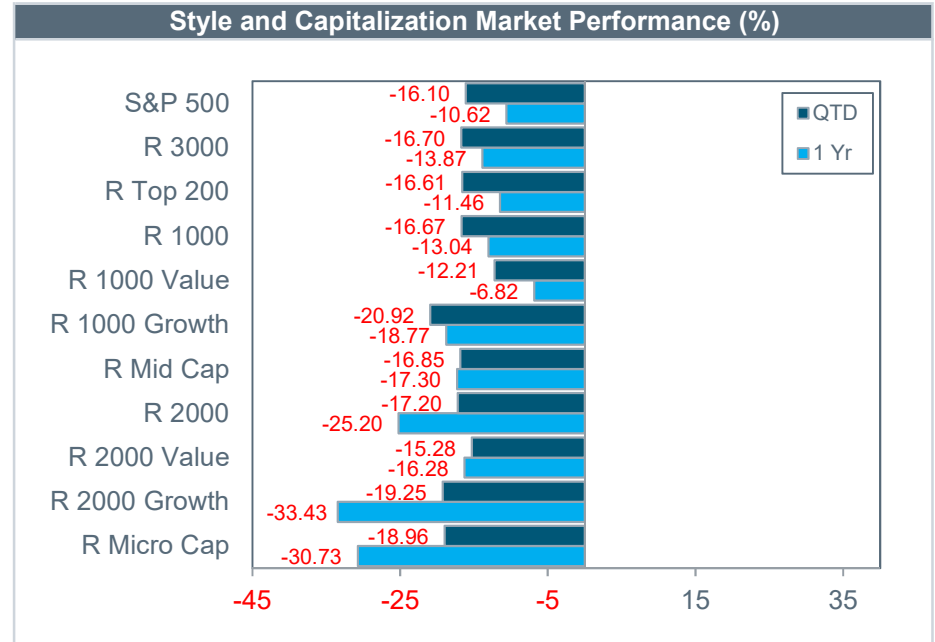


### Second Quarter Review

**Broad Market**  
 US equity markets were down sharply in Q2 in the midst of increasing concerns of a looming recession as the Fed acted to respond to sustained, elevated levels of inflation. With declines affecting all sectors, investors fled to defensive stocks as these were comparatively resilient. Likewise, investors in energy stocks benefited as the sector was buoyed by commodity prices.

**Market Cap**  
 There was significant outperformance of value stocks over growth stocks, with the Russell 1000 Value and Russell 2000 Value indexes outperforming their growth counterparts by 8.7% and 4.0%, respectively.

**Style and Sector**  
 Active management performed well in Q2, with the exception of large-cap growth managers. Small- and mid-cap core and value managers had an exceptionally strong Q2 with a majority outpacing their respective benchmarks by significant margins.



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



Second Quarter Review

Developed Markets

Developed International markets fared better than the domestic market, albeit still finishing Q2 in negative territory with the MSCI EAFE Index notching a -14.5% return for the period. Value stocks remained in favor with continued outperformance over growth stocks, while large-cap stocks outperformed small-cap stocks. All developed market countries and sectors were negative for the quarter, with the Asia-Pacific region and information technology sector leading markets lower.

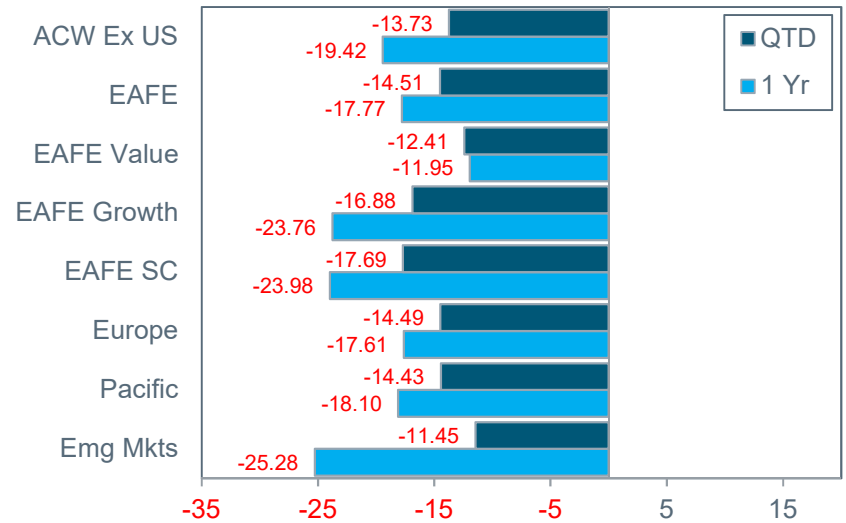
Emerging Markets

Emerging markets outperformed developed in Q2 with the MSCI EM Index returning -11.4%. Nearly all emerging market countries experienced negative returns.

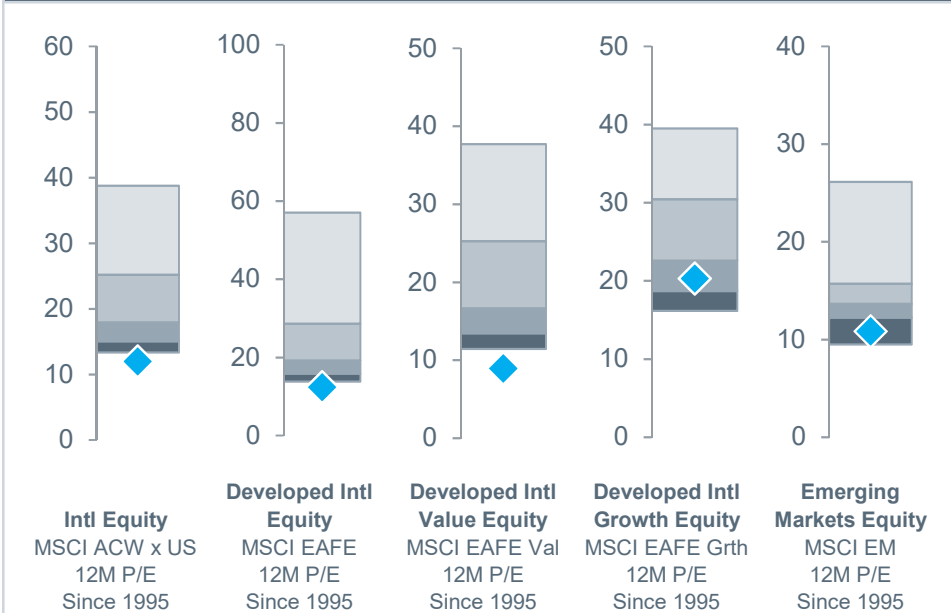
Market Cap & Style

In international markets, value stocks outperformed growth, while large-cap stocks outperformed small-cap. In emerging markets, value stocks outperformed growth, and large-cap stocks outperformed small-cap.

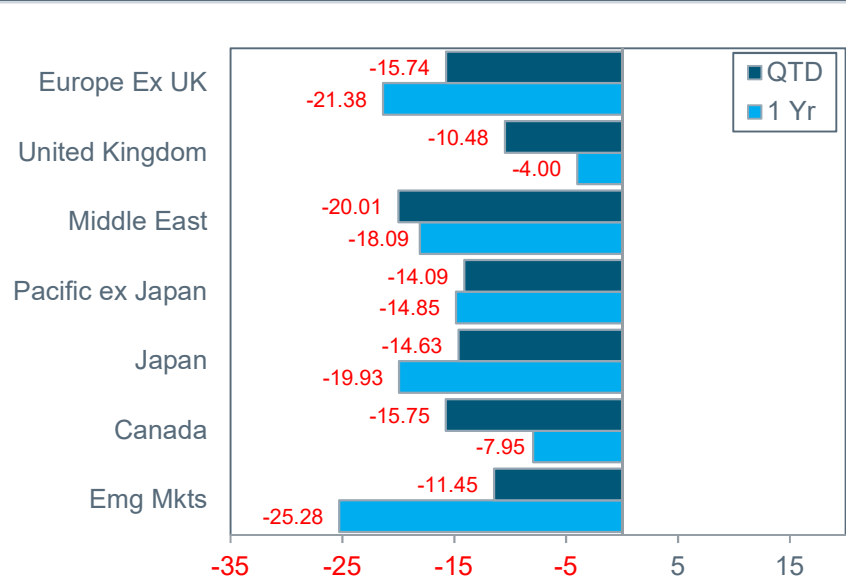
MSCI Style and Capitalization Market Performance (%)



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.





**Second Quarter Review**

**Broad Market**

In Q2, Treasury yields rose 66 basis points from 2.32% to 2.98% with an intra-quarter high of 3.49%, as measured by the 10-year US Treasury yield. The Federal Reserve hiked the Federal Funds rate by 75 basis points over the quarter, the largest single increase since 1994. The Bloomberg US Aggregate ended the quarter down with an overall return of -4.7%.

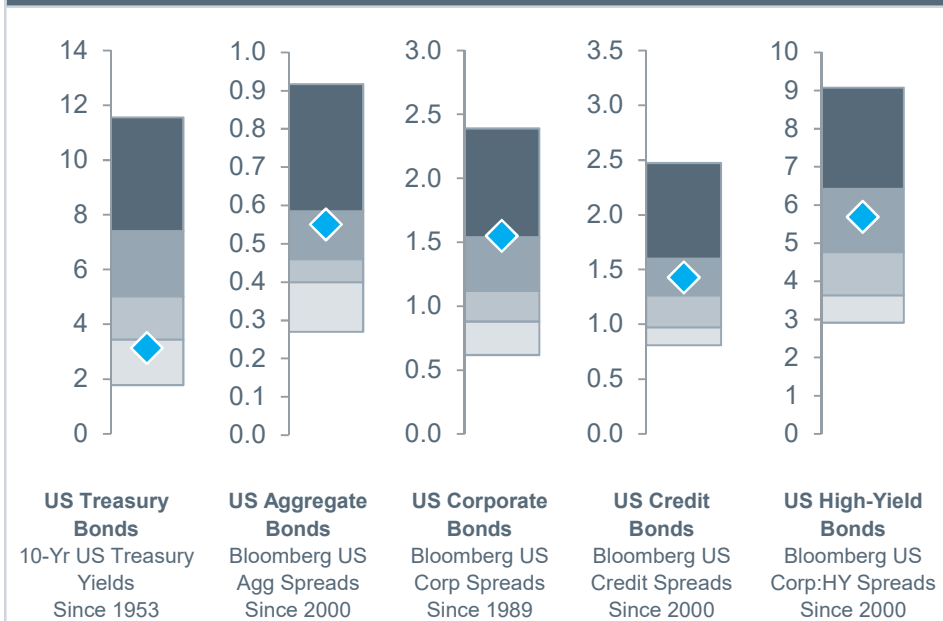
**Credit Market**

While fixed income broadly experienced negative absolute performance over the quarter, widening credit spreads presented additional headwinds to corporate credit. US Investment Grade credit detracted -6.9%, while US High Yield returned -9.8%, as measured by the Bloomberg US Credit Index and Bloomberg US High Yield index, respectively.

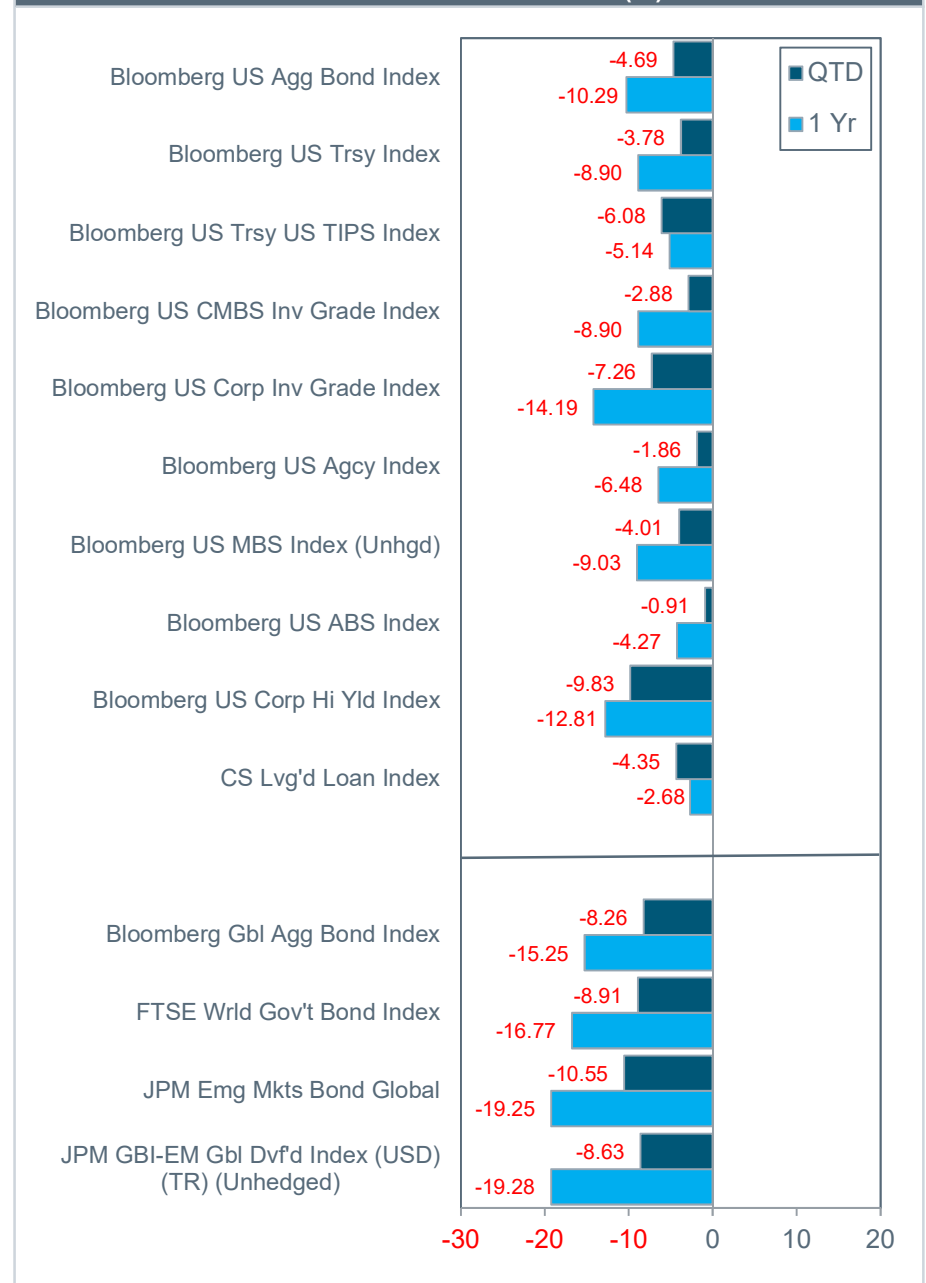
**Emerging Market Debt**

Foreign fixed income experienced headwinds from the Russia-Ukraine war, inflationary concerns, and mixed central bank policy. These factors led to a -11.4% return in Q2 for the JPM EMBI Global Diversified Index.

**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.

**Second Quarter Review - Absolute Return**

**General Market - Hedge Funds**

Dispersion continues to be the theme across the hedge fund landscape. Although the HFRI Asset Weighted Composite returned -0.3% during the quarter, its year-to-date return remained positive at 2.1%. By contrast, the Equal Weighted Index, which is dominated by long/short equity strategies (“ELS”), returned -4.9% in Q2, led lower by ELS managers returning -8.3%. Prime brokerage data indicates that the 1st half of 2022 was one of the strongest on record for short alpha, as higher interest rates tend to structurally benefit short sellers.

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

Global Tactical Asset Allocation (GTAA) strategies that RVK follows closely generated disparate performance in Q2. Although overall performance was negative, nearly all managers outperformed a US centric blend of 60% equity and 40% fixed income. The top performing long-biased GTAA strategies tended to emphasize relative undervaluation in their asset allocation processes, while underperformers tended to hold larger allocations to US equity and non-USD fixed income.

**Second Quarter Review - Real Assets**

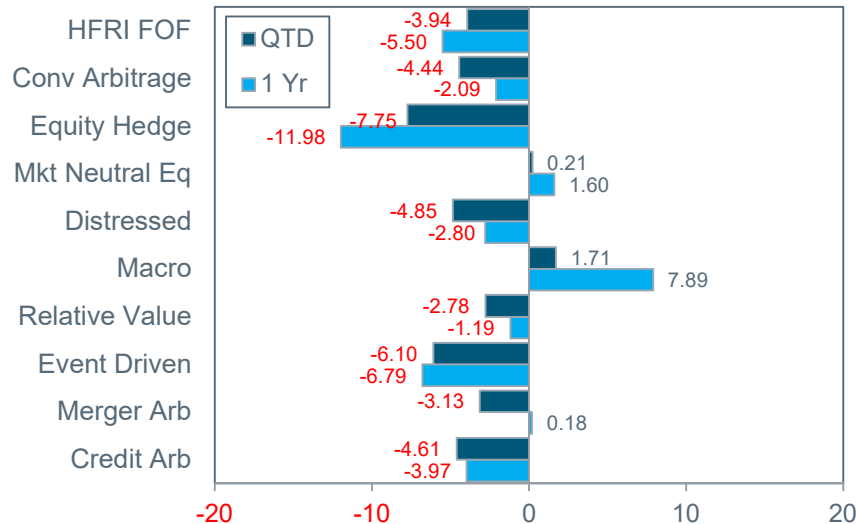
**General Market - Diversified Inflation Strategies (DIS)**

After responding positively to record inflationary pressures in Q1, DIS posted losses ranging from negative mid-single digit to negative low double-digit. Manager allocations to inflation sensitive assets were affected by cross currents of Fed rate hikes combined with changing market estimates of future economic growth. During the quarter, nearly all inflation sensitive asset classes were negative except for energy commodities. Managers with larger TIPS allocations tended to outperform peers, especially in cases where shorter duration TIPS were targeted.

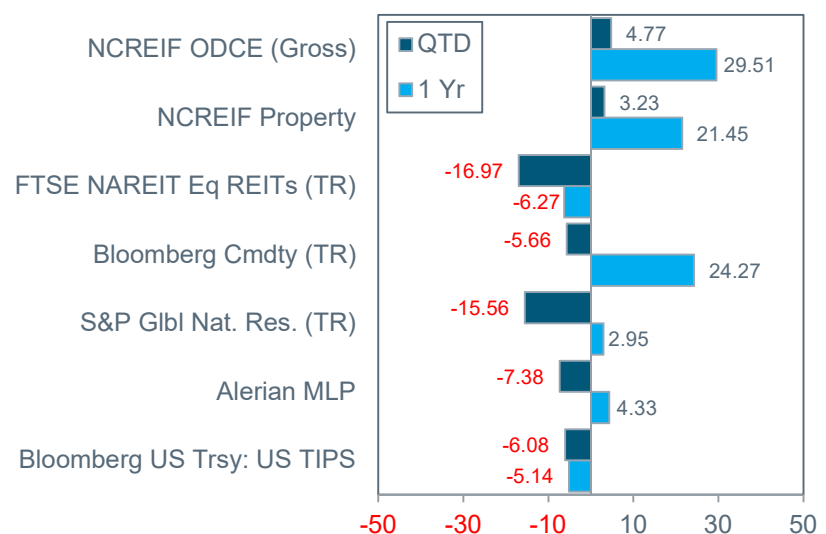
**General Market - Real Estate**

Core private real estate generated a positive 4.8% return in Q2, as reported by the NFI-ODCE Index, with the total return comprising of 0.9% income and 3.9% price appreciation. While the income return is trending at the lower end of historical levels, the price appreciation return remains elevated. Investors in publicly traded real estate significantly underperformed their private market counterparts by a meaningful margin.

**HFRI Hedge Fund Performance (%)**



**Real Asset Performance (%)**



Annual Asset Class Performance

As of June 30, 2022

	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	YTD
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	18.44
	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	12.49
	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	0.15
	-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	-6.59
	-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	-8.92
	-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	-10.35
	-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	-14.19
	-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	-17.63
	-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	-18.57
	-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	-19.96
	-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	-20.20
	-43.38	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	-21.88
	-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	-23.43
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	-24.71
	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>93,772,385</b>	<b>-12.67</b>	<b>-7.34</b>	<b>6.22</b>	<b>6.94</b>	<b>6.91</b>	<b>8.12</b>	<b>15.43</b>	<b>12.11</b>	<b>17.31</b>	<b>-2.90</b>
PERS (DB) Total Fund Benchmark		-11.77	-7.06	6.22	6.71	6.70	7.67	15.28	11.65	17.06	-3.08
Difference		-0.90	-0.28	0.00	0.23	0.21	0.45	0.15	0.46	0.25	0.18
Rank		63	55	60	58	53	50	52	49	49	44
<b>PERS (HC 115)</b>	<b>11,932,667</b>	<b>-15.66</b>	<b>-11.98</b>	<b>4.39</b>	<b>5.32</b>	<b>5.38</b>	<b>6.35</b>	<b>14.34</b>	<b>10.96</b>	<b>19.59</b>	<b>-5.76</b>
PERS (HC 115) Total Fund Benchmark		-15.65	-12.25	3.80	4.86	5.03	5.95	13.76	10.13	19.20	-5.97
Difference		-0.01	0.27	0.59	0.46	0.35	0.40	0.58	0.83	0.39	0.21
Rank		95	93	92	93	94	95	63	64	17	91
<b>STRS</b>	<b>87,615,530</b>	<b>-9.98</b>	<b>-3.61</b>	<b>8.72</b>	<b>8.57</b>	<b>8.24</b>	<b>9.32</b>	<b>19.36</b>	<b>12.26</b>	<b>18.39</b>	<b>-1.75</b>
STRS Total Fund Benchmark		-10.97	-5.62	7.58	7.79	7.54	8.89	17.36	11.92	18.27	-2.04
Difference		0.99	2.01	1.14	0.78	0.70	0.43	2.00	0.34	0.12	0.29
Rank		38	29	17	14	8	5	12	47	29	27
<b>OP&amp;F</b>	<b>17,124,866</b>	<b>-8.84</b>	<b>-1.18</b>	<b>8.19</b>	<b>8.13</b>	<b>7.88</b>	<b>9.11</b>	<b>20.48</b>	<b>9.09</b>	<b>17.39</b>	<b>-1.52</b>
OP&F Total Fund Benchmark		-10.71	-5.01	6.26	6.48	6.43	7.55	16.20	9.84	16.95	-3.09
Difference		1.87	3.83	1.93	1.65	1.45	1.56	4.28	-0.75	0.44	1.57
Rank		26	15	24	22	18	11	10	85	47	22
<b>SERS</b>	<b>17,137,463</b>	<b>-6.72</b>	<b>0.20</b>	<b>9.77</b>	<b>9.29</b>	<b>8.87</b>	<b>9.78</b>	<b>17.88</b>	<b>12.99</b>	<b>17.69</b>	<b>-1.28</b>
SERS Total Fund Benchmark		-8.41	-3.60	7.31	7.33	7.01	8.03	14.66	11.55	16.04	-2.03
Difference		1.69	3.80	2.46	1.96	1.86	1.75	3.22	1.44	1.65	0.75
Rank		11	9	6	5	2	2	23	35	41	19
<b>HPRS</b>	<b>987,538</b>	<b>-11.12</b>	<b>-7.43</b>	<b>8.94</b>	<b>8.20</b>	<b>7.47</b>	<b>8.71</b>	<b>16.91</b>	<b>16.86</b>	<b>18.85</b>	<b>-4.57</b>
HPRS Total Fund Benchmark		-11.06	-6.41	7.56	7.43	6.98	8.15	16.61	13.16	17.85	-3.38
Difference		-0.06	-1.02	1.38	0.77	0.49	0.56	0.30	3.70	1.00	-1.19
Rank		49	56	13	20	30	25	37	3	24	76
<i>All Public Plans &gt; \$1B-Total Fund Median</i>		<i>-11.53</i>	<i>-7.03</i>	<i>6.81</i>	<i>7.22</i>	<i>7.05</i>	<i>8.08</i>	<i>15.52</i>	<i>12.05</i>	<i>17.30</i>	<i>-3.14</i>

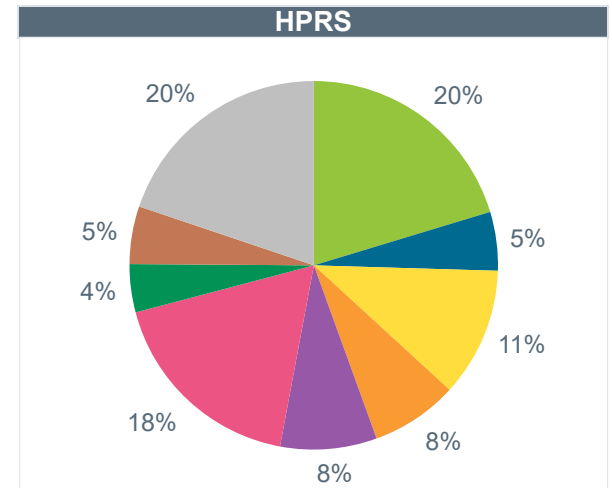
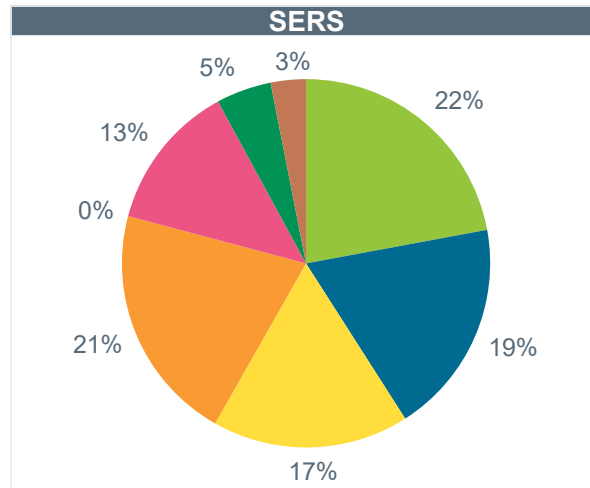
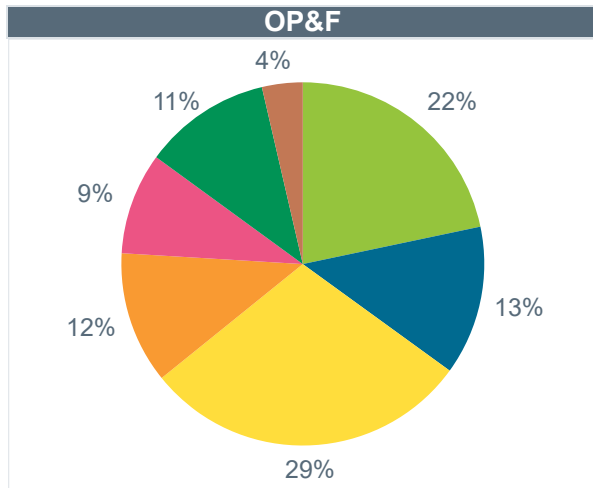
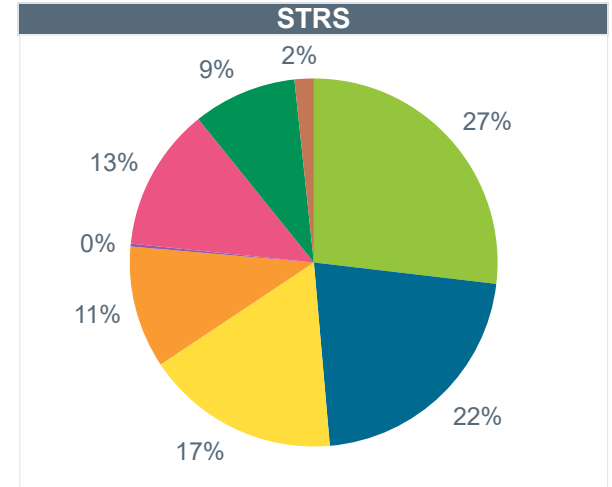
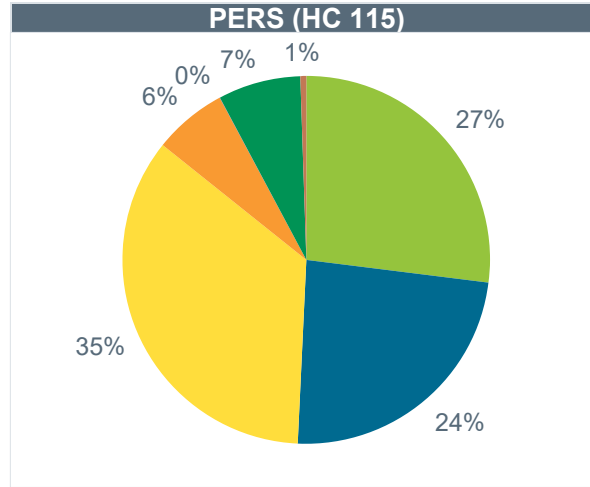
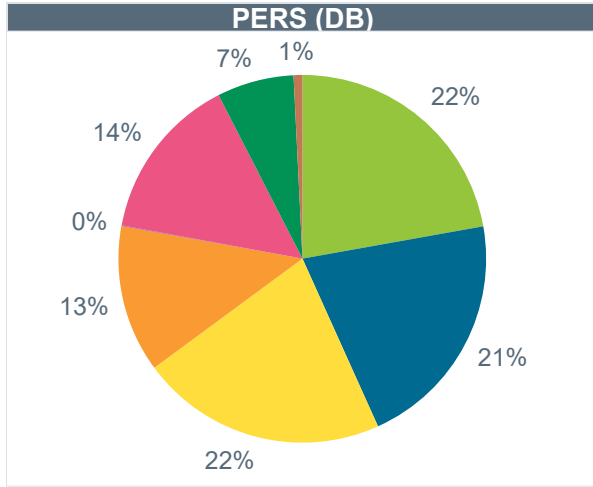
OPERS health care plan is not a pension plan and therefore has significantly different characteristics including a shorter focus asset allocation with more liquidity than the pension plans. For purposes of this study, the OPERS health care plan has been included in the results. The results for OPERS 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: Performance of the Defined Benefit portfolio in the first half of 2022 was reduced by 0.93% because of a change in the methodology used for cash distributions from private equity and real estate funds. PERS DB: Performance of the Defined Benefit portfolio in the first half of 2022 was reduced by 0.93% because of a change in the methodology used for cash distributions from private equity and real estate funds.

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>93,772,385</b>	<b>-12.70</b>	<b>-7.40</b>	<b>6.14</b>	<b>6.86</b>	<b>6.79</b>	<b>7.95</b>	<b>15.34</b>	<b>12.02</b>	<b>17.23</b>	<b>-2.99</b>
PERS (DB) Total Fund Benchmark		-11.77	-7.06	6.22	6.71	6.70	7.67	15.28	11.65	17.06	-3.08
Difference		-0.93	-0.34	-0.08	0.15	0.09	0.28	0.06	0.37	0.17	0.09
<b>PERS (HC 115)</b>	<b>11,932,667</b>	<b>-15.66</b>	<b>-11.98</b>	<b>4.39</b>	<b>5.32</b>	<b>5.35</b>	<b>6.29</b>	<b>14.34</b>	<b>10.96</b>	<b>19.59</b>	<b>-5.76</b>
PERS (HC 115) Total Fund Benchmark		-15.65	-12.25	3.80	4.86	5.03	5.95	13.76	10.13	19.20	-5.97
Difference		-0.01	0.27	0.59	0.46	0.32	0.34	0.58	0.83	0.39	0.21
<b>STRS</b>	<b>87,615,530</b>	<b>-10.04</b>	<b>-3.73</b>	<b>8.61</b>	<b>8.44</b>	<b>8.11</b>	<b>9.18</b>	<b>19.24</b>	<b>12.14</b>	<b>18.27</b>	<b>-1.89</b>
STRS Total Fund Benchmark		-10.97	-5.62	7.58	7.79	7.54	8.89	17.36	11.92	18.27	-2.04
Difference		0.93	1.89	1.03	0.65	0.57	0.29	1.88	0.22	0.00	0.15
<b>OP&amp;F</b>	<b>17,124,866</b>	<b>-9.22</b>	<b>-1.97</b>	<b>7.48</b>	<b>7.45</b>	<b>7.23</b>	<b>8.49</b>	<b>19.63</b>	<b>8.51</b>	<b>16.71</b>	<b>-2.14</b>
OP&F Total Fund Benchmark		-10.71	-5.01	6.26	6.48	6.43	7.55	16.20	9.84	16.95	-3.09
Difference		1.49	3.04	1.22	0.97	0.80	0.94	3.43	-1.33	-0.24	0.95
<b>SERS</b>	<b>17,137,463</b>	<b>-7.05</b>	<b>-0.49</b>	<b>9.11</b>	<b>8.62</b>	<b>8.19</b>	<b>9.09</b>	<b>17.13</b>	<b>12.40</b>	<b>16.96</b>	<b>-1.94</b>
SERS Total Fund Benchmark		-8.41	-3.60	7.31	7.33	7.01	8.03	14.66	11.55	16.04	-2.03
Difference		1.36	3.11	1.80	1.29	1.18	1.06	2.47	0.85	0.92	0.09
<b>HPRS</b>	<b>987,538</b>	<b>-11.29</b>	<b>-7.86</b>	<b>8.48</b>	<b>7.74</b>	<b>6.99</b>	<b>8.25</b>	<b>16.32</b>	<b>16.38</b>	<b>18.43</b>	<b>-5.02</b>
HPRS Total Fund Benchmark		-11.06	-6.41	7.56	7.43	6.98	8.15	16.61	13.16	17.85	-3.38
Difference		-0.23	-1.45	0.92	0.31	0.01	0.10	-0.29	3.22	0.58	-1.64

Performance shown is net of all investment management costs. PERS DB: Performance of the Defined Benefit portfolio in the first half of 2022 was reduced by 0.93% because of a change in the methodology used for cash distributions from private equity and real estate funds. PERS DB: Performance of the Defined Benefit portfolio in the first half of 2022 was reduced by 0.93% because of a change in the methodology used for cash distributions from private equity and real estate funds.

Ohio Retirement Study Council  
Current Asset Allocation by Asset Class



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

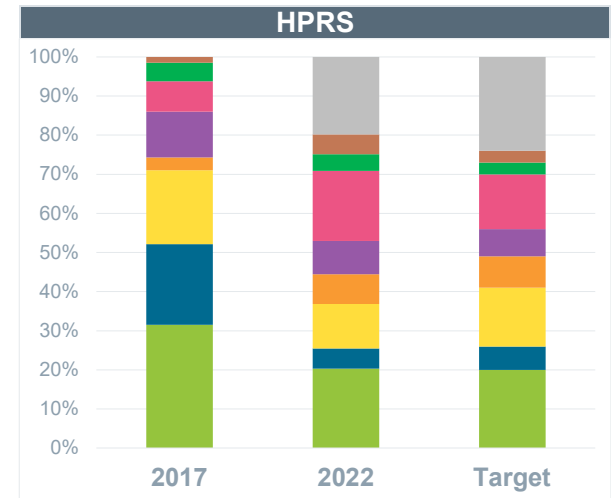
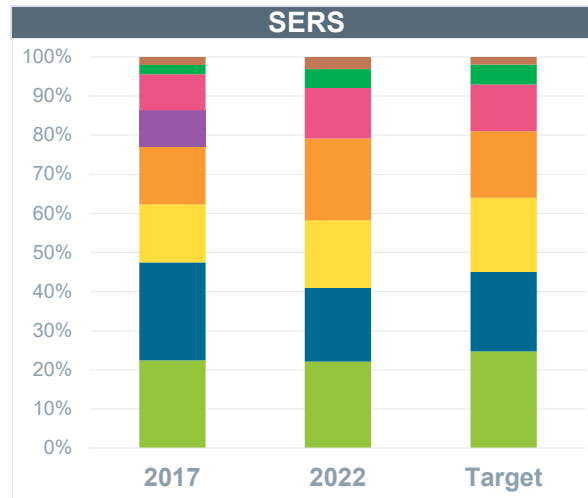
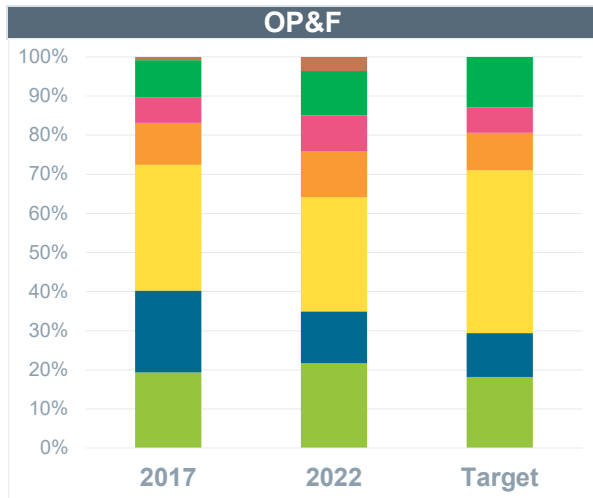
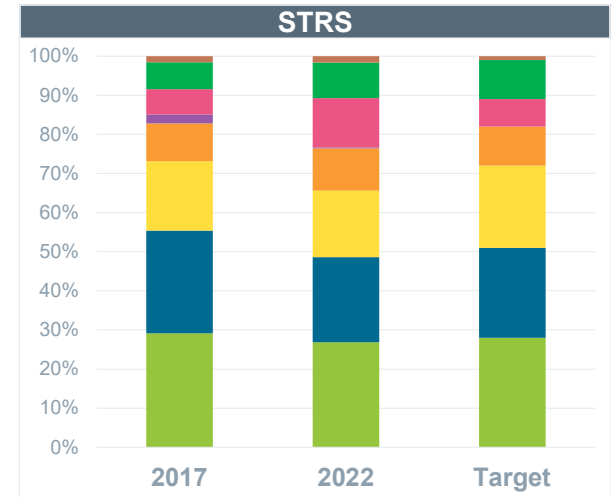
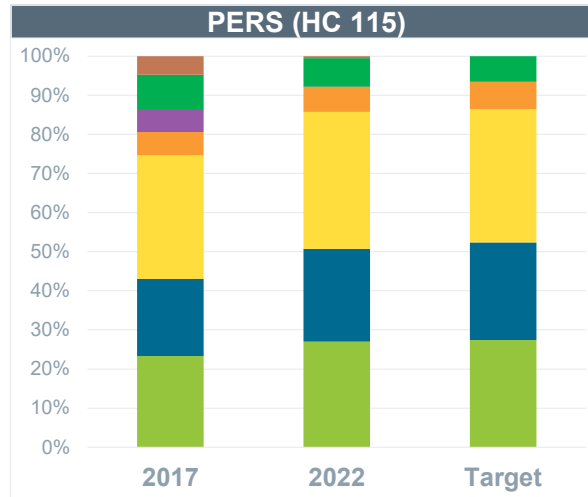
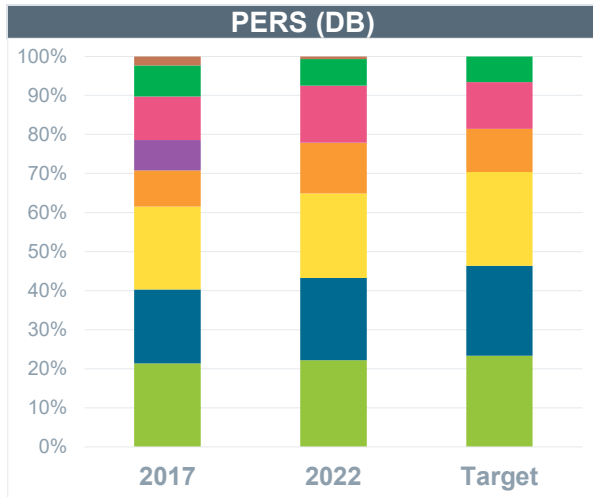
Allocations shown may not sum up to 100% exactly due to rounding. Cash Equivalents for PERS (DB) and PERS (HC 115) consists of cash, rebalancing, and additional annuity.





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



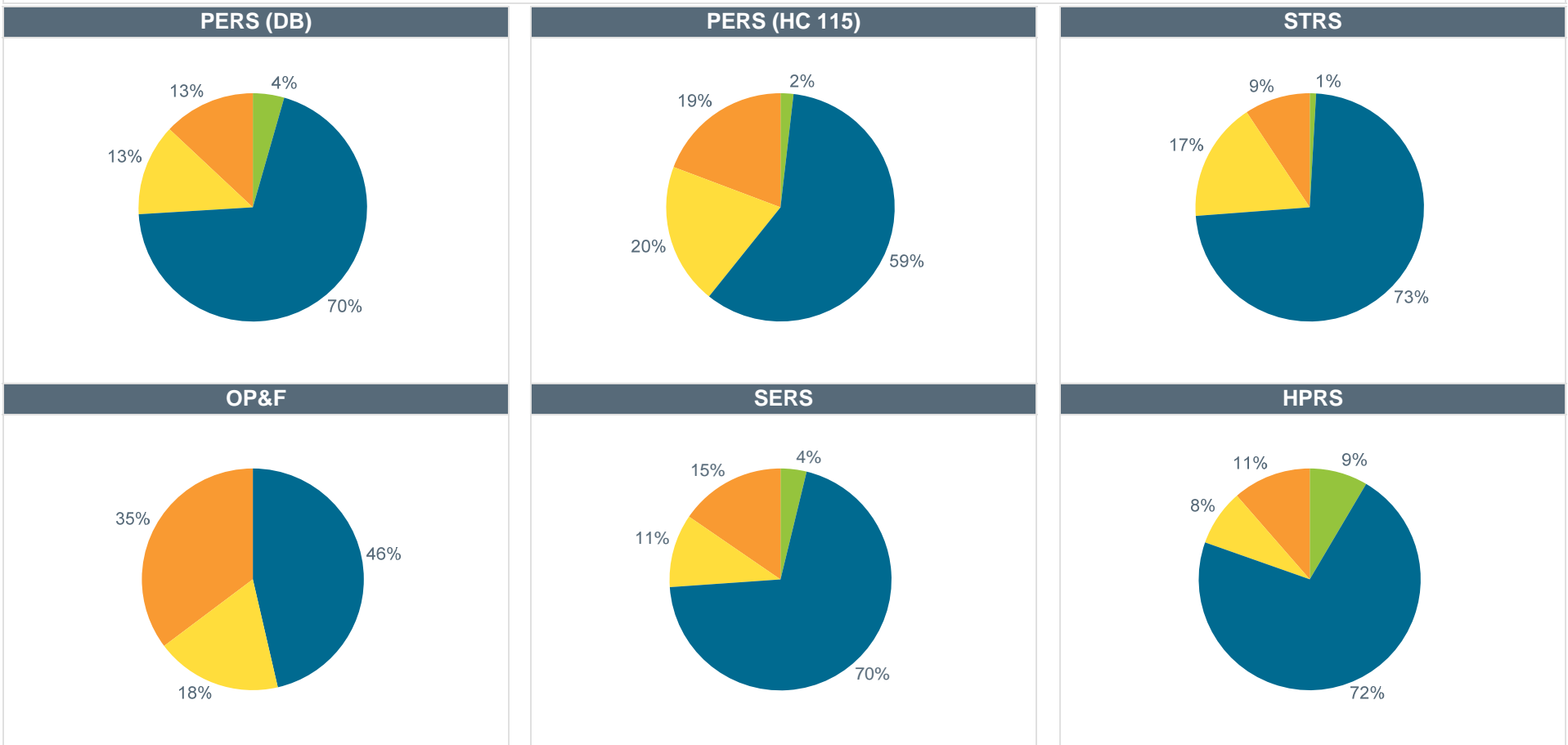


- US Equity
- International Equity
- Fixed Income
- Real Estate
- Global Equity
- Hedge Funds
- Private Equity
- Other Alternatives
- Cash Equivalents



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)



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.

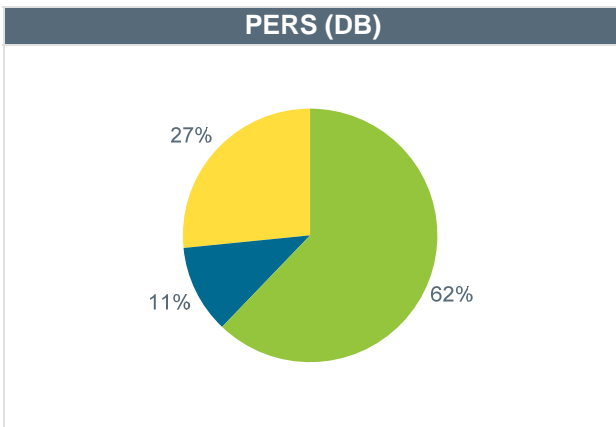
Summary

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

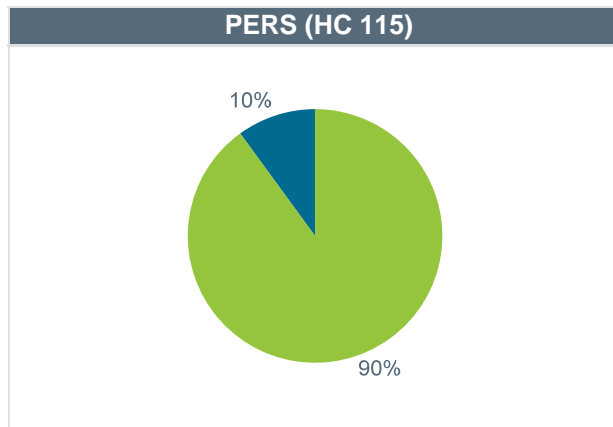
**Liquid Investments:** Publicly traded assets, largely exchanged traded with significant trading volume for the overall asset classes. Takes a relatively small discount or time required to raise cash, but generally expected to clear at quoted bid prices within several trading days.

**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.

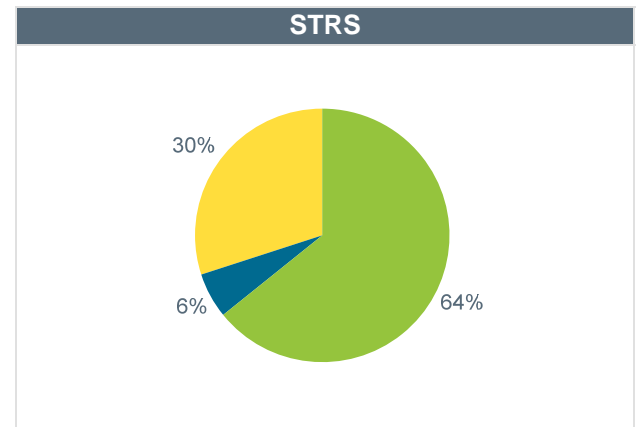
**Not Liquid Investments:** Private appraisal-based transactions, vehicle-based liquidity constraints, or privately held assets. Extreme discount to raise cash or 6-12+ months required to receive cash.



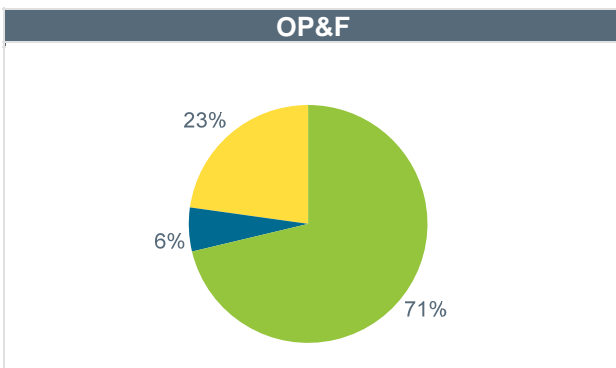
PERS (DB) Liquidity Rating 68



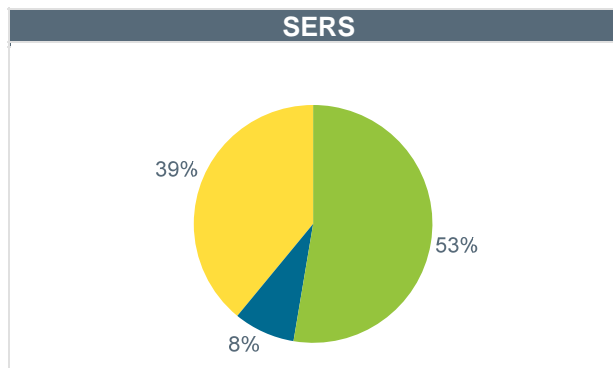
PERS (HC 115) Liquidity Rating 89



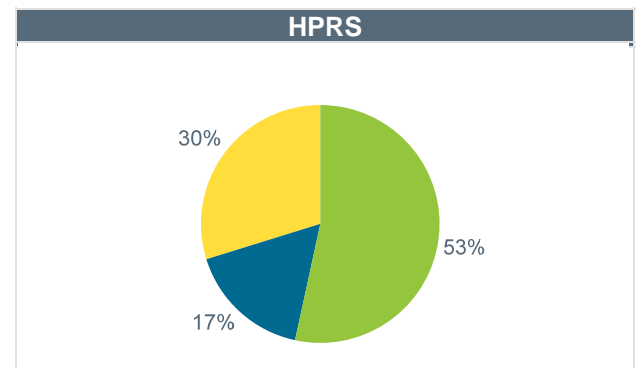
STRS Liquidity Rating 67



OP&F Liquidity Rating 66

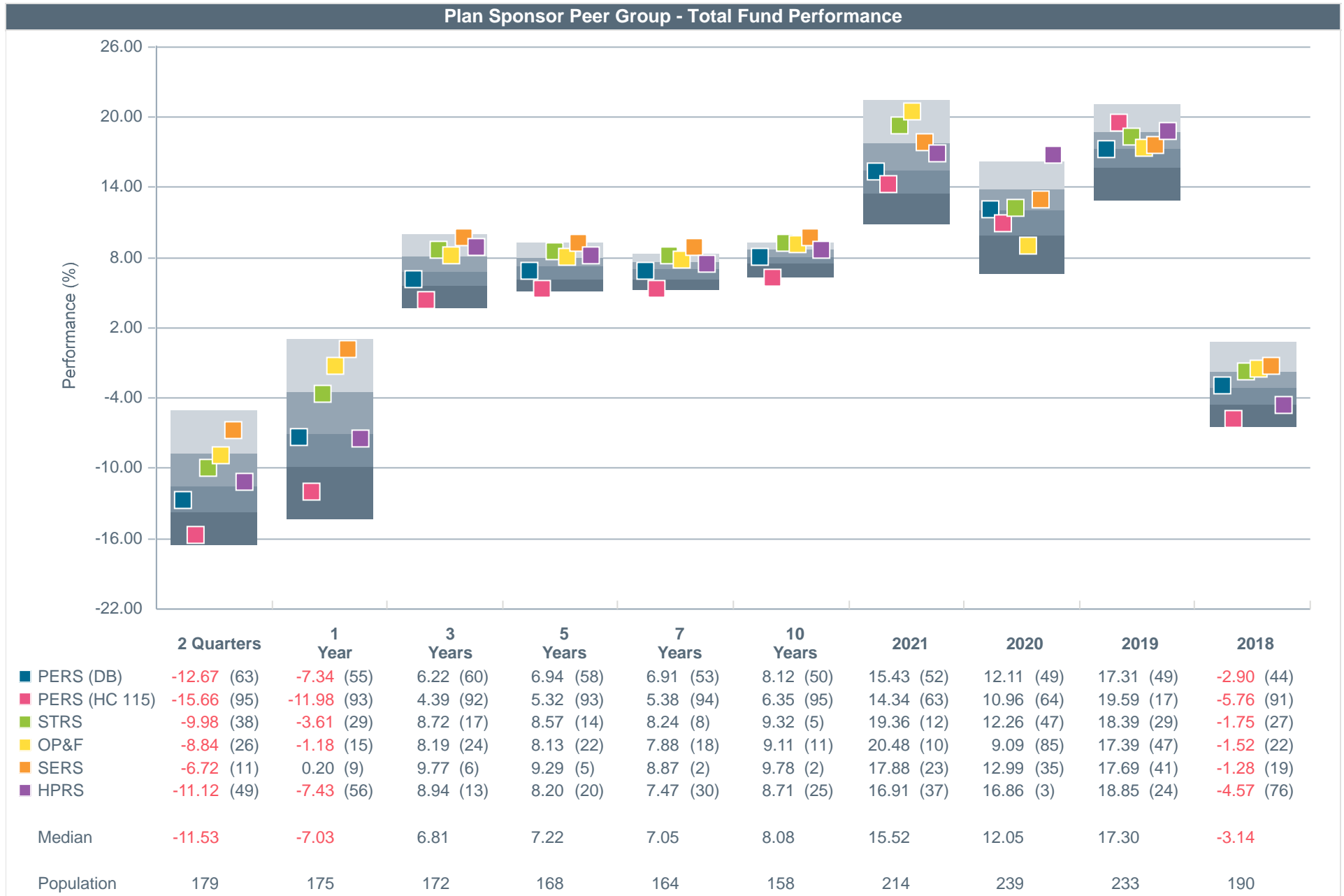


SERS Liquidity Rating 63



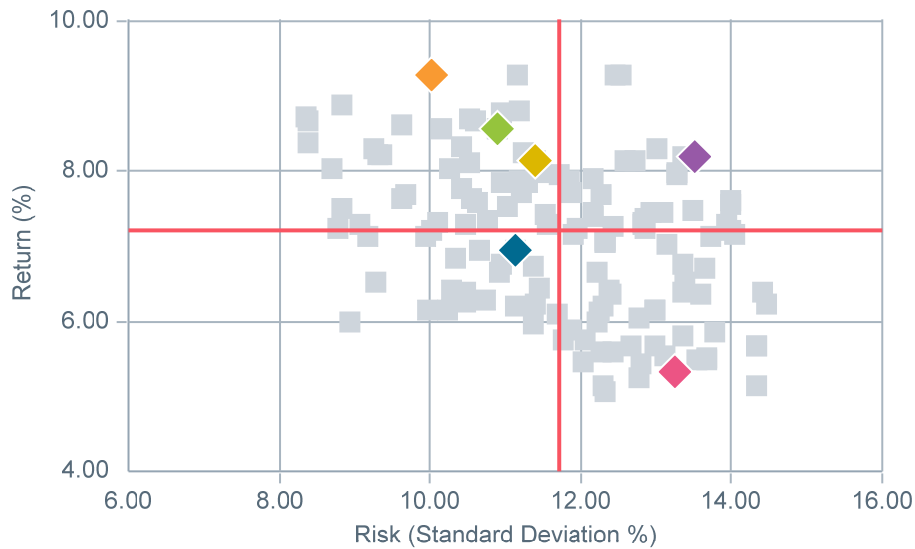
HPRS Liquidity Rating 55

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: Performance of the Defined Benefit portfolio in the first half of 2022 was reduced by 0.93% because of a change in the methodology used for cash distributions from private equity and real estate funds. PERS DB: Performance of the Defined Benefit portfolio in the first half of 2022 was reduced by 0.93% because of a change in the methodology used for cash distributions from private equity and real estate funds.

Plan Sponsor Peer Group Scattergram - 5 Years

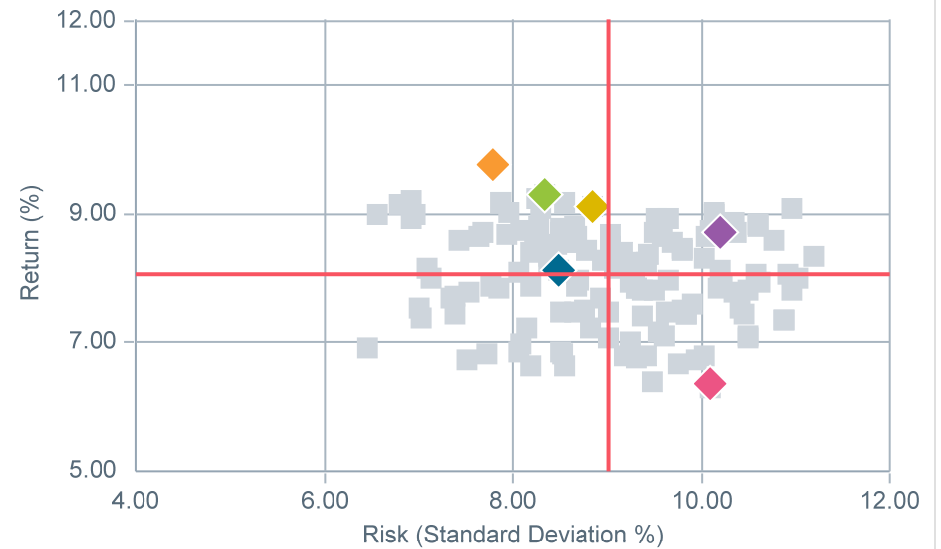


	Return	Standard Deviation
◆ PERS (DB)	6.94	11.14
◆ PERS (HC 115)	5.32	13.25
◆ STRS	8.57	10.90
◆ OP&F	8.13	11.39
◆ SERS	9.29	10.01
◆ HPRS	8.20	13.51
— Median	7.22	11.71

Sharpe Ratio - 5 Year

PERS (DB)	0.56
PERS (HC 115)	0.37
STRS	0.71
OP&F	0.64
SERS	0.82
HPRS	0.57
<i>All Public Plans &gt; \$1B-Total Fund Median</i>	<i>0.54</i>

Plan Sponsor Peer Group Scattergram - 10 Years



	Return	Standard Deviation
◆ PERS (DB)	8.12	8.49
◆ PERS (HC 115)	6.35	10.10
◆ STRS	9.32	8.34
◆ OP&F	9.11	8.84
◆ SERS	9.78	7.79
◆ HPRS	8.71	10.20
— Median	8.08	9.03

Sharpe Ratio - 10 Year

PERS (DB)	0.89
PERS (HC 115)	0.60
STRS	1.03
OP&F	0.96
SERS	1.15
HPRS	0.81
<i>All Public Plans &gt; \$1B-Total Fund Median</i>	<i>0.81</i>

Performance shown is gross of fees.

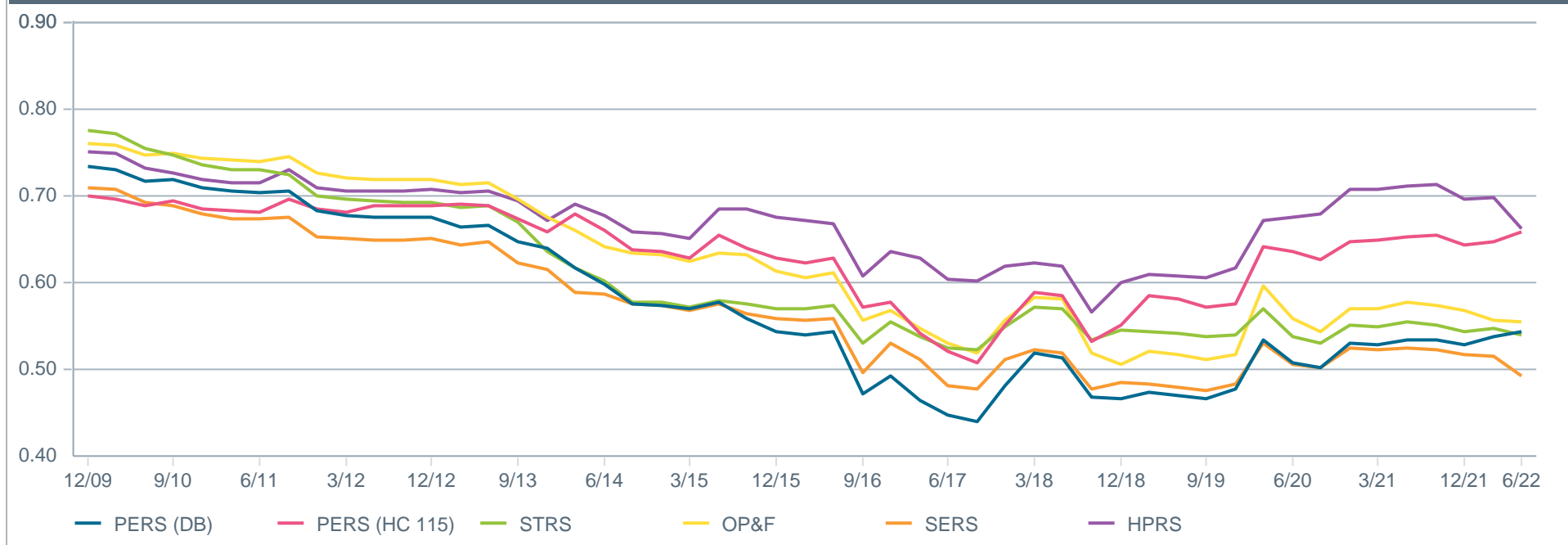
Summary

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

Equity Beta

	3 Years	5 Years	7 Years	10 Years
PERS (DB)	0.57	0.54	0.54	0.53
PERS (HC 115)	0.69	0.66	0.66	0.64
STRS	0.55	0.54	0.55	0.54
OP&F	0.57	0.55	0.56	0.55
SERS	0.50	0.49	0.50	0.49
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

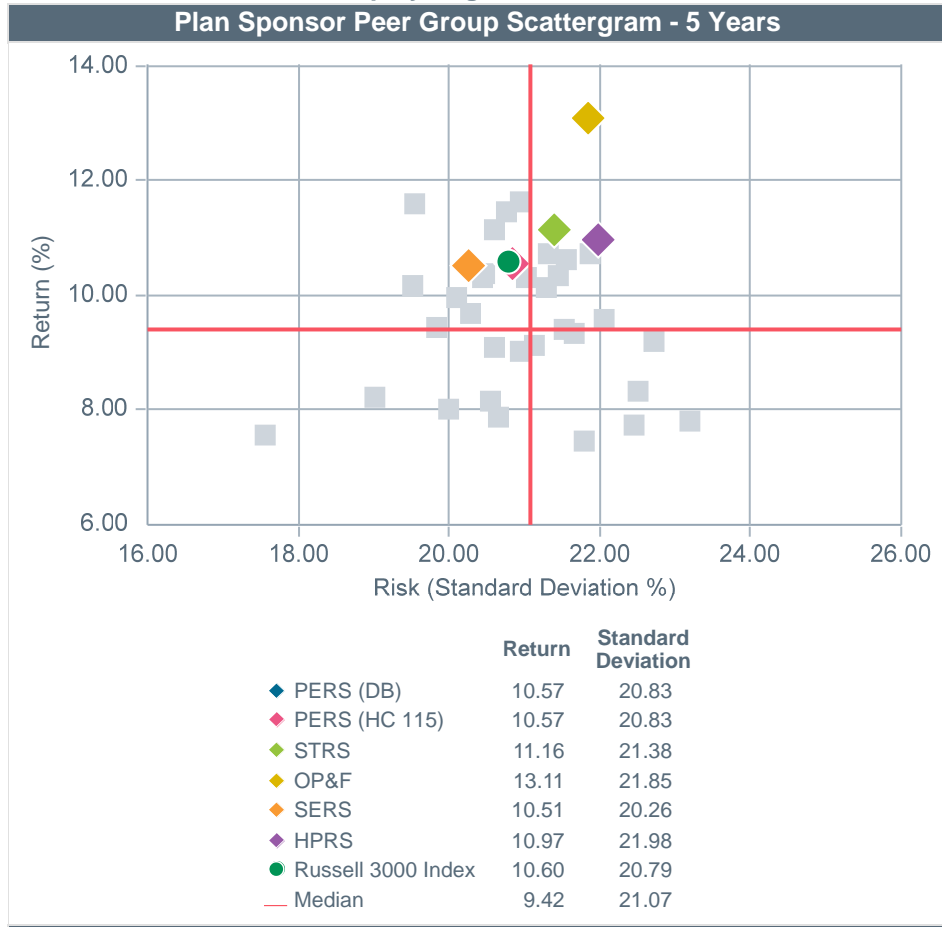


Performance shown is gross of fees and is calculated using quarterly periodicity.



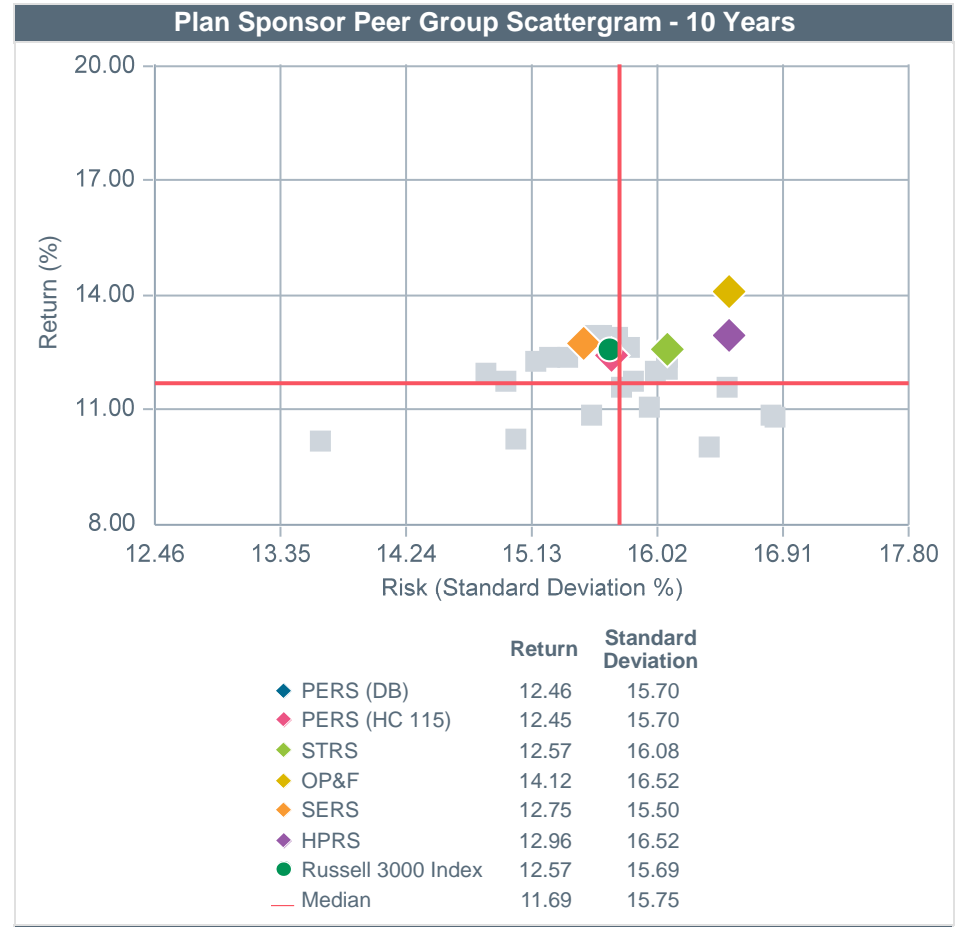
Performance										
	Trailing Performance (%)						Calendar Year Performance (%)			
	2 Quarters	1 Year	3 Years	5 Years	7 Years	10 Years	2021	2020	2019	2018
<b>US Equity</b>										
<b>PERS (DB)</b>	<b>-20.94</b>	<b>-13.41</b>	<b>9.61</b>	<b>10.57</b>	<b>10.31</b>	<b>12.46</b>	<b>26.30</b>	<b>19.69</b>	<b>30.76</b>	<b>-5.00</b>
Russell 3000 Index	-21.10	-13.87	9.77	10.60	10.43	12.57	25.66	20.89	31.02	-5.24
Difference	0.16	0.46	-0.16	-0.03	-0.12	-0.11	0.64	-1.20	-0.26	0.24
Rank	61	47	31	21	19	20	34	43	33	25
<b>PERS (HC 115)</b>	<b>-20.94</b>	<b>-13.41</b>	<b>9.61</b>	<b>10.57</b>	<b>10.31</b>	<b>12.45</b>	<b>26.30</b>	<b>19.69</b>	<b>30.76</b>	<b>-5.00</b>
Russell 3000 Index	-21.10	-13.87	9.77	10.60	10.43	12.57	25.66	20.89	31.02	-5.24
Difference	0.16	0.46	-0.16	-0.03	-0.12	-0.12	0.64	-1.20	-0.26	0.24
Rank	61	47	31	21	19	20	34	43	33	25
<b>STRS</b>	<b>-21.88</b>	<b>-14.89</b>	<b>10.33</b>	<b>11.16</b>	<b>10.71</b>	<b>12.57</b>	<b>26.53</b>	<b>23.00</b>	<b>32.43</b>	<b>-5.33</b>
Russell 3000 Index	-21.10	-13.87	9.77	10.60	10.43	12.57	25.66	20.89	31.02	-5.24
Difference	-0.78	-1.02	0.56	0.56	0.28	0.00	0.87	2.11	1.41	-0.09
Rank	79	63	12	13	14	19	32	16	4	39
<b>OP&amp;F</b>	<b>-18.91</b>	<b>-9.08</b>	<b>12.96</b>	<b>13.11</b>	<b>12.59</b>	<b>14.12</b>	<b>30.14</b>	<b>22.79</b>	<b>31.77</b>	<b>-3.30</b>
Wilshire 5000 Index	-20.89	-13.19	10.17	10.83	10.73	12.71	26.70	20.82	31.02	-5.27
Difference	1.98	4.11	2.79	2.28	1.86	1.41	3.44	1.97	0.75	1.97
Rank	23	8	2	1	1	1	5	17	16	7
<b>SERS</b>	<b>-20.72</b>	<b>-13.10</b>	<b>9.93</b>	<b>10.51</b>	<b>10.33</b>	<b>12.75</b>	<b>24.90</b>	<b>21.87</b>	<b>30.60</b>	<b>-6.15</b>
Russell 3000 Index	-21.10	-13.87	9.77	10.60	10.43	12.57	25.66	20.89	31.02	-5.24
Difference	0.38	0.77	0.16	-0.09	-0.10	0.18	-0.76	0.98	-0.42	-0.91
Rank	59	41	19	22	18	17	43	22	35	64
<b>HPRS</b>	<b>-20.00</b>	<b>-11.55</b>	<b>11.48</b>	<b>10.97</b>	<b>10.73</b>	<b>12.96</b>	<b>27.38</b>	<b>23.28</b>	<b>30.36</b>	<b>-7.97</b>
Russell 3000 Index	-21.10	-13.87	9.77	10.60	10.43	12.57	25.66	20.89	31.02	-5.24
Difference	1.10	2.32	1.71	0.37	0.30	0.39	1.72	2.39	-0.66	-2.73
Rank	49	26	4	15	14	9	26	11	39	88
<i>All Public Plans &gt; \$1B-US Equity Segment Median</i>	<i>-20.35</i>	<i>-13.71</i>	<i>8.59</i>	<i>9.42</i>	<i>9.65</i>	<i>11.69</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.



### Sharpe Ratio - 5 Years

PERS (DB)	0.54
PERS (HC 115)	0.54
STRS	0.56
OP&F	0.63
SERS	0.55
HPRS	0.54
Russell 3000 Index	0.54
<i>All Public Plans &gt; \$1B-US Equity Segment Median</i>	0.49



### Sharpe Ratio - 10 Years

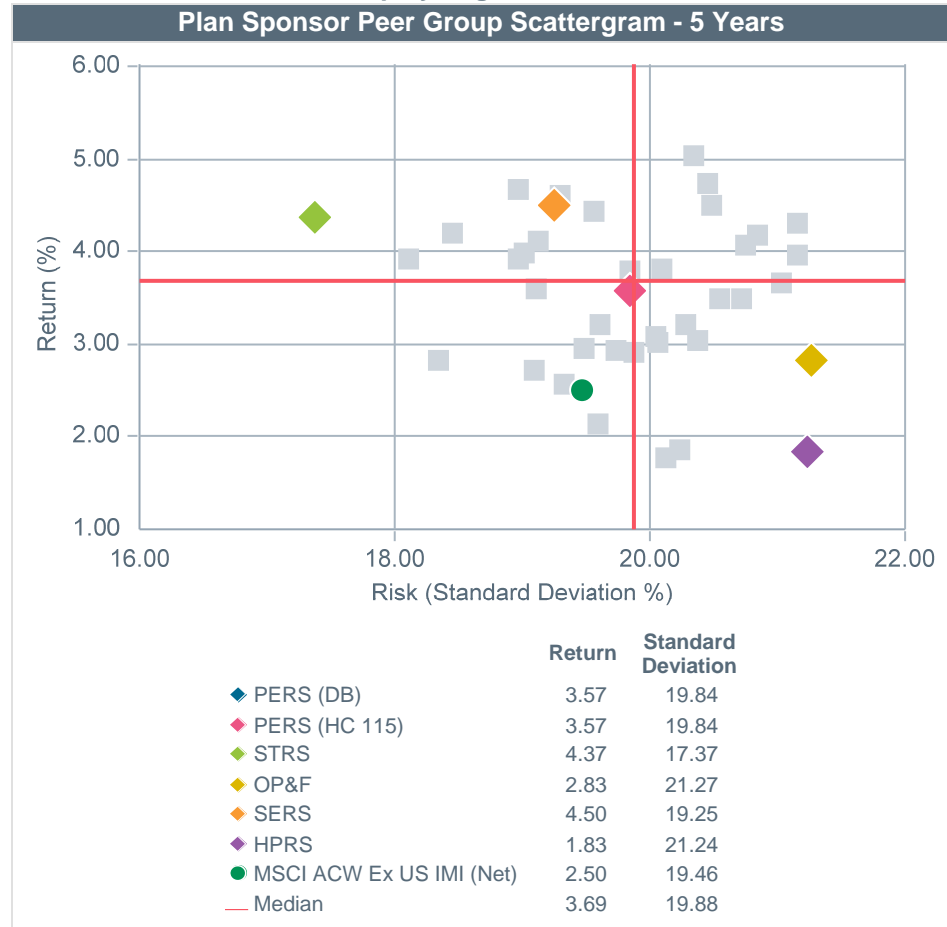
PERS (DB)	0.79
PERS (HC 115)	0.79
STRS	0.79
OP&F	0.85
SERS	0.82
HPRS	0.79
Russell 3000 Index	0.80
<i>All Public Plans &gt; \$1B-US Equity Segment Median</i>	0.75

Performance shown is gross of fees.



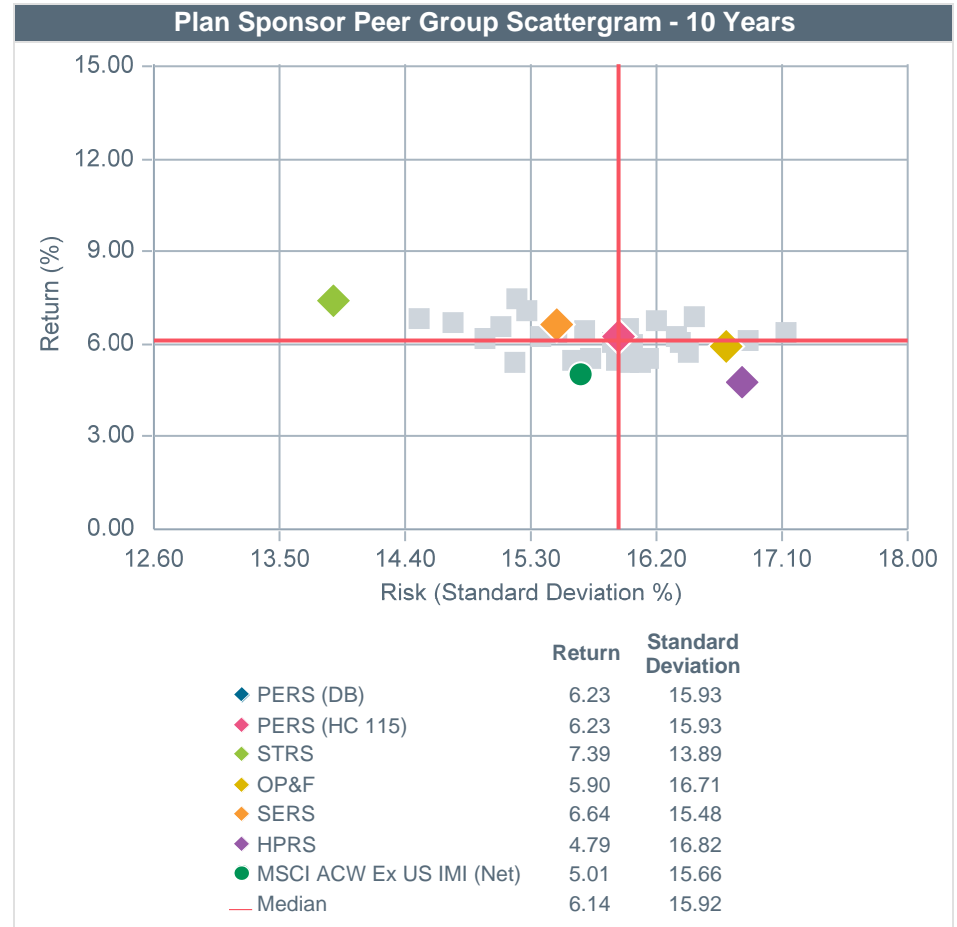
Performance										
	Trailing Performance (%)						Calendar Year Performance (%)			
	2 Quarters	1 Year	3 Years	5 Years	7 Years	10 Years	2021	2020	2019	2018
<b>International Equity</b>										
<b>PERS (DB)</b>	<b>-20.17</b>	<b>-20.73</b>	<b>2.49</b>	<b>3.57</b>	<b>4.35</b>	<b>6.23</b>	<b>9.00</b>	<b>14.81</b>	<b>23.21</b>	<b>-14.17</b>
PERS (DB) International Equity Custom Benchmark	-18.97	-20.24	1.62	2.58	3.10	4.84	7.89	11.90	21.09	-14.74
Difference	-1.20	-0.49	0.87	0.99	1.25	1.39	1.11	2.91	2.12	0.57
Rank	57	52	57	56	38	43	62	39	61	66
<b>PERS (HC 115)</b>	<b>-20.17</b>	<b>-20.73</b>	<b>2.49</b>	<b>3.57</b>	<b>4.35</b>	<b>6.23</b>	<b>9.00</b>	<b>14.81</b>	<b>23.21</b>	<b>-14.17</b>
PERS (HC 115) International Equity Custom Benchmark	-18.97	-20.24	1.62	2.58	3.10	4.84	7.89	11.90	21.09	-14.74
Difference	-1.20	-0.49	0.87	0.99	1.25	1.39	1.11	2.91	2.12	0.57
Rank	57	52	57	56	38	43	62	39	61	66
<b>STRS</b>	<b>-13.21</b>	<b>-11.80</b>	<b>3.97</b>	<b>4.37</b>	<b>4.99</b>	<b>7.39</b>	<b>13.20</b>	<b>6.78</b>	<b>21.54</b>	<b>-11.80</b>
STRS International Equity Custom Benchmark	-15.25	-14.09	3.32	4.09	4.26	6.54	12.36	7.88	22.51	-12.08
Difference	2.04	2.29	0.65	0.28	0.73	0.85	0.84	-1.10	-0.97	0.28
Rank	5	3	16	21	15	7	19	97	85	9
<b>OP&amp;F</b>	<b>-19.58</b>	<b>-19.26</b>	<b>3.14</b>	<b>2.83</b>	<b>3.54</b>	<b>5.90</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)	-19.08	-19.86	1.55	2.50	3.02	5.01	8.53	11.12	21.63	-14.76
Difference	-0.50	0.60	1.59	0.33	0.52	0.89	3.26	1.31	1.74	-2.56
Rank	49	44	43	81	80	69	31	54	59	100
<b>SERS</b>	<b>-18.35</b>	<b>-18.54</b>	<b>4.25</b>	<b>4.50</b>	<b>4.94</b>	<b>6.64</b>	<b>10.76</b>	<b>15.29</b>	<b>24.36</b>	<b>-14.03</b>
SERS International Equity Custom Benchmark	-18.36	-19.61	1.26	2.44	2.88	4.93	7.46	10.65	21.51	-14.20
Difference	0.01	1.07	2.99	2.06	2.06	1.71	3.30	4.64	2.85	0.17
Rank	27	34	9	18	16	28	45	34	42	61
<b>HPRS International Equity</b>	<b>-24.43</b>	<b>-30.64</b>	<b>-0.12</b>	<b>1.83</b>	<b>2.41</b>	<b>4.79</b>	<b>1.89</b>	<b>19.02</b>	<b>25.47</b>	<b>-14.88</b>
HPRS International Equity Custom Benchmark	-19.98	-24.73	-1.03	0.93	1.82	4.19	1.59	11.12	21.63	-14.76
Difference	-4.45	-5.91	0.91	0.90	0.59	0.60	0.30	7.90	3.84	-0.12
Rank	95	100	97	92	95	100	100	12	26	83
<b>HPRS Global Equity</b>	<b>-23.87</b>	<b>-23.96</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>
HPRS Global Equity Custom Benchmark	-20.18	-15.75	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Difference	-3.69	-8.21	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>-19.66</i>	<i>-20.50</i>	<i>2.92</i>	<i>3.69</i>	<i>4.07</i>	<i>6.14</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)	0.22
PERS (HC 115)	0.22
STRS	0.27
OP&F	0.19
SERS	0.27
HPRS	0.14
MSCI ACW Ex US IMI (Net)	0.17
<i>All Public Plans &gt; \$1B-Intl. Equity Segment Median</i>	<i>0.23</i>



### Sharpe Ratio - 10 Years

PERS (DB)	0.42
PERS (HC 115)	0.42
STRS	0.54
OP&F	0.39
SERS	0.45
HPRS	0.33
MSCI ACW Ex US IMI (Net)	0.35
<i>All Public Plans &gt; \$1B-Intl. Equity Segment Median</i>	<i>0.41</i>

Performance shown is gross of fees.

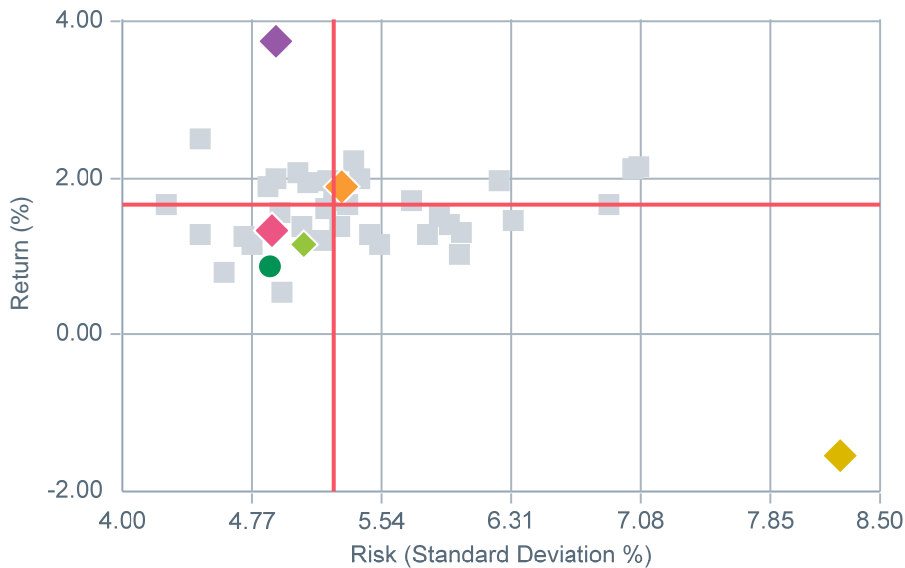
Performance										
	Trailing Performance (%)						Calendar Year Performance (%)			
	2 Quarters	1 Year	3 Years	5 Years	7 Years	10 Years	2021	2020	2019	2018
<b>Fixed Income</b>										
<b>PERS (DB) Core Fixed Income</b>	<b>-10.07</b>	<b>-9.88</b>	<b>-0.16</b>	<b>1.34</b>	<b>1.81</b>	<b>2.02</b>	<b>-0.98</b>	<b>9.09</b>	<b>8.72</b>	<b>-0.06</b>
PERS (DB) Core Fixed Income Custom Benchmark	-10.35	-10.29	-0.93	0.88	1.42	1.54	-1.54	7.51	8.72	0.01
Difference	0.28	0.41	0.77	0.46	0.39	0.48	0.56	1.58	0.00	-0.07
Rank	42	56	61	68	77	71	86	41	68	39
<b>PERS (HC 115) Core Fixed Income</b>	<b>-10.07</b>	<b>-9.88</b>	<b>-0.16</b>	<b>1.34</b>	<b>1.81</b>	<b>2.02</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	-10.35	-10.29	-0.93	0.88	1.42	1.58	-1.54	7.51	8.72	0.01
Difference	0.28	0.41	0.77	0.46	0.39	0.44	0.56	1.58	0.00	-0.07
Rank	42	56	61	68	77	71	86	41	68	39
<b>STRS Core Fixed Income</b>	<b>-10.88</b>	<b>-10.76</b>	<b>-0.63</b>	<b>1.14</b>	<b>1.88</b>	<b>2.05</b>	<b>-0.76</b>	<b>8.12</b>	<b>9.28</b>	<b>-0.17</b>
Bloomberg US Universal index	-10.94	-10.89	-0.94	0.93	1.61	1.83	-1.10	7.58	9.29	-0.26
Difference	0.06	0.13	0.31	0.21	0.27	0.22	0.34	0.54	-0.01	0.09
Rank	63	71	82	86	69	70	82	63	52	43
<b>OP&amp;F Core Fixed Income</b>	<b>-20.19</b>	<b>-19.86</b>	<b>-5.18</b>	<b>-1.55</b>	<b>-0.14</b>	<b>0.64</b>	<b>-2.97</b>	<b>7.35</b>	<b>8.13</b>	<b>1.24</b>
Bloomberg US Agg Bond Index + Leverage Factor	-20.72	-20.74	-5.37	-1.86	-0.55	0.16	-3.40	8.00	8.71	0.02
Difference	0.53	0.88	0.19	0.31	0.41	0.48	0.43	-0.65	-0.58	1.22
Rank	100	100	100	100	99	97	97	80	78	9
<b>SERS</b>	<b>-10.44</b>	<b>-10.42</b>	<b>0.42</b>	<b>1.89</b>	<b>2.42</b>	<b>2.70</b>	<b>-0.56</b>	<b>10.59</b>	<b>9.95</b>	<b>-0.38</b>
Bloomberg US Agg Bond Index	-10.35	-10.29	-0.94	0.88	1.42	1.54	-1.55	7.51	8.72	0.01
Difference	-0.09	-0.13	1.36	1.01	1.00	1.16	0.99	3.08	1.23	-0.39
Rank	54	68	38	33	31	33	75	18	29	57
<b>HPRS</b>	<b>-6.44</b>	<b>-5.07</b>	<b>2.71</b>	<b>3.74</b>	<b>3.93</b>	<b>3.50</b>	<b>3.59</b>	<b>8.30</b>	<b>9.33</b>	<b>2.56</b>
HPRS Fixed Income Custom Benchmark	-9.27	-8.64	0.06	1.47	1.89	1.87	1.51	5.95	7.94	0.68
Difference	2.83	3.57	2.65	2.27	2.04	1.63	2.08	2.35	1.39	1.88
Rank	11	8	1	1	1	8	4	59	48	4
<i>All Public Plans &gt; \$1B-US Fixed Income Segment Median</i>	<i>-10.30</i>	<i>-9.74</i>	<i>0.07</i>	<i>1.66</i>	<i>2.12</i>	<i>2.38</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

Plan Sponsor Peer Group Scattergram - 5 Years

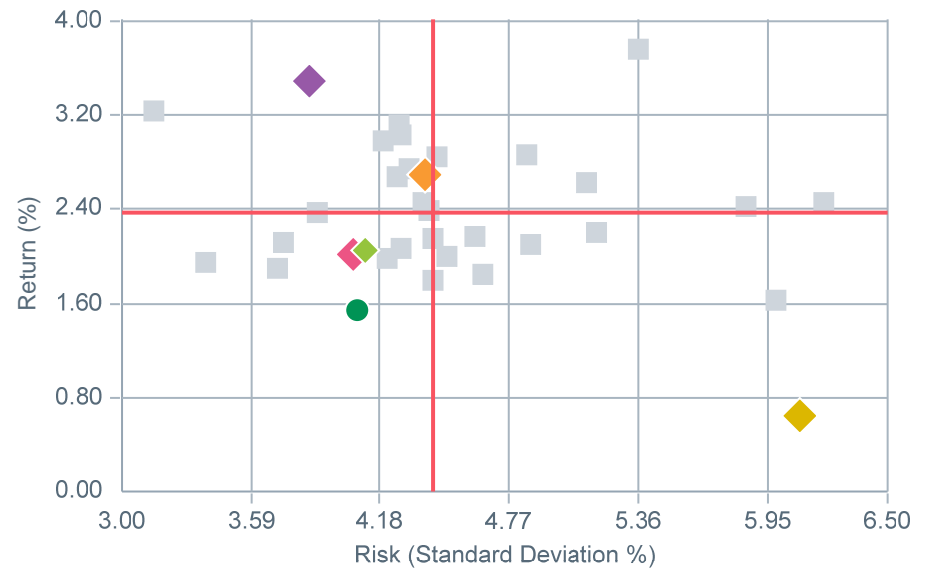


	Return	Standard Deviation
◆ PERS (DB) Core Fixed Income	1.34	4.89
◆ PERS (HC 115) Core Fixed Income	1.34	4.89
◆ STRS Core Fixed Income	1.14	5.08
◆ OP&F Core Fixed Income	-1.55	8.27
◆ SERS	1.89	5.30
◆ HPRS	3.74	4.91
● Bloomberg US Agg Bond Index	0.88	4.88
— Median	1.66	5.26

Sharpe Ratio - 5 Years

PERS (DB) Core Fixed Income	0.07
PERS (HC 115) Core Fixed Income	0.07
STRS Core Fixed Income	0.03
OP&F Core Fixed Income	-0.28
SERS	0.17
HPRS	0.54
Bloomberg US Agg Bond Index	-0.02
All Public Plans > \$1B-US Fixed Income Segment Median	0.12

Plan Sponsor Peer Group Scattergram - 10 Years



	Return	Standard Deviation
◆ PERS (DB) Core Fixed Income	2.02	4.05
◆ PERS (HC 115) Core Fixed Income	2.02	4.05
◆ STRS Core Fixed Income	2.05	4.11
◆ OP&F Core Fixed Income	0.64	6.10
◆ SERS	2.70	4.39
◆ HPRS	3.50	3.85
● Bloomberg US Agg Bond Index	1.54	4.07
— Median	2.38	4.42

Sharpe Ratio - 10 Years

PERS (DB) Core Fixed Income	0.37
PERS (HC 115) Core Fixed Income	0.37
STRS Core Fixed Income	0.36
OP&F Core Fixed Income	0.03
SERS	0.49
HPRS	0.74
Bloomberg US Agg Bond Index	0.25
All Public Plans > \$1B-US Fixed Income Segment Median	0.38

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>-9.03</b>	<b>-8.80</b>	<b>-0.80</b>	<b>0.79</b>	<b>1.09</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	-9.14	-8.90	-0.88	0.74	1.06	N/A	-2.32	8.00	6.86	0.86
Difference	0.11	0.10	0.08	0.05	0.03	N/A	0.05	0.08	-0.02	-0.02
<b>PERS (DB) EMD</b>	<b>-17.76</b>	<b>-20.97</b>	<b>-5.22</b>	<b>-1.56</b>	<b>0.69</b>	<b>0.61</b>	<b>-4.65</b>	<b>5.36</b>	<b>13.55</b>	<b>-5.63</b>
PERS (DB) EMD Custom Benchmark	-16.69	-19.24	-5.03	-1.61	0.54	0.32	-5.18	4.32	14.01	-5.33
Difference	-1.07	-1.73	-0.19	0.05	0.15	0.29	0.53	1.04	-0.46	-0.30
<b>PERS (DB) High Yield</b>	<b>-13.56</b>	<b>-12.00</b>	<b>0.56</b>	<b>2.36</b>	<b>3.48</b>	<b>4.60</b>	<b>5.16</b>	<b>7.42</b>	<b>14.76</b>	<b>-2.06</b>
Bloomberg U.S. High Yield Index	-14.19	-12.81	0.21	2.10	3.48	4.47	5.28	7.11	14.32	-2.08
Difference	0.63	0.81	0.35	0.26	0.00	0.13	-0.12	0.31	0.44	0.02
<b>PERS (DB) Securitized Debt</b>	<b>-9.63</b>	<b>-9.08</b>	<b>1.82</b>	<b>3.76</b>	<b>3.37</b>	<b>7.94</b>	<b>5.20</b>	<b>7.40</b>	<b>11.70</b>	<b>3.21</b>
Bloomberg CMBS Index + 2%	-9.20	-9.96	-0.68	2.30	3.11	3.72	4.50	1.18	10.70	2.79
Difference	-0.43	0.88	2.50	1.46	0.26	4.22	0.70	6.22	1.00	0.42
<b>PERS (DB) TIPS</b>	<b>-8.90</b>	<b>-5.10</b>	<b>3.02</b>	<b>3.20</b>	<b>2.79</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	-8.92	-5.14	3.04	3.21	2.82	N/A	5.96	10.99	8.43	-1.26
Difference	0.02	0.04	-0.02	-0.01	-0.03	N/A	0.00	-0.10	-0.01	0.00
<b>PERS (HC 115) EMD</b>	<b>-17.76</b>	<b>-20.97</b>	<b>-5.22</b>	<b>-1.56</b>	<b>0.69</b>	<b>0.62</b>	<b>-4.65</b>	<b>5.36</b>	<b>13.55</b>	<b>-5.63</b>
PERS (HC 115) EMD Custom Benchmark	-16.69	-19.24	-5.03	-1.61	0.54	0.32	-5.18	4.32	14.01	-5.33
Difference	-1.07	-1.73	-0.19	0.05	0.15	0.30	0.53	1.04	-0.46	-0.30

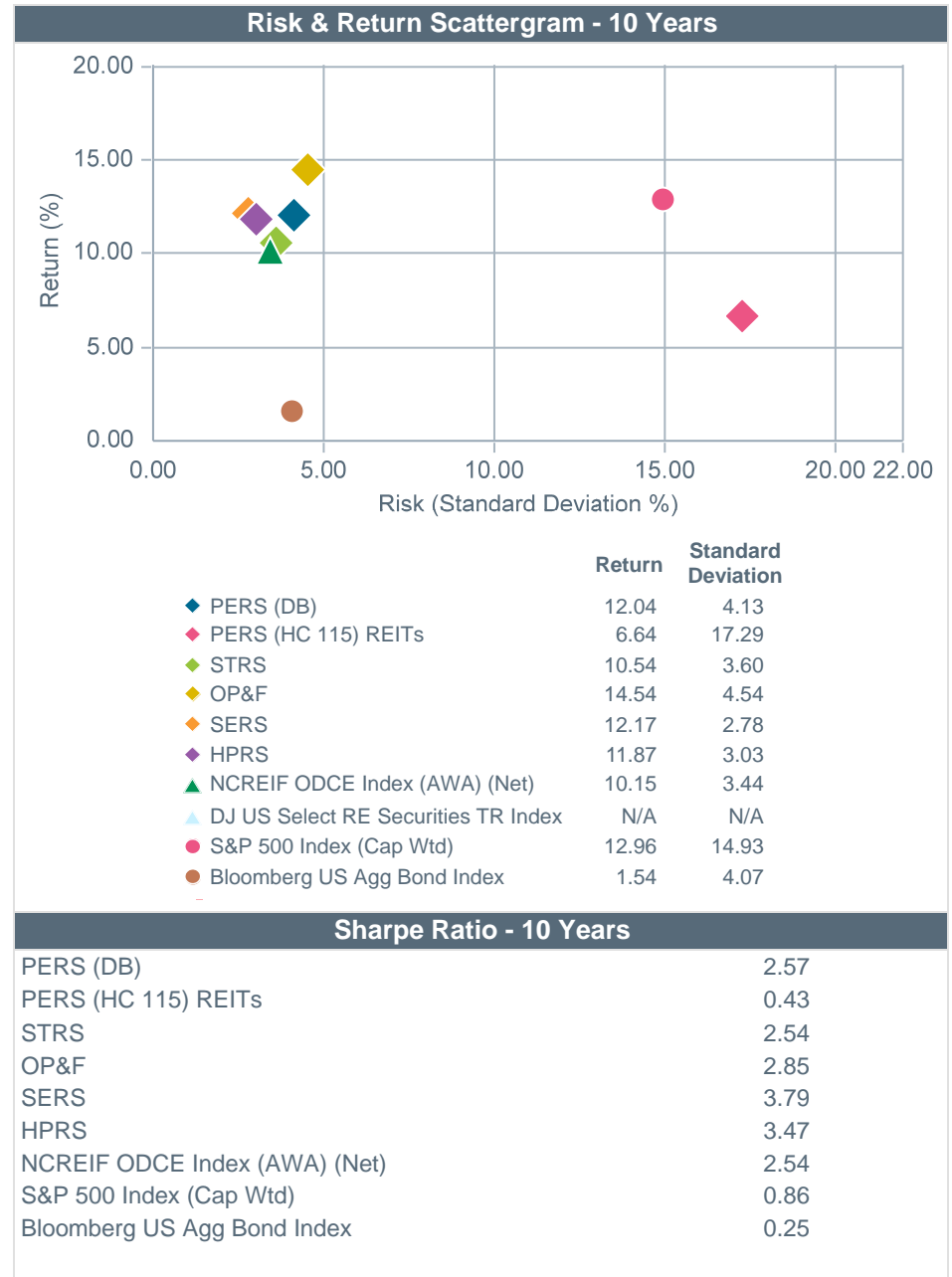
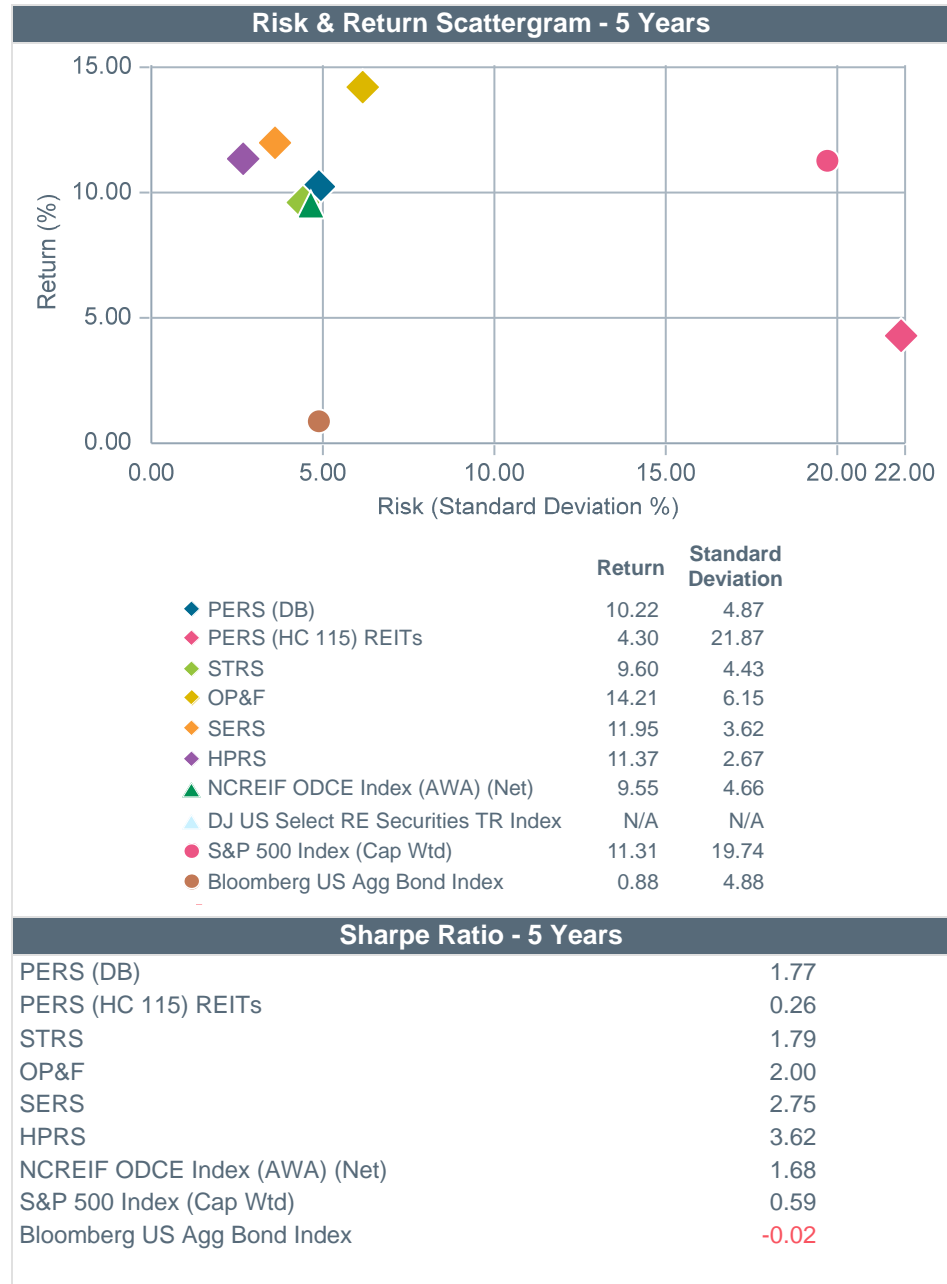
Performance shown is gross of fees.

	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>										
<b>PERS (HC 115) High Yield</b>	<b>-13.56</b>	<b>-12.00</b>	0.56	2.36	3.48	4.60	5.16	7.42	14.76	<b>-2.06</b>
Bloomberg Barclays U.S. High Yield Index	-14.19	-12.81	0.21	2.10	3.48	4.47	5.28	7.11	14.32	-2.08
Difference	0.63	0.81	0.35	0.26	0.00	0.13	-0.12	0.31	0.44	0.02
<b>PERS (HC 115) Securitized Debt</b>	<b>-9.63</b>	<b>-9.08</b>	1.82	3.76	3.37	7.93	5.20	7.40	11.70	3.21
Bloomberg CMBS Index + 2%	-9.20	-9.96	-0.68	2.30	3.11	3.72	4.50	1.18	10.70	2.79
Difference	-0.43	0.88	2.50	1.46	0.26	4.21	0.70	6.22	1.00	0.42
<b>PERS (HC 115) TIPS</b>	<b>-8.90</b>	<b>-5.10</b>	3.02	3.20	2.79	1.73	5.96	10.89	8.42	<b>-1.26</b>
Bloomberg U.S. Tips Index	-8.92	-5.14	3.04	3.21	2.82	1.73	5.96	10.99	8.43	-1.26
Difference	0.02	0.04	-0.02	-0.01	-0.03	0.00	0.00	-0.10	-0.01	0.00
<b>STRS Liquid Treasury Portfolio</b>	<b>-5.78</b>	<b>-6.30</b>	<b>-0.24</b>	0.94	N/A	N/A	<b>-1.67</b>	5.90	5.24	1.47
Bloomberg US Intermediate Treasury Index	-5.80	-6.35	-0.31	0.87	N/A	N/A	-1.72	5.78	5.22	1.41
Difference	0.02	0.05	0.07	0.07	N/A	N/A	0.05	0.12	0.02	0.06
<b>OP&amp;F High Yield</b>	<b>-12.92</b>	<b>-11.69</b>	0.78	2.61	3.61	4.55	5.39	6.71	13.49	<b>-0.48</b>
CS Developed Countries High Yield	-14.04	-12.69	-0.08	1.93	3.35	4.32	5.34	6.08	14.41	-2.26
Difference	1.12	1.00	0.86	0.68	0.26	0.23	0.05	0.63	-0.92	1.78
<b>OP&amp;F Private Credit Fixed Income</b>	<b>4.93</b>	<b>9.24</b>	7.25	8.15	7.50	N/A	15.80	<b>-1.54</b>	10.47	7.51
S&P LTSA Levered Loan Index + 2%	1.64	5.33	6.35	N/A	N/A	N/A	10.58	3.09	5.26	7.30
Difference	3.29	3.91	0.90	N/A	N/A	N/A	5.22	-4.63	5.21	0.21
<b>OP&amp;F US TIPS</b>	<b>-9.98</b>	<b>-0.17</b>	9.44	8.33	7.76	7.56	15.47	20.11	15.70	<b>-0.26</b>
Bridgewater Custom US TIPS Index	-20.15	-13.25	4.32	4.21	4.79	4.50	11.81	23.25	15.12	-5.04
Difference	10.17	13.08	5.12	4.12	2.97	3.06	3.66	-3.14	0.58	4.78
<b>SERS Private Credit</b>	<b>4.86</b>	<b>10.57</b>	N/A	N/A	N/A	N/A	16.30	N/A	N/A	N/A
3 Month LIBOR Rate + 4.5%	2.39	4.73	N/A	N/A	N/A	N/A	4.67	N/A	N/A	N/A
Difference	2.47	5.84	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 inceptioned 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>10.41</b>	<b>25.56</b>	<b>11.50</b>	<b>10.22</b>	<b>10.27</b>	<b>12.04</b>	<b>17.08</b>	<b>2.55</b>	<b>7.86</b>	<b>4.37</b>
PERS (DB) Real Estate Custom Benchmark	15.75	28.11	11.16	9.75	10.05	10.75	14.49	1.37	5.49	8.56
Difference	-5.34	-2.55	0.34	0.47	0.22	1.29	2.59	1.18	2.37	-4.19
<b>PERS (HC 115) REITs</b>	<b>-21.16</b>	<b>-6.44</b>	<b>2.49</b>	<b>4.30</b>	<b>5.74</b>	<b>6.64</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	-21.14	-6.41	2.54	4.28	5.73	6.60	45.91	-11.20	23.10	-4.22
Difference	-0.02	-0.03	-0.05	0.02	0.01	0.04	0.11	-0.20	0.13	0.12
<b>STRS</b>	<b>8.12</b>	<b>21.96</b>	<b>10.45</b>	<b>9.60</b>	<b>9.42</b>	<b>10.54</b>	<b>20.64</b>	<b>-1.27</b>	<b>10.65</b>	<b>6.65</b>
STRS Real Estate Custom Benchmark	4.16	17.30	9.74	8.65	8.77	9.53	21.38	0.89	9.31	5.09
Difference	3.96	4.66	0.71	0.95	0.65	1.01	-0.74	-2.16	1.34	1.56
<b>OP&amp;F</b>	<b>19.76</b>	<b>38.67</b>	<b>15.79</b>	<b>14.21</b>	<b>13.86</b>	<b>14.54</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)	15.34	27.26	10.30	8.90	9.20	9.92	13.64	0.52	4.64	7.71
Difference	4.42	11.41	5.49	5.31	4.66	4.62	10.57	-0.41	4.12	5.98
<b>SERS</b>	<b>12.08</b>	<b>25.67</b>	<b>12.79</b>	<b>11.95</b>	<b>11.72</b>	<b>12.17</b>	<b>18.47</b>	<b>3.30</b>	<b>9.84</b>	<b>11.41</b>
SERS Global Real Assets Custom Benchmark	11.80	21.87	9.60	8.54	8.83	9.61	12.15	2.00	6.24	7.16
Difference	0.28	3.80	3.19	3.41	2.89	2.56	6.32	1.30	3.60	4.25
<b>HPRS</b>	<b>6.97</b>	<b>15.67</b>	<b>9.85</b>	<b>11.37</b>	<b>9.94</b>	<b>11.87</b>	<b>14.28</b>	<b>3.32</b>	<b>10.52</b>	<b>15.75</b>
HPRS Real Estate Custom Benchmark (Net)	6.02	13.77	8.53	9.58	9.56	10.11	12.91	2.11	9.55	14.00
Difference	0.95	1.90	1.32	1.79	0.38	1.76	1.37	1.21	0.97	1.75
<b>NCREIF ODCE Index (AWA) (Net)</b>	<b>12.00</b>	<b>28.31</b>	<b>11.66</b>	<b>9.55</b>	<b>9.35</b>	<b>10.15</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: Performance of the Real Estate portfolio in the first half of 2022 was reduced by 3.78% because of a change in the methodology used for cash distributions from private equity and real estate funds.

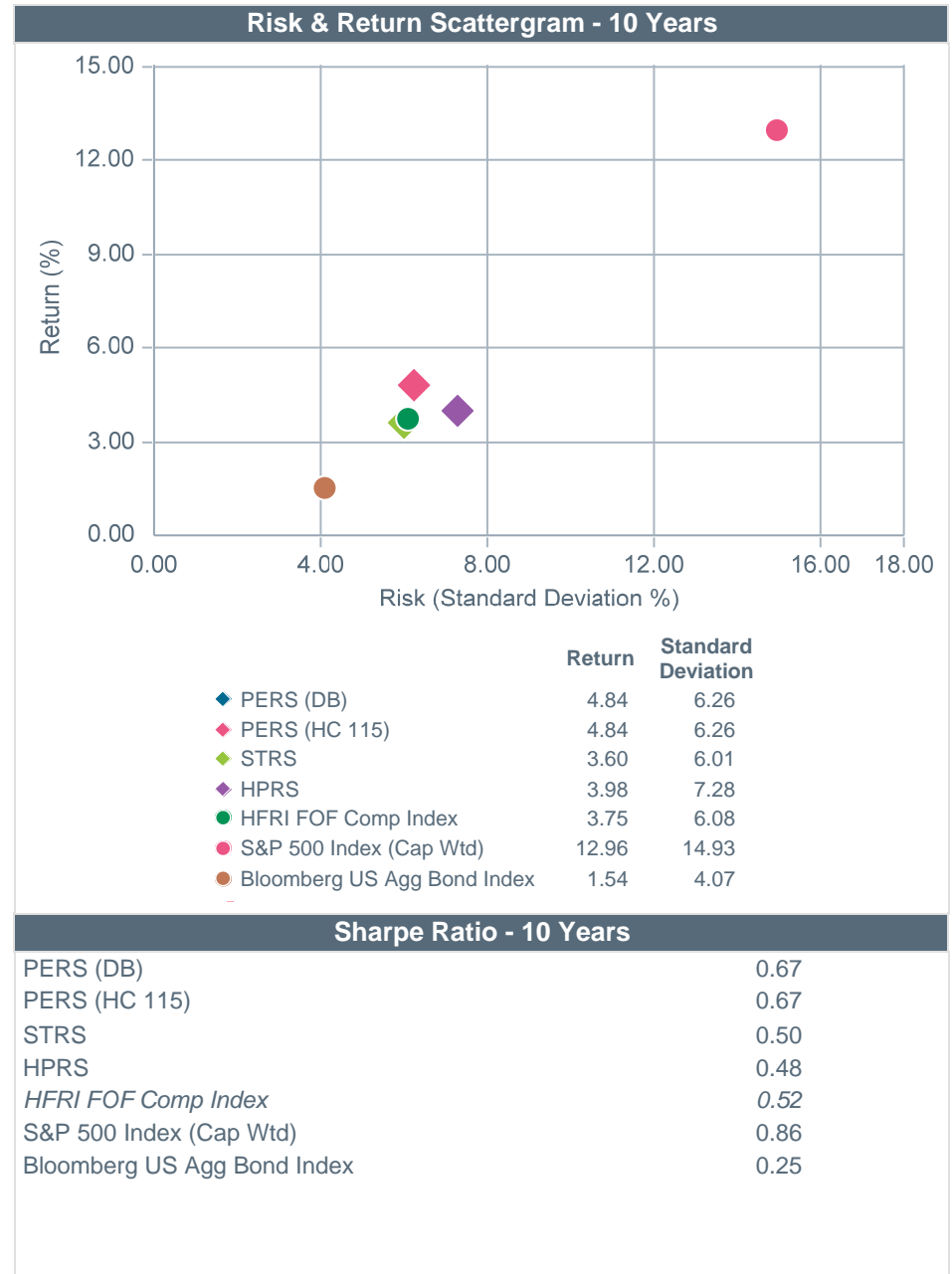
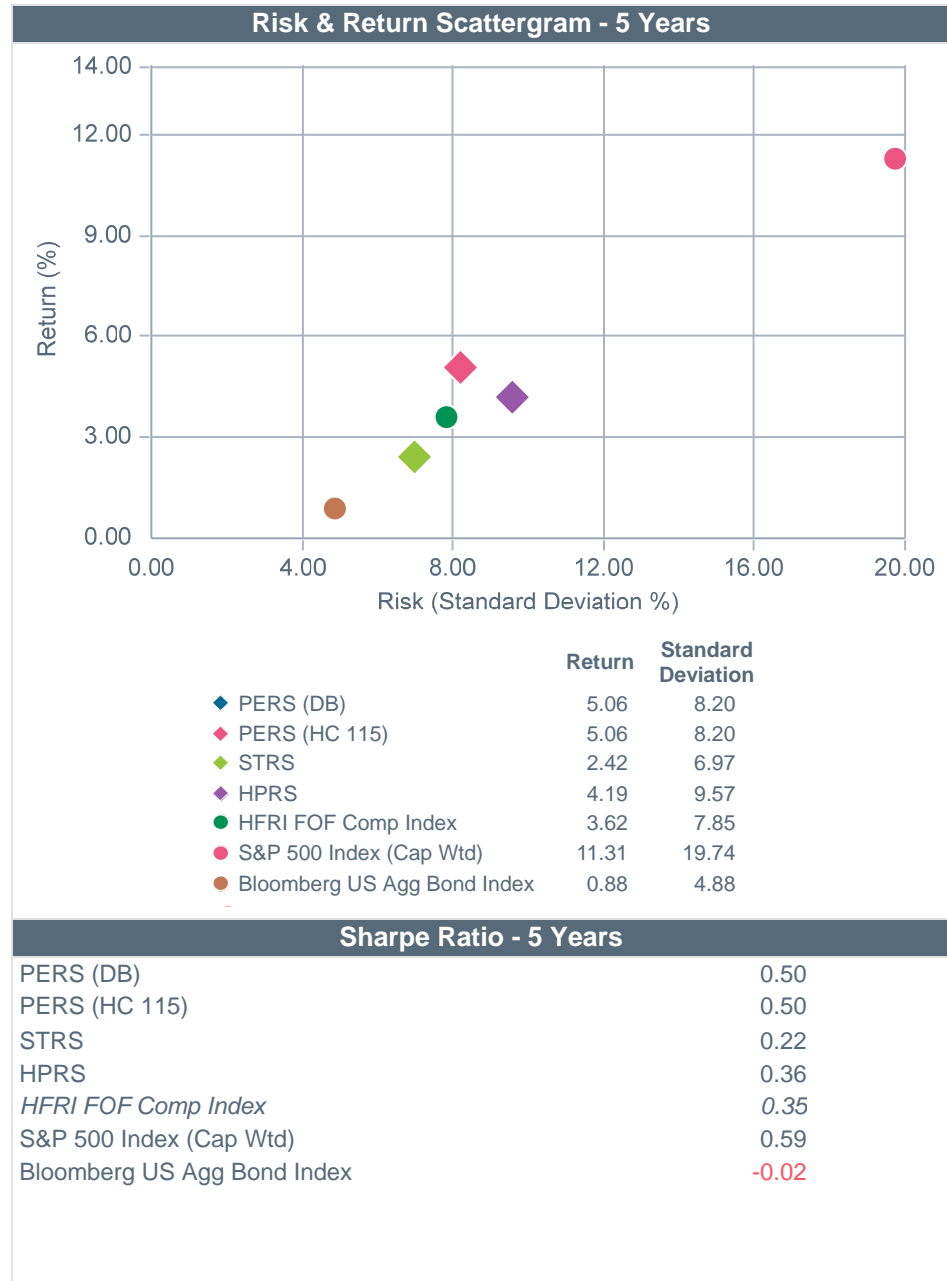


Performance shown may be net or gross of fees depending on underlying investments.



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>2.42</b>	<b>8.45</b>	<b>5.90</b>	<b>5.06</b>	<b>4.07</b>	<b>4.84</b>	<b>9.78</b>	<b>3.63</b>	<b>7.66</b>	<b>-1.51</b>
PERS (DB) Hedge Funds Custom Benchmark	-5.55	-4.85	4.28	3.93	3.59	4.04	10.71	6.04	8.49	-3.19
Difference	7.97	13.30	1.62	1.13	0.48	0.80	-0.93	-2.41	-0.83	1.68
<b>PERS (HC 115)</b>	<b>2.42</b>	<b>8.45</b>	<b>5.90</b>	<b>5.06</b>	<b>4.07</b>	<b>4.84</b>	<b>9.78</b>	<b>3.63</b>	<b>7.66</b>	<b>-1.51</b>
PERS (HC 115) Hedge Funds Custom Benchmark	-5.55	-4.85	4.28	3.93	3.59	4.04	10.71	6.04	8.49	-3.19
Difference	7.97	13.30	1.62	1.13	0.48	0.80	-0.93	-2.41	-0.83	1.68
<b>STRS</b>	<b>4.99</b>	<b>11.35</b>	<b>2.01</b>	<b>2.42</b>	<b>2.28</b>	<b>3.60</b>	<b>2.14</b>	<b>-2.47</b>	<b>3.91</b>	<b>0.64</b>
HFRI FOF Comp Index	-6.59	-5.50	3.94	3.62	2.68	3.75	6.17	10.88	8.39	-4.02
Difference	11.58	16.85	-1.93	-1.20	-0.40	-0.15	-4.03	-13.35	-4.48	4.66
<b>HPRS</b>	<b>-8.17</b>	<b>-8.24</b>	<b>4.74</b>	<b>4.19</b>	<b>2.81</b>	<b>3.98</b>	<b>8.09</b>	<b>12.02</b>	<b>12.31</b>	<b>-5.96</b>
HFRI FOF Comp Index	-6.59	-5.50	3.94	3.62	2.68	3.75	6.17	10.88	8.39	-4.02
Difference	-1.58	-2.74	0.80	0.57	0.13	0.23	1.92	1.14	3.92	-1.94

Performance shown is net of fees. SERS Hedge Funds strategy was closed during Q3 2021.



Performance shown is net of fees.

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>-2.18</b>	<b>18.88</b>	<b>21.17</b>	<b>18.33</b>	<b>15.60</b>	<b>15.50</b>	<b>44.84</b>	<b>16.38</b>	<b>10.39</b>	<b>15.48</b>
PERS (DB) Private Equity Custom Benchmark	5.06	24.00	23.03	19.06	16.11	15.77	49.22	13.78	8.02	15.00
Difference	-7.24	-5.12	-1.86	-0.73	-0.51	-0.27	-4.38	2.60	2.37	0.48
<b>STRS</b>	<b>2.63</b>	<b>23.21</b>	<b>29.13</b>	<b>24.13</b>	<b>19.88</b>	<b>18.89</b>	<b>53.50</b>	<b>25.49</b>	<b>13.97</b>	<b>19.85</b>
STRS Private Equity Benchmark	2.96	21.31	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Difference	-0.33	1.90	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
<b>OP&amp;F</b>	<b>-4.48</b>	<b>17.35</b>	<b>24.93</b>	<b>21.94</b>	<b>18.67</b>	<b>16.94</b>	<b>54.51</b>	<b>22.30</b>	<b>13.65</b>	<b>19.82</b>
OP&F Private Equity Custom Benchmark	-4.48	17.35	24.93	21.94	18.67	16.94	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>9.48</b>	<b>34.35</b>	<b>26.18</b>	<b>22.63</b>	<b>20.12</b>	<b>19.45</b>	<b>48.06</b>	<b>15.77</b>	<b>12.76</b>	<b>18.27</b>
Burgiss All Private Equity Benchmark	8.73	22.28	22.41	18.66	15.87	15.85	44.38	12.16	8.08	16.05
Difference	0.75	12.07	3.77	3.97	4.25	3.60	3.68	3.61	4.68	2.22
<b>HPRS</b>	<b>4.51</b>	<b>15.73</b>	<b>21.50</b>	<b>16.71</b>	<b>13.88</b>	<b>12.62</b>	<b>37.63</b>	<b>20.12</b>	<b>9.66</b>	<b>8.80</b>
HPRS Private Equity Custom Benchmark	4.51	15.26	21.33	16.67	14.84	16.39	37.07	20.12	9.87	8.80
Difference	0.00	0.47	0.17	0.04	-0.96	-3.77	0.56	0.00	-0.21	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: Performance of the Private Equity portfolio in the first half of 2022 was reduced by 6.02% because of a change in the methodology used for cash distributions from private equity and real estate funds.

**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>18.35</b>	<b>24.60</b>	<b>9.56</b>	<b>8.70</b>	<b>0.47</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)	18.44	24.27	8.29	7.89	-0.24	N/A	35.46	-23.72	17.63	-13.82
Difference	-0.09	0.33	1.27	0.81	0.71	N/A	1.53	1.76	-0.09	0.23
<b>PERS (DB) Risk Parity</b>	<b>-23.88</b>	<b>-20.40</b>	<b>-1.50</b>	<b>3.32</b>	<b>3.75</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	-24.38	-21.43	-2.10	1.86	3.28	N/A	11.56	5.25	29.93	-10.07
Difference	0.50	1.03	0.60	1.46	0.47	N/A	0.38	0.71	0.37	0.14
<b>PERS (DB) Opportunistic</b>	<b>-11.80</b>	<b>-8.30</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	-13.35	-8.93	N/A	N/A	N/A	N/A	12.63	N/A	N/A	N/A
Difference	1.55	0.63	N/A	N/A	N/A	N/A	-1.04	N/A	N/A	N/A
<b>PERS (HC 115) Commodities</b>	<b>18.35</b>	<b>24.60</b>	<b>9.56</b>	<b>8.70</b>	<b>0.47</b>	<b>-2.74</b>	<b>36.99</b>	<b>-21.96</b>	<b>17.54</b>	<b>-13.59</b>
S&P Goldman Sachs Commodity Index (TR)	18.44	24.27	8.29	7.89	-0.24	-3.51	35.46	-23.72	17.63	-13.82
Difference	-0.09	0.33	1.27	0.81	0.71	0.77	1.53	1.76	-0.09	0.23
<b>PERS (HC 115) Risk Parity</b>	<b>-23.88</b>	<b>-20.40</b>	<b>-1.50</b>	<b>3.32</b>	<b>3.75</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	-24.38	-21.43	-2.10	1.86	3.28	N/A	11.56	5.25	29.93	-10.07
Difference	0.50	1.03	0.60	1.46	0.47	N/A	0.38	0.71	0.37	0.14
<b>PERS (HC 115) Opportunistic</b>	<b>-11.80</b>	<b>-8.30</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	-13.35	-8.93	N/A	N/A	N/A	N/A	12.63	N/A	N/A	N/A
Difference	1.55	0.63	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>	2.15	11.80	8.67	7.34	6.21	6.96	23.68	-1.50	5.93	4.74
STRS Opportunistic/Diversified Blended Benchmark	1.86	8.29	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Difference	0.29	3.51	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
<b>OP&amp;F Real Assets</b>	7.28	13.65	6.05	6.27	5.28	4.94	9.36	-0.28	5.80	10.45
OP&F Real Assets Custom Benchmark	9.40	13.10	7.36	6.98	7.14	N/A	9.84	-0.11	12.27	0.40
Difference	-2.12	0.55	-1.31	-0.71	-1.86	N/A	-0.48	-0.17	-6.47	10.05
<b>OP&amp;F MLPs</b>	13.11	13.99	3.91	2.59	-0.13	N/A	41.02	-26.09	13.46	-13.10
Alerian MLP Index	13.24	10.71	6.61	3.58	0.56	N/A	39.35	-23.37	17.21	-12.42
Difference	-0.13	3.28	-2.70	-0.99	-0.69	N/A	1.67	-2.72	-3.75	-0.68
<b>OP&amp;F Gold</b>	-1.70	1.08	N/A	N/A	N/A	N/A	-3.62	N/A	N/A	N/A
S&P GSCI Gold Index Minus the Cost of Financing	-2.03	0.73	N/A	N/A	N/A	N/A	-4.41	N/A	N/A	N/A
Difference	0.33	0.35	N/A	N/A	N/A	N/A	0.79	N/A	N/A	N/A
<b>SERS Opportunistic &amp; Tactical Portfolio</b>	-0.04	6.72	7.42	7.82	6.94	N/A	22.04	0.96	5.47	5.33
SERS Opportunistic Custom Benchmark	-9.06	-8.29	-1.11	2.20	3.32	N/A	0.46	0.36	16.04	-2.03
Difference	9.02	15.01	8.53	5.62	3.62	N/A	21.58	0.60	-10.57	7.36
<b>HPRS Real Assets</b>	13.18	26.00	14.36	9.07	N/A	N/A	29.85	-1.80	12.89	-6.64
HPRS Real Assets Custom Benchmark (Net)	13.01	25.57	14.04	9.86	N/A	N/A	29.17	-1.80	12.54	-0.53
Difference	0.17	0.43	0.32	-0.79	N/A	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

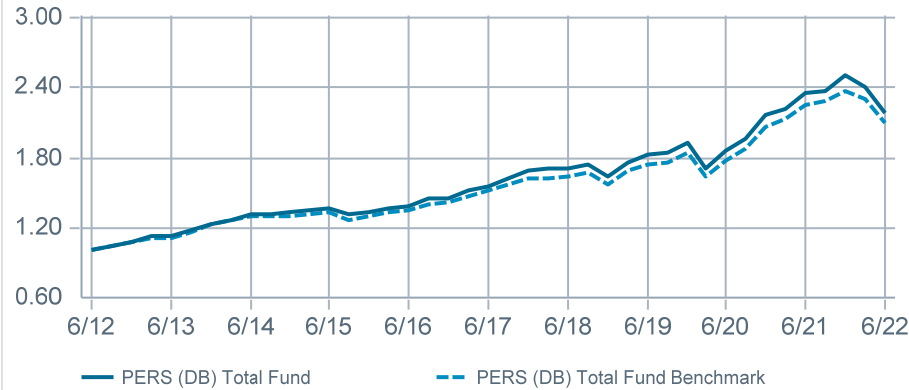




**Summary**

- PERS (DB) has generated an annualized 0.11% of alpha over the trailing 5-year period and 0.29% 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**



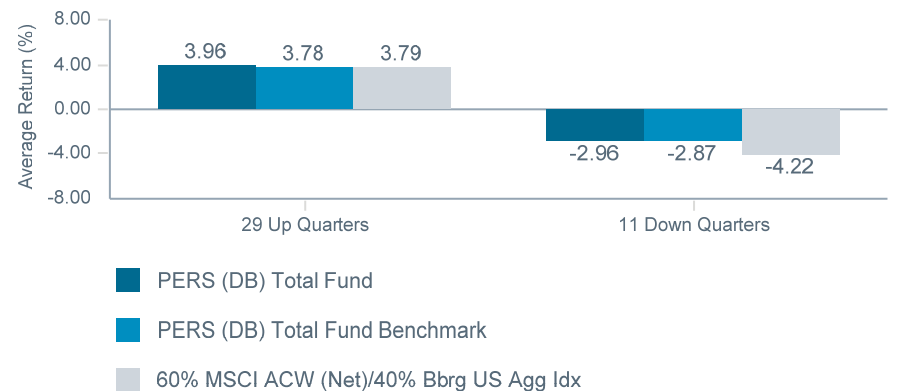
**MPT Stats**

	5 Years	10 Years
Maximum Return	10.35	10.35
Minimum Return	-11.66	-11.66
Standard Deviation	11.14	8.49
vs. PERS (DB) Total Fund Benchmark		
Info Ratio	0.23	0.50
Tracking Error	1.07	0.87
Alpha	0.11	0.29
vs. S&P 500 Index (Cap Wtd)		
Beta	0.54	0.53
vs. ICE BofAML 3 Mo US T-Bill Index		
Sharpe Ratio	0.56	0.89

**Asset Allocation vs. Targets**

	Market Value (\$)	Allocation (%)	Target (%)
US Equity	20,805,420,500	22.19	23.40
International Equity	19,745,505,853	21.06	23.00
Core Fixed Income	9,368,465,494	9.99	11.00
U.S. Treasury	2,071,480,621	2.21	3.00
High Yield	1,812,154,128	1.93	2.00
Global High Yield	6,681	0.00	0.00
EMD	2,824,587,579	3.01	4.00
Floating Rate Debt	535,830	0.00	0.00
Securitized Debt	1,273,132,226	1.36	1.00
TIPS	2,966,608,250	3.16	3.00
Real Estate	11,278,475,227	12.03	10.00
REITs	847,683,453	0.90	1.00
Hedge Funds	61,361,140	0.07	0.00
Opportunistic	486,583,776	0.52	0.60
Commodities	1,765,680,084	1.88	1.00
Private Equity	13,656,562,458	14.56	12.00
Risk Parity	4,094,357,746	4.37	5.00
Cash Equivalents	698,572,545	0.74	0.00
Additional Annuity	15,107,708	0.02	0.00
Other Pension Assets	46,163	0.00	0.00
Rebalancing	727	0.00	0.00
Total Fund	93,772,328,188	100.00	100.00

**Up/Down Markets - 10 Years**

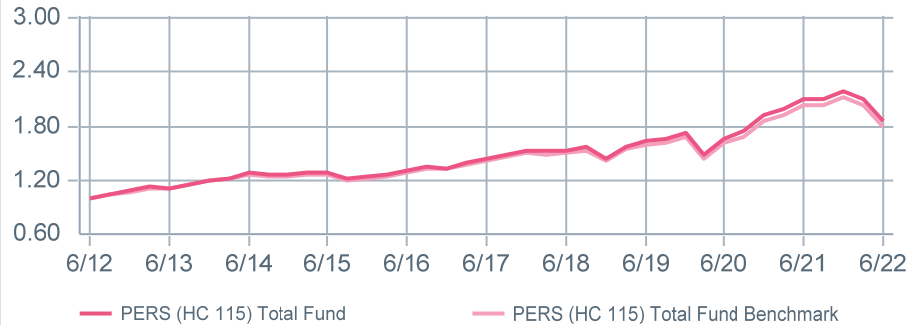


Performance shown is gross of fees. Calculations are based on quarterly periodicity. Allocations shown may not sum up to 100% exactly due to rounding.

**Summary**

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

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



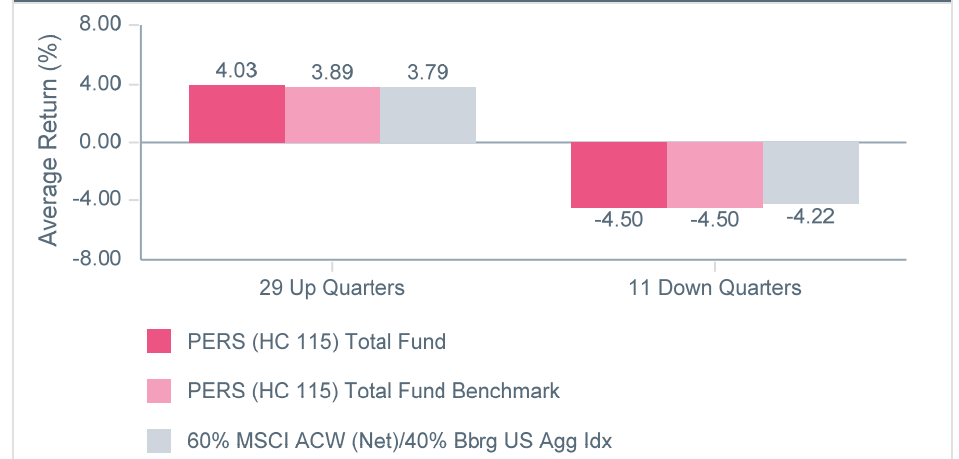
**MPT Stats**

	<b>10 Years</b>
Maximum Return	12.24
Standard Deviation	10.10
Minimum Return	-14.63
vs. PERS (HC 115) Total Fund Benchmark	
Info Ratio	0.99
Tracking Error	0.40
Alpha	0.38
vs. S&P 500 Index (Cap Wtd)	
Beta	0.61
vs. ICE BofAML 3 Mo US T-Bill Index	
Sharpe Ratio	-0.98

**Asset Allocation vs. Targets**

	Market Value (\$)	Allocation (%)	Target (%)
US Equity	3,220,564,337	26.99	27.40
International Equity	2,833,609,752	23.75	25.00
Core Fixed Income	2,125,532,580	17.81	17.00
EMD	134,645,894	1.13	2.00
High Yield	480,128,232	4.02	4.00
Floating Rate Debt	139,629	0.00	0.00
Securitized Debt	293,125,734	2.46	2.00
TIPS	941,741,424	7.89	7.00
Global High Yield	33,117	0.00	0.00
REITs	771,454,383	6.47	7.00
Hedge Funds	2,584,336	0.02	0.00
Opportunistic	66,352,333	0.56	0.60
Commodities	581,902,588	4.88	4.00
Risk Parity	217,458,317	1.82	2.00
Cash Equivalents	62,658,700	0.53	0.00
U.S. Treasury	200,735,451	1.68	2.00
Rebalancing	-	0.00	0.00
<b>Total Fund</b>	<b>11,932,666,806</b>	<b>100.00</b>	<b>100.00</b>

**Up/Down Markets - 10 Years**

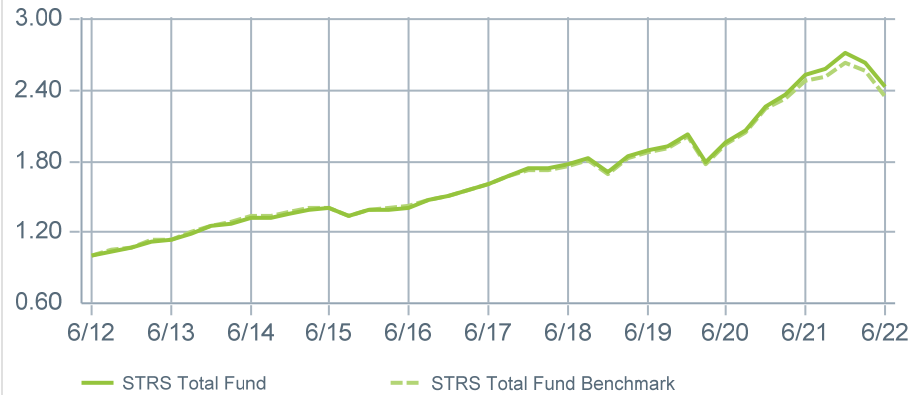


Performance shown is gross of fees. Calculations are based on quarterly periodicity. Allocations shown may not sum up to 100% exactly due to rounding.

**Summary**

- STRS has generated 0.74% of alpha over the trailing 5-year period and 0.45% of alpha over the trailing 10-year period.
- Relative to a 60 Equity/40 Bond portfolio, the plan has exhibited larger up-market capture and smaller down-market capture characteristics over the past 10 years.

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



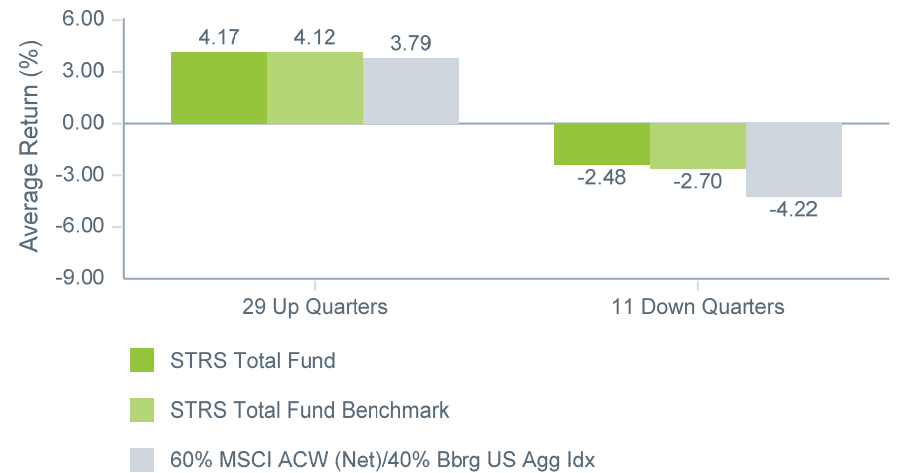
**MPT Stats**

	5 Years	10 Years
Maximum Return	10.00	10.00
Minimum Return	-11.51	-11.51
Standard Deviation	10.90	8.34
vs. STRS Total Fund Benchmark		
Info Ratio	1.37	0.79
Tracking Error	0.54	0.50
Alpha	0.74	0.45
vs. S&P 500 Index (Cap Wtd)		
Beta	0.54	0.54
vs. ICE BofAML 3 Mo US T-Bill Index		
Sharpe Ratio	0.71	1.03

**Asset Allocation vs. Targets**

	Market Value (\$)	Allocation (%)	Target (%)
US Equity	23,578,406,975	26.91	28.00
International Equity	19,106,381,112	21.81	23.00
Fixed Income	14,976,008,394	17.09	21.00
Real Estate	9,437,272,099	10.77	10.00
Opportunistic (Incl. Hedge Funds)	7,980,794,337	9.11	10.00
Private Equity	11,051,249,849	12.61	7.00
Cash Equivalents	1,485,416,856	1.70	1.00
Total Fund	87,615,529,622	100.00	100.00

**Up/Down Markets - 10 Years**

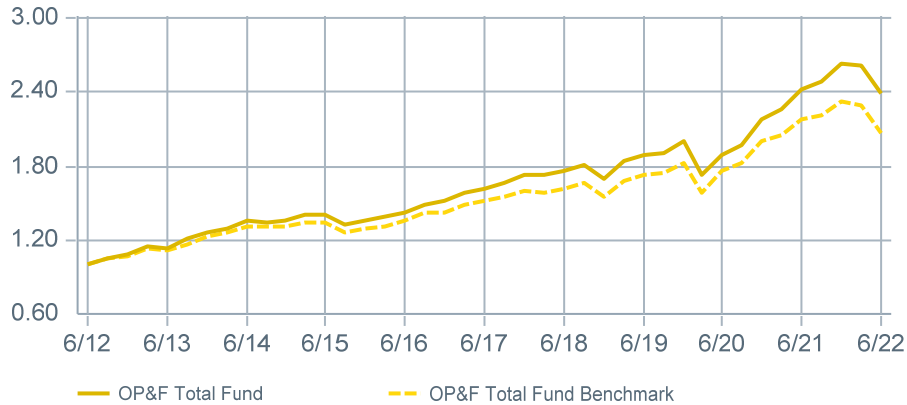


Performance shown is gross of fees. Calculations are based on quarterly periodicity. Allocations shown may not sum up to 100% exactly due to rounding.

**Summary**

- OP&F has generated 1.58% of alpha over the trailing 5-year period and 1.49% 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**



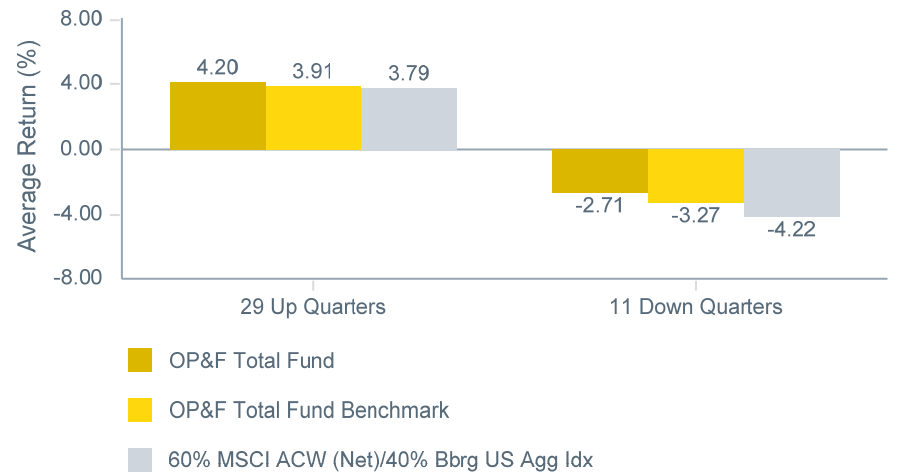
**MPT Stats**

	5 Years	10 Years
Maximum Return	10.66	10.66
Minimum Return	-13.55	-13.55
Standard Deviation	11.39	8.84
vs. OP&F Total Fund Benchmark		
Info Ratio	1.16	1.24
Tracking Error	1.36	1.19
Alpha	1.58	1.49
vs. S&P 500 Index (Cap Wtd)		
Beta	0.55	0.55
vs. ICE BofAML 3 Mo US T-Bill Index		
Sharpe Ratio	0.64	0.96

**Asset Allocation vs. Targets**

	Market Value (\$)	Allocation (%)	Target (%)
US Equity	3,715,404,107	21.70	18.24
International Equity	2,276,558,620	13.29	11.20
High Yield Fixed Income	1,264,802,507	7.39	6.80
US TIPS	1,598,592,076	9.33	13.60
Core Fixed Income	1,651,519,231	9.64	18.40
Private Credit	484,656,844	2.83	2.80
Real Estate	2,014,743,088	11.77	9.60
Private Markets	1,551,979,634	9.06	6.40
MLPs	1,041,016,057	6.08	4.00
Real Assets	783,078,851	4.57	4.00
Gold	119,559,306	0.70	4.96
Cash Equivalents	622,955,866	3.64	0.00
Total Fund	17,124,866,187	100.00	100.00

**Up/Down Markets - 10 Years**

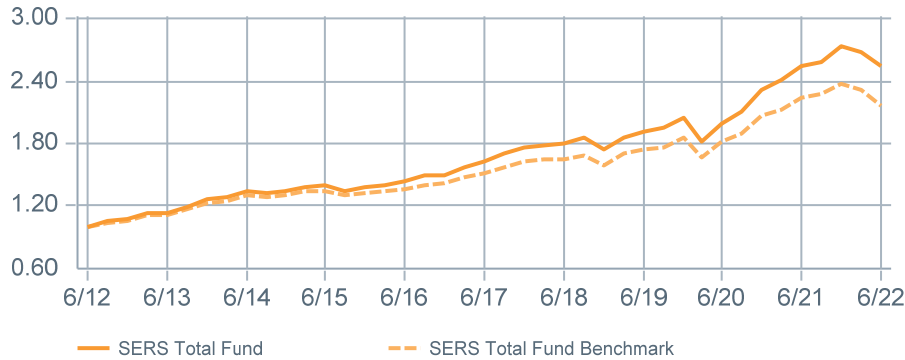


Performance shown is gross of fees. Calculations are based on quarterly periodicity. Allocations shown may not sum up to 100% exactly due to rounding. OP&F's target allocations are based on notional value, and have been scaled to 100% for this report.

**Summary**

- SERS has generated 1.43% of alpha over the trailing 5-year period and 1.06% 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**



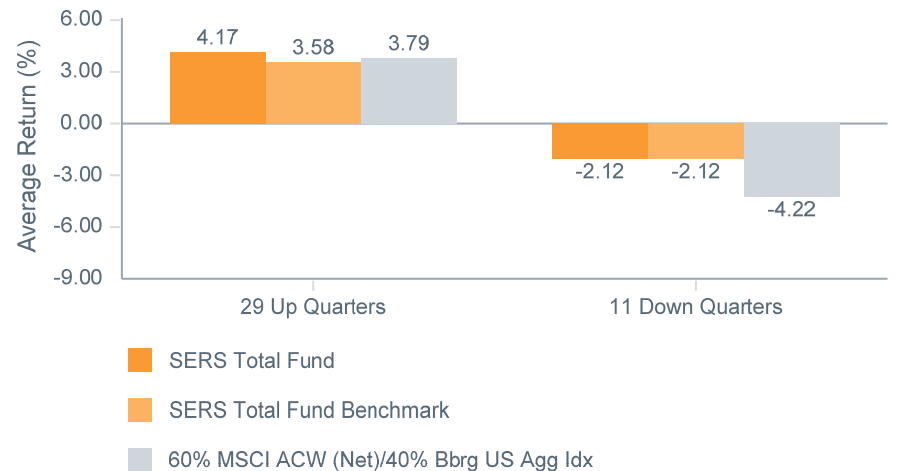
**MPT Stats**

	5 Years	10 Years
Maximum Return	9.94	9.94
Minimum Return	-11.00	-11.00
Standard Deviation	10.01	7.79
vs. SERS Total Fund Benchmark		
Info Ratio	1.59	1.51
Tracking Error	1.20	1.12
Alpha	1.43	1.06
vs. S&P 500 Index (Cap Wtd)		
Beta	0.49	0.49
vs. ICE BofAML 3 Mo US T-Bill Index		
Sharpe Ratio	0.82	1.15

**Asset Allocation vs. Targets**

	Market Value (\$)	Allocation (%)	Target (%)
US Equity	3,786,608,069	22.10	24.75
International Equity	3,232,411,753	18.86	20.25
Fixed Income	2,163,869,741	12.63	19.00
Private Credit	795,616,273	4.64	5.00
Real Estate	3,585,202,183	20.92	17.00
Opportunistic Investments	828,957,262	4.84	0.00
Private Equity	2,215,420,053	12.93	12.00
Cash Equivalents	529,377,390	3.09	2.00
Total Fund	17,137,462,723	100.00	100.00

**Up/Down Markets - 10 Years**

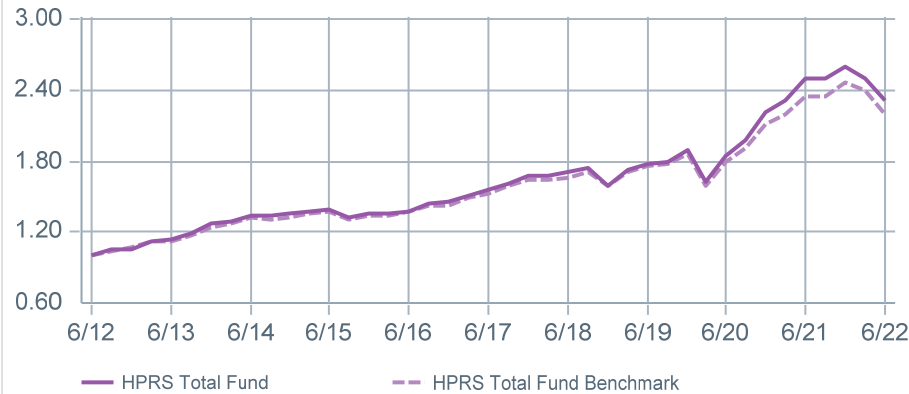


Performance shown is gross of fees. Calculations are based on quarterly periodicity. Allocations shown may not sum up to 100% exactly due to rounding.

**Summary**

- HPRS has generated .41% of alpha over the trailing 5-year period and .12% 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**



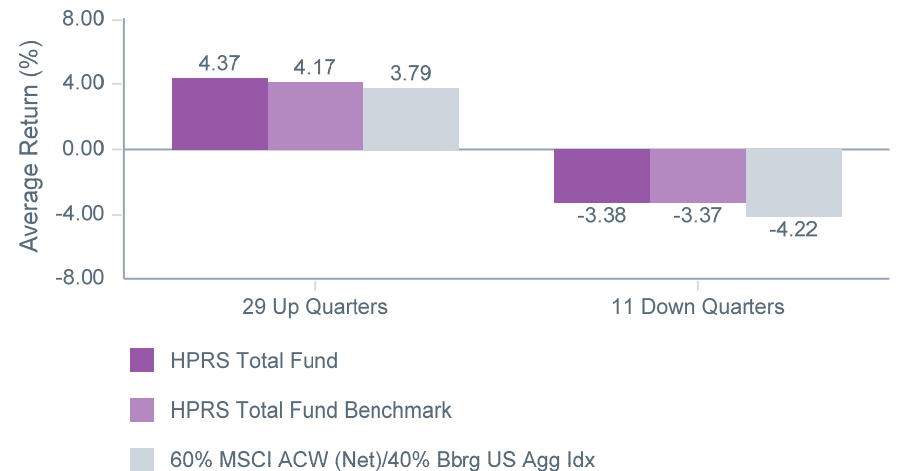
**MPT Stats**

	5 Years	10 Years
Maximum Return	13.60	13.60
Minimum Return	-14.84	-14.84
Standard Deviation	13.51	10.20
vs. HPRS Total Fund Benchmark		
Info Ratio	0.61	0.50
Tracking Error	1.35	1.15
Alpha	0.41	0.12
vs. S&P 500 Index (Cap Wtd)		
Beta	0.66	0.66
vs. ICE BofAML 3 Mo US T-Bill Index		
Sharpe Ratio	0.57	0.81

**Asset Allocation vs. Targets**

	Market Value (\$)	Allocation (%)	Target (%)
US Equity	200,603,510	20.31	20.00
International Equity	51,034,101	5.17	6.00
Global Equity	195,790,947	19.83	24.00
Fixed Income	111,932,371	11.33	15.00
Real Estate	75,471,569	7.64	8.00
Hedge Funds	83,756,829	8.48	7.00
Private Equity	177,386,237	17.96	14.00
Real Assets	41,638,685	4.22	3.00
Cash Equivalents	49,923,716	5.06	3.00
Total Fund	987,537,965	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.

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

As of June 30, 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>987,538</b>	<b>-11.12</b>	<b>-7.43</b>	<b>8.94</b>	<b>8.20</b>	<b>7.47</b>	<b>8.71</b>	<b>16.91</b>	<b>16.86</b>	<b>18.85</b>	<b>-4.57</b>
HPRS Total Fund Benchmark		-11.06	-6.41	7.56	7.43	6.98	8.15	16.61	13.16	17.85	-3.38
Difference		-0.06	-1.02	1.38	0.77	0.49	0.56	0.30	3.70	1.00	-1.19
<i>All Public Plans &gt; \$1B-TF Median</i>		<b>-11.53</b>	<b>-7.03</b>	<b>6.81</b>	<b>7.22</b>	<b>7.05</b>	<b>8.08</b>	<b>15.52</b>	<b>12.05</b>	<b>17.30</b>	<b>-3.14</b>
Rank		49	56	13	20	30	25	37	3	24	76
Population		179	175	172	168	164	158	214	239	233	190
<i>All Public Plans \$250M to \$1B-TF Median</i>		<b>-14.16</b>	<b>-10.47</b>	<b>5.73</b>	<b>6.46</b>	<b>6.40</b>	<b>7.83</b>	<b>14.05</b>	<b>13.05</b>	<b>18.72</b>	<b>-4.48</b>
Rank		15	20	1	3	8	11	15	10	45	54
Population		108	108	106	102	100	97	128	141	148	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 06/30/2022

	(annualized fees shown in basis points)							
	Domestic Equity	Global Equity	International Equity	Fixed Income	Real Estate	Private Equity	Hedge Funds	Other Alternatives
 PERS (DB)	2	-	24	6	105	53	147	44
 PERS (HC 115)	0	-	3	1	-	-	6	2
 STRS	12	-	20	5	44	82	56	60
 OP&F	48	-	44	30	78	75	-	68
 SERS	14	-	51	53	76	101	-	114
 HPRS	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, Private Equity, and Hedge Funds 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 0.35 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 06/30/2022

Percentage of Assets Managed by External Managers - As of 06/30/2022								
	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%	77%	21%	93%	100%	100%	67%
<span style="color: red;">■</span> PERS (HC 115)	26%	4%	77%	12%	-	-	100%	27%
<span style="color: green;">■</span> STRS	36%	9%	47%	11%	13%	100%	100%	86%
<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 45% 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 06/30/2022

Percentage of Assets Actively Managed - As of 06/30/2022								
	Total Fund	Domestic Equity	International Equity	Fixed Income	Real Estate	Private Equity	Hedge Funds	Other Alternatives
<span style="color: blue;">■</span> PERS (DB)	72%	17%	82%	85%	93%	100%	100%	72%
<span style="color: red;">■</span> PERS (HC 115)	54%	17%	82%	78%	-	-	100%	33%
<span style="color: green;">■</span> STRS	88%	66%	100%	100%	91%	100%	100%	100%
<span style="color: yellow;">■</span> OP&F	81%	71%	100%	50%	100%	100%	-	100%
<span style="color: orange;">■</span> SERS	80%	26%	82%	100%	97%	100%	100%	100%
<span style="color: purple;">■</span> HPRS	84%	20%	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:

- 23.4% 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% PERS (DB) REITs Custom Benchmark
- 12.0% PERS (DB) Private Equity Custom Benchmark
- 0.6% 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:

- 27.4% 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
- 0.6% 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:

- 28.0% Russell 3000 Index
- 23.0% MSCI World Ex US Index (50% Hedged)/ MSCI Emg Mkts Index
- 21.0% STRS Fixed Income Blended Benchmark
- 10.0% STRS Real Estate Custom Benchmark
- 17.0% 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
- 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.

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**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

**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.

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