



# Investment Performance Analysis

## Ohio Retirement Study Council

Period Ended: December 31, 2020



## INDEX GLOSSARY

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

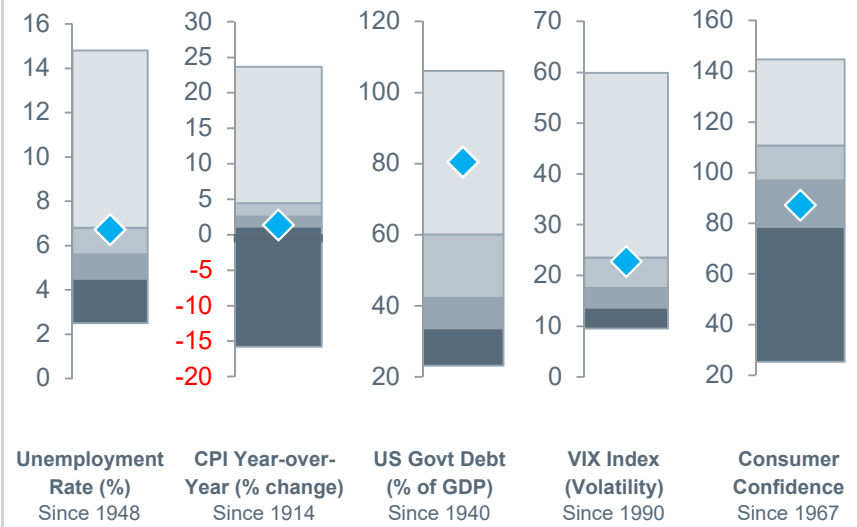
# Capital Markets Review



**Fourth Quarter Economic Environment**

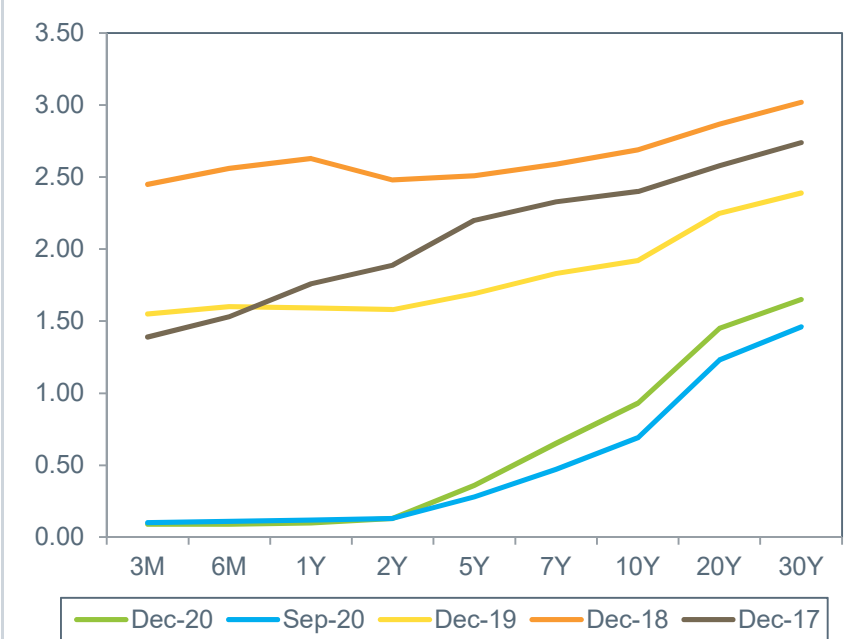
In Q4, multiple fundamental developments reinforced market sentiment and kept many investors positioned to add incremental risk despite the relatively weak economic environment and worsening global pandemic. Importantly, two closely watched coronavirus vaccine trials from Pfizer/BioNTech and Moderna released promising efficacy results leading to emergency use authorizations from the FDA, allowing market participants to pull forward expectations for normalized economic activity for much of the developed world in 2021. Investors also reacted favorably to completed negotiations around new fiscal stimulus following the November US elections, which culminated in a \$900B package being signed into law under a larger omnibus spending bill. The package included new supplemental unemployment benefits of \$300 per week for the 6.7% of unemployed Americans, as well as another one-time round of stimulus checks in the amount of \$600 for most individuals. The Fed reiterated its commitment to maintain monthly asset purchases, currently at \$120B, and zero interest rates until the economy makes significant progress toward its goal of full employment. Given the backdrop of supportive monetary and fiscal policies, risk assets posted another quarter of stellar returns. Though financial markets have rebounded from the sharp drawdown in early 2020, global economic activity remains well off its pre-pandemic peak.

**Key Economic Indicators**



Economic Indicators	Dec-20	Sep-20	Dec-19	Dec-17	20 Yr
Federal Funds Rate (%)	0.09	0.09	1.55	1.33	1.49
Breakeven Infl. - 5 Yr (%)	1.97 ▲	1.49	1.70	1.88	1.82
Breakeven Infl. - 10 Yr (%)	1.99 ▲	1.63	1.79	1.98	2.01
CPI YoY (Headline) (%)	1.4	1.4	2.3	2.1	2.1
Unemployment Rate (%)	6.7 ▼	7.8	3.6	4.1	6.1
Real GDP YoY (%)	-2.5 ▲	-2.8	2.3	2.7	1.7
PMI - Manufacturing	60.5 ▲	55.7	47.7	59.2	52.6
USD Total Wtd Idx	111.56 ▼	117.26	114.68	110.08	103.23
WTI Crude Oil per Barrel (\$)	48.5 ▲	40.2	61.1	60.4	62.4
Gold Spot per Oz (\$)	1,898 ▲	1,886	1,517	1,303	1,009

**Treasury Yield Curve (%)**



Market Performance (%)	QTD	CYTD	1 Yr	5 Yr	10 Yr
S&P 500 (Cap Wtd)	12.15	18.40	18.40	15.22	13.88
Russell 2000	31.37	19.96	19.96	13.26	11.20
MSCI EAFE (Net)	16.05	7.82	7.82	7.45	5.51
MSCI EAFE SC (Net)	17.27	12.34	12.34	9.40	7.85
MSCI Emg Mkts (Net)	19.70	18.31	18.31	12.81	3.63
Bloomberg US Agg Bond	0.67	7.51	7.51	4.44	3.84
ICE BofAML 3 Mo US T-Bill	0.03	0.67	0.67	1.20	0.63
NCREIF ODCE (Gross)	1.30	1.19	1.19	6.21	9.88
FTSE NAREIT Eq REIT (TR)	11.57	-8.00	-8.00	4.77	8.31
HFRI FOF Comp	8.09	10.86	10.86	4.55	3.32
Bloomberg Cmnty (TR)	10.19	-3.12	-3.12	1.03	-6.50



**Fourth Quarter Review**

**Broad Market**

US equity markets finished strong in Q4 following a period of heightened volatility earlier in the quarter. Negotiations around another US fiscal stimulus package stalled in October and spikes in coronavirus infections contributed to the S&P 500 Index returning -2.7% for the month. In the latter half of the quarter, optimism around vaccine authorization, the announcement of additional stimulus in December, and the prospect of further fiscal support drove positive investor sentiment.

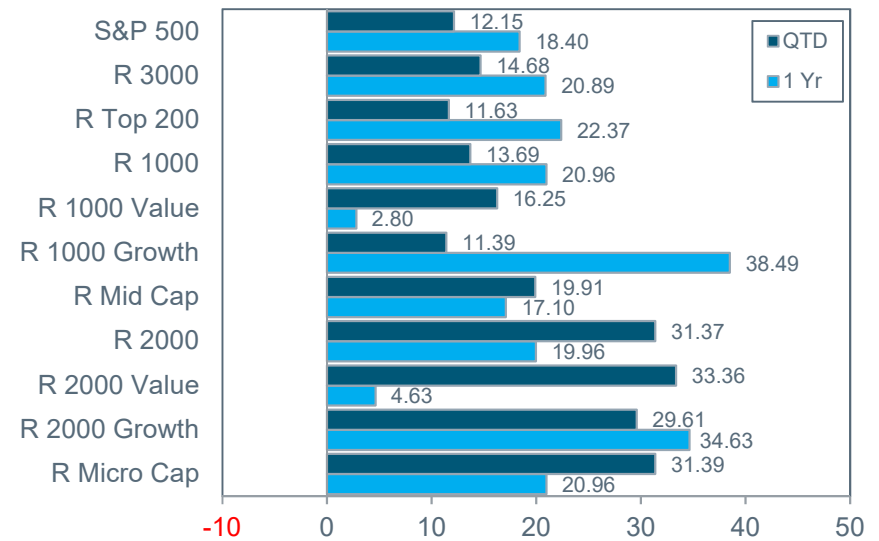
**Market Cap**

Additionally, small-cap stocks fared best in Q4, a reversal of what was seen in Q3. The prospect of lockdowns easing in 2021 also contributed to strong performance for small-cap stocks, with the Russell 2000 Index up 31.4% relative to the S&P 500 Index returning 12.1%.

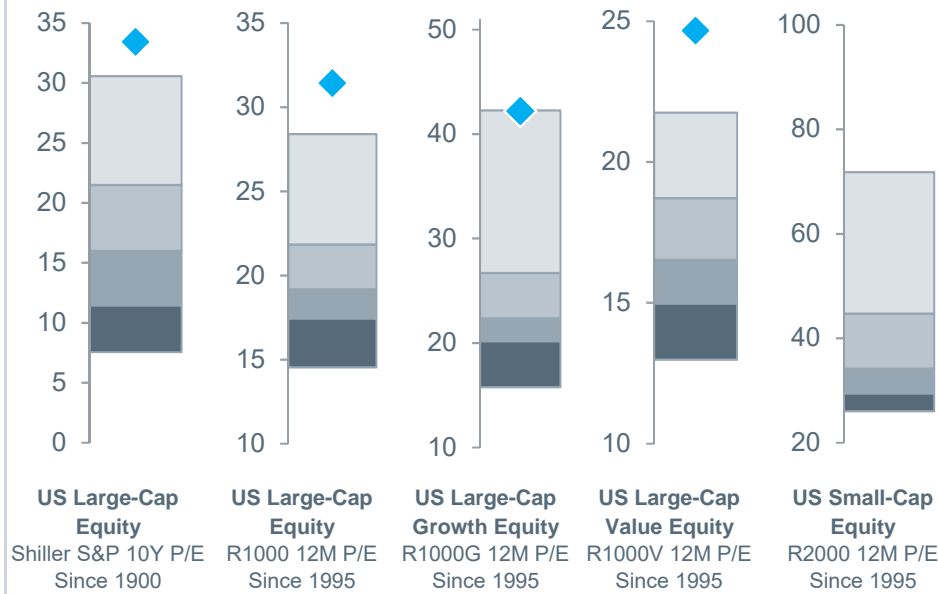
**Style and Sector**

This quarter marked the end of a consistent string of growth-led quarters, with value stocks outperforming their growth counterparts.

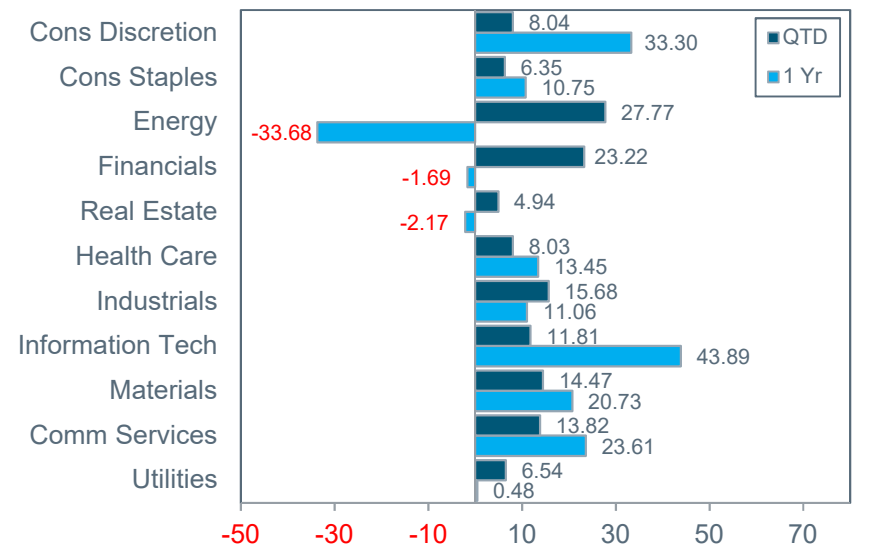
**Style and Capitalization Market Performance (%)**



**Valuations**



**S&P 500 Index Sector Performance (%)**



Valuation data courtesy of Bloomberg Professional Service and Robert J. Shiller, Irrational Exuberance, Second Edition. P/E metrics shown represent the 5th through 95th percentiles to minimize the effect of outliers. Current R2000 P/E is unavailable due to negative earnings per share as of 12/31/2020.



**Fourth Quarter Review**

**Developed Markets**

Developed international markets had another strong quarter of returns. Value stocks outperformed growth, while small stocks beat their larger counterparts. Nearly all developed market countries saw double digit positive returns for the quarter. Active management saw split results during the quarter, with a majority of small-cap developed international equity managers beating their benchmarks while the majority of large-cap managers underperformed.

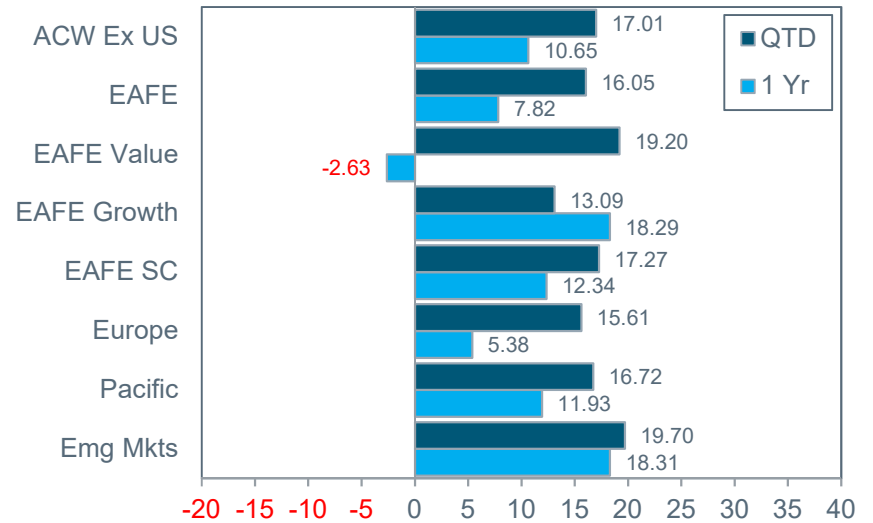
**Emerging Markets**

Emerging markets outpaced developed during the quarter continuing the trend for the third quarter in a row. Emerging market value stocks outperformed growth, while small stocks continued their outperformance of large since Q2. All sectors posted positive performance for the quarter led by technology, but more value-oriented sectors were not far behind.

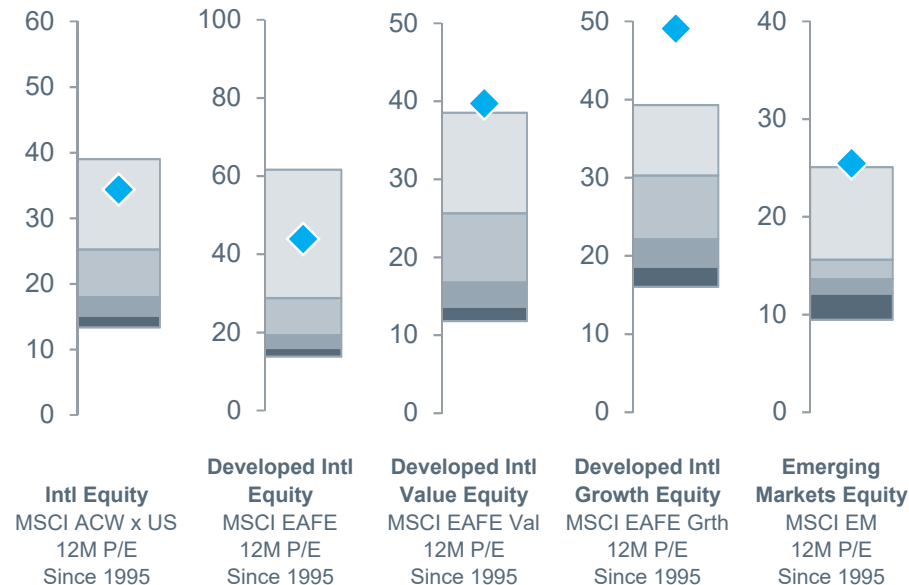
**Market Cap & Style**

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

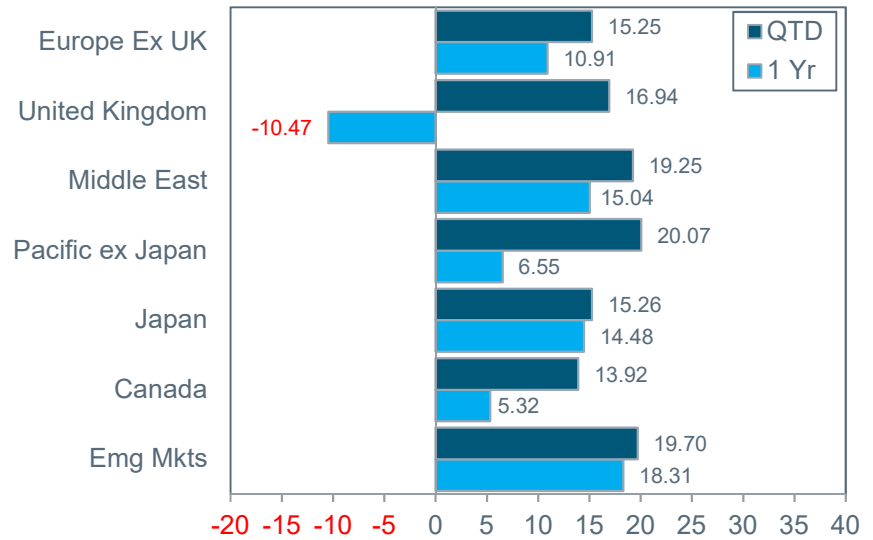
**MSCI Style and Capitalization Market Performance (%)**



**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.





**Fourth Quarter Review**

**Broad Market**

The Bloomberg US Aggregate Index returned a modest 0.7% in Q4, capping off a 7.5% YTD return and an overall strong year for US fixed income, supported by record fiscal and monetary stimulus. In Q4, the Treasury yield curve steepened as front end rates remained anchored near zero, a sign of the Federal Reserve’s continued support, while yields for intermediate- and long-dated maturities increased over Q4.

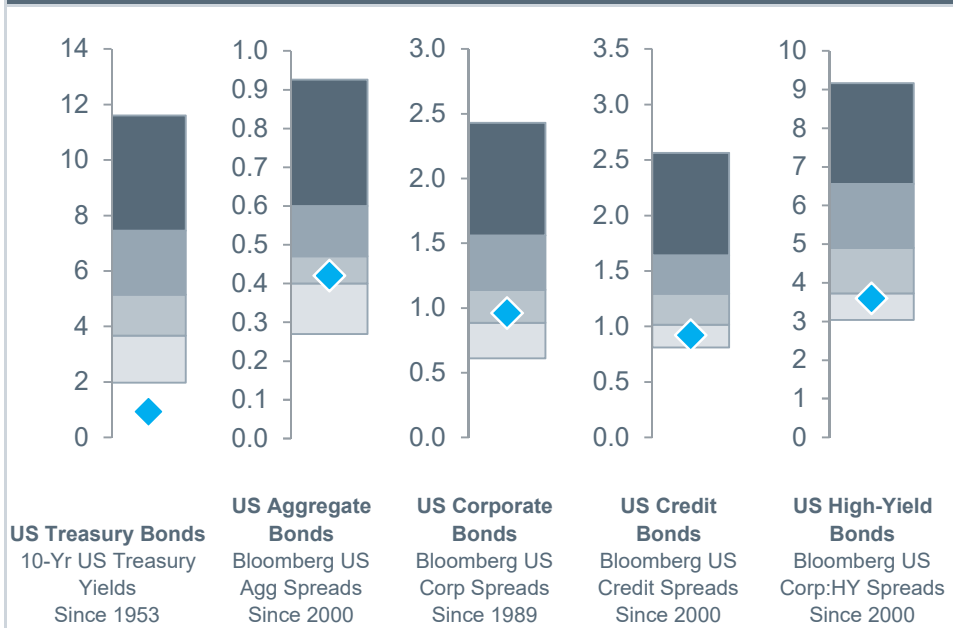
**Credit Market**

The Bloomberg US Credit Index returned 2.8% for Q4 2020, outperforming the broader fixed income market. Despite record-setting new issuance, credit spreads continued to tighten, compressing to 92 bps.

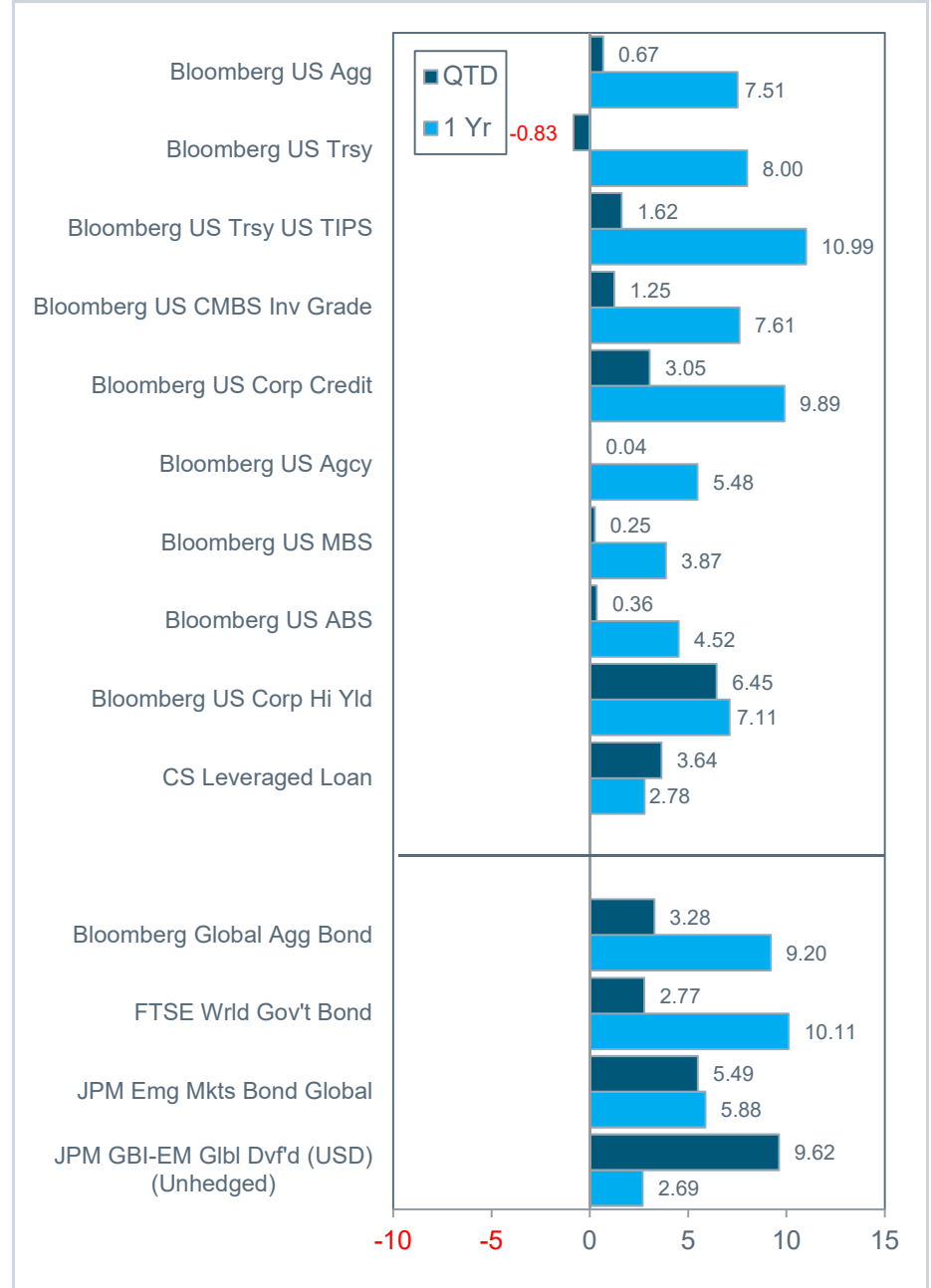
**Emerging Market Debt**

Emerging market debt also ended the year on a high note, with the JPM EMBI Global Diversified Index returning 5.8% for the quarter. However, the hard currency index was overshadowed by its local currency counterpart.

**Valuations**



**Fixed Income Performance (%)**



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



**Fourth Quarter Review - Absolute Return**

**General Market - Hedge Funds**

The hedge fund industry posted double digit gains in back to back years for the first time since 2009-2010 as the HFRI Fund Weighted Composite Index returned 10.7% in Q4, bringing YTD returns to 11.6%. Equity Long/Short (“ELS”) managers led the way, reporting a Q4 return of 14.5% and a full-year return of 17.5% in one of the best alpha-generating years for fundamental equity managers in recent memory.

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

Performance across GTAA strategies RVK follows closely generated positive absolute returns during the quarter ranging from mid-single digits to low double-digits. Long-biased strategies reported mixed performance versus a static and less diversified blend of 60% US equity and 40% US fixed income. Broadly speaking, strategies that have kept higher levels of risk and equity exposure have tended to outperform peers that opted to keep equity allocations relatively muted.

**Fourth Quarter Review - Real Assets**

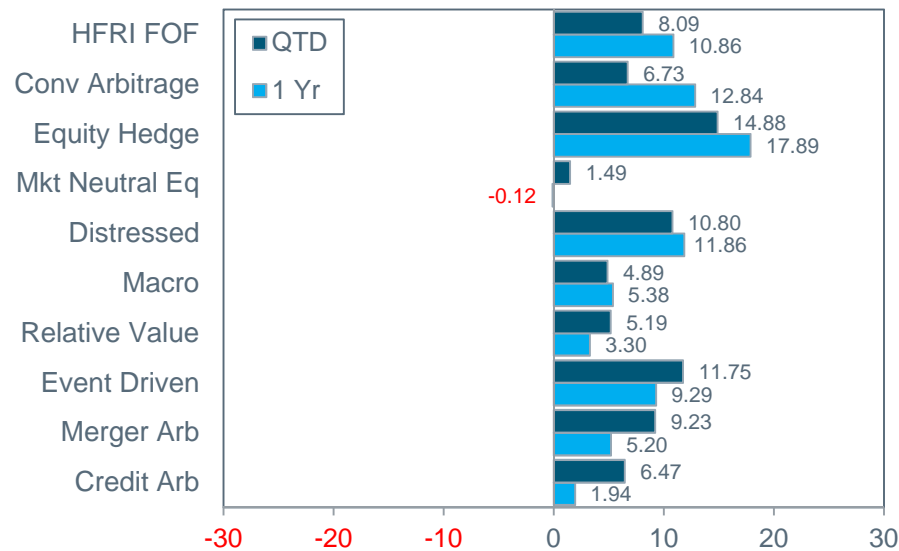
**General Market - Diversified Inflation Strategies (DIS)**

Performance for DIS managers that RVK follows closely largely generated positive absolute performance during Q4, while producing mix results for the full year. For the quarter, most traditionally inflation-sensitive asset classes were drivers of positive returns. In Q4, strategies with relatively larger allocations to segments with higher historical volatility, such as REITs, listed infrastructure and global natural resources, generated stronger relative returns versus peers.

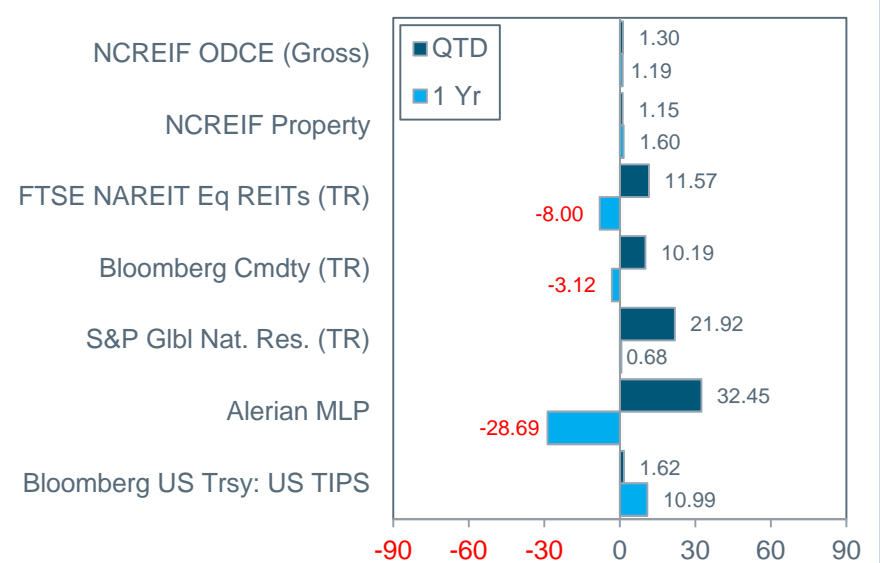
**General Market - Real Estate**

Core private real estate returned 1.3% in Q4, as reported by the NFI-ODCE Index, with the total return comprised of 0.9% income and 0.4% price appreciation. While the income component remained relatively healthy and in-line with historical levels, price appreciation rebounded meaningfully from a negative return in Q3. Investors in publicly traded real estate outperformed their private market counterparts by a meaningful margin.

**HFRI Hedge Fund Performance (%)**



**Real Asset Performance (%)**



Annual Asset Class Performance

As of December 31, 2020

	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	CYTD
Best	35.03	39.38	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
	32.18	16.23	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
	26.34	15.97	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
	19.31	11.63	-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
	18.37	11.17	-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
	16.32	10.25	-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
	15.79	6.97	-26.16	26.46	15.12	2.11	15.81	7.44	3.64	-0.27	8.52	7.77	-4.38	18.44	10.86
	11.86	6.60	-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
	10.39	5.49	-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
	4.85	5.00	-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
	4.34	1.87	-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
	2.72	1.45	-43.38	1.92	6.31	-13.32	4.21	-8.61	-4.90	-4.47	1.00	3.01	-13.79	7.69	0.67
	2.07	-1.57	-47.01	0.21	5.70	-15.94	0.11	-8.83	-4.95	-14.92	0.51	1.70	-14.58	5.34	-3.12
Worst	0.49	-15.70	-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
	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 Comdty (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

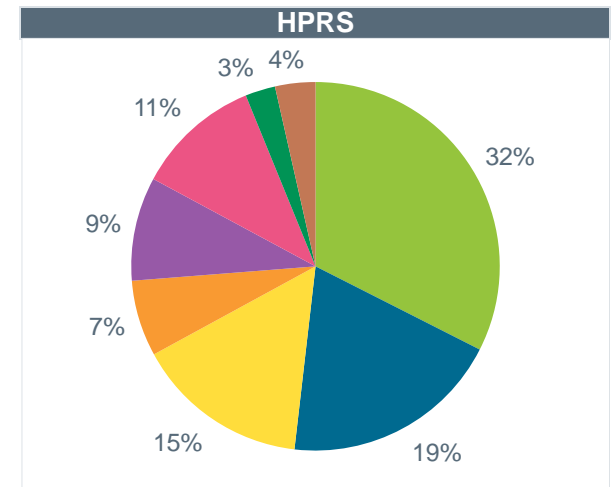
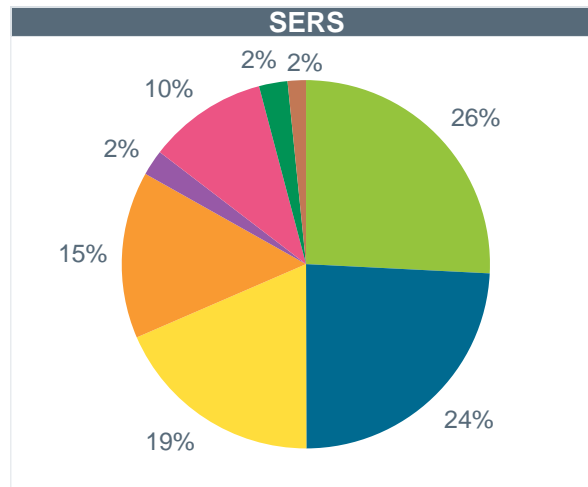
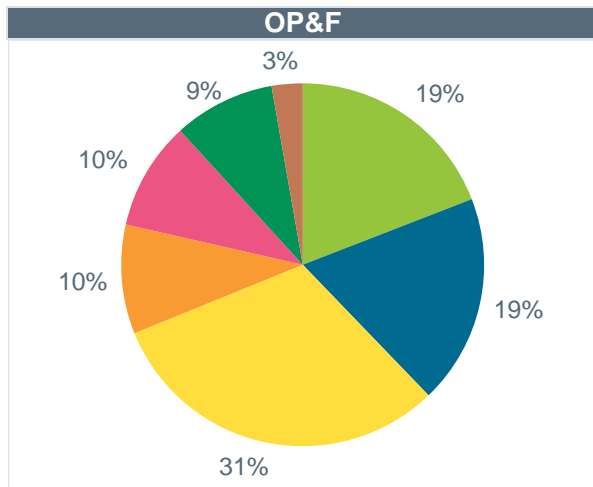
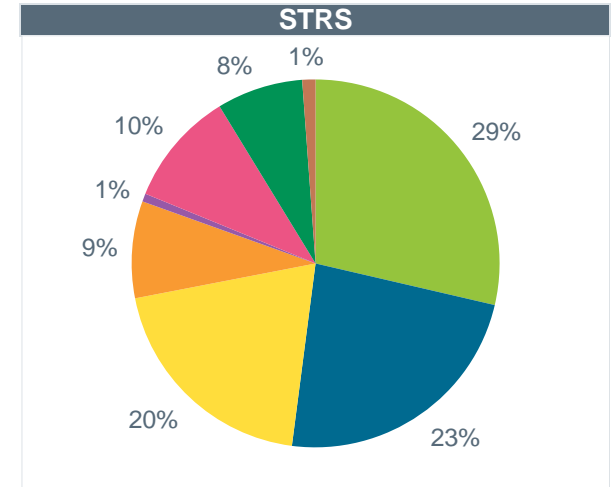
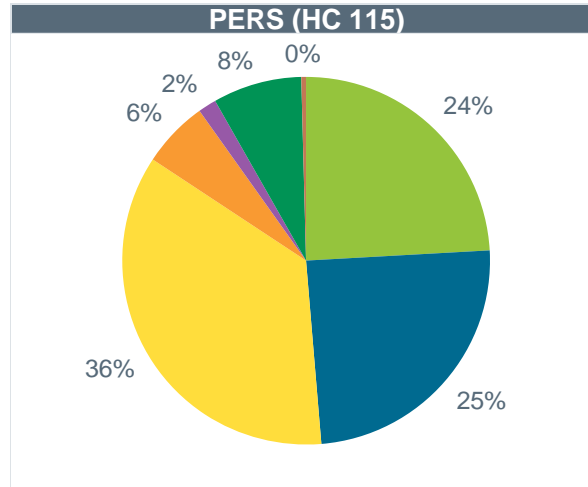
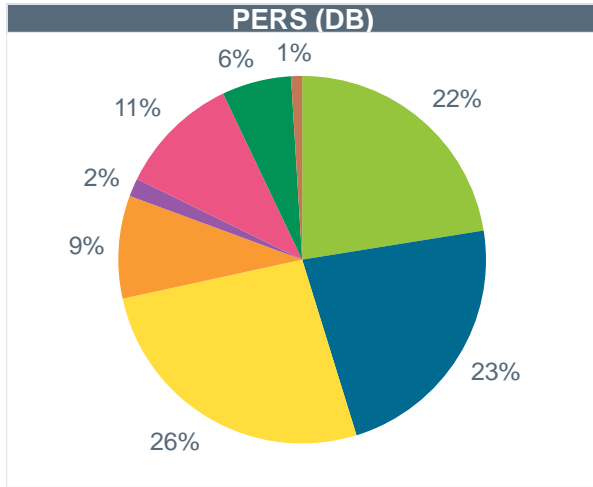


Asset Allocation & Performance - Gross of Fees											
	Market Value (\$000)	Trailing Performance (%)						Calendar Year Performance (%)			
		2 Quarters	1 Year	3 Years	5 Years	7 Years	10 Years	2019	2018	2017	2016
<b>PERS (DB)</b>	<b>98,439,420</b>	<b>16.47</b>	<b>12.11</b>	<b>8.49</b>	<b>10.15</b>	<b>8.31</b>	<b>8.76</b>	<b>17.31</b>	<b>-2.90</b>	<b>16.94</b>	<b>8.56</b>
PERS (DB) Total Fund Benchmark		15.83	11.65	8.20	9.65	7.71	8.18	17.06	-3.08	15.19	8.63
Difference		0.64	0.46	0.29	0.50	0.60	0.58	0.25	0.18	1.75	-0.07
Rank		37	49	43	33	25	32	50	45	26	25
<b>PERS (HC 115)</b>	<b>13,351,045</b>	<b>15.80</b>	<b>10.96</b>	<b>7.74</b>	<b>9.19</b>	<b>6.96</b>	<b>7.33</b>	<b>19.59</b>	<b>-5.76</b>	<b>15.25</b>	<b>7.67</b>
PERS (HC 115) Total Fund Benchmark		15.64	10.13	7.27	8.74	6.61	6.93	19.20	-5.97	14.31	7.75
Difference		0.16	0.83	0.47	0.45	0.35	0.40	0.39	0.21	0.94	-0.08
Rank		55	62	65	67	84	86	16	91	64	61
<b>STRS</b>	<b>86,974,148</b>	<b>15.98</b>	<b>12.26</b>	<b>9.30</b>	<b>10.36</b>	<b>8.85</b>	<b>9.38</b>	<b>18.39</b>	<b>-1.75</b>	<b>15.90</b>	<b>8.18</b>
STRS Total Fund Benchmark		15.60	11.92	9.05	10.07	8.57	9.21	18.27	-2.04	15.35	8.00
Difference		0.38	0.34	0.25	0.29	0.28	0.17	0.12	0.29	0.55	0.18
Rank		52	46	24	24	11	11	29	28	55	38
<b>OP&amp;F</b>	<b>17,058,585</b>	<b>15.57</b>	<b>9.21</b>	<b>8.23</b>	<b>9.95</b>	<b>8.12</b>	<b>9.10</b>	<b>17.88</b>	<b>-1.52</b>	<b>14.01</b>	<b>11.15</b>
OP&F Total Fund Benchmark		13.91	9.84	7.58	9.18	7.23	8.11	16.95	-3.09	12.27	10.98
Difference		1.66	-0.63	0.65	0.77	0.89	0.99	0.93	1.57	1.74	0.17
Rank		59	81	50	40	33	20	38	23	83	3
<b>SERS</b>	<b>16,527,178</b>	<b>16.14</b>	<b>12.99</b>	<b>9.49</b>	<b>10.74</b>	<b>9.04</b>	<b>9.37</b>	<b>17.69</b>	<b>-1.28</b>	<b>17.36</b>	<b>8.08</b>
SERS Total Fund Benchmark		13.44	11.55	8.24	9.19	7.69	8.20	16.04	-2.03	14.37	7.02
Difference		2.70	1.44	1.25	1.55	1.35	1.17	1.65	0.75	2.99	1.06
Rank		45	35	20	12	8	13	42	20	12	42
<b>HPRS</b>	<b>1,016,906</b>	<b>18.61</b>	<b>14.75</b>	<b>9.18</b>	<b>9.96</b>	<b>8.04</b>	<b>8.33</b>	<b>18.85</b>	<b>-4.57</b>	<b>15.01</b>	<b>7.42</b>
HPRS Total Fund Benchmark		16.28	11.46	8.27	9.32	7.64	8.39	17.85	-3.38	14.55	7.40
Difference		2.33	3.29	0.91	0.64	0.40	-0.06	1.00	-1.19	0.46	0.02
Rank		10	14	27	39	38	50	24	75	67	69
<i>All Public Plans &gt; \$1B-Total Fund Median</i>		<i>16.00</i>	<i>11.99</i>	<i>8.23</i>	<i>9.67</i>	<i>7.68</i>	<i>8.30</i>	<i>17.30</i>	<i>-3.13</i>	<i>16.02</i>	<i>7.95</i>

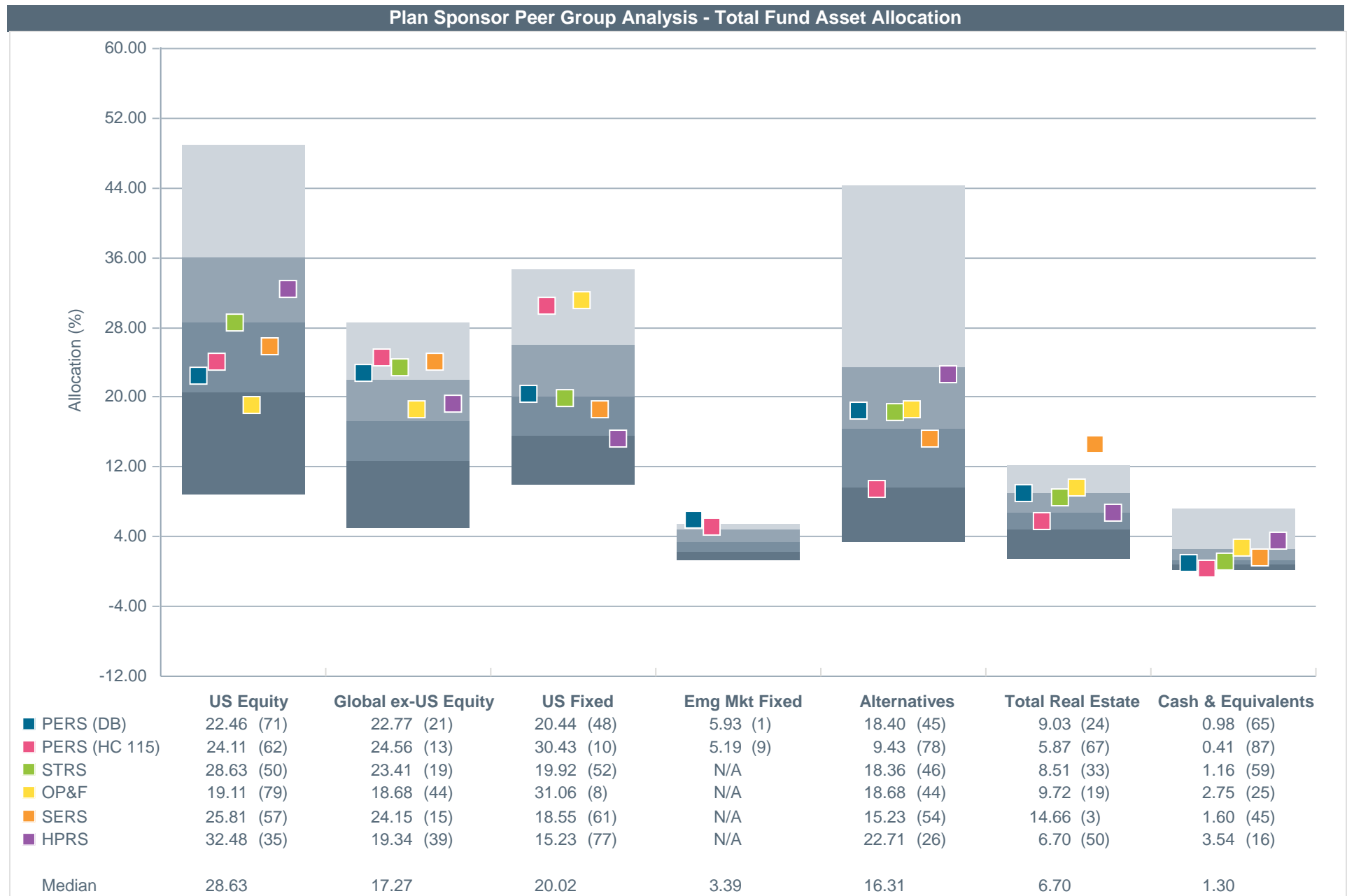
OPERS health care plan is not a pension plan and therefore has significantly different characteristics including a shorter focus asset allocation with more liquidity than the pension plans. For purposes of this study, the OPERS health care plan has been included in the results. The results for OPERS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

Asset Allocation & Performance - Net of Fees											
	Market Value (\$000)	Trailing Performance (%)						Calendar Year Performance (%)			
		2 Quarters	1 Year	3 Years	5 Years	7 Years	10 Years	2019	2018	2017	2016
<b>PERS (DB)</b>	<b>98,439,420</b>	<b>16.42</b>	<b>12.02</b>	<b>8.40</b>	<b>10.02</b>	<b>8.14</b>	<b>8.56</b>	<b>17.23</b>	<b>-2.99</b>	<b>16.81</b>	<b>8.31</b>
PERS (DB) Total Fund Benchmark		15.83	11.65	8.20	9.65	7.71	8.18	17.06	-3.08	15.19	8.63
Difference		0.59	0.37	0.20	0.37	0.43	0.38	0.17	0.09	1.62	-0.32
<b>PERS (HC 115)</b>	<b>13,351,045</b>	<b>15.80</b>	<b>10.96</b>	<b>7.74</b>	<b>9.16</b>	<b>6.90</b>	<b>7.25</b>	<b>19.59</b>	<b>-5.76</b>	<b>15.25</b>	<b>7.55</b>
PERS (HC 115) Total Fund Benchmark		15.64	10.13	7.27	8.74	6.61	6.93	19.20	-5.97	14.31	7.75
Difference		0.16	0.83	0.47	0.42	0.29	0.32	0.39	0.21	0.94	-0.20
<b>STRS</b>	<b>86,974,148</b>	<b>15.90</b>	<b>12.12</b>	<b>9.15</b>	<b>10.21</b>	<b>8.71</b>	<b>9.24</b>	<b>18.23</b>	<b>-1.89</b>	<b>15.74</b>	<b>8.03</b>
STRS Total Fund Benchmark		15.60	11.92	9.05	10.07	8.57	9.21	18.27	-2.04	15.35	8.00
Difference		0.30	0.20	0.10	0.14	0.14	0.03	-0.04	0.15	0.39	0.03
<b>OP&amp;F</b>	<b>17,058,585</b>	<b>15.27</b>	<b>8.64</b>	<b>7.62</b>	<b>9.33</b>	<b>7.52</b>	<b>8.55</b>	<b>17.22</b>	<b>-2.14</b>	<b>13.39</b>	<b>10.54</b>
OP&F Total Fund Benchmark		13.91	9.84	7.58	9.18	7.23	8.11	16.95	-3.09	12.27	10.98
Difference		1.36	-1.20	0.04	0.15	0.29	0.44	0.27	0.95	1.12	-0.44
<b>SERS</b>	<b>16,527,178</b>	<b>15.87</b>	<b>12.40</b>	<b>8.84</b>	<b>10.06</b>	<b>8.37</b>	<b>8.66</b>	<b>16.96</b>	<b>-1.94</b>	<b>16.65</b>	<b>7.37</b>
SERS Total Fund Benchmark		13.44	11.55	8.24	9.19	7.69	8.20	16.04	-2.03	14.37	7.02
Difference		2.43	0.85	0.60	0.87	0.68	0.46	0.92	0.09	2.28	0.35
<b>HPRS</b>	<b>1,016,906</b>	<b>18.46</b>	<b>14.40</b>	<b>8.77</b>	<b>9.50</b>	<b>7.56</b>	<b>7.90</b>	<b>18.43</b>	<b>-5.02</b>	<b>14.29</b>	<b>7.03</b>
HPRS Total Fund Benchmark		16.28	11.46	8.27	9.32	7.64	8.39	17.85	-3.38	14.55	7.40
Difference		2.18	2.94	0.50	0.18	-0.08	-0.49	0.58	-1.64	-0.26	-0.37

Performance shown is net of all investment management costs.

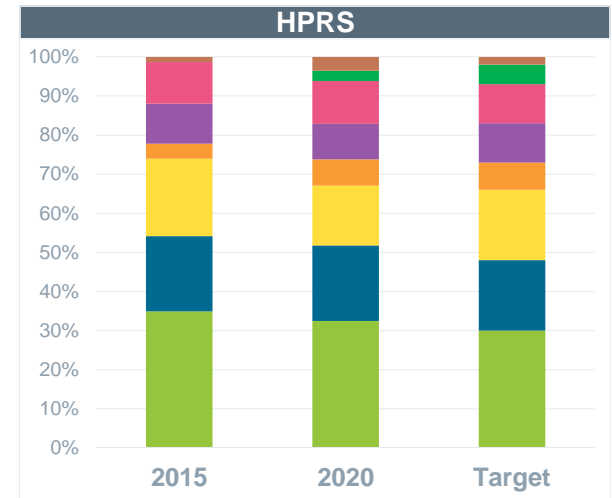
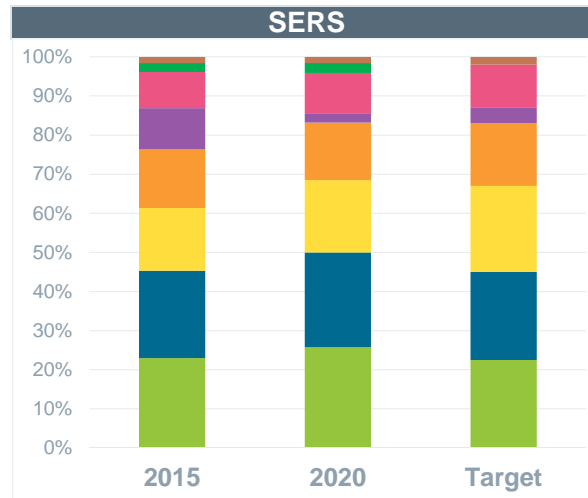
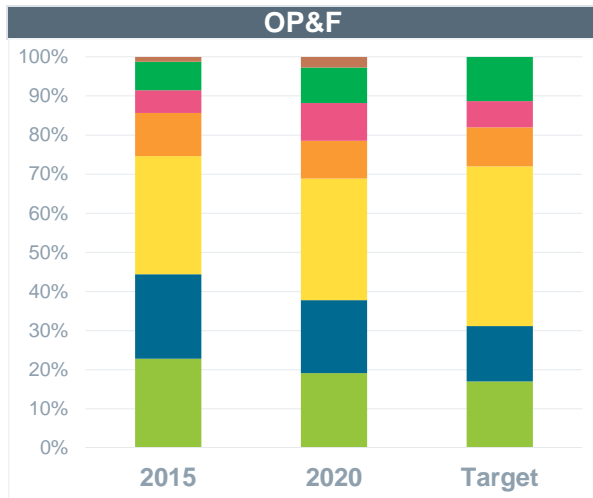
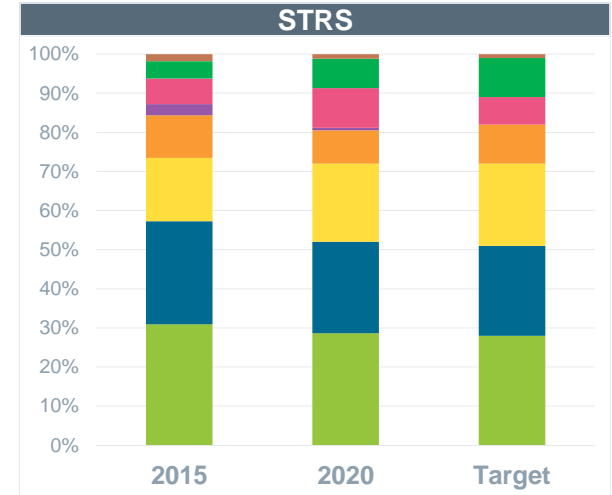
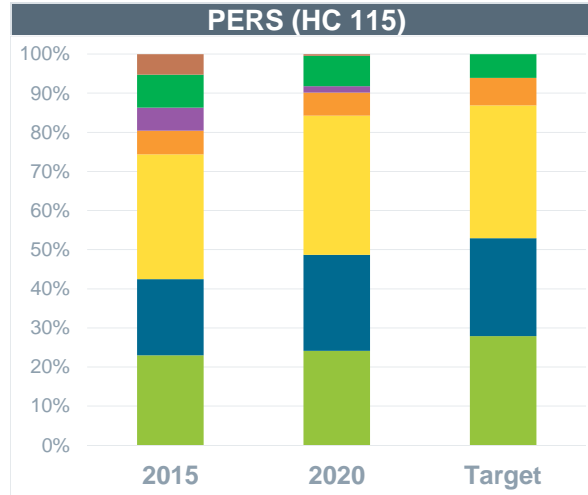
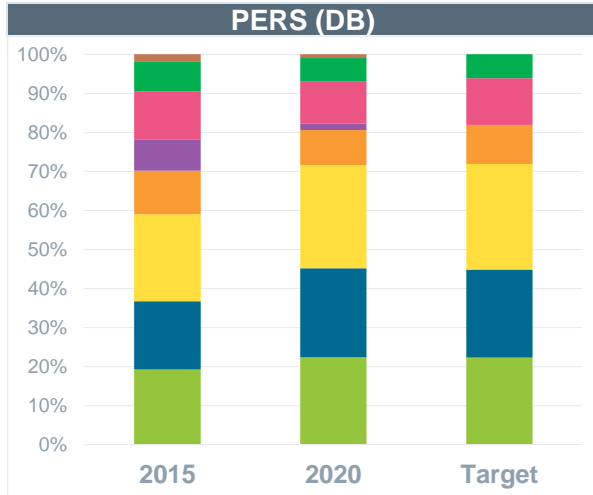


Allocations shown may not sum up to 100% exactly due to rounding. Cash Equivalents for PERS (DB) and PERS (HC 115) consists of cash, rebalancing, and additional annuity.



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.



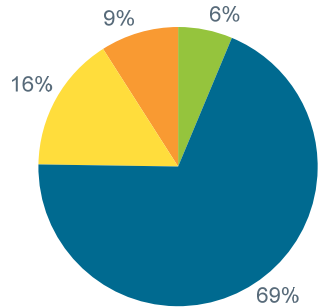


- US Equity
- International Equity
- Fixed Income
- Real Estate
- Hedge Funds
- Private Equity
- Other Alternatives
- Cash Equivalents

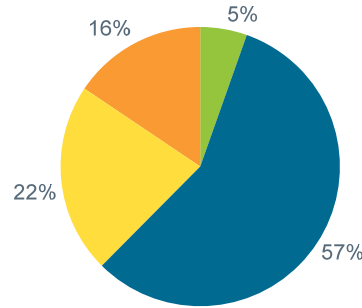
Summary

- **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)

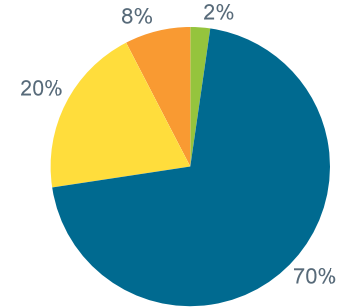
PERS (DB)



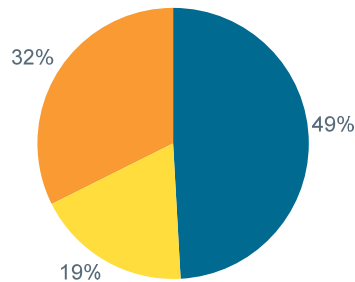
PERS (HC 115)



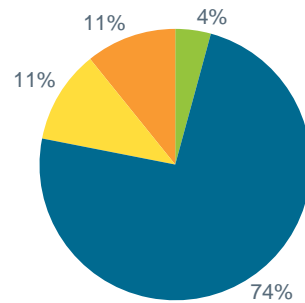
STRS



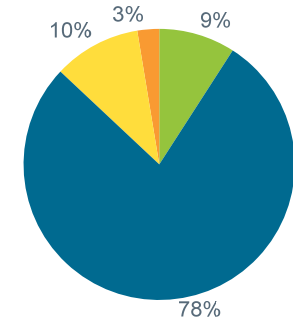
OP&F



SERS



HPRS



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

Summary

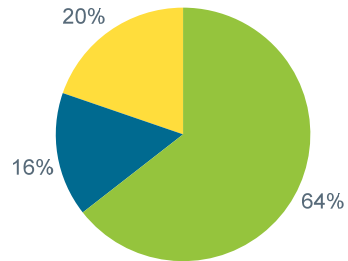
**RVK Liquidity Rating** - A qualitative method developed and calculated by RVK for determining the relative amount of liquidity in a portfolio.

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

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

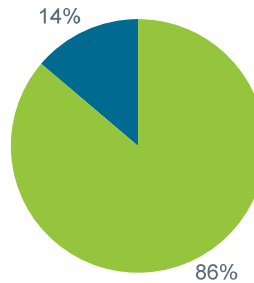
**Not Liquid Investments:** Private appraisal-based transactions, vehicle-based liquidity constraints, or privately held assets. Extreme discount to raise cash or 6-12+ months required to receive cash.

PERS (DB)



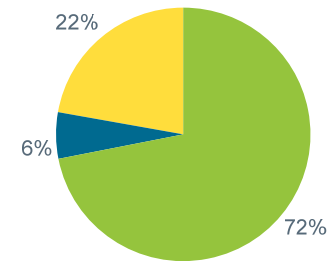
PERS (DB) Liquidity Rating 67

PERS (HC 115)



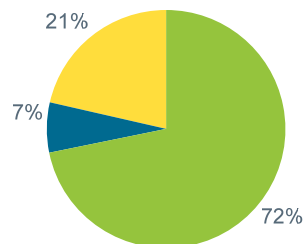
PERS (HC 115) Liquidity Rating 86

STRS



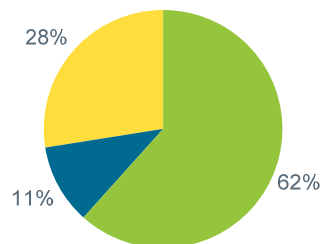
STRS Liquidity Rating 69

OP&F



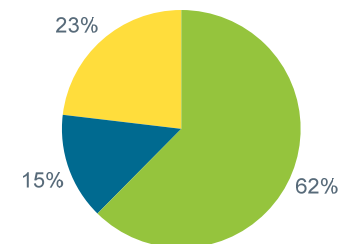
OP&F Liquidity Rating 65

SERS



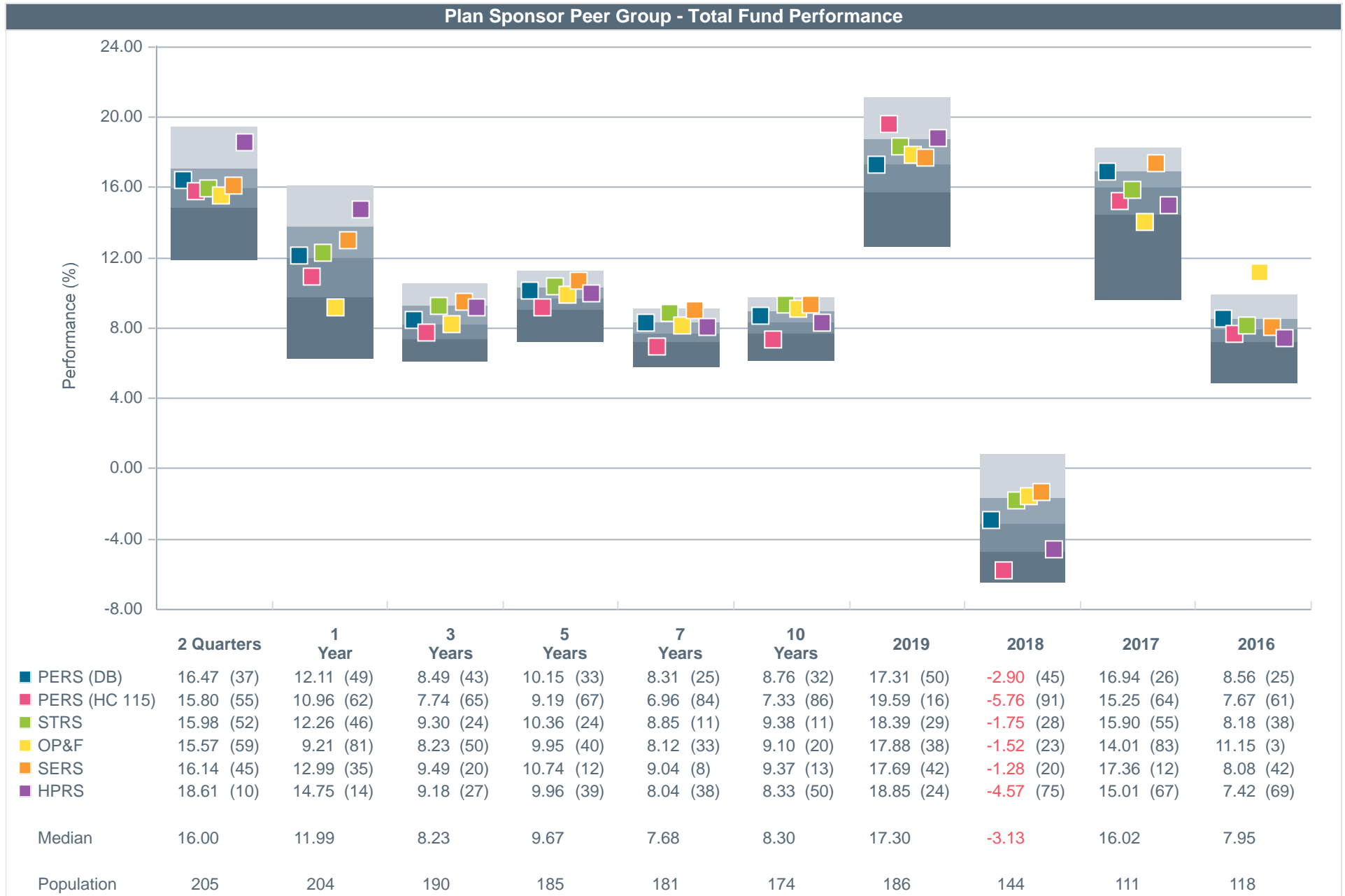
SERS Liquidity Rating 66

HPRS



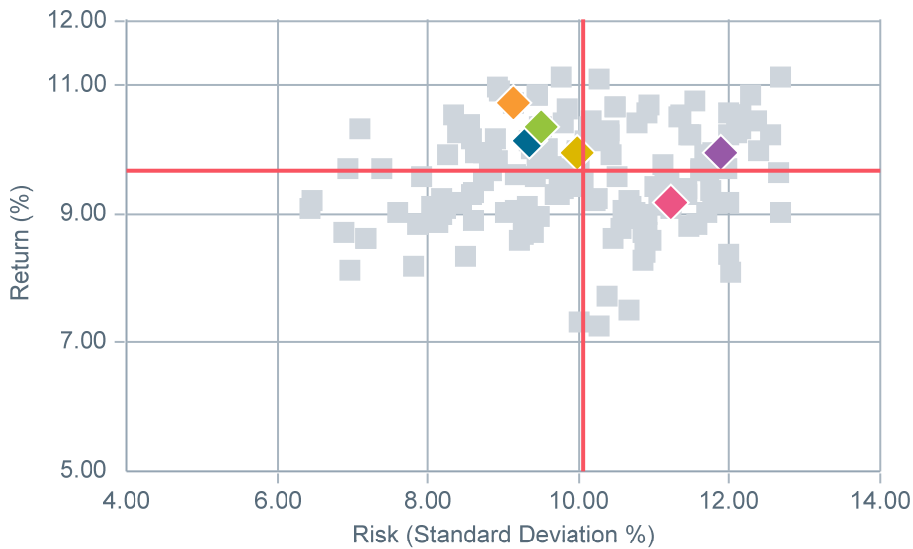
HPRS Liquidity Rating 66

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.

Plan Sponsor Peer Group Scattergram - 5 Years

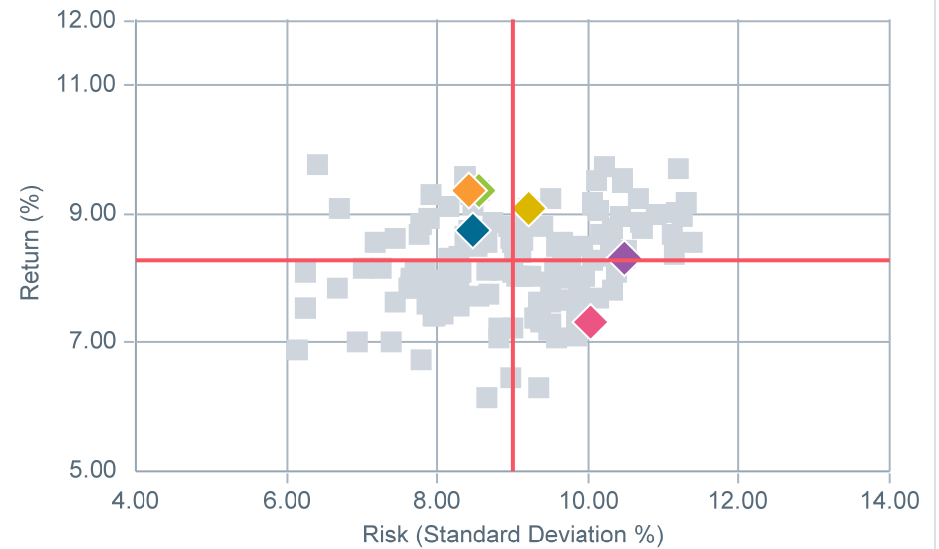


	Return	Standard Deviation
◆ PERS (DB)	10.15	9.36
◆ PERS (HC 115)	9.19	11.23
◆ STRS	10.36	9.49
◆ OP&F	9.95	9.99
◆ SERS	10.74	9.14
◆ HPRS	9.96	11.89
— Median	9.67	10.05

Sharpe Ratio - 5 Year

PERS (DB)	0.94
PERS (HC 115)	0.73
STRS	0.95
OP&F	0.87
SERS	1.02
HPRS	0.76
<i>All Public Plans &gt; \$1B-Total Fund Median</i>	<i>0.85</i>

Plan Sponsor Peer Group Scattergram - 10 Years



	Return	Standard Deviation
◆ PERS (DB)	8.76	8.46
◆ PERS (HC 115)	7.33	10.03
◆ STRS	9.38	8.54
◆ OP&F	9.10	9.21
◆ SERS	9.37	8.41
◆ HPRS	8.33	10.48
— Median	8.30	9.01

Sharpe Ratio - 10 Year

PERS (DB)	0.96
PERS (HC 115)	0.69
STRS	1.02
OP&F	0.92
SERS	1.03
HPRS	0.76
<i>All Public Plans &gt; \$1B-Total Fund Median</i>	<i>0.87</i>

Performance shown is gross of fees.

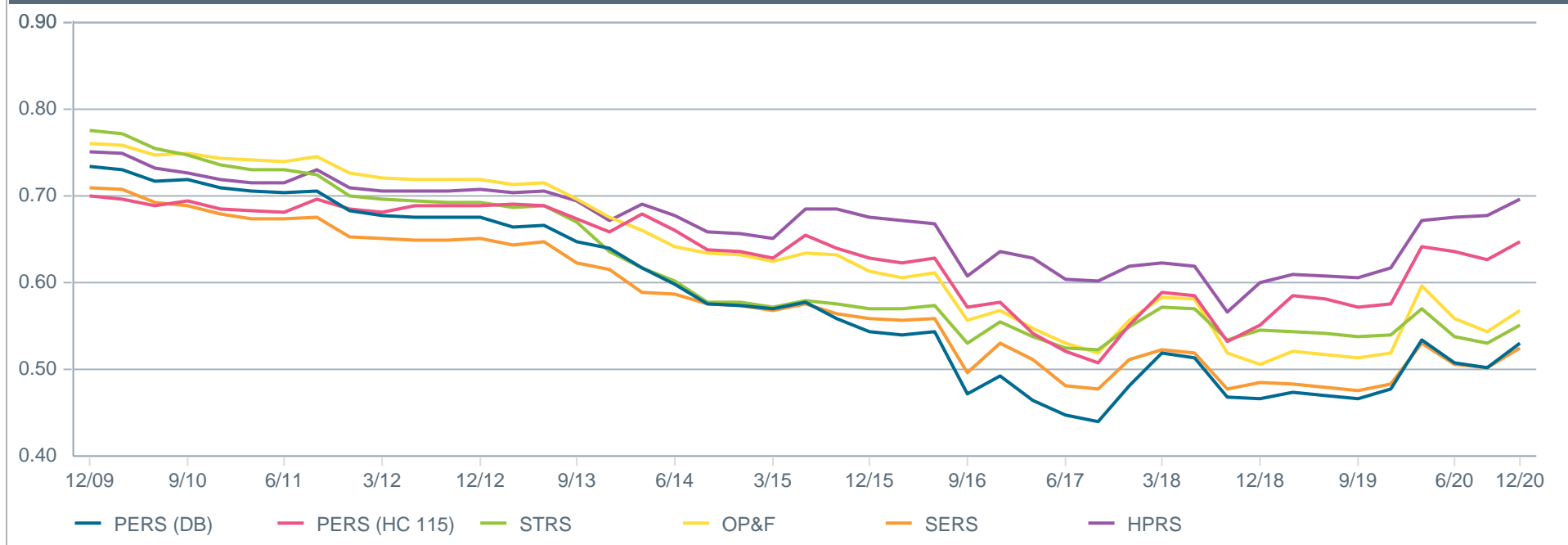
Summary

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)	0.53	0.53	0.53	0.54
PERS (HC 115)	0.65	0.65	0.65	0.64
STRS	0.55	0.55	0.55	0.56
OP&F	0.57	0.57	0.57	0.58
SERS	0.52	0.52	0.52	0.54
HPRS	0.70	0.70	0.69	0.69
S&P 500 Index (Cap Wtd)	1.00	1.00	1.00	1.00

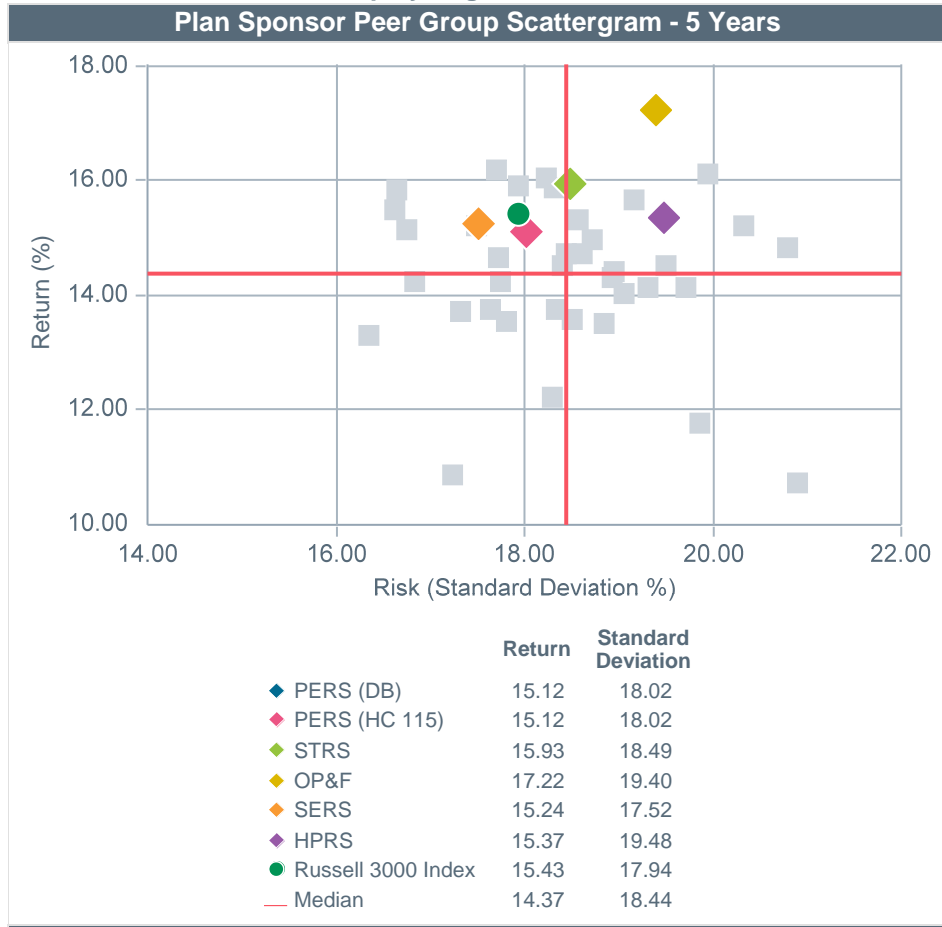
5 Year Rolling Equity Beta



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

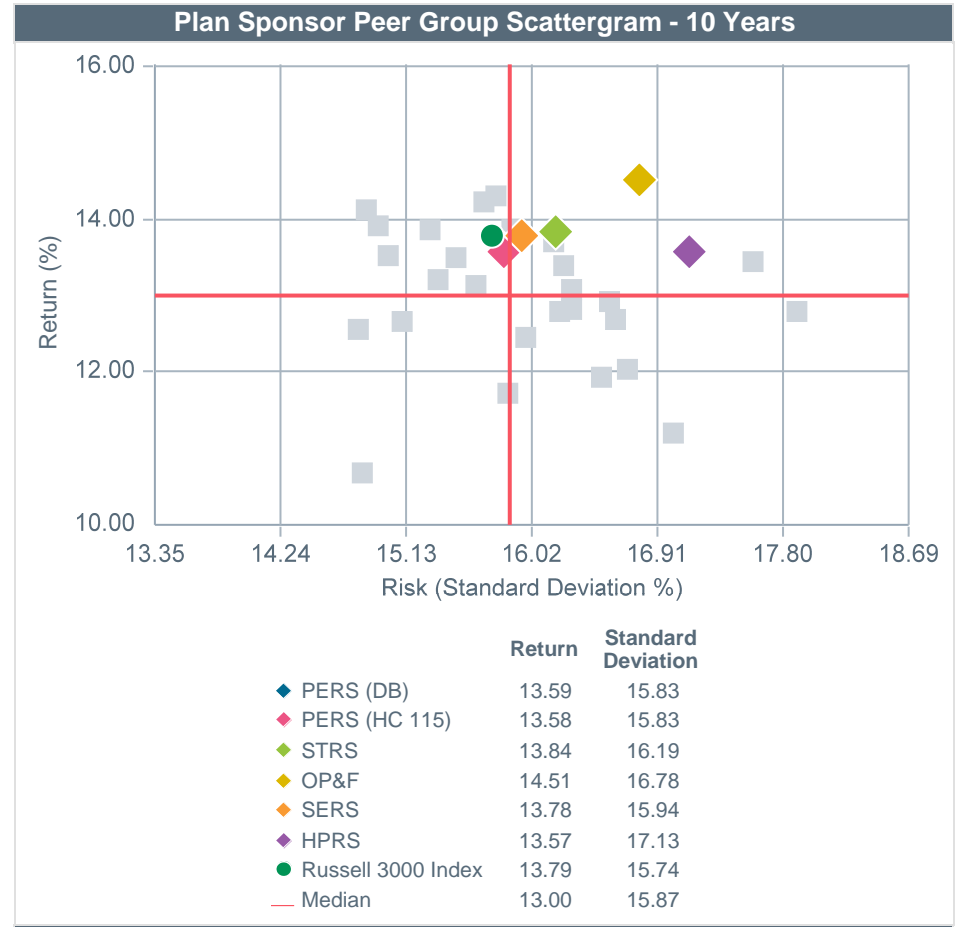
Performance										
	Trailing Performance (%)						Calendar Year Performance (%)			
	2 Quarters	1 Year	3 Years	5 Years	7 Years	10 Years	2019	2018	2017	2016
<b>US Equity</b>										
<b>PERS (DB)</b>	<b>24.90</b>	<b>19.69</b>	<b>14.13</b>	<b>15.12</b>	<b>12.39</b>	<b>13.59</b>	<b>30.76</b>	<b>-5.00</b>	<b>21.30</b>	<b>12.09</b>
Russell 3000 Index	25.24	20.89	14.49	15.43	12.76	13.79	31.02	-5.24	21.13	12.74
Difference	-0.34	-1.20	-0.36	-0.31	-0.37	-0.20	-0.26	0.24	0.17	-0.65
Rank	59	43	33	31	29	28	33	25	29	64
<b>PERS (HC 115)</b>	<b>24.90</b>	<b>19.69</b>	<b>14.13</b>	<b>15.12</b>	<b>12.38</b>	<b>13.58</b>	<b>30.76</b>	<b>-5.00</b>	<b>21.30</b>	<b>12.09</b>
Russell 3000 Index	25.24	20.89	14.49	15.43	12.76	13.79	31.02	-5.24	21.13	12.74
Difference	-0.34	-1.20	-0.36	-0.31	-0.38	-0.21	-0.26	0.24	0.17	-0.65
Rank	59	43	33	31	29	29	33	25	29	64
<b>STRS</b>	<b>25.96</b>	<b>23.00</b>	<b>15.53</b>	<b>15.93</b>	<b>13.04</b>	<b>13.84</b>	<b>32.43</b>	<b>-5.33</b>	<b>22.01</b>	<b>11.32</b>
Russell 3000 Index	25.24	20.89	14.49	15.43	12.76	13.79	31.02	-5.24	21.13	12.74
Difference	0.72	2.11	1.04	0.50	0.28	0.05	1.41	-0.09	0.88	-1.42
Rank	40	16	10	13	15	24	4	39	18	80
<b>OP&amp;F</b>	<b>29.77</b>	<b>22.79</b>	<b>16.09</b>	<b>17.22</b>	<b>13.85</b>	<b>14.51</b>	<b>31.77</b>	<b>-3.30</b>	<b>22.40</b>	<b>15.56</b>
Wilshire 5000 Index	24.94	20.82	14.46	15.52	12.87	13.79	31.02	-5.27	20.99	13.37
Difference	4.83	1.97	1.63	1.70	0.98	0.72	0.75	1.97	1.41	2.19
Rank	4	17	2	2	1	1	16	7	13	8
<b>SERS</b>	<b>24.37</b>	<b>21.87</b>	<b>14.31</b>	<b>15.24</b>	<b>12.52</b>	<b>13.78</b>	<b>30.60</b>	<b>-6.15</b>	<b>22.27</b>	<b>11.27</b>
Russell 3000 Index	25.24	20.89	14.49	15.43	12.76	13.79	31.02	-5.24	21.13	12.74
Difference	-0.87	0.98	-0.18	-0.19	-0.24	-0.01	-0.42	-0.91	1.14	-1.47
Rank	63	22	29	26	26	25	35	64	14	80
<b>HPRS</b>	<b>27.48</b>	<b>23.28</b>	<b>13.93</b>	<b>15.37</b>	<b>12.59</b>	<b>13.57</b>	<b>30.36</b>	<b>-7.97</b>	<b>21.53</b>	<b>13.73</b>
Russell 3000 Index	25.24	20.89	14.49	15.43	12.76	13.79	31.02	-5.24	21.13	12.74
Difference	2.24	2.39	-0.56	-0.06	-0.17	-0.22	-0.66	-2.73	0.40	0.99
Rank	22	11	38	23	24	29	39	88	21	24
<i>All Public Plans &gt; \$1B-US Equity Segment Median</i>	<i>25.18</i>	<i>18.92</i>	<i>13.04</i>	<i>14.37</i>	<i>11.69</i>	<i>13.00</i>	<i>30.06</i>	<i>-5.86</i>	<i>20.23</i>	<i>12.76</i>

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



### Sharpe Ratio - 5 Years

PERS (DB)	0.81
PERS (HC 115)	0.81
STRS	0.84
OP&F	0.87
SERS	0.84
HPRS	0.78
Russell 3000 Index	0.83
<i>All Public Plans &gt; \$1B-US Equity Segment Median</i>	<i>0.77</i>



### Sharpe Ratio - 10 Years

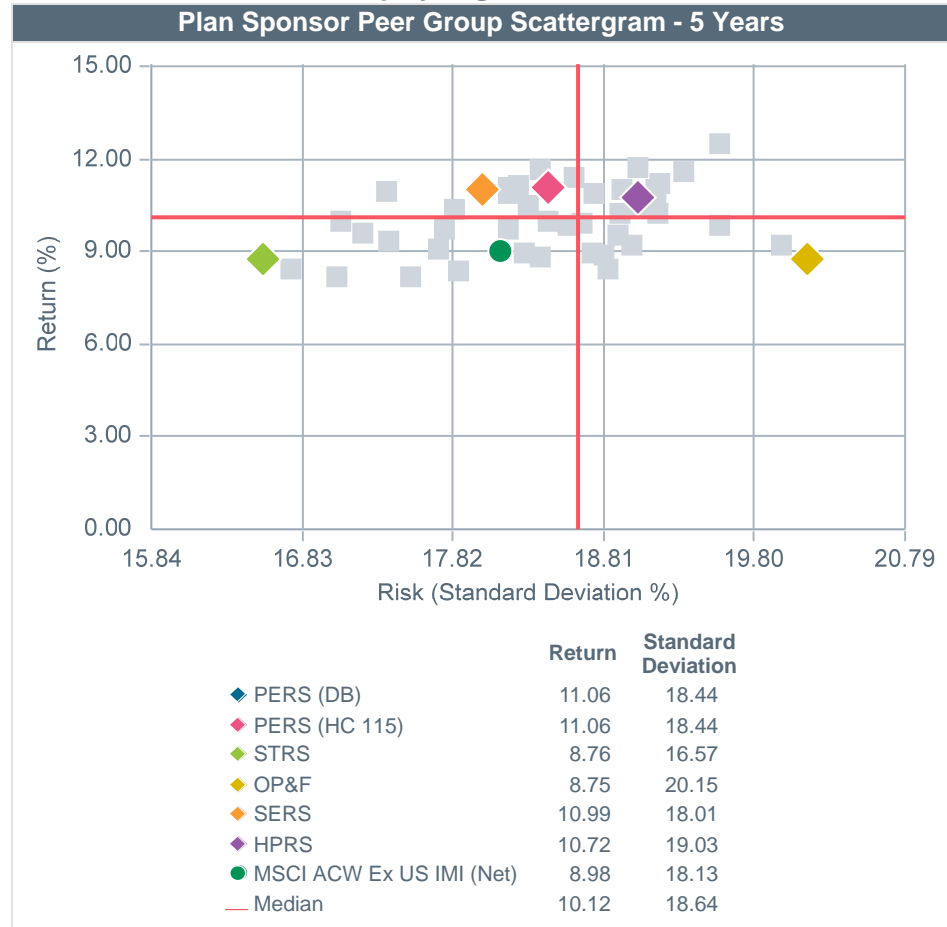
PERS (DB)	0.85
PERS (HC 115)	0.85
STRS	0.85
OP&F	0.86
SERS	0.86
HPRS	0.80
Russell 3000 Index	0.87
<i>All Public Plans &gt; \$1B-US Equity Segment Median</i>	<i>0.81</i>

Performance shown is gross of fees.



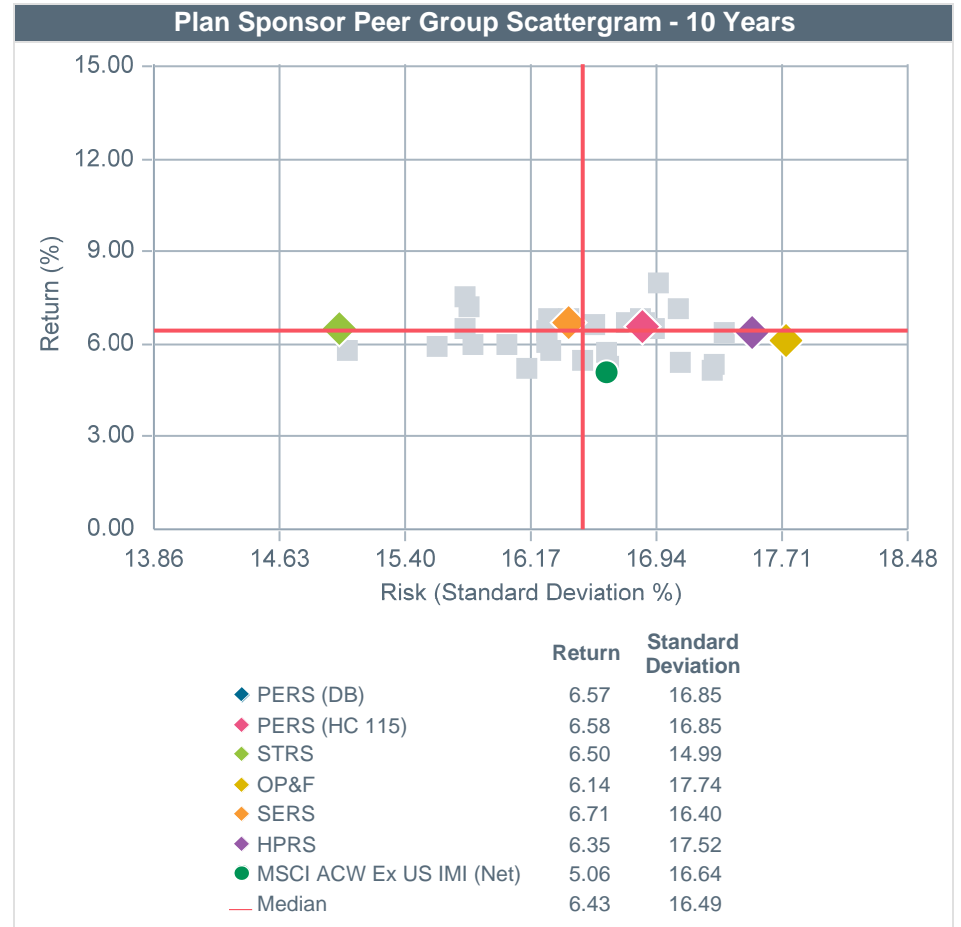
Performance										
	Trailing Performance (%)						Calendar Year Performance (%)			
	2 Quarters	1 Year	3 Years	5 Years	7 Years	10 Years	2019	2018	2017	2016
<b>International Equity</b>										
<b>PERS (DB)</b>	<b>26.68</b>	<b>14.81</b>	<b>6.68</b>	<b>11.06</b>	<b>6.92</b>	<b>6.57</b>	<b>23.21</b>	<b>-14.17</b>	<b>31.64</b>	<b>5.72</b>
PERS (DB) International Equity Custom Benchmark	25.88	11.90	4.93	9.52	5.24	4.96	21.09	-14.74	29.24	5.54
Difference	0.80	2.91	1.75	1.54	1.68	1.61	2.12	0.57	2.40	0.18
Rank	43	39	50	24	28	42	61	66	11	22
<b>PERS (HC 115)</b>	<b>26.68</b>	<b>14.81</b>	<b>6.68</b>	<b>11.06</b>	<b>6.93</b>	<b>6.58</b>	<b>23.21</b>	<b>-14.17</b>	<b>31.64</b>	<b>5.72</b>
PERS (HC 115) International Equity Custom Benchmark	25.88	11.90	4.93	9.52	5.24	4.96	21.09	-14.74	29.24	5.54
Difference	0.80	2.91	1.75	1.54	1.69	1.62	2.12	0.57	2.40	0.18
Rank	43	39	50	24	28	42	61	66	11	22
<b>STRS</b>	<b>20.64</b>	<b>6.78</b>	<b>4.60</b>	<b>8.76</b>	<b>6.35</b>	<b>6.50</b>	<b>21.54</b>	<b>-11.80</b>	<b>24.16</b>	<b>7.09</b>
STRS International Equity Custom Benchmark	20.19	7.88	5.13	8.82	5.83	5.92	22.51	-12.08	23.43	6.39
Difference	0.45	-1.10	-0.53	-0.06	0.52	0.58	-0.97	0.28	0.73	0.70
Rank	100	97	89	84	45	46	85	9	99	13
<b>OP&amp;F</b>	<b>28.68</b>	<b>12.43</b>	<b>4.67</b>	<b>8.75</b>	<b>5.20</b>	<b>6.14</b>	<b>23.37</b>	<b>-17.32</b>	<b>29.12</b>	<b>2.75</b>
MSCI ACW Ex US IM Index (USD) (Net)	25.19	11.12	4.83	8.98	5.03	5.06	21.63	-14.76	27.81	4.41
Difference	3.49	1.31	-0.16	-0.23	0.17	1.08	1.74	-2.56	1.31	-1.66
Rank	17	54	89	84	90	56	59	100	53	78
<b>SERS</b>	<b>28.02</b>	<b>15.29</b>	<b>7.22</b>	<b>10.99</b>	<b>6.72</b>	<b>6.71</b>	<b>24.36</b>	<b>-14.03</b>	<b>29.11</b>	<b>5.81</b>
SERS International Equity Custom Benchmark	24.33	10.65	4.88	8.92	4.82	5.21	21.51	-14.20	27.19	4.50
Difference	3.69	4.64	2.34	2.07	1.90	1.50	2.85	0.17	1.92	1.31
Rank	23	34	35	30	35	33	42	61	53	21
<b>HPRS</b>	<b>29.58</b>	<b>19.02</b>	<b>8.32</b>	<b>10.72</b>	<b>6.37</b>	<b>6.35</b>	<b>25.47</b>	<b>-14.88</b>	<b>28.72</b>	<b>1.69</b>
MSCI ACW Ex US IM Index (USD) (Net)	25.19	11.12	4.83	8.98	5.03	5.06	21.63	-14.76	27.81	4.41
Difference	4.39	7.90	3.49	1.74	1.34	1.29	3.84	-0.12	0.91	-2.72
Rank	7	12	20	38	45	54	26	83	60	85
<i>All Public Plans &gt; \$1B-Intl. Equity Segment Median</i>	26.03	12.76	6.66	10.12	6.21	6.43	23.71	-13.59	29.22	3.95

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



### Sharpe Ratio - 5 Years

PERS (DB)	0.60
PERS (HC 115)	0.60
STRS	0.52
OP&F	0.46
SERS	0.61
HPRS	0.57
MSCI ACW Ex US IMI (Net)	0.50
<i>All Public Plans &gt; \$1B-Intl. Equity Segment Median</i>	<i>0.55</i>



### Sharpe Ratio - 10 Years

PERS (DB)	0.43
PERS (HC 115)	0.43
STRS	0.46
OP&F	0.39
SERS	0.44
HPRS	0.41
MSCI ACW Ex US IMI (Net)	0.35
<i>All Public Plans &gt; \$1B-Intl. Equity Segment Median</i>	<i>0.42</i>

Performance shown is gross of fees.

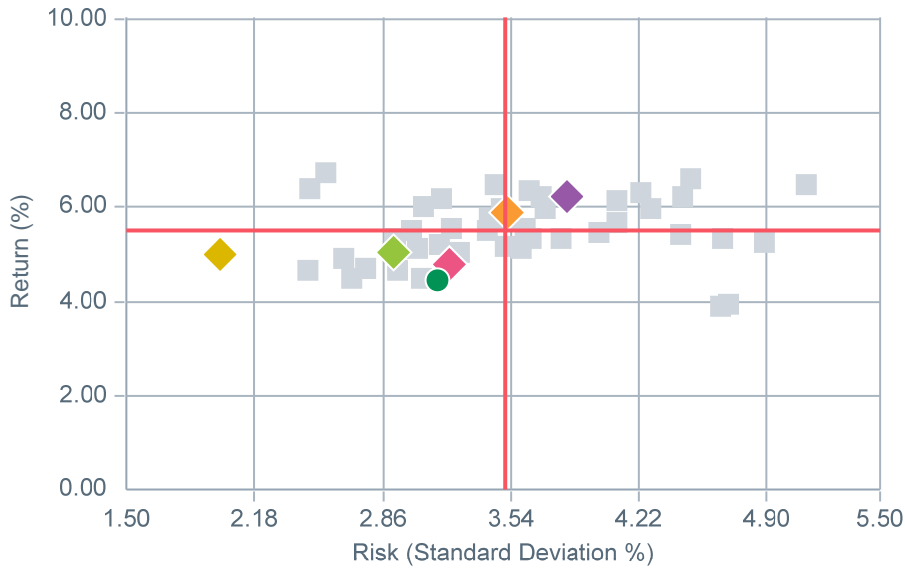
Performance										
	Trailing Performance (%)						Calendar Year Performance (%)			
	2 Quarters	1 Year	3 Years	5 Years	7 Years	10 Years	2019	2018	2017	2016
<b>Fixed Income</b>										
<b>PERS (DB) Core Fixed Income</b>	<b>1.90</b>	<b>9.09</b>	<b>5.83</b>	<b>4.77</b>	<b>4.46</b>	<b>4.25</b>	<b>8.72</b>	<b>-0.06</b>	<b>3.75</b>	<b>2.66</b>
PERS (DB) Core Fixed Income Custom Benchmark	1.29	7.51	5.34	4.44	4.09	3.84	8.72	0.01	3.54	2.65
Difference	0.61	1.58	0.49	0.33	0.37	0.41	0.00	-0.07	0.21	0.01
Rank	82	41	49	82	74	81	68	39	79	89
<b>PERS (HC 115) Core Fixed Income</b>	<b>1.90</b>	<b>9.09</b>	<b>5.83</b>	<b>4.77</b>	<b>4.45</b>	<b>4.25</b>	<b>8.72</b>	<b>-0.06</b>	<b>3.75</b>	<b>2.66</b>
PERS (HC 115) Core Fixed Income Custom Benchmark	1.29	7.51	5.34	4.44	4.11	4.00	8.72	0.01	3.54	2.65
Difference	0.61	1.58	0.49	0.33	0.34	0.25	0.00	-0.07	0.21	0.01
Rank	82	41	49	82	74	81	68	39	79	89
<b>STRS</b>	<b>2.15</b>	<b>7.95</b>	<b>5.47</b>	<b>5.03</b>	<b>4.38</b>	<b>4.29</b>	<b>8.51</b>	<b>0.16</b>	<b>3.98</b>	<b>4.77</b>
STRS Fixed Income Blended Benchmark	1.74	7.39	5.26	4.71	4.21	4.08	8.51	0.09	3.86	3.91
Difference	0.41	0.56	0.21	0.32	0.17	0.21	0.00	0.07	0.12	0.86
Rank	79	67	68	76	75	78	73	27	74	54
<b>OP&amp;F Core Fixed Income</b>	<b>2.15</b>	<b>7.35</b>	<b>5.53</b>	<b>5.00</b>	<b>4.38</b>	<b>4.22</b>	<b>8.13</b>	<b>1.24</b>	<b>4.26</b>	<b>4.14</b>
Bloomberg US Agg Bond Index + Leverage Factor	1.75	8.00	5.50	4.53	4.15	3.89	8.71	0.02	3.55	2.64
Difference	0.40	-0.65	0.03	0.47	0.23	0.33	-0.58	1.22	0.71	1.50
Rank	79	80	64	78	75	82	78	9	67	68
<b>SERS</b>	<b>4.50</b>	<b>10.59</b>	<b>6.60</b>	<b>5.91</b>	<b>5.01</b>	<b>5.04</b>	<b>9.95</b>	<b>-0.38</b>	<b>5.09</b>	<b>4.67</b>
Bloomberg US Agg Bond Index	1.29	7.51	5.34	4.44	4.09	3.84	8.72	0.01	3.54	2.65
Difference	3.21	3.08	1.26	1.47	0.92	1.20	1.23	-0.39	1.55	2.02
Rank	30	18	16	34	41	38	29	57	41	56
<b>HPRS</b>	<b>5.79</b>	<b>7.79</b>	<b>6.52</b>	<b>6.24</b>	<b>5.09</b>	<b>4.86</b>	<b>9.33</b>	<b>2.56</b>	<b>5.29</b>	<b>6.36</b>
HPRS Fixed Income Custom Benchmark	4.42	5.95	4.81	4.22	3.94	3.74	7.94	0.68	3.43	3.27
Difference	1.37	1.84	1.71	2.02	1.15	1.12	1.39	1.88	1.86	3.09
Rank	7	75	19	20	39	47	48	4	38	29
<i>All Public Plans &gt; \$1B-US Fixed Income Segment Median</i>	<i>3.53</i>	<i>8.58</i>	<i>5.79</i>	<i>5.50</i>	<i>4.74</i>	<i>4.72</i>	<i>9.30</i>	<i>-0.27</i>	<i>4.81</i>	<i>4.82</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

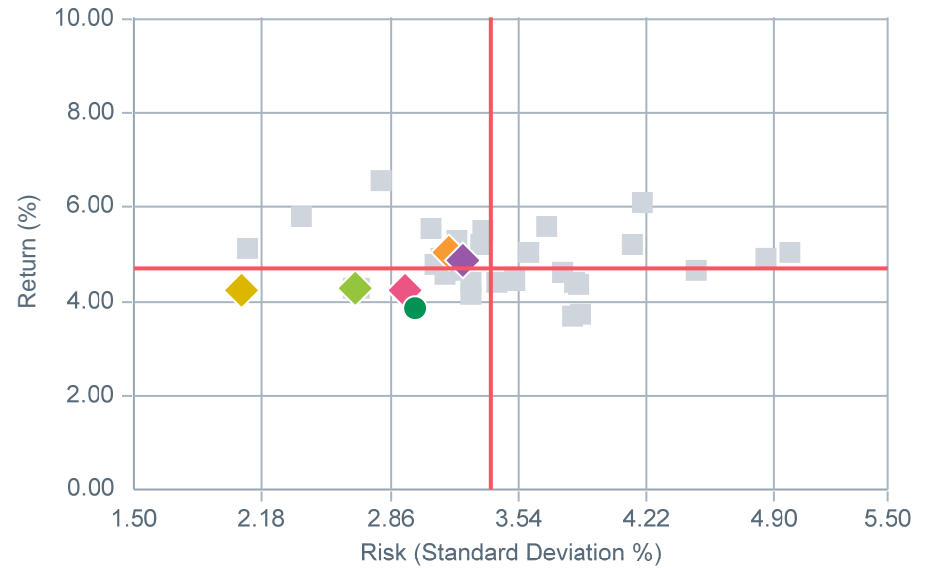


	Return	Standard Deviation
◆ PERS (DB) Core Fixed Income	4.77	3.21
◆ PERS (HC 115) Core Fixed Income	4.77	3.21
◆ STRS	5.03	2.92
◆ OP&F Core Fixed Income	5.00	2.00
◆ SERS	5.91	3.53
◆ HPRS	6.24	3.84
● Bloomberg US Agg Bond Index	4.44	3.15
— Median	5.50	3.51

Sharpe Ratio - 5 Years

PERS (DB) Core Fixed Income	1.12
PERS (HC 115) Core Fixed Income	1.12
STRS	1.28
OP&F Core Fixed Income	1.83
SERS	1.28
HPRS	1.23
Bloomberg US Agg Bond Index	1.05
All Public Plans > \$1B-US Fixed Income Segment Median	1.16

Plan Sponsor Peer Group Scattergram - 10 Years



	Return	Standard Deviation
◆ PERS (DB) Core Fixed Income	4.25	2.94
◆ PERS (HC 115) Core Fixed Income	4.25	2.94
◆ STRS	4.29	2.68
◆ OP&F Core Fixed Income	4.22	2.07
◆ SERS	5.04	3.17
◆ HPRS	4.86	3.25
● Bloomberg US Agg Bond Index	3.84	2.99
— Median	4.72	3.39

Sharpe Ratio - 10 Years

PERS (DB) Core Fixed Income	1.24
PERS (HC 115) Core Fixed Income	1.24
STRS	1.35
OP&F Core Fixed Income	1.72
SERS	1.36
HPRS	1.26
Bloomberg US Agg Bond Index	1.09
All Public Plans > \$1B-US Fixed Income Segment Median	1.22

Performance shown is gross of fees.

Performance										
	Trailing Performance (%)						Calendar Year Performance (%)			
	2 Quarters	1 Year	3 Years	5 Years	7 Years	10 Years	2019	2018	2017	2016
<b>Additional Fixed Income</b>										
<b>PERS (DB) US Treasury</b>	<b>-0.62</b>	<b>8.08</b>	<b>5.21</b>	<b>3.77</b>	<b>N/A</b>	<b>N/A</b>	<b>6.84</b>	<b>0.84</b>	<b>2.33</b>	<b>0.99</b>
Bloomberg US Trsy Index	-0.66	8.00	5.19	3.77	N/A	N/A	6.86	0.86	2.31	1.04
Difference	0.04	0.08	0.02	0.00	N/A	N/A	-0.02	-0.02	0.02	-0.05
<b>PERS (DB) EMD</b>	<b>11.76</b>	<b>5.36</b>	<b>4.12</b>	<b>7.29</b>	<b>3.85</b>	<b>N/A</b>	<b>13.55</b>	<b>-5.63</b>	<b>13.52</b>	<b>10.94</b>
PERS (DB) EMD Custom Benchmark	9.10	4.32	4.03	6.85	3.71	N/A	14.01	-5.33	12.26	10.18
Difference	2.66	1.04	0.09	0.44	0.14	N/A	-0.46	-0.30	1.26	0.76
<b>PERS (DB) High Yield</b>	<b>11.42</b>	<b>7.42</b>	<b>6.49</b>	<b>8.18</b>	<b>5.77</b>	<b>6.87</b>	<b>14.76</b>	<b>-2.06</b>	<b>7.23</b>	<b>14.44</b>
Bloomberg U.S. High Yield Index	11.34	7.11	6.24	8.59	5.74	6.80	14.32	-2.08	7.50	17.13
Difference	0.08	0.31	0.25	-0.41	0.03	0.07	0.44	0.02	-0.27	-2.69
<b>PERS (DB) Securitized Debt</b>	<b>9.27</b>	<b>7.40</b>	<b>7.38</b>	<b>5.72</b>	<b>7.28</b>	<b>N/A</b>	<b>11.70</b>	<b>3.21</b>	<b>7.52</b>	<b>-0.80</b>
Bloomberg CMBS Index + 2%	13.94	1.18	4.81	5.21	4.91	N/A	10.70	2.79	5.76	5.87
Difference	-4.67	6.22	2.57	0.51	2.37	N/A	1.00	0.42	1.76	-6.67
<b>PERS (DB) TIPS</b>	<b>4.66</b>	<b>10.89</b>	<b>5.88</b>	<b>5.04</b>	<b>3.89</b>	<b>N/A</b>	<b>8.42</b>	<b>-1.26</b>	<b>2.88</b>	<b>4.69</b>
Bloomberg U.S. TIPS Index	4.70	10.99	5.92	5.08	3.92	N/A	8.43	-1.26	3.01	4.68
Difference	-0.04	-0.10	-0.04	-0.04	-0.03	N/A	-0.01	0.00	-0.13	0.01
<b>PERS (HC 115) EMD</b>	<b>11.76</b>	<b>5.36</b>	<b>4.12</b>	<b>7.29</b>	<b>3.87</b>	<b>4.02</b>	<b>13.55</b>	<b>-5.63</b>	<b>13.52</b>	<b>10.94</b>
PERS (HC 115) EMD Custom Benchmark	9.10	4.32	4.03	6.85	3.71	3.78	14.01	-5.33	12.26	10.18
Difference	2.66	1.04	0.09	0.44	0.16	0.24	-0.46	-0.30	1.26	0.76

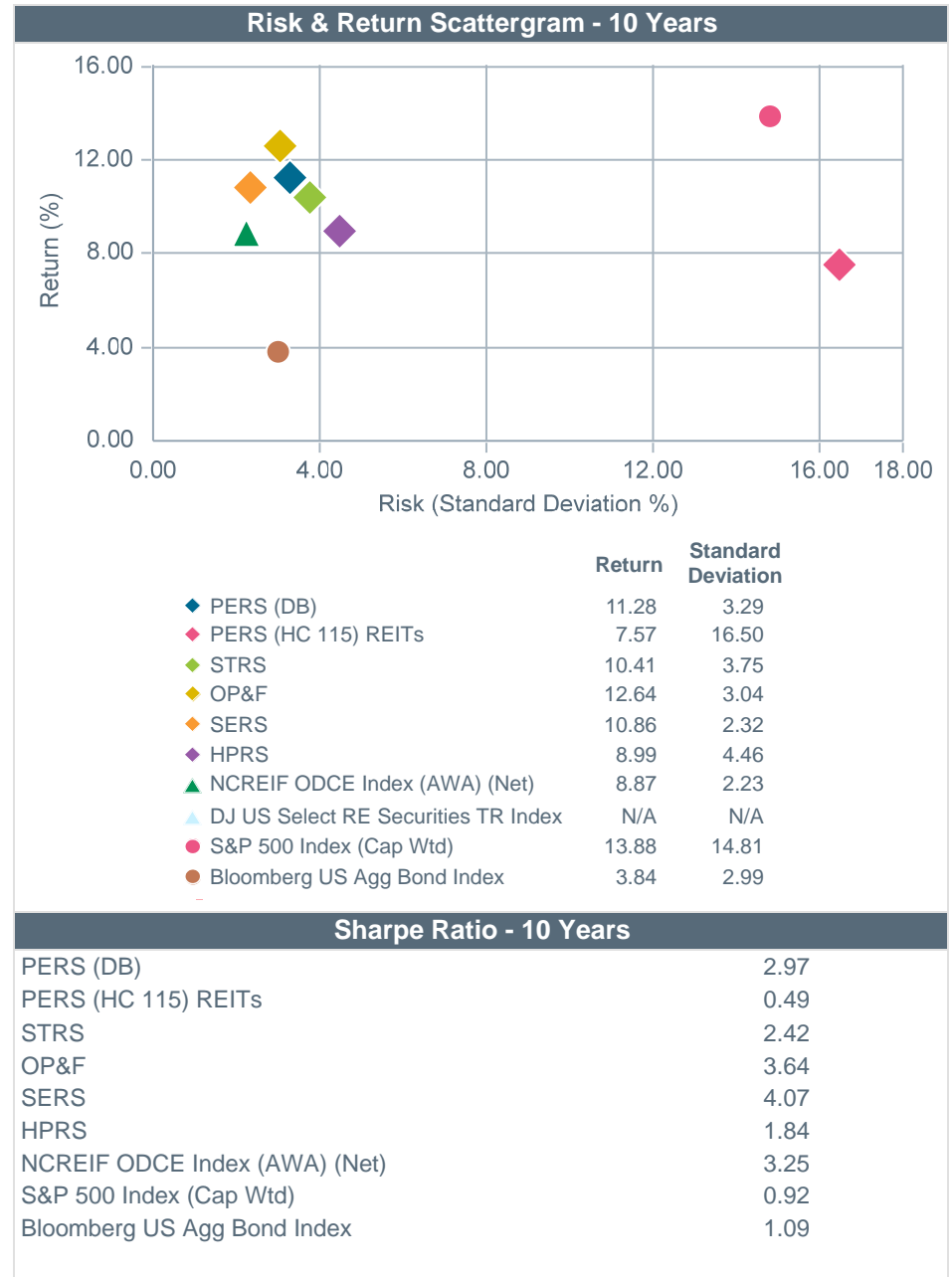
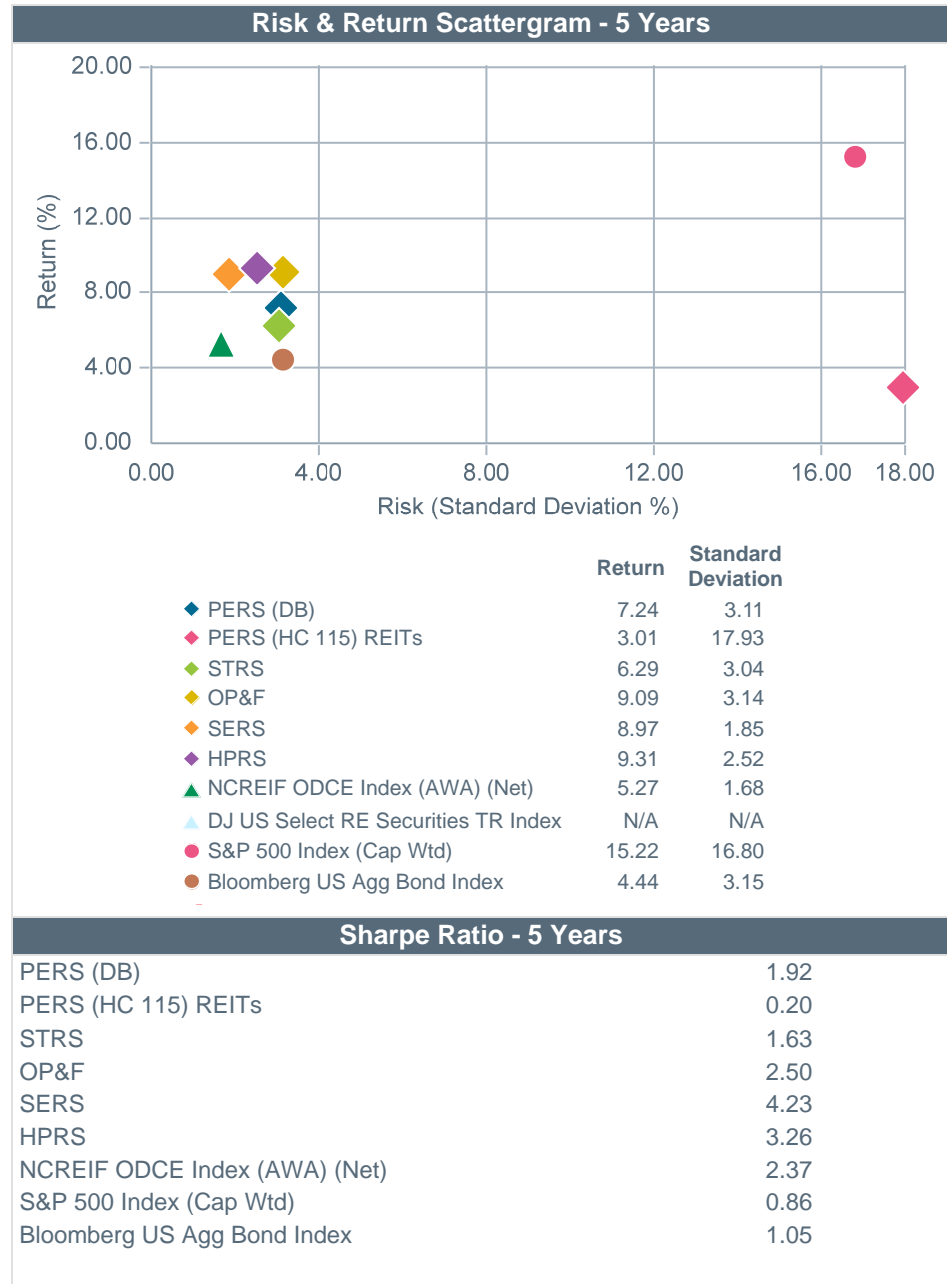
Performance shown is gross of fees. The PERS (DB) Floating Rate Debt composite has been removed due to its ongoing liquidation.

	Trailing Performance (%)						Calendar Year Performance (%)			
	2 Quarters	1 Year	3 Years	5 Years	7 Years	10 Years	2019	2018	2017	2016
<b>Additional Fixed Income</b>										
<b>PERS (HC 115) High Yield</b>	11.42	7.42	6.49	8.18	5.77	6.87	14.76	-2.06	7.23	14.44
Bloomberg Barclays U.S. High Yield Index	11.34	7.11	6.24	8.59	5.74	6.80	14.32	-2.08	7.50	17.13
Difference	0.08	0.31	0.25	-0.41	0.03	0.07	0.44	0.02	-0.27	-2.69
<b>PERS (HC 115) Securitized Debt</b>	9.27	7.40	7.38	5.72	7.27	N/A	11.70	3.21	7.52	-0.80
Bloomberg CMBS Index + 2%	13.94	1.18	4.81	5.21	4.91	N/A	10.70	2.79	5.76	5.87
Difference	-4.67	6.22	2.57	0.51	2.36	N/A	1.00	0.42	1.76	-6.67
<b>PERS (HC 115) TIPS</b>	4.66	10.89	5.88	5.04	3.89	3.80	8.42	-1.26	2.88	4.69
Bloomberg Barclays U.S. Tips Index	4.70	10.99	5.92	5.08	3.92	3.81	8.43	-1.26	3.01	4.68
Difference	-0.04	-0.10	-0.04	-0.04	-0.03	-0.01	-0.01	0.00	-0.13	0.01
<b>OP&amp;F High Yield</b>	11.06	6.71	6.42	7.79	5.78	6.79	13.48	-0.48	7.05	12.80
CS Developed Countries High Yield	11.47	6.08	5.86	8.50	5.53	6.61	14.41	-2.26	7.48	17.95
Difference	-0.41	0.63	0.56	-0.71	0.25	0.18	-0.93	1.78	-0.43	-5.15
<b>OP&amp;F Private Credit Fixed Income</b>	2.06	3.09	N/A	N/A	N/A	N/A	11.62	N/A	N/A	N/A
S&P LTSA Levered Loan Index + 2%	15.38	3.09	5.20	N/A	N/A	N/A	5.26	7.30	N/A	N/A
Difference	-13.32	0.00	N/A	N/A	N/A	N/A	6.36	N/A	N/A	N/A
<b>OP&amp;F US TIPS</b>	13.09	20.11	11.49	11.11	10.63	10.94	15.70	-0.26	2.89	18.76
Bridgewater Custom US TIPS Index	9.67	23.25	10.45	9.90	9.26	8.59	15.12	-5.04	1.90	16.77
Difference	3.42	-3.14	1.04	1.21	1.37	2.35	0.58	4.78	0.99	1.99
<b>SERS Private Credit</b>	8.36	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
3 Month LIBOR Rate + 4.5%	2.36	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Difference	6.00	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Performance shown is gross of fees. The PERS (HC 115) Floating Rate Debt composite has been removed due to its ongoing liquidation. The SERS Private Credit composite was inceptioned during the second half of 2020.

Performance										
	Trailing Performance (%)						Calendar Year Performance (%)			
	2 Quarters	1 Year	3 Years	5 Years	7 Years	10 Years	2019	2018	2017	2016
<b>Real Estate</b>										
<b>PERS (DB)</b>	<b>0.53</b>	<b>2.55</b>	<b>4.90</b>	<b>7.24</b>	<b>10.24</b>	<b>11.28</b>	<b>7.86</b>	<b>4.37</b>	<b>9.61</b>	<b>12.08</b>
PERS (DB) Real Estate Custom Benchmark	-1.09	1.37	5.10	6.54	8.47	9.89	5.49	8.56	7.55	9.93
Difference	1.62	1.18	-0.20	0.70	1.77	1.39	2.37	-4.19	2.06	2.15
<b>PERS (HC 115) REITs</b>	<b>13.84</b>	<b>-11.40</b>	<b>1.55</b>	<b>3.01</b>	<b>6.88</b>	<b>7.57</b>	<b>23.23</b>	<b>-4.10</b>	<b>3.81</b>	<b>6.70</b>
DJ US Select Real Estate Securities TR Index	13.86	-11.20	1.54	2.99	6.91	7.50	23.10	-4.22	3.76	6.65
Difference	-0.02	-0.20	0.01	0.02	-0.03	0.07	0.13	0.12	0.05	0.05
<b>STRS</b>	<b>0.99</b>	<b>-1.27</b>	<b>5.23</b>	<b>6.29</b>	<b>8.55</b>	<b>10.41</b>	<b>10.65</b>	<b>6.65</b>	<b>6.14</b>	<b>9.68</b>
STRS Real Estate Custom Benchmark	3.58	0.89	5.04	5.98	7.99	9.10	9.31	5.09	6.70	8.10
Difference	-2.59	-2.16	0.19	0.31	0.56	1.31	1.34	1.56	-0.56	1.58
<b>OP&amp;F</b>	<b>0.19</b>	<b>0.11</b>	<b>7.37</b>	<b>9.09</b>	<b>11.48</b>	<b>12.64</b>	<b>8.76</b>	<b>13.69</b>	<b>10.30</b>	<b>13.14</b>
NCREIF ODCE Index (AWA) (Net) (1 Qtr Lag)	-1.49	0.52	4.25	5.69	7.62	9.26	4.64	7.71	6.70	9.08
Difference	1.68	-0.41	3.12	3.40	3.86	3.38	4.12	5.98	3.60	4.06
<b>SERS</b>	<b>2.90</b>	<b>3.30</b>	<b>8.13</b>	<b>8.97</b>	<b>10.39</b>	<b>10.86</b>	<b>9.84</b>	<b>11.41</b>	<b>10.24</b>	<b>10.27</b>
SERS Global Real Assets Custom Benchmark	-0.26	2.00	5.11	6.28	7.99	9.37	6.24	7.16	6.89	9.26
Difference	3.16	1.30	3.02	2.69	2.40	1.49	3.60	4.25	3.35	1.01
<b>HPRS</b>	<b>3.84</b>	<b>2.84</b>	<b>9.51</b>	<b>9.31</b>	<b>10.61</b>	<b>8.99</b>	<b>10.32</b>	<b>15.75</b>	<b>10.30</b>	<b>7.75</b>
HPRS Real Estate Custom Benchmark (Net)	3.62	2.34	8.69	8.44	9.54	10.25	10.07	14.00	6.90	9.22
Difference	0.22	0.50	0.82	0.87	1.07	-1.26	0.25	1.75	3.40	-1.47

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.

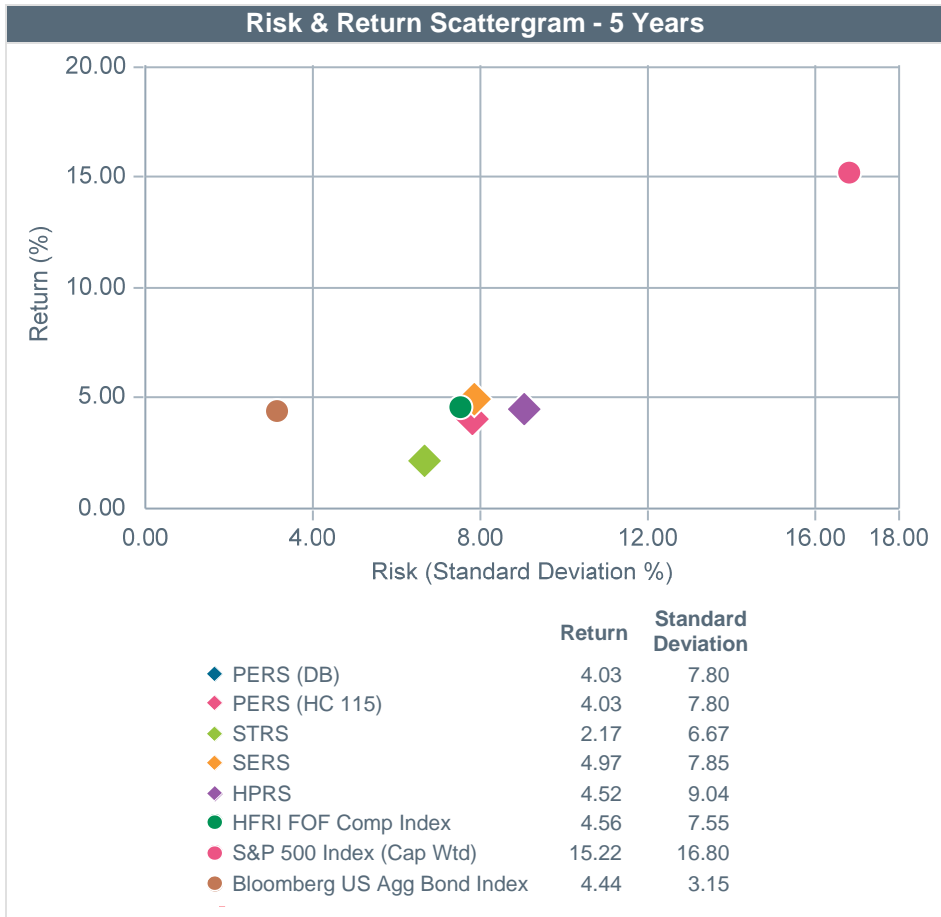


Performance shown may be net or gross of fees depending on underlying investments.



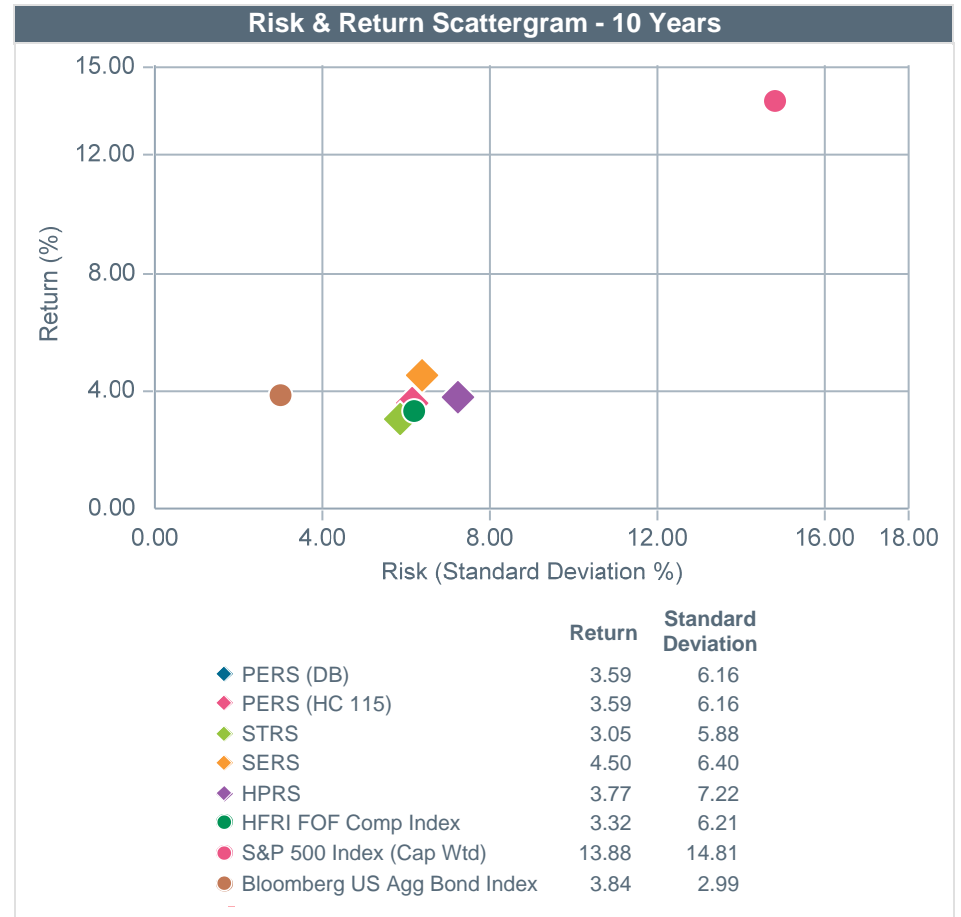
Performance										
	Trailing Performance (%)						Calendar Year Performance (%)			
	2 Quarters	1 Year	3 Years	5 Years	7 Years	10 Years	2019	2018	2017	2016
<b>Hedge Funds</b>										
<b>PERS (DB)</b>	<b>12.80</b>	<b>3.63</b>	<b>3.19</b>	<b>4.03</b>	<b>3.25</b>	<b>3.59</b>	<b>7.66</b>	<b>-1.51</b>	<b>7.25</b>	<b>3.38</b>
PERS (DB) Hedge Funds Custom Benchmark	9.97	6.05	3.66	4.95	3.63	4.63	8.49	-3.19	7.38	6.44
Difference	2.83	-2.42	-0.47	-0.92	-0.38	-1.04	-0.83	1.68	-0.13	-3.06
<b>PERS (HC 115)</b>	<b>12.80</b>	<b>3.63</b>	<b>3.19</b>	<b>4.03</b>	<b>3.25</b>	<b>3.59</b>	<b>7.66</b>	<b>-1.51</b>	<b>7.25</b>	<b>3.38</b>
PERS (HC 115) Hedge Funds Custom Benchmark	9.97	6.05	3.66	4.95	3.63	4.63	8.49	-3.19	7.38	6.44
Difference	2.83	-2.42	-0.47	-0.92	-0.38	-1.04	-0.83	1.68	-0.13	-3.06
<b>STRS</b>	<b>5.34</b>	<b>-2.47</b>	<b>0.66</b>	<b>2.17</b>	<b>1.93</b>	<b>3.05</b>	<b>3.91</b>	<b>0.64</b>	<b>5.59</b>	<b>3.38</b>
HFRI FOF Comp Index	12.71	10.88	4.88	4.56	3.68	3.32	8.39	-4.02	7.77	0.51
Difference	-7.37	-13.35	-4.22	-2.39	-1.75	-0.27	-4.48	4.66	-2.18	2.87
<b>SERS</b>	<b>11.40</b>	<b>9.23</b>	<b>5.14</b>	<b>4.97</b>	<b>4.11</b>	<b>4.50</b>	<b>8.15</b>	<b>-1.61</b>	<b>7.27</b>	<b>2.20</b>
HFRI FOF Comp Index + 1%	13.28	11.99	5.92	5.60	4.72	4.36	9.47	-3.06	8.85	1.52
Difference	-1.88	-2.76	-0.78	-0.63	-0.61	0.14	-1.32	1.45	-1.58	0.68
<b>HPRS</b>	<b>13.66</b>	<b>12.02</b>	<b>5.77</b>	<b>4.52</b>	<b>3.87</b>	<b>3.77</b>	<b>12.31</b>	<b>-5.96</b>	<b>5.70</b>	<b>-0.27</b>
HFRI FOF Comp Index	12.71	10.88	4.88	4.56	3.68	3.32	8.39	-4.02	7.77	0.51
Difference	0.95	1.14	0.89	-0.04	0.19	0.45	3.92	-1.94	-2.07	-0.78

Performance shown is net of fees.



### Sharpe Ratio - 5 Years

PERS (DB)	0.39
PERS (HC 115)	0.39
STRS	0.17
SERS	0.50
HPRS	0.40
HFRI FOF Comp Index	0.46
S&P 500 Index (Cap Wtd)	0.86
Bloomberg US Agg Bond Index	1.05



### Sharpe Ratio - 10 Years

PERS (DB)	0.49
PERS (HC 115)	0.49
STRS	0.43
SERS	0.61
HPRS	0.46
HFRI FOF Comp Index	0.45
S&P 500 Index (Cap Wtd)	0.92
Bloomberg US Agg Bond Index	1.09

Performance shown is net of fees.

Performance										
	2 Quarters	1 Year	3 Years	5 Years	7 Years	10 Years	2019	2018	2017	2016
<b>Private Equity</b>										
<b>PERS (DB)</b>	<b>25.34</b>	<b>16.38</b>	<b>14.06</b>	<b>13.62</b>	<b>13.12</b>	<b>14.24</b>	<b>10.39</b>	<b>15.48</b>	<b>19.60</b>	<b>6.72</b>
PERS (DB) Private Equity Custom Benchmark	21.11	13.78	12.22	12.04	11.63	13.85	8.02	15.00	15.13	8.48
Difference	4.23	2.60	1.84	1.58	1.49	0.39	2.37	0.48	4.47	-1.76
<b>STRS</b>	<b>28.64</b>	<b>25.49</b>	<b>19.68</b>	<b>16.91</b>	<b>16.16</b>	<b>16.07</b>	<b>13.97</b>	<b>19.85</b>	<b>19.35</b>	<b>6.76</b>
STRS Private Equity Custom Benchmark	25.84	22.08	15.63	16.58	13.88	15.26	32.30	-4.29	22.32	13.85
Difference	2.80	3.41	4.05	0.33	2.28	0.81	-18.33	24.14	-2.97	-7.09
<b>OP&amp;F</b>	<b>28.08</b>	<b>22.30</b>	<b>18.53</b>	<b>16.43</b>	<b>15.99</b>	<b>15.04</b>	<b>13.65</b>	<b>19.82</b>	<b>18.02</b>	<b>8.84</b>
OP&F Private Equity Custom Benchmark	28.08	22.30	18.53	16.43	15.99	15.04	13.65	19.82	18.02	8.84
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>20.84</b>	<b>16.39</b>	<b>15.79</b>	<b>16.22</b>	<b>16.78</b>	<b>16.19</b>	<b>12.76</b>	<b>18.27</b>	<b>21.56</b>	<b>12.37</b>
Burgiss All Private Equity Benchmark	14.71	12.16	12.05	11.46	11.46	13.78	8.08	16.05	12.10	9.07
Difference	6.13	4.23	3.74	4.76	5.32	2.41	4.68	2.22	9.46	3.30
<b>HPRS</b>	<b>13.14</b>	<b>4.46</b>	<b>7.62</b>	<b>8.93</b>	<b>8.22</b>	<b>6.63</b>	<b>9.66</b>	<b>8.80</b>	<b>8.46</b>	<b>13.44</b>
HPRS Private Equity Custom Benchmark	13.14	4.46	7.71	9.76	11.30	13.56	9.96	8.80	12.37	13.44
Difference	0.00	0.00	-0.09	-0.83	-3.08	-6.93	-0.30	0.00	-3.91	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.

Performance										
	Trailing Performance (%)						Calendar Year Performance (%)			
	2 Quarters	1 Year	3 Years	5 Years	7 Years	10 Years	2019	2018	2017	2016
<b>Other Alternatives</b>										
<b>PERS (DB) Commodities</b>	<b>20.03</b>	<b>-21.96</b>	<b>-7.46</b>	<b>-1.15</b>	<b>-11.27</b>	<b>N/A</b>	<b>17.54</b>	<b>-13.59</b>	<b>6.40</b>	<b>11.92</b>
S&P Goldman Sachs Commodity Index (TR)	19.76	-23.72	-8.21	-1.85	-11.98	N/A	17.63	-13.82	5.77	11.37
Difference	0.27	1.76	0.75	0.70	0.71	N/A	-0.09	0.23	0.63	0.55
<b>PERS (DB) Risk Parity</b>	<b>19.05</b>	<b>5.96</b>	<b>7.54</b>	<b>11.23</b>	<b>7.63</b>	<b>N/A</b>	<b>30.30</b>	<b>-9.93</b>	<b>18.51</b>	<b>15.51</b>
PERS (DB) Risk Parity Custom Benchmark	19.17	5.25	7.14	7.97	7.24	N/A	29.93	-10.07	11.50	7.00
Difference	-0.12	0.71	0.40	3.26	0.39	N/A	0.37	0.14	7.01	8.51
<b>PERS (DB) Opportunistic</b>	<b>N/A</b>	<b>N/A</b>	<b>N/A</b>	<b>N/A</b>	<b>N/A</b>	<b>N/A</b>	<b>N/A</b>	<b>N/A</b>	<b>N/A</b>	<b>N/A</b>
PERS (DB) Opportunistic Benchmark	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Difference	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
<b>PERS (HC 115) Commodities</b>	<b>20.03</b>	<b>-21.96</b>	<b>-7.46</b>	<b>-1.15</b>	<b>-11.19</b>	<b>-7.90</b>	<b>17.54</b>	<b>-13.59</b>	<b>6.40</b>	<b>11.92</b>
S&P Goldman Sachs Commodity Index (TR)	19.76	-23.72	-8.21	-1.85	-11.98	-8.76	17.63	-13.82	5.77	11.37
Difference	0.27	1.76	0.75	0.70	0.79	0.86	-0.09	0.23	0.63	0.55
<b>PERS (HC 115) Risk Parity</b>	<b>19.05</b>	<b>5.96</b>	<b>7.54</b>	<b>11.23</b>	<b>7.64</b>	<b>N/A</b>	<b>30.30</b>	<b>-9.93</b>	<b>18.51</b>	<b>15.51</b>
PERS (HC 115) Risk Parity Custom Benchmark	19.17	5.25	7.14	7.97	7.24	N/A	29.93	-10.07	11.50	7.00
Difference	-0.12	0.71	0.40	3.26	0.40	N/A	0.37	0.14	7.01	8.51
<b>PERS (HC 115) Opportunistic</b>	<b>N/A</b>	<b>N/A</b>	<b>N/A</b>	<b>N/A</b>	<b>N/A</b>	<b>N/A</b>	<b>N/A</b>	<b>N/A</b>	<b>N/A</b>	<b>N/A</b>
PERS (HC 115) Opportunistic Benchmark	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Difference	N/A	N/A	N/A	N/A	N/A	N/A	N/A	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	2019	2018	2017	2016
<b>Other Alternatives</b>										
<b>STRS Opportunistic Investments ex HF</b>	<b>10.33</b>	<b>-1.58</b>	<b>3.62</b>	<b>4.25</b>	<b>5.32</b>	<b>7.25</b>	<b>6.39</b>	<b>6.25</b>	<b>6.07</b>	<b>4.32</b>
STRS Opportunistic Custom Benchmark	24.64	19.70	13.37	14.30	11.65	12.68	29.75	-6.18	19.95	11.63
Difference	-14.31	-21.28	-9.75	-10.05	-6.33	-5.43	-23.36	12.43	-13.88	-7.31
<b>OP&amp;F Real Assets</b>	<b>0.66</b>	<b>-0.28</b>	<b>5.23</b>	<b>4.18</b>	<b>4.08</b>	<b>N/A</b>	<b>5.80</b>	<b>10.45</b>	<b>3.26</b>	<b>1.99</b>
OP&F Real Assets Custom Benchmark	5.82	-0.11	4.03	5.94	6.16	N/A	12.27	0.40	10.59	7.19
Difference	-5.16	-0.17	1.20	-1.76	-2.08	N/A	-6.47	10.05	-7.33	-5.20
<b>OP&amp;F MLPs</b>	<b>8.23</b>	<b>-26.09</b>	<b>-10.01</b>	<b>-3.39</b>	<b>-5.06</b>	<b>N/A</b>	<b>13.46</b>	<b>-13.10</b>	<b>-4.08</b>	<b>20.42</b>
Alerian MLP Index	8.86	-23.37	-7.69	-2.75	-6.72	N/A	17.21	-12.42	-6.52	18.30
Difference	-0.63	-2.72	-2.32	-0.64	1.66	N/A	-3.75	-0.68	2.44	2.12
<b>OP&amp;F Gold</b>	<b>N/A</b>	<b>N/A</b>	<b>N/A</b>	<b>N/A</b>	<b>N/A</b>	<b>N/A</b>	<b>N/A</b>	<b>N/A</b>	<b>N/A</b>	<b>N/A</b>
S&P GSCI Gold Index Minus the Cost of Financing	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Difference	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
<b>SERS Opportunistic &amp; Tactical Portfolio</b>	<b>10.53</b>	<b>2.27</b>	<b>4.89</b>	<b>8.00</b>	<b>5.93</b>	<b>N/A</b>	<b>7.11</b>	<b>5.33</b>	<b>14.55</b>	<b>11.17</b>
SERS Opportunistic Custom Benchmark	2.06	0.36	4.49	6.91	6.08	N/A	16.04	-2.03	14.37	7.02
Difference	8.47	1.91	0.40	1.09	-0.15	N/A	-8.93	7.36	0.18	4.15
<b>HPRS Real Assets</b>	<b>11.29</b>	<b>-3.04</b>	<b>0.70</b>	<b>0.39</b>	<b>N/A</b>	<b>N/A</b>	<b>12.81</b>	<b>-6.64</b>	<b>-4.27</b>	<b>4.28</b>
HPRS Real Assets Custom Benchmark (Net)	11.29	-3.04	2.77	3.36	N/A	N/A	12.54	-0.53	-0.43	9.17
Difference	0.00	0.00	-2.07	-2.97	N/A	N/A	0.27	-6.11	-3.84	-4.89

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.

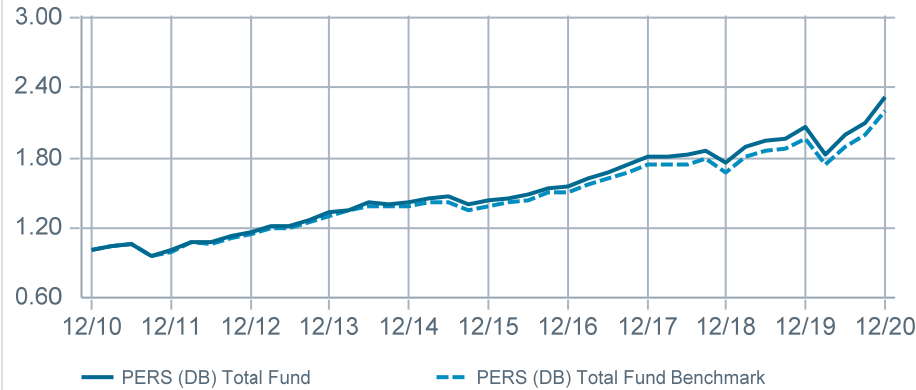
# Plan Specific Pages



**Summary**

- PERS (DB) has generated an annualized 0.36% of alpha over the trailing 5-year period and 0.56% 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**



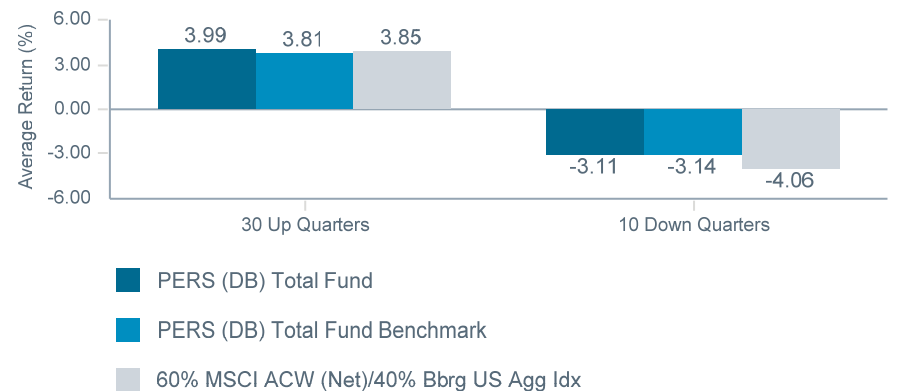
**MPT Stats**

	5 Years	10 Years
Maximum Return	10.35	10.35
Minimum Return	-11.66	-11.66
Standard Deviation	9.36	8.46
vs. PERS (DB) Total Fund Benchmark		
Info Ratio	0.86	0.72
Tracking Error	0.55	0.74
Alpha	0.36	0.56
vs. S&P 500 Index (Cap Wtd)		
Beta	0.53	0.54
vs. ICE BofAML 3 Mo US T-Bill Index		
Sharpe Ratio	0.94	0.96

**Asset Allocation vs. Targets**

	Market Value (\$)	Allocation (%)	Target (%)
US Equity	22,108,596,060	22.46	22.40
International Equity	22,411,121,705	22.77	22.50
Core Fixed Income	10,853,581,968	11.03	11.00
U.S. Treasury	3,661,139,652	3.72	5.00
High Yield	2,259,183,561	2.29	2.00
Global High Yield	8,546	0.00	0.00
EMD	5,834,678,812	5.93	6.00
Floating Rate Debt	3,032,326	0.00	0.00
Securitized Debt	1,205,856,560	1.22	1.00
TIPS	2,134,905,259	2.17	2.00
Real Estate	8,891,546,223	9.03	10.00
Hedge Funds	1,586,499,977	1.61	0.00
PERS (DB) Opportunistic	90,467,876	0.09	0.10
Commodities	1,296,487,327	1.32	1.00
Private Equity	10,520,766,916	10.69	12.00
Risk Parity	4,616,620,381	4.69	5.00
Cash Equivalents	948,042,347	0.96	0.00
Additional Annuity	16,838,669	0.02	0.00
Other Pension Assets	46,163	0.00	0.00
Total Fund	98,439,420,329	100.00	100.00

**Up/Down Markets - 10 Years**

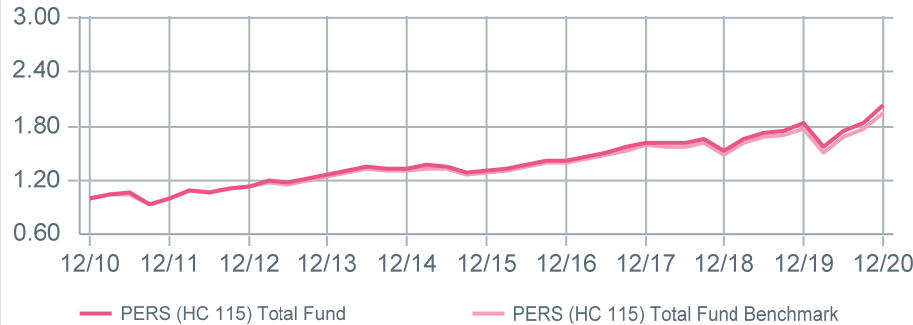


Performance shown is gross of fees. Calculations are based on quarterly periodicity. Allocations shown may not sum up to 100% exactly due to rounding.

**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**



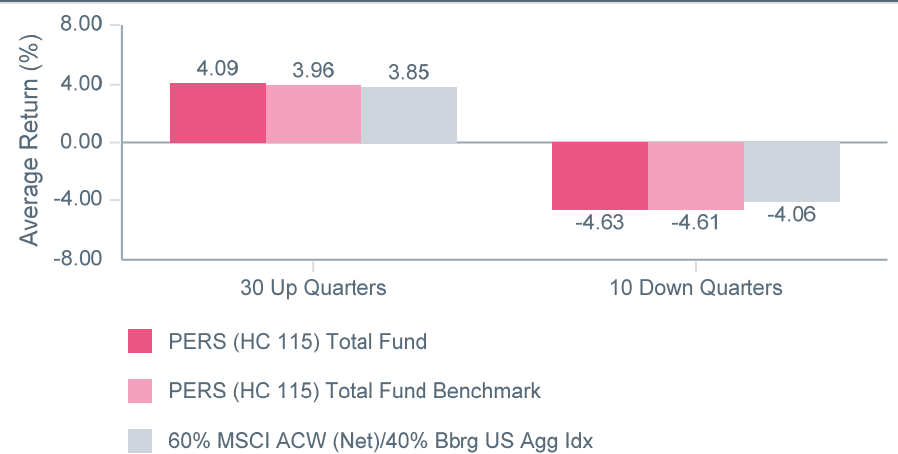
**MPT Stats**

	<b>10 Years</b>
Maximum Return	12.24
Standard Deviation	10.03
Minimum Return	-14.63
vs. PERS (HC 115) Total Fund Benchmark	
Info Ratio	0.95
Tracking Error	0.40
Alpha	0.37
vs. S&P 500 Index (Cap Wtd)	
Beta	0.70
vs. ICE BofAML 3 Mo US T-Bill Index	
Sharpe Ratio	0.56

**Asset Allocation vs. Targets**

	Market Value (\$)	Allocation (%)	Target (%)
US Equity	3,218,310,353	24.11	27.90
International Equity	3,279,158,194	24.56	25.00
Core Fixed Income	2,740,570,063	20.53	17.00
EMD	693,077,828	5.19	2.00
High Yield	269,323,134	2.02	4.00
Floating Rate Debt	341,368	0.00	0.00
Securitized Debt	140,732,705	1.05	2.00
TIPS	770,209,613	5.77	7.00
Global High Yield	28,937	0.00	0.00
REITs	783,725,056	5.87	7.00
Hedge Funds	214,688,311	1.61	0.00
PERS (HC 115) Opportunistic	12,336,529	0.09	0.10
Commodities	522,620,738	3.91	4.00
Risk Parity	509,478,889	3.82	2.00
Cash Equivalents	54,531,566	0.41	0.00
U.S. Treasury	141,911,944	1.06	2.00
Rebalancing	-3	0.00	0.00
<b>Total Fund</b>	<b>13,351,045,225</b>	<b>100.00</b>	<b>100.00</b>

**Up/Down Markets - 10 Years**



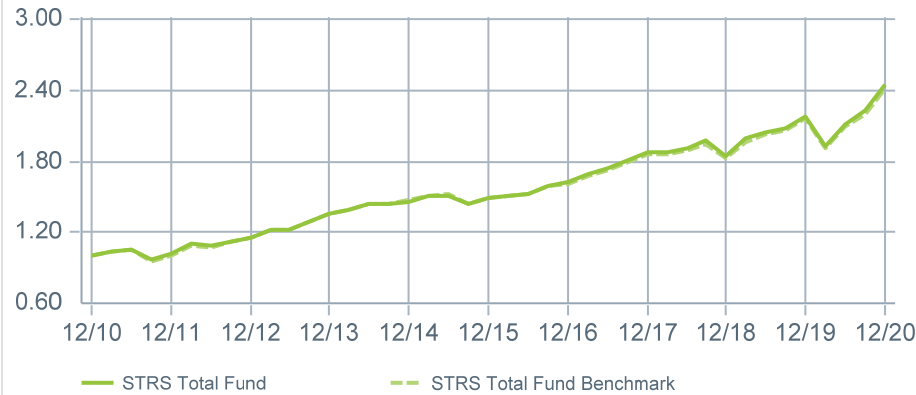
Performance shown is gross of fees. Calculations are based on quarterly periodicity. Allocations shown may not sum up to 100% exactly due to rounding.



**Summary**

- STRS has generated 0.12% of alpha over the trailing 5-year period and 0.28% 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**



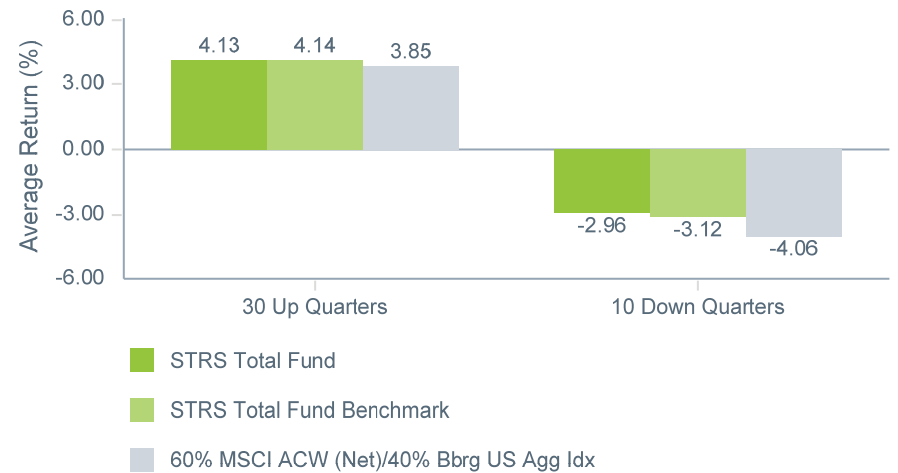
**MPT Stats**

	5 Years	10 Years
Maximum Return	10.00	10.00
Minimum Return	-11.51	-11.51
Standard Deviation	9.49	8.54
vs. STRS Total Fund Benchmark		
Info Ratio	0.82	0.32
Tracking Error	0.36	0.47
Alpha	0.12	0.28
vs. S&P 500 Index (Cap Wtd)		
Beta	0.55	0.56
vs. ICE BofAML 3 Mo US T-Bill Index		
Sharpe Ratio	0.95	1.02

**Asset Allocation vs. Targets**

	Market Value (\$)	Allocation (%)	Target (%)
US Equity	24,903,818,952	28.63	28.00
International Equity	20,359,573,946	23.41	23.00
Fixed Income	17,323,927,590	19.92	21.00
Real Estate	7,405,105,723	8.51	10.00
Opportunistic (Incl. Hedge Funds)	7,183,324,098	8.26	10.00
Private Equity	8,785,376,717	10.10	7.00
Cash Equivalents	1,013,021,374	1.16	1.00
<b>Total Fund</b>	<b>86,974,148,400</b>	<b>100.00</b>	<b>100.00</b>

**Up/Down Markets - 10 Years**

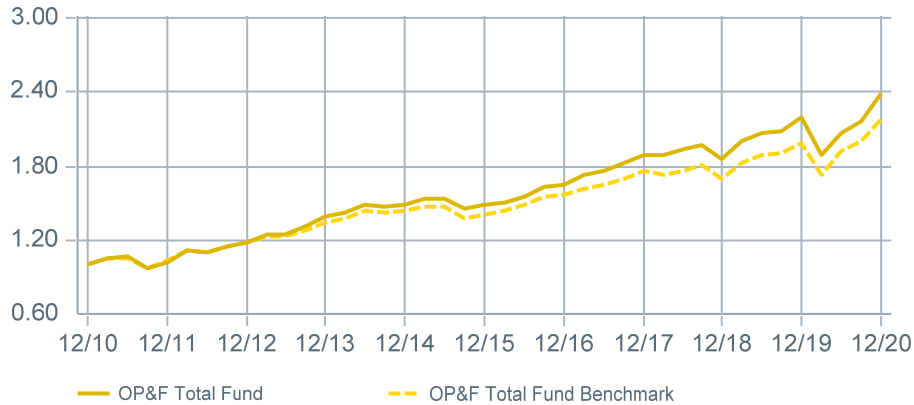


Performance shown is gross of fees. Calculations are based on quarterly periodicity. Allocations shown may not sum up to 100% exactly due to rounding.

**Summary**

- OP&F has generated 0.62% of alpha over the trailing 5-year period and 0.73% 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**



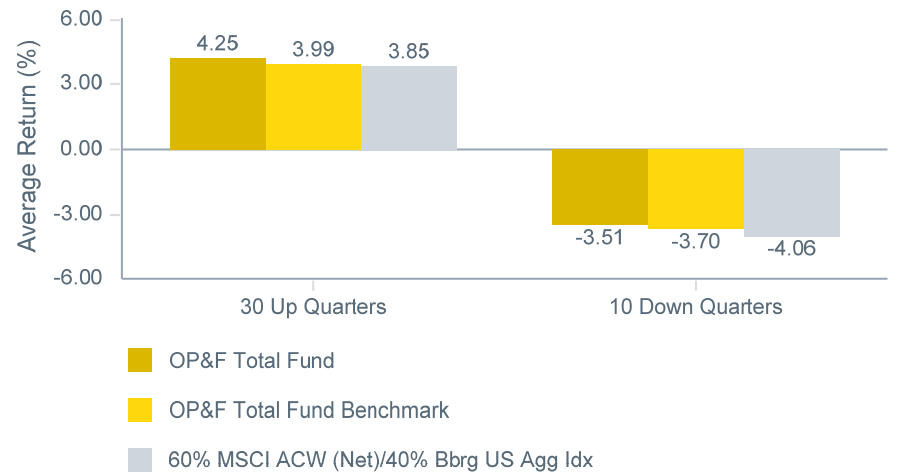
**MPT Stats**

	5 Years	10 Years
Maximum Return	10.64	10.64
Minimum Return	-13.47	-13.47
Standard Deviation	9.99	9.21
vs. OP&F Total Fund Benchmark		
Info Ratio	0.58	0.86
Tracking Error	1.27	1.13
Alpha	0.62	0.73
vs. S&P 500 Index (Cap Wtd)		
Beta	0.57	0.58
vs. ICE BofAML 3 Mo US T-Bill Index		
Sharpe Ratio	0.87	0.92

**Asset Allocation vs. Targets**

	Market Value (\$)	Allocation (%)	Target (%)
US Equity	3,259,721,396	19.11	17.00
International Equity	3,186,966,444	18.68	14.20
High Yield Fixed Income	1,377,003,549	8.07	7.50
US TIPS	1,537,931,690	9.02	14.20
Core Fixed Income	1,889,959,175	11.08	16.60
Private Credit	493,439,223	2.89	2.50
Real Estate	1,657,473,564	9.72	10.00
Private Markets	1,645,518,515	9.65	6.70
MLPs	860,878,823	5.05	4.20
Real Assets	547,895,239	3.21	3.30
Gold	133,005,588	0.78	3.80
Cash Equivalents	468,791,768	2.75	0.00
Total Fund	17,058,584,974	100.00	100.00

**Up/Down Markets - 10 Years**

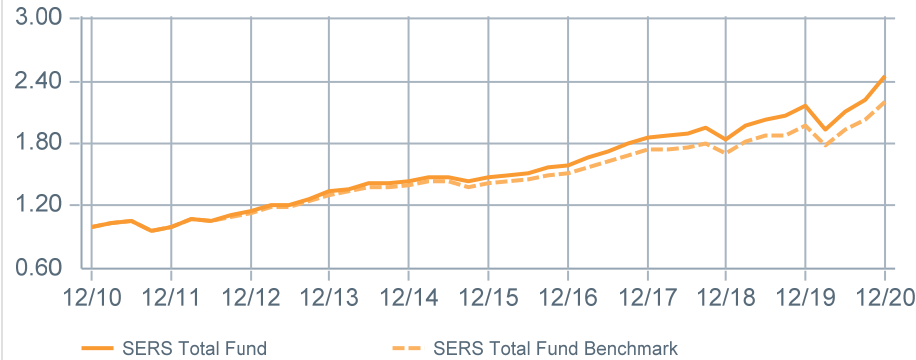


Performance shown is gross of fees. Calculations are based on quarterly periodicity. Allocations shown may not sum up to 100% exactly due to rounding. OP&F's target allocations are based on notional value, and have been scaled to 100% for this report.

**Summary**

- SERS has generated 0.50% of alpha over the trailing 5-year period and 0.04% 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**



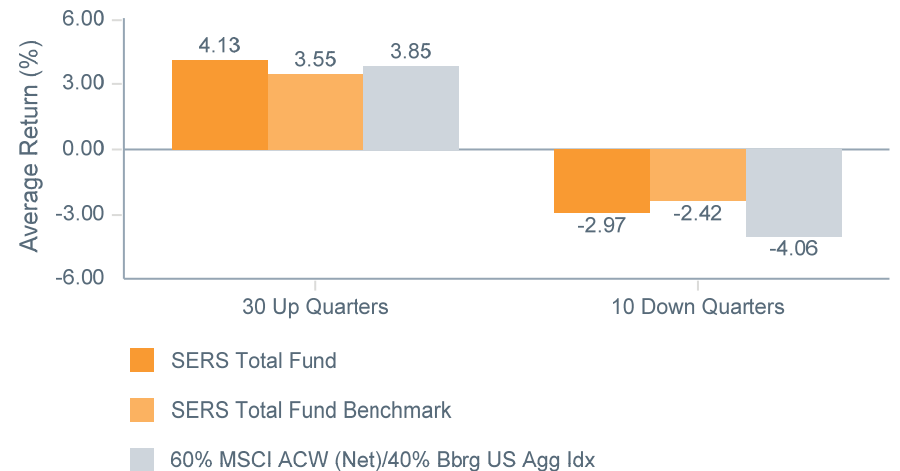
**MPT Stats**

	5 Years	10 Years
Maximum Return	9.94	9.94
Minimum Return	-11.00	-11.00
Standard Deviation	9.14	8.41
vs. SERS Total Fund Benchmark		
Info Ratio	1.36	0.83
Tracking Error	1.12	1.43
Alpha	0.50	0.04
vs. S&P 500 Index (Cap Wtd)		
Beta	0.52	0.54
vs. ICE BofAML 3 Mo US T-Bill Index		
Sharpe Ratio	1.02	1.03

**Asset Allocation vs. Targets**

	Market Value (\$)	Allocation (%)	Target (%)
US Equity	4,264,941,647	25.81	22.50
International Equity	3,991,009,363	24.15	22.50
Fixed Income	2,792,990,787	16.90	19.00
Private Credit	273,407,048	1.65	3.00
Real Estate	2,422,342,583	14.66	16.00
Hedge Funds	371,963,924	2.25	4.00
Opportunistic Investments	412,400,082	2.50	0.00
Private Equity	1,733,150,508	10.49	11.00
Cash Equivalents	264,971,839	1.60	2.00
Total Fund	16,527,177,781	100.00	100.00

**Up/Down Markets - 10 Years**

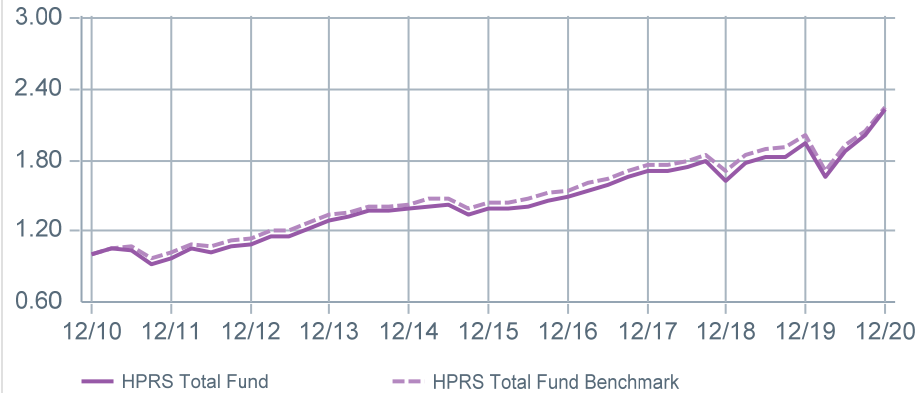


Performance shown is gross of fees. Calculations are based on quarterly periodicity. Allocations shown may not sum up to 100% exactly due to rounding.

**Summary**

- HPRS has generated 0.11% of alpha over the trailing 5-year period, but lost **-0.70%** 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**



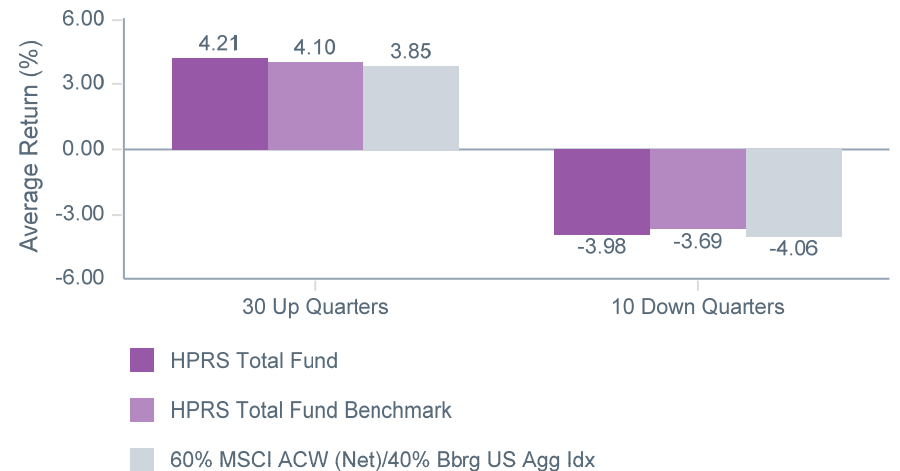
**MPT Stats**

	5 Years	10 Years
Maximum Return	13.60	13.60
Minimum Return	<b>-14.84</b>	<b>-14.84</b>
Standard Deviation	11.89	10.48
vs. HPRS Total Fund Benchmark		
Info Ratio	0.60	0.02
Tracking Error	1.12	1.53
Alpha	0.11	<b>-0.70</b>
vs. S&P 500 Index (Cap Wtd)		
Beta	0.70	0.69
vs. ICE BofAML 3 Mo US T-Bill Index		
Sharpe Ratio	0.76	0.76

**Asset Allocation vs. Targets**

	Market Value (\$)	Allocation (%)	Target (%)
US Equity	330,266,285	32.48	30.00
International Equity	196,698,135	19.34	18.00
Fixed Income	154,868,004	15.23	18.00
Real Estate	68,139,046	6.70	7.00
Hedge Funds	92,372,146	9.08	10.00
Private Equity	111,848,625	11.00	10.00
Real Assets	26,740,698	2.63	5.00
Cash Equivalents	35,973,383	3.54	2.00
Total Fund	1,016,906,322	100.00	100.00

**Up/Down Markets - 10 Years**



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

	Market Value (\$000)	Trailing Performance (%)						Calendar Year Performance (%)			
		2 Quarters	1 Year	3 Years	5 Years	7 Years	10 Years	2019	2018	2017	2016
<b>HPRS</b>	<b>1,016,906</b>	<b>18.61</b>	<b>14.75</b>	<b>9.18</b>	<b>9.96</b>	<b>8.04</b>	<b>8.33</b>	<b>18.85</b>	<b>-4.57</b>	<b>15.01</b>	<b>7.42</b>
HPRS Total Fund Benchmark		16.28	11.46	8.27	9.32	7.64	8.39	17.85	-3.38	14.55	7.40
Difference		2.33	3.29	0.91	0.64	0.40	-0.06	1.00	-1.19	0.46	0.02
<i>All Public Plans &gt; \$1B-TF Median</i>		16.00	11.99	8.23	9.67	7.68	8.30	17.30	-3.13	16.02	7.95
Rank		10	14	27	39	38	50	24	75	67	69
Population		205	204	190	185	181	174	186	144	111	118
<i>All Public Plans \$250M to \$1B-TF Median</i>		16.33	13.01	8.92	10.06	7.94	8.65	18.77	-4.66	15.75	7.87
Rank		19	28	40	55	48	63	48	48	66	63
Population		125	122	109	106	104	99	124	79	44	49







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

## Appendix

### Performance Related Comments

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

### Asset Class Fee Comparison – as of 12/31/2020

(annualized fees shown in basis points)							
	Domestic Equity	International Equity	Fixed Income	Real Estate	Private Equity	Hedge Funds	Other Alternatives
 PERS (DB)	3	23	7	68	46	114	46
 PERS (HC 115)	0	3	1	-	-	15	5
 STRS	12	21	6	40	68	132	73
 OP&F	47	33	32	78	71	-	91
 SERS	15	41	27	82	111	106	175
 HPRS	33	76	40	129	118	87	105

- Fees for HPRS are as of 06/30/2020.
- 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, GTAA, Commodities and Opportunistic.
- 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 (HC 115) Domestic Equity fee is 0.4 bps.
- STRS Other Alternatives fees include Opportunistic/Diversified Investments excluding Hedge Fund exposure.
- OP&F Other Alternatives fees include Real Assets, MLPs, and Gold.
- SERS Other Alternatives fees include Opportunistic and Tactical Portfolio.
- HPRS Other Alternatives fees include Real Assets.

## Appendix

### Percentage of Assets Managed by External Managers – as of 12/31/2020

Percentage of Assets Managed by External Managers - As of 12/31/2020								
	Total Fund	Domestic Equity	International Equity	Fixed Income	Real Estate	Private Equity	Hedge Funds	Other Alternatives
<span style="color: blue;">■</span> PERS (DB)	52%	4%	75%	29%	100%	100%	100%	77%
<span style="color: red;">■</span> PERS (HC 115)	32%	4%	75%	19%	-	-	100%	49%
<span style="color: green;">■</span> STRS	33%	10%	45%	12%	13%	97%	100%	71%
<span style="color: yellow;">■</span> OP&F	99%	100%	100%	100%	100%	100%	-	100%
<span style="color: orange;">■</span> SERS	98%	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, Commodities and Opportunistic.
- STRS Other Alternatives include Opportunistic/Diversified Investments excluding 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 SERS Other Alternatives include Opportunistic and Tactical Portfolio.
- SERS has one internally-managed Cash mandate.
- HPRS Other Alternatives fees include Real Assets.

### Percentage of Actively Managed Assets – as of 12/31/2020

Percentage of Assets Actively Managed - As of 12/31/2020								
	Total Fund	Domestic Equity	International Equity	Fixed Income	Real Estate	Private Equity	Hedge Funds	Other Alternatives
<span style="color: blue;">■</span> PERS (DB)	70%	16%	82%	78%	100%	100%	100%	78%
<span style="color: red;">■</span> PERS (HC 115)	59%	16%	82%	81%	-	-	100%	50%
<span style="color: green;">■</span> STRS	89%	61%	100%	100%	84%	100%	100%	100%
<span style="color: yellow;">■</span> OP&F	83%	60%	100%	75%	100%	100%	-	91%
<span style="color: orange;">■</span> SERS	76%	32%	74%	100%	98%	100%	100%	100%
<span style="color: purple;">■</span> HPRS	85%	54%	100%	100%	100%	100%	100%	100%

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

## Custom Benchmark Glossary

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

- 22.4% Russell 3000 Index
- 22.5% PERS (DB) International Equity Custom Benchmark
- 11.0% PERS (DB) Core Fixed Income Custom Benchmark
- 5.0% Bloomberg Barclays U.S. Treasury Index
- 2.0% Bloomberg Barclays U.S. High Yield Index
- 6.0% PERS (DB) EMD Custom Benchmark
- 1.0% PERS (DB) Securitized Debt Custom Benchmark
- 2.0% Bloomberg Barclays U.S. TIPS Index
- 10.0% PERS (DB) Real Estate Custom Benchmark
- 12.0% PERS (DB) Private Equity Custom Benchmark
- 0.1% PERS (DB) S&P Risk Parity Index – 8% Target Volatility
- 1.0% S&P Goldman Sachs Commodity Index (TR)
- 5.0% PERS (DB) Risk Parity Custom Benchmark

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

- 27.9% 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 Barclays U.S. High Yield Index
- 2.0% PERS (HC 115) Securitized Debt Custom Benchmark
- 7.0% Bloomberg Barclays U.S. TIPS Index
- 7.0% Dow Jones U.S. Select Real Estate Securities TR Index
- 0.1% PERS (HC 115) S&P Risk Parity Index – 8% Target Volatility
- 4.0% S&P Goldman Sachs Commodity Index (TR)
- 2.0% PERS (HC 115) Risk Parity Custom Benchmark
- 2.0% Bloomberg Barclays 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
- 10.0% Opportunistic Composite Performance
- 7.0% Private Equity Composite Performance
- 1.0% BofA Merrill Lynch 91-Day T-Bill

### OP&F Total Fund Custom Benchmark:

- 17.0% Wilshire 5000 Index
- 14.2% MSCI ACW Ex US IMI Index (Net)
- 16.6% Bloomberg US Aggregate Bond Index + Leverage Factor
- 7.5% CS High Yield Dev. Countries Only Index
- 14.2% Bridgewater Custom US TIPS Index
- 2.5% S&P LTSA Levered Loan Index + 2%
- 10.0% NCREIF ODCE (Net) (1 Quarter Lag)
- 3.3% OP&F Real Assets Custom Index
- 4.2% Alerian MLP Index
- 6.7% OP&F Private Equity Custom Benchmark
- 3.8% 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:

- 22.5% Russell 3000 Index
- 22.5% SERS International Equity Custom Benchmark
- 19.0% Bloomberg US Aggregate Bond Index
- 16.0% NCREIF Property Index (1 Quarter Lag)
- 4.0% HFRI FOF Composite Index + 1%
- 3.0% 3 Month LIBOR Rate + 4.5%
- 11.0% Burgiss All Private Equity (1 Quarter Lag)
- 2.0% Citigroup 30 Day T-Bill Index

### HPRS Total Fund Custom Benchmark:

- 30.0% Russell 3000 Index
- 18.0% MSCI ACW Ex US IM Index (USD) (Net)
- 18.0% HPRS Fixed Income Custom Benchmark
- 7.0% HPRS Total Real Estate Composite (Net)
- 10.0% HFRI FOF Composite Index
- 10.0% HPRS Total Private Equity Custom Composite
- 5.0% HPRS Real Assets Composite (Net)
- 2.0% 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 Barclays 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 Barclays Non-Agency Investment Grade CMBS: BBB Total Return Index (Unhedged) (USD)
- 50% Bloomberg Barclays 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:

- 20% HFRI Equity Hedge (Total) Index
- 30% HFRI Event Driven (Total) Index
- 25% HFRI Relative Value (Total) Index
- 25% HFRI Macro (Total) Index
- Prior to 2014Q2: The minimum of 700 basis points or 3-month LIBOR plus 400 basis points

### PERS (DB) Opportunistic Custom Benchmark:

- The market weight of underlying portfolio benchmarks

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

- HFR Risk Parity Vol 15 Institutional 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 Barclays 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 Barclays Non-Agency Investment Grade CMBS: BBB Total Return Index (Unhedged) (USD)
- 50% Bloomberg Barclays Non-Agency CMBS Agg Eligible Total Return Index Value (Unhedged) (USD)

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

- 20% HFRI Equity Hedge (Total) Index
- 30% HFRI Event Driven (Total) Index
- 25% HFRI Relative Value (Total) Index
- 25% HFRI Macro (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 Vol 15 Institutional Index

### STRS International Equity Custom Benchmark:

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

### STRS Fixed Income Blended Benchmark:

- Effective July 1, 2017, the Fixed Income Blended Benchmark is calculated using the actual daily beginning weight of Core Fixed Income multiplied by the Bloomberg Barclays U.S. Universal Index return combined with the actual daily beginning weight of the Liquid Treasury Portfolio multiplied by the Bloomberg Barclays US Intermediate Treasury Index return. Prior to July 1, 2017, the Fixed Income Blended Benchmark consisted of the Bloomberg Barclays U.S. Universal Index.

### STRS Real Estate Custom Benchmark:

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

## Custom Benchmark Glossary

### STRS Private Equity Custom Benchmark:

- Russell 3000 + 100 basis points

### STRS Opportunistic Custom Benchmark:

- Russell 3000 - 100 basis points

### 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 Fixed Income Custom Benchmark:

- 53.0% Bloomberg Aggregate Bond Index
- 31.5% Credit Suisse Leveraged Loans
- 15.5% 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.

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

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

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

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

## Glossary

### Peer Groups -

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

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

1 - Highest Statistical Value                      100 - Lowest Statistical Value

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

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

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

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

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

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

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

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

## Glossary

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

### Alpha

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

### Capital Appreciation

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

### Capital Preservation

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

### Inflation

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

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

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

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

PORTLAND

BOISE

CHICAGO

NEW YORK

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