



Investment Performance Analysis

Ohio Retirement Study Council

Period Ended: June 30, 2018



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.

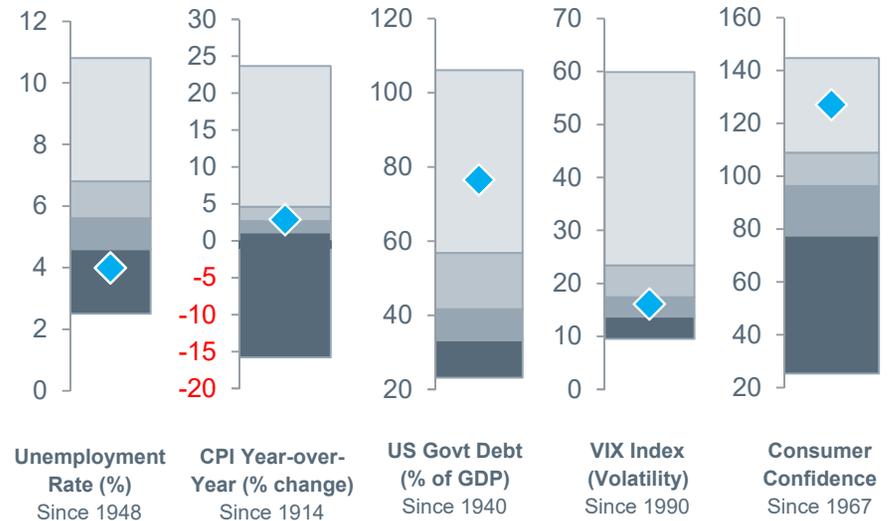
S&P Goldman Sachs Commodity: The **S&P Goldman Sachs Commodity Index** is a composite index of commodity sector returns representing an unleveraged, long-only investment in commodity futures that is broadly diversified across the spectrum of commodities. Components are weighted by their respective world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

Second Quarter Economic Environment

Key Economic Indicators

The US dollar strengthened significantly relative to a trade weighted basket of currencies during the second quarter of 2018, reversing a trend of weakening that began over a year earlier. This tightening dollar liquidity environment and the escalating trade tensions between the United States and its global trading partners put significant pressure on non-US assets. Economic data released during the quarter continue to indicate a strong economic expansion in the United States. According to the Bureau of Economic Analysis, first quarter GDP grew at an annual rate of 2.0%. The heightened equity market volatility that characterized the first quarter of 2018 softened to a degree during Q2, as the S&P 500 produced three straight months of positive returns. Despite what appear to be relatively tight labor market conditions, wage growth has remained subdued. With this backdrop, the Federal Open Market Committee raised the Federal Funds rate to a range between 1.75% and 2.00% during its June meeting. The continued robust US economic activity also flowed through to heightened expectations for additional interest rate increases.

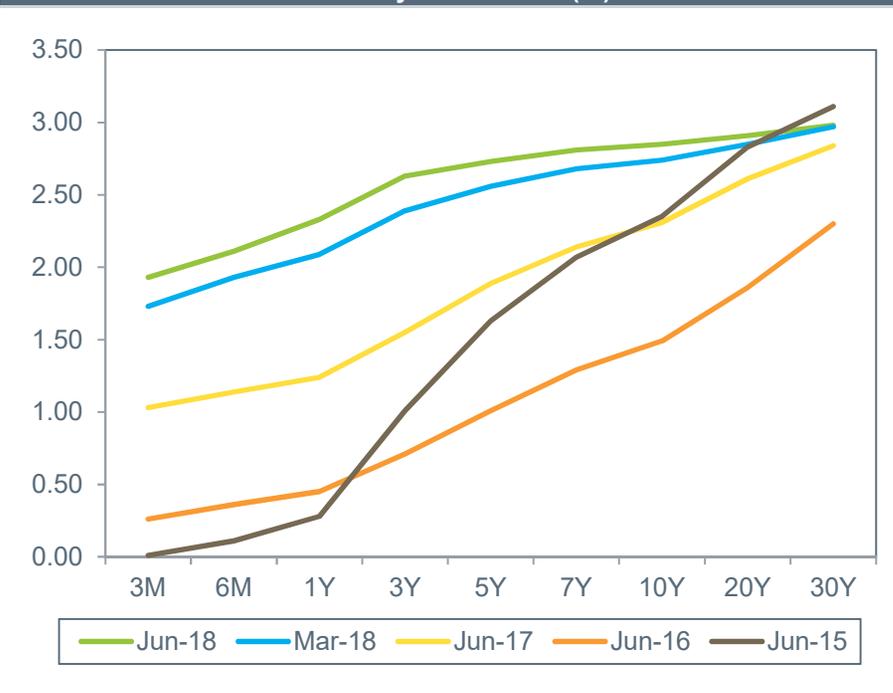
Key Economic Indicators



Economic Indicators

	Jun-18	Mar-18	Jun-17	Jun-15	20 Yr
Federal Funds Rate (%)	1.91 ▲	1.68	1.06	0.08	2.02
Breakeven Infl. - 1 Yr (%)	1.42 ▼	2.23	0.72	0.73	N/A
Breakeven Infl. - 10 Yr (%)	2.13 ▲	2.06	1.74	1.89	N/A
CPI YoY (Headline) (%)	2.9 ▲	2.4	1.6	0.1	2.2
Unemployment Rate (%)	4.0 ▼	4.1	4.3	5.3	5.9
Real GDP YoY (%)	2.8 ▲	2.6	2.1	3.4	2.3
PMI - Manufacturing	60.2 ▲	59.3	56.7	52.3	52.5
USD Total Wtd Idx	89.97 ▲	86.37	90.49	89.82	86.45
WTI Crude Oil per Barrel (\$)	74.2 ▲	64.9	46.0	59.5	58.8
Gold Spot per Oz (\$)	1,253 ▼	1,326	1,242	1,172	856

Treasury Yield Curve (%)



Market Performance (%)

	QTD	CYTD	1 Yr	5 Yr	10 Yr
S&P 500 (Cap Wtd)	3.43	2.65	14.37	13.42	10.17
Russell 2000	7.75	7.66	17.57	12.46	10.60
MSCI EAFE (Net)	-1.24	-2.75	6.84	6.44	2.84
MSCI EAFE SC (Net)	-1.57	-1.33	12.45	11.32	6.81
MSCI Emg Mkts (Net)	-7.96	-6.66	8.20	5.01	2.26
Bloomberg US Agg Bond	-0.16	-1.62	-0.40	2.27	3.72
ICE BofAML 3 Mo US T-Bill	0.45	0.81	1.36	0.42	0.35
NCREIF ODCE (Gross)	2.05	4.30	8.44	11.04	5.29
Wilshire US REIT	9.73	1.52	3.88	8.42	7.81
HFRI FOF Comp	0.41	0.68	5.13	3.45	1.40
Bloomberg Cmtdy (TR)	0.40	0.00	7.35	-6.40	-9.04

Treasury data courtesy of the US Department of the Treasury. Economic data courtesy of Bloomberg Professional Service. Breakeven Inflation does not have 20 years of history; therefore, its 20-year average is shown as N/A.

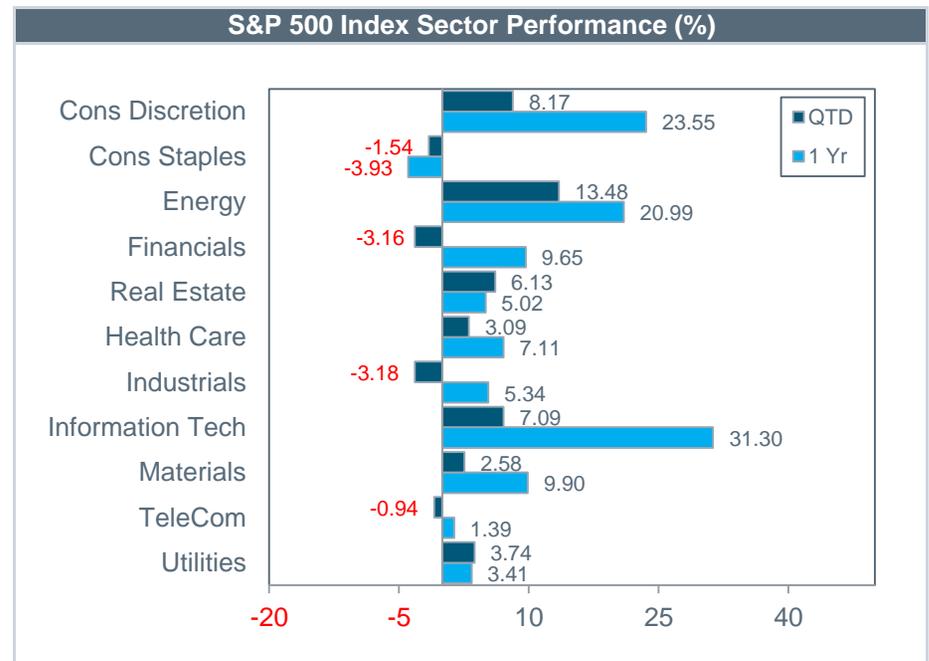
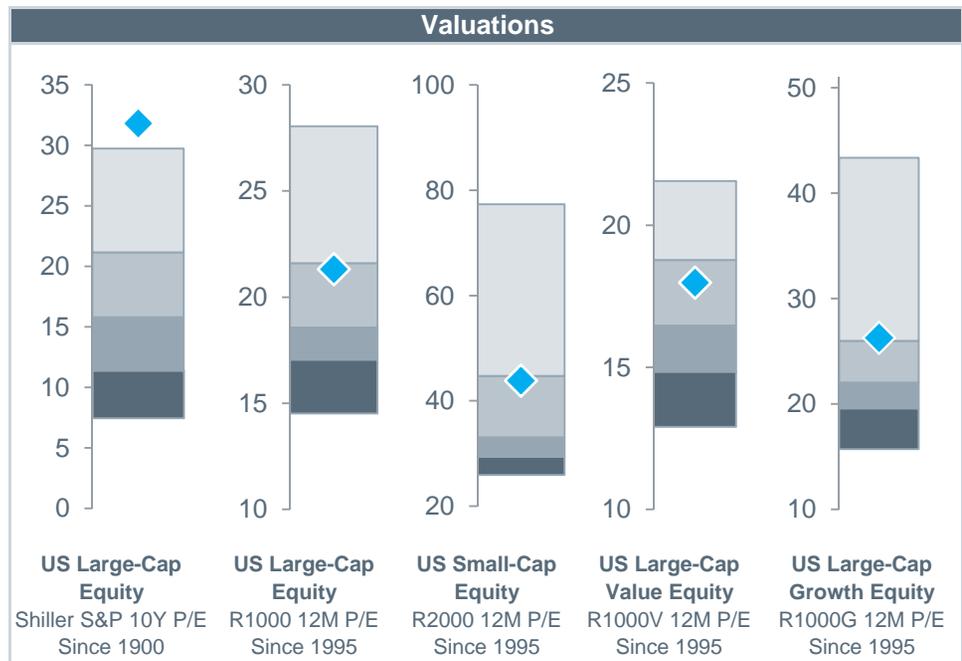
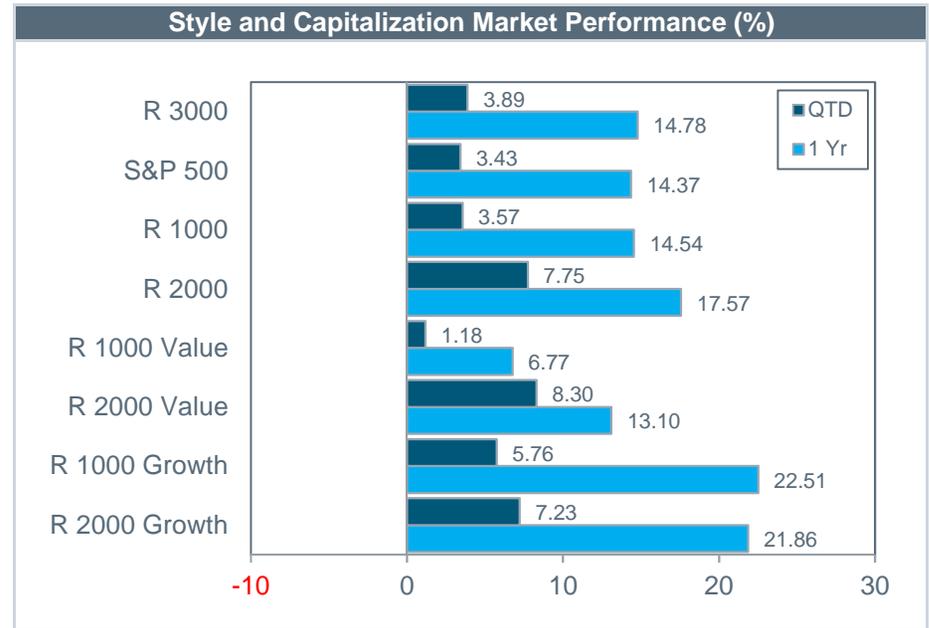


Second Quarter Review

Broad Market
 US equity markets delivered positive results across all market caps and styles for the quarter. The S&P 500 Index returned 3.4%, buoyed by strong performance in the energy sector as oil prices continued to rise throughout the quarter. Continuing a first quarter trend, technology and consumer discretionary sectors drove market performance as the S&P 500 Technology and Consumer Discretionary Indices returned 7.1% and 8.2%, respectively.

Market Cap
 Increasing global trade tension pushed investors toward the more domestically-oriented small and micro cap segments of US equity markets and away from larger cap, multinational companies.

Style and Sector
 Active large cap growth and value managers generally fared well as secular growth trends and continued strong corporate earnings provided a positive stock-picking environment.



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



Second Quarter Review

Developed Markets

The tightening dollar liquidity environment and the escalating trade tensions between the US and its global trading partners put significant pressure on non-US assets. Emerging market equities fell 7.96% during the quarter. Developed international equities also declined, further exacerbating losses experienced in Q1.

Emerging Markets

Emerging markets had a challenging quarter, making it by far the worst performing equity class this year. The MSCI Emerging Markets Index trailed the MSCI EAFE Index by 672 basis points during the quarter.

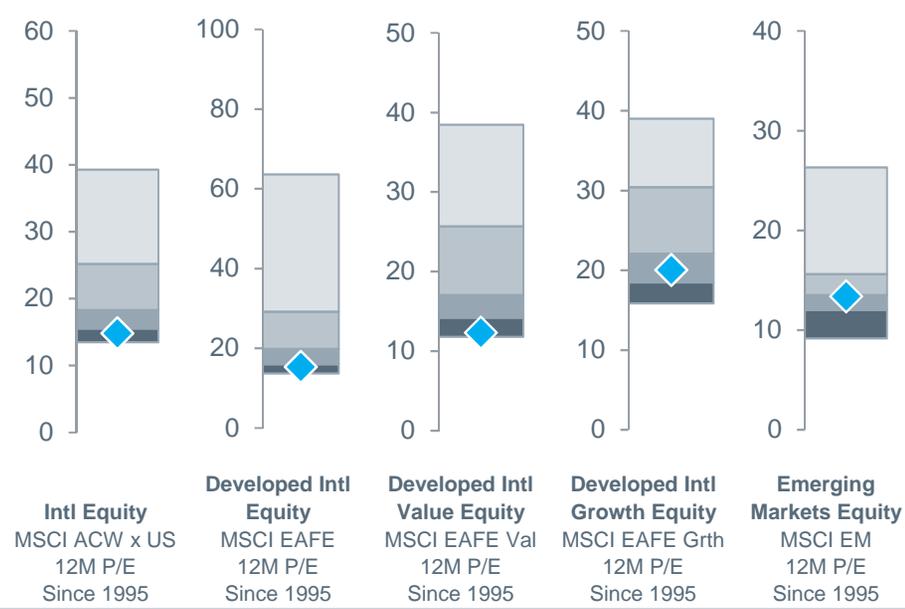
Market Cap & Style

While developed international growth stocks were slightly positive, value stocks brought down the overall market during the quarter. Small cap stocks fared worse than large cap stocks. Emerging markets growth stocks outperformed value stocks and large cap stocks outperformed small cap stocks.

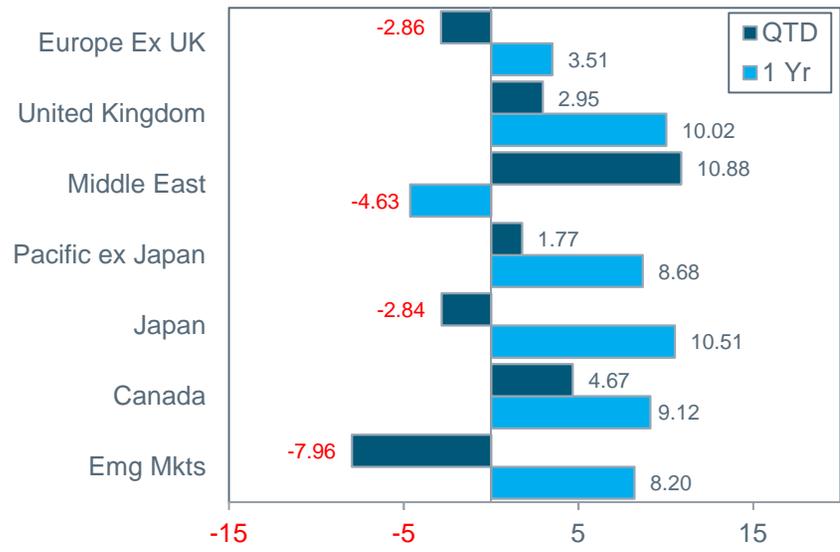
MSCI Style and Capitalization Market Performance (%)



Valuations



MSCI Region Performance (%)



Valuation data courtesy of Bloomberg Professional Service.

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



Second Quarter Review

Broad Market

The Federal Open Market Committee raised the Federal Funds rate to a range between 1.75% and 2.00% during its June meeting. The Bloomberg Barclays US Aggregate Bond Index posted a return of -0.16% as interest rates slightly increased and the Treasury yield curve flattened during the quarter.

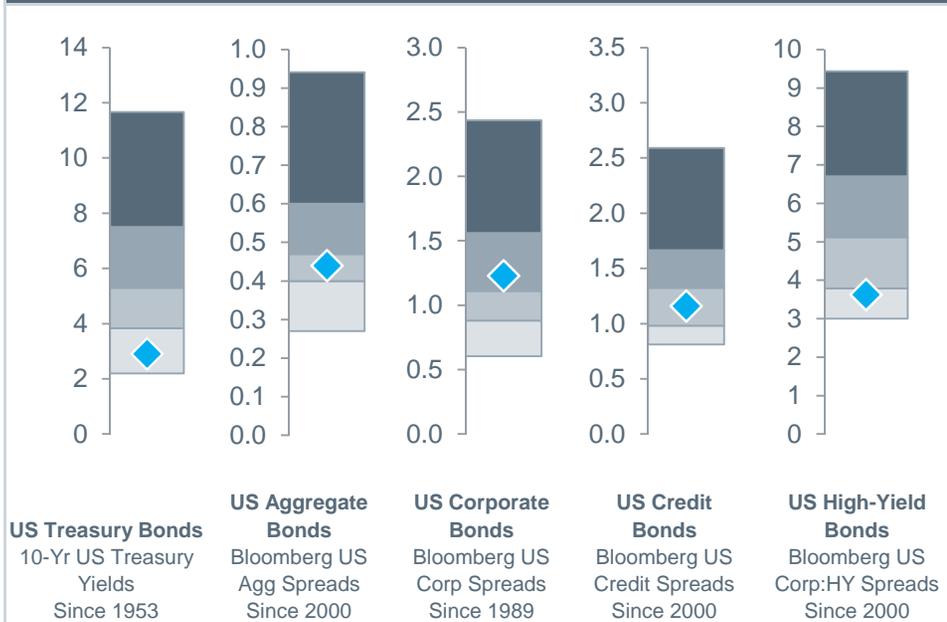
Credit Market

The option-adjusted spread on investment grade corporate bonds increased from 1.17% to 1.30%. The Bloomberg Barclays US Corporate Credit returned -0.98% for the quarter and underperformed the Bloomberg Barclays Corporate High Yield Index which returned 1.03%.

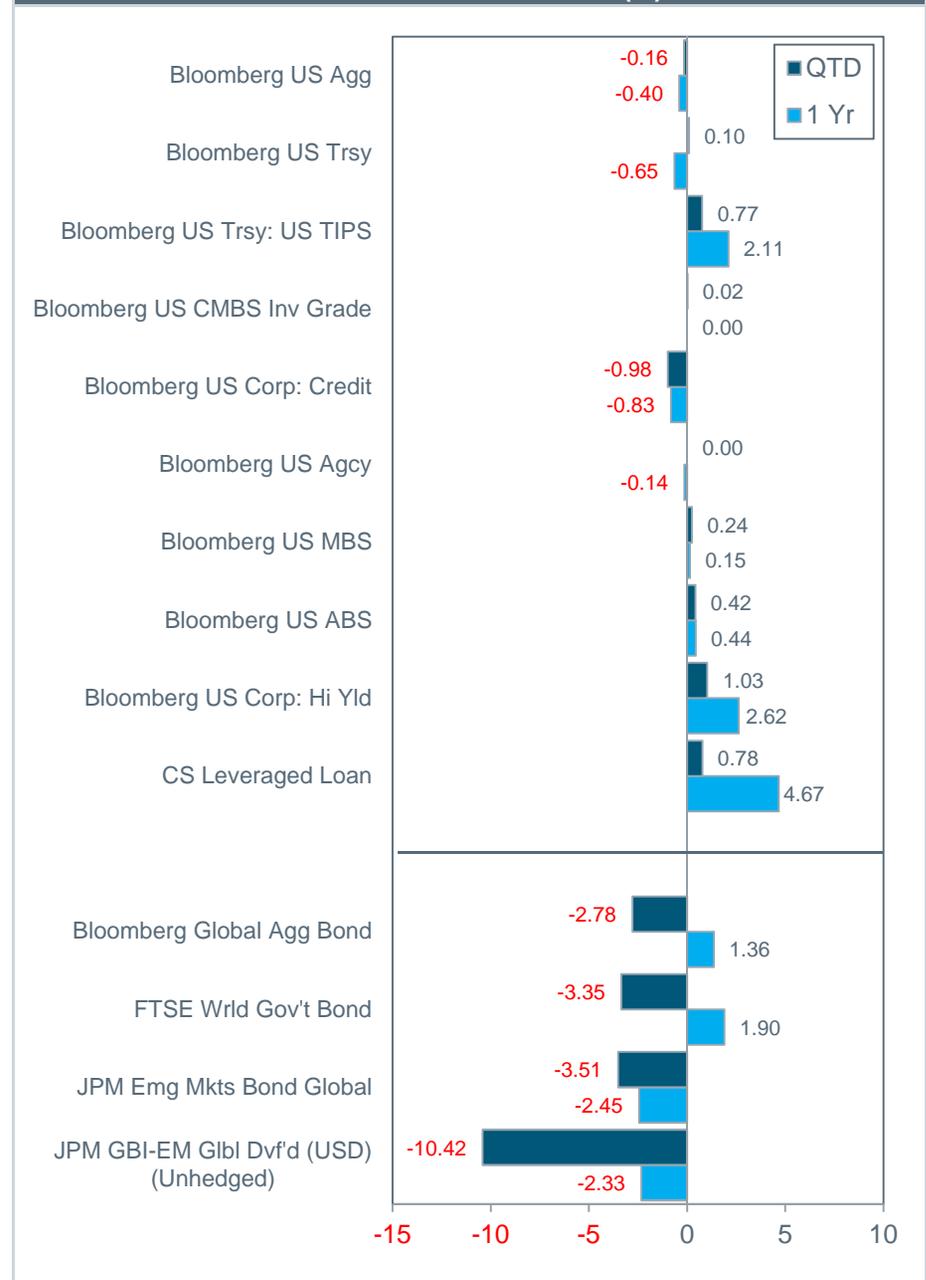
Emerging Market Debt

The JP Morgan GBI-EM Global Diversified Index returned -10.42% for the quarter. Strengthening of the US dollar, turmoil in Turkey and Argentina, and escalating trade wars are all factors leading to a large loss in emerging market debt.

Valuations



Fixed Income Performance (%)



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



Second Quarter Review - Absolute Return

General Market - Hedge Funds

Hedge funds produced marginally positive returns during the second quarter, building on the gains realized in Q1. Most FoHF managers have lowered net exposures and rotated away from traditional strategies such as long/short equity in favor of more diversifying exposures. Managers that have significant systematic macro or managed futures exposure have suffered as those strategies remain largely negative year-to-date.

General Market - Global Tactical Asset Allocation (GTAA)

GTAA managers mostly provided negative returns in the second quarter and most dramatically underperformed a static, US-centric 60/40 portfolio of stocks and bonds. Globally-oriented managers that rely on fundamental value based investment processes have increasingly allocated to emerging markets exposures, which are believed to be undervalued across asset classes. This positioning was a significant detractor during the quarter, as strong gains in the US dollar resulted in added pressure to certain emerging economies, leading to a difficult quarter for emerging markets equities and currencies.

Second Quarter Review - Real Assets

General Market - Diversified Inflation Strategies (DIS)

DIS portfolios mostly provided strong returns in Q2 as inflationary pressures persisted. Headline CPI increased to 2.90% YoY, and the spot price for West Texas Intermediate crude oil rose nearly 14% to \$74 per barrel over the quarter. In response, most other inflation-sensitive asset classes provided strong performance led by asset classes such as US REITs, energy related exposures in commodities, natural resources equities, MLPs, and global listed infrastructure.

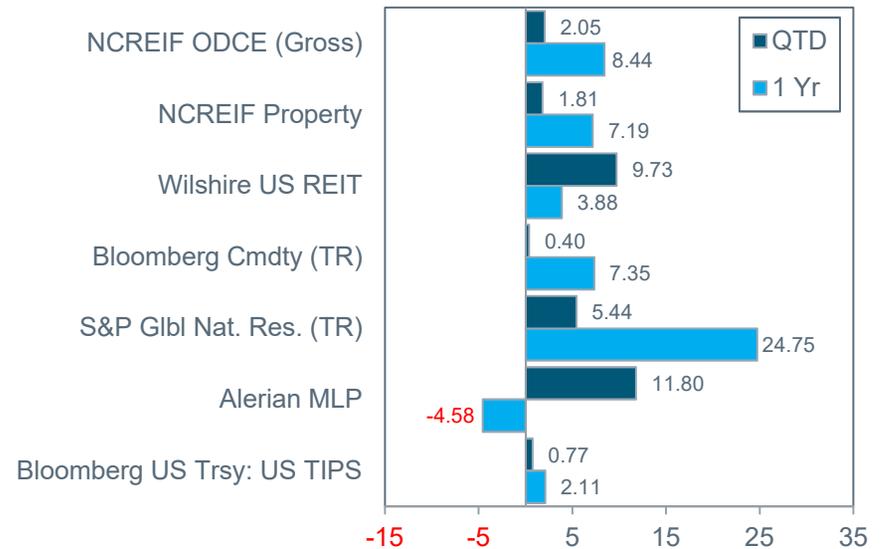
General Market - Real Estate

The core private real estate index, NCREIF-ODCE, returned 2.1% during Q2, with income and appreciation returns being about equal. This represented a slight decrease compared to last quarter's appreciation component of total return. Real estate valuations remain elevated, supported by continued strength in the overall economy with increases from personal consumption and business investment. The potential for increased discretionary spending by consumers due to the recent tax reform provides additional support for current valuations.

HFRI Hedge Fund Performance (%)



Real Asset Performance (%)



Annual Asset Class Performance

As of June 30, 2018

	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	YTD
Best	33.16	34.00	35.97	39.38	8.44	78.51	28.60	22.49	20.00	38.82	31.78	15.02	21.31	37.28	7.66
	31.45	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	4.30
	25.55	21.39	26.34	15.97	2.06	46.78	22.04	13.56	17.59	29.30	13.69	4.23	11.96	25.03	2.65
	20.25	21.36	19.31	11.63	-2.35	31.78	18.88	9.24	17.32	22.78	12.50	1.38	11.77	21.83	1.52
	18.33	13.82	18.37	11.17	-10.01	28.60	16.83	7.84	16.35	13.94	5.97	0.55	11.19	14.65	0.81
	13.06	13.54	16.32	10.25	-21.37	27.17	16.36	4.98	16.00	8.96	4.89	0.05	8.77	10.71	0.68
	11.14	7.49	15.79	6.97	-26.16	26.46	15.12	2.11	15.81	7.44	3.64	-0.27	7.24	7.77	0.16
	10.88	5.34	11.86	6.60	-33.79	18.91	15.06	0.10	10.94	1.86	3.37	-0.81	6.67	7.62	0.00
	9.15	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	-0.02
	8.56	4.55	4.85	5.00	-37.00	11.41	7.75	-5.72	6.98	-2.02	0.04	-3.30	2.65	4.18	-1.33
	8.46	3.07	4.34	1.87	-39.20	5.93	6.54	-12.14	4.79	-2.60	-2.19	-4.41	2.18	3.54	-1.62
	6.86	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	-2.75
	4.34	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	-4.98
Worst	1.33	2.43	0.49	-17.55	-53.33	-29.76	0.13	-18.42	-1.06	-9.52	-17.01	-24.66	0.33	0.86	-6.66
	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	Wilshire US REIT - REITs	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.

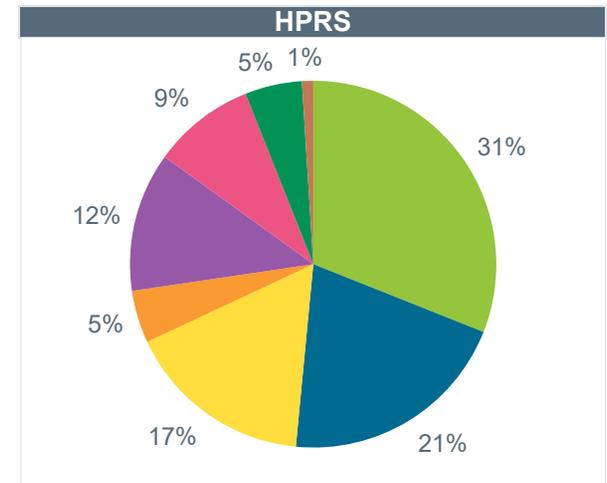
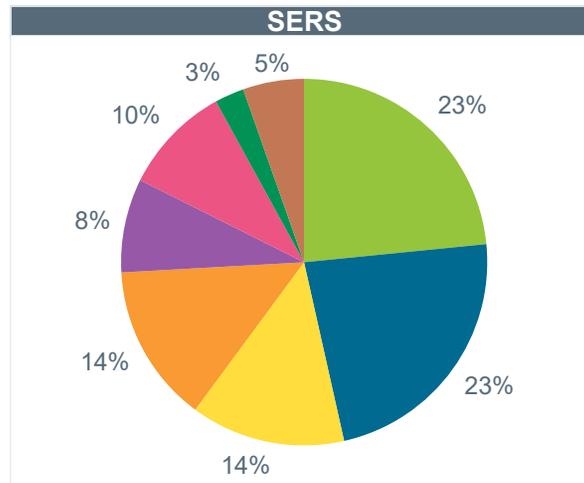
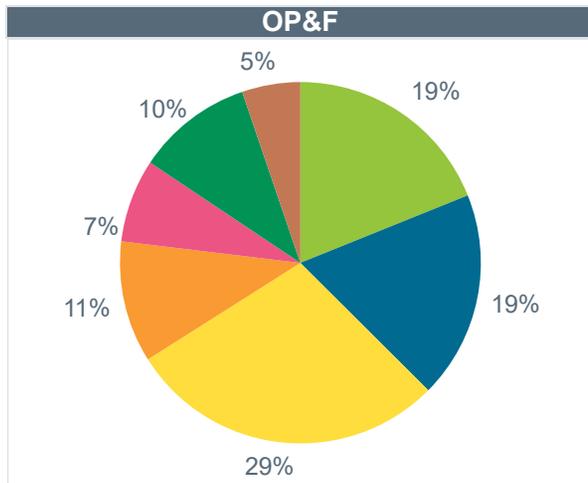
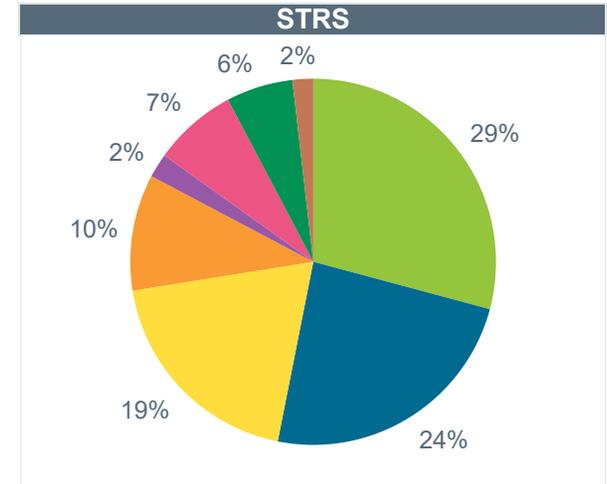
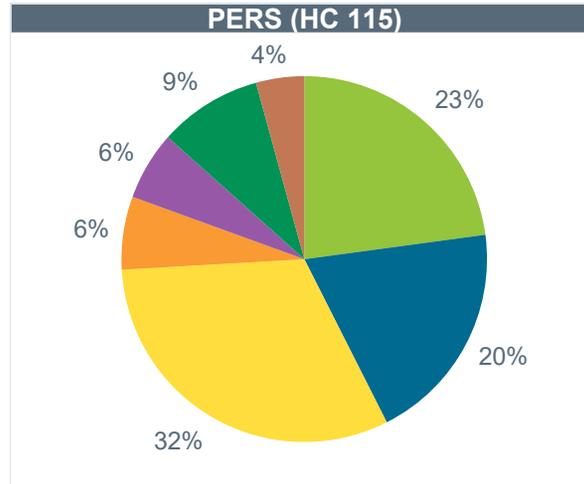
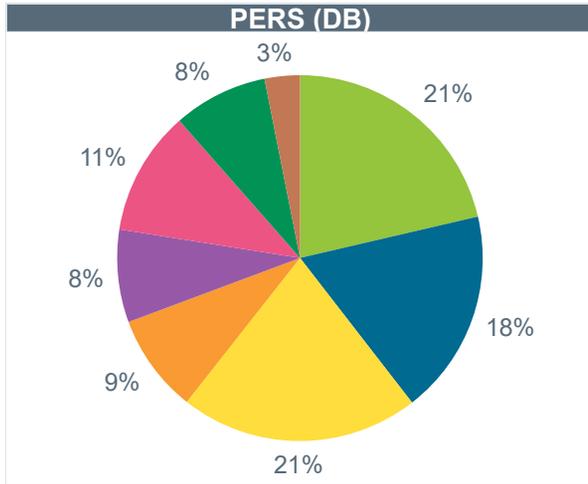


Asset Allocation & Performance											
	Market Value (\$000)	Trailing Performance (%)						Calendar Year Performance (%)			
		2 Quarters	1 Year	3 Years	5 Years	7 Years	10 Years	2017	2016	2015	2014
PERS (DB)	84,980,903	0.45	9.13	7.60	8.60	8.13	6.83	16.94	8.56	0.58	7.25
PERS (DB) Total Fund Benchmark		0.66	8.07	7.14	7.93	7.43	6.40	15.19	8.63	0.25	5.81
Difference		-0.21	1.06	0.46	0.67	0.70	0.43	1.75	-0.07	0.33	1.44
Rank		71	32	26	30	31	37	25	23	41	30
PERS (HC 115)	12,460,304	-0.19	7.24	6.09	6.75	6.36	6.02	15.25	7.67	-2.11	5.46
PERS (HC 115) Total Fund Benchmark		-0.41	6.63	5.84	6.44	6.00	5.68	14.31	7.75	-1.93	5.01
Difference		0.22	0.61	0.25	0.31	0.36	0.34	0.94	-0.08	-0.18	0.45
Rank		89	84	88	87	89	77	63	58	95	72
STRS	77,749,730	1.89	9.57	8.12	9.26	8.85	7.04	15.90	8.18	2.46	7.95
STRS Total Fund Benchmark		1.43	8.94	7.58	8.98	8.68	7.05	15.35	8.00	1.70	8.26
Difference		0.46	0.63	0.54	0.28	0.17	-0.01	0.55	0.18	0.76	-0.31
Rank		13	22	9	13	7	26	54	37	3	17
OP&F	15,739,702	2.27	9.20	8.14	9.28	8.91	7.57	14.30	11.52	0.65	6.87
OP&F Total Fund Benchmark		0.72	6.70	6.48	7.64	7.68	6.42	12.41	11.46	-2.18	6.87
Difference		1.55	2.50	1.66	1.64	1.23	1.15	1.89	0.06	2.83	0.00
Rank		5	30	9	10	6	5	80	1	37	36
SERS	14,293,520	1.69	9.86	8.49	9.52	8.82	6.73	17.36	8.08	2.93	6.92
SERS Total Fund Benchmark		1.21	8.25	6.88	7.99	7.62	6.23	14.37	7.02	1.48	6.66
Difference		0.48	1.61	1.61	1.53	1.20	0.50	2.99	1.06	1.45	0.26
Rank		20	18	2	4	8	45	15	39	1	32
HPRS	898,482	1.61	9.43	6.91	8.44	7.68	6.44	15.01	7.42	0.15	6.73
HPRS Total Fund Benchmark		1.16	8.32	6.67	8.09	7.64	6.86	14.55	7.40	0.19	7.03
Difference		0.45	1.11	0.24	0.35	0.04	-0.42	0.46	0.02	-0.04	-0.30
Rank		26	26	60	35	43	61	67	63	57	42
<i>All Public Plans > \$1B-Total Fund Median</i>		<i>1.05</i>	<i>8.58</i>	<i>7.07</i>	<i>8.17</i>	<i>7.55</i>	<i>6.63</i>	<i>16.02</i>	<i>7.90</i>	<i>0.33</i>	<i>6.46</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	2017	2016	2015	2014
PERS (DB)	84,980,903	0.39	9.03	7.41	8.37	7.90	6.65	16.81	8.31	0.33	6.96
PERS (DB) Total Fund Benchmark		0.66	8.07	7.14	7.93	7.43	6.40	15.19	8.63	0.25	5.81
Difference		-0.27	0.96	0.27	0.44	0.47	0.25	1.62	-0.32	0.08	1.15
PERS (HC 115)	12,460,304	-0.19	7.24	6.02	6.65	6.25	5.93	15.25	7.55	-2.23	5.28
PERS (HC 115) Total Fund Benchmark		-0.41	6.63	5.84	6.44	6.00	5.68	14.31	7.75	-1.93	5.01
Difference		0.22	0.61	0.18	0.21	0.25	0.25	0.94	-0.20	-0.30	0.27
STRS	77,749,730	1.82	9.42	7.97	9.12	8.72	6.91	15.74	8.03	2.33	7.82
STRS Total Fund Benchmark		1.43	8.94	7.58	8.98	8.68	7.05	15.35	8.00	1.70	8.26
Difference		0.39	0.48	0.39	0.14	0.04	-0.14	0.39	0.03	0.63	-0.44
OP&F	15,739,702	1.90	8.50	7.50	8.69	8.36	7.08	13.68	10.90	0.07	6.27
OP&F Total Fund Benchmark		0.72	6.70	6.48	7.64	7.68	6.42	12.41	11.46	-2.18	6.87
Difference		1.18	1.80	1.02	1.05	0.68	0.66	1.27	-0.56	2.25	-0.60
SERS	14,293,520	1.35	9.17	7.80	8.82	8.10	6.00	16.65	7.37	2.31	6.25
SERS Total Fund Benchmark		1.21	8.25	6.88	7.99	7.62	6.23	14.37	7.02	1.48	6.66
Difference		0.14	0.92	0.92	0.83	0.48	-0.23	2.28	0.35	0.83	-0.41
HPRS	898,482	1.36	8.93	6.38	7.94	7.24	6.04	14.29	7.03	-0.43	6.30
HPRS Total Fund Benchmark		1.16	8.32	6.67	8.09	7.64	6.86	14.55	7.40	0.19	7.03
Difference		0.20	0.61	-0.29	-0.15	-0.40	-0.82	-0.26	-0.37	-0.62	-0.73

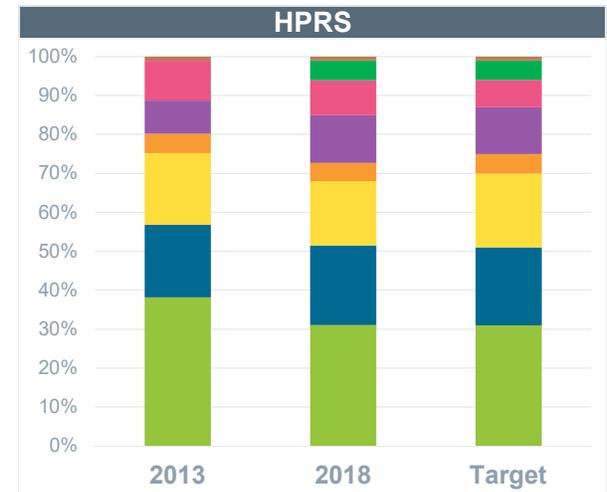
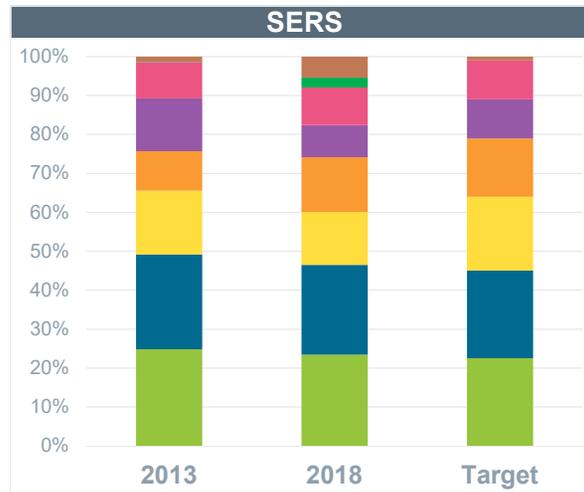
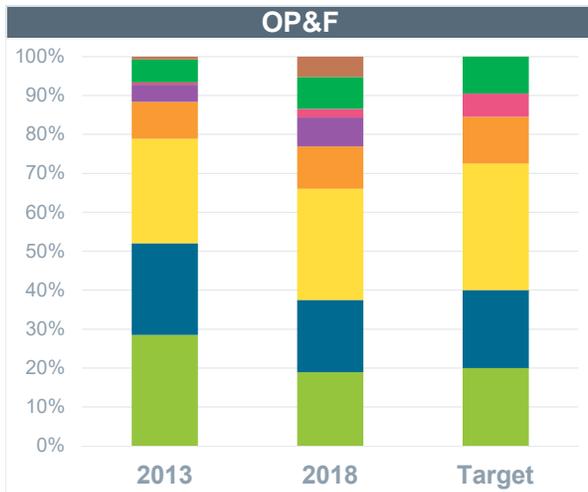
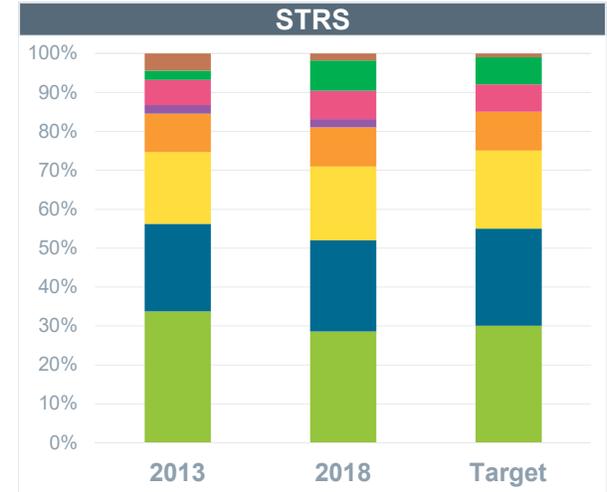
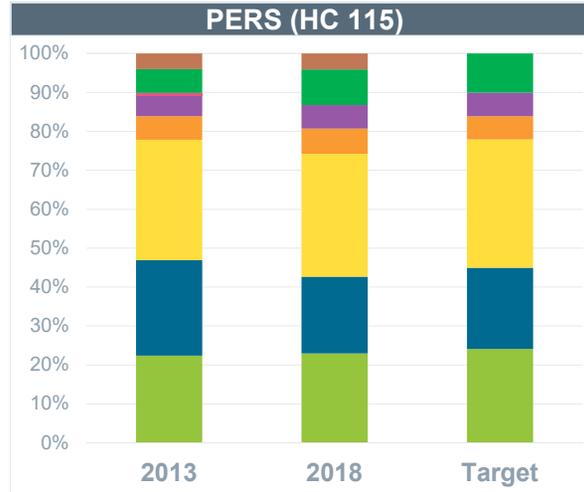
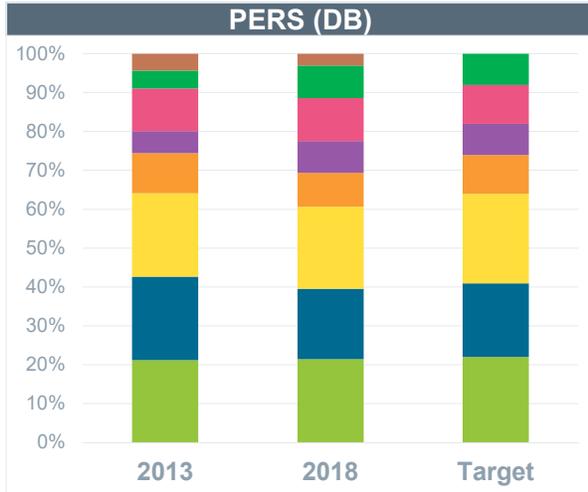
Performance shown is net of all investment management costs.



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



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

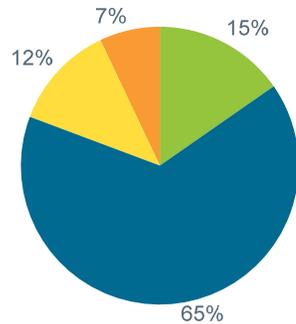


- US Equity
- International Equity
- Fixed Income
- Real Estate
- Hedge Funds
- Private Equity
- Other Alternatives
- Cash Equivalents

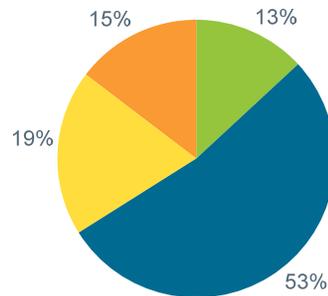
Summary

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

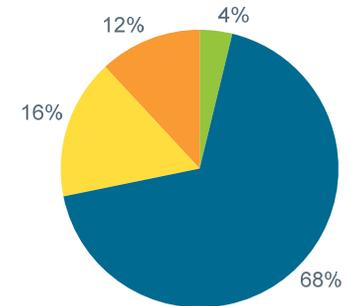
PERS (DB)



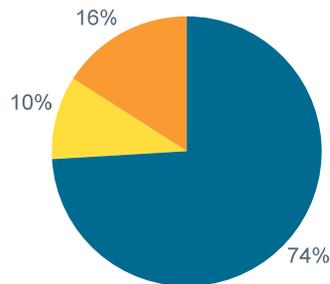
PERS (HC 115)



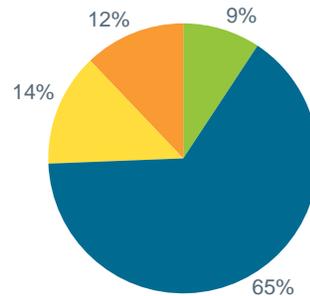
STRS



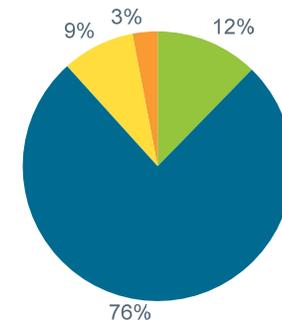
OP&F



SERS



HPRS



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

Summary

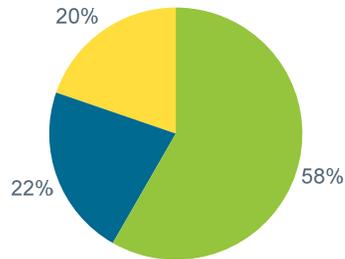
RVK Liquidity Rating - A qualitative method developed and calculated by RVK for determining the relative amount of liquidity in a portfolio.

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

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

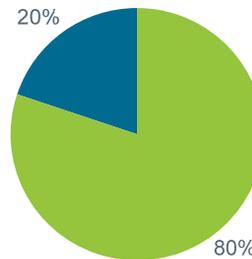
Not Liquid Investments: Private appraisal-based transactions, vehicle-based liquidity constraints, or privately held assets. Extreme discount to raise cash or 6-12+ months required to receive cash.

PERS (DB)



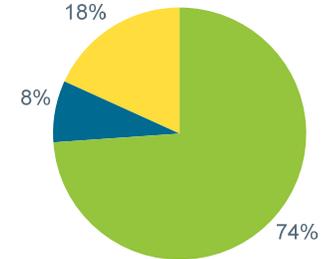
PERS (DB) Liquidity Rating 66

PERS (HC 115)



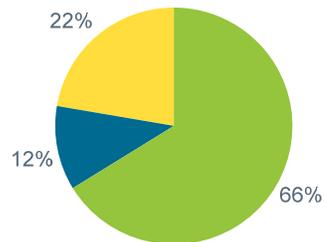
PERS (HC 115) Liquidity Rating 85

STRS



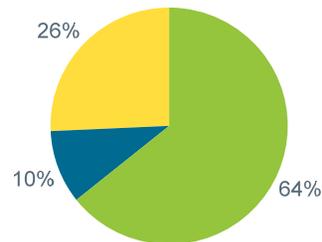
STRS Liquidity Rating 71

OP&F



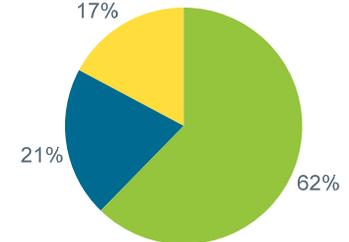
OP&F Liquidity Rating 67

SERS



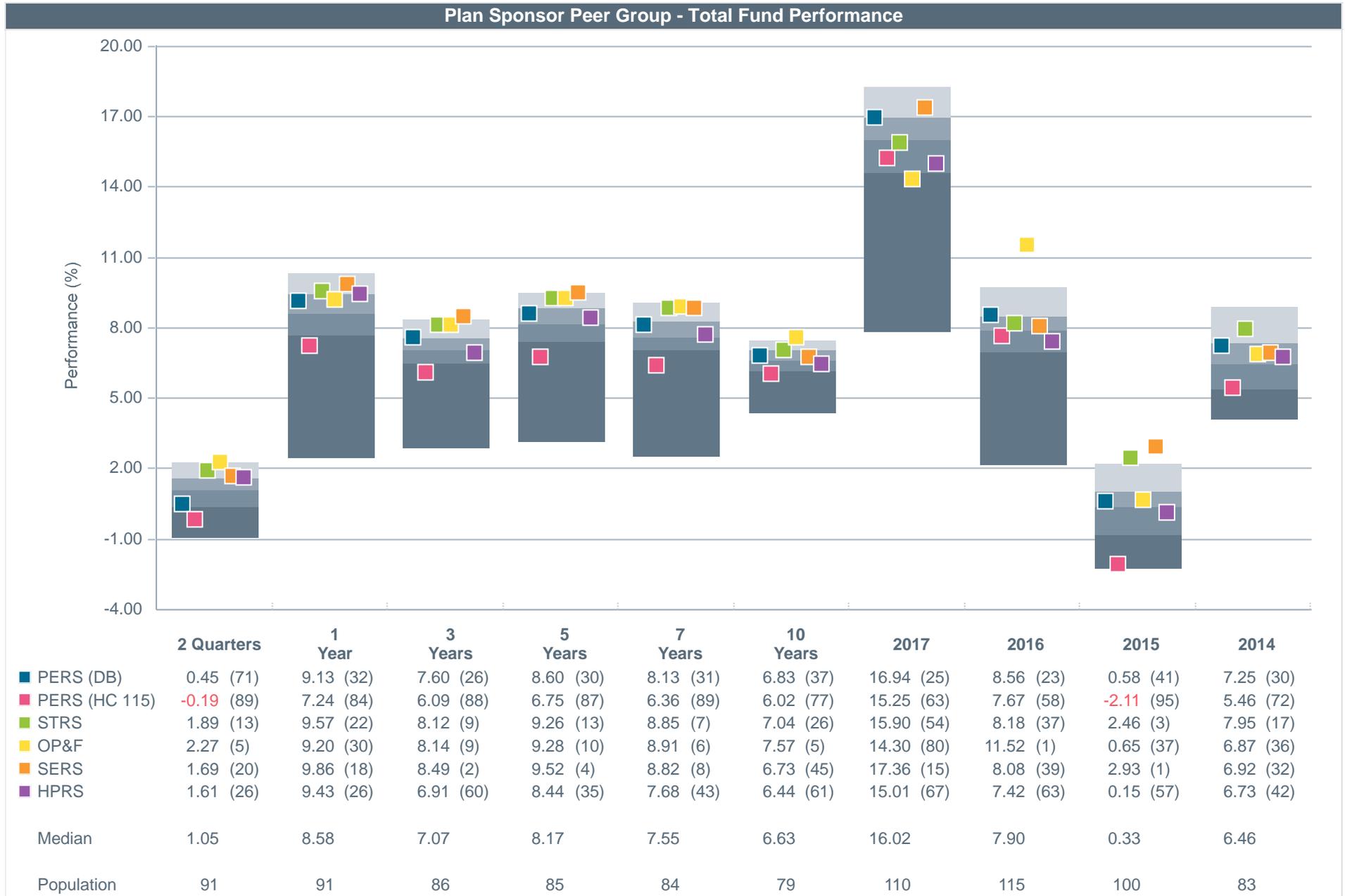
SERS Liquidity Rating 65

HPRS



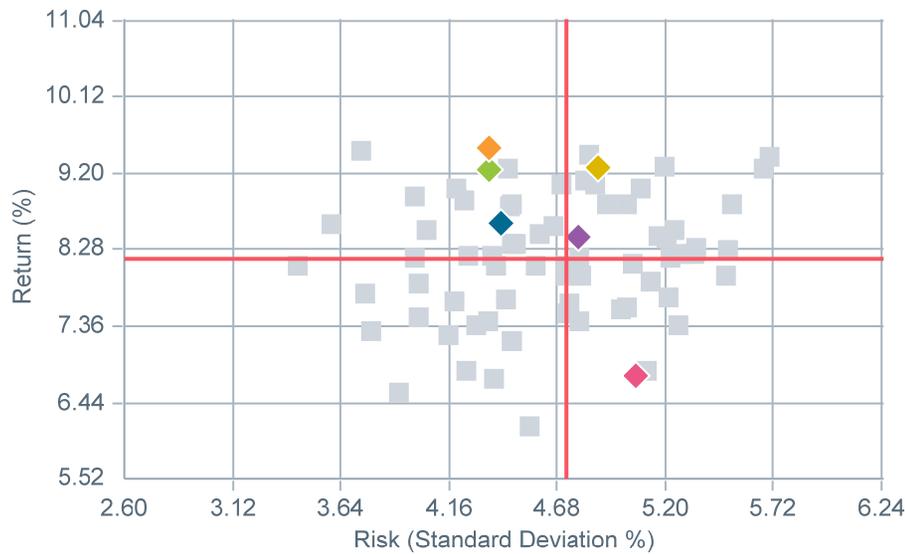
HPRS Liquidity Rating 67

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

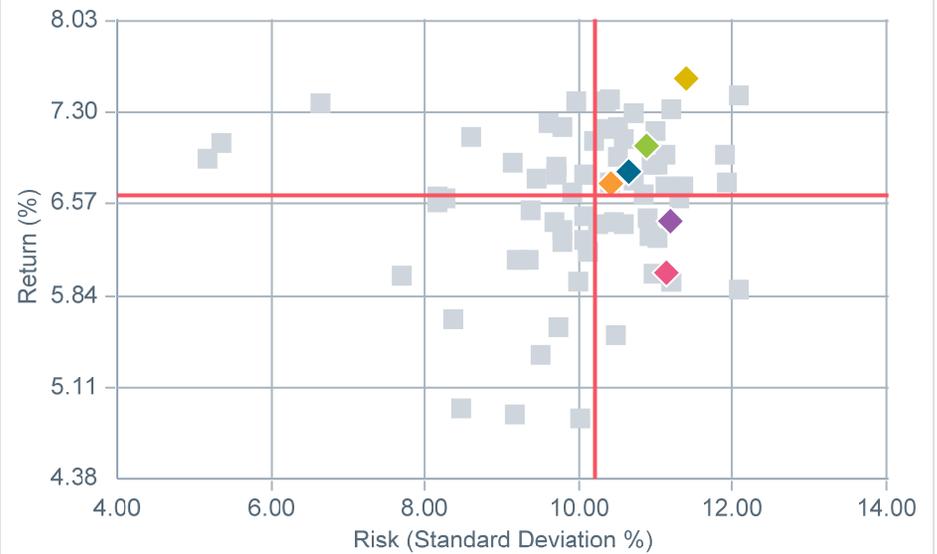


	Return	Standard Deviation
◆ PERS (DB)	8.60	4.41
◆ PERS (HC 115)	6.75	5.06
◆ STRS	9.26	4.35
◆ OP&F	9.28	4.88
◆ SERS	9.52	4.35
◆ HPRS	8.44	4.78
— Median	8.17	4.73

Sharpe Ratio - 5 Year

PERS (DB)	1.81
PERS (HC 115)	1.25
STRS	1.98
OP&F	1.78
SERS	2.04
HPRS	1.65
<i>All Public Plans > \$1B-Total Fund Median</i>	1.59

Plan Sponsor Peer Group Scattergram - 10 Years



	Return	Standard Deviation
◆ PERS (DB)	6.83	10.66
◆ PERS (HC 115)	6.02	11.13
◆ STRS	7.04	10.89
◆ OP&F	7.57	11.39
◆ SERS	6.73	10.41
◆ HPRS	6.44	11.20
— Median	6.63	10.20

Sharpe Ratio - 10 Year

PERS (DB)	0.64
PERS (HC 115)	0.55
STRS	0.65
OP&F	0.67
SERS	0.64
HPRS	0.58
<i>All Public Plans > \$1B-Total Fund Median</i>	0.64

Performance shown is gross of fees.

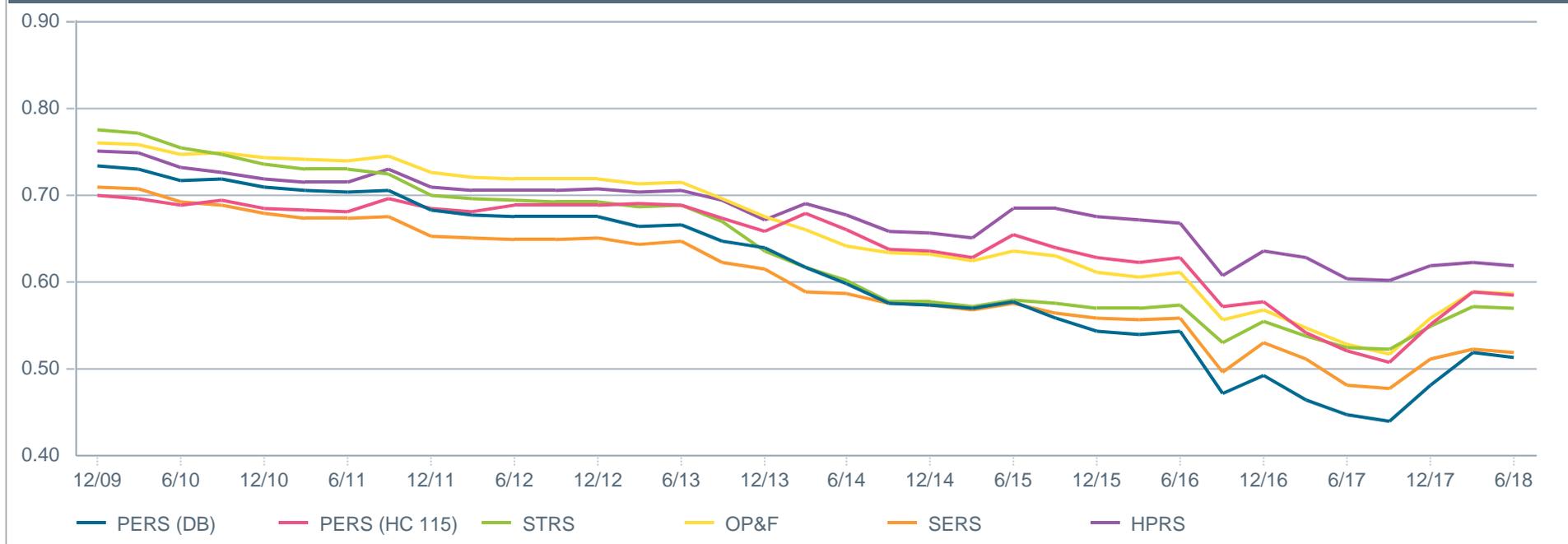
Summary

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)	0.56	0.51	0.55	0.65
PERS (HC 115)	0.65	0.58	0.63	0.68
STRS	0.63	0.57	0.57	0.68
OP&F	0.65	0.59	0.61	0.70
SERS	0.55	0.52	0.56	0.64
HPRS	0.65	0.62	0.66	0.70
S&P 500 Index (Cap Wtd)	1.00	1.00	1.00	1.00

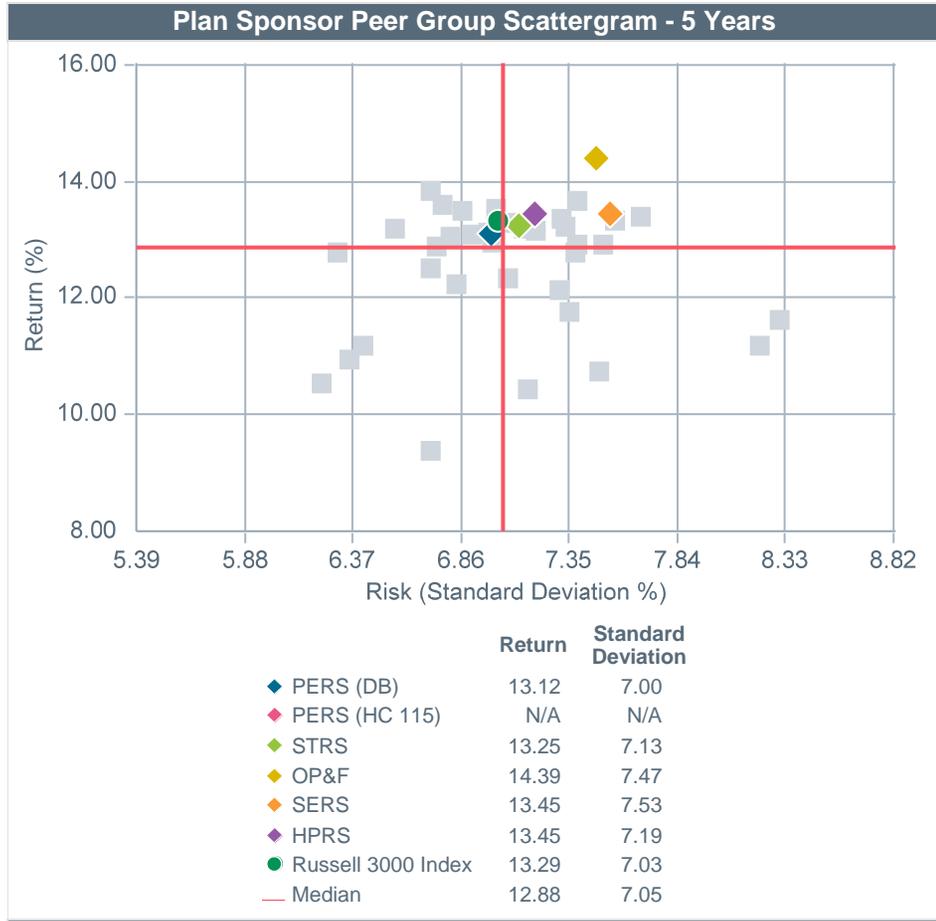
5 Year Rolling Equity Beta



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

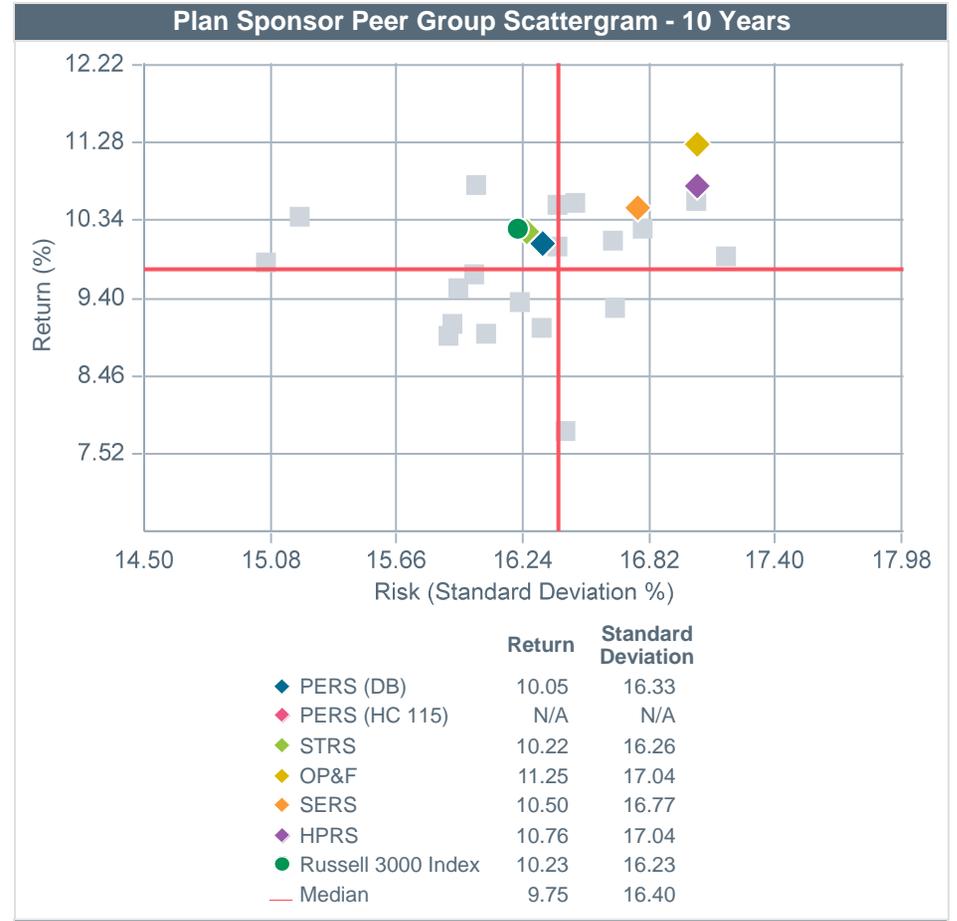
Performance										
	Trailing Performance (%)						Calendar Year Performance (%)			
	2 Quarters	1 Year	3 Years	5 Years	7 Years	10 Years	2017	2016	2015	2014
US Equity										
PERS (DB)	3.39	15.08	11.45	13.12	12.89	10.05	21.30	12.09	0.68	11.29
Russell 3000 Index	3.22	14.78	11.58	13.29	13.01	10.23	21.13	12.74	0.48	12.56
Difference	0.17	0.30	-0.13	-0.17	-0.12	-0.18	0.17	-0.65	0.20	-1.27
Rank	60	39	41	38	28	38	33	67	31	52
PERS (HC 115)	3.39	15.08	11.45	N/A	N/A	N/A	21.30	12.09	0.68	N/A
Russell 3000 Index	3.22	14.78	11.58	N/A	N/A	N/A	21.13	12.74	0.48	N/A
Difference	0.17	0.30	-0.13	N/A	N/A	N/A	0.17	-0.65	0.20	N/A
Rank	60	39	41	N/A	N/A	N/A	33	67	31	N/A
STRS	4.36	16.21	11.75	13.25	12.76	10.22	22.01	11.32	0.83	11.70
Russell 3000 Index	3.22	14.78	11.58	13.29	13.01	10.23	21.13	12.74	0.48	12.56
Difference	1.14	1.43	0.17	-0.04	-0.25	-0.01	0.88	-1.42	0.35	-0.86
Rank	20	15	30	28	32	33	22	81	28	43
OP&F	4.50	17.16	13.24	14.39	13.49	11.25	22.41	15.60	0.66	11.27
Wilshire 5000 Index	3.04	14.66	11.85	13.36	13.03	10.21	20.99	13.37	0.67	12.71
Difference	1.46	2.50	1.39	1.03	0.46	1.04	1.42	2.23	-0.01	-1.44
Rank	16	4	3	2	3	2	14	9	31	52
SERS	3.26	15.03	11.57	13.45	13.07	10.50	22.27	11.27	1.24	10.99
Russell 3000 Index	3.22	14.78	11.58	13.29	13.01	10.23	21.13	12.74	0.48	12.56
Difference	0.04	0.25	-0.01	0.16	0.06	0.27	1.14	-1.47	0.76	-1.57
Rank	63	40	39	17	14	25	16	82	21	59
HPRS	3.25	15.28	11.83	13.45	12.86	10.76	21.53	13.73	0.18	11.97
Russell 3000 Index	3.22	14.78	11.58	13.29	13.01	10.23	21.13	12.74	0.48	12.56
Difference	0.03	0.50	0.25	0.16	-0.15	0.53	0.40	0.99	-0.30	-0.59
Rank	63	29	26	16	30	13	25	27	44	33
<i>All Public Plans > \$1B-US Equity Segment Median</i>	<i>3.57</i>	<i>14.75</i>	<i>11.16</i>	<i>12.88</i>	<i>12.56</i>	<i>9.75</i>	<i>20.24</i>	<i>12.94</i>	<i>-0.11</i>	<i>11.41</i>

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



Sharpe Ratio - 5 Years

PERS (DB)	1.77
PERS (HC 115)	N/A
STRS	1.76
OP&F	1.81
SERS	1.68
HPRS	1.76
Russell 3000 Index	1.78
<i>All Public Plans > \$1B-US Equity Segment Median</i>	1.69



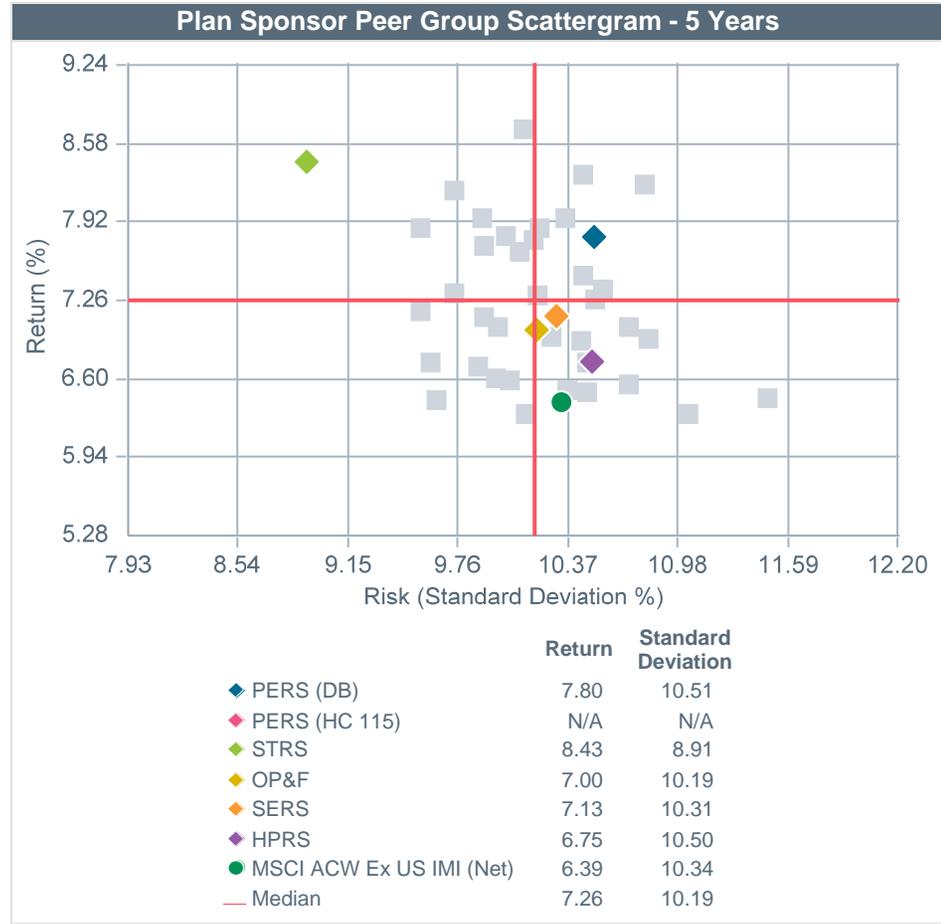
Sharpe Ratio - 10 Years

PERS (DB)	0.65
PERS (HC 115)	N/A
STRS	0.67
OP&F	0.70
SERS	0.67
HPRS	0.67
Russell 3000 Index	0.67
<i>All Public Plans > \$1B-US Equity Segment Median</i>	0.64

Performance shown is gross of fees.

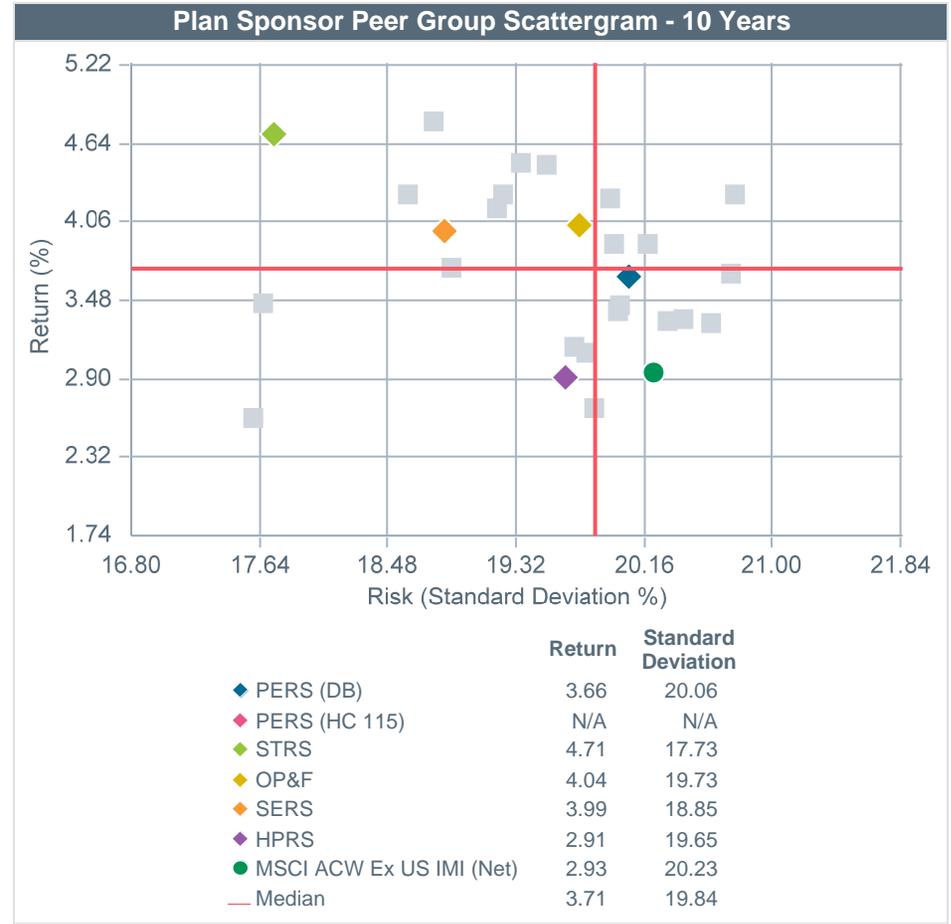
Performance										
	Trailing Performance (%)						Calendar Year Performance (%)			
	2 Quarters	1 Year	3 Years	5 Years	7 Years	10 Years	2017	2016	2015	2014
International Equity										
PERS (DB)	-3.37	8.99	7.21	7.80	5.44	3.66	31.64	5.72	-4.01	-1.48
PERS (DB) International Equity Custom Benchmark	-4.03	7.93	5.57	6.30	3.84	2.54	29.24	5.54	-6.09	-3.42
Difference	0.66	1.06	1.64	1.50	1.60	1.12	2.40	0.18	2.08	1.94
Rank	71	34	19	31	49	55	11	22	76	27
PERS (HC 115)	-3.37	8.99	7.21	N/A	N/A	N/A	31.64	5.72	-4.01	N/A
PERS (HC 115) International Equity Custom Benchmark	-4.03	7.93	5.57	N/A	N/A	N/A	29.24	5.54	-6.09	N/A
Difference	0.66	1.06	1.64	N/A	N/A	N/A	2.40	0.18	2.08	N/A
Rank	71	34	19	N/A	N/A	N/A	11	22	76	N/A
STRS	-2.72	7.15	6.75	8.43	6.60	4.71	24.16	7.09	0.30	0.83
STRS International Equity Custom Benchmark	-2.31	7.87	5.75	7.39	5.58	3.86	23.43	6.39	-2.78	0.24
Difference	-0.41	-0.72	1.00	1.04	1.02	0.85	0.73	0.70	3.08	0.59
Rank	47	76	30	11	9	11	93	12	12	6
OP&F	-3.92	7.15	5.94	7.00	5.30	4.04	29.12	2.75	-0.77	-5.58
MSCI ACW Ex US IM Index (USD) (Net)	-3.65	7.75	5.46	6.39	4.08	2.93	27.81	4.41	-4.60	-3.89
Difference	-0.27	-0.60	0.48	0.61	1.22	1.11	1.31	-1.66	3.83	-1.67
Rank	81	76	63	60	59	41	51	76	23	99
SERS	-3.58	7.78	6.63	7.13	5.50	3.99	29.11	5.81	-2.37	-4.10
SERS International Equity Custom Benchmark	-3.77	7.28	5.07	5.76	4.43	3.22	27.19	4.50	-5.66	-3.87
Difference	0.19	0.50	1.56	1.37	1.07	0.77	1.92	1.31	3.29	-0.23
Rank	75	56	32	54	48	41	51	22	45	88
HPRS	-1.79	9.87	5.84	6.75	4.52	2.91	28.72	1.69	-2.91	-4.65
MSCI ACW Ex US Index (USD) (Net)	-3.77	7.28	5.07	5.99	3.81	2.54	27.19	4.50	-5.66	-3.87
Difference	1.98	2.59	0.77	0.76	0.71	0.37	1.53	-2.81	2.75	-0.78
Rank	16	21	66	68	80	87	57	83	52	93
<i>All Public Plans > \$1B-Intl. Equity Segment Median</i>	<i>-2.86</i>	<i>7.90</i>	<i>6.16</i>	<i>7.26</i>	<i>5.38</i>	<i>3.71</i>	<i>29.14</i>	<i>3.93</i>	<i>-2.54</i>	<i>-2.94</i>

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



Sharpe Ratio - 5 Years

PERS (DB)	0.73
PERS (HC 115)	N/A
STRS	0.91
OP&F	0.68
SERS	0.69
HPRS	0.64
MSCI ACW Ex US IMI (Net)	0.62
<i>All Public Plans > \$1B-Intl. Equity Segment Median</i>	<i>0.69</i>



Sharpe Ratio - 10 Years

PERS (DB)	0.26
PERS (HC 115)	N/A
STRS	0.33
OP&F	0.28
SERS	0.29
HPRS	0.23
MSCI ACW Ex US IMI (Net)	0.23
<i>All Public Plans > \$1B-Intl. Equity Segment Median</i>	<i>0.27</i>

Performance shown is gross of fees.

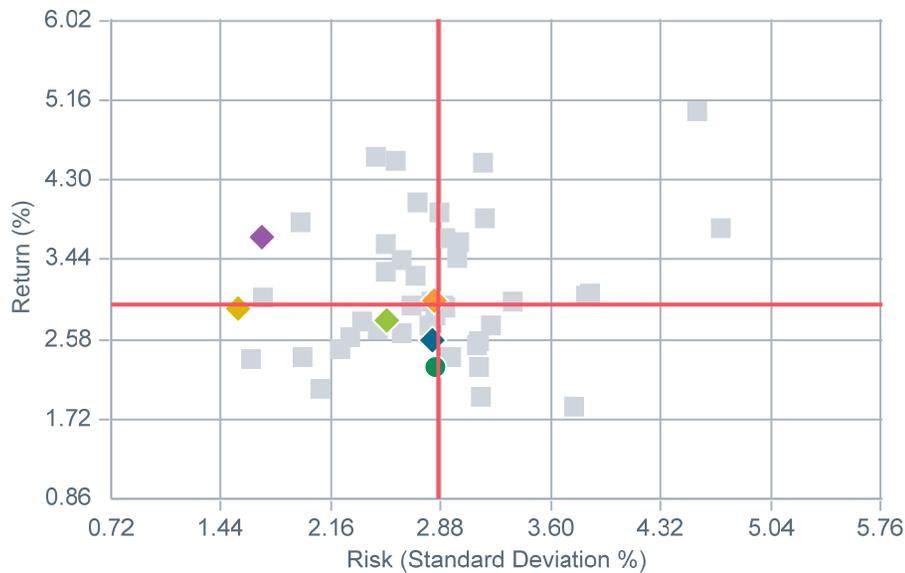
Performance										
	Trailing Performance (%)						Calendar Year Performance (%)			
	2 Quarters	1 Year	3 Years	5 Years	7 Years	10 Years	2017	2016	2015	2014
Fixed Income										
PERS (DB) Core Fixed Income	-1.69	-0.45	1.83	2.58	2.90	3.82	3.75	2.66	0.96	6.47
PERS (DB) Core Fixed Income Custom Benchmark	-1.62	-0.40	1.72	2.27	2.57	3.72	3.54	2.65	0.55	5.97
Difference	-0.07	-0.05	0.11	0.31	0.33	0.10	0.21	0.01	0.41	0.50
Rank	87	98	84	71	75	77	80	88	19	40
PERS (HC 115) Core Fixed Income	-1.69	-0.45	1.83	N/A	N/A	N/A	3.75	2.66	0.96	N/A
PERS (HC 115) Core Fixed Income Benchmark	-1.62	-0.40	1.72	N/A	N/A	N/A	3.54	2.65	0.56	N/A
Difference	-0.07	-0.05	0.11	N/A	N/A	N/A	0.21	0.01	0.40	N/A
Rank	87	98	84	N/A	N/A	N/A	80	88	19	N/A
STRS	-1.30	-0.06	2.44	2.78	3.19	4.53	3.98	4.77	0.60	5.02
STRS Fixed Income Blended Benchmark	-1.47	-0.30	2.11	2.62	2.94	4.06	3.86	3.91	0.43	5.56
Difference	0.17	0.24	0.33	0.16	0.25	0.47	0.12	0.86	0.17	-0.54
Rank	64	84	53	59	59	49	75	52	29	81
OP&F Core Fixed Income	-0.25	1.35	2.76	2.91	3.20	4.66	4.26	4.14	1.45	4.31
Bloomberg US Agg Bond Index	-1.62	-0.40	1.72	2.27	2.57	3.72	3.54	2.65	0.55	5.97
Difference	1.37	1.75	1.04	0.64	0.63	0.94	0.72	1.49	0.90	-1.66
Rank	16	19	43	56	59	47	67	66	9	87
SERS	-1.62	0.14	2.53	3.01	3.57	5.40	5.09	4.67	-0.14	5.84
Bloomberg US Agg Bond Index	-1.62	-0.40	1.72	2.27	2.57	3.72	3.54	2.65	0.55	5.97
Difference	0.00	0.54	0.81	0.74	1.00	1.68	1.55	2.02	-0.69	-0.13
Rank	81	76	48	46	43	22	41	54	57	60
HPRS	1.16	3.26	4.03	3.69	3.86	4.86	5.29	6.36	0.54	4.00
Bloomberg US Agg Bond Index	-1.62	-0.40	1.72	2.27	2.57	3.72	3.54	2.65	0.55	5.97
Difference	2.78	3.66	2.31	1.42	1.29	1.14	1.75	3.71	-0.01	-1.97
Rank	1	2	6	28	33	39	38	28	29	91
<i>All Public Plans > \$1B-US Fixed Income Segment Median</i>	<i>-1.11</i>	<i>0.67</i>	<i>2.49</i>	<i>2.96</i>	<i>3.30</i>	<i>4.50</i>	<i>4.81</i>	<i>4.80</i>	<i>0.06</i>	<i>6.12</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. PERS (DB) and PERS (HC) changed mandates in 2010 and are therefore unable to report 7- and 10-year trailing returns.

Risk & Return - Fixed Income

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

Plan Sponsor Peer Group Scattergram - 5 Years

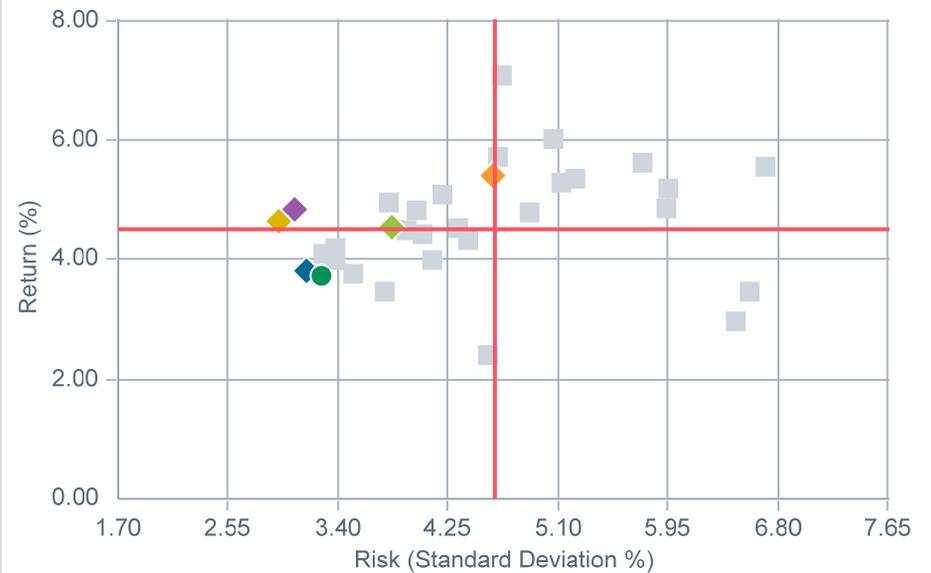


	Return	Standard Deviation
◆ PERS (DB) Core Fixed Income	2.58	2.82
◆ PERS (HC 115) Core Fixed Income	N/A	N/A
◆ STRS	2.78	2.53
◆ OP&F Core Fixed Income	2.91	1.56
◆ SERS	3.01	2.83
◆ HPRS	3.69	1.71
● Bloomberg US Agg Bond Index	2.27	2.86
— Median	2.96	2.87

Sharpe Ratio - 5 Years

PERS (DB) Core Fixed Income	0.75
PERS (HC 115) Core Fixed Income	N/A
STRS	0.91
OP&F Core Fixed Income	1.52
SERS	0.89
HPRS	1.89
Bloomberg US Agg Bond Index	0.64
All Public Plans > \$1B-US Fixed Income Segment Median	0.92

Plan Sponsor Peer Group Scattergram - 10 Years



	Return	Standard Deviation
◆ PERS (DB) Core Fixed Income	3.82	3.16
◆ PERS (HC 115) Core Fixed Income	N/A	N/A
◆ STRS	4.53	3.82
◆ OP&F Core Fixed Income	4.66	2.95
◆ SERS	5.40	4.59
◆ HPRS	4.86	3.06
● Bloomberg US Agg Bond Index	3.72	3.29
— Median	4.50	4.61

Sharpe Ratio - 10 Years

PERS (DB) Core Fixed Income	1.06
PERS (HC 115) Core Fixed Income	N/A
STRS	1.06
OP&F Core Fixed Income	1.40
SERS	1.07
HPRS	1.42
Bloomberg US Agg Bond Index	1.01
All Public Plans > \$1B-US Fixed Income Segment Median	0.95

Performance shown is gross of fees.

Performance										
	Trailing Performance (%)						Calendar Year Performance (%)			
	2 Quarters	1 Year	3 Years	5 Years	7 Years	10 Years	2017	2016	2015	2014
Additional Fixed Income										
PERS (DB) U.S. Treasury	-1.08	-0.63	1.01	N/A	N/A	N/A	2.33	0.99	N/A	N/A
Bloomberg US Trsy Index	-1.08	-0.65	1.02	N/A	N/A	N/A	2.31	1.04	N/A	N/A
Difference	0.00	0.02	-0.01	N/A	N/A	N/A	0.02	-0.05	N/A	N/A
PERS (DB) EMD	-5.76	-1.59	3.75	1.78	N/A	N/A	13.52	10.94	-6.82	-1.64
PERS (DB) EMD Custom Benchmark	-5.79	-2.31	3.22	1.53	N/A	N/A	12.26	10.18	-7.12	-0.20
Difference	0.03	0.72	0.53	0.25	N/A	N/A	1.26	0.76	0.30	-1.44
PERS (DB) High Yield	-0.10	2.26	4.95	5.33	6.29	N/A	7.23	14.44	-2.74	2.73
Bloomberg U.S. High Yield Index	0.16	2.62	5.53	5.51	6.32	N/A	7.50	17.13	-4.47	2.45
Difference	-0.26	-0.36	-0.58	-0.18	-0.03	N/A	-0.27	-2.69	1.73	0.28
PERS (DB) Floating Rate Debt	9.94	20.36	5.49	5.60	N/A	N/A	6.41	0.86	2.83	4.43
CS Lvg'd Loan Index	2.38	4.67	4.33	4.24	N/A	N/A	4.25	9.88	-0.38	2.06
Difference	7.56	15.69	1.16	1.36	N/A	N/A	2.16	-9.02	3.21	2.37
PERS (DB) Securitized Debt	0.64	2.83	2.54	7.84	N/A	N/A	7.52	-0.80	4.93	17.98
Bloomberg CMBS Index + 2%	0.03	2.61	4.29	4.54	N/A	N/A	5.76	5.87	2.59	5.76
Difference	0.61	0.22	-1.75	3.30	N/A	N/A	1.76	-6.67	2.34	12.22
PERS (DB) TIPS	-0.03	2.11	1.89	1.67	N/A	N/A	2.88	4.69	-1.43	3.66
Bloomberg U.S. TIPS Index	-0.02	2.11	1.93	1.68	N/A	N/A	3.01	4.68	-1.44	3.64
Difference	-0.01	0.00	-0.04	-0.01	N/A	N/A	-0.13	0.01	0.01	0.02
PERS (HC 115) EMD	-5.76	-1.59	3.75	N/A	N/A	N/A	13.52	10.94	-6.82	N/A
PERS (HC 115) EMD Custom Benchmark	-5.79	-2.31	3.22	N/A	N/A	N/A	12.26	10.18	-7.12	N/A
Difference	0.03	0.72	0.53	N/A	N/A	N/A	1.26	0.76	0.30	N/A

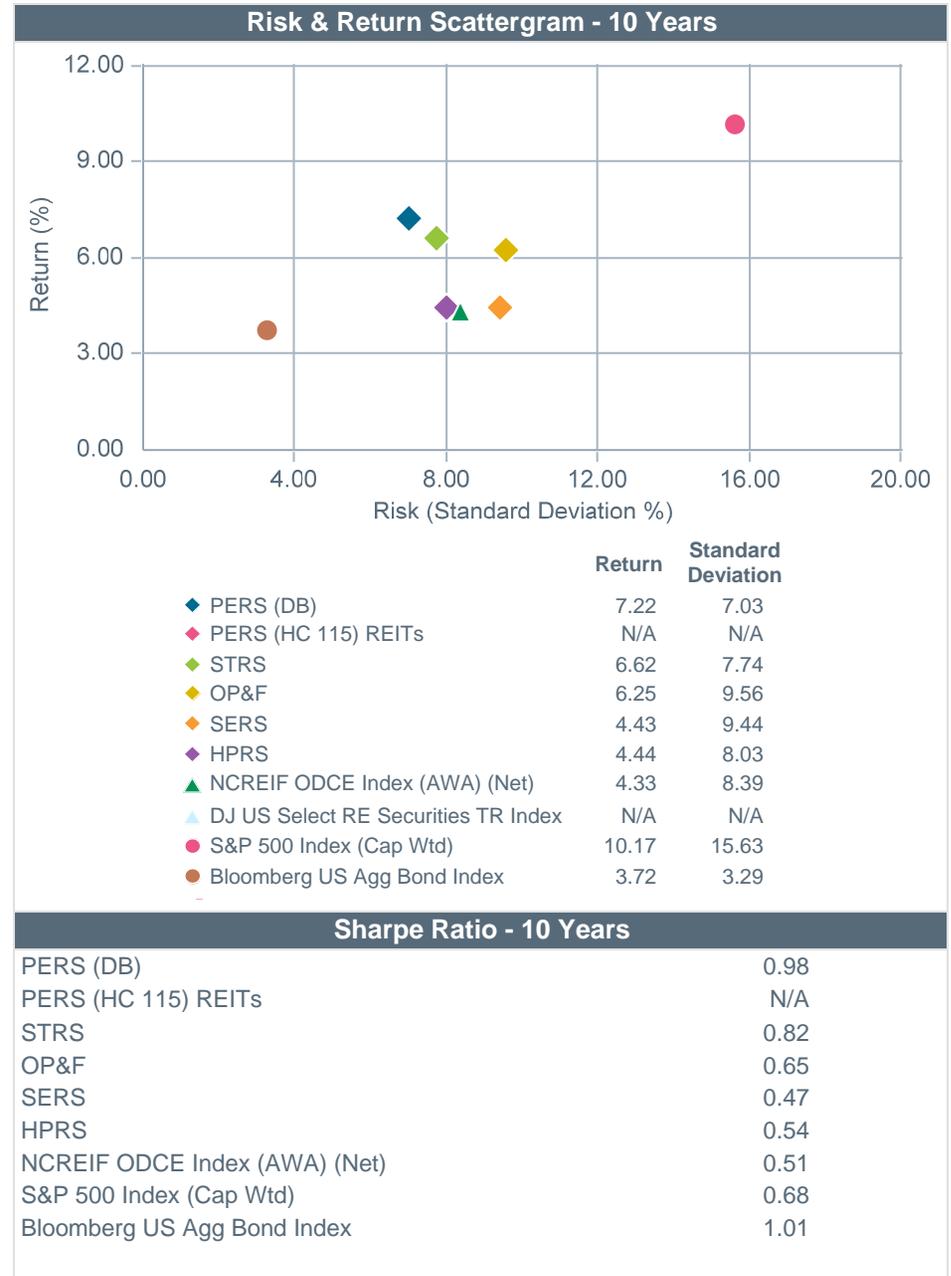
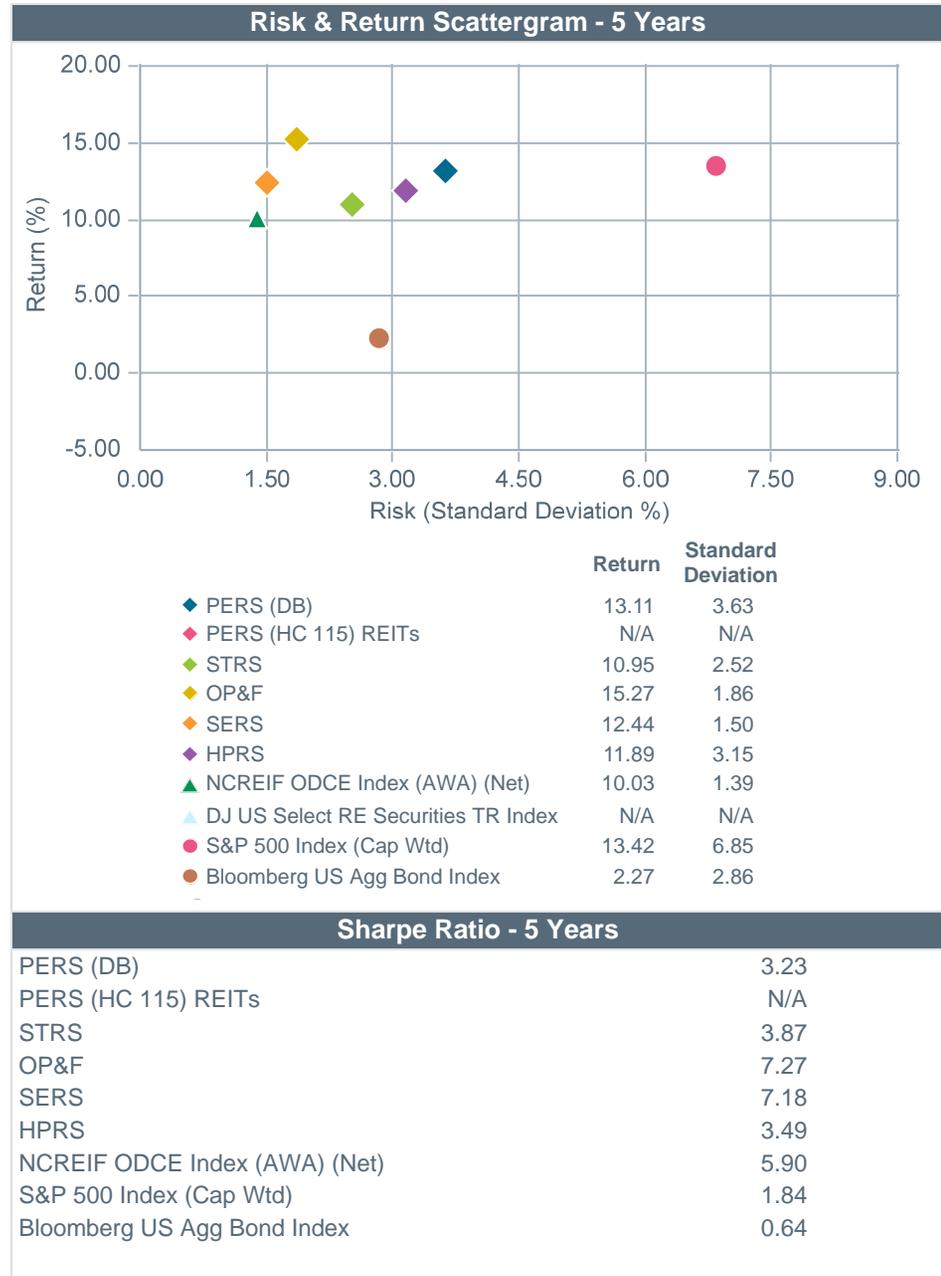
Performance shown is gross of fees.

	Trailing Performance (%)						Calendar Year Performance (%)			
	2 Quarters	1 Year	3 Years	5 Years	7 Years	10 Years	2017	2016	2015	2014
Additional Fixed Income										
PERS (HC 115) High Yield	-0.10	2.26	4.95	N/A	N/A	N/A	7.23	14.44	-2.74	N/A
Bloomberg Barclays U.S. High Yield Index	0.16	2.62	5.53	N/A	N/A	N/A	7.50	17.13	-4.47	N/A
Difference	-0.26	-0.36	-0.58	N/A	N/A	N/A	-0.27	-2.69	1.73	N/A
PERS (HC 115) Floating Rate Debt	9.94	20.36	N/A	N/A	N/A	N/A	6.41	N/A	N/A	N/A
CS Lvg'd Loan Index	2.38	4.67	N/A	N/A	N/A	N/A	4.25	N/A	N/A	N/A
Difference	7.56	15.69	N/A	N/A	N/A	N/A	2.16	N/A	N/A	N/A
PERS (HC 115) Securitized Debt	0.64	2.83	N/A	N/A	N/A	N/A	7.52	N/A	N/A	N/A
Bloomberg Barclays CMBS Index + 2%	0.03	2.61	N/A	N/A	N/A	N/A	5.76	N/A	N/A	N/A
Difference	0.61	0.22	N/A	N/A	N/A	N/A	1.76	N/A	N/A	N/A
PERS (HC 115) TIPS	-0.03	2.11	1.89	N/A	N/A	N/A	2.88	4.69	-1.43	N/A
Bloomberg Barclays U.S. Tips Index	-0.02	2.11	1.93	N/A	N/A	N/A	3.01	4.68	-1.44	N/A
Difference	-0.01	0.00	-0.04	N/A	N/A	N/A	-0.13	0.01	0.01	N/A
OP&F Mortgages	1.96	4.76	3.72	5.69	5.00	5.64	2.87	5.63	3.21	8.56
Bloomberg Mortgage Index (1 Qtr Lag)	-1.04	0.78	1.13	1.80	2.45	3.46	0.30	3.63	3.43	3.78
Difference	3.00	3.98	2.59	3.89	2.55	2.18	2.57	2.00	-0.22	4.78
OP&F High Yield	0.97	3.86	5.39	5.49	6.31	8.14	7.05	12.80	-0.92	2.81
CS Developed Countries High Yield	0.07	2.52	5.47	5.43	6.23	7.75	7.48	17.95	-4.83	1.85
Difference	0.90	1.34	-0.08	0.06	0.08	0.39	-0.43	-5.15	3.91	0.96
OP&F Private Credit Fixed Income	2.60	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
S&P LTSA Levered Loan Index + 2%	3.60	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Difference	-1.00	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
OP&F U.S. TIPS	0.93	4.52	5.74	8.20	9.02	9.67	2.89	18.76	0.26	19.43
Bridgewater Custom US TIPS Index	-1.11	1.04	4.48	5.93	6.42	6.51	1.90	16.77	-2.36	18.76
Difference	2.04	3.48	1.26	2.27	2.60	3.16	0.99	1.99	2.62	0.67

Performance shown is gross of fees.

Performance										
	Trailing Performance (%)						Calendar Year Performance (%)			
	2 Quarters	1 Year	3 Years	5 Years	7 Years	10 Years	2017	2016	2015	2014
Real Estate										
PERS (DB)	0.31	9.32	10.05	13.11	13.02	7.22	9.61	12.08	17.28	18.92
PERS (DB) Real Estate Custom Benchmark	4.30	7.96	9.85	11.27	11.44	6.68	7.55	9.93	14.71	12.21
Difference	-3.99	1.36	0.20	1.84	1.58	0.54	2.06	2.15	2.57	6.71
PERS (HC 115) REITs	1.84	4.29	7.68	N/A	N/A	N/A	3.81	6.70	4.41	N/A
DJ US Select Real Estate Securities TR Index	1.82	4.23	7.67	N/A	N/A	N/A	3.76	6.65	4.46	N/A
Difference	0.02	0.06	0.01	N/A	N/A	N/A	0.05	0.05	-0.05	N/A
STRS	4.83	9.08	9.02	10.95	11.44	6.62	6.14	9.68	11.36	17.57
STRS Real Estate Custom Benchmark	3.27	6.74	8.28	9.65	10.19	6.92	6.70	8.10	11.89	14.54
Difference	1.56	2.34	0.74	1.30	1.25	-0.30	-0.56	1.58	-0.53	3.03
OP&F	8.62	14.61	13.53	15.27	14.78	6.25	10.30	13.14	16.83	18.57
NCREIF ODCE Index (AWA) (Net) (1 Qtr Lag)	3.85	7.11	9.00	10.41	10.76	4.16	6.70	9.08	13.86	11.36
Difference	4.77	7.50	4.53	4.86	4.02	2.09	3.60	4.06	2.97	7.21
SERS	5.91	10.94	11.09	12.44	11.69	4.43	10.24	10.27	13.81	14.22
SERS Global Real Assets Benchmark	3.53	7.12	8.73	10.01	10.56	6.61	6.89	9.26	13.48	11.26
Difference	2.38	3.82	2.36	2.43	1.13	-2.18	3.35	1.01	0.33	2.96
HPRS	7.25	13.69	8.81	11.89	10.15	4.44	10.30	7.75	6.34	22.02
NCREIF Property Index (1 Qtr Lag)	3.53	7.12	8.72	10.00	10.55	6.09	6.89	9.22	13.48	11.26
Difference	3.72	6.57	0.09	1.89	-0.40	-1.65	3.41	-1.47	-7.14	10.76

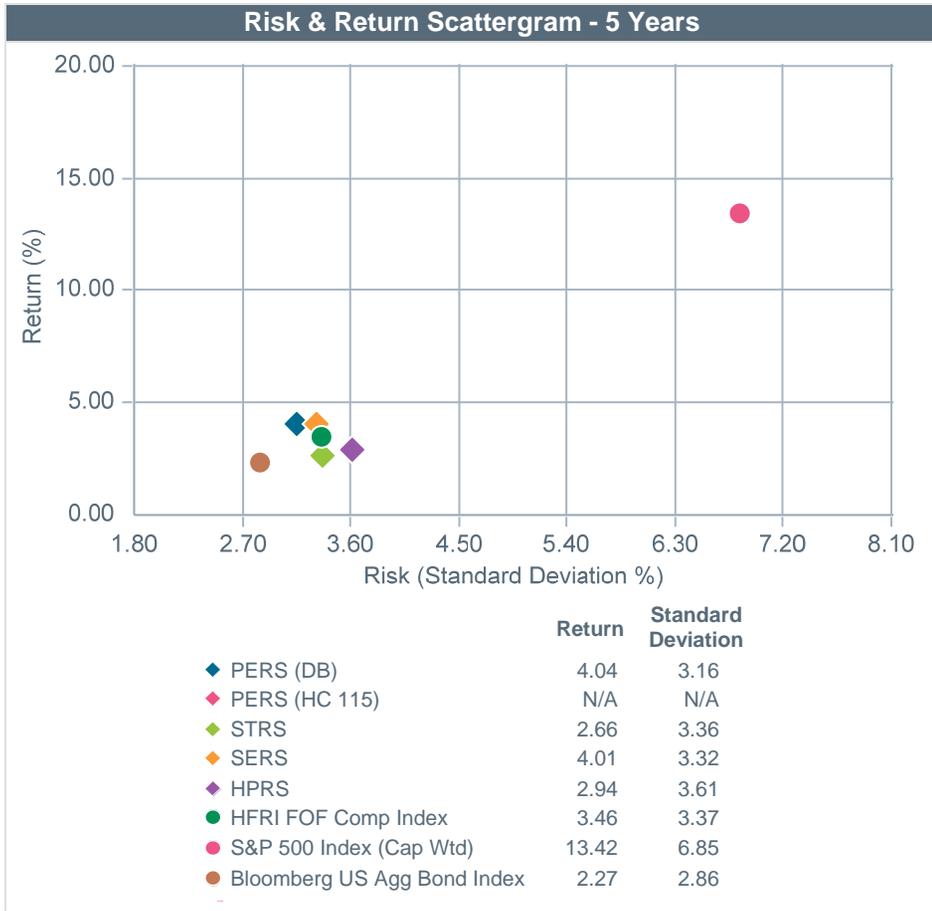
Performance shown may be net or gross of fees depending on underlying investments. Prior to 2008, HPRS's real estate portfolio consisted of two buildings. Since then, HPRS has shifted its focus to externally managed funds.



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

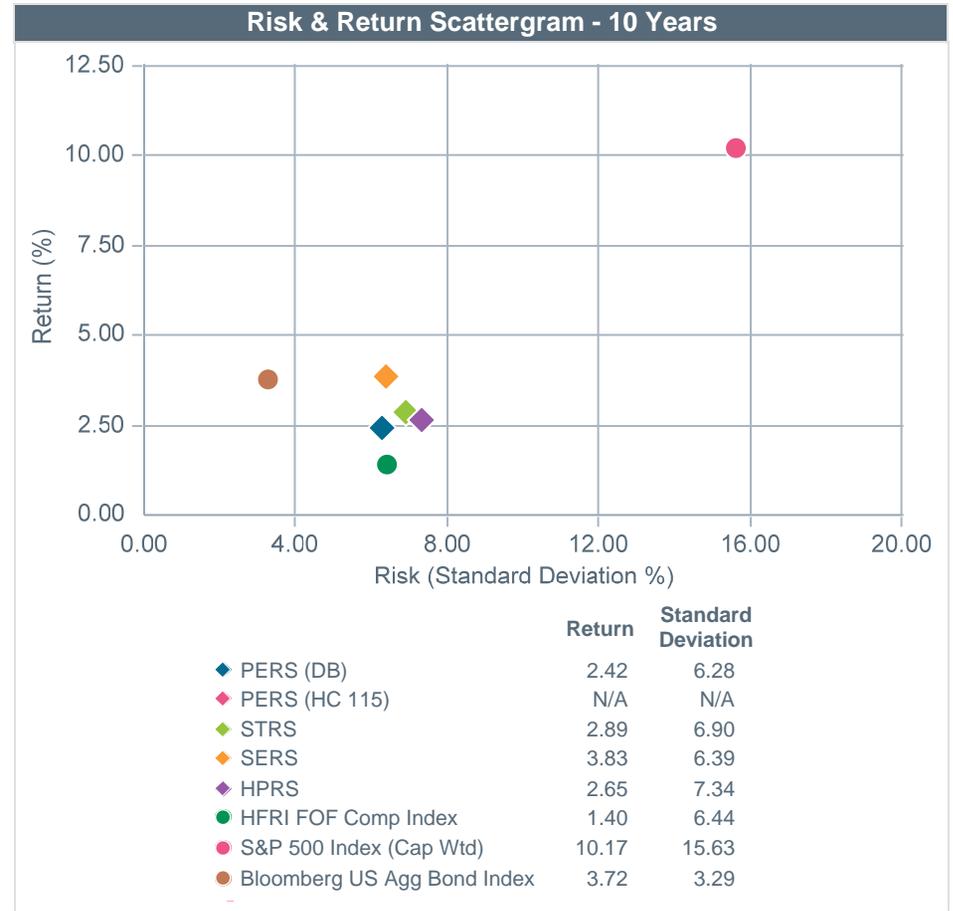
Performance										
	Trailing Performance (%)						Calendar Year Performance (%)			
	2 Quarters	1 Year	3 Years	5 Years	7 Years	10 Years	2017	2016	2015	2014
Hedge Funds										
PERS (DB)	1.64	5.29	2.84	4.04	3.86	2.42	7.25	3.38	-1.20	3.93
PERS (DB) Hedge Funds Custom Benchmark	0.80	4.94	3.48	3.75	4.67	4.86	7.38	6.44	-1.70	2.59
Difference	0.84	0.35	-0.64	0.29	-0.81	-2.44	-0.13	-3.06	0.50	1.34
PERS (HC 115)	1.64	5.29	2.84	N/A	N/A	N/A	7.25	3.38	-1.20	N/A
Hedge Funds Custom Benchmark	0.80	4.94	3.48	N/A	N/A	N/A	7.38	6.44	-1.70	N/A
Difference	0.84	0.35	-0.64	N/A	N/A	N/A	-0.13	-3.06	0.50	N/A
STRS	2.37	5.48	3.11	2.66	4.35	2.89	5.59	3.38	-0.55	3.27
HFRI FOF Comp Index	0.71	5.17	1.94	3.46	2.81	1.40	7.77	0.51	-0.27	3.37
Difference	1.66	0.31	1.17	-0.80	1.54	1.49	-2.18	2.87	-0.28	-0.10
SERS	1.04	3.93	2.64	4.01	4.00	3.83	7.27	2.20	-0.05	4.10
HFRI FOF Comp Index + 1%	1.22	6.22	2.96	4.50	3.84	2.42	8.85	1.52	0.73	4.40
Difference	-0.18	-2.29	-0.32	-0.49	0.16	1.41	-1.58	0.68	-0.78	-0.30
HPRS	0.34	4.89	1.22	2.94	2.87	2.65	5.70	-0.27	1.21	3.34
HFRI FOF Comp Index	0.71	5.17	1.94	3.46	2.81	1.40	7.77	0.51	-0.27	3.37
Difference	-0.37	-0.28	-0.72	-0.52	0.06	1.25	-2.07	-0.78	1.48	-0.03

Performance shown is net of fees.



Sharpe Ratio - 5 Years

PERS (DB)	1.15
PERS (HC 115)	N/A
STRS	0.68
SERS	1.08
HPRS	0.71
<i>HFRI FOF Comp Index</i>	<i>0.91</i>
S&P 500 Index (Cap Wtd)	1.84
Bloomberg US Agg Bond Index	0.64



Sharpe Ratio - 10 Years

PERS (DB)	0.36
PERS (HC 115) Hedge Funds	N/A
STRS	0.39
SERS	0.56
HPRS	0.34
<i>HFRI FOF Comp Index</i>	<i>0.19</i>
S&P 500 Index (Cap Wtd)	0.68
Bloomberg US Agg Bond Index	1.01

Performance shown is net of fees.

Performance										
	2 Quarters	1 Year	3 Years	5 Years	7 Years	10 Years	2017	2016	2015	2014
Private Equity										
PERS (DB)	6.23	17.24	11.72	12.98	13.42	10.66	19.60	6.72	6.09	17.94
PERS (DB) Private Equity Custom Benchmark	7.34	15.89	11.27	12.38	12.69	10.80	15.13	8.48	6.04	15.41
Difference	-1.11	1.35	0.45	0.60	0.73	-0.14	4.47	-1.76	0.05	2.53
STRS	9.66	19.69	13.05	14.89	13.76	10.46	19.35	6.76	9.89	18.90
STRS Private Equity Custom Benchmark	3.73	15.92	12.69	14.42	14.46	12.22	22.32	13.85	1.48	13.67
Difference	5.93	3.77	0.36	0.47	-0.70	-1.76	-2.97	-7.09	8.41	5.23
OP&F	8.29	19.00	17.16	16.47	14.19	10.19	21.80	14.37	12.06	18.34
OP&F Private Equity Custom Benchmark	7.17	17.13	13.83	16.55	15.81	12.97	22.48	18.82	2.65	21.45
Difference	1.12	1.87	3.33	-0.08	-1.62	-2.78	-0.68	-4.45	9.41	-3.11
SERS	8.16	19.84	15.97	17.88	16.65	11.35	21.56	12.37	13.81	22.77
Burgiss All Private Equity Benchmark	9.16	16.28	11.51	12.92	13.33	10.95	12.10	9.07	7.37	15.75
Difference	-1.00	3.56	4.46	4.96	3.32	0.40	9.46	3.30	6.44	7.02
HPRS	3.60	8.84	7.67	9.90	8.41	5.17	8.46	13.44	0.85	12.41
HPRS Private Equity Custom Benchmark	3.60	8.85	9.89	14.26	14.20	12.57	12.37	13.44	9.64	21.15
Difference	0.00	-0.01	-2.22	-4.36	-5.79	-7.40	-3.91	0.00	-8.79	-8.74

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.

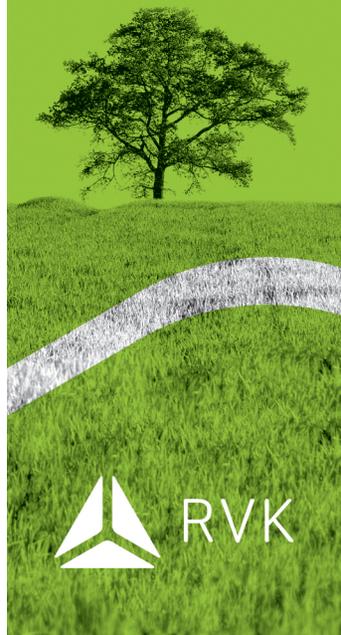
Performance										
	Trailing Performance (%)						Calendar Year Performance (%)			
	2 Quarters	1 Year	3 Years	5 Years	7 Years	10 Years	2017	2016	2015	2014
Other Alternatives										
PERS (DB) Opportunistic Investments	-1.10	-0.60	1.09	N/A	N/A	N/A	2.50	0.89	1.12	N/A
PERS (DB) Opportunistic Custom Benchmark	-1.08	-0.65	1.02	N/A	N/A	N/A	2.31	1.04	0.84	N/A
Difference	-0.02	0.05	0.07	N/A	N/A	N/A	0.19	-0.15	0.28	N/A
PERS (DB) Commodities	10.37	30.32	-3.90	-8.78	N/A	N/A	6.40	11.92	-32.44	-32.12
S&P Goldman Sachs Commodity Index (TR)	10.36	30.04	-4.37	-9.41	N/A	N/A	5.77	11.37	-32.86	-33.06
Difference	0.01	0.28	0.47	0.63	N/A	N/A	0.63	0.55	0.42	0.94
PERS (DB) Risk Parity	-1.54	9.39	6.33	7.23	N/A	N/A	18.51	15.51	-10.42	9.73
PERS (DB) Risk Parity Custom Benchmark	-1.60	4.01	5.94	6.67	N/A	N/A	11.50	7.00	3.30	7.64
Difference	0.06	5.38	0.39	0.56	N/A	N/A	7.01	8.51	-13.72	2.09
PERS (DB) GTAA	-2.38	5.60	6.26	6.48	N/A	N/A	17.03	6.58	0.94	4.44
PERS (DB) GTAA Custom Benchmark	0.07	7.18	6.19	6.68	N/A	N/A	15.16	5.77	-0.69	3.61
Difference	-2.45	-1.58	0.07	-0.20	N/A	N/A	1.87	0.81	1.63	0.83
PERS (HC 115) Opportunistic	-1.10	-0.60	1.09	N/A	N/A	N/A	2.50	0.89	1.12	N/A
PERS (HC 115) Opportunistic Custom Benchmark	-1.08	-0.65	1.02	N/A	N/A	N/A	2.31	1.04	0.84	N/A
Difference	-0.02	0.05	0.07	N/A	N/A	N/A	0.19	-0.15	0.28	N/A
PERS (HC 115) Commodities	10.37	30.32	-3.90	N/A	N/A	N/A	6.40	11.92	-32.44	N/A
S&P Goldman Sachs Commodity Index (TR)	10.36	30.04	-4.37	N/A	N/A	N/A	5.77	11.37	-32.86	N/A
Difference	0.01	0.28	0.47	N/A	N/A	N/A	0.63	0.55	0.42	N/A
PERS (HC 115) Risk Parity	-1.54	9.39	6.33	N/A	N/A	N/A	18.51	15.51	-10.42	N/A
PERS (HC 115) Risk Parity Custom Benchmark	-1.60	4.01	5.94	N/A	N/A	N/A	11.50	7.00	3.30	N/A
Difference	0.06	5.38	0.39	N/A	N/A	N/A	7.01	8.51	-13.72	N/A
PERS (HC 115) GTAA	-2.38	5.60	6.26	N/A	N/A	N/A	17.03	6.58	0.94	N/A
PERS (HC 115) GTAA Custom Benchmark	0.07	7.18	6.19	N/A	N/A	N/A	15.16	5.77	-0.69	N/A
Difference	-2.45	-1.58	0.07	N/A	N/A	N/A	1.87	0.81	1.63	N/A

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.

	Trailing Performance (%)						Calendar Year Performance (%)			
	2 Quarters	1 Year	3 Years	5 Years	7 Years	10 Years	2017	2016	2015	2014
Other Alternatives										
STRS Opportunistic Investments ex HF	5.46	9.07	5.97	7.47	7.81	N/A	6.07	4.32	4.57	11.66
STRS Opportunistic Custom Benchmark	2.71	13.66	10.49	12.18	11.90	N/A	19.95	11.63	-0.52	11.45
Difference	2.75	-4.59	-4.52	-4.71	-4.09	N/A	-13.88	-7.31	5.09	0.21
OP&F Real Assets	6.24	6.21	4.66	4.50	N/A	N/A	4.65	2.99	1.03	8.99
Consumer Price Index + 5% (1 Qtr Lag)	3.60	7.48	6.95	6.47	N/A	N/A	7.34	6.54	4.96	6.74
Difference	2.64	-1.27	-2.29	-1.97	N/A	N/A	-2.69	-3.55	-3.93	2.25
OP&F MLPs	1.82	-0.47	-4.60	1.19	N/A	N/A	-4.08	20.42	-23.31	16.91
Alerian MLP Index	-0.63	-4.58	-5.93	-4.09	N/A	N/A	-6.52	18.30	-32.59	4.80
Difference	2.45	4.11	1.33	5.28	N/A	N/A	2.44	2.12	3.28	12.11
SERS Opportunistic & Tactical Portfolio	4.78	11.62	7.00	7.74	N/A	N/A	14.55	11.17	-5.64	7.96
SERS Opportunistic Custom Benchmark	1.21	8.25	6.88	7.99	N/A	N/A	14.37	7.02	1.48	6.66
Difference	3.57	3.37	0.12	-0.25	N/A	N/A	0.18	4.15	-7.12	1.30
HPRS Real Assets	1.24	2.72	N/A	N/A	N/A	N/A	-4.27	4.28	N/A	N/A
HPRS Real Assets Custom Benchmark	3.11	2.81	N/A	N/A	N/A	N/A	-0.43	9.17	N/A	N/A
Difference	-1.87	-0.09	N/A	N/A	N/A	N/A	-3.84	-4.89	N/A	N/A

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

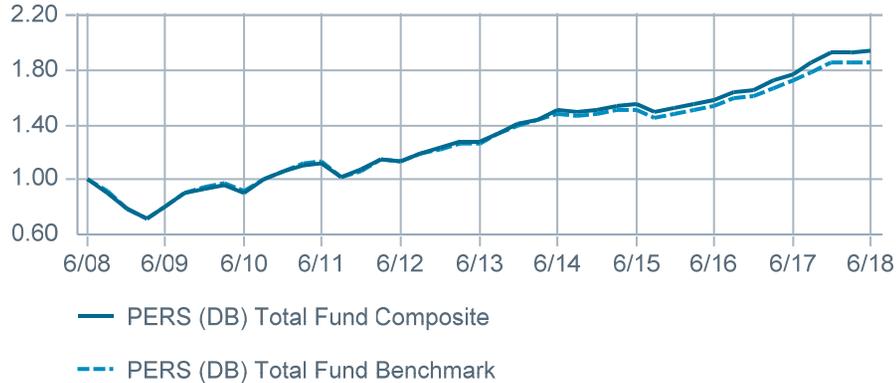
Plan Specific Pages



Summary

- PERS (DB) has generated an annualized 0.49% of alpha over the trailing 5-year period and 0.49% 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



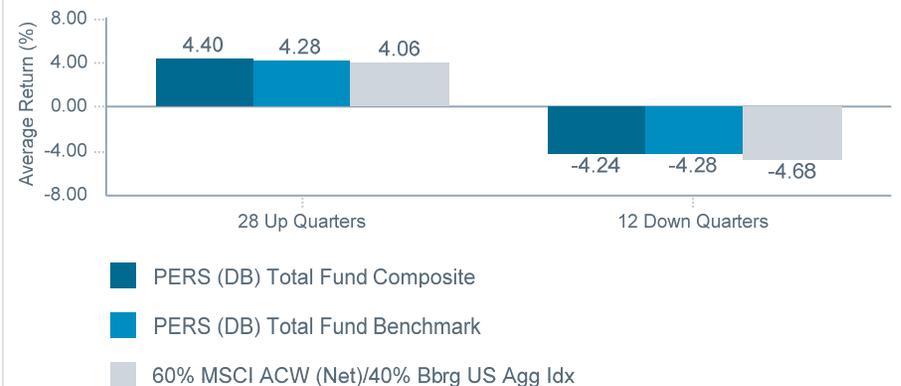
MPT Stats

	5 Years	10 Years
Maximum Return	4.87	12.34
Minimum Return	-4.18	-13.81
Standard Deviation	4.41	10.66
vs. PERS (DB) Total Fund Benchmark		
Info Ratio	0.99	0.44
Tracking Error	0.64	0.90
Alpha	0.49	0.49
vs. S&P 500 Index (Cap Wtd)		
Beta	0.51	0.65
vs. ICE BofAML 3 Mo US T-Bill Index		
Sharpe Ratio	1.81	0.64

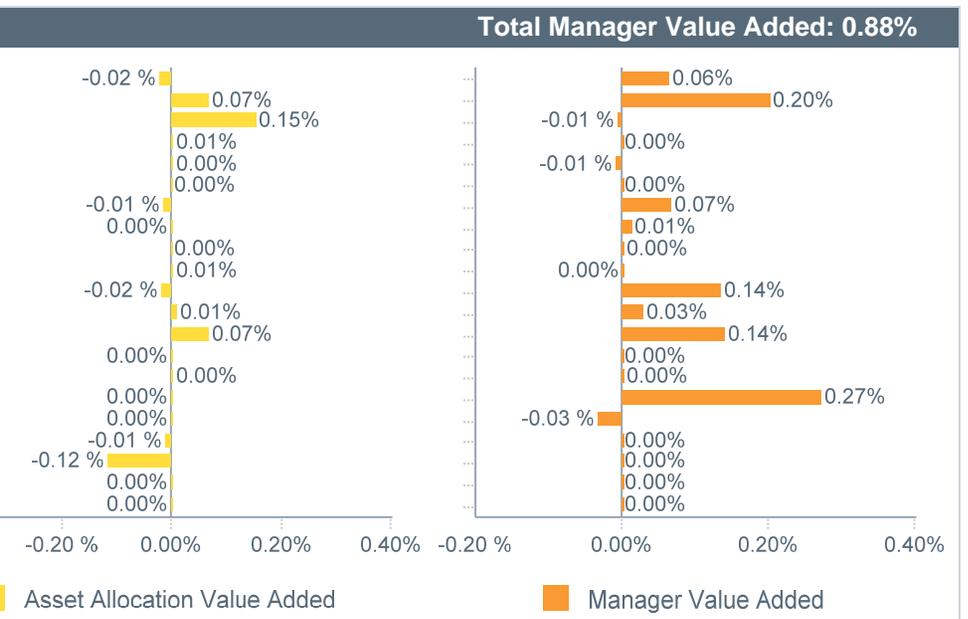
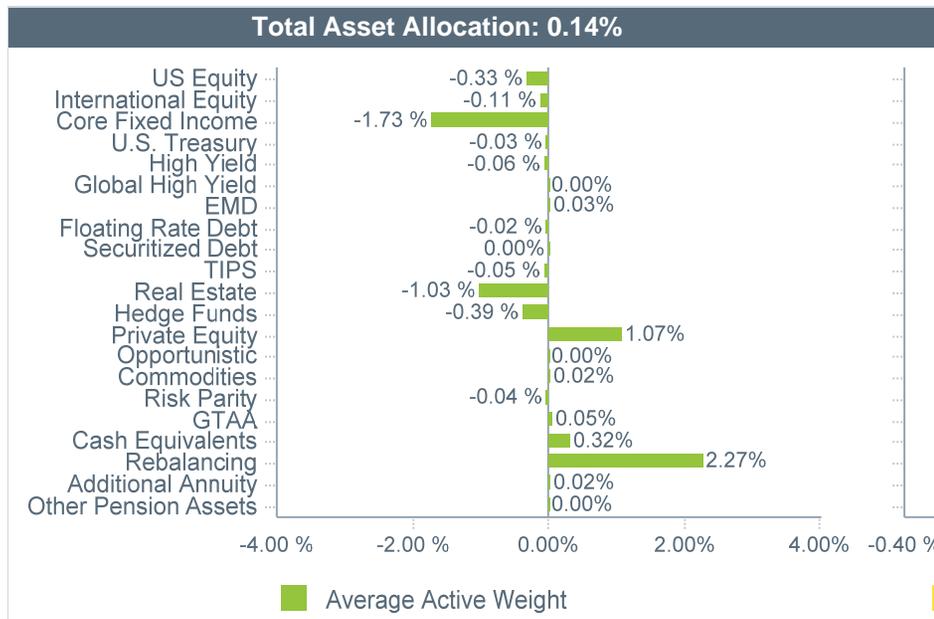
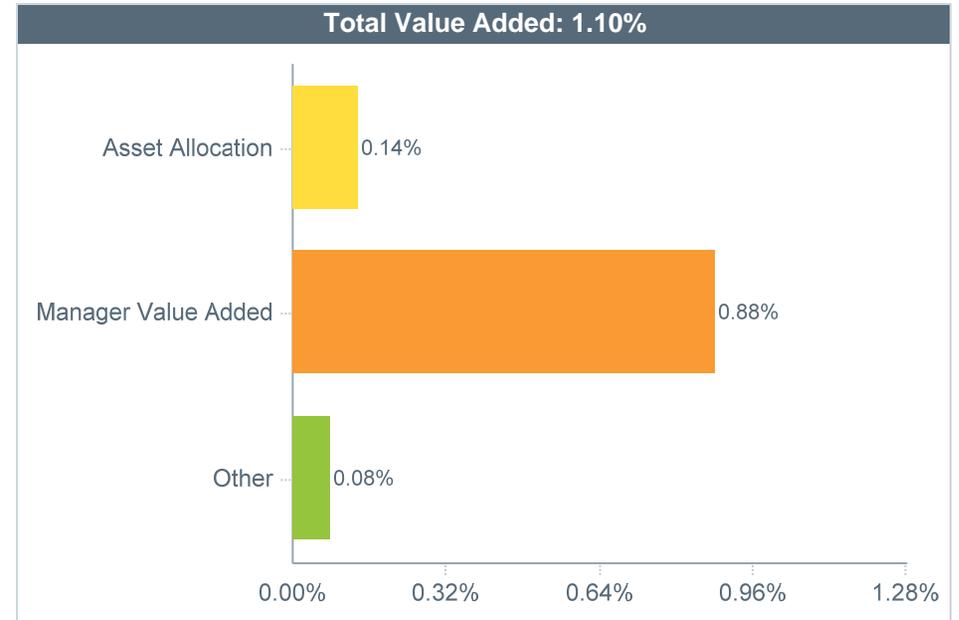
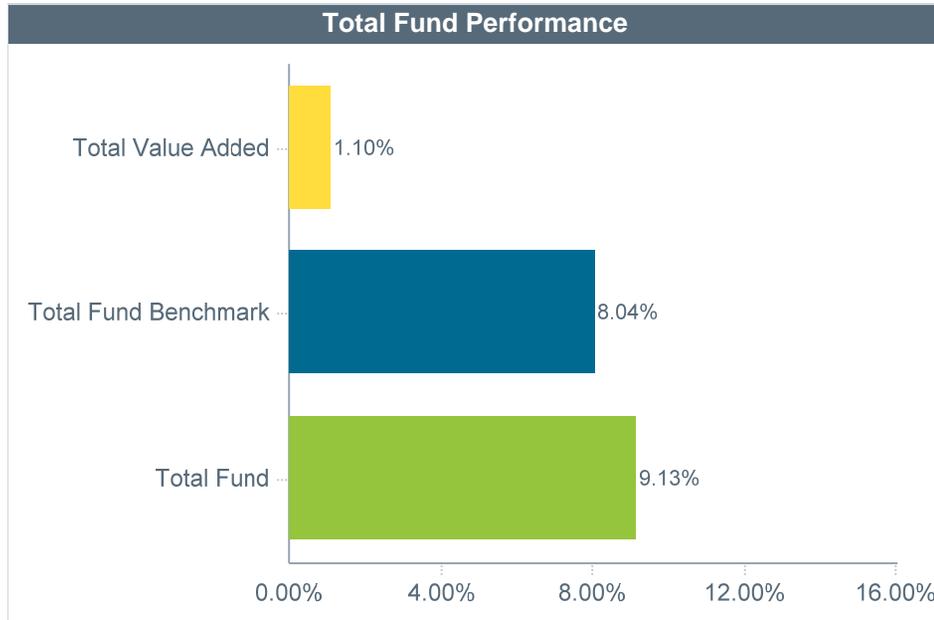
Asset Allocation vs. Targets

	Market Value (\$)	Allocation (%)	Target (%)
US Equity	18,153,954,375	21.36	20.90
International Equity	15,414,465,534	18.14	20.00
Core Fixed Income	7,922,552,525	9.32	10.90
U.S. Treasury	897,437,636	1.06	1.00
High Yield	1,692,959,988	1.99	2.00
Global High Yield	4,163	0.00	0.00
EMD	4,716,397,253	5.55	6.00
Floating Rate Debt	48,885,541	0.06	0.10
Securitized Debt	887,894,592	1.04	1.00
TIPS	1,778,514,513	2.09	2.00
Real Estate	7,387,423,451	8.69	10.00
Hedge Funds	6,965,612,059	8.20	8.00
Private Equity	9,368,942,337	11.02	10.00
Opportunistic	83,815,562	0.10	0.10
Commodities	980,852,018	1.15	1.00
Risk Parity	4,292,146,607	5.05	5.00
GTAA	1,749,251,302	2.06	2.00
Cash Equivalents	197,539,821	0.23	0.00
Rebalancing	2,425,393,990	2.85	0.00
Additional Annuity	16,859,840	0.02	0.00
Other Pension Assets	213	0.00	0.00
Total Fund	84,980,903,321	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.

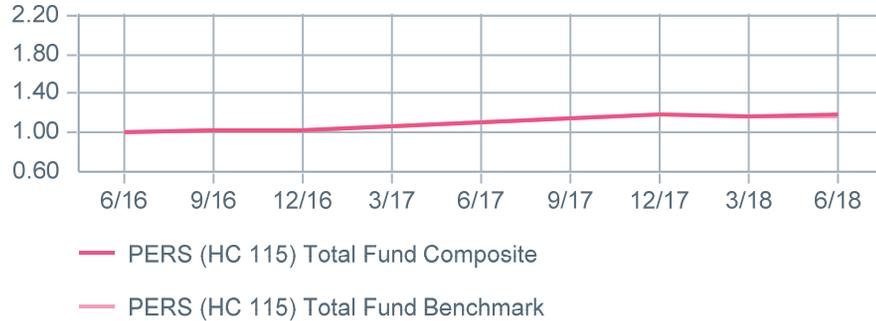


Performance shown is gross of fees. Calculation is based on monthly periodicity. See Glossary for additional information regarding the Total Fund Attribution calculation. Total Fund Benchmark return is calculated by RVK and may differ from Plan provided return due to rounding.

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



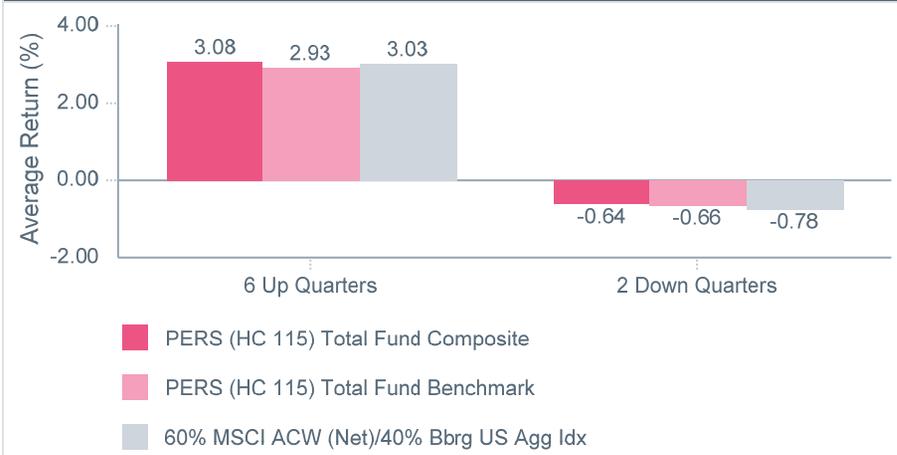
MPT Stats

	1 Year
Maximum Return	3.66
Standard Deviation	3.87
Minimum Return	-0.78
vs. PERS (HC 115) Total Fund Benchmark	
Info Ratio	2.00
Tracking Error	0.29
Alpha	0.61
vs. S&P 500 Index (Cap Wtd)	
Beta	0.65
vs. ICE BofAML 3 Mo US T-Bill Index	
Sharpe Ratio	1.45

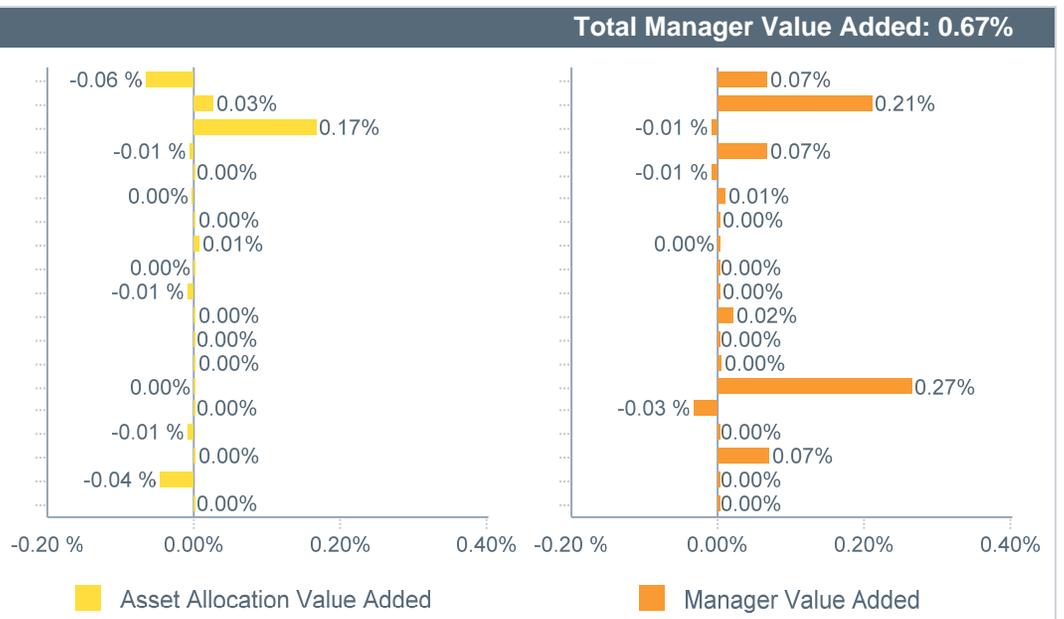
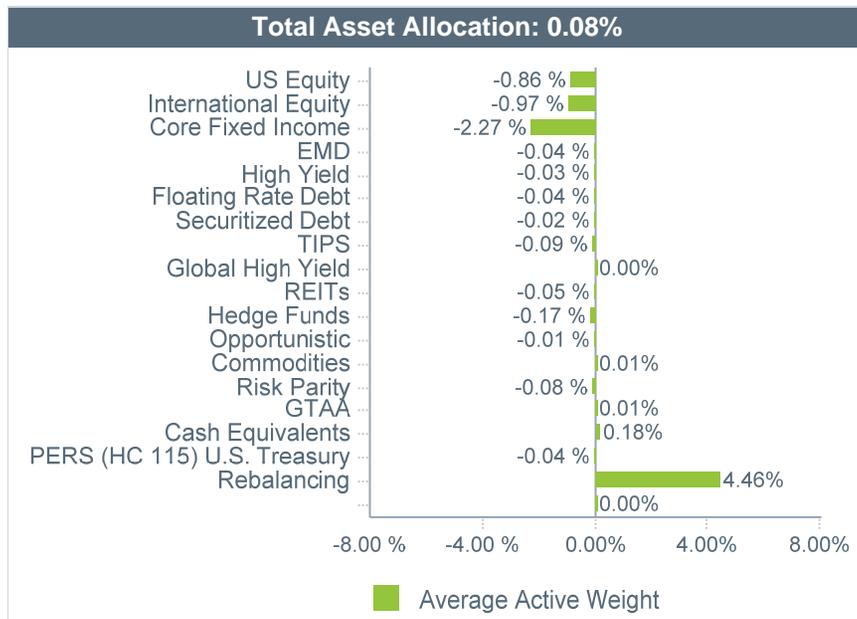
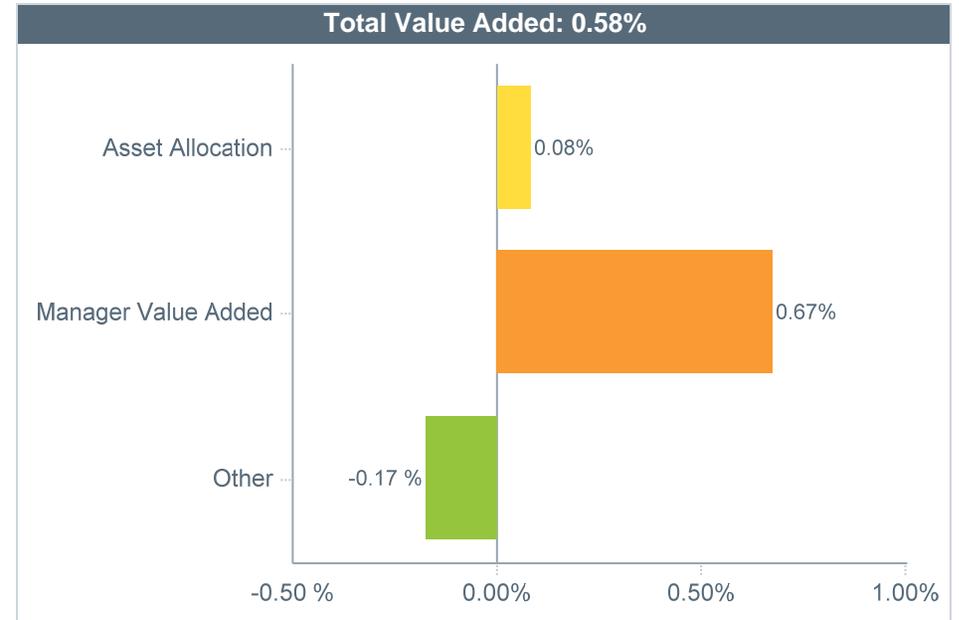
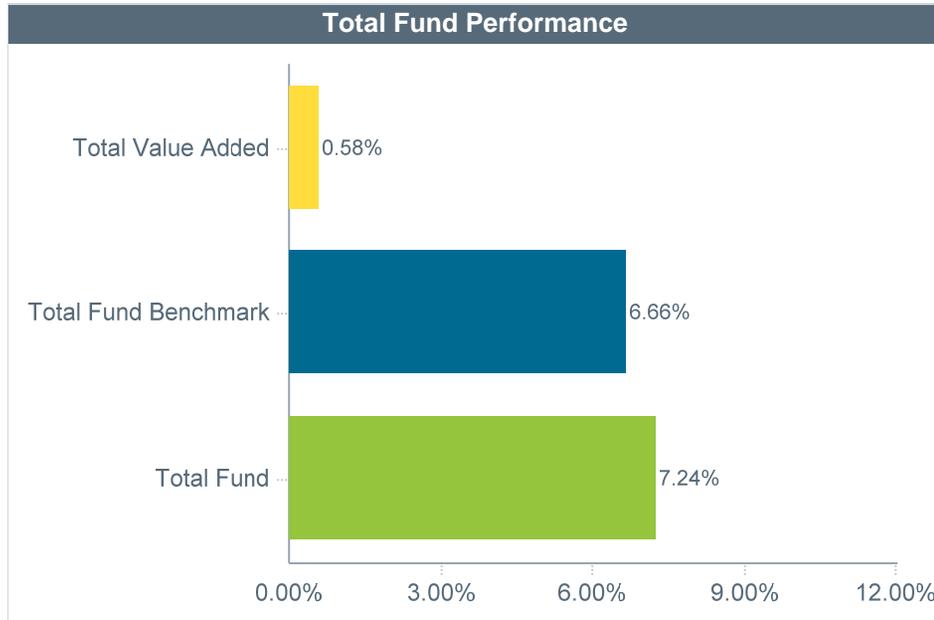
Asset Allocation vs. Targets

	Market Value (\$)	Allocation (%)	Target (%)
US Equity	2,849,844,128	22.87	22.90
International Equity	2,452,468,875	19.68	22.00
Core Fixed Income	1,957,964,095	15.71	17.90
EMD	691,563,911	5.55	6.00
High Yield	254,808,957	2.04	2.00
Floating Rate Debt	2,162,813	0.02	0.10
Securitized Debt	132,517,613	1.06	1.00
TIPS	764,434,248	6.13	6.00
Global High Yield	28,431	0.00	0.00
REITs	805,549,532	6.46	6.00
Hedge Funds	754,069,038	6.05	6.00
Opportunistic	11,561,351	0.09	0.10
Commodities	250,693,409	2.01	2.00
Risk Parity	629,722,256	5.05	5.00
GTAA	248,325,634	1.99	2.00
Cash Equivalents	12,276,010	0.10	0.00
PERS (HC 115) U.S. Treasury	125,221,219	1.00	1.00
Rebalancing	517,092,382	4.15	0.00
Total Fund	12,460,303,902	100.00	100.00

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.

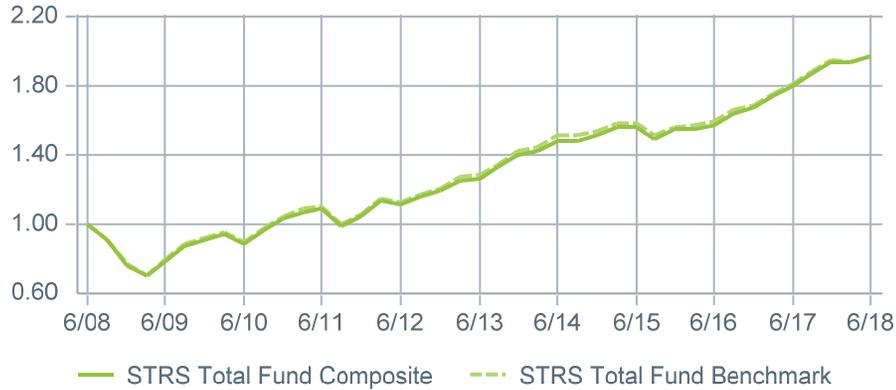


Performance shown is gross of fees. Calculation is based on monthly periodicity. See Glossary for additional information regarding the Total Fund Attribution calculation. Total Fund Benchmark return is calculated by RVK and may differ from Plan provided return due to rounding.

Summary

- STRS has generated 0.45% of alpha over the trailing 5-year period and 0.08% 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



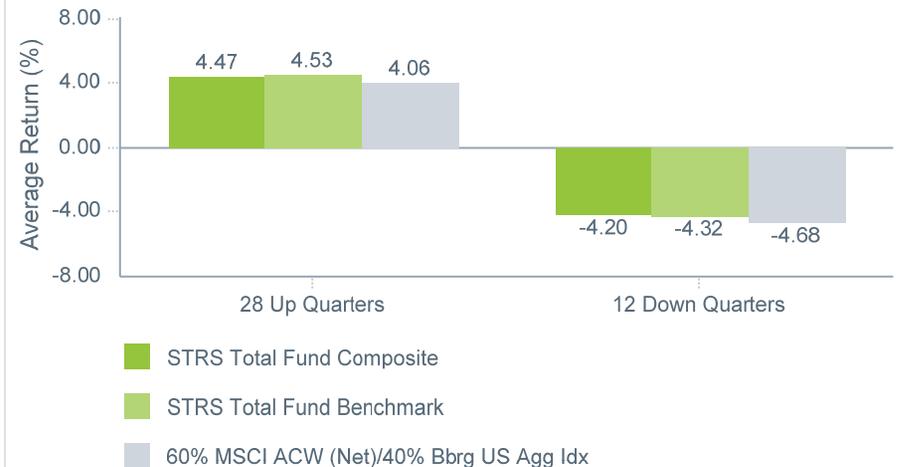
MPT Stats

	5 Years	10 Years
Maximum Return	5.23	12.25
Minimum Return	-4.44	-15.99
Standard Deviation	4.35	10.89
vs. STRS Total Fund Benchmark		
Info Ratio	0.72	-0.03
Tracking Error	0.35	0.61
Alpha	0.45	0.08
vs. S&P 500 Index (Cap Wtd)		
Beta	0.57	0.68
vs. ICE BofAML 3 Mo US T-Bill Index		
Sharpe Ratio	1.98	0.65

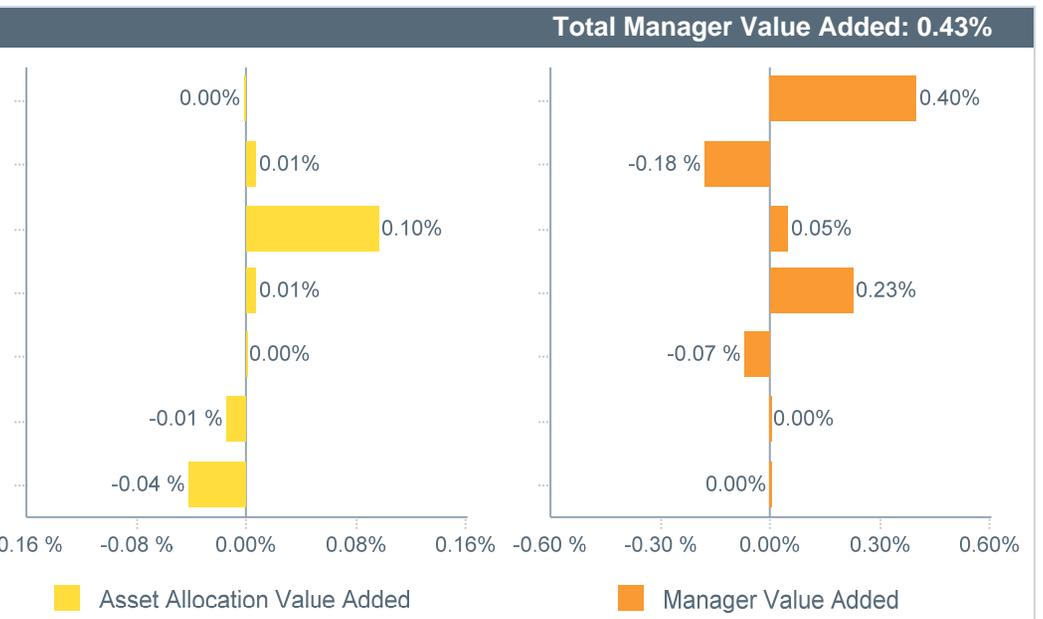
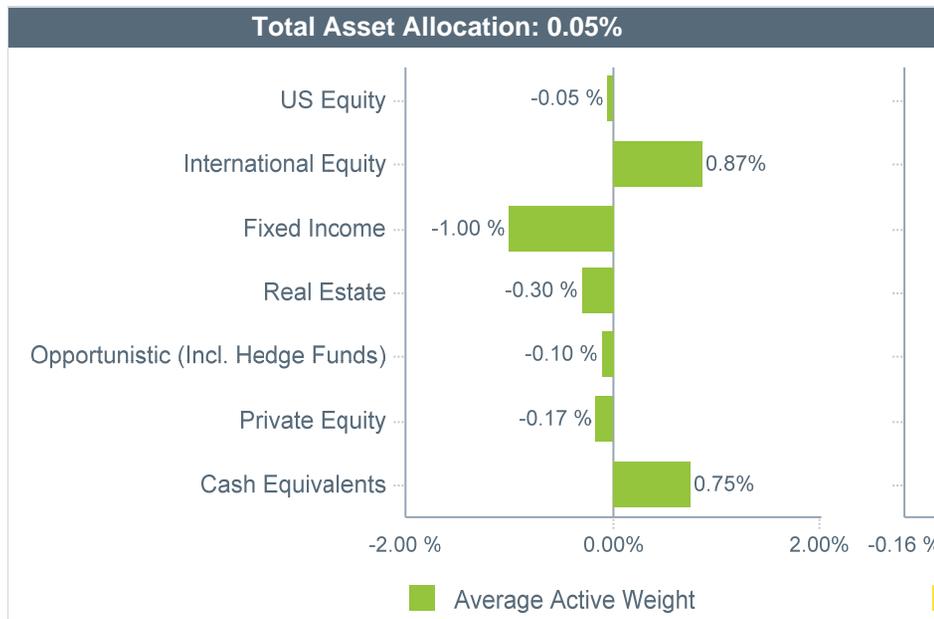
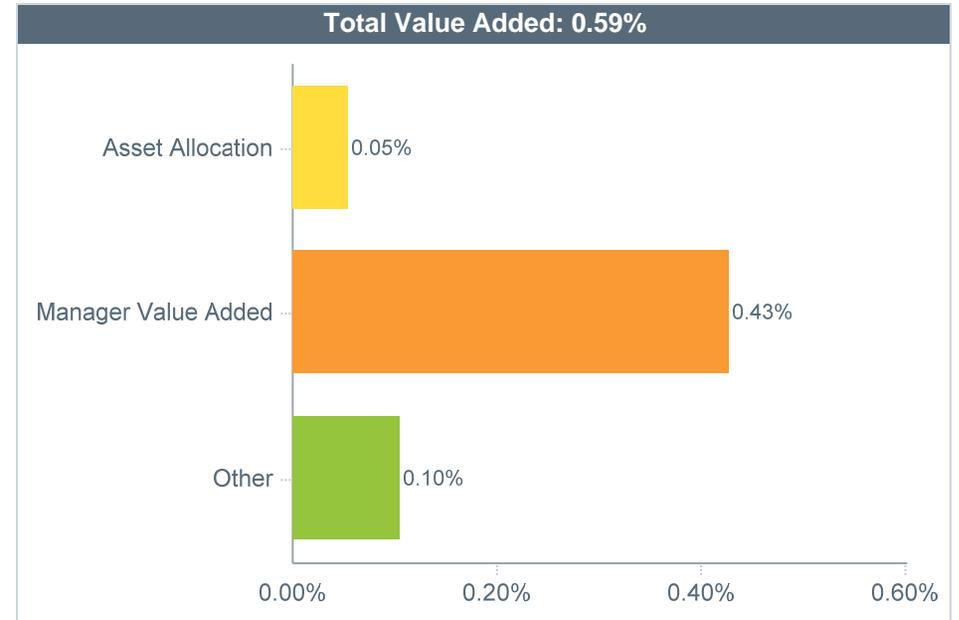
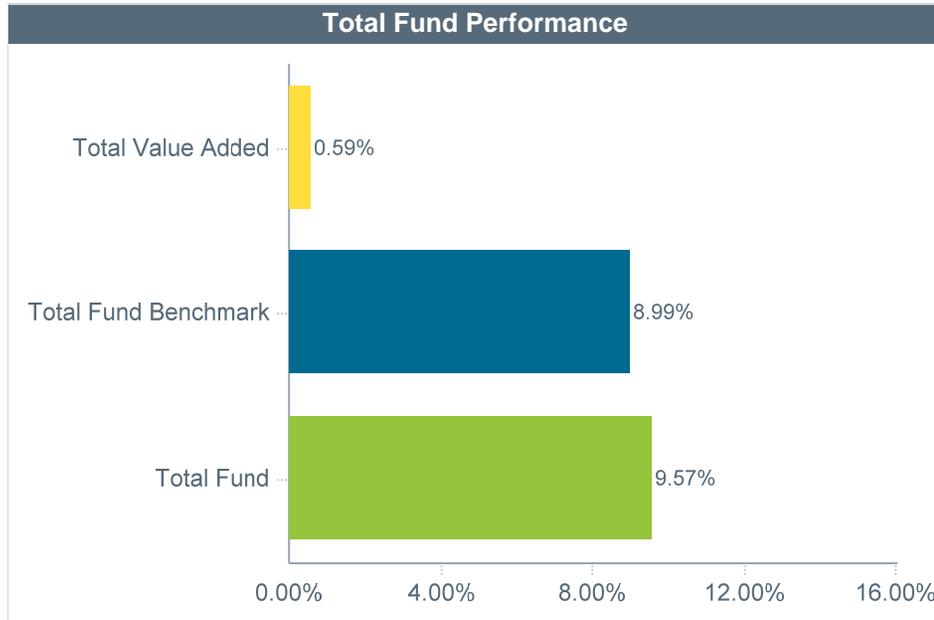
Asset Allocation vs. Targets

	Market Value (\$)	Allocation (%)	Target (%)
US Equity	22,685,945,032	29.18	29.00
International Equity	18,601,604,791	23.92	24.00
Fixed Income	15,055,456,129	19.36	21.00
Real Estate	7,983,735,655	10.27	10.00
Opportunistic (Incl. Hedge Funds)	6,228,166,831	8.01	8.00
Private Equity	5,772,546,647	7.42	7.00
Cash Equivalents	1,422,274,545	1.83	1.00
Total Fund	77,749,729,630	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.

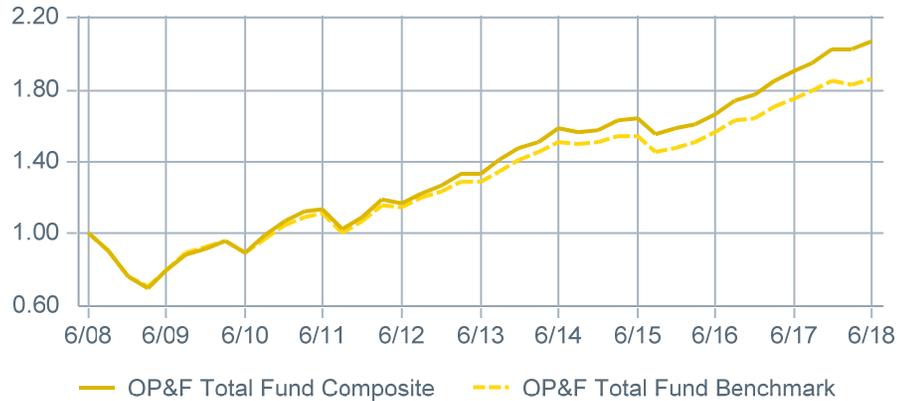


Performance shown is gross of fees. Calculation is based on monthly periodicity. See Glossary for additional information regarding the Total Fund Attribution calculation. Total Fund Benchmark return is calculated by RVK and may differ from Plan provided return due to rounding.

Summary

- OP&F has generated 1.71% of alpha over the trailing 5-year period and 1.00% 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



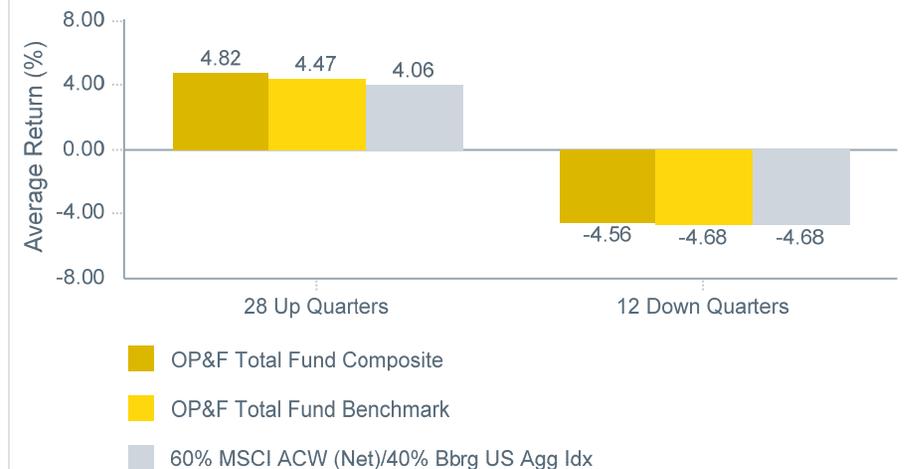
MPT Stats

	5 Years	10 Years
Maximum Return	5.71	13.00
Minimum Return	-5.33	-15.45
Standard Deviation	4.88	11.39
vs. OP&F Total Fund Benchmark		
Info Ratio	1.43	1.05
Tracking Error	1.08	1.07
Alpha	1.72	1.00
vs. S&P 500 Index (Cap Wtd)		
Beta	0.59	0.70
vs. ICE BofAML 3 Mo US T-Bill Index		
Sharpe Ratio	1.78	0.67

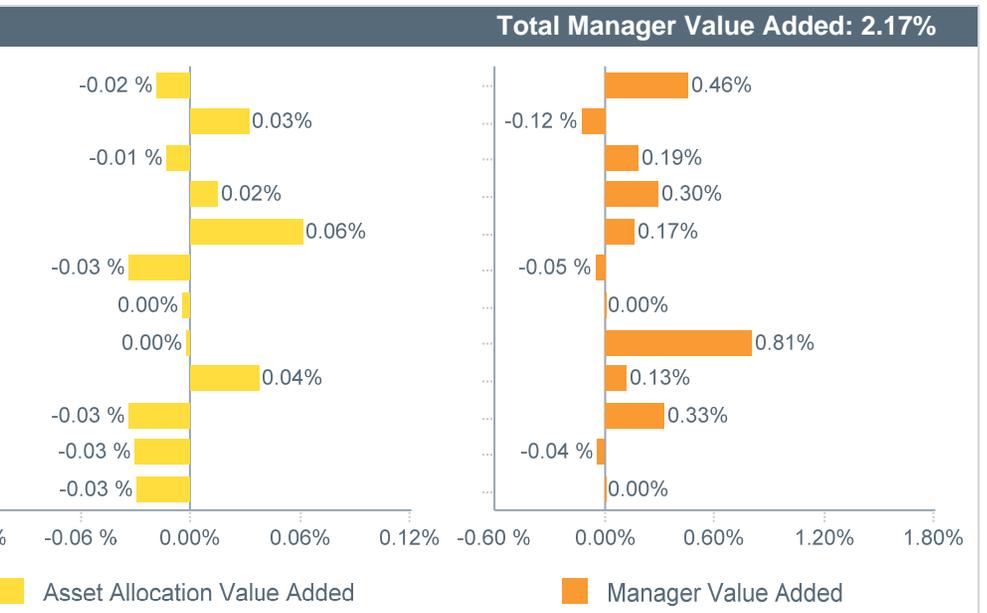
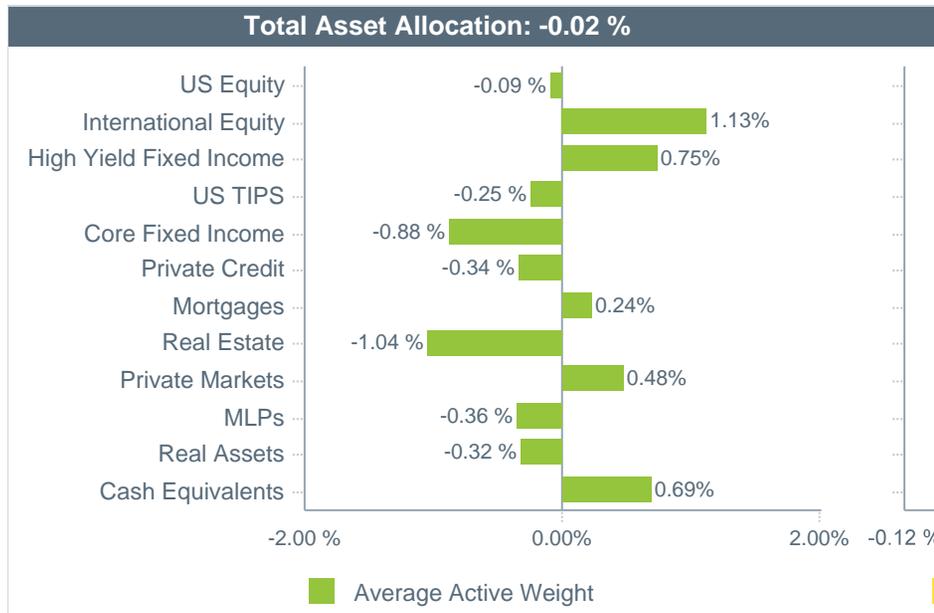
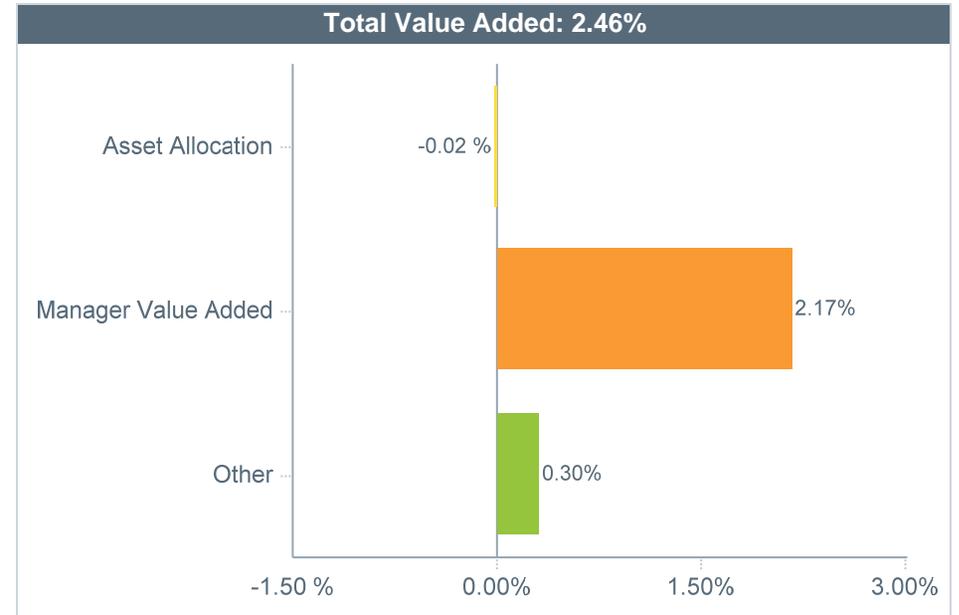
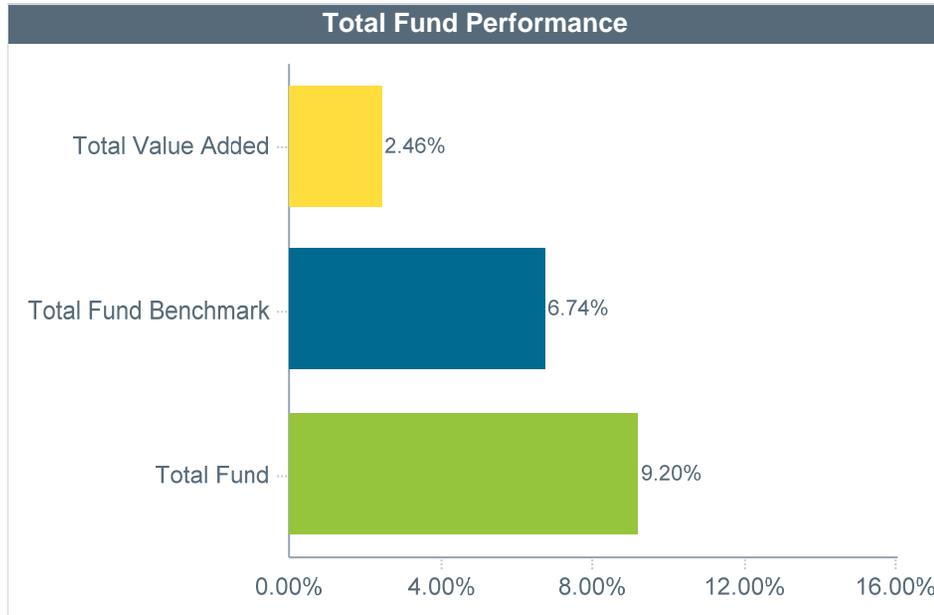
Asset Allocation vs. Targets

	Market Value (\$)	Allocation (%)	Target (%)
US Equity	2,977,672,018	18.92	19.25
International Equity	2,918,670,802	18.54	19.25
High Yield Fixed Income	1,802,517,470	11.45	12.50
US TIPS	1,337,058,666	8.49	8.50
Core Fixed Income	1,047,906,390	6.66	10.00
Private Credit	270,380,801	1.72	1.25
Mortgages	36,458,419	0.23	0.00
Real Estate	1,713,135,730	10.88	12.00
Private Markets	1,173,387,569	7.45	6.50
MLPs	1,287,845,801	8.18	8.00
Real Assets	349,404,341	2.22	2.75
Cash Equivalents	825,263,599	5.24	0.00
Total Fund	15,739,701,606	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.

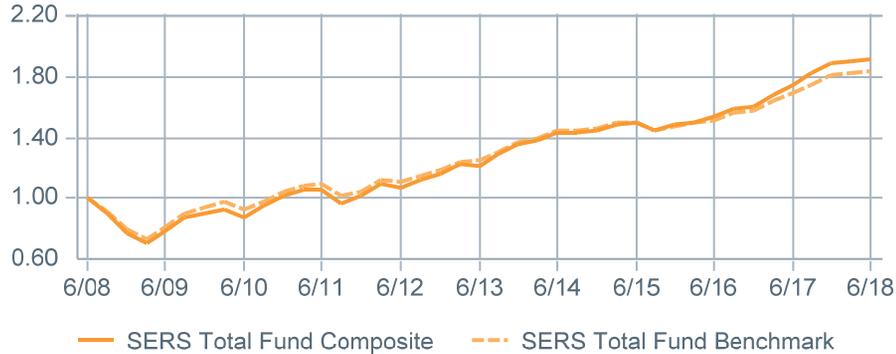


Performance shown is gross of fees. Calculation is based on monthly periodicity. See Glossary for additional information regarding the Total Fund Attribution calculation. Total Fund Benchmark return is calculated by RVK and may differ from Plan provided return due to rounding.

Summary

- SERS has generated 0.56% of alpha over the trailing 5-year period and 0.05% 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



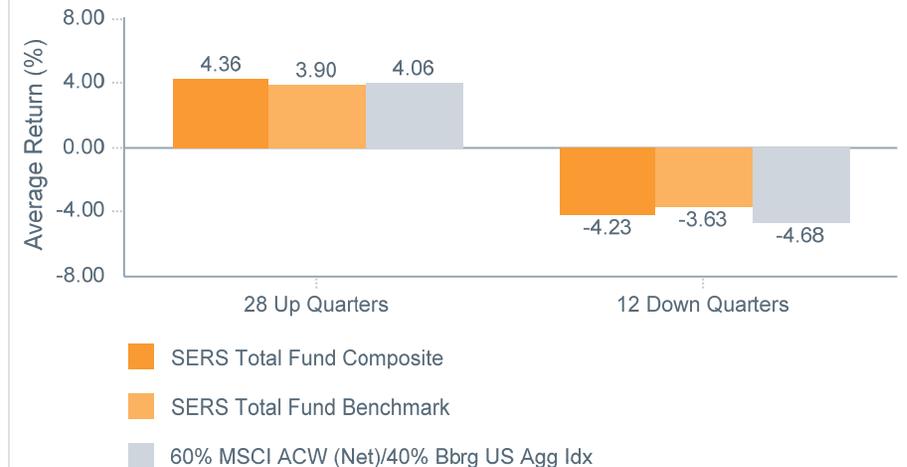
MPT Stats

	5 Years	10 Years
Maximum Return	5.41	11.01
Minimum Return	-3.77	-13.65
Standard Deviation	4.35	10.41
vs. SERS Total Fund Benchmark		
Info Ratio	2.02	0.33
Tracking Error	0.72	1.73
Alpha	0.56	0.05
vs. S&P 500 Index (Cap Wtd)		
Beta	0.52	0.64
vs. ICE BofAML 3 Mo US T-Bill Index		
Sharpe Ratio	2.04	0.64

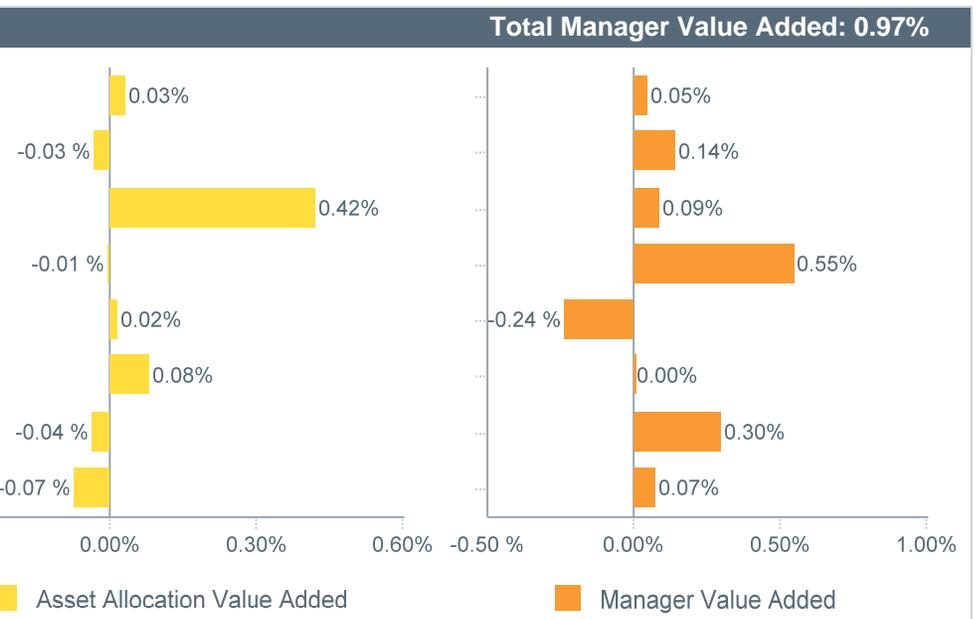
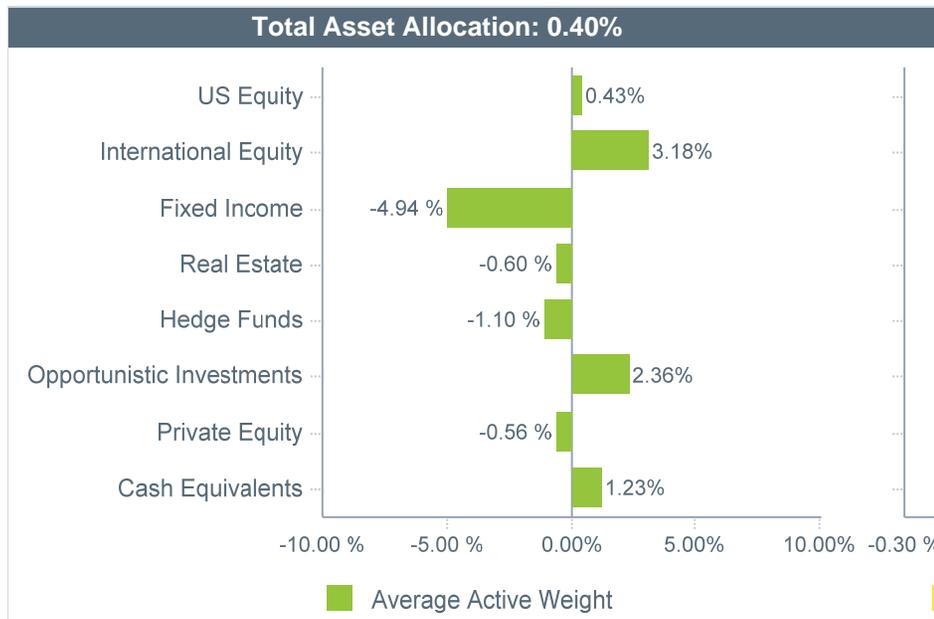
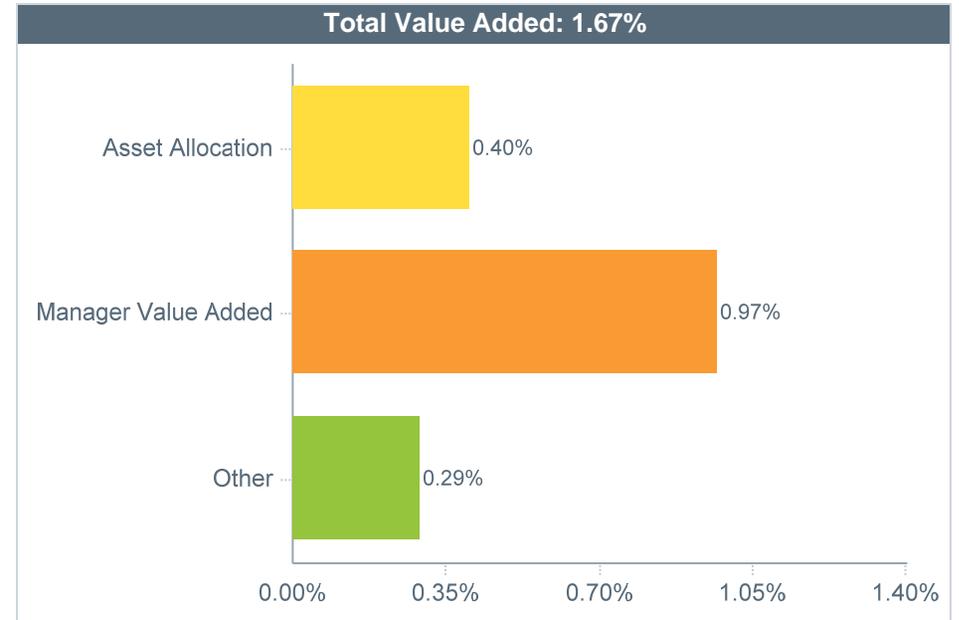
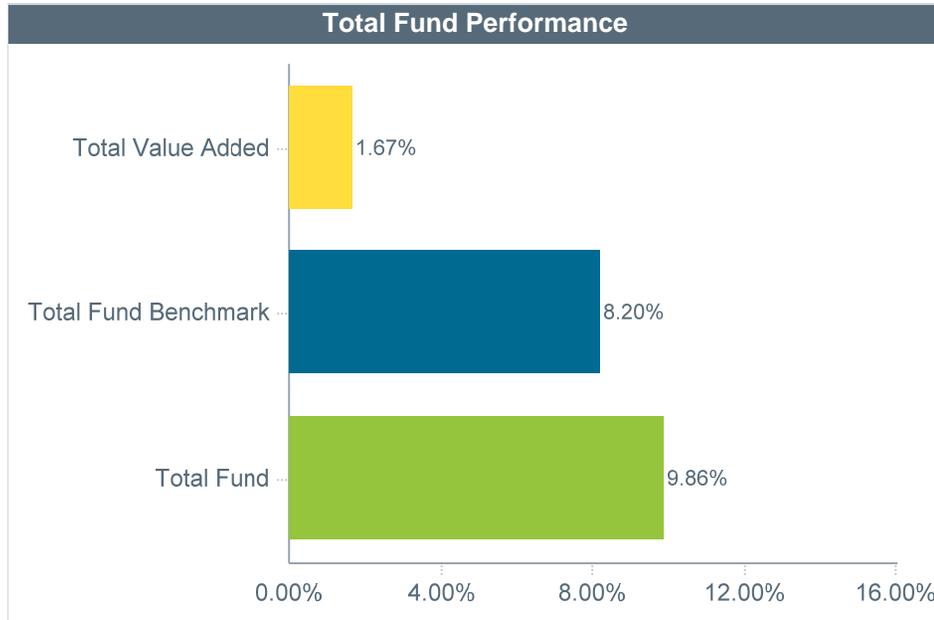
Asset Allocation vs. Targets

	Market Value (\$)	Allocation (%)	Target (%)
US Equity	3,350,227,339	23.44	22.50
International Equity	3,293,469,111	23.04	22.50
Fixed Income	1,949,529,904	13.64	19.00
Real Estate	1,999,069,528	13.99	15.00
Hedge Funds	1,183,267,482	8.28	10.00
Opportunistic Investments	370,771,704	2.59	0.00
Private Equity	1,377,535,709	9.64	10.00
Cash Equivalents	769,649,520	5.38	1.00
Total Fund	14,293,520,296	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.

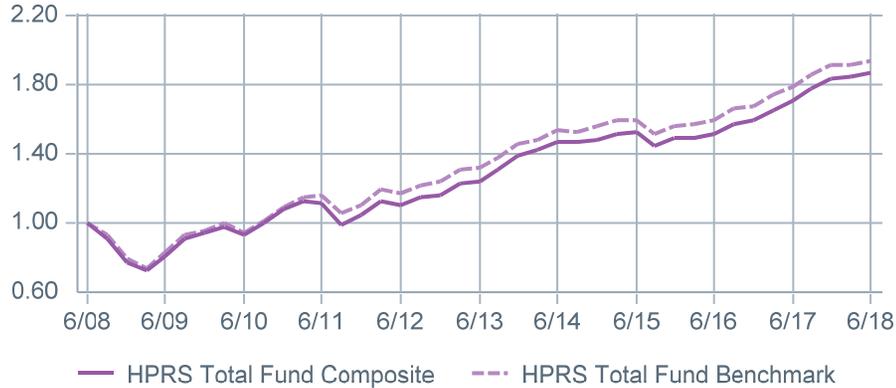


Performance shown is gross of fees. Calculation is based on monthly periodicity. See Glossary for additional information regarding the Total Fund Attribution calculation. Total Fund Benchmark return is calculated by RVK and may differ from Plan provided return due to rounding.

Summary

- HPRS has lost 0.03% of alpha over the trailing 5-year period and lost 0.85% 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



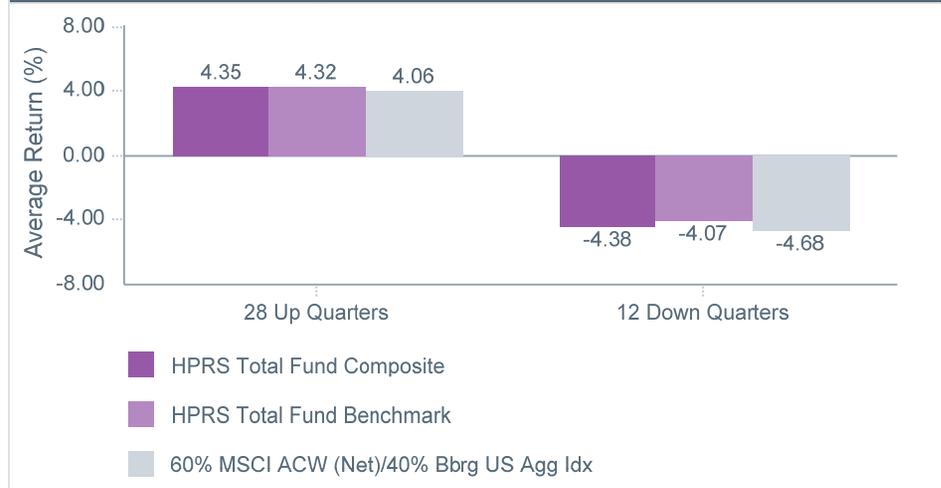
Asset Allocation vs. Targets

	Market Value (\$)	Allocation (%)	Target (%)
US Equity	278,673,618	31.02	30.00
International Equity	184,182,853	20.50	20.00
Fixed Income	148,329,263	16.51	19.00
Real Estate	41,800,649	4.65	5.00
Hedge Funds	110,333,492	12.28	11.00
Private Equity	81,054,026	9.02	9.00
Real Assets	45,291,061	5.04	5.00
Cash Equivalents	8,817,097	0.98	1.00
Total Fund	898,482,059	100.00	100.00

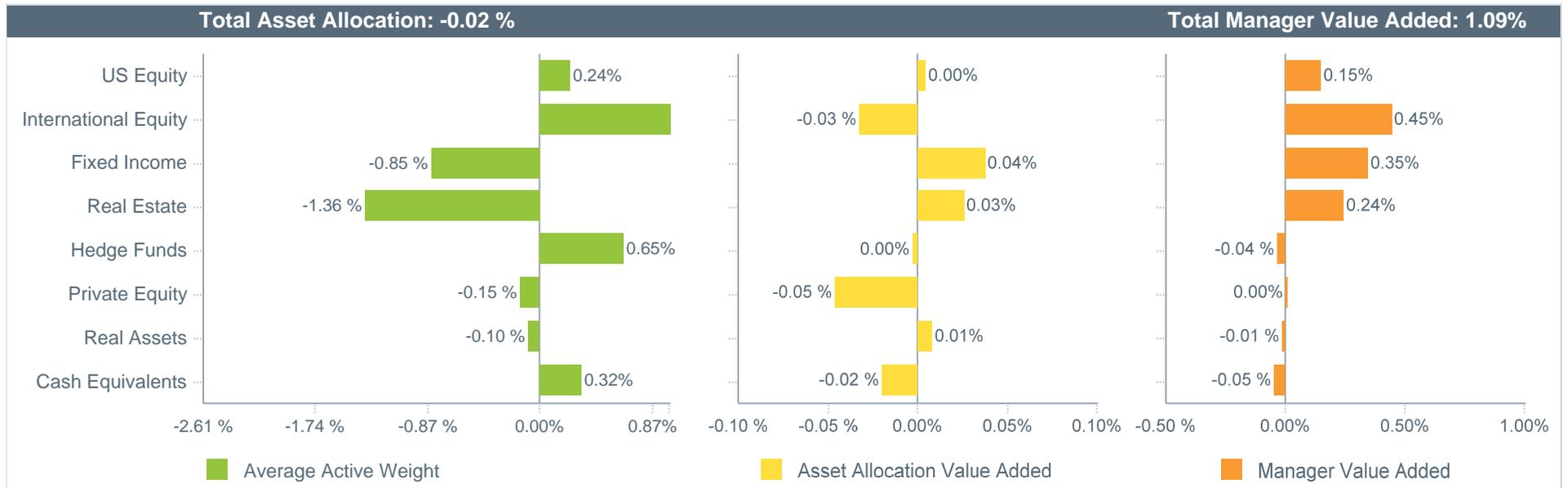
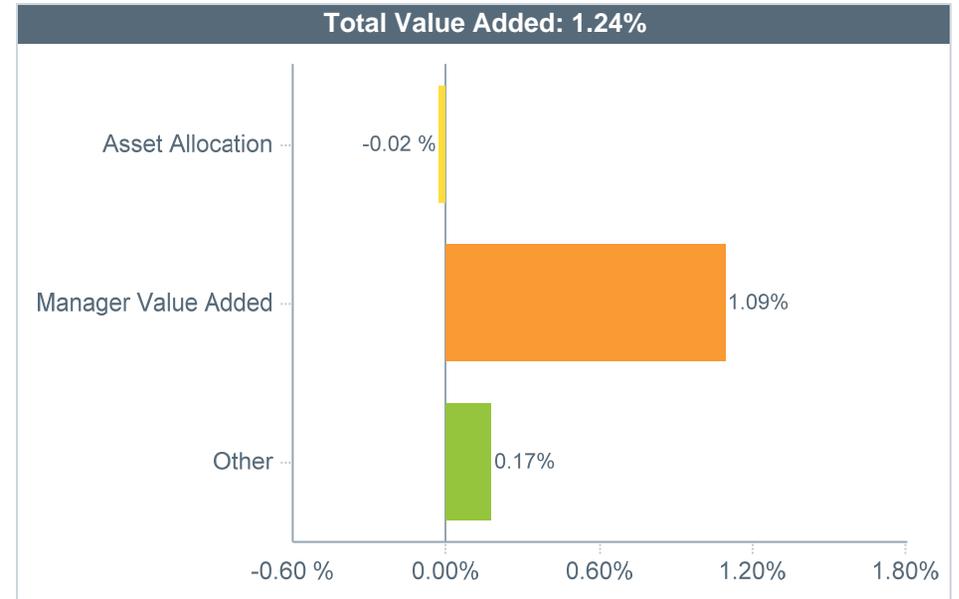
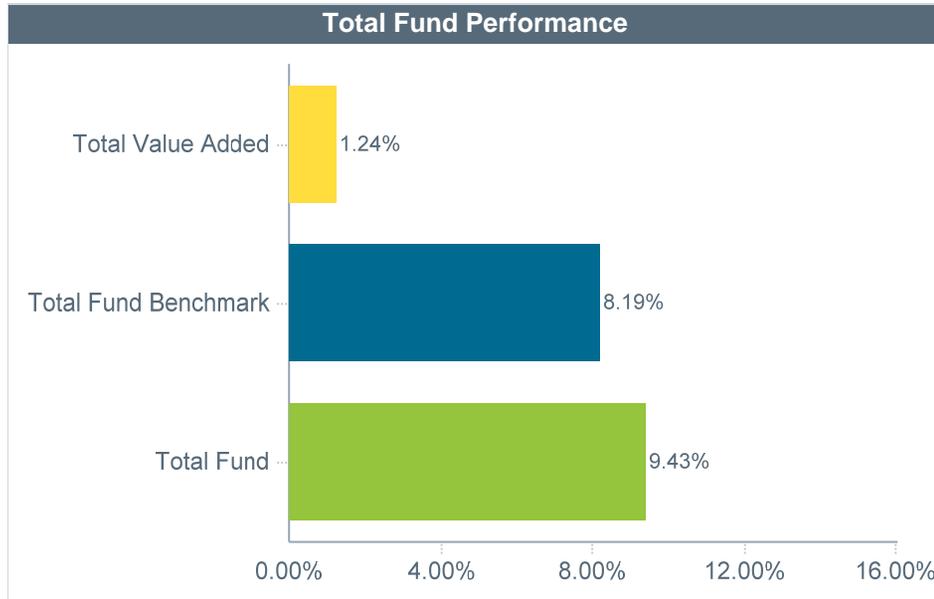
MPT Stats

	5 Years	10 Years
Maximum Return	6.04	12.56
Minimum Return	-5.33	-16.16
Standard Deviation	4.78	11.20
vs. HPRS Total Fund Benchmark		
Info Ratio	0.45	-0.19
Tracking Error	0.76	1.59
Alpha	-0.03	-0.85
vs. S&P 500 Index (Cap Wtd)		
Beta	0.62	0.70
vs. ICE BofAML 3 Mo US T-Bill Index		
Sharpe Ratio	1.65	0.58

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 June 30, 2018

	Market Value (\$000)	Trailing Performance (%)						Calendar Year Performance (%)			
		2 Quarters	1 Year	3 Years	5 Years	7 Years	10 Years	2017	2016	2015	2014
HPRS	898,482	1.61	9.43	6.91	8.44	7.68	6.44	15.01	7.42	0.15	6.73
HPRS Total Fund Benchmark		1.16	8.32	6.67	8.09	7.64	6.86	14.55	7.40	0.19	7.03
Difference		0.45	1.11	0.24	0.35	0.04	-0.42	0.46	0.02	-0.04	-0.30
<i>All Public Plans > \$1B-TF Median</i>		1.05	8.58	7.07	8.17	7.55	6.63	16.02	7.90	0.33	6.46
Rank		26	26	60	35	43	61	67	63	57	42
Population		91	91	86	85	84	79	110	115	100	83
<i>All Public Plans \$250M to \$1B-TF Median</i>		0.77	8.35	7.07	8.32	7.98	7.06	15.39	8.21	0.33	6.46
Rank		23	29	60	45	66	74	61	68	59	41
Population		52	51	48	48	46	45	64	67	60	55

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

Appendix

Performance Related Comments

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

Asset Class Fee Comparison – as of 06/30/2018

(annualized fees shown in basis points)							
	Domestic Equity	International Equity	Fixed Income	Real Estate	Private Equity	Hedge Funds	Other Alternatives
■ PERS (DB)	7	26	10	82	57	114	37
■ PERS (HC 115)	1	4	2	-	-	12	5
■ STRS	11	21	8	44	67	149	68
■ OP&F	45	35	46	98	100	-	86
■ SERS	25	43	21	74	55	141	70
■ HPRS	35	77	49	143	104	102	98

- Fees for Private Equity are based on committed capital, with the exception of 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 06/30/2018

Percentage of Assets Managed by External Managers - As of 06/30/2018								
	Total Fund	Domestic Equity	International Equity	Fixed Income	Real Estate	Private Equity	Hedge Funds	Other Alternatives
■ PERS (DB)	60%	17%	78%	34%	100%	100%	100%	85%
■ PERS (HC 115)	40%	17%	78%	23%	-	-	100%	77%
■ STRS	30%	11%	43%	11%	12%	95%	100%	69%
■ OP&F	100%	100%	100%	100%	100%	100%	-	100%
■ SERS	95%	100%	100%	100%	100%	100%	100%	91%
■ HPRS	100%	100%	100%	100%	100%	100%	100%	100%

- 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 Investments.
- SERS has one internally-managed Cash mandate.
- HPRS Other Alternatives fees include Real Assets.

Percentage of Actively Managed Assets – as of 06/30/2018

Percentage of Assets Actively Managed - As of 06/30/2018								
	Total Fund	Domestic Equity	International Equity	Fixed Income	Real Estate	Private Equity	Hedge Funds	Other Alternatives
■ PERS (DB)	79%	42%	78%	83%	100%	100%	100%	86%
■ PERS (HC 115)	66%	42%	78%	76%	0%	-	100%	78%
■ STRS	87%	61%	100%	100%	85%	100%	100%	100%
■ OP&F	94%	55%	100%	100%	100%	100%	-	100%
■ SERS	83%	60%	72%	100%	97%	100%	100%	100%
■ HPRS	86%	54%	100%	100%	100%	100%	100%	100%

- 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 Investments.
- SERS has one internally-managed Cash mandate.
- HPRS Other Alternatives fees include Real Assets.

Custom Benchmark Glossary

PERS (DB) Total Fund Custom Benchmark:

- 20.9% Russell 3000 Index
- 20.0% PERS (DB) International Equity Custom Benchmark
- 10.9% PERS (DB) Core Fixed Income Custom Benchmark
- 1.0% 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
- 8.0% PERS (DB) Hedge Funds Custom Benchmark
- 10.0% PERS (DB) Private Equity Custom Benchmark
- 0.1% PERS (DB) Opportunistic Custom Benchmark
- 1.0% S&P Goldman Sachs Commodity Index (TR)
- 5.0% PERS (DB) Risk Parity Custom Benchmark
- 2.0% PERS (DB) GTAA Custom Benchmark

PERS (HC 115) Total Fund Custom Benchmark:

- 22.9% Russell 3000 Index
- 22.0% 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
- 6.0% PERS (HC 115) Hedge Funds Custom Benchmark
- 0.1% PERS (HC 115) Opportunistic Custom Benchmark
- 2.0% S&P Goldman Sachs Commodity Index (TR)
- 5.0% PERS (HC 115) Risk Parity Custom Benchmark
- 2.0% PERS (HC 115) GTAA Custom Benchmark
- 1.0% Bloomberg Barclays U.S. Treasury Index

STRS Total Fund Custom Benchmark:

- 30.0% Russell 3000 Index
- 25.0% MSCI World Ex US Index (50% Hedged)/ MSCI Emg Mkts Index
- 20.0% STRS Fixed Income Blended Benchmark
- 10.0% STRS Real Estate Custom Benchmark
- 7.0% 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:

- 19.25% Wilshire 5000 Index
- 19.25% MSCI ACW Ex US IMI Index (Net)
- 10.0% Bloomberg US Aggregate Bond Index
- 12.5% CS High Yield Dev. Countries Only Index
- 8.5% Bridgewater Custom US TIPS Index
- 1.25% S&P LTSA Levered Loan Index + 2%
- 12.0% NCREIF ODCE (Net) (1 Quarter Lag)
- 2.75% CPI + 5% (1 Quarter Lag)
- 8.0% Alerian MLP Index
- 6.5% 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
- 20.0% MSCI ACW Ex US IM Index (USD) (Net)
- 19.0% HPRS Fixed Income Custom Benchmark
- 5.0% HPRS Total Real Estate Composite
- 11.0% HFRI FOF Composite Index
- 9.0% HPRS Total Private Equity Custom Composite
- 5.0% HPRS Real Assets Custom Index
- 1.0% BofA Merrill Lynch 91-Day T-Bill

Custom Benchmark Glossary

PERS (DB) International Equity Custom Benchmark:

- 55% MSCI World Ex US Index
- 10% MSCI World Ex US Small Cap Index
- 31% MSCI Emerging Markets 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)
- 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
- 15% HFRI Relative Value (Total) Index
- 20% HFRI Macro (Total) Index
- 15% HFRI Fund Weighted Composite 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:

- The market weight of underlying portfolio benchmarks

PERS (DB) GTAA Custom Benchmark:

- The market weight of underlying portfolio benchmarks

PERS (HC 115) International Equity Custom Benchmark:

- 55% MSCI World Ex US Index
- 10% MSCI World Ex US Small Cap Index
- 31% MSCI Emerging Markets 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)
- 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
- 15% HFRI Relative Value (Total) Index
- 20% HFRI Macro (Total) Index
- 15% HFRI Fund Weighted Composite Index

PERS (HC 115) Opportunistic Custom Benchmark:

- The market weight of underlying portfolio benchmarks

PERS (HC 115) Risk Parity Custom Benchmark:

- The market weight of underlying portfolio benchmarks

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

Custom Benchmark Glossary

STRS Fixed Income Blended Benchmark:

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

STRS Real Estate Custom Benchmark:

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

STRS Private Equity Custom Benchmark:

- Russell 3000 + 100 basis points

STRS Opportunistic Custom Benchmark:

- Russell 3000 - 100 basis points

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

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

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