



# Investment Performance Analysis

## Ohio Retirement Study Council

Period Ended: December 31, 2019



## 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.

**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.

# Capital Markets Review



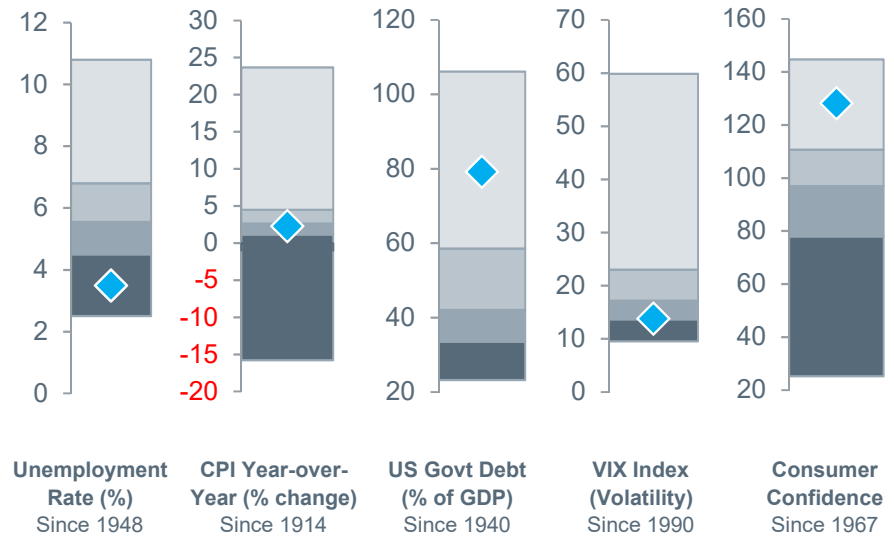


Fourth Quarter Economic Environment

Key Economic Indicators

The fourth quarter of 2019 was a strong quarter for global equity markets, with representative US, developed non-US, and emerging market indices each substantially adding to gains realized earlier in the year. Credit markets also finished in positive territory, as supportive financial conditions and a general risk-on market sentiment drove spreads to tighten across the quality spectrum. Falling discount rates drove valuations and performance for US equities during the first half of the year, but increases in Q4 appeared more directly tied to optimism around international trade. Bilateral negotiations between the US and China finally resulted in an announced “Phase One” trade agreement, including a partial rollback of tariffs, which de-escalated trade tensions to a degree. US economic data released during Q4 was generally positive—although softness remains in some key sectors, such as manufacturing. The ISM PMI value was below 50 in Q4, indicating contraction in the manufacturing sector. Global central banks remain accommodative, though the market expects little additional help from the Federal Reserve in 2020. During its most recent meeting, the FOMC did not forecast any additional rate cuts in 2020.

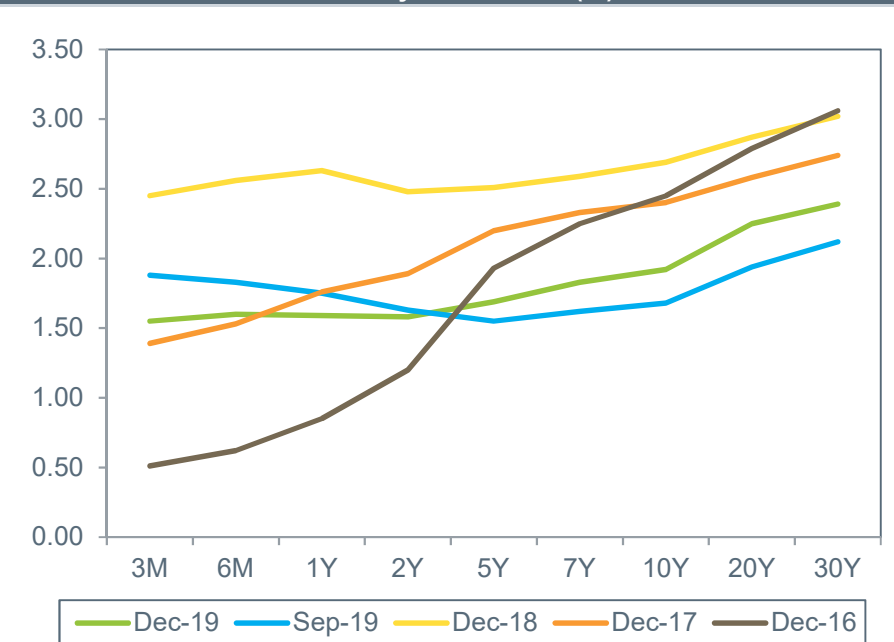
Key Economic Indicators



Economic Indicators

	Dec-19	Sep-19	Dec-18	Dec-16	20 Yr
Federal Funds Rate (%)	1.55 ▼	1.90	2.40	0.55	1.79
Breakeven Infl. - 5 Yr (%)	1.70 ▲	1.35	1.49	1.86	1.85
Breakeven Infl. - 10 Yr (%)	1.79 ▲	1.52	1.71	1.97	2.03
CPI YoY (Headline) (%)	2.3 ▲	1.7	1.9	2.1	2.2
Unemployment Rate (%)	3.5 —	3.5	3.9	4.7	5.9
Real GDP YoY (%)	2.3 ▲	2.1	2.5	2.0	2.1
PMI - Manufacturing	47.8 ▼	48.2	55.0	54.4	52.7
USD Total Wtd Idx	90.82 ▼	93.25	91.79	95.72	86.07
WTI Crude Oil per Barrel (\$)	61.1 ▲	54.1	45.4	53.7	61.9
Gold Spot per Oz (\$)	1,517 ▲	1,472	1,282	1,148	935

Treasury Yield Curve (%)



Market Performance (%)

	QTD	CYTD	1 Yr	5 Yr	10 Yr
S&P 500 (Cap Wtd)	9.07	31.49	31.49	11.70	13.56
Russell 2000	9.94	25.53	25.53	8.23	11.83
MSCI EAFE (Net)	8.17	22.01	22.01	5.67	5.50
MSCI EAFE SC (Net)	11.52	24.96	24.96	8.85	8.74
MSCI Emg Mkts (Net)	11.84	18.44	18.44	5.61	3.68
Bloomberg US Agg Bond	0.18	8.72	8.72	3.05	3.75
ICE BofAML 3 Mo US T-Bill	0.46	2.28	2.28	1.07	0.58
NCREIF ODCE (Gross)	1.51	5.34	5.34	8.97	11.42
FTSE NAREIT Eq REIT (TR)	-0.76	26.00	26.00	7.21	11.94
HFRI FOF Comp	3.09	8.40	8.40	2.37	2.83
Bloomberg Cmdb (TR)	4.42	7.69	7.69	-3.92	-4.73

Fourth Quarter Review

**Broad Market**

US markets enjoyed a strong finish to the year amid de-escalation of the US-China trade war and stimulative monetary policy from the Fed. The quarter saw high single and low double digit returns for major indexes across all size segments and styles. The strong quarter pushed the S&P 500 Index to a 31.5% return on the year.

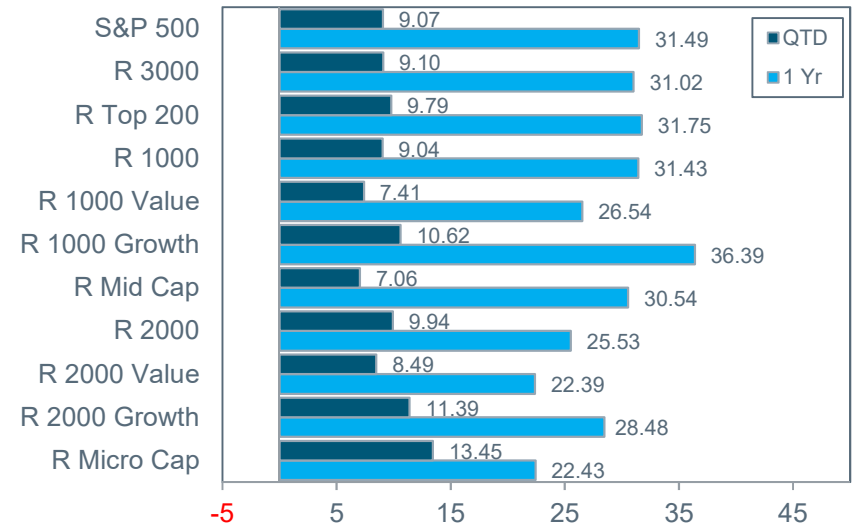
**Market Cap**

Large and mid-cap stocks lagged slightly behind small-cap stocks in Q4, with the Russell 2000 Index returning 9.9% and the S&P 500 and Russell MidCap Indexes returning 9.1% and 7.1%, respectively.

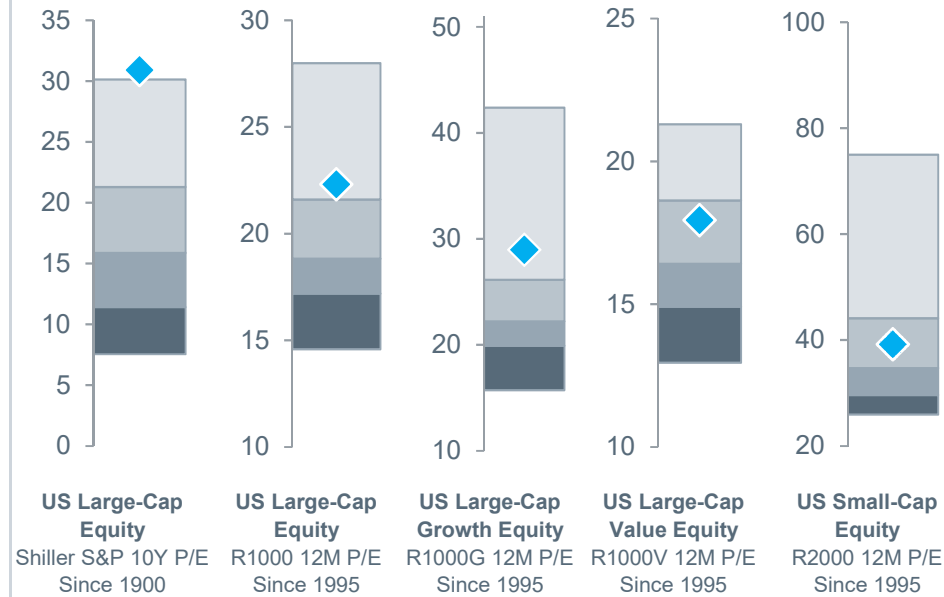
**Style and Sector**

Active managers struggled to keep up with strong benchmark returns in Q4. In addition, value-tilted managers performed notably better than growth and core managers in the quarter.

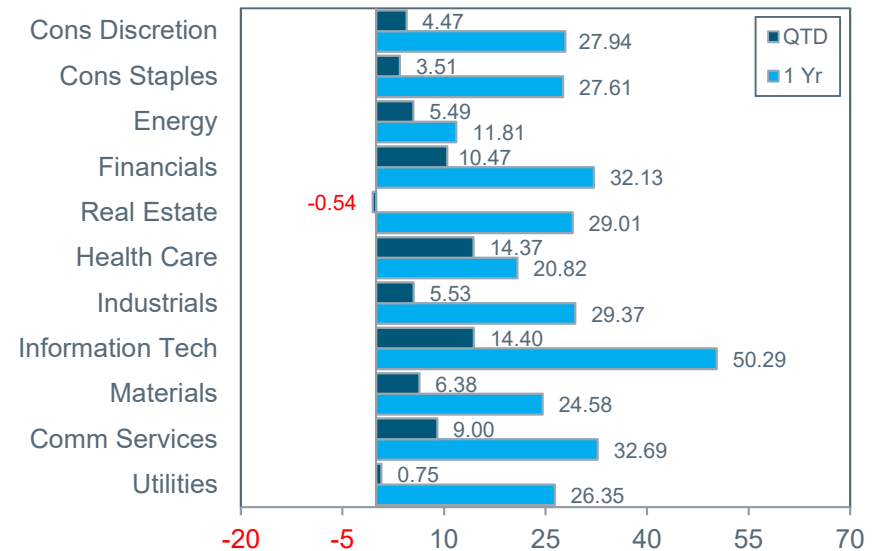
Style and Capitalization Market Performance (%)



Valuations



S&P 500 Index Sector Performance (%)



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

**Fourth Quarter Review**

**Developed Markets**

Developed international markets delivered strong absolute returns in Q4, but they still lagged both domestic and emerging markets. By country, returns for the quarter were positive almost across the board, with only Belgium ending in slightly negative territory. However, Q4 returns were largely driven by multiple expansion, as growth continues to be weak in developed international markets.

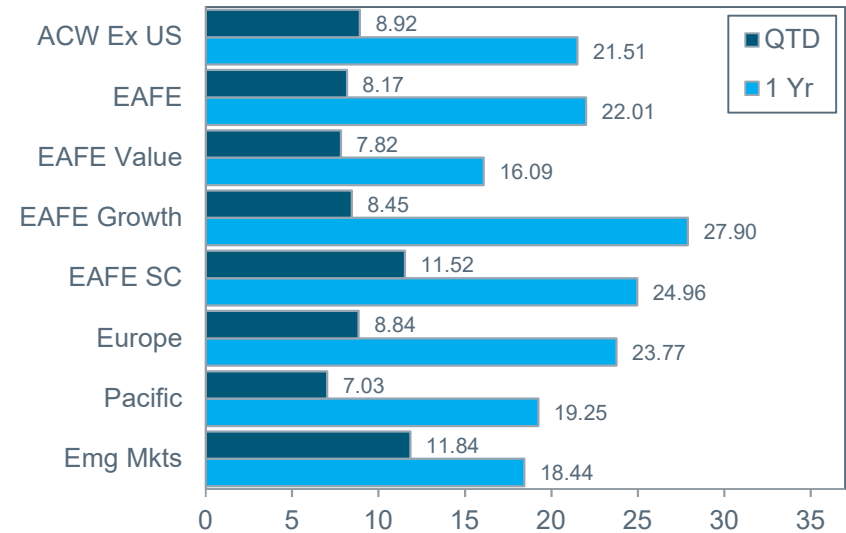
**Emerging Markets**

Emerging markets outperformed all other equity markets in Q4. Returns were largely lifted by the announcement of the initial phase of a trade deal between China and US, potentially indicating de-escalation in the ongoing trade war.

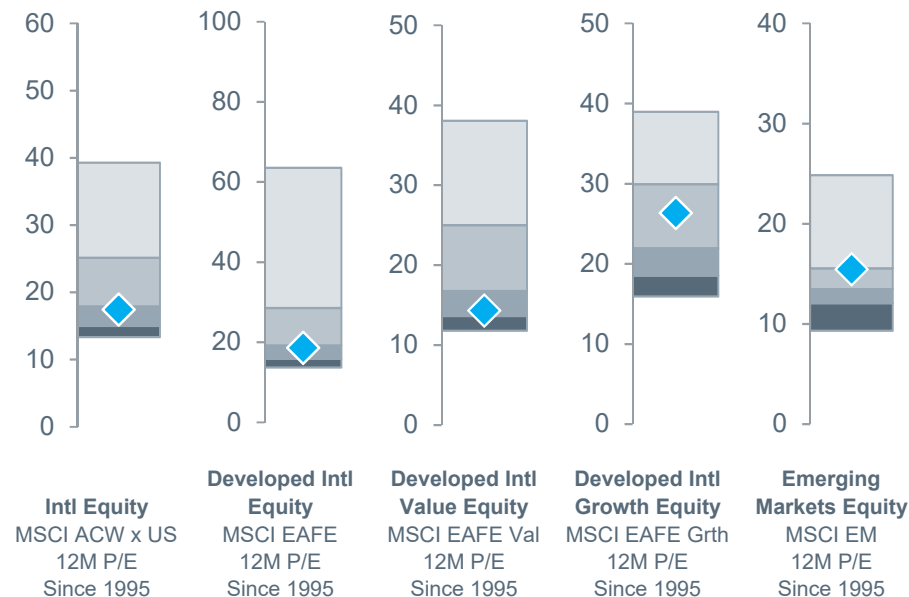
**Market Cap & Style**

In developed international markets, value stocks continued to underperform growth, while small-cap stocks outperformed large-cap for the quarter. In emerging markets, growth stocks outperformed value and large-cap outperformed small-cap.

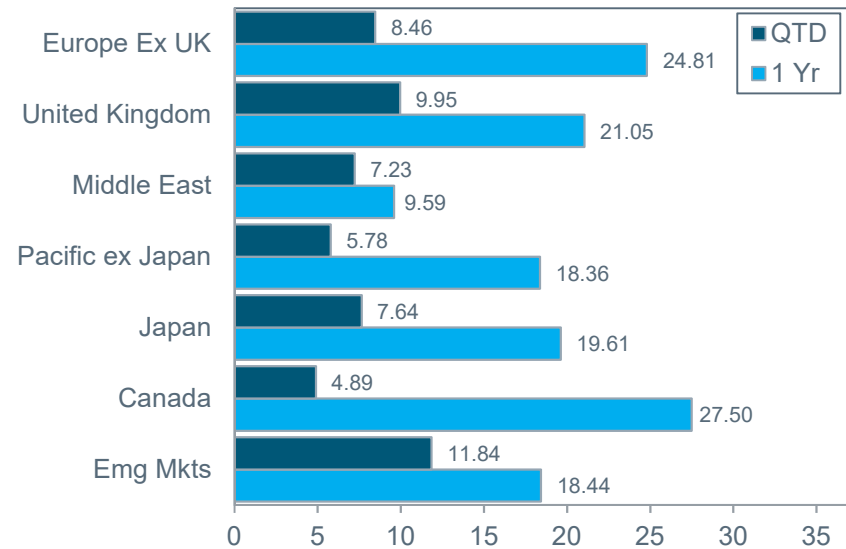
**MSCI Style and Capitalization Market Performance (%)**



**Valuations**



**MSCI Region Performance (%)**



Valuation data courtesy of Bloomberg Professional Service.

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

**Fourth Quarter Review**

**Broad Market**

After a solid first three quarters supported by declining rates, the Bloomberg US Aggregate Index finished the year more subdued, returning just 0.2% for the final quarter. The Bloomberg US Government Long Duration Index fell sharply, finishing the quarter with a -4.1% return, but the index still ended the year in positive territory with a return of 14.7%.

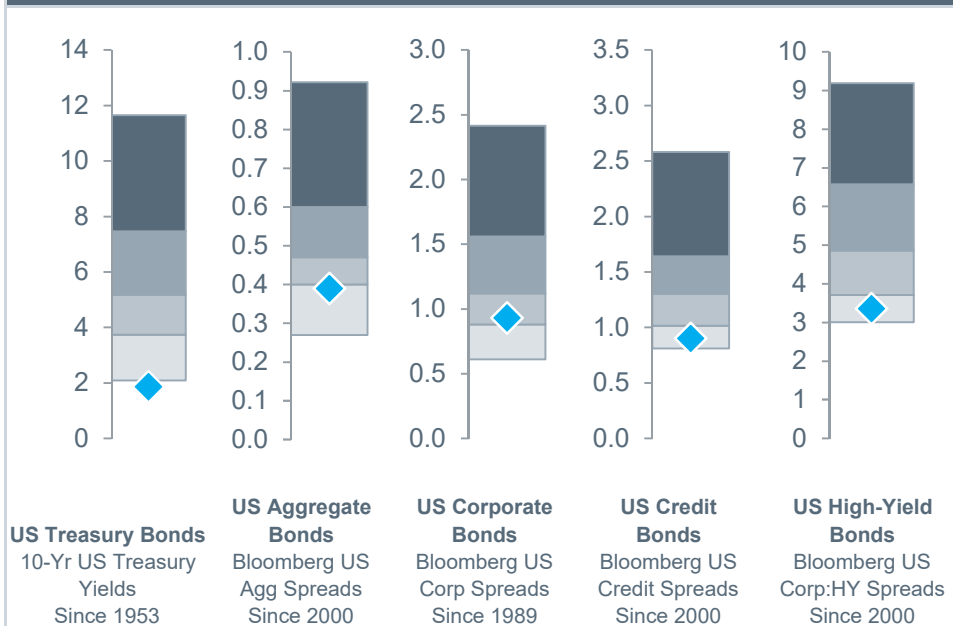
**Credit Market**

Corporate credit fared better than the broader index for the quarter, as strong economic data signaled optimism for the sector. Spreads tightened over the quarter, and the Bloomberg US Corporate Index returned 1.2%, contributing to an already-impressive annual return of 14.5%.

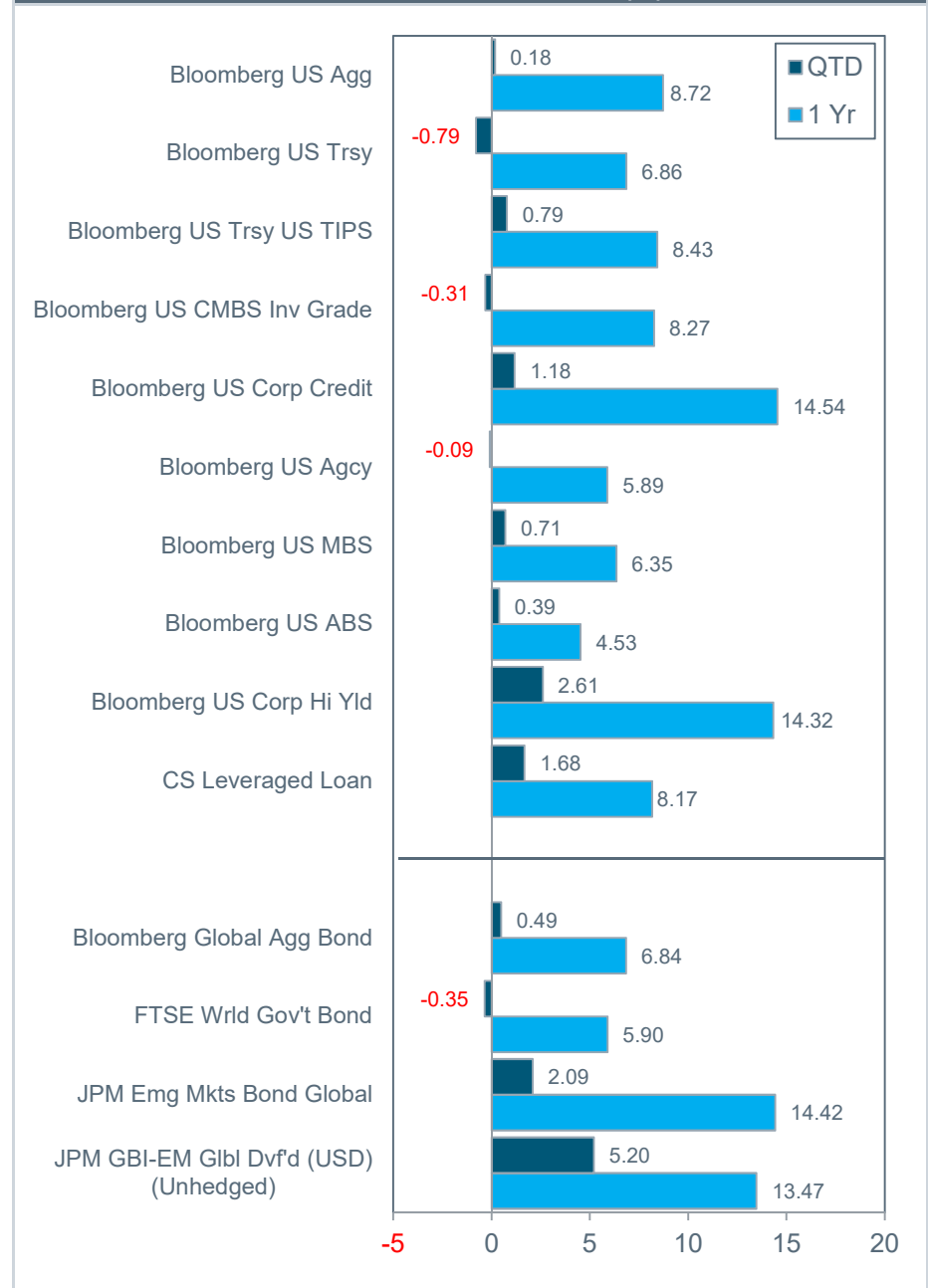
**Emerging Market Debt**

Hard currency emerging markets debt also added to a strong year. The JPM EMBI Global Diversified Index posted 1.8% in the final quarter to finish the year up 15.0%.

**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**

Hedge funds finished the year on a positive note, as the vast majority of strategies in the space added to gains realized earlier in the year. The HFRI Equity Hedge Index return for 2019, at 13.7%, was the best returning year for the index since 2013. Fund of Hedge Funds that maintained significant strategic exposure to Long/Short Equity and Long/Short Credit outperformed funds that rotated towards diversifying, market neutral strategies.

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

Most GTAA managers showed positive absolute performance in 2019, though they generally underperformed a static and less diversified blend of 60% US equity and 40% US fixed income. Nearly all GTAA managers underperformed this measure due to the extraordinarily strong 2019 performance of US large-cap equities compared to most of the other diversifying global asset classes included within GTAA strategies. Generally, those with the strongest returns in 2019 held higher relative allocations to US equities as opposed to developed international or emerging market equities.

**Fourth Quarter Review - Real Assets**

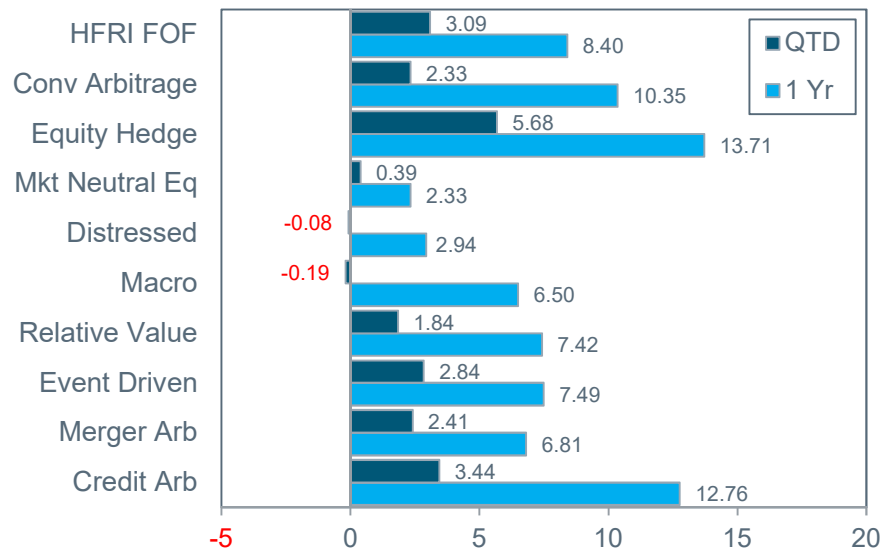
**General Market - Diversified Inflation Strategies (DIS)**

Performance of DIS managers ranged widely throughout both Q4 and the calendar year, though nearly all managers provided significantly stronger than typical positive absolute returns. Managers with larger TIPS allocations tended to underperform peers for the year, despite still achieving their own real return expectations. DIS managers that outperformed peers by the widest margins emphasized allocations to REITs, global listed infrastructure, and/or global natural resource equities.

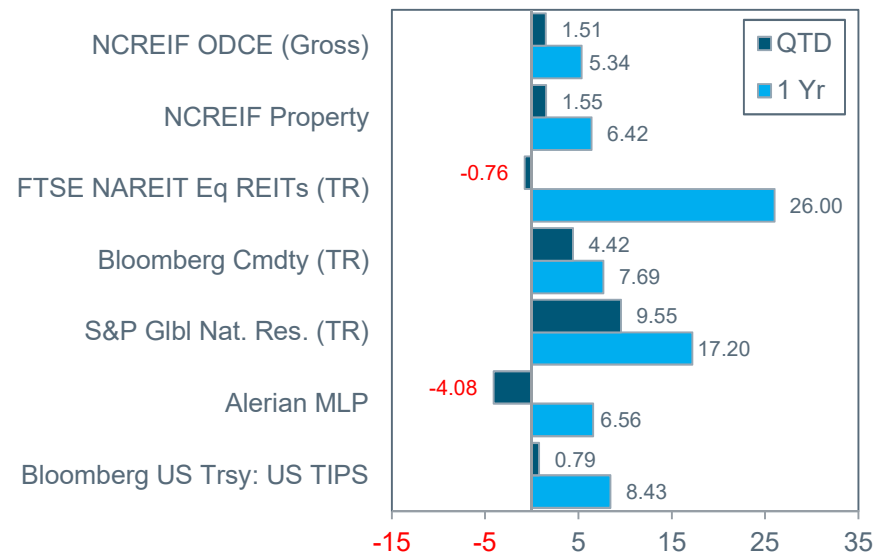
**General Market - Real Estate**

Core private real estate returned 1.5% during the quarter, as reported by the NCREIF-ODCE Index, with the total return comprised of 1.0% income and 0.5% price appreciation. While the income component stayed in-line with historical levels, price appreciation experienced a modest increase of 0.2% compared to the relatively flat Q3 return. Investments in publicly traded real estate trailed their private market counterparts during Q4.

**HFRI Hedge Fund Performance (%)**



**Real Asset Performance (%)**



Annual Asset Class Performance

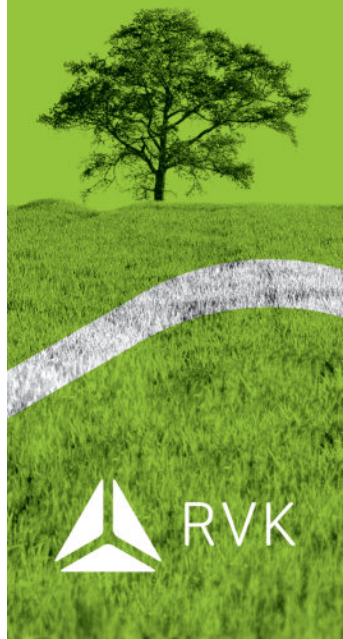
As of December 31, 2019

	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	CYTD
Best	34.00	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
	26.19	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
	21.39	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
	21.36	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
	13.54	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
	12.17	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
	7.49	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
	5.34	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
	4.91	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
	4.55	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
	3.07	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	8.40
	2.84	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
	2.74	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
Worst	2.43	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
	S&P 500 - US Large Cap	R 2000 - US Small Cap	MSCI EAFE (Net) - Int'l Dev.	MSCI EAFE SC (Net) - Int'l SC	MSCI EM (Net) - Int'l Emg Mkts	Bloombrg US Agg Bond - FI	Bloombrg US Corp Hi Yield - FI	Bloombrg US Trsy US TIPS - FI	Bloombrg US Gov Credit Lng - FI	NCREIF ODCE (Gross) - Real Estate	FTSE NAREIT Eq REITs Index (TR)	HFRI FOF Comp Index - ARS	Bloombrg Cmdty (TR) - Commod.	ICE BofAML 3 Mo T-Bill - Cash Equiv	

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



# Performance Report - All Systems



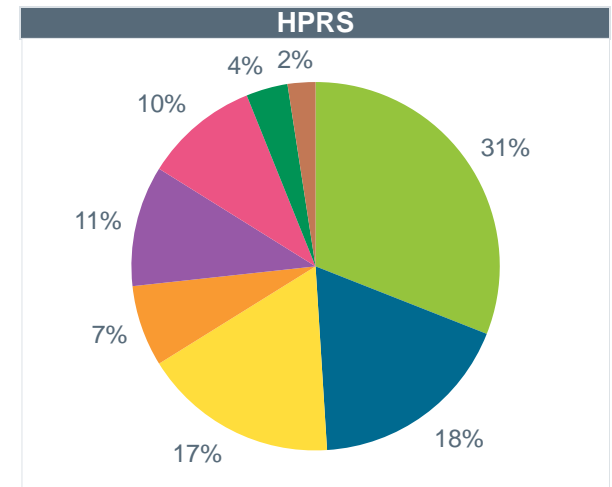
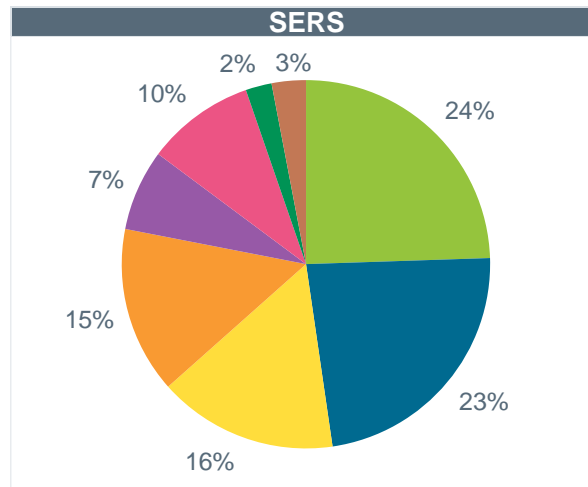
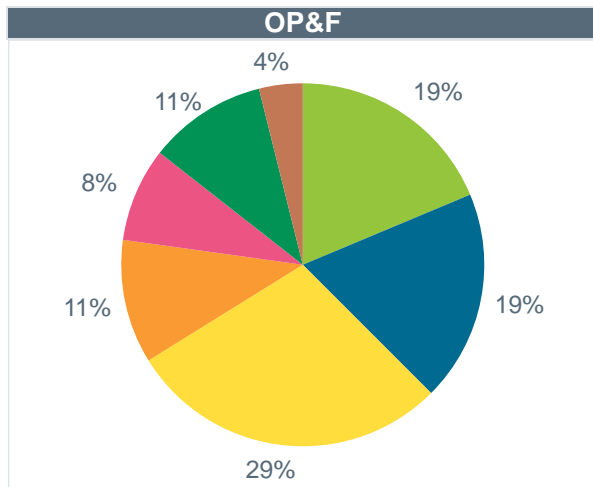
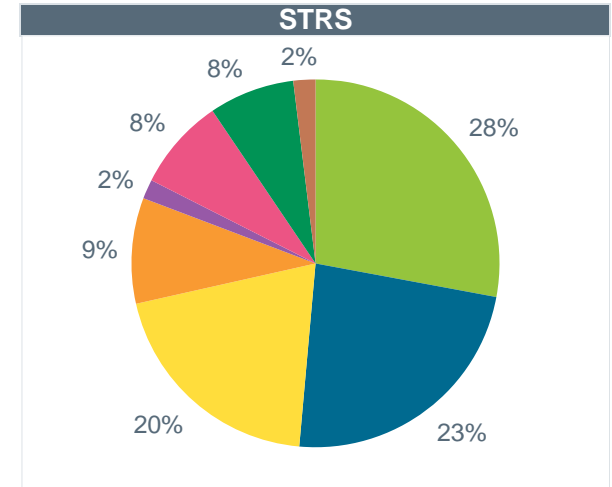
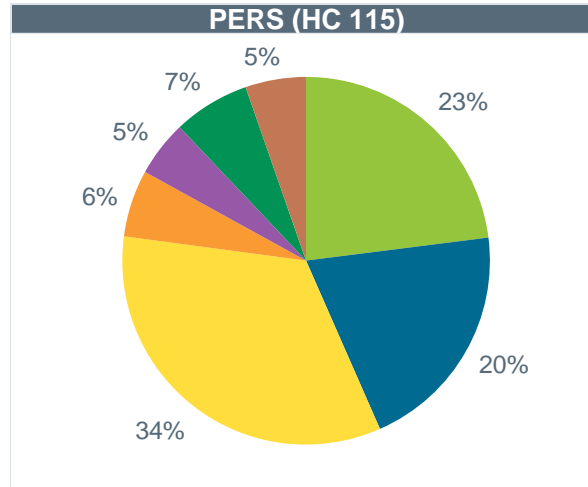
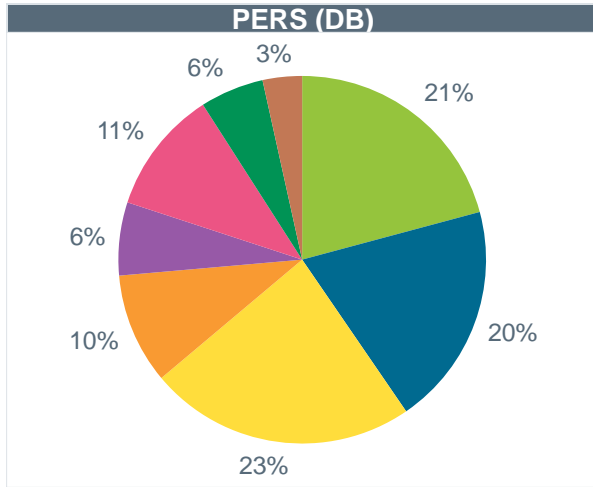
Asset Allocation & Performance - Gross of Fees											
	Market Value (\$000)	Trailing Performance (%)						Calendar Year Performance (%)			
		2 Quarters	1 Year	3 Years	5 Years	7 Years	10 Years	2018	2017	2016	2015
<b>PERS (DB)</b>	<b>91,441,805</b>	<b>6.05</b>	<b>17.31</b>	<b>10.03</b>	<b>7.78</b>	<b>8.66</b>	<b>8.94</b>	<b>-2.90</b>	<b>16.94</b>	<b>8.56</b>	<b>0.58</b>
PERS (DB) Total Fund Benchmark		5.55	17.06	9.33	7.31	8.06	8.32	-3.08	15.19	8.63	0.25
Difference		0.50	0.25	0.70	0.47	0.60	0.62	0.18	1.75	-0.07	0.33
Rank		32	48	28	24	29	28	46	23	23	44
<b>PERS (HC 115)</b>	<b>12,763,894</b>	<b>6.32</b>	<b>19.59</b>	<b>9.11</b>	<b>6.48</b>	<b>7.04</b>	<b>7.62</b>	<b>-5.76</b>	<b>15.25</b>	<b>7.67</b>	<b>-2.11</b>
PERS (HC 115) Total Fund Benchmark		5.85	19.20	8.61	6.24	6.69	7.19	-5.97	14.31	7.75	-1.93
Difference		0.47	0.39	0.50	0.24	0.35	0.43	0.21	0.94	-0.08	-0.18
Rank		23	16	60	81	80	77	91	65	59	96
<b>STRS</b>	<b>81,977,660</b>	<b>6.55</b>	<b>18.39</b>	<b>10.47</b>	<b>8.36</b>	<b>9.55</b>	<b>9.48</b>	<b>-1.75</b>	<b>15.90</b>	<b>8.18</b>	<b>2.46</b>
STRS Total Fund Benchmark		6.46	18.27	10.15	7.98	9.41	9.37	-2.04	15.35	8.00	1.70
Difference		0.09	0.12	0.32	0.38	0.14	0.11	0.29	0.55	0.18	0.76
Rank		17	29	13	5	7	8	30	54	38	4
<b>OP&amp;F</b>	<b>16,429,151</b>	<b>5.82</b>	<b>17.88</b>	<b>9.80</b>	<b>8.16</b>	<b>9.17</b>	<b>9.75</b>	<b>-1.52</b>	<b>14.01</b>	<b>11.15</b>	<b>0.61</b>
OP&F Total Fund Benchmark		5.28	16.32	8.31	6.76	7.86	8.42	-2.80	12.38	11.61	-2.18
Difference		0.54	1.56	1.49	1.40	1.31	1.33	1.28	1.63	-0.46	2.79
Rank		50	37	38	10	15	2	24	84	2	42
<b>SERS</b>	<b>15,246,982</b>	<b>6.47</b>	<b>17.69</b>	<b>10.89</b>	<b>8.69</b>	<b>9.56</b>	<b>9.31</b>	<b>-1.28</b>	<b>17.36</b>	<b>8.08</b>	<b>2.93</b>
SERS Total Fund Benchmark		5.49	16.04	9.14	7.14	8.21	8.09	-2.03	14.37	7.02	1.48
Difference		0.98	1.65	1.75	1.55	1.35	1.22	0.75	2.99	1.06	1.45
Rank		20	40	8	2	6	11	21	11	40	1
<b>HPRS</b>	<b>931,618</b>	<b>6.25</b>	<b>18.59</b>	<b>9.18</b>	<b>6.96</b>	<b>8.65</b>	<b>8.21</b>	<b>-4.57</b>	<b>15.01</b>	<b>7.42</b>	<b>0.15</b>
HPRS Total Fund Benchmark		5.82	17.63	9.19	6.97	8.33	8.55	-3.38	14.55	7.40	0.19
Difference		0.43	0.96	-0.01	-0.01	0.32	-0.34	-1.19	0.46	0.02	-0.04
Rank		25	26	57	60	30	54	76	68	66	60
<i>All Public Plans &gt; \$1B-Total Fund Median</i>		<i>5.80</i>	<i>17.23</i>	<i>9.35</i>	<i>7.09</i>	<i>8.10</i>	<i>8.33</i>	<i>-3.13</i>	<i>16.01</i>	<i>7.91</i>	<i>0.36</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.

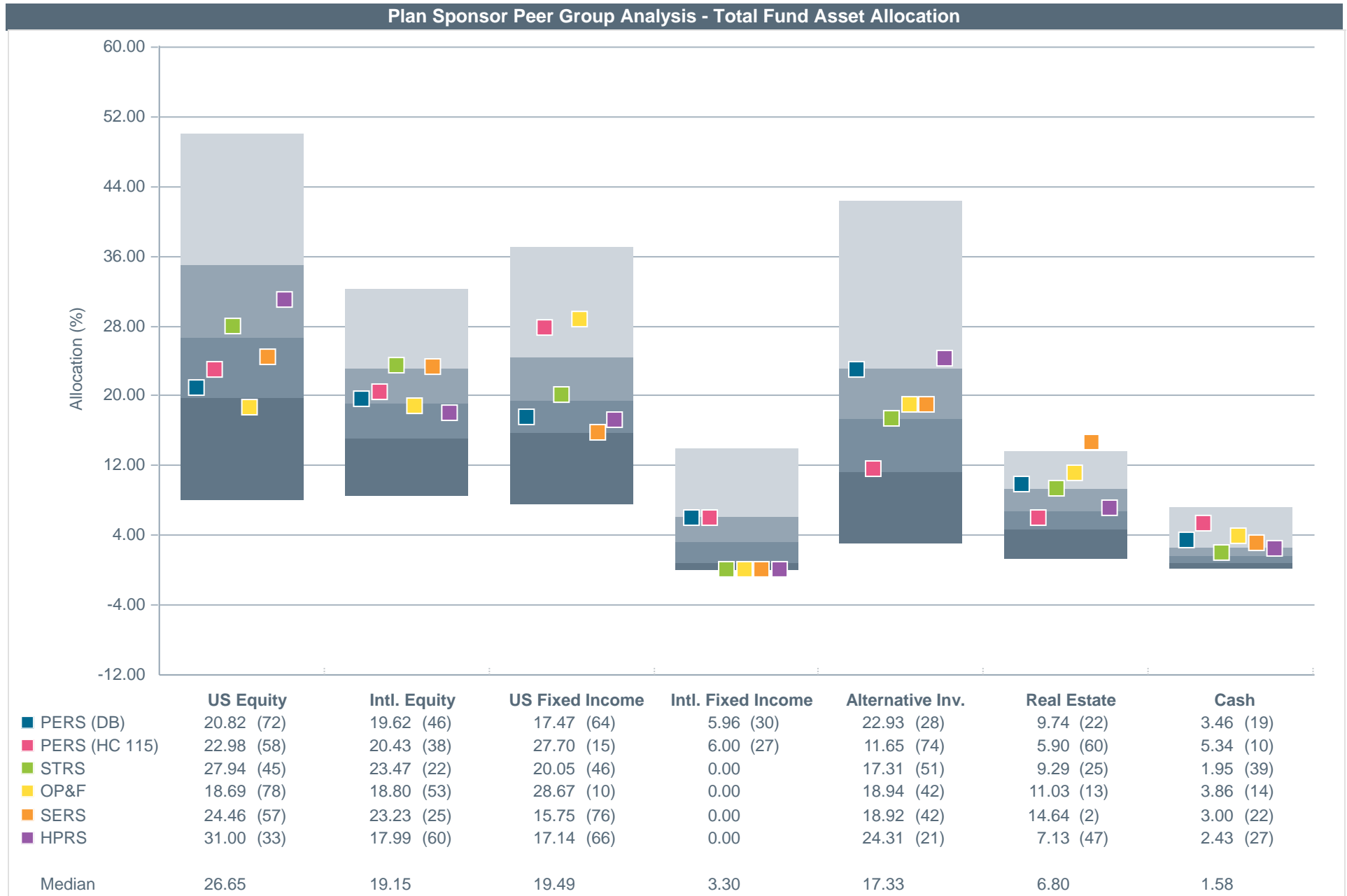
Asset Allocation & Performance - Net of Fees											
	Market Value (\$000)	Trailing Performance (%)						Calendar Year Performance (%)			
		2 Quarters	1 Year	3 Years	5 Years	7 Years	10 Years	2018	2017	2016	2015
<b>PERS (DB)</b>	<b>91,441,805</b>	<b>6.01</b>	<b>17.23</b>	<b>9.93</b>	<b>7.62</b>	<b>8.47</b>	<b>8.75</b>	<b>-2.99</b>	<b>16.81</b>	<b>8.31</b>	<b>0.33</b>
PERS (DB) Total Fund Benchmark		5.55	17.06	9.33	7.31	8.06	8.32	-3.08	15.19	8.63	0.25
Difference		0.46	0.17	0.60	0.31	0.41	0.43	0.09	1.62	-0.32	0.08
<b>PERS (HC 115)</b>	<b>12,763,894</b>	<b>6.32</b>	<b>19.59</b>	<b>9.11</b>	<b>6.43</b>	<b>6.96</b>	<b>7.53</b>	<b>-5.76</b>	<b>15.25</b>	<b>7.55</b>	<b>-2.23</b>
PERS (HC 115) Total Fund Benchmark		5.85	19.20	8.61	6.24	6.69	7.19	-5.97	14.31	7.75	-1.93
Difference		0.47	0.39	0.50	0.19	0.27	0.34	0.21	0.94	-0.20	-0.30
<b>STRS</b>	<b>81,977,660</b>	<b>6.48</b>	<b>18.23</b>	<b>10.32</b>	<b>8.22</b>	<b>9.41</b>	<b>9.34</b>	<b>-1.89</b>	<b>15.74</b>	<b>8.03</b>	<b>2.33</b>
STRS Total Fund Benchmark		6.46	18.27	10.15	7.98	9.41	9.37	-2.04	15.35	8.00	1.70
Difference		0.02	-0.04	0.17	0.24	0.00	-0.03	0.15	0.39	0.03	0.63
<b>OP&amp;F</b>	<b>16,429,151</b>	<b>5.50</b>	<b>17.22</b>	<b>9.16</b>	<b>7.54</b>	<b>8.58</b>	<b>9.21</b>	<b>-2.14</b>	<b>13.39</b>	<b>10.54</b>	<b>0.03</b>
OP&F Total Fund Benchmark		5.28	16.32	8.31	6.76	7.86	8.42	-2.80	12.38	11.61	-2.18
Difference		0.22	0.90	0.85	0.78	0.72	0.79	0.66	1.01	-1.07	2.21
<b>SERS</b>	<b>15,246,982</b>	<b>6.13</b>	<b>16.96</b>	<b>10.19</b>	<b>8.00</b>	<b>8.87</b>	<b>8.57</b>	<b>-1.94</b>	<b>16.65</b>	<b>7.37</b>	<b>2.31</b>
SERS Total Fund Benchmark		5.49	16.04	9.14	7.14	8.21	8.09	-2.03	14.37	7.02	1.48
Difference		0.64	0.92	1.05	0.86	0.66	0.48	0.09	2.28	0.35	0.83
<b>HPRS</b>	<b>931,618</b>	<b>6.11</b>	<b>18.19</b>	<b>8.66</b>	<b>6.45</b>	<b>8.19</b>	<b>7.79</b>	<b>-5.02</b>	<b>14.29</b>	<b>7.03</b>	<b>-0.43</b>
HPRS Total Fund Benchmark		5.82	17.63	9.19	6.97	8.33	8.55	-3.38	14.55	7.40	0.19
Difference		0.29	0.56	-0.53	-0.52	-0.14	-0.76	-1.64	-0.26	-0.37	-0.62

Performance shown is net of all investment management costs.

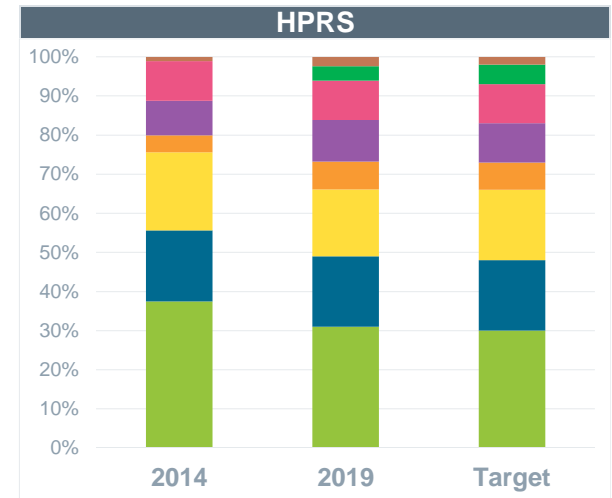
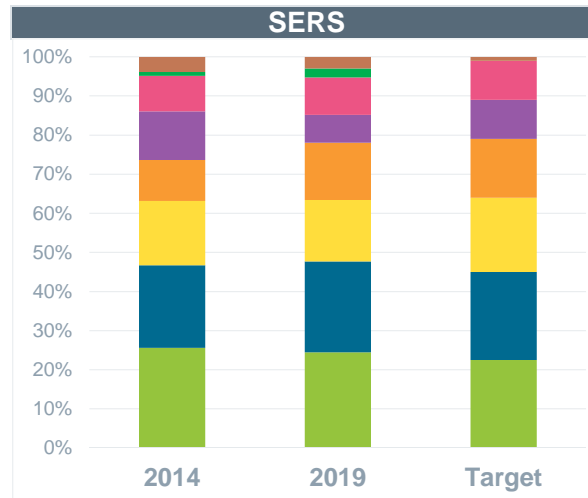
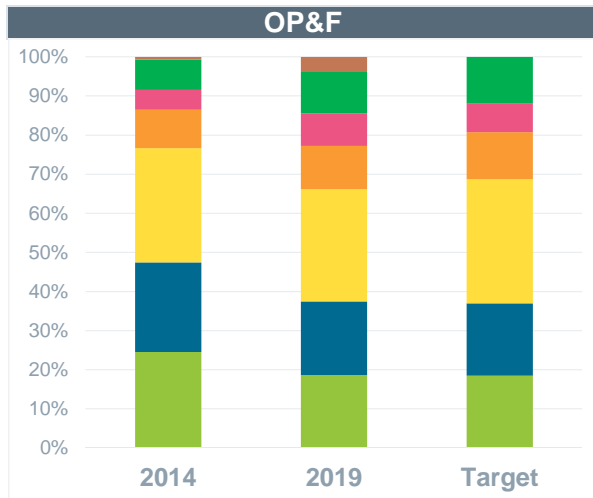
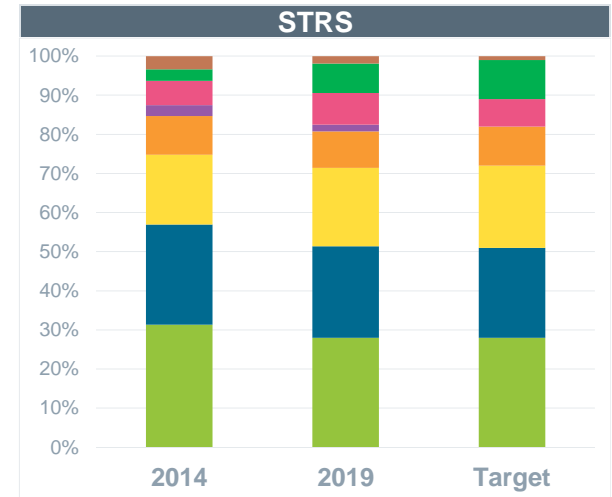
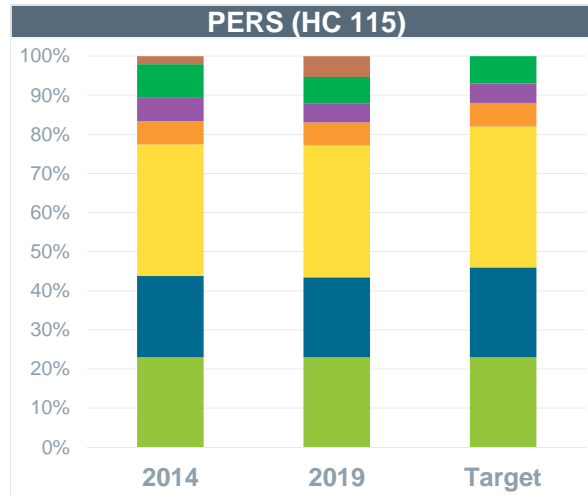
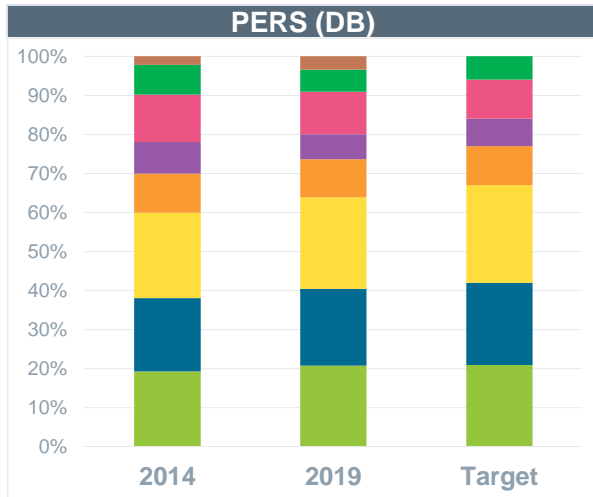




Allocations shown may not sum up to 100% exactly due to rounding. Cash Equivalents for PERS (DB) and PERS (HC 115) consists of cash, rebalancing, and additional annuity.



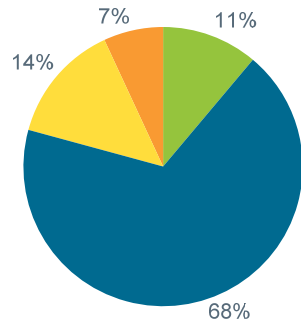
Allocations shown may not add up to 100% due to rounding. US Fixed Income may include allocations to Intl. Fixed Income not explicitly broken out by the plans. Parentheses contain percentile ranks. Cash Equivalents for PERS (DB) consists of cash, rebalancing, and additional annuity. Cash Equivalents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



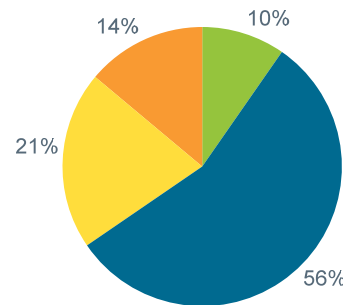
Summary

- **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)

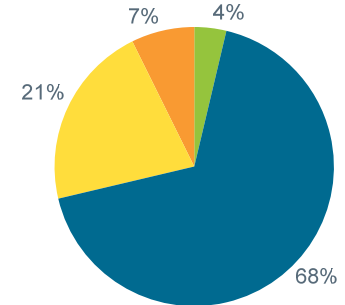
PERS (DB)



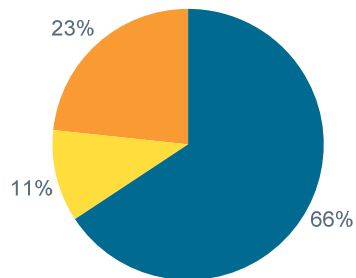
PERS (HC 115)



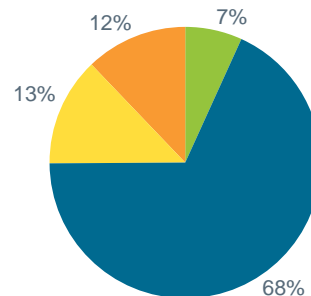
STRS



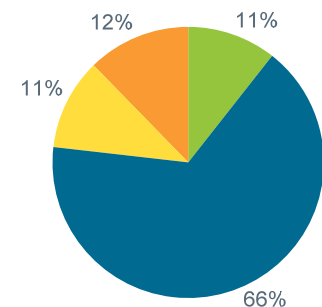
OP&F



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

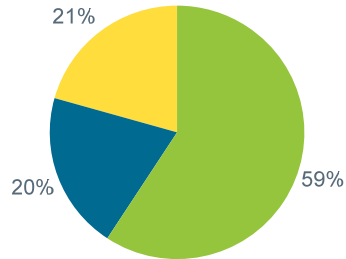
**RVK Liquidity Rating** - A qualitative method developed and calculated by RVK for determining the relative amount of liquidity in a portfolio.

**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.

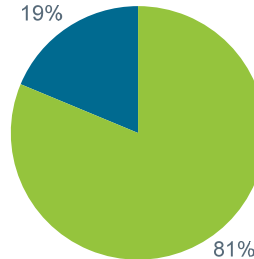
**Not Liquid Investments:** Private appraisal-based transactions, vehicle-based liquidity constraints, or privately held assets. Extreme discount to raise cash or 6-12+ months required to receive cash.

PERS (DB)



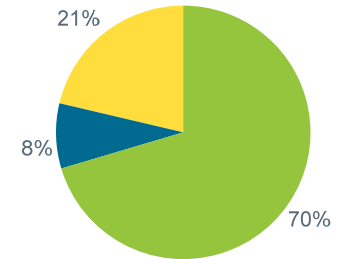
PERS (DB) Liquidity Rating 65

PERS (HC 115)



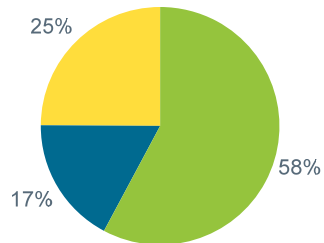
PERS (HC 115) Liquidity Rating 85

STRS



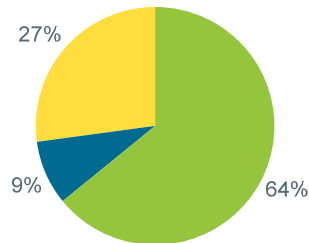
STRS Liquidity Rating 70

OP&F



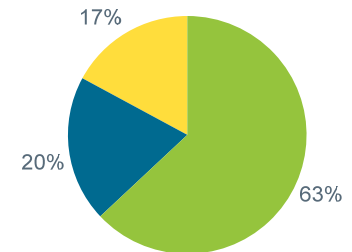
OP&F Liquidity Rating 66

SERS



SERS Liquidity Rating 65

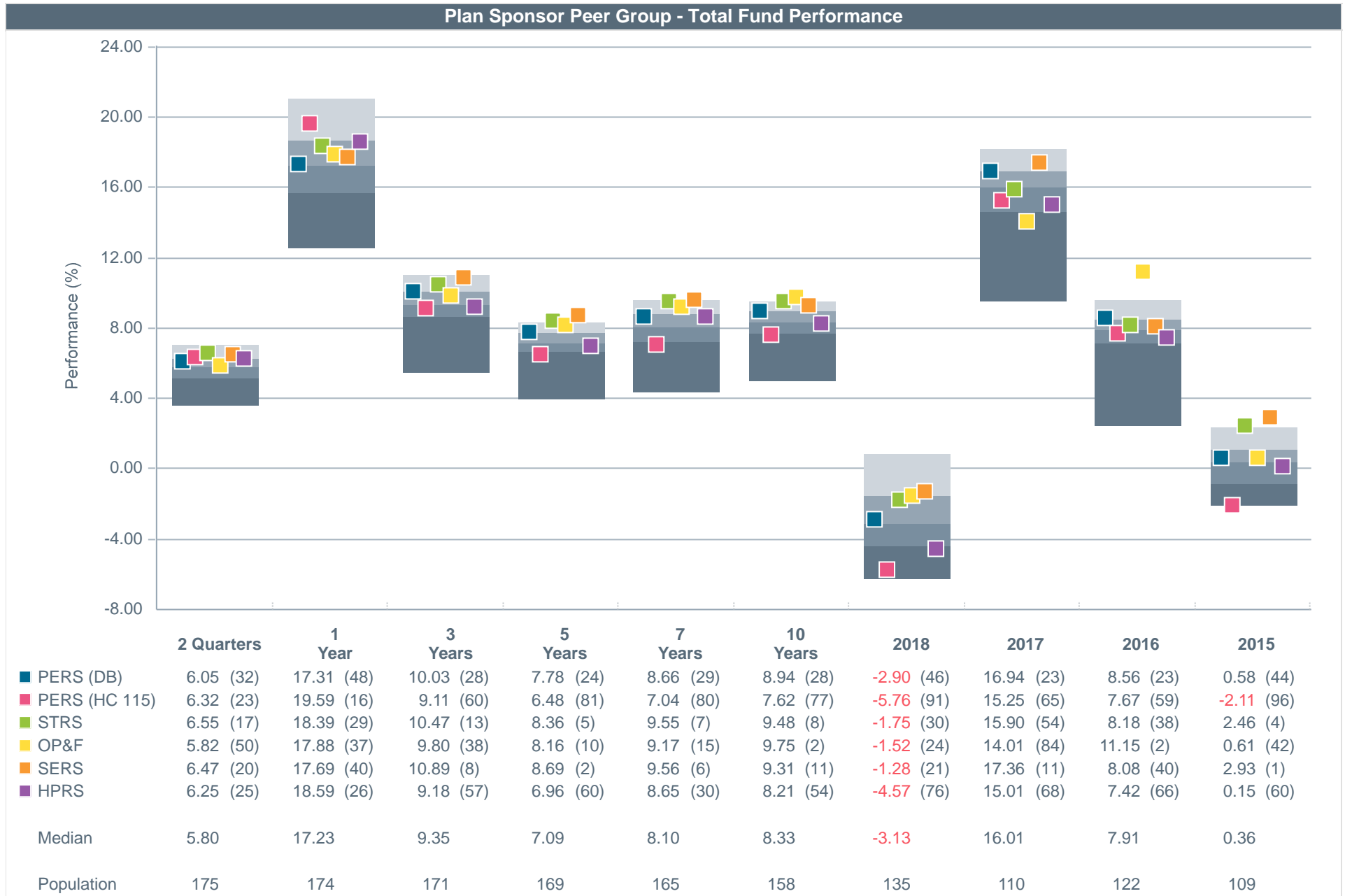
HPRS



HPRS Liquidity Rating 66

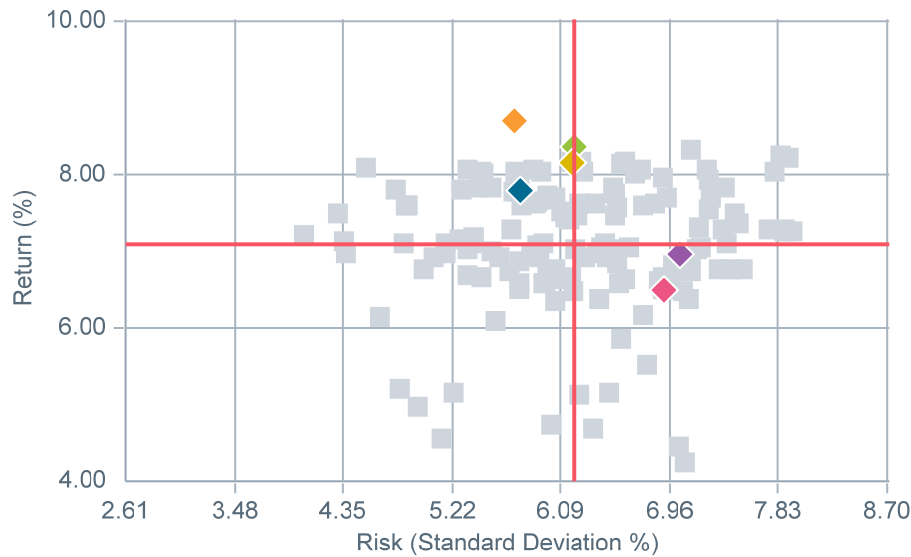
Asset Allocation by Liquidity percentages are provided by the Plans. Allocations are based on dedicated composite allocations and not underlying investment manager exposures; as such, liquidity allocations are approximations. Allocations shown may not sum up to exactly 100% due to rounding. The RVK Liquidity 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

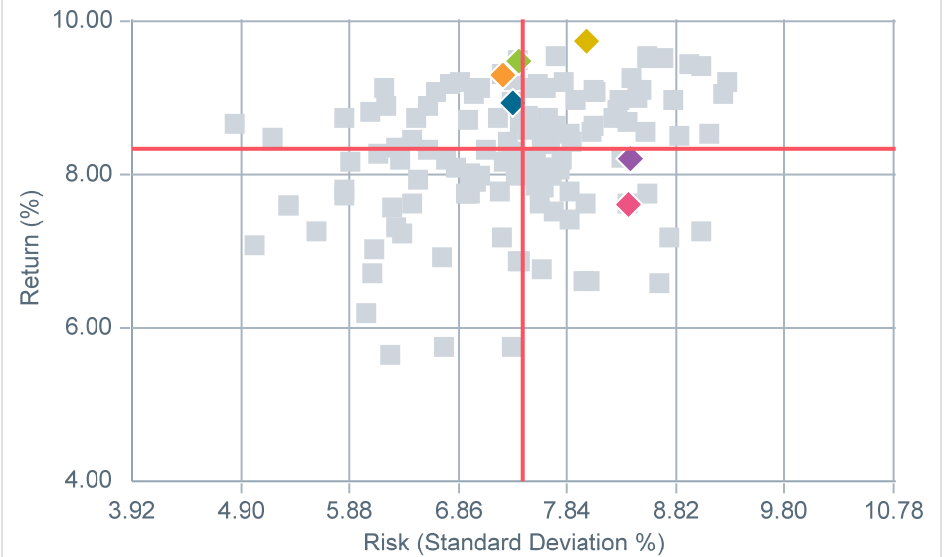


	Return	Standard Deviation
◆ PERS (DB)	7.78	5.76
◆ PERS (HC 115)	6.48	6.91
◆ STRS	8.36	6.19
◆ OP&F	8.16	6.18
◆ SERS	8.69	5.72
◆ HPRS	6.96	7.05
— Median	7.09	6.20

Sharpe Ratio - 5 Year

PERS (DB)	1.16
PERS (HC 115)	0.80
STRS	1.17
OP&F	1.14
SERS	1.32
HPRS	0.85
<i>All Public Plans &gt; \$1B-Total Fund Median</i>	<i>0.96</i>

Plan Sponsor Peer Group Scattergram - 10 Years



	Return	Standard Deviation
◆ PERS (DB)	8.94	7.36
◆ PERS (HC 115)	7.62	8.39
◆ STRS	9.48	7.40
◆ OP&F	9.75	8.01
◆ SERS	9.31	7.27
◆ HPRS	8.21	8.41
— Median	8.33	7.44

Sharpe Ratio - 10 Year

PERS (DB)	1.13
PERS (HC 115)	0.86
STRS	1.20
OP&F	1.14
SERS	1.19
HPRS	0.92
<i>All Public Plans &gt; \$1B-Total Fund Median</i>	<i>1.04</i>

Performance shown is gross of fees.

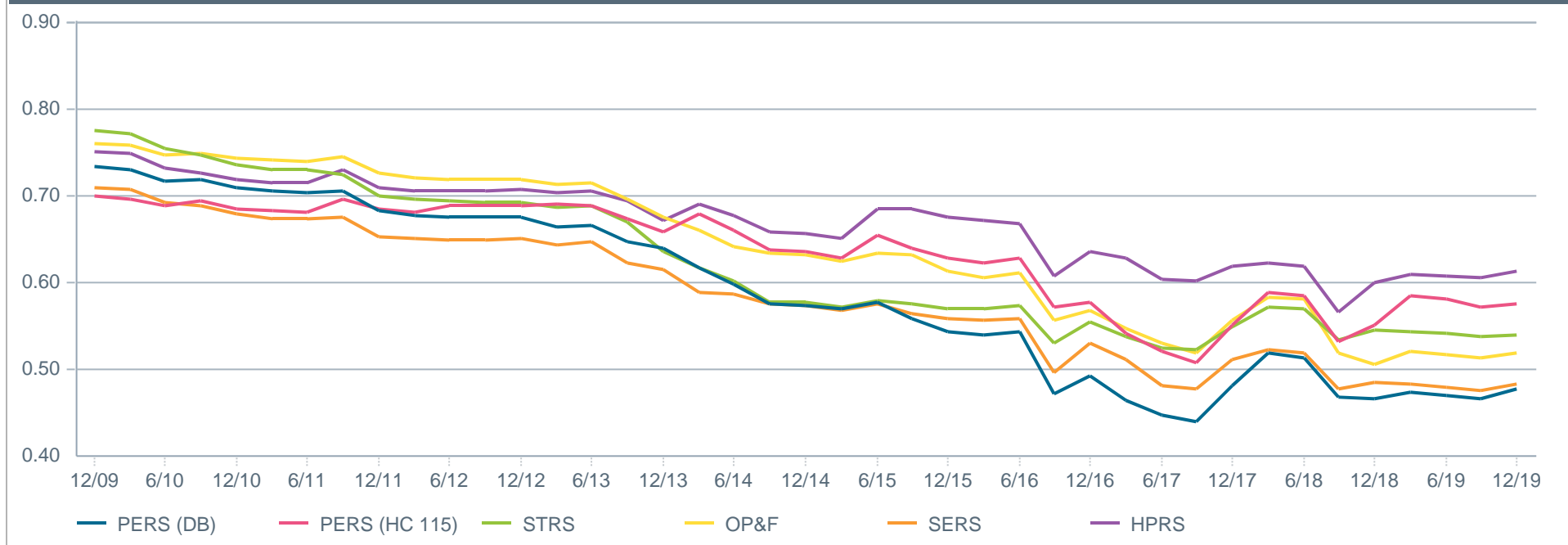
Summary

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)	0.47	0.48	0.47	0.54
PERS (HC 115)	0.56	0.58	0.55	0.61
STRS	0.52	0.54	0.53	0.56
OP&F	0.49	0.52	0.51	0.59
SERS	0.47	0.48	0.48	0.54
HPRS	0.61	0.61	0.61	0.64
S&P 500 Index (Cap Wtd)	1.00	1.00	1.00	1.00

5 Year Rolling Equity Beta

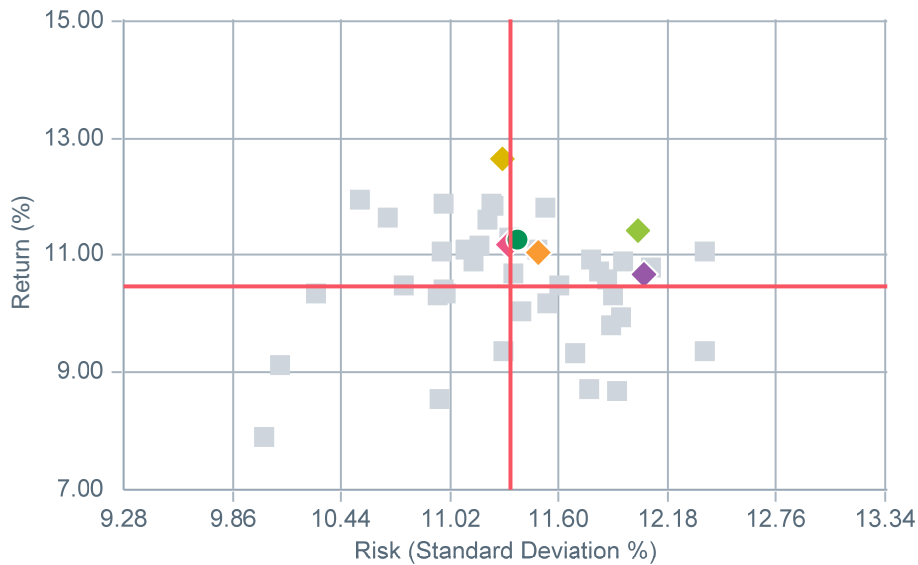


Performance shown is gross of fees and is calculated using quarterly periodicity.

Performance										
	Trailing Performance (%)						Calendar Year Performance (%)			
	2 Quarters	1 Year	3 Years	5 Years	7 Years	10 Years	2018	2017	2016	2015
<b>US Equity</b>										
<b>PERS (DB)</b>	<b>10.18</b>	<b>30.76</b>	<b>14.64</b>	<b>11.20</b>	<b>14.20</b>	<b>13.30</b>	<b>-5.00</b>	<b>21.30</b>	<b>12.09</b>	<b>0.68</b>
Russell 3000 Index	10.37	31.02	14.57	11.24	14.38	13.42	-5.24	21.13	12.74	0.48
Difference	-0.19	-0.26	0.07	-0.04	-0.18	-0.12	0.24	0.17	-0.65	0.20
Rank	19	33	29	23	31	39	24	29	66	30
<b>PERS (HC 115)</b>	<b>10.18</b>	<b>30.76</b>	<b>14.64</b>	<b>11.20</b>	<b>14.19</b>	<b>13.29</b>	<b>-5.00</b>	<b>21.30</b>	<b>12.09</b>	<b>0.68</b>
Russell 3000 Index	10.37	31.02	14.57	11.24	14.38	13.42	-5.24	21.13	12.74	0.48
Difference	-0.19	-0.26	0.07	-0.04	-0.19	-0.13	0.24	0.17	-0.65	0.20
Rank	19	33	29	23	31	39	24	29	66	30
<b>STRS</b>	<b>10.47</b>	<b>32.43</b>	<b>15.22</b>	<b>11.42</b>	<b>14.21</b>	<b>13.24</b>	<b>-5.33</b>	<b>22.01</b>	<b>11.32</b>	<b>0.83</b>
Russell 3000 Index	10.37	31.02	14.57	11.24	14.38	13.42	-5.24	21.13	12.74	0.48
Difference	0.10	1.41	0.65	0.18	-0.17	-0.18	-0.09	0.88	-1.42	0.35
Rank	16	6	14	21	31	44	39	18	81	29
<b>OP&amp;F</b>	<b>11.23</b>	<b>31.77</b>	<b>15.97</b>	<b>12.65</b>	<b>15.46</b>	<b>14.49</b>	<b>-3.30</b>	<b>22.40</b>	<b>15.56</b>	<b>0.66</b>
Wilshire 5000 Index	10.42	31.02	14.52	11.38	14.44	13.42	-5.27	20.99	13.37	0.67
Difference	0.81	0.75	1.45	1.27	1.02	1.07	1.97	1.41	2.19	-0.01
Rank	3	18	4	5	5	9	6	13	10	30
<b>SERS</b>	<b>10.06</b>	<b>30.60</b>	<b>14.44</b>	<b>11.04</b>	<b>14.27</b>	<b>13.47</b>	<b>-6.15</b>	<b>22.27</b>	<b>11.27</b>	<b>1.24</b>
Russell 3000 Index	10.37	31.02	14.57	11.24	14.38	13.42	-5.24	21.13	12.74	0.48
Difference	-0.31	-0.42	-0.13	-0.20	-0.11	0.05	-0.91	1.14	-1.47	0.76
Rank	23	35	33	31	29	34	63	14	81	21
<b>HPRS</b>	<b>10.30</b>	<b>30.36</b>	<b>13.39</b>	<b>10.68</b>	<b>14.12</b>	<b>13.34</b>	<b>-7.97</b>	<b>21.53</b>	<b>13.73</b>	<b>0.18</b>
Russell 3000 Index	10.37	31.02	14.57	11.24	14.38	13.42	-5.24	21.13	12.74	0.48
Difference	-0.07	-0.66	-1.18	-0.56	-0.26	-0.08	-2.73	0.40	0.99	-0.30
Rank	17	39	59	44	33	37	87	21	26	44
<i>All Public Plans &gt; \$1B-US Equity Segment Median</i>	<i>9.41</i>	<i>30.06</i>	<i>13.58</i>	<i>10.46</i>	<i>13.65</i>	<i>13.00</i>	<i>-5.89</i>	<i>20.23</i>	<i>12.87</i>	<i>-0.11</i>

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

Plan Sponsor Peer Group Scattergram - 5 Years

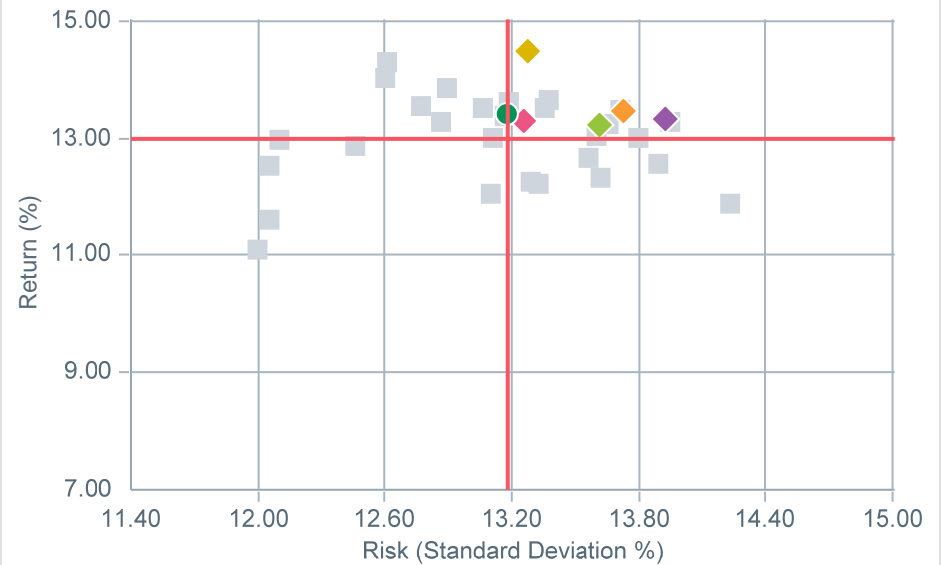


	Return	Standard Deviation
◆ PERS (DB)	11.20	11.33
◆ PERS (HC 115)	11.20	11.33
◆ STRS	11.42	12.03
◆ OP&F	12.65	11.30
◆ SERS	11.04	11.49
◆ HPRS	10.68	12.06
● Russell 3000 Index	11.24	11.38
— Median	10.46	11.34

Sharpe Ratio - 5 Years

PERS (DB)	0.92
PERS (HC 115)	0.92
STRS	0.89
OP&F	1.04
SERS	0.89
HPRS	0.83
Russell 3000 Index	0.92
All Public Plans > \$1B-US Equity Segment Median	0.85

Plan Sponsor Peer Group Scattergram - 10 Years



	Return	Standard Deviation
◆ PERS (DB)	13.30	13.26
◆ PERS (HC 115)	13.29	13.26
◆ STRS	13.24	13.61
◆ OP&F	14.49	13.28
◆ SERS	13.47	13.73
◆ HPRS	13.34	13.93
● Russell 3000 Index	13.42	13.18
— Median	13.00	13.18

Sharpe Ratio - 10 Years

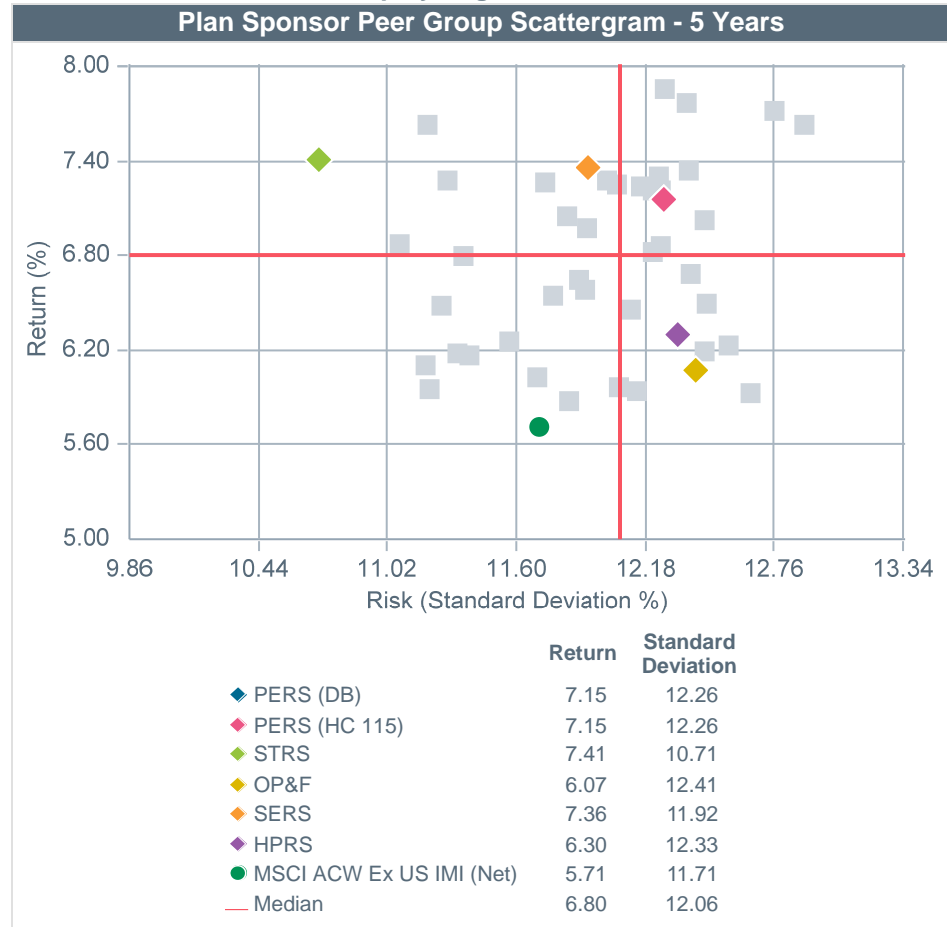
PERS (DB)	0.98
PERS (HC 115)	0.98
STRS	0.95
OP&F	1.06
SERS	0.96
HPRS	0.94
Russell 3000 Index	0.99
All Public Plans > \$1B-US Equity Segment Median	0.97

Performance shown is gross of fees.



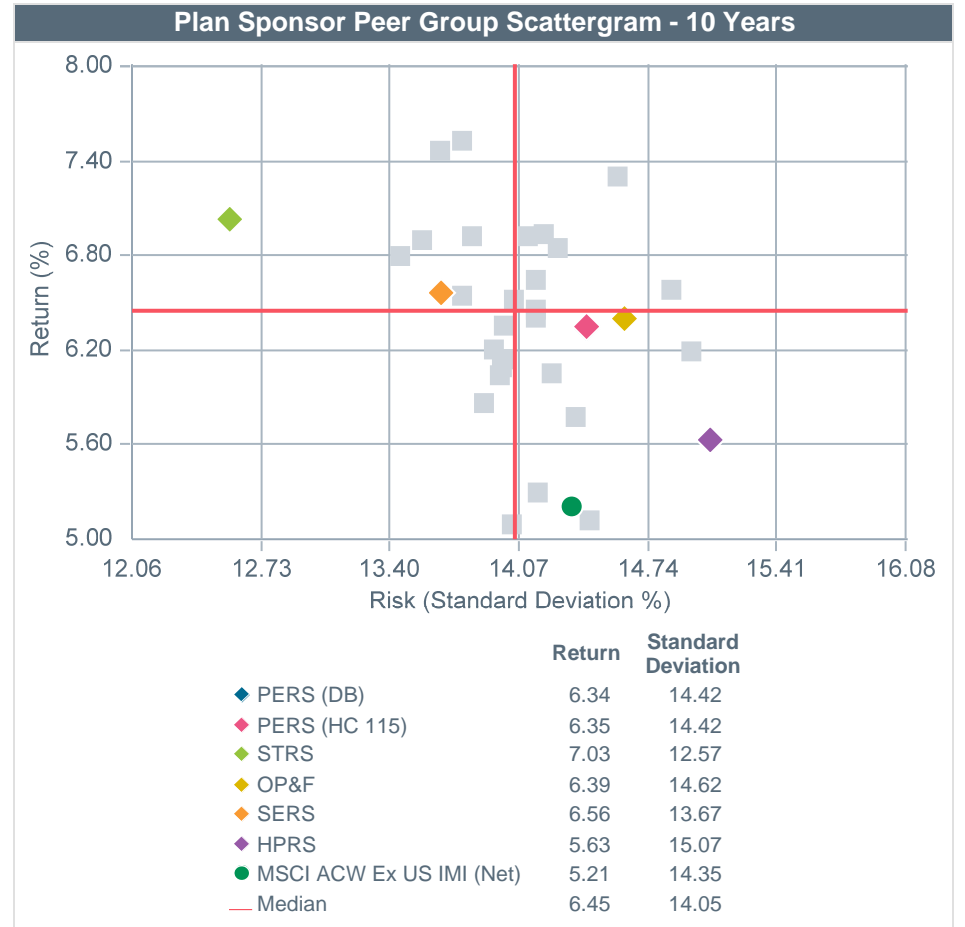
Performance										
	Trailing Performance (%)						Calendar Year Performance (%)			
	2 Quarters	1 Year	3 Years	5 Years	7 Years	10 Years	2018	2017	2016	2015
<b>International Equity</b>										
<b>PERS (DB)</b>	<b>7.77</b>	<b>23.21</b>	<b>11.66</b>	<b>7.15</b>	<b>7.03</b>	<b>6.34</b>	<b>-14.17</b>	<b>31.64</b>	<b>5.72</b>	<b>-4.01</b>
PERS (DB) International Equity Custom Benchmark	7.26	21.09	10.09	5.75	5.37	4.89	-14.74	29.24	5.54	-6.09
Difference	0.51	2.12	1.57	1.40	1.66	1.45	0.57	2.40	0.18	2.08
Rank	61	61	31	38	41	60	66	11	22	75
<b>PERS (HC 115)</b>	<b>7.77</b>	<b>23.21</b>	<b>11.66</b>	<b>7.15</b>	<b>7.04</b>	<b>6.35</b>	<b>-14.17</b>	<b>31.64</b>	<b>5.72</b>	<b>-4.01</b>
PERS (HC 115) International Equity Custom Benchmark	7.26	21.09	10.09	5.75	5.37	4.89	-14.74	29.24	5.54	-6.09
Difference	0.51	2.12	1.57	1.40	1.67	1.46	0.57	2.40	0.18	2.08
Rank	61	61	31	38	41	59	66	11	22	75
<b>STRS</b>	<b>7.14</b>	<b>21.54</b>	<b>10.00</b>	<b>7.41</b>	<b>8.04</b>	<b>7.03</b>	<b>-11.80</b>	<b>24.16</b>	<b>7.09</b>	<b>0.30</b>
STRS International Equity Custom Benchmark	7.37	22.51	9.96	6.58	7.15	6.13	-12.08	23.43	6.39	-2.78
Difference	-0.23	-0.97	0.04	0.83	0.89	0.90	0.28	0.73	0.70	3.08
Rank	90	85	89	20	5	18	9	99	13	13
<b>OP&amp;F</b>	<b>8.55</b>	<b>23.37</b>	<b>9.61</b>	<b>6.07</b>	<b>6.31</b>	<b>6.39</b>	<b>-17.32</b>	<b>29.12</b>	<b>2.75</b>	<b>-0.77</b>
MSCI ACW Ex US IM Index (USD) (Net)	7.33	21.63	9.84	5.71	5.65	5.21	-14.76	27.81	4.41	-4.60
Difference	1.22	1.74	-0.23	0.36	0.66	1.18	-2.56	1.31	-1.66	3.83
Rank	26	59	99	83	75	54	100	54	78	24
<b>SERS</b>	<b>8.67</b>	<b>24.36</b>	<b>11.35</b>	<b>7.36</b>	<b>6.98</b>	<b>6.56</b>	<b>-14.03</b>	<b>29.11</b>	<b>5.81</b>	<b>-2.37</b>
SERS International Equity Custom Benchmark	6.96	21.51	9.86	5.50	5.68	5.22	-14.20	27.19	4.50	-5.66
Difference	1.71	2.85	1.49	1.86	1.30	1.34	0.17	1.92	1.31	3.29
Rank	22	42	38	21	42	42	61	54	21	47
<b>HPRS</b>	<b>8.72</b>	<b>25.47</b>	<b>11.19</b>	<b>6.30</b>	<b>6.37</b>	<b>5.63</b>	<b>-14.88</b>	<b>28.72</b>	<b>1.69</b>	<b>-2.91</b>
MSCI ACW Ex US IM Index (USD) (Net)	7.33	21.63	9.84	5.71	5.65	5.21	-14.76	27.81	4.41	-4.60
Difference	1.39	3.84	1.35	0.59	0.72	0.42	-0.12	0.91	-2.72	1.69
Rank	21	26	48	71	74	86	83	61	85	54
<i>All Public Plans &gt; \$1B-Intl. Equity Segment Median</i>	<i>8.13</i>	<i>23.71</i>	<i>11.16</i>	<i>6.80</i>	<i>6.81</i>	<i>6.45</i>	<i>-13.59</i>	<i>29.25</i>	<i>3.95</i>	<i>-2.48</i>

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



### Sharpe Ratio - 5 Years

PERS (DB)	0.54
PERS (HC 115)	0.54
STRS	0.63
OP&F	0.45
SERS	0.57
HPRS	0.48
MSCI ACW Ex US IMI (Net)	0.45
<i>All Public Plans &gt; \$1B-Intl. Equity Segment Median</i>	<i>0.53</i>



### Sharpe Ratio - 10 Years

PERS (DB)	0.46
PERS (HC 115)	0.46
STRS	0.56
OP&F	0.46
SERS	0.50
HPRS	0.41
MSCI ACW Ex US IMI (Net)	0.39
<i>All Public Plans &gt; \$1B-Intl. Equity Segment Median</i>	<i>0.47</i>

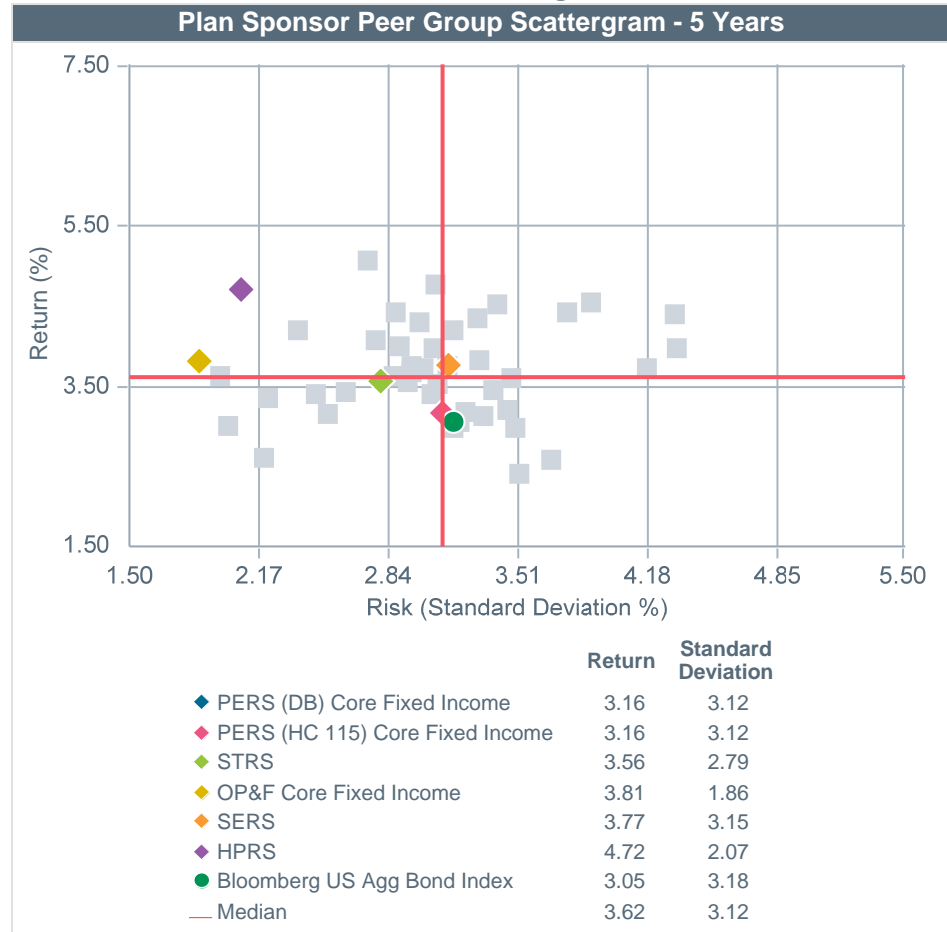
Performance shown is gross of fees.

Performance										
	Trailing Performance (%)						Calendar Year Performance (%)			
	2 Quarters	1 Year	3 Years	5 Years	7 Years	10 Years	2018	2017	2016	2015
<b>Fixed Income</b>										
<b>PERS (DB) Core Fixed Income</b>	<b>2.44</b>	<b>8.72</b>	<b>4.07</b>	<b>3.16</b>	<b>3.01</b>	<b>4.12</b>	<b>-0.06</b>	<b>3.75</b>	<b>2.66</b>	<b>0.96</b>
PERS (DB) Core Fixed Income Custom Benchmark	2.45	8.72	4.03	3.05	2.72	3.75	0.01	3.54	2.65	0.55
Difference	-0.01	0.00	0.04	0.11	0.29	0.37	-0.07	0.21	0.01	0.41
Rank	59	66	73	72	59	80	39	78	88	17
<b>PERS (HC 115) Core Fixed Income</b>	<b>2.44</b>	<b>8.72</b>	<b>4.07</b>	<b>3.16</b>	<b>3.01</b>	<b>4.12</b>	<b>-0.06</b>	<b>3.75</b>	<b>2.66</b>	<b>0.96</b>
PERS (HC 115) Core Fixed Income Custom Benchmark	2.45	8.72	4.03	3.05	2.75	3.85	0.01	3.54	2.65	0.55
Difference	-0.01	0.00	0.04	0.11	0.26	0.27	-0.07	0.21	0.01	0.41
Rank	59	66	73	72	60	80	39	78	88	17
<b>STRS</b>	<b>2.29</b>	<b>8.51</b>	<b>4.16</b>	<b>3.56</b>	<b>3.10</b>	<b>4.27</b>	<b>0.16</b>	<b>3.98</b>	<b>4.77</b>	<b>0.60</b>
STRS Fixed Income Blended Benchmark	2.25	8.51	4.10	3.31	2.95	4.06	0.09	3.86	3.91	0.43
Difference	0.04	0.00	0.06	0.25	0.15	0.21	0.07	0.12	0.86	0.17
Rank	74	71	72	55	46	65	27	72	52	27
<b>OP&amp;F Core Fixed Income</b>	<b>2.55</b>	<b>8.13</b>	<b>4.50</b>	<b>3.81</b>	<b>3.17</b>	<b>4.44</b>	<b>1.24</b>	<b>4.26</b>	<b>4.14</b>	<b>1.45</b>
Bloomberg US Agg Bond Index	2.45	8.72	4.03	3.05	2.72	3.75	0.01	3.54	2.65	0.55
Difference	0.10	-0.59	0.47	0.76	0.45	0.69	1.23	0.72	1.49	0.90
Rank	46	75	44	38	45	63	9	65	66	9
<b>SERS</b>	<b>2.81</b>	<b>9.95</b>	<b>4.80</b>	<b>3.77</b>	<b>3.46</b>	<b>4.99</b>	<b>-0.38</b>	<b>5.09</b>	<b>4.67</b>	<b>-0.14</b>
Bloomberg US Agg Bond Index	2.45	8.72	4.03	3.05	2.72	3.75	0.01	3.54	2.65	0.55
Difference	0.36	1.23	0.77	0.72	0.74	1.24	-0.39	1.55	2.02	-0.69
Rank	29	28	34	39	38	39	56	40	54	55
<b>HPRS</b>	<b>2.98</b>	<b>9.06</b>	<b>5.60</b>	<b>4.72</b>	<b>3.81</b>	<b>4.83</b>	<b>2.56</b>	<b>5.29</b>	<b>6.36</b>	<b>0.54</b>
Bloomberg US Agg Bond Index	2.45	8.72	4.03	3.05	2.72	3.75	0.01	3.54	2.65	0.55
Difference	0.53	0.34	1.57	1.67	1.09	1.08	2.55	1.75	3.71	-0.01
Rank	21	54	6	9	27	46	3	37	28	28
<i>All Public Plans &gt; \$1B-US Fixed Income Segment Median</i>	<i>2.49</i>	<i>9.27</i>	<i>4.45</i>	<i>3.62</i>	<i>3.04</i>	<i>4.80</i>	<i>-0.29</i>	<i>4.80</i>	<i>4.80</i>	<i>-0.07</i>

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

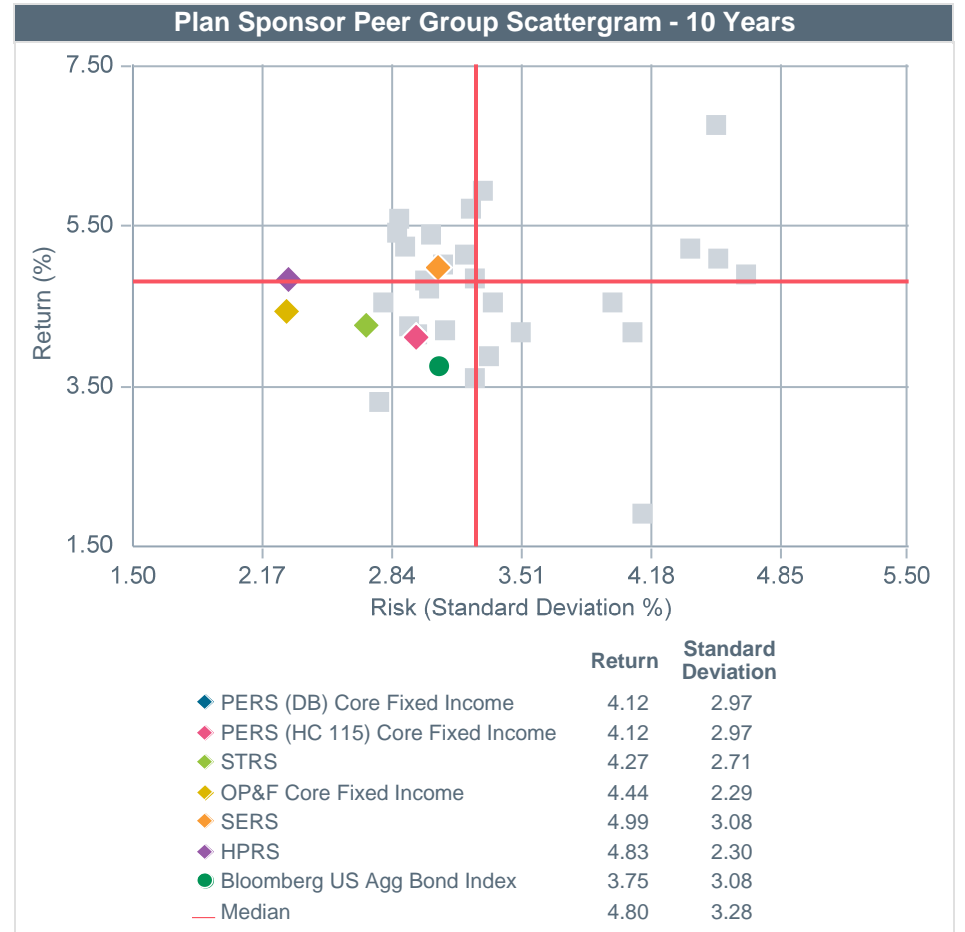
Risk & Return - Fixed Income

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



### Sharpe Ratio - 5 Years

PERS (DB) Core Fixed Income	0.70
PERS (HC 115) Core Fixed Income	0.70
STRS	0.91
OP&F Core Fixed Income	1.55
SERS	0.88
HPRS	1.83
Bloomberg US Agg Bond Index	0.65
All Public Plans > \$1B-US Fixed Income Segment Median	0.87



### Sharpe Ratio - 10 Years

PERS (DB) Core Fixed Income	1.19
PERS (HC 115) Core Fixed Income	1.19
STRS	1.35
OP&F Core Fixed Income	1.66
SERS	1.42
HPRS	1.85
Bloomberg US Agg Bond Index	1.03
All Public Plans > \$1B-US Fixed Income Segment Median	1.25

Performance shown is gross of fees.

Performance										
	Trailing Performance (%)						Calendar Year Performance (%)			
	2 Quarters	1 Year	3 Years	5 Years	7 Years	10 Years	2018	2017	2016	2015
<b>Additional Fixed Income</b>										
<b>PERS (DB) US Treasury</b>	<b>1.60</b>	<b>6.84</b>	<b>3.31</b>	<b>N/A</b>	<b>N/A</b>	<b>N/A</b>	<b>0.84</b>	<b>2.33</b>	<b>0.99</b>	<b>N/A</b>
Bloomberg US Trsy Index	1.59	6.86	3.31	N/A	N/A	N/A	0.86	2.31	1.04	N/A
Difference	0.01	-0.02	0.00	N/A	N/A	N/A	-0.02	0.02	-0.05	N/A
<b>PERS (DB) EMD</b>	<b>3.05</b>	<b>13.55</b>	<b>6.75</b>	<b>4.69</b>	<b>2.12</b>	<b>N/A</b>	<b>-5.63</b>	<b>13.52</b>	<b>10.94</b>	<b>-6.82</b>
PERS (DB) EMD Custom Benchmark	3.94	14.01	6.61	4.39	1.91	N/A	-5.33	12.26	10.18	-7.12
Difference	-0.89	-0.46	0.14	0.30	0.21	N/A	-0.30	1.26	0.76	0.30
<b>PERS (DB) High Yield</b>	<b>4.14</b>	<b>14.76</b>	<b>6.42</b>	<b>6.05</b>	<b>5.84</b>	<b>N/A</b>	<b>-2.06</b>	<b>7.23</b>	<b>14.44</b>	<b>-2.74</b>
Bloomberg U.S. High Yield Index	3.98	14.32	6.37	6.13	5.78	N/A	-2.08	7.50	17.13	-4.47
Difference	0.16	0.44	0.05	-0.08	0.06	N/A	0.02	-0.27	-2.69	1.73
<b>PERS (DB) Securitized Debt</b>	<b>3.38</b>	<b>11.70</b>	<b>7.42</b>	<b>5.23</b>	<b>9.15</b>	<b>N/A</b>	<b>3.21</b>	<b>7.52</b>	<b>-0.80</b>	<b>4.93</b>
Bloomberg CMBS Index + 2%	2.06	10.70	6.37	5.50	5.07	N/A	2.79	5.76	5.87	2.59
Difference	1.32	1.00	1.05	-0.27	4.08	N/A	0.42	1.76	-6.67	2.34
<b>PERS (DB) TIPS</b>	<b>2.15</b>	<b>8.42</b>	<b>3.27</b>	<b>2.59</b>	<b>N/A</b>	<b>N/A</b>	<b>-1.26</b>	<b>2.88</b>	<b>4.69</b>	<b>-1.43</b>
Bloomberg U.S. TIPS Index	2.14	8.43	3.32	2.62	N/A	N/A	-1.26	3.01	4.68	-1.44
Difference	0.01	-0.01	-0.05	-0.03	N/A	N/A	0.00	-0.13	0.01	0.01
<b>PERS (HC 115) EMD</b>	<b>3.05</b>	<b>13.55</b>	<b>6.75</b>	<b>4.69</b>	<b>2.13</b>	<b>4.92</b>	<b>-5.63</b>	<b>13.52</b>	<b>10.94</b>	<b>-6.82</b>
PERS (HC 115) EMD Custom Benchmark	3.94	14.01	6.61	4.39	1.91	4.69	-5.33	12.26	10.18	-7.12
Difference	-0.89	-0.46	0.14	0.30	0.22	0.23	-0.30	1.26	0.76	0.30

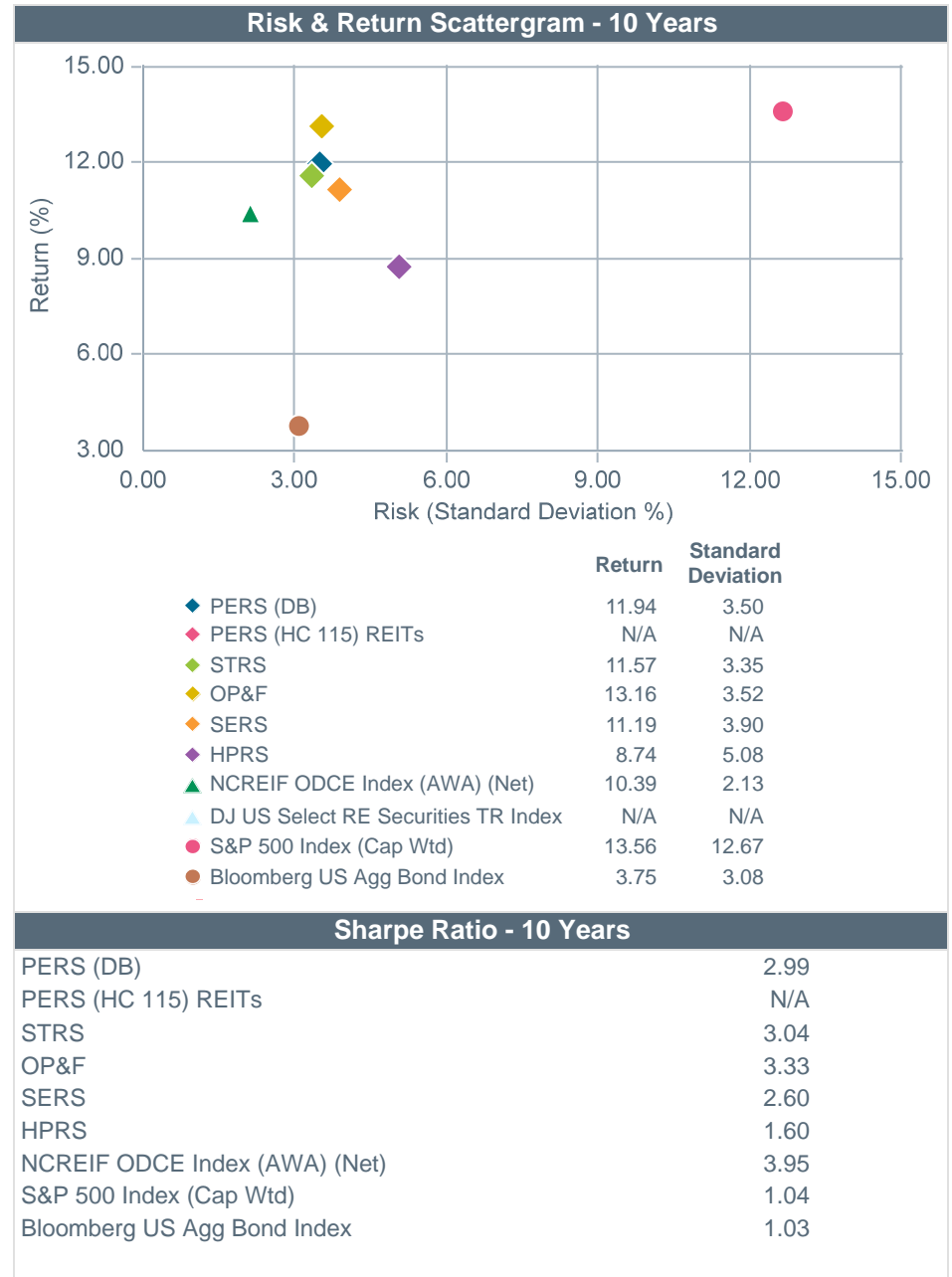
Performance shown is gross of fees. The PERS (DB) Floating Rate Debt composite has been removed due to its ongoing liquidation.

	Trailing Performance (%)						Calendar Year Performance (%)			
	2 Quarters	1 Year	3 Years	5 Years	7 Years	10 Years	2018	2017	2016	2015
<b>Additional Fixed Income</b>										
<b>PERS (HC 115) High Yield</b>	4.14	14.76	6.42	6.05	5.84	N/A	-2.06	7.23	14.44	-2.74
Bloomberg Barclays U.S. High Yield Index	3.98	14.32	6.37	6.13	5.78	N/A	-2.08	7.50	17.13	-4.47
Difference	0.16	0.44	0.05	-0.08	0.06	N/A	0.02	-0.27	-2.69	1.73
<b>PERS (HC 115) Securitized Debt</b>	3.38	11.70	7.42	5.23	9.14	N/A	3.21	7.52	-0.80	4.93
Bloomberg CMBS Index + 2%	2.06	10.70	6.37	5.50	5.07	N/A	2.79	5.76	5.87	2.59
Difference	1.32	1.00	1.05	-0.27	4.07	N/A	0.42	1.76	-6.67	2.34
<b>PERS (HC 115) TIPS</b>	2.15	8.42	3.27	2.59	1.07	3.39	-1.26	2.88	4.69	-1.43
Bloomberg Barclays U.S. Tips Index	2.14	8.43	3.32	2.62	1.08	3.36	-1.26	3.01	4.68	-1.44
Difference	0.01	-0.01	-0.05	-0.03	-0.01	0.03	0.00	-0.13	0.01	0.01
<b>OP&amp;F Mortgages</b>	4.79	6.73	4.95	4.73	5.56	6.53	5.29	2.87	5.63	3.21
Bloomberg Mortgage Index (1 Qtr Lag)	3.36	7.80	2.32	2.80	2.36	3.14	-0.92	0.30	3.63	3.43
Difference	1.43	-1.07	2.63	1.93	3.20	3.39	6.21	2.57	2.00	-0.22
<b>OP&amp;F High Yield</b>	4.53	13.48	6.53	6.20	5.70	7.59	-0.48	7.05	12.80	-0.92
CS Developed Countries High Yield	3.86	14.41	6.32	6.17	5.73	7.42	-2.26	7.48	17.95	-4.83
Difference	0.67	-0.93	0.21	0.03	-0.03	0.17	1.78	-0.43	-5.15	3.91
<b>OP&amp;F Private Credit Fixed Income</b>	8.36	11.62	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
S&P LTSA Levered Loan Index + 2%	3.71	5.17	N/A	N/A	N/A	N/A	7.30	N/A	N/A	N/A
Difference	4.65	6.45	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
<b>OP&amp;F US TIPS</b>	4.99	15.70	5.89	7.17	6.06	10.48	-0.26	2.89	18.76	0.26
Bridgewater Custom US TIPS Index	3.17	15.12	3.66	4.90	3.94	6.96	-5.04	1.90	16.77	-2.36
Difference	1.82	0.58	2.23	2.27	2.12	3.52	4.78	0.99	1.99	2.62

Performance shown is gross of fees. The PERS (HC 115) Floating Rate Debt composite has been removed due to its ongoing liquidation.

Performance										
	Trailing Performance (%)						Calendar Year Performance (%)			
	2 Quarters	1 Year	3 Years	5 Years	7 Years	10 Years	2018	2017	2016	2015
<b>Real Estate</b>										
<b>PERS (DB)</b>	<b>4.57</b>	<b>7.86</b>	<b>7.26</b>	<b>10.16</b>	<b>12.12</b>	<b>11.94</b>	<b>4.37</b>	<b>9.61</b>	<b>12.08</b>	<b>17.28</b>
PERS (DB) Real Estate Custom Benchmark	2.24	5.49	7.19	9.21	10.14	10.37	8.56	7.55	9.93	14.71
Difference	2.33	2.37	0.07	0.95	1.98	1.57	-4.19	2.06	2.15	2.57
<b>PERS (HC 115) REITs</b>	<b>5.54</b>	<b>23.23</b>	<b>7.05</b>	<b>6.45</b>	<b>8.95</b>	<b>N/A</b>	<b>-4.10</b>	<b>3.81</b>	<b>6.70</b>	<b>4.41</b>
DJ US Select Real Estate Securities TR Index	5.51	23.10	6.95	6.39	8.94	N/A	-4.22	3.76	6.65	4.46
Difference	0.03	0.13	0.10	0.06	0.01	N/A	0.12	0.05	0.05	-0.05
<b>STRS</b>	<b>4.62</b>	<b>10.65</b>	<b>7.79</b>	<b>8.88</b>	<b>10.29</b>	<b>11.57</b>	<b>6.65</b>	<b>6.14</b>	<b>9.68</b>	<b>11.36</b>
STRS Real Estate Custom Benchmark	3.60	9.31	7.02	8.19	9.30	10.59	5.09	6.70	8.10	11.89
Difference	1.02	1.34	0.77	0.69	0.99	0.98	1.56	-0.56	1.58	-0.53
<b>OP&amp;F</b>	<b>4.26</b>	<b>8.76</b>	<b>10.90</b>	<b>12.51</b>	<b>13.73</b>	<b>13.16</b>	<b>13.69</b>	<b>10.30</b>	<b>13.14</b>	<b>16.83</b>
NCREIF ODCE Index (AWA) (Net) (1 Qtr Lag)	1.86	4.64	6.34	8.36	9.29	9.84	7.71	6.70	9.08	13.86
Difference	2.40	4.12	4.56	4.15	4.44	3.32	5.98	3.60	4.06	2.97
<b>SERS</b>	<b>4.61</b>	<b>9.84</b>	<b>10.50</b>	<b>11.11</b>	<b>11.67</b>	<b>11.19</b>	<b>11.41</b>	<b>10.24</b>	<b>10.27</b>	<b>13.81</b>
SERS Global Real Assets Custom Benchmark	2.94	6.24	6.76	8.57	9.30	9.72	7.16	6.89	9.26	13.48
Difference	1.67	3.60	3.74	2.54	2.37	1.47	4.25	3.35	1.01	0.33
<b>HPRS</b>	<b>4.75</b>	<b>10.32</b>	<b>12.10</b>	<b>10.05</b>	<b>12.22</b>	<b>8.74</b>	<b>15.75</b>	<b>10.30</b>	<b>7.75</b>	<b>6.34</b>
NCREIF Property Index (1 Qtr Lag)	2.94	6.24	6.76	8.57	9.29	9.77	7.16	6.89	9.22	13.48
Difference	1.81	4.08	5.34	1.48	2.93	-1.03	8.59	3.41	-1.47	-7.14

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.

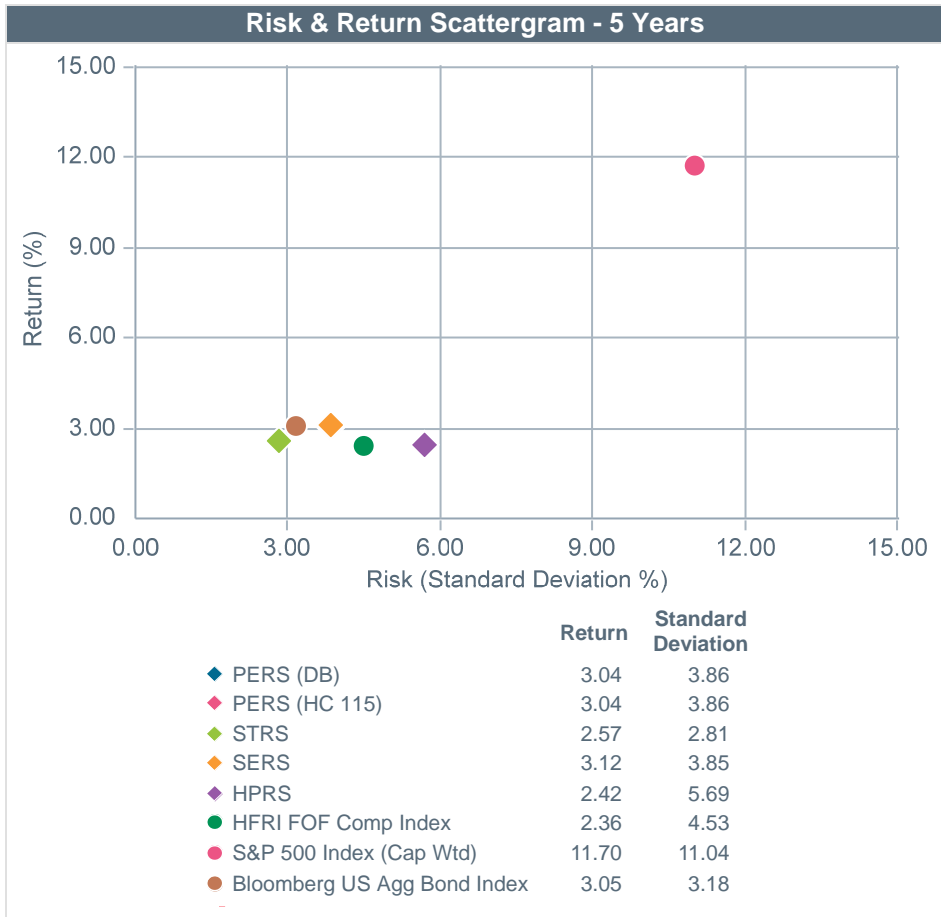


Performance shown may be net or gross of fees depending on underlying investments.



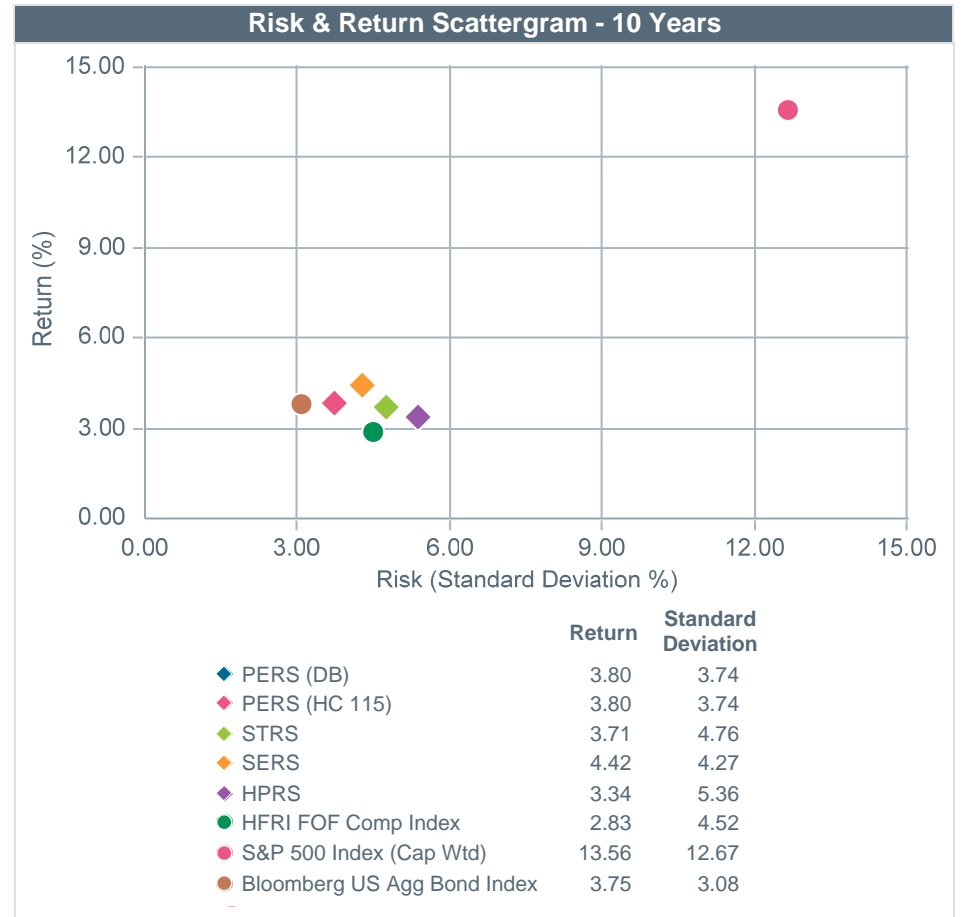
Performance										
	Trailing Performance (%)						Calendar Year Performance (%)			
	2 Quarters	1 Year	3 Years	5 Years	7 Years	10 Years	2018	2017	2016	2015
<b>Hedge Funds</b>										
<b>PERS (DB)</b>	<b>1.92</b>	<b>7.66</b>	<b>4.38</b>	<b>3.04</b>	<b>4.08</b>	<b>3.80</b>	<b>-1.51</b>	<b>7.25</b>	<b>3.38</b>	<b>-1.20</b>
PERS (DB) Hedge Funds Custom Benchmark	2.28	8.49	4.09	3.37	3.77	4.46	-3.19	7.38	6.44	-1.70
Difference	-0.36	-0.83	0.29	-0.33	0.31	-0.66	1.68	-0.13	-3.06	0.50
<b>PERS (HC 115)</b>	<b>1.92</b>	<b>7.66</b>	<b>4.38</b>	<b>3.04</b>	<b>4.08</b>	<b>3.80</b>	<b>-1.51</b>	<b>7.25</b>	<b>3.38</b>	<b>-1.20</b>
PERS (HC 115) Hedge Funds Custom Benchmark	2.28	8.49	4.09	3.37	3.77	4.46	-3.19	7.38	6.44	-1.70
Difference	-0.36	-0.83	0.29	-0.33	0.31	-0.66	1.68	-0.13	-3.06	0.50
<b>STRS</b>	<b>1.48</b>	<b>3.91</b>	<b>3.36</b>	<b>2.57</b>	<b>3.89</b>	<b>3.71</b>	<b>0.64</b>	<b>5.59</b>	<b>3.38</b>	<b>-0.55</b>
HFRI FOF Comp Index	2.10	8.39	3.89	2.36	3.42	2.83	-4.02	7.77	0.51	-0.27
Difference	-0.62	-4.48	-0.53	0.21	0.47	0.88	4.66	-2.18	2.87	-0.28
<b>SERS</b>	<b>2.26</b>	<b>8.15</b>	<b>4.51</b>	<b>3.12</b>	<b>4.19</b>	<b>4.42</b>	<b>-1.61</b>	<b>7.27</b>	<b>2.20</b>	<b>-0.05</b>
HFRI FOF Comp Index + 1%	2.61	9.47	4.93	3.39	4.46	3.86	-3.06	8.85	1.52	0.73
Difference	-0.35	-1.32	-0.42	-0.27	-0.27	0.56	1.45	-1.58	0.68	-0.78
<b>HPRS</b>	<b>3.34</b>	<b>12.30</b>	<b>3.74</b>	<b>2.42</b>	<b>3.53</b>	<b>3.34</b>	<b>-5.96</b>	<b>5.70</b>	<b>-0.27</b>	<b>1.21</b>
HFRI FOF Comp Index	2.10	8.39	3.89	2.36	3.42	2.83	-4.02	7.77	0.51	-0.27
Difference	1.24	3.91	-0.15	0.06	0.11	0.51	-1.94	-2.07	-0.78	1.48

Performance shown is net of fees.



### Sharpe Ratio - 5 Years

PERS (DB)	0.52
PERS (HC 115)	0.52
STRS	0.53
SERS	0.54
HPRS	0.26
<i>HFRI FOF Comp Index</i>	<i>0.30</i>
S&P 500 Index (Cap Wtd)	0.98
Bloomberg US Agg Bond Index	0.65



### Sharpe Ratio - 10 Years

PERS (DB)	0.86
PERS (HC 115)	0.86
STRS	0.66
SERS	0.90
HPRS	0.53
<i>HFRI FOF Comp Index</i>	<i>0.51</i>
S&P 500 Index (Cap Wtd)	1.04
Bloomberg US Agg Bond Index	1.03

Performance shown is net of fees.

Performance										
	2 Quarters	1 Year	3 Years	5 Years	7 Years	10 Years	2018	2017	2016	2015
<b>Private Equity</b>										
<b>PERS (DB)</b>	<b>7.88</b>	<b>10.39</b>	<b>15.10</b>	<b>11.54</b>	<b>13.10</b>	<b>14.71</b>	<b>15.48</b>	<b>19.60</b>	<b>6.72</b>	<b>6.09</b>
PERS (DB) Private Equity Custom Benchmark	4.39	8.02	12.67	10.47	12.86	13.90	15.00	15.13	8.48	6.04
Difference	3.49	2.37	2.43	1.07	0.24	0.81	0.48	4.47	-1.76	0.05
<b>STRS</b>	<b>8.92</b>	<b>13.97</b>	<b>17.69</b>	<b>13.85</b>	<b>15.42</b>	<b>15.34</b>	<b>19.85</b>	<b>19.35</b>	<b>6.76</b>	<b>9.89</b>
STRS Private Equity Custom Benchmark	10.91	32.30	15.70	12.35	15.51	15.11	-4.29	22.32	13.85	1.48
Difference	-1.99	-18.33	1.99	1.50	-0.09	0.23	24.14	-2.97	-7.09	8.41
<b>OP&amp;F</b>	<b>8.04</b>	<b>13.65</b>	<b>17.13</b>	<b>14.31</b>	<b>14.47</b>	<b>14.09</b>	<b>19.82</b>	<b>18.02</b>	<b>8.84</b>	<b>11.58</b>
OP&F Private Equity Custom Benchmark	6.83	6.07	16.31	13.93	16.45	16.50	21.12	22.48	18.82	2.65
Difference	1.21	7.58	0.82	0.38	-1.98	-2.41	-1.30	-4.46	-9.98	8.93
<b>SERS</b>	<b>7.06</b>	<b>12.76</b>	<b>17.47</b>	<b>15.70</b>	<b>16.91</b>	<b>15.78</b>	<b>18.27</b>	<b>21.56</b>	<b>12.37</b>	<b>13.81</b>
Burgiss All Private Equity Benchmark	4.18	8.08	12.03	10.49	12.86	13.88	16.05	12.10	9.07	7.37
Difference	2.88	4.68	5.44	5.21	4.05	1.90	2.22	9.46	3.30	6.44
<b>HPRS</b>	<b>2.67</b>	<b>8.46</b>	<b>8.57</b>	<b>7.93</b>	<b>9.62</b>	<b>6.88</b>	<b>8.80</b>	<b>8.46</b>	<b>13.44</b>	<b>0.85</b>
HPRS Private Equity Custom Benchmark	2.67	8.67	9.93	10.57	14.08	13.38	8.80	12.37	13.44	9.64
Difference	0.00	-0.21	-1.36	-2.64	-4.46	-6.50	0.00	-3.91	0.00	-8.79

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.

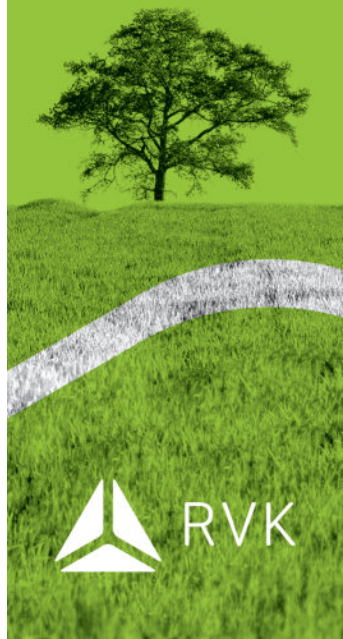
Performance										
	Trailing Performance (%)						Calendar Year Performance (%)			
	2 Quarters	1 Year	3 Years	5 Years	7 Years	10 Years	2018	2017	2016	2015
<b>Other Alternatives</b>										
<b>PERS (DB) Commodities</b>	<b>3.94</b>	<b>17.54</b>	<b>2.62</b>	<b>-3.96</b>	<b>N/A</b>	<b>N/A</b>	<b>-13.59</b>	<b>6.40</b>	<b>11.92</b>	<b>-32.44</b>
S&P Goldman Sachs Commodity Index (TR)	3.78	17.63	2.35	-4.32	N/A	N/A	-13.82	5.77	11.37	-32.86
Difference	0.16	-0.09	0.27	0.36	N/A	N/A	0.23	0.63	0.55	0.42
<b>PERS (DB) Risk Parity</b>	<b>5.84</b>	<b>30.30</b>	<b>11.63</b>	<b>7.56</b>	<b>N/A</b>	<b>N/A</b>	<b>-9.93</b>	<b>18.51</b>	<b>15.51</b>	<b>-10.42</b>
PERS (DB) Risk Parity Custom Benchmark	5.68	29.93	9.22	7.57	N/A	N/A	-10.07	11.50	7.00	3.30
Difference	0.16	0.37	2.41	-0.01	N/A	N/A	0.14	7.01	8.51	-13.72
<b>PERS (HC 115) Commodities</b>	<b>3.94</b>	<b>17.54</b>	<b>2.62</b>	<b>-3.96</b>	<b>-8.08</b>	<b>N/A</b>	<b>-13.59</b>	<b>6.40</b>	<b>11.92</b>	<b>-32.44</b>
S&P Goldman Sachs Commodity Index (TR)	3.78	17.63	2.35	-4.32	-8.67	N/A	-13.82	5.77	11.37	-32.86
Difference	0.16	-0.09	0.27	0.36	0.59	N/A	0.23	0.63	0.55	0.42
<b>PERS (HC 115) Risk Parity</b>	<b>5.84</b>	<b>30.30</b>	<b>11.63</b>	<b>7.56</b>	<b>N/A</b>	<b>N/A</b>	<b>-9.93</b>	<b>18.51</b>	<b>15.51</b>	<b>-10.42</b>
PERS (HC 115) Risk Parity Custom Benchmark	5.68	29.93	9.22	7.57	N/A	N/A	-10.07	11.50	7.00	3.30
Difference	0.16	0.37	2.41	-0.01	N/A	N/A	0.14	7.01	8.51	-13.72

Performance shown may be net or gross of fees depending on underlying investments. PERS (DB) funded a new opportunistic investments portfolio in the third quarter of 2014. Historical performance is represented by an opportunistic investments portfolio that was closed at the end of 2013. The PERS (DB) GTAA composite has been removed due to being liquidated as of 09/2019. The PERS (HC 115) GTAA 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	2018	2017	2016	2015
<b>Other Alternatives</b>										
<b>STRS Opportunistic Investments ex HF</b>	3.60	6.39	6.24	5.52	7.27	8.96	6.25	6.07	4.32	4.57
STRS Opportunistic Custom Benchmark	3.12	6.35	6.35	6.61	6.74	6.92	6.35	6.35	7.00	7.00
Difference	0.48	0.04	-0.11	-1.09	0.53	2.04	-0.10	-0.28	-2.68	-2.43
<b>OP&amp;F Real Assets</b>	2.55	7.08	7.81	5.45	5.60	N/A	11.81	4.65	2.99	1.03
Consumer Price Index + 5% (1 Qtr Lag)	3.50	6.80	7.18	6.60	6.57	N/A	7.39	7.34	6.54	4.96
Difference	-0.95	0.28	0.63	-1.15	-0.97	N/A	4.42	-2.69	-3.55	-3.93
<b>OP&amp;F MLPs</b>	-4.82	13.46	-1.84	-4.25	3.17	N/A	-13.10	-4.08	20.42	-29.31
Alerian MLP Index	0.21	17.21	-1.37	-5.21	0.33	N/A	-12.42	-6.52	18.30	-32.59
Difference	-5.03	-3.75	-0.47	0.96	2.84	N/A	-0.68	2.44	2.12	3.28
<b>SERS Opportunistic &amp; Tactical Portfolio</b>	2.21	7.11	8.93	6.28	N/A	N/A	5.33	14.55	11.17	-5.64
SERS Opportunistic Custom Benchmark	5.49	16.04	9.14	7.14	N/A	N/A	-2.03	14.37	7.02	1.48
Difference	-3.28	-8.93	-0.21	-0.86	N/A	N/A	7.36	0.18	4.15	-7.12
<b>HPRS Real Assets</b>	2.01	11.05	-0.25	N/A	N/A	N/A	-6.64	-4.27	4.28	N/A
HPRS Real Assets Custom Benchmark	1.93	10.88	3.17	N/A	N/A	N/A	-0.53	-0.43	9.17	N/A
Difference	0.08	0.17	-3.42	N/A	N/A	N/A	-6.11	-3.84	-4.89	N/A

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

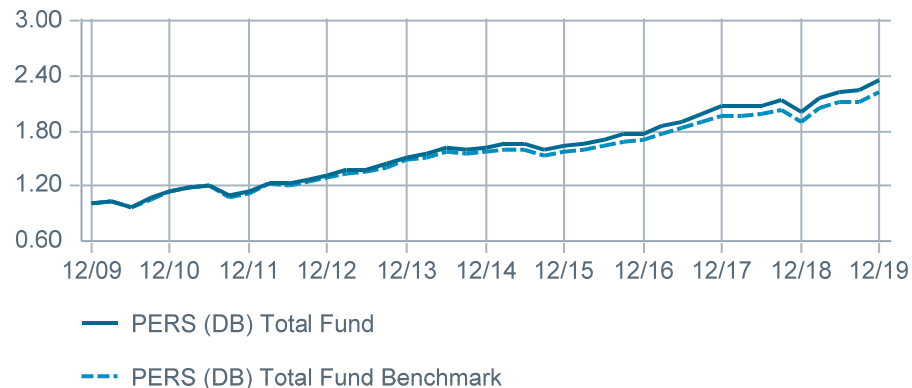
# Plan Specific Pages



**Summary**

- PERS (DB) has generated an annualized 0.43% of alpha over the trailing 5-year period and 0.60% 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**



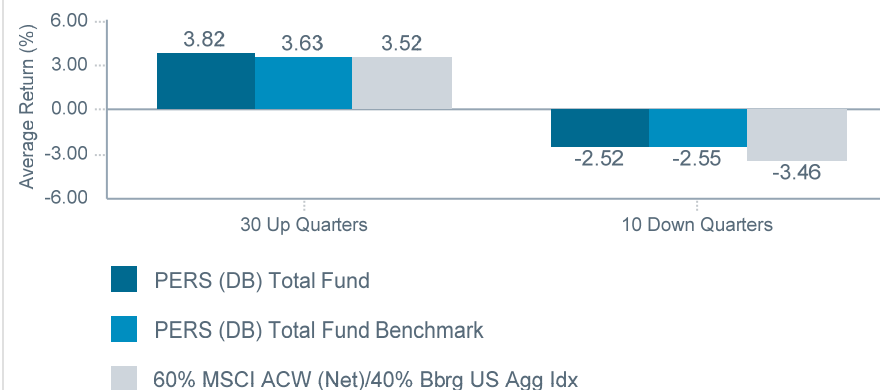
**MPT Stats**

	5 Years	10 Years
Maximum Return	7.17	9.71
Minimum Return	-5.60	-9.24
Standard Deviation	5.76	7.36
vs. PERS (DB) Total Fund Benchmark		
Info Ratio	0.83	0.77
Tracking Error	0.54	0.76
Alpha	0.43	0.60
vs. S&P 500 Index (Cap Wtd)		
Beta	0.48	0.54
vs. ICE BofAML 3 Mo US T-Bill Index		
Sharpe Ratio	1.16	1.13

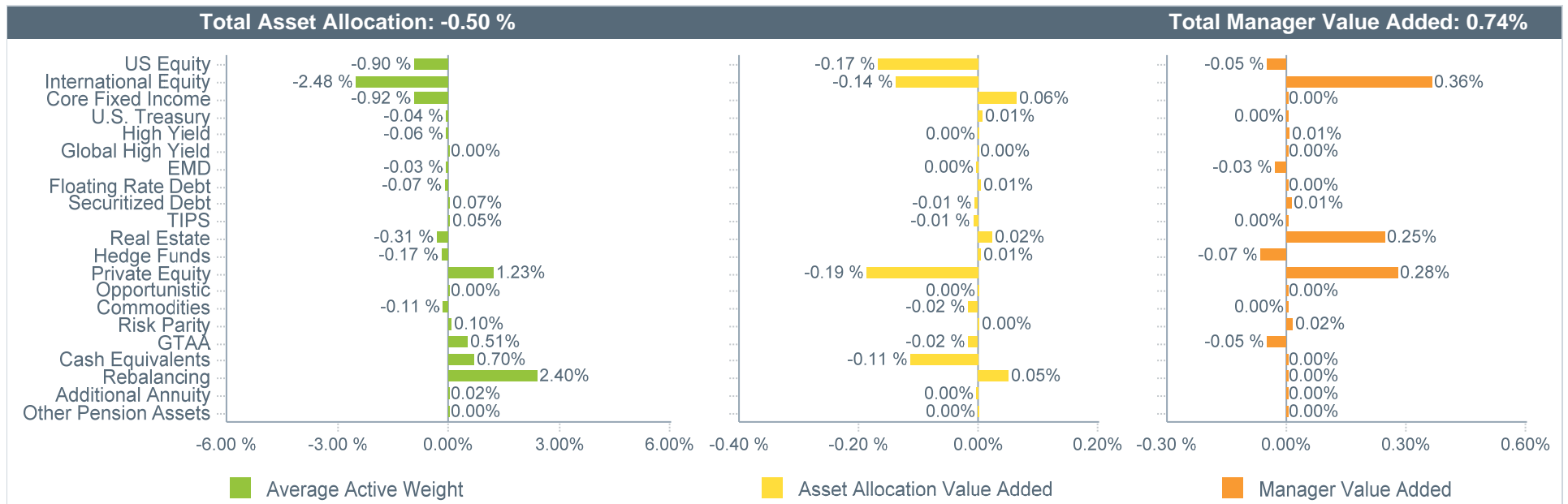
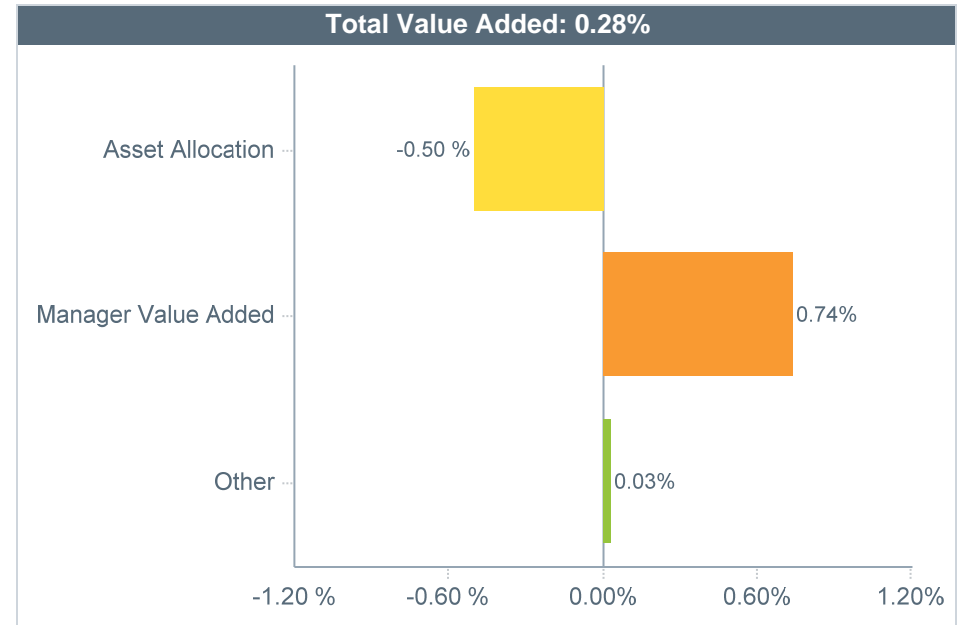
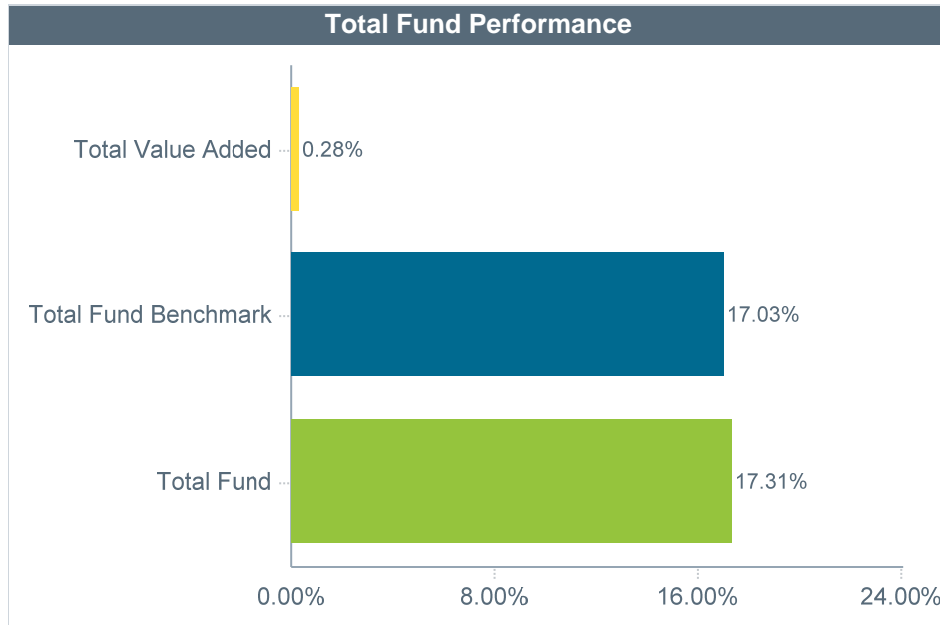
**Asset Allocation vs. Targets**

	Market Value (\$)	Allocation (%)	Target (%)
US Equity	19,037,564,402	20.82	21.00
International Equity	17,944,328,073	19.62	21.00
Core Fixed Income	8,933,242,839	9.77	10.90
U.S. Treasury	2,414,528,941	2.64	3.00
High Yield	1,808,262,859	1.98	2.00
Global High Yield	8,369	0.00	0.00
EMD	5,447,119,348	5.96	6.00
Floating Rate Debt	6,748,370	0.01	0.10
Securitized Debt	968,770,833	1.06	1.00
TIPS	1,847,685,150	2.02	2.00
Real Estate	8,909,782,775	9.74	10.00
Hedge Funds	5,867,937,635	6.42	7.00
Private Equity	9,962,891,719	10.90	10.00
Opportunistic	-	0.00	0.00
Commodities	833,350,262	0.91	1.00
Risk Parity	4,299,787,810	4.70	5.00
GTAA	-	0.00	0.00
Cash Equivalents	680,801,745	0.74	0.00
Rebalancing	2,461,625,192	2.69	0.00
Additional Annuity	17,322,401	0.02	0.00
Other Pension Assets	46,268	0.00	0.00
Total Fund	91,441,804,991	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.



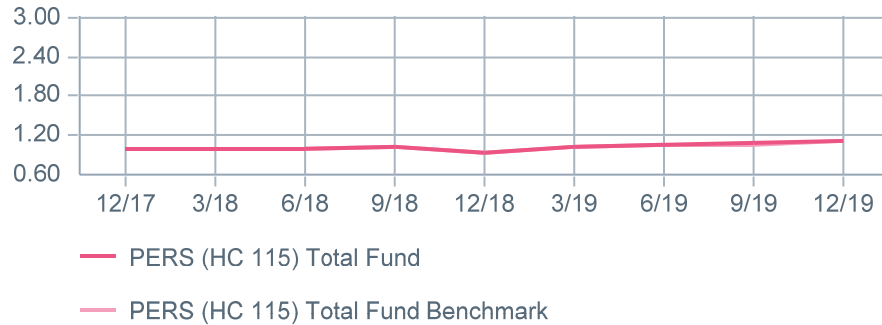
Performance shown is gross of fees. Calculation is based on monthly periodicity. See Glossary for additional information regarding the Total Fund Attribution calculation. Total Fund Benchmark return is calculated by RVK and may differ from Plan provided return due to rounding.



**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 - 2 Years**



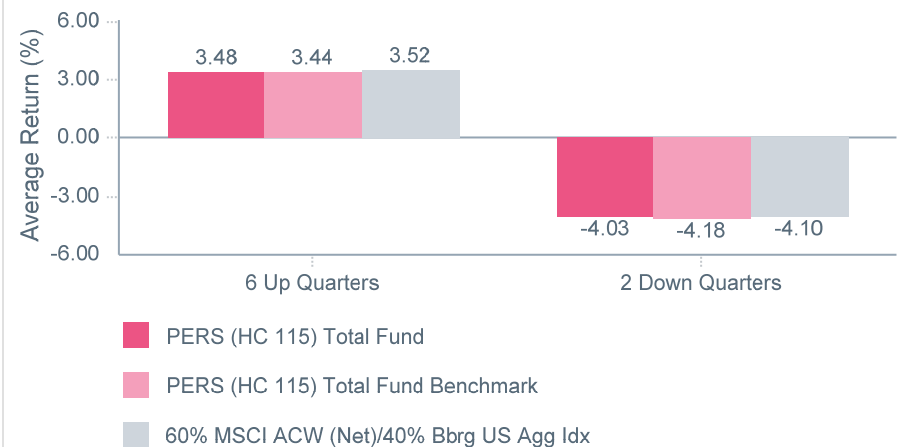
**Asset Allocation vs. Targets**

	Market Value (\$)	Allocation (%)	Target (%)
US Equity	2,933,176,241	22.98	23.00
International Equity	2,607,399,090	20.43	23.00
Core Fixed Income	2,027,798,389	15.89	17.90
EMD	765,902,368	6.00	6.00
High Yield	255,824,310	2.00	2.00
Floating Rate Debt	709,370	0.01	0.10
Securitized Debt	133,486,973	1.05	1.00
TIPS	767,263,797	6.01	6.00
Global High Yield	28,339	0.00	0.00
REITs	753,046,756	5.90	6.00
Hedge Funds	627,559,487	4.92	5.00
Opportunistic	-	0.00	0.00
Commodities	253,513,257	1.99	2.00
Risk Parity	605,802,419	4.75	5.00
GTAA	93,055	0.00	0.00
Cash Equivalents	40,027,998	0.31	0.00
PERS (HC 115) U.S. Treasury	350,234,994	2.74	3.00
Rebalancing	642,027,299	5.03	0.00
<b>Total Fund</b>	<b>12,763,894,138</b>	<b>100.00</b>	<b>100.00</b>

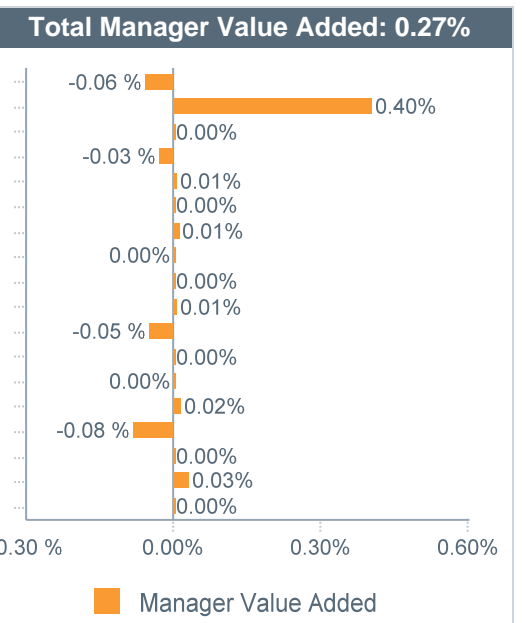
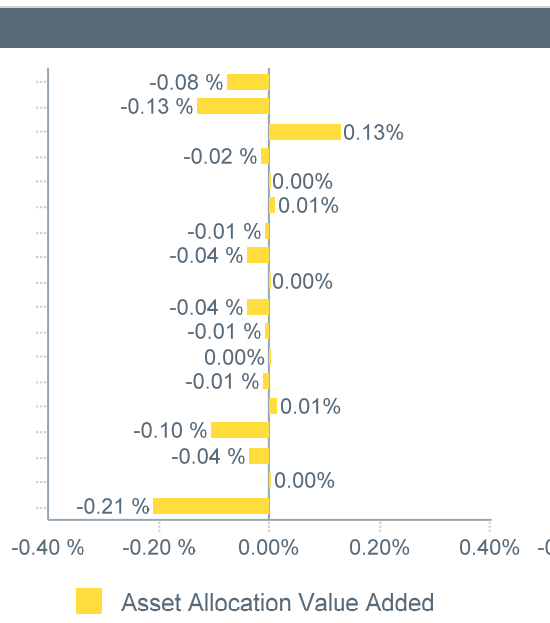
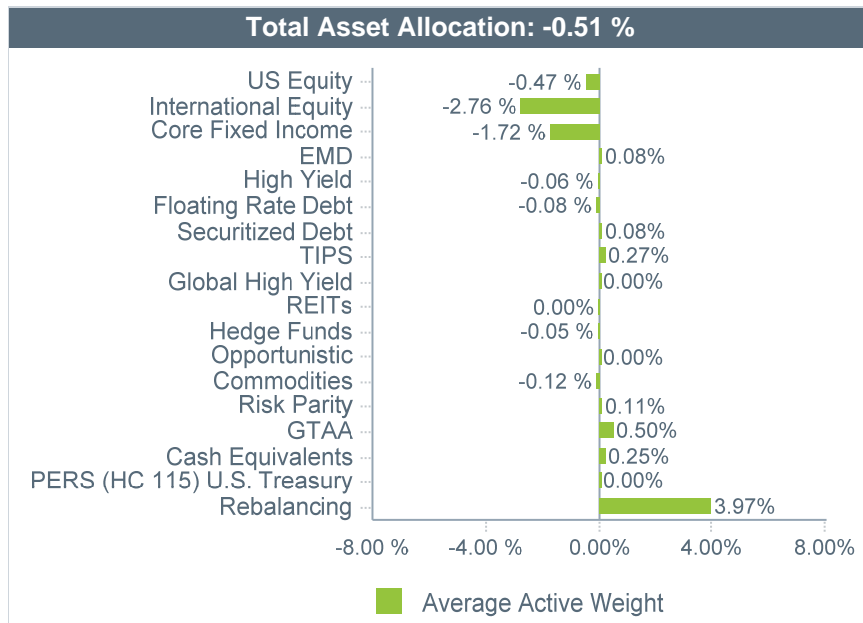
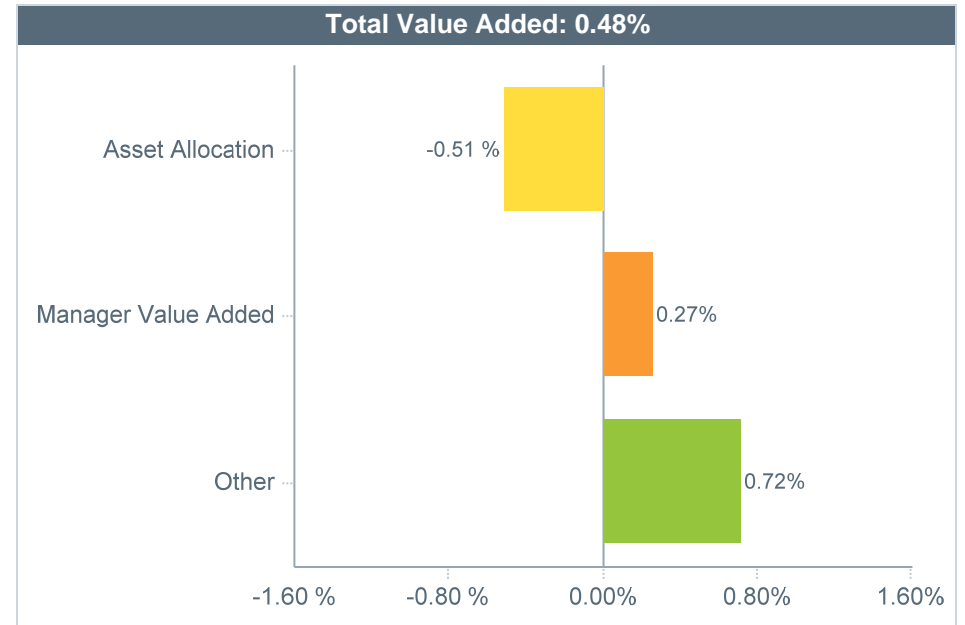
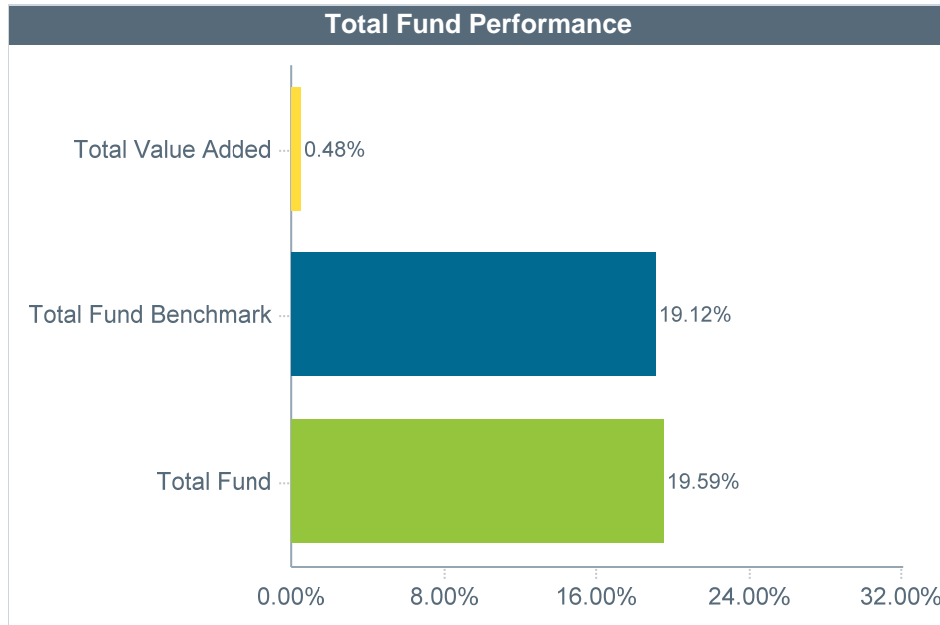
**MPT Stats**

	10 Years
Maximum Return	10.07
Standard Deviation	8.39
Minimum Return	-10.71
vs. PERS (HC 115) Total Fund Benchmark	
Info Ratio	0.93
Tracking Error	0.44
Alpha	0.32
vs. S&P 500 Index (Cap Wtd)	
Beta	0.60
vs. ICE BofAML 3 Mo US T-Bill Index	
Sharpe Ratio	2.88

**Up/Down Markets - 2 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.

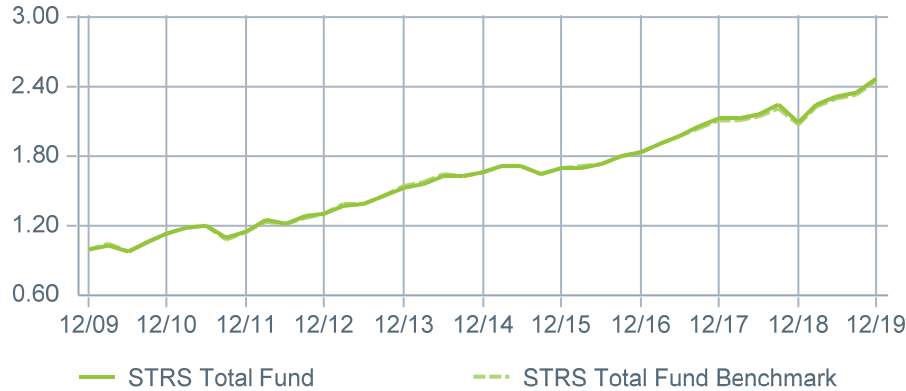


Performance shown is gross of fees. Calculation is based on monthly periodicity. See Glossary for additional information regarding the Total Fund Attribution calculation. Total Fund Benchmark return is calculated by RVK and may differ from Plan provided return due to rounding.

**Summary**

- STRS has generated 0.23% of alpha over the trailing 5-year period and 0.35% 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**



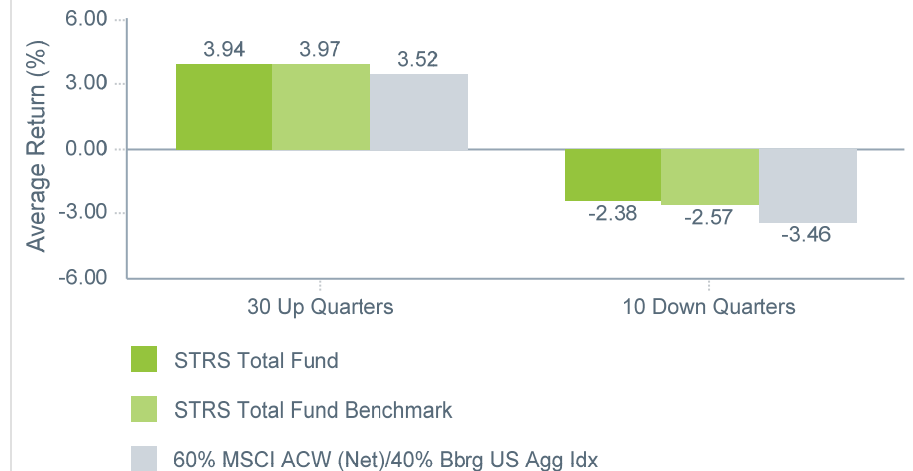
**MPT Stats**

	5 Years	10 Years
Maximum Return	7.66	8.86
Minimum Return	-6.73	-8.92
Standard Deviation	6.19	7.40
vs. STRS Total Fund Benchmark		
Info Ratio	1.05	0.18
Tracking Error	0.35	0.49
Alpha	0.23	0.35
vs. S&P 500 Index (Cap Wtd)		
Beta	0.54	0.56
vs. ICE BofAML 3 Mo US T-Bill Index		
Sharpe Ratio	1.17	1.20

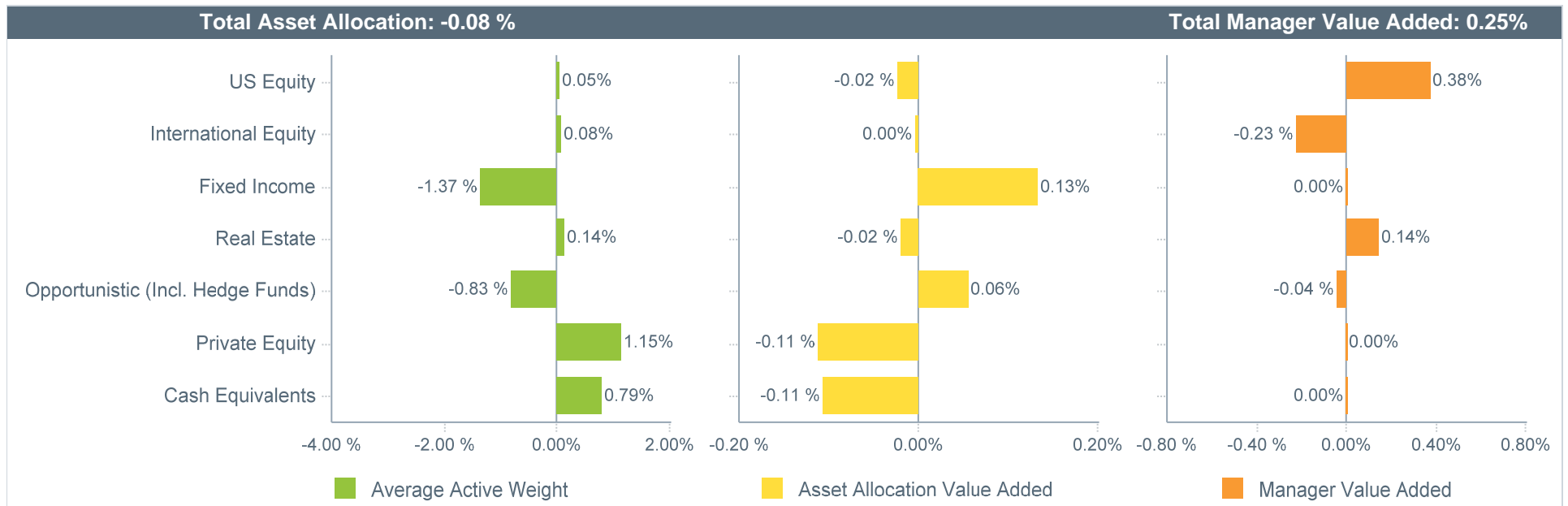
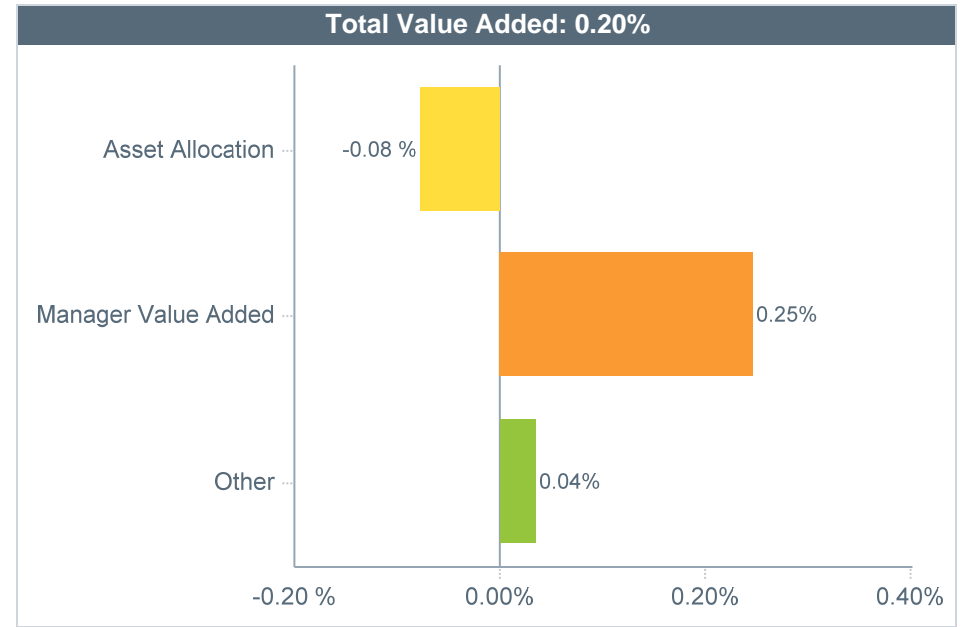
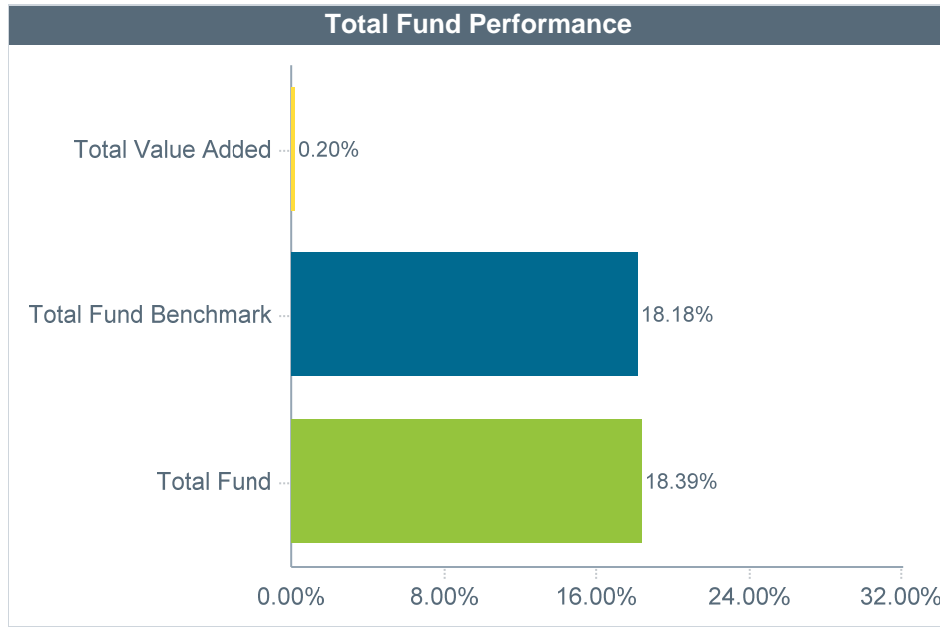
**Asset Allocation vs. Targets**

	Market Value (\$)	Allocation (%)	Target (%)
US Equity	22,906,128,362	27.94	28.00
International Equity	19,237,525,519	23.47	23.00
Fixed Income	16,435,446,360	20.05	21.00
Real Estate	7,614,243,827	9.29	10.00
Opportunistic (Incl. Hedge Funds)	7,560,453,621	9.22	10.00
Private Equity	6,626,384,309	8.08	7.00
Cash Equivalents	1,597,477,651	1.95	1.00
Total Fund	81,977,659,648	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.

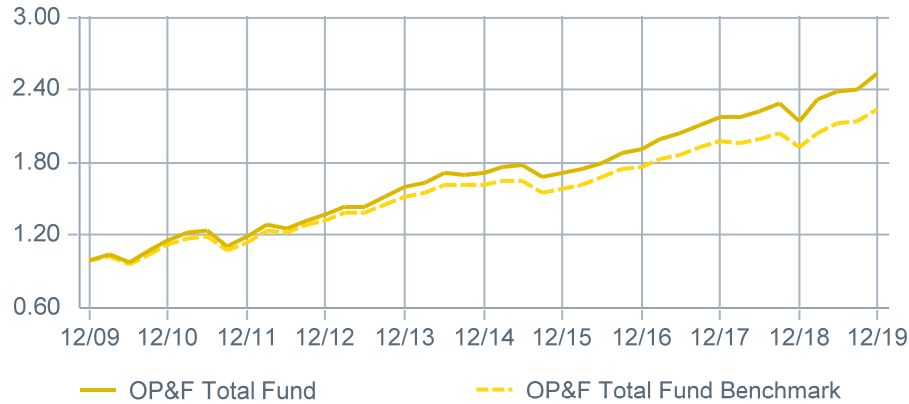


Performance shown is gross of fees. Calculation is based on monthly periodicity. See Glossary for additional information regarding the Total Fund Attribution calculation. Total Fund Benchmark return is calculated by RVK and may differ from Plan provided return due to rounding.

**Summary**

- OP&F has generated 1.33% of alpha over the trailing 5-year period and 0.93% 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**



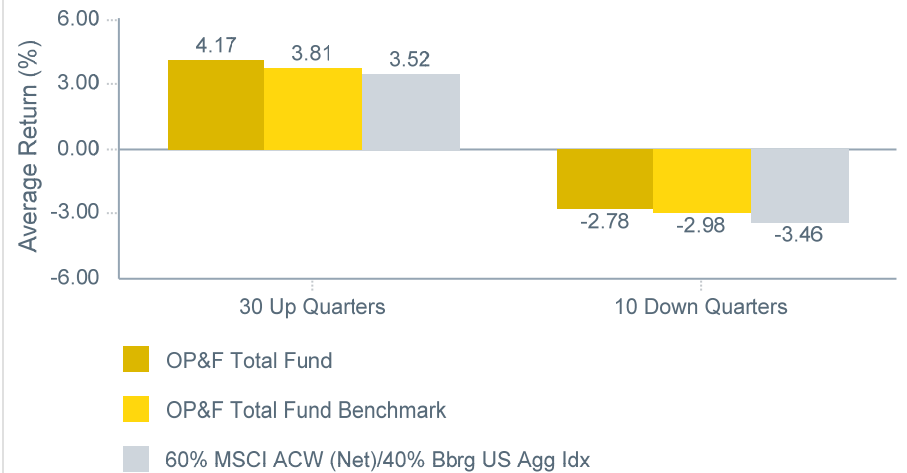
**MPT Stats**

	5 Years	10 Years
Maximum Return	8.09	10.07
Minimum Return	-5.95	-9.75
Standard Deviation	6.18	8.01
vs. OP&F Total Fund Benchmark		
Info Ratio	1.06	1.15
Tracking Error	1.25	1.10
Alpha	1.33	0.93
vs. S&P 500 Index (Cap Wtd)		
Beta	0.52	0.59
vs. ICE BofAML 3 Mo US T-Bill Index		
Sharpe Ratio	1.14	1.14

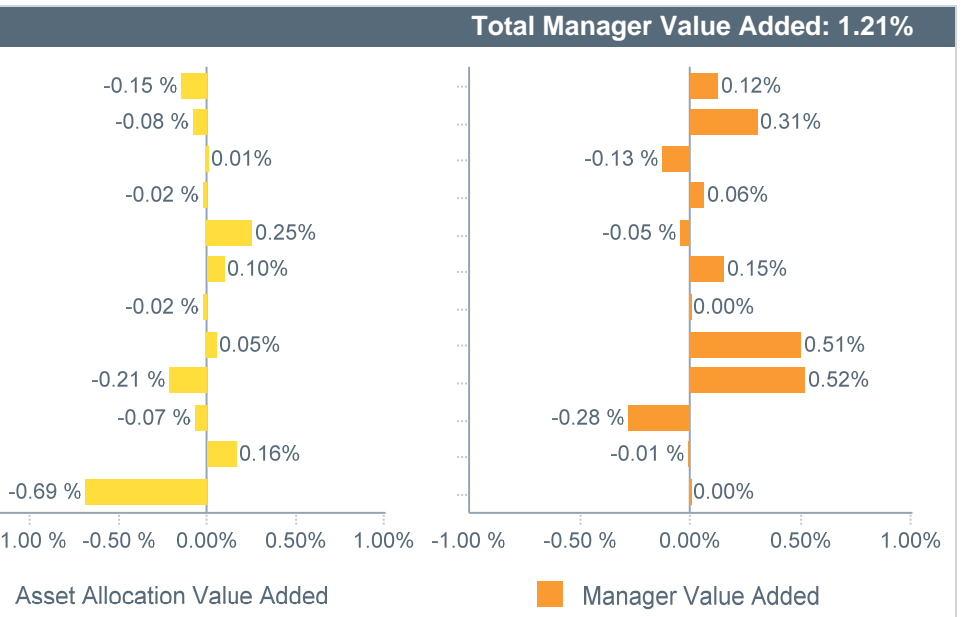
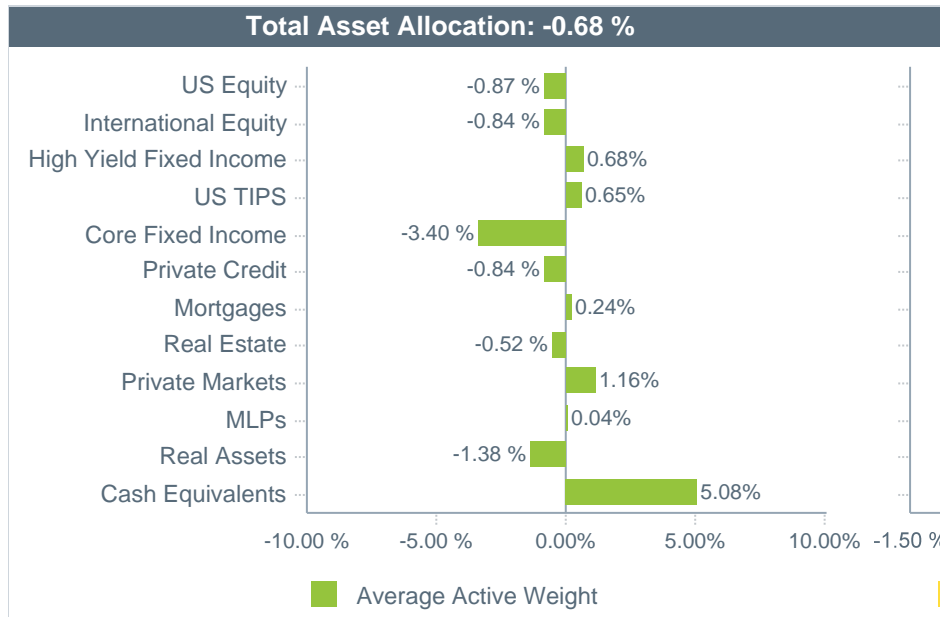
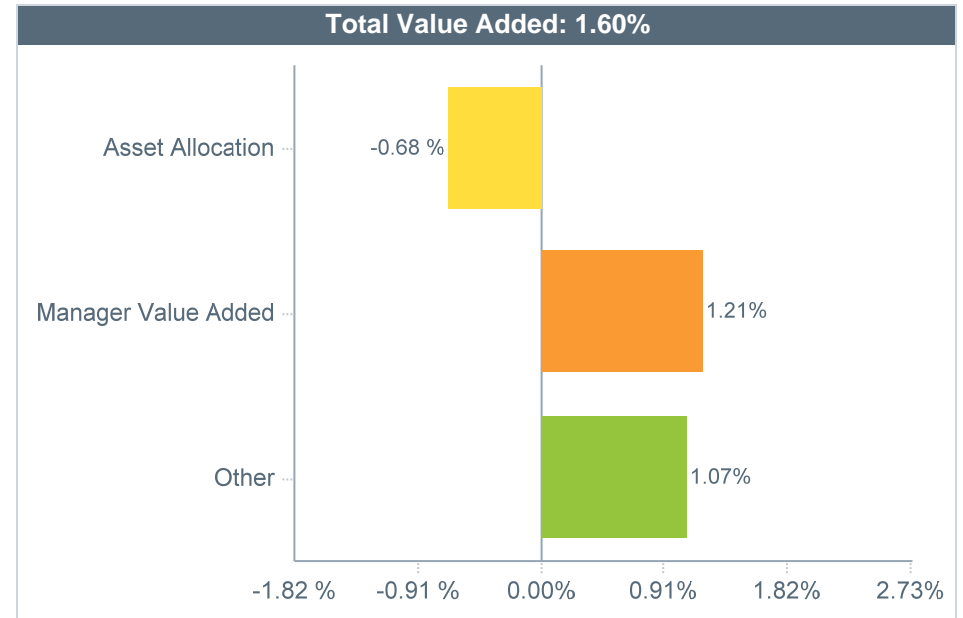
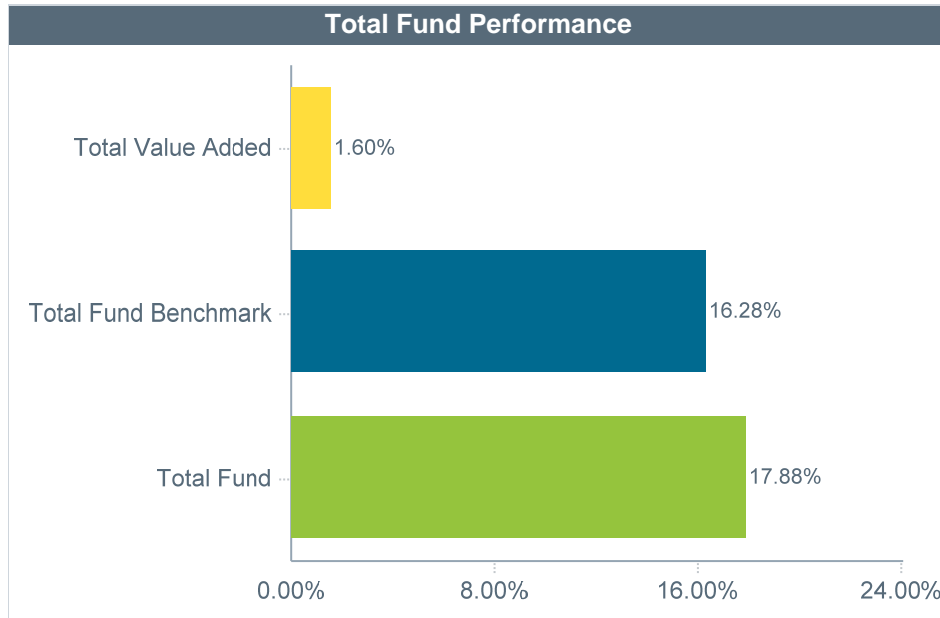
**Asset Allocation vs. Targets**

	Market Value (\$)	Allocation (%)	Target (%)
US Equity	3,070,368,107	18.69	18.50
International Equity	3,087,991,245	18.80	18.50
High Yield Fixed Income	1,596,329,941	9.72	9.75
US TIPS	1,528,703,251	9.30	8.50
Core Fixed Income	1,138,155,406	6.93	10.50
Private Credit	410,620,786	2.50	3.00
Mortgages	37,082,203	0.23	0.00
Real Estate	1,812,751,987	11.03	12.00
Private Markets	1,377,262,289	8.38	7.25
MLPs	1,247,699,445	7.59	8.00
Real Assets	487,324,267	2.97	4.00
Cash Equivalents	634,862,555	3.86	0.00
Total Fund	16,429,151,483	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.

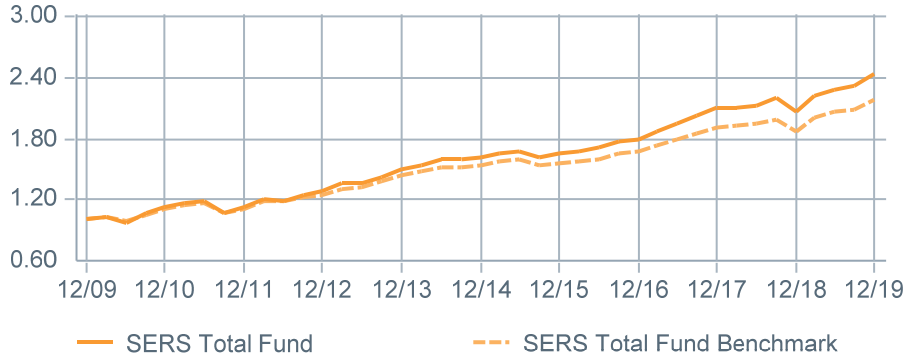


Performance shown is gross of fees. Calculation is based on monthly periodicity. See Glossary for additional information regarding the Total Fund Attribution calculation. Total Fund Benchmark return is calculated by RVK and may differ from Plan provided return due to rounding.

**Summary**

- SERS has generated 0.95% 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**



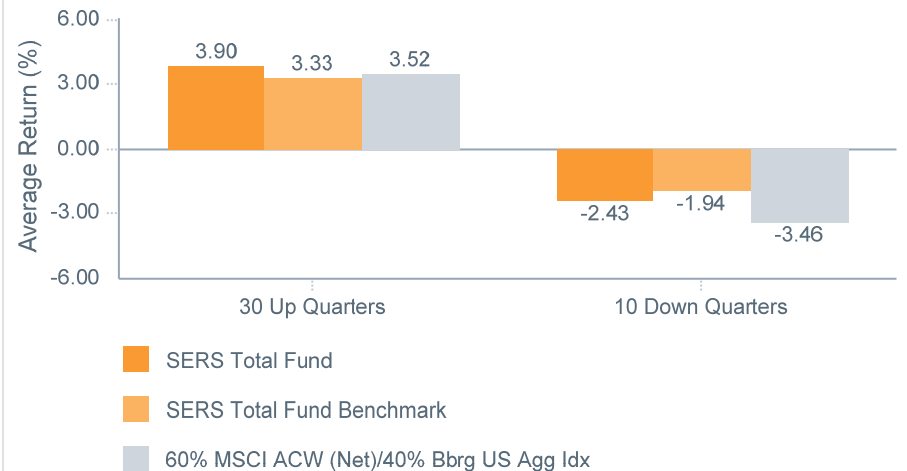
**MPT Stats**

	5 Years	10 Years
Maximum Return	7.03	8.54
Minimum Return	<b>-5.89</b>	<b>-9.12</b>
Standard Deviation	5.72	7.27
vs. SERS Total Fund Benchmark		
Info Ratio	2.33	0.80
Tracking Error	0.64	1.52
Alpha	0.95	<b>-0.04</b>
vs. S&P 500 Index (Cap Wtd)		
Beta	0.48	0.54
vs. ICE BofAML 3 Mo US T-Bill Index		
Sharpe Ratio	1.32	1.19

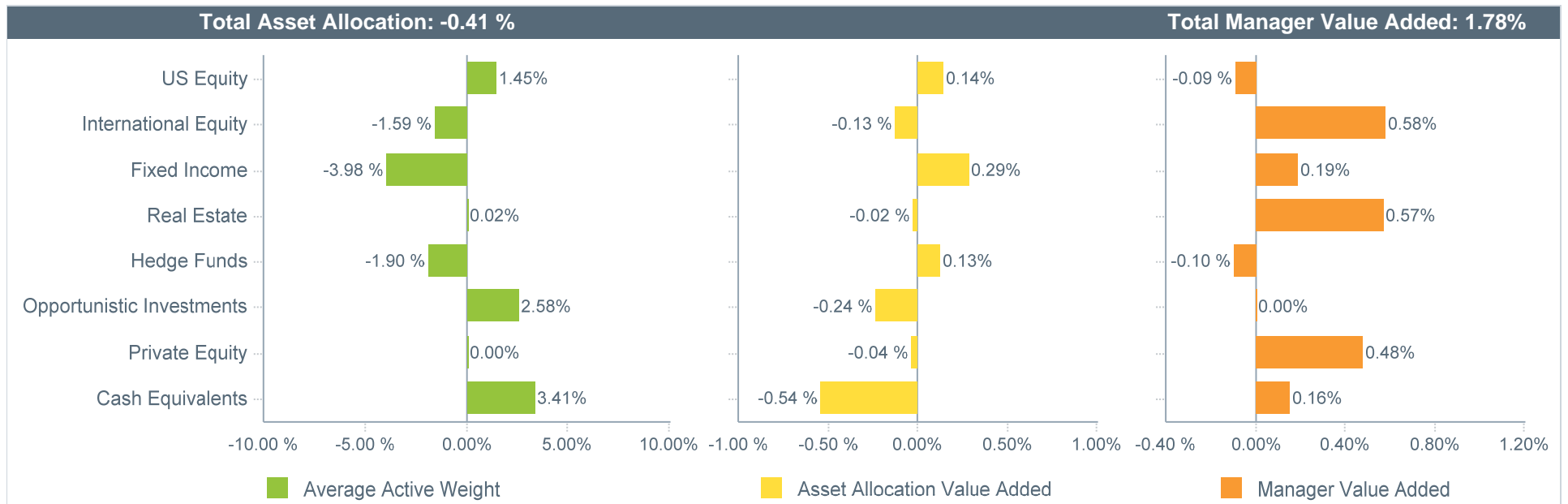
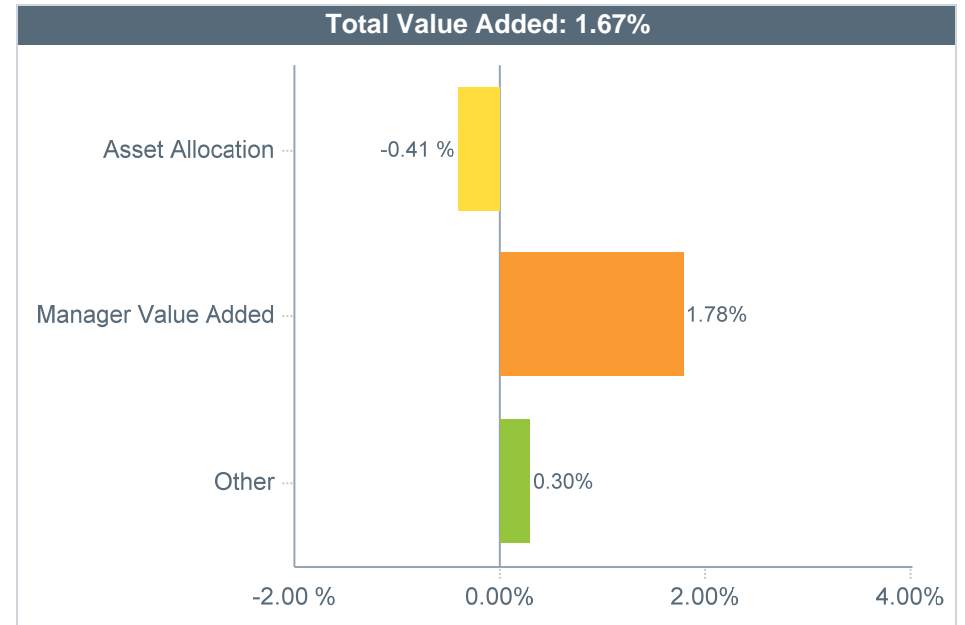
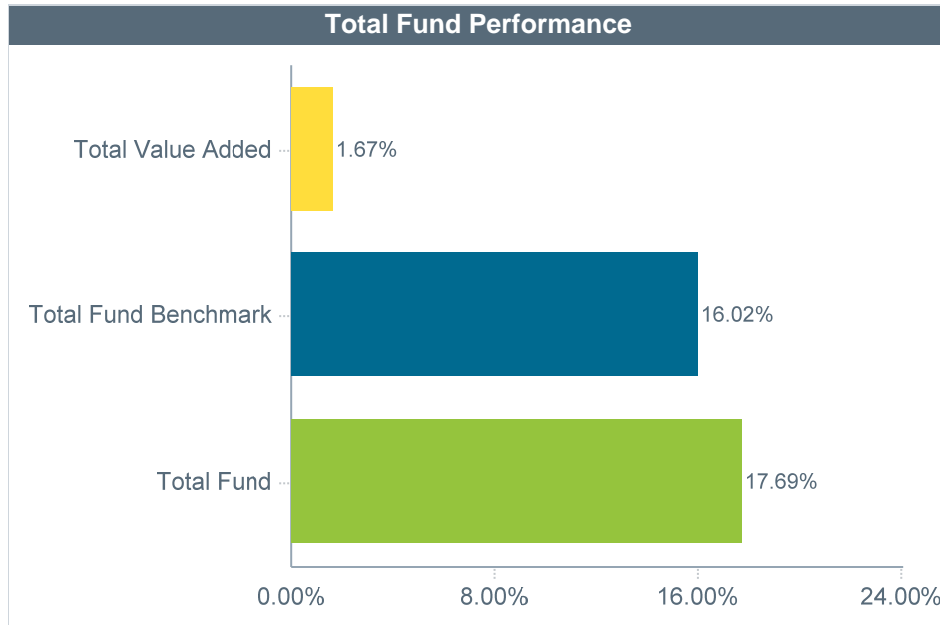
**Asset Allocation vs. Targets**

	Market Value (\$)	Allocation (%)	Target (%)
US Equity	3,729,519,971	24.46	22.50
International Equity	3,541,163,013	23.23	22.50
Fixed Income	2,401,318,402	15.75	19.00
Real Estate	2,232,716,473	14.64	15.00
Hedge Funds	1,084,736,084	7.11	10.00
Opportunistic Investments	349,525,958	2.29	0.00
Private Equity	1,451,189,193	9.52	10.00
Cash Equivalents	456,812,968	3.00	1.00
Total Fund	15,246,982,063	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.



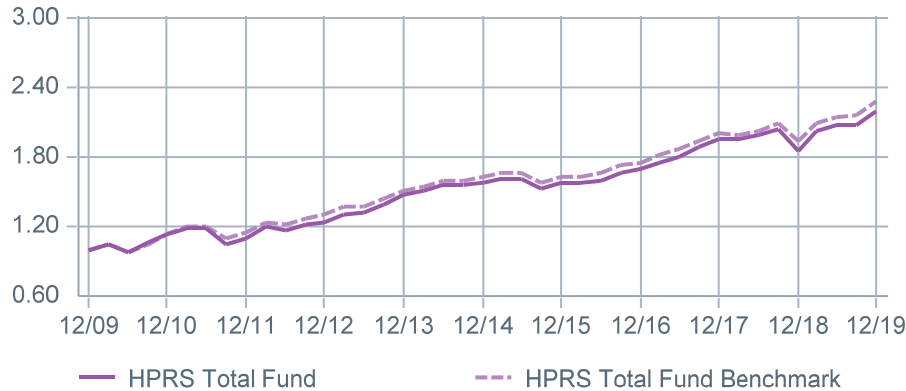
Performance shown is gross of fees. Calculation is based on monthly periodicity. See Glossary for additional information regarding the Total Fund Attribution calculation. Total Fund Benchmark return is calculated by RVK and may differ from Plan provided return due to rounding.



Summary

- HPRS has lost **-0.49%** of alpha over the trailing 5-year period and lost **-1.04%** 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



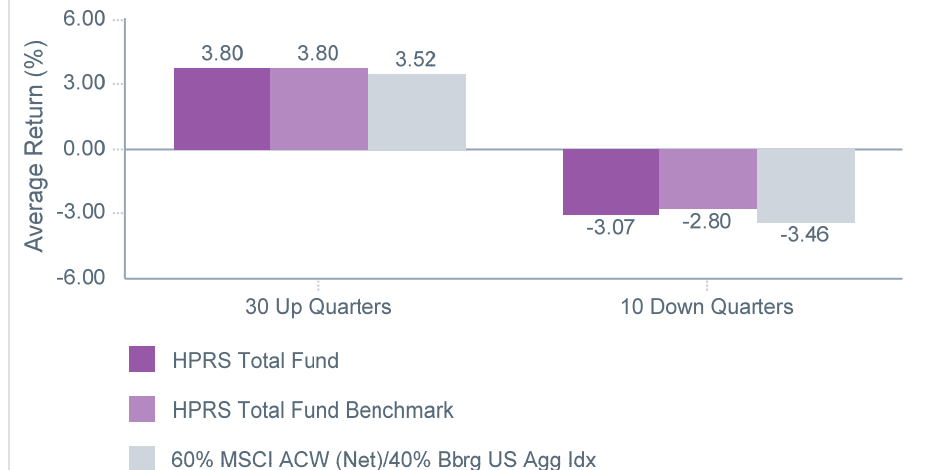
MPT Stats

	5 Years	10 Years
Maximum Return	8.50	8.50
Minimum Return	<b>-8.66</b>	<b>-11.24</b>
Standard Deviation	7.05	8.41
vs. HPRS Total Fund Benchmark		
Info Ratio	0.03	<b>-0.18</b>
Tracking Error	0.90	1.43
Alpha	<b>-0.49</b>	<b>-1.04</b>
vs. S&P 500 Index (Cap Wtd)		
Beta	0.61	0.64
vs. ICE BofAML 3 Mo US T-Bill Index		
Sharpe Ratio	0.85	0.92

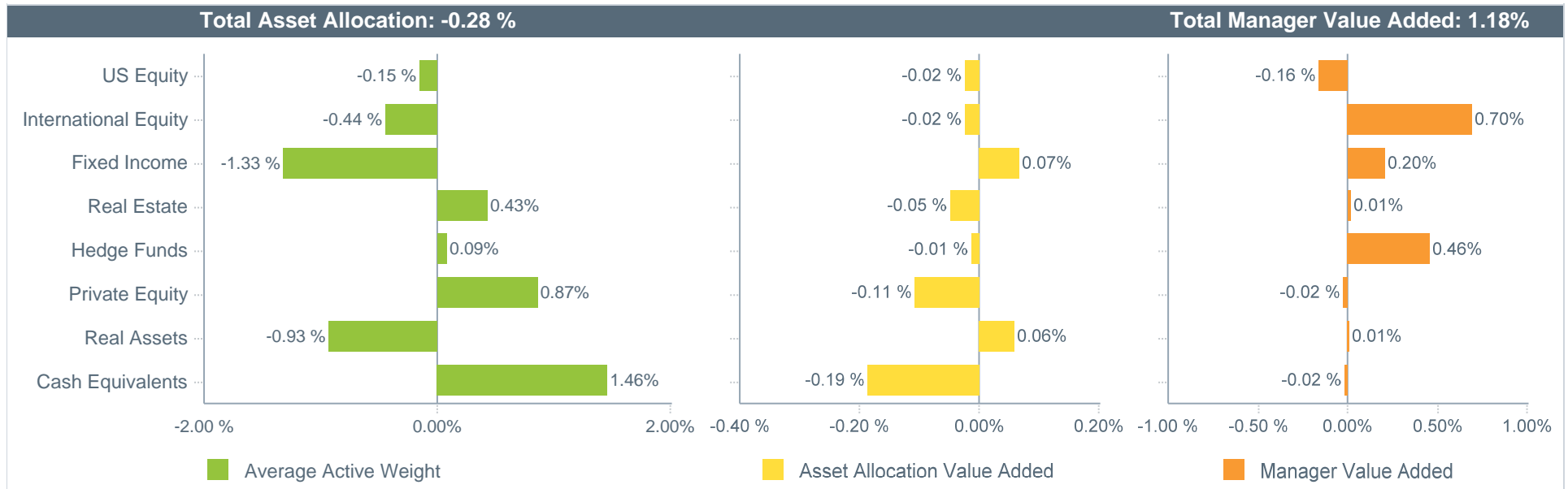
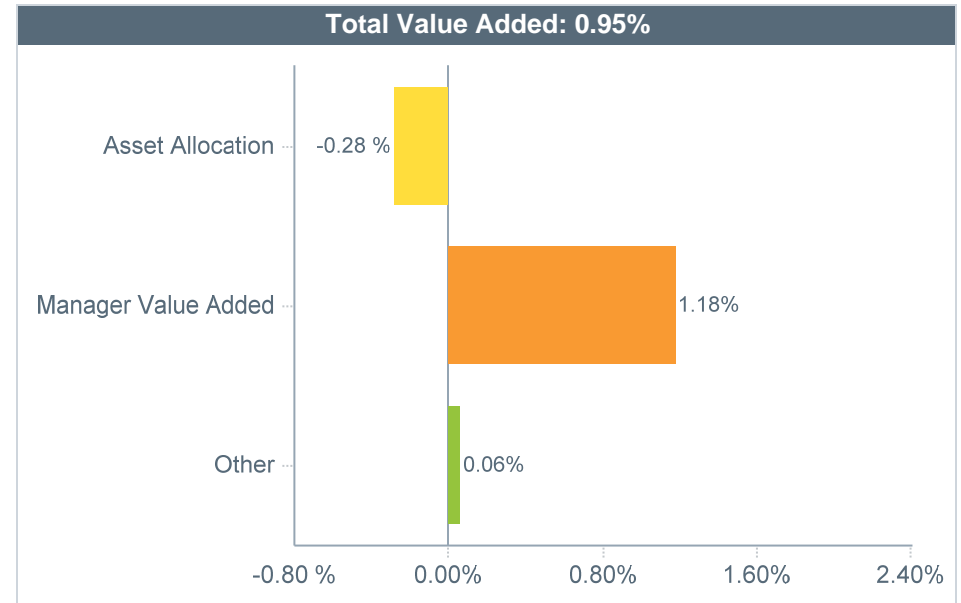
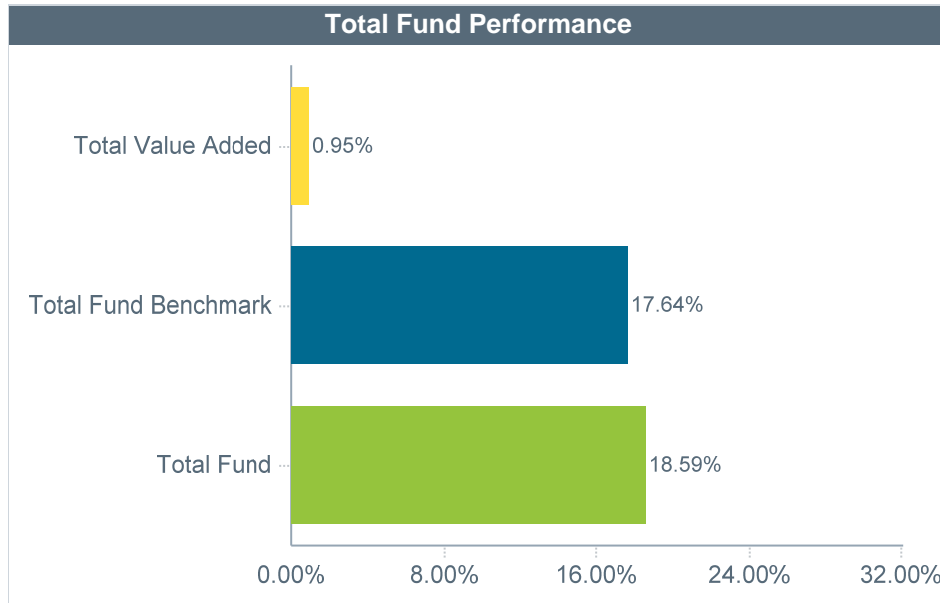
Asset Allocation vs. Targets

	Market Value (\$)	Allocation (%)	Target (%)
US Equity	288,777,333	31.00	30.00
International Equity	167,631,890	17.99	18.00
Fixed Income	159,672,409	17.14	18.00
Real Estate	66,400,554	7.13	7.00
Hedge Funds	98,906,670	10.62	10.00
Private Equity	93,368,071	10.02	10.00
Real Assets	34,209,005	3.67	5.00
Cash Equivalents	22,651,947	2.43	2.00
Total Fund	931,617,879	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.



Performance shown is gross of fees. Calculation is based on monthly periodicity. See Glossary for additional information regarding the Total Fund Attribution calculation. Total Fund Benchmark return is calculated by RVK and may differ from Plan provided return due to rounding.

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

As of December 31, 2019

	Market Value (\$000)	Trailing Performance (%)						Calendar Year Performance (%)			
		2 Quarters	1 Year	3 Years	5 Years	7 Years	10 Years	2018	2017	2016	2015
<b>HPRS</b>	<b>931,618</b>	<b>6.25</b>	<b>18.59</b>	<b>9.18</b>	<b>6.96</b>	<b>8.65</b>	<b>8.21</b>	<b>-4.57</b>	<b>15.01</b>	<b>7.42</b>	<b>0.15</b>
HPRS Total Fund Benchmark		5.82	17.63	9.19	6.97	8.33	8.55	-3.38	14.55	7.40	0.19
Difference		0.43	0.96	-0.01	-0.01	0.32	-0.34	-1.19	0.46	0.02	-0.04
<i>All Public Plans &gt; \$1B-TF Median</i>		5.80	17.23	9.35	7.09	8.10	8.33	-3.13	16.01	7.91	0.36
Rank		25	26	57	60	30	54	76	68	66	60
Population		175	174	171	169	165	158	135	110	122	109
<i>All Public Plans \$250M to \$1B-TF Median</i>		6.16	18.75	9.48	7.23	8.39	8.47	-4.58	16.22	7.86	0.15
Rank		46	53	60	62	44	60	50	64	62	50
Population		113	113	110	107	103	98	74	72	73	72







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 12/31/2019

(annualized fees shown in basis points)							
	Domestic Equity	International Equity	Fixed Income	Real Estate	Private Equity	Hedge Funds	Other Alternatives
 PERS (DB)	6	25	8	66	55	117	46
 PERS (HC 115)	1	4	2	-	-	13	6
 STRS	11	20	7	41	65	163	70
 OP&F	40	39	42	82	73	-	91
 SERS	20	37	20	88	111	125	158
 HPRS	34	75	54	139	112	97	93

- 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.
- STRS Other Alternatives include Opportunistic/Diversified Investments excluding Hedge Fund exposure.
- OP&F Other Alternatives include Real Assets and MLPs.
- SERS Other Alternatives include Opportunistic & Tactical Portfolio.
- HPRS Other Alternatives fees include Real Assets.

## Appendix

### Percentage of Assets Managed by External Managers – as of 12/31/2019

Percentage of Assets Managed by External Managers - As of 12/31/2019								
	Total Fund	Domestic Equity	International Equity	Fixed Income	Real Estate	Private Equity	Hedge Funds	Other Alternatives
<span style="color: blue;">■</span> PERS (DB)	57%	10%	79%	31%	100%	100%	100%	84%
<span style="color: red;">■</span> PERS (HC 115)	36%	10%	79%	22%	-	-	100%	71%
<span style="color: green;">■</span> STRS	31%	11%	43%	11%	12%	96%	100%	71%
<span style="color: yellow;">■</span> OP&F	97%	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 and MLPs.
- SERS Other Alternatives include Opportunistic Investments.
- SERS has one internally-managed Cash mandate.
- HPRS Other Alternatives fees include Real Assets.

### Percentage of Actively Managed Assets – as of 12/31/2019

Percentage of Assets Actively Managed - As of 12/31/2019								
	Total Fund	Domestic Equity	International Equity	Fixed Income	Real Estate	Private Equity	Hedge Funds	Other Alternatives
<span style="color: blue;">■</span> PERS (DB)	75%	26%	79%	80%	100%	100%	100%	84%
<span style="color: red;">■</span> PERS (HC 115)	62%	26%	79%	74%	-	-	100%	71%
<span style="color: green;">■</span> STRS	88%	62%	100%	100%	85%	100%	100%	100%
<span style="color: yellow;">■</span> OP&F	94%	60%	100%	100%	100%	100%	-	100%
<span style="color: orange;">■</span> SERS	76%	32%	72%	100%	97%	100%	100%	100%
<span style="color: purple;">■</span> HPRS	86%	53%	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 and MLPs.
- 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:

- 21.0% Russell 3000 Index
- 21.0% PERS (DB) International Equity Custom Benchmark
- 10.9% PERS (DB) Core Fixed Income Custom Benchmark
- 3.0% Bloomberg Barclays U.S. Treasury Index
- 2.0% Bloomberg Barclays U.S. High Yield Index
- 6.0% PERS (DB) EMD Custom Benchmark
- 0.1% CS Leveraged Loan Index
- 1.0% PERS (DB) Securitized Debt Custom Benchmark
- 2.0% Bloomberg Barclays U.S. TIPS Index
- 10.0% PERS (DB) Real Estate Custom Benchmark
- 7.0% PERS (DB) Hedge Funds Custom Benchmark
- 10.0% PERS (DB) Private Equity Custom Benchmark
- 1.0% S&P Goldman Sachs Commodity Index (TR)
- 5.0% PERS (DB) Risk Parity Custom Benchmark

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

- 23.0% Russell 3000 Index
- 23.0% PERS (HC 115) International Equity Custom Benchmark
- 17.9% PERS (HC 115) Core Fixed Income Custom Benchmark
- 6.0% PERS (HC 115) EMD Custom Benchmark
- 2.0% Bloomberg Barclays U.S. High Yield Index
- 0.1% CS Leveraged Loan Index
- 1.0% PERS (HC 115) Securitized Debt Custom Benchmark
- 6.0% Bloomberg Barclays U.S. TIPS Index
- 6.0% Dow Jones U.S. Select Real Estate Securities TR Index
- 5.0% PERS (HC 115) Hedge Funds Custom Benchmark
- 2.0% S&P Goldman Sachs Commodity Index (TR)
- 5.0% PERS (HC 115) Risk Parity Custom Benchmark
- 3.0% 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 ML 3 Mo US T-Bill Index

### OP&F Total Fund Custom Benchmark:

- 18.50% Wilshire 5000 Index
- 18.50% MSCI ACW Ex US IMI Index (Net)
- 10.5% Bloomberg US Aggregate Bond Index
- 9.75% CS High Yield Dev. Countries Only Index
- 8.5% Bridgewater Custom US TIPS Index
- 3.0% S&P LTSA Levered Loan Index + 2%
- 12.0% NCREIF ODCE (Net) (1 Quarter Lag)
- 4.0% CPI + 5% (1 Quarter Lag)
- 8.0% Alerian MLP Index
- 7.25% OP&F Private Equity Custom Benchmark

### SERS Total Fund Custom Benchmark:

- 22.5% Russell 3000 Index
- 22.5% SERS International Equity Custom Benchmark
- 19.0% Bloomberg US Aggregate Bond Index
- 15.0% NCREIF Property Index (1 Quarter Lag)
- 10.0% HFRI FOF Composite Index + 1%
- 10.0% Burgiss All Private Equity (1 Quarter Lag)
- 1.0% 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
- 10.0% HFRI FOF Composite Index
- 10.0% HPRS Total Private Equity Custom Composite
- 5.0% HPRS Real Assets Custom Index
- 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

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

- The market weight of underlying portfolio benchmarks

### **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.

## Custom Benchmark Glossary

### STRS Real Estate Custom Benchmark:

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

### STRS Private Equity Custom Benchmark:

- Russell 3000 + 100 basis points

### STRS Opportunistic Custom Benchmark:

- Beginning with the December 2019 report, STRS Ohio changed its benchmark series for Other Alternatives to an absolute return objective from a relative return objective.

### OP&F Private Equity Custom Benchmark:

- Wilshire 5000 + 3% (1 Quarter Lag)
- Prior to 2007Q1: Wilshire 5000 (1 Quarter Lag)
- Prior to 2006Q4: Wilshire 5000 + 5%

### 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:

- SERS Total Fund Custom Benchmark

### HPRS Fixed Income Custom Benchmark:

- 53% Bloomberg Aggregate Bond Index
- 15.7% Citi WGBI
- 15.7% Credit Suisse Leveraged Loans
- 15.6% BofA Merrill Lynch 91-Day T-Bill

### HPRS Total Private Equity Custom Benchmark:

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

### HPRS Real Assets Custom Benchmark:

- 60% NCREIF Timberland
- 40% Alerian MLP



## 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.

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

## 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:

<u>Alpha</u>	<u>Capital Appreciation</u>	<u>Capital Preservation</u>	<u>Inflation</u>
Absolute Return Strategies	Public Equity	Core Fixed Income	TIPS
Currency Overlay	Private Equity	CMBS Fixed Income	Bank Loans
GTAA (Global Tactical Asset Allocation)	Preferred Securities	Asset Backed Fixed Income	Core Real Estate
	High Yield	Domestic Core Plus Fixed Income	Real Return
	Convertible Fixed Income	Mortgage Backed Fixed Income	Inflation Hedges
	TALF Funds	International Developed Fixed Income	REITs
	Distressed Debt	Cash Equivalents	Commodities
	Emerging Market Fixed Income	Stable Value	
	MLPs		
	Value Added Real Estate		
	Opportunistic Real Estate		

**Total Fund Attribution** - A method for identifying the sources of a total fund's over- or underperformance relative to its benchmark. The calculation identifies the contributions of positive or negative total fund excess return caused by allocation differences relative to the total fund's custom benchmark, and performance differences of the investment managers relative to the benchmark components that represent them.

### **Total Fund Performance -**

**Total Fund** - The percentage return of the total fund for the specified time period.

**Total Fund Benchmark** - The percentage return of the total fund benchmark for the specified time period; calculated using the target asset allocation and the corresponding benchmark returns.

**Total Value Added** - The percentage of over- or underperformance of the total fund as compared to the total fund benchmark.

### **Total Value Added -**

**Asset Allocation** - Shows how the variance of the total fund's actual allocation from its target allocation added to or subtracted from fund performance.

**Manager Value Added** - The portion of the total value added attributable to the outperformance or underperformance of the fund's investment managers, relative to the individual benchmarks that represent them in the total fund benchmark.

**Market Timing/Other** - The contribution of other residual factors, including estimation error and transaction timing.

**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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