

Arizona State Retirement System

Independent ASRS Investment Program Oversight for the Period Ending June 30, 2018

September 28, 2018

Allan Martin, Partner, NEPC
Don Stracke, Sr. Consultant, NEPC
Michael Malchenko, Sr. Analyst, NEPC



CONTENTS

- ASRS Investment Objectives/Performance
- Independent Oversight/Compliance
 - SAA Policy Compliance
 - Total Fund and Asset Class Analysis
 - Asset Class Committee Monitoring
- Market Environment Update and Outlook
- Appendix: SAA Policy History



ASRS INVESTMENT OBJECTIVES/PERFORMANCE

Note: All of the data shown on the following pages is as of June 30, 2018 and reflects the deduction of investment manager fees, unless otherwise noted.

NEPC, LLC

ASRS INVESTMENT OBJECTIVES

Macro

- Objective #1: Achieve a twenty-year rolling annual total fund net rate of return equal to or greater than the actuarial assumed interest rate.
- Objective #2: Achieve one- and three-year rolling annual total fund net rates of return equal to or greater than the return of the ASRS Strategic Asset Allocation Policy (SAAP) Benchmark.
- Objective #3: Achieve one- and three-year rolling annual net rates of return for ASRS strategic asset classes that are equal to or greater than their respective strategic asset class benchmarks.
- Objective #4: Ensure sufficient monies are available to meet pension benefits, health insurance, member refunds, administrative payments, and other cash flow requirements.

Micro



Source: ASRS Strategic Plan, March 2013

TOTAL FUND PERFORMANCE

- Objective #1: Achieve a twenty-year rolling annual total fund net rate of return equal to or greater than the actuarial assumed interest rate.

20 Year Annualized Return	
Total Fund	6.5%
Constant 8%	<u>8.0%</u>
Excess Return	(1.5)%

**Goal Met:
No**



TOTAL FUND PERFORMANCE

- Objective #2: Achieve one- and three-year rolling annual total fund net rates of return equal to or greater than the return of the ASRS Strategic Asset Allocation Policy (SAAP) Benchmark.

	Quarter	1 Year	3 Years	5 Years	10 Years	Since Inception (6/30/75)
Total Fund	1.3%	9.4%	7.8%	8.9%	7.4%	9.7%
Interim SAA Policy¹	0.9%	8.4%	7.1%	8.0%	6.7%	9.4%
Excess Return	0.4%	1.0%	0.7%	0.9%	0.7%	0.3%

**1 Year Goal Met: Yes
3 Year Goal Met: Yes**



¹Composition of SAA Policy can be found in the appendix.

TOTAL FUND ATTRIBUTION ANALYSIS

Total Plan	1 Year	3 Years	5 Years
Allocation Effect ¹	0.35%	0.11%	0.37%
Manager Selection Effect ²	0.66%	0.66%	0.56%
Residual ³	-0.01%	-0.03%	-0.01%
Excess Return	1.00%	0.74%	0.92%

The Brinson-Fachler Attribution model explains excess return by identifying the size of contributors or detractors from excess return based on the three effects defined below:

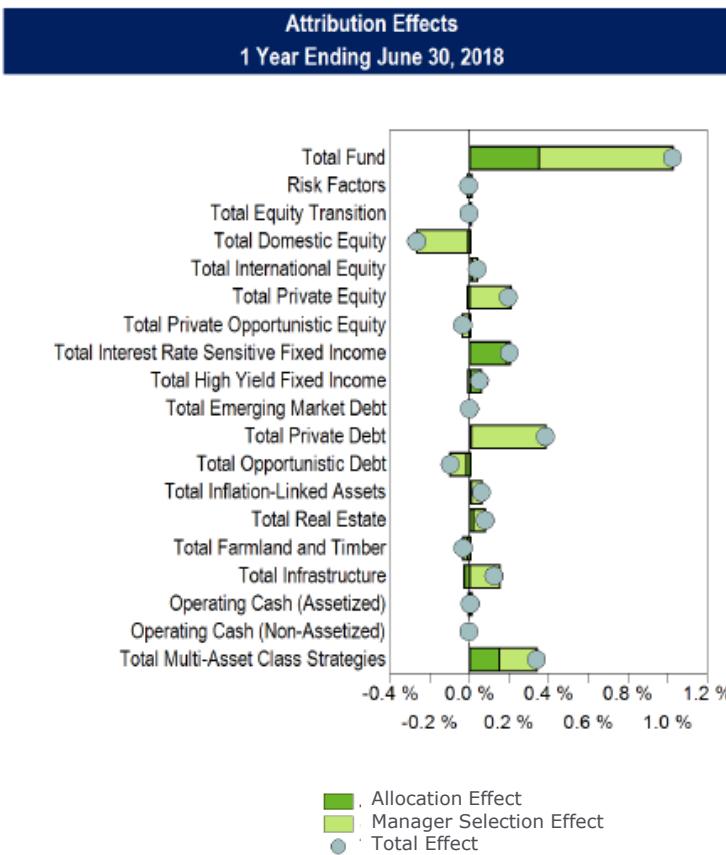
1. Allocation Effect: Measures the impact of the decision to over/under weight asset classes relative to Interim SAAP benchmark weights. (Return Asset Class Index – Total Interim Policy Index Return) × (Weight Asset Class Portfolio – Weight Asset Class Interim Policy Index).

2. Manager Selection Effect: Measures the impact of over/under performance of asset classes in the portfolio relative to the asset class benchmarks in the Interim SAAP benchmark. [Weight Asset Class Benchmark × (Return Portfolio Asset Class – Return Asset Class in Interim Policy Index)] + **Interaction Effect:** Measures the impact of over/under weighting decisions and over/under performance. (Return Asset Class Portfolio (Weight Asset Class Portfolio – Weight Asset Class Policy Index)) – (Return Asset Class Index (Weight Asset Class Portfolio – Weight Asset Class Index)).

3. Residual: Contribution to excess return not captured in Allocation Effect and Manager Selection Effect.



TOTAL FUND ATTRIBUTION DETAIL



1 Year Excess Return: 1.00%

- Allocation Effect: (+0.35%)
 - Public Markets Fixed Income underweight (+0.25%)
 - Multi-Asset Class Strategies underweight (+0.15%)
 - Infrastructure overweight (-0.03%)
 - Opportunistic Debt tactical overweight (-0.02%)
- Manager Selection Effect: (+0.66%)
 - Private Debt outperformed (+0.38%)
 - Private Equity outperformed (+0.21%)
 - Multi-Asset Class Strategies outperformed (+0.19%)
 - Infrastructure outperformed (+0.15%)
 - Inflation-Linked Assets outperformed (+0.05%)
 - International Equity outperformed (+0.03%)
 - Domestic Equity underperformed (-0.26%)
 - Opportunistic Debt underperformed (-0.08%)
 - High Yield Fixed Income underperformed (-0.01%)
- Residual: (-0.01%)

The Brinson-Fachler Attribution model explains excess return by identifying the size of contributors or detractors from excess return based on the three effects defined below:

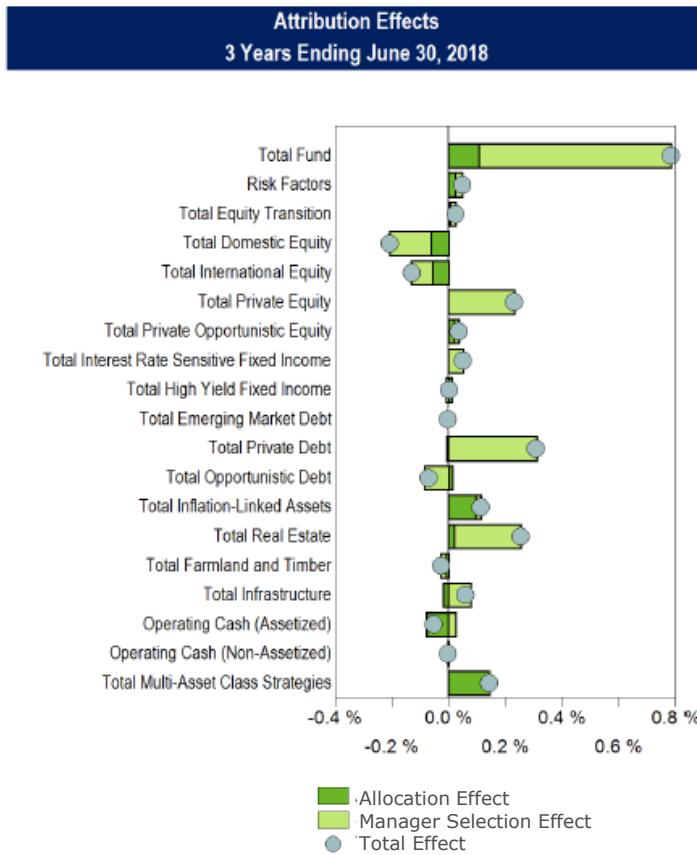
Allocation Effect: Measures the impact of the decision to over/under weight asset classes relative to Interim SAAP benchmark weights. $(\text{Return Asset Class Index} - \text{Total Interim Policy Index Return}) \times (\text{Weight Asset Class Portfolio} - \text{Weight Asset Class Interim Policy Index})$.

Manager Selection Effect: Measures the impact of over/under performance of asset classes in the portfolio relative to the asset class benchmarks in the Interim SAAP benchmark. $[\text{Weight Asset Class Benchmark} \times (\text{Return Portfolio Asset Class} - \text{Return Asset Class in Interim Policy Index})] + \text{Interaction Effect}$: Measures the impact of over/under weighting decisions and over/under performance. $(\text{Return Asset Class Portfolio} (\text{Weight Asset Class Portfolio} - \text{Weight Asset Class Policy Index})) - (\text{Return Asset Class Index} (\text{Weight Asset Class Portfolio} - \text{Weight Asset Class Index}))$.

Residual: Contribution to excess return not captured in Allocation Effect and Manager Selection Effect.



TOTAL FUND ATTRIBUTION DETAIL



3 Year Excess Return: +0.74%

- Allocation Effect: (+0.11%)
 - Multi-Asset Class Strategies underweight (+0.14%)
 - Inflation-Linked Assets tactical underweight (+0.10%)
 - Real Estate underweight (+0.02%)
 - Private Opportunistic Equity overweight (+0.02%)
 - High Yield underweight (+0.01%)
 - Private Opportunistic Equity tactical overweight (+0.02%)
 - Assetized Cash overweight (-0.08%)
 - Domestic Equity underweight (-0.06%)
 - International Equity overweight (-0.06%)
- Manager Selection Effect: (+0.66%)
 - Private Debt outperformed (+0.31%)
 - Real Estate outperformed (+0.23%)
 - Private Equity outperformed (+0.23%)
 - Interest Rate Sensitive Fixed Income outperformed (+0.05%)
 - Domestic Equity underperformed (-0.15%)
 - High Yield underperformed (-0.01%)
- Residual: (-0.03%)

The Brinson-Fachler Attribution model explains excess return by identifying the size of contributors or detractors from excess return based on the three effects defined below:

Allocation Effect: Measures the impact of the decision to over/under weight asset classes relative to Interim SAAP benchmark weights. ($\text{Return Asset Class Index} - \text{Total Interim Policy Index Return}$) \times ($\text{Weight Asset Class Portfolio} - \text{Weight Asset Class Interim Policy Index}$)

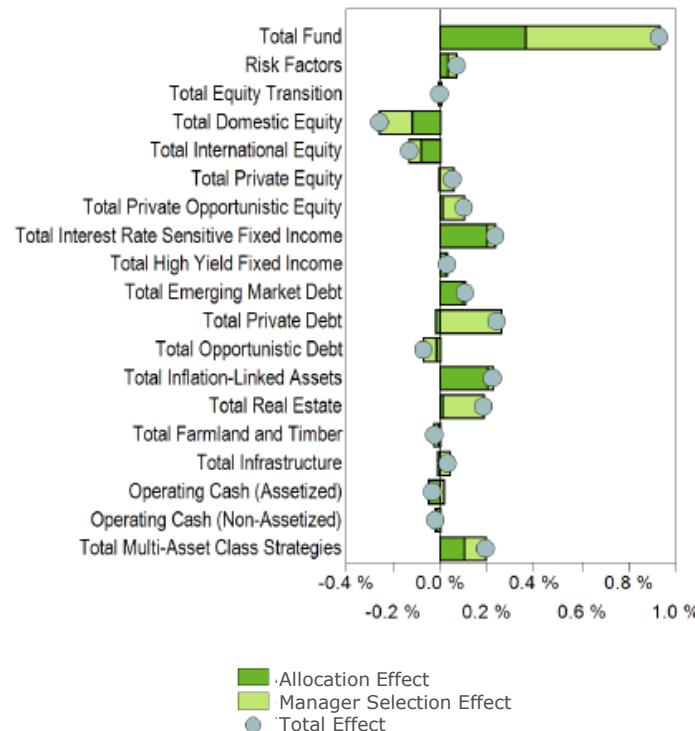
Manager Selection Effect: Measures the impact of over/under performance of asset classes in the portfolio relative to the asset class benchmarks in the Interim SAAP benchmark. [$\text{Weight Asset Class Benchmark} \times (\text{Return Portfolio Asset Class} - \text{Return Asset Class in Interim Policy Index})$] **+ Interaction Effect:** Measures the impact of over/under weighting decisions and over/under performance. ($\text{Return Asset Class Portfolio} (\text{Weight Asset Class Portfolio} - \text{Weight Asset Class Policy Index}) - (\text{Return Asset Class Index} (\text{Weight Asset Class Portfolio} - \text{Weight Asset Class Index}))$)

Residual: Contribution to excess return not captured in Allocation Effect and Manager Selection Effect.



TOTAL FUND ATTRIBUTION DETAIL

Attribution Effects 5 Years Ending June 30, 2018



5 Year Excess Return: +0.92%

- Allocation Effect: (+0.37%)
 - Public Markets Fixed Income tactical underweight (+0.33%)
 - Inflation-Linked Assets tactical underweight (+0.20%)
 - Multi-Asset Class Strategies underweight (+0.11%)
 - Domestic Equity underweight (-0.12%)
 - International Equity underweight (-0.08%)
 - Assetized Cash overweight (-0.05%)
 - Operating Cash (Non-Assetized) (-0.02%)
- Manager Selection Effect: (+0.56%)
 - Private Debt outperformed due to various managers (+0.26%)
 - Real Estate outperformed due to various managers (+0.17%)
 - Opportunistic Equity outperformed (+0.09%)
 - Multi-Asset Class Strategies outperformed (+0.09%)
 - Private Equity outperformed (+0.06%)
 - Risk Factor outperformed (+0.04%)
 - Domestic Equity underperformed (-0.14%)
 - Farmland and Timber underperformed (-0.01%)
- Residual: (-0.01%)

The Brinson-Fachler Attribution model explains excess return by identifying the size of contributors or detractors from excess return based on the three effects defined below:

Allocation Effect: Measures the impact of the decision to over/under weight asset classes relative to Interim SAAP benchmark weights. ($\text{Return Asset Class Index} - \text{Total Interim Policy Index Return} \times (\text{Weight Asset Class Portfolio} - \text{Weight Asset Class Interim Policy Index})$).

Manager Selection Effect: Measures the impact of over/under performance of asset classes in the portfolio relative to the asset class benchmarks in the Interim SAAP benchmark. [$\text{Weight Asset Class Benchmark} \times (\text{Return Portfolio Asset Class} - \text{Return Asset Class in Interim Policy Index})$] + **Interaction Effect:** Measures the impact of over/under weighting decisions and over/under performance. ($\text{Return Asset Class Portfolio} (\text{Weight Asset Class Portfolio} - \text{Weight Asset Class Policy Index}) - (\text{Return Asset Class Index} (\text{Weight Asset Class Portfolio} - \text{Weight Asset Class Index}))$).

Residual: Contribution to excess return not captured in Allocation Effect and Manager Selection Effect.



ASSET CLASS PERFORMANCE VS. BENCHMARK – PUBLIC MARKETS

- Objective #3: Achieve one- and three-year rolling annual net rates of return for ASRS strategic asset classes that are equal to or greater than their respective strategic asset class benchmarks.

	1 Year Return	3 Year Return
ASRS Total Domestic and Int'l Equity ¹	11.0%	8.7%
ASRS Custom Total Equity Benchmark	11.5%	9.0%
Excess Return	-0.5%	-0.3%
ASRS Domestic Equity	14.0%	11.5%
ASRS Custom Domestic Equity Benchmark	15.0%	12.1%
Excess Return	-1.0%	-0.6%
ASRS International Equity	7.7%	5.2%
ASRS Custom Int'l Equity Benchmark	7.6%	5.5%
Excess Return	0.1%	-0.3%
ASRS Public Markets Fixed Income	-0.1%	2.6%
ASRS Custom Fixed Income Benchmark	0.1%	2.6%
Excess Return	-0.2%	0.0%
ASRS Inflation-Linked	13.0%	-3.0%
ASRS Custom Inflation-Linked Benchmark	7.4%	-4.5%
Excess Return	5.7%	1.5%
ASRS Multi-Asset Class Strategies	7.3%	0.9%
ASRS Multi-Asset Class Strategies Benchmark	1.3%	0.3%
Excess Return	6.0%	0.6%

¹Performance of ASRS Total Domestic and Int'l Equity includes the performance of the ASRS Domestic Equity and ASRS International Equity asset classes and the Equity Risk Factor Portfolio with an inception date of 6/1/2013.

Note: Composition of ASRS Custom Asset Class Benchmarks can be found in the appendix.



**Goal Met:
Partially**

ASSET CLASS PERFORMANCE VS. BENCHMARK – PRIVATE MARKETS

- Objective #3: Achieve one- and three-year rolling annual net rates of return for ASRS strategic asset classes that are equal to or greater than their respective strategic asset class benchmarks.

	1 Year Return	3 Year Return	IRR Since Inception	Inception Date
ASRS Private Equity	14.6%	12.2%	12.1%	Oct-07
Russell 2000	10.4%	8.1%	12.5%	
Excess Return	4.2%	4.1%	-0.4%	
ASRS Private Opportunistic Equity ²	3.3%	9.5%	20.8%	Apr-11
ASRS Private Debt	10.4%	10.8%	11.2%	Jul-12
S&P/LSTA Leveraged Loan Index + 250 bps	7.1%	7.4%	7.2%	
Excess Return	3.3%	3.4%	4.0%	
ASRS Opportunistic Debt ²	6.1%	5.7%	9.4%	Jan-08
ASRS Real Estate	7.6%	10.9%	8.4%	Oct-05
NFI - ODCE Index	6.7%	9.4%	7.2%	
Excess Return	0.9%	1.5%	1.2%	
ASRS Farmland and Timber	2.2%	2.6%	2.9%	Jul-13
CPI ex-Food and Energy + 350 bps	5.7%	5.7%	5.6%	
Excess Return	-3.5%	-3.1%	-2.7%	
ASRS Total Infrastructure	21.9%	13.7%	11.7%	Dec-14
CPI ex-Food and Energy + 350 bps	5.7%	5.7%	5.6%	
Excess Return	16.2%	8.0%	6.1%	

¹Performance of private markets portfolios and corresponding benchmarks is reported on a one quarter lag on an IRR basis. Performance shown as of March 31, 2018.

²Net absolute rate of return expectations range from 10-14% per annum.

Note: Due to the drawdown nature of private markets portfolios in which the investment managers call capital over time, dollar-weighted performance, or internal rate of return (IRR), is a more appropriate measure of the performance of ASRS private markets portfolios. Numbers represent point to point IRRs.



**Goal Met:
Partially**

CASH MANAGEMENT

- Objective #4: Ensure sufficient monies are available to meet pension benefits, health insurance, member refunds, administrative payments, and other cash flow requirements.

Month	External CFs	Last day of the Month Ending Balance*
Jun - 17	(\$78.0)	\$58.4
Jul - 17	(\$173.1)	\$369.5
Aug - 17	(\$143.8)	\$93.9
Sep - 17	(\$88.6)	\$115.6
Oct - 17	(\$105.9)	\$383.9
Nov - 17	(\$110.4)	\$127.1
Dec - 17	(\$85.5)	\$861.3
Jan - 18	(\$112.4)	\$596.4
Feb - 18	(\$111.6)	\$672.6
Mar - 18	(\$81.6)	\$545.4
Apr - 18	(\$117.5)	\$377.8
May - 18	(\$77.8)	\$978.1
Jun - 18	(\$79.1)	\$474.7

*Includes assetized & unassetized cash balances (Inception of 1/26/15); represents monies to be used for funding needs that occur in subsequent month(s). Generally, monthly pension payments occur on the first day of month.

**Goal Met:
Yes**



TOTAL FUND RISK STATISTICS VS. PEER UNIVERSE

Total Fund vs. InvestorForce Public DB > \$1B Net (USD) (peer)

1 Year



Note: The information contained herein is for comparison purposes only and is not a Total Fund benchmark. Peer universe comparisons are subject to several limitations, including: peer groups are not comprehensive; several funds are included in multiple peer groups; peer groups are constructed using net of fee returns; and survivorship bias in that poorly performing funds may no longer report results.

Universes are constructed using net of fee returns; therefore, ASRS rank is based on net of fee returns.

Rankings are from highest (1) to lowest (100) in the InvestorForce Public Funds > \$1 Billion Net Universe.

The InvestorForce Public Funds > \$1 Billion Net Universe contains 52 observations for the period ending June 30, 2018, with total assets of \$420 billion.

Composition of Interim SAA Policy can be found in the appendix.

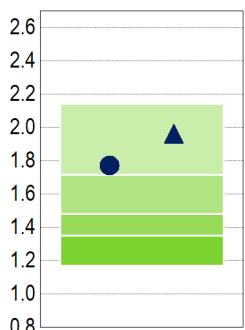
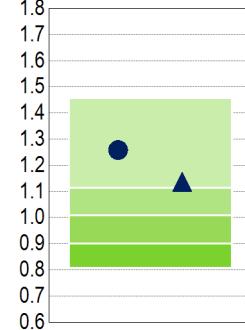
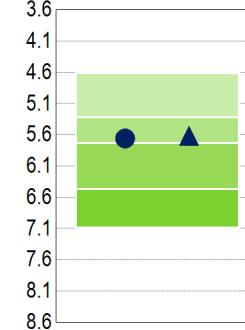
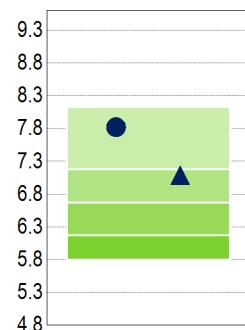


TOTAL FUND RISK STATISTICS VS. PEER UNIVERSE

Total Fund vs. InvestorForce Public DB > \$1B Net (USD) (peer)

3 Year

Anlzd Return	Anlzd Standard Deviation	Sharpe Ratio	Sortino Ratio
--------------	--------------------------	--------------	---------------



● Total Fund

Value 7.8
Rank 7

▲ Interim SAA Policy

Value 7.1
Rank 30

● Total Fund

Value 5.7
Rank 46

▲ Interim SAA Policy

Value 5.6
Rank 45

● Total Fund

Value 1.3
Rank 17

▲ Interim SAA Policy

Value 1.1
Rank 24

● Total Fund

Value 1.8
Rank 16

▲ Interim SAA Policy

Value 2.0
Rank 10

Universe

5th %tile 8.1
25th %tile 7.2
Median 6.7
75th %tile 6.2
95th %tile 5.8

Universe

5th %tile 4.6
25th %tile 5.3
Median 5.7
75th %tile 6.5
95th %tile 7.1

Universe

5th %tile 1.5
25th %tile 1.1
Median 1.0
75th %tile 0.9
95th %tile 0.8

Universe

5th %tile 2.1
25th %tile 1.7
Median 1.5
75th %tile 1.4
95th %tile 1.2

Note: The information contained herein is for comparison purposes only and is not a Total Fund benchmark. Peer universe comparisons are subject to several limitations, including: peer groups are not comprehensive; several funds are included in multiple peer groups; peer groups are constructed using net of fee returns; and survivorship bias in that poorly performing funds may no longer report results.

Universes are constructed using net of fee returns; therefore, ASRS rank is based on net of fee returns.

Rankings are from highest (1) to lowest (100) in the InvestorForce Public Funds > \$1 Billion Net Universe.

The InvestorForce Public Funds > \$1 Billion Net Universe contains 52 observations for the period ending June 30, 2018, with total assets of \$420 billion.

Composition of Interim SAA Policy can be found in the appendix.



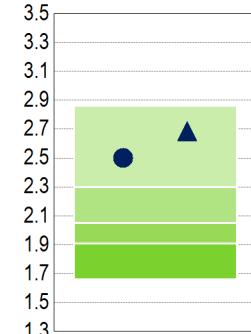
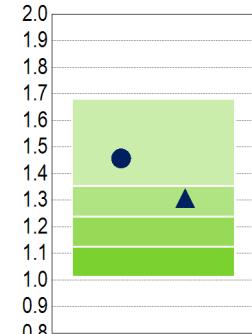
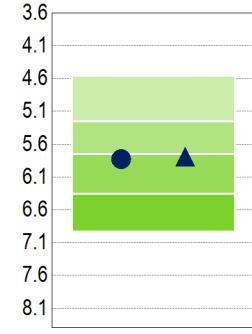
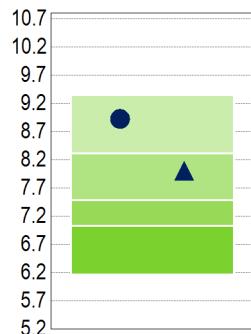
Arizona State Retirement System

TOTAL FUND RISK STATISTICS VS. PEER UNIVERSE

Total Fund vs. InvestorForce Public DB > \$1B Net (USD) (peer)

5 Year

Anlzd Return	Anlzd Standard Deviation	Sharpe Ratio	Sortino Ratio
--------------	--------------------------	--------------	---------------



● Total Fund

Value 8.9
Rank 8

▲ Interim SAA Policy

Value 8.0
Rank 40

● Total Fund

Value 5.8
Rank 57

▲ Interim SAA Policy

Value 5.8
Rank 57

● Total Fund

Value 1.5
Rank 20

▲ Interim SAA Policy

Value 1.3
Rank 33

● Total Fund

Value 2.5
Rank 17

▲ Interim SAA Policy

Value 2.7
Rank 9

Universe

5th %tile 9.3
25th %tile 8.3
Median 7.5
75th %tile 7.0
95th %tile 6.2

Universe

5th %tile 4.6
25th %tile 5.2
Median 5.7
75th %tile 6.3
95th %tile 6.9

Universe

5th %tile 1.7
25th %tile 1.4
Median 1.2
75th %tile 1.1
95th %tile 1.0

Universe

5th %tile 2.9
25th %tile 2.3
Median 2.1
75th %tile 1.9
95th %tile 1.7

Note: The information contained herein is for comparison purposes only and is not a Total Fund benchmark. Peer universe comparisons are subject to several limitations, including: peer groups are not comprehensive; several funds are included in multiple peer groups; peer groups are constructed using net of fee returns; and survivorship bias in that poorly performing funds may no longer report results.

Universes are constructed using net of fee returns; therefore, ASRS rank is based on net of fee returns.

Rankings are from highest (1) to lowest (100) in the InvestorForce Public Funds > \$1 Billion Net Universe.

The InvestorForce Public Funds > \$1 Billion Net Universe contains 52 observations for the period ending June 30, 2018, with total assets of \$420 billion.

Composition of Interim SAA Policy can be found in the appendix.

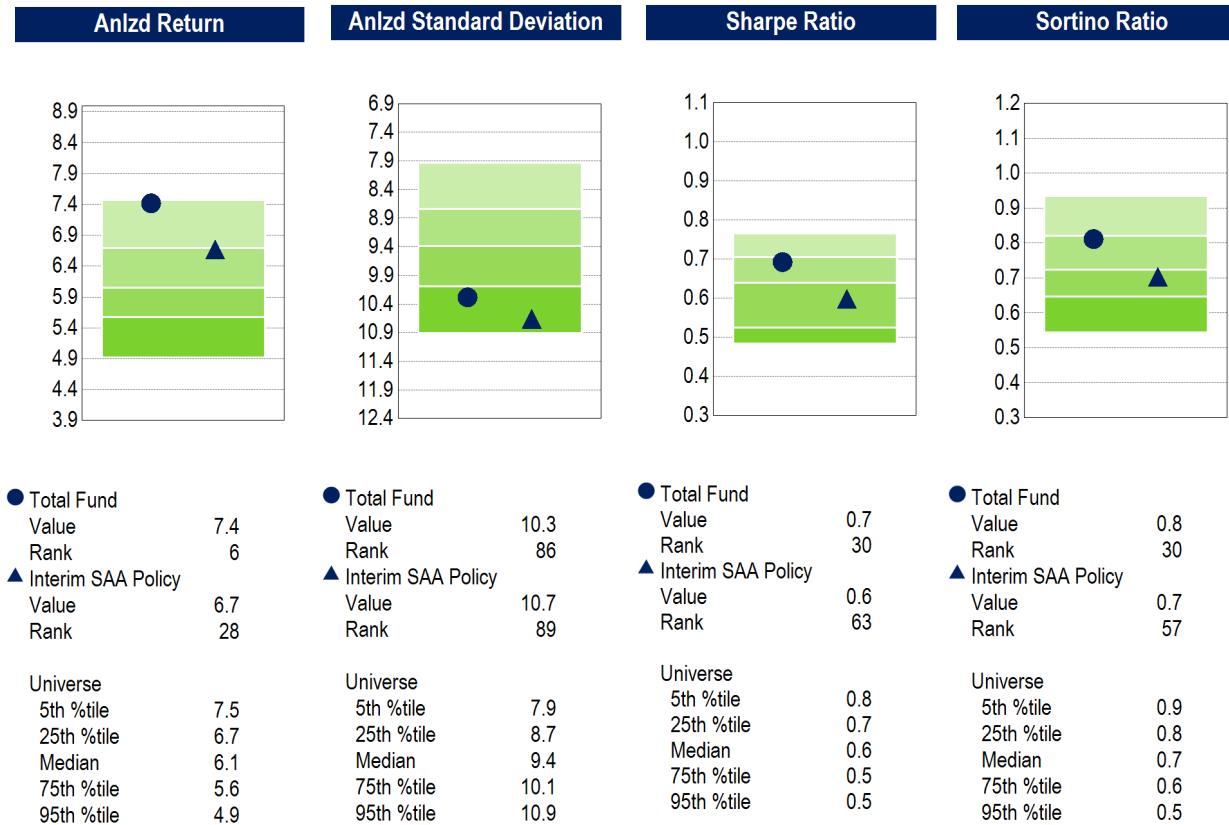


Arizona State Retirement System

TOTAL FUND RISK STATISTICS VS. PEER UNIVERSE

Total Fund vs. InvestorForce Public DB > \$1B Net (USD) (peer)

10 Year



Note: The information contained herein is for comparison purposes only and is not a Total Fund benchmark. Peer universe comparisons are subject to several limitations, including: peer groups are not comprehensive; several funds are included in multiple peer groups; peer groups are constructed using net of fee returns; and survivorship bias in that poorly performing funds may no longer report results.

Universes are constructed using net of fee returns; therefore, ASRS rank is based on net of fee returns.

Rankings are from highest (1) to lowest (100) in the InvestorForce Public Funds > \$1 Billion Net Universe.

The InvestorForce Public Funds > \$1 Billion Net Universe contains 52 observations for the period ending June 30, 2018, with total assets of \$420 billion.

Composition of Interim SAA Policy can be found in the appendix.



INDEPENDENT OVERSIGHT/COMPLIANCE

Note: All of the data shown on the following pages is as of June 30, 2018 and reflects the deduction of investment manager fees, unless otherwise noted.

NEPC, LLC

SAA POLICY COMPLIANCE

	<u>Current Allocation</u>	<u>Interim SAAP</u>	<u>Assets</u>	<u>Current Mkt Value</u>	<u>Current Allocation</u>	<u>Interim SAAP</u>	<u>Interim SAAP Difference</u>	<u>Policy Range</u>	<u>Within Range</u>	<u>SAAP</u>
Total Equity 56.2%	25.2%	26%	Total Domestic and International Equity	\$18,609,687,087	47.0%	50%	-3.0%			50%
			Domestic Equity ¹	\$9,998,544,637	25.2%	26%	-0.8%	16% - 36%	Yes	26%
			U.S. Large Cap	\$7,560,518,266	19.1%	20%	-0.9%			20%
			U.S. Mid Cap	\$1,243,301,995	3.1%	3%	0.1%			3%
			U.S. Small Cap	\$1,184,346,539	3.0%	3%	0.0%			3%
	21.7%	24%	Public Opportunistic Equity ³	\$10,377,832						
			International Equity ¹	\$8,609,774,728	21.7%	24%	-2.3%	14% - 34%	Yes	24%
			Developed Large Cap	\$6,093,992,139	15.4%	17%	-1.6%			17%
	8.6%	8%	Developed Small Cap	\$708,762,938	1.8%	2%	-0.2%			2%
			Emerging Markets	\$1,806,670,308	4.6%	5%	-0.4%			5%
Total Fixed Income 26.6%	0.7%	8%	Private Equity ²	\$3,405,399,217	8.6%	8%	0.6%	6% - 10%	Yes	8%
			Private Opportunistic Equity ^{2,3}	\$270,683,926	0.7%	0%	0.7%			0%
			Total Equity	\$22,285,770,230	56.2%	58%	-1.8%	48% - 65%	Yes	58%
			Public Markets Fixed Income ^{1,4}	\$4,165,772,053	10.5%	14%	-3.5%			13%
			Treasuries Long Duration	\$0	0.0%	0%	0.0%	0% - 10%	Yes	0%
	10.5%	14%	Interest Rate Sensitive ⁴	\$3,857,595,286	9.7%	12%	-2.3%			11%
			High Yield	\$308,176,767	0.8%	2%	-1.2%			2%
			Private Debt ²	\$4,698,066,511	11.9%	11%	0.9%	8% - 12%	Yes	12%
	11.9%	11%	Opportunistic Debt ^{2,3}	\$1,680,527,745	4.2%	0%	4.2%			0%
			Total Fixed Income	\$10,544,366,308	26.6%	25%	1.6%	18% - 35%	Yes	25%
			Commodities	\$240,822,256	0.6%	2%	-1.4%	0% - 4%	Yes	2%
			Real Estate ²	\$4,249,932,776	10.7%	10%	0.7%	8% - 12%	Yes	10%
			Infrastructure ²	\$378,117,145	1.0%	0%	1.0%	0% - 3%	Yes	0%
Total Inflation-Linked 12.8%	4.2%	2%	Farmland and Timber ²	\$189,668,246	0.5%	0%	0.5%	0% - 3%	Yes	0%
			Opportunistic Inflation-Linked ³	\$0	0.0%	0%	0.0%			0%
			Total Inflation-Linked	\$5,058,540,424	12.8%	12%	0.8%	10% - 16%	Yes	12%
			Multi-Asset Class Strategies	\$1,242,146,522	3.1%	5%	-1.9%	0% - 12%	Yes	5%
			Operating Cash (Non Assetized) ⁴	\$493,730,715	1.2%	0%				
			Total	\$39,624,554,200	100%	100%				100%

¹Domestic Equity, International Equity and Public Markets Fixed Income market values include residual values remaining in terminated manager accounts.

²Values shown for private markets portfolios include cash flows that occurred during 2Q 2018.

³Aggregate Opportunistic asset classes not to exceed 10%.

⁴Assetized Cash market value is allocated according to policy benchmark in Assetized Cash.

Note: Interim SAA Policy includes proration of 1% Private Debt which is unfunded.

Policy Ranges shown are relative to the long-term SAAP and may cause some asset classes to be out of range while implementation of the long-term SAAP is in process.

Market values include manager held cash.



Arizona State Retirement System

ASSET CLASS PERFORMANCE SUMMARY - PUBLIC MARKETS

	Market Value (\$)	% of Portfolio	3 Mo (%)	Rank	YTD (%)	Rank	1 Yr (%)	Rank	3 Yrs (%)	Rank	5 Yrs (%)	(%)	Rank	10 Yrs (%)	Rank	Inception (%)	Since
Total Fund	39,624,554,200	100.0	1.3	20	2.0	10	9.4	10	7.8	7	8.9	8	7.4	6	9.7	Jul-75	
Interim SAA Policy			0.9	40	1.1	30	8.4	33	7.1	30	8.0	40	6.7	28	9.4	Jul-75	
Over/Under			0.4		1.0		1.1		0.7		0.9		0.7		0.3		
InvestorForce Public DB > \$1B Net Median			0.6		0.6		8.0		6.7		7.5		6.1		--	Jul-75	
Total Domestic and International Equity	18,609,687,087	47.0	0.8	30	0.4	45	11.0	47	8.7	45	10.1	34	7.8	13	7.1	Jan-98	
ASRS Custom Total Equity Benchmark			0.9	30	0.2	49	11.5	43	9.0	27	10.5	11	7.8	14	6.6	Jan-98	
Over/Under			-0.1		0.2		-0.5		-0.3		-0.4		0.0		0.5		
InvestorForce Public DB > \$1 Billion Total Equity Net Median			0.5		0.1		10.9		8.5		9.8		6.8		6.3		
Total Domestic Equity	9,998,544,637	25.2	3.9	57	3.5	53	14.0	77	11.5	32	13.1	47	10.6	5	11.3	Jul-75	
ASRS Custom Domestic Equity Benchmark			4.1	32	3.5	47	15.0	38	12.1	14	13.5	14	10.6	5	11.4	Jul-75	
Over/Under			-0.2		0.0		-1.0		-0.6		-0.4		0.0		-0.1		
InvestorForce Public DB > \$1 Billion US Equity Net Median			4.0		3.5		14.8		11.2		13.0		9.9		--	Jul-75	
Total International Equity	8,609,774,728	21.7	-2.5	48	-3.0	31	7.7	50	5.2	83	6.4	73	3.1	60	6.1	Apr-87	
ASRS Custom Int'l Equity Benchmark			-2.7	50	-3.4	42	7.6	50	5.5	66	6.6	62	3.2	58	5.9	Apr-87	
Over/Under			0.2		0.4		0.2		-0.3		-0.2		-0.1		0.2		
InvestorForce Public DB > \$1 Billion Global ex-US Equity Net Median			-2.7		-3.6		7.6		6.0		6.7		3.3		--	Apr-87	
Total Public Markets Fixed Income	4,165,772,053	10.5	-0.1	34	-1.5	71	-0.1	89	2.6	69	2.7	67	4.3	73	7.9	Jan-00	
ASRS Custom Public Markets Fixed Income Benchmark			0.0	14	-1.4	65	0.1	85	2.6	69	2.3	82	3.8	98	--	Jul-75	
Over/Under			-0.1		-0.1		-0.2		0.0		0.4		0.5				
InvestorForce Public DB > \$1 Billion Fixed Income Net Median			-0.6		-1.0		0.8		3.1		2.9		5.1		--	Jul-75	
Total Inflation-Linked Assets	240,822,256	0.6	2.0	46	1.8	53	13.0	5	-3.0	99	-5.2	99	--	--	-3.1	Feb-10	
ASRS Custom Inflation-Linked Benchmark			0.4	91	0.0	81	7.4	50	-4.5	99	-6.4	99	--		-4.8	Feb-10	
Over/Under			1.6		1.8		5.6		1.5		1.2				1.7		
InvestorForce Public DB > \$1 Billion Real Assets/Commodities Net Median			1.8		2.3		7.3		4.4		6.2				5.5	Feb-10	
Total Multi-Asset Class Strategies	1,242,146,522	3.1	1.0	--	4.5	--	7.3	--	0.9	--	4.9	--	6.5	--	6.4	Jan-04	
Multi-Asset Class Strategies Custom Benchmark			0.4	--	0.8	--	1.3	--	0.3	--	3.7	--	4.5	--	5.1	Jan-04	
Over/Under			0.6		3.7		6.0		0.6		1.2		2.0		1.3		
InvestorForce Public DB > \$1 Billion Global Tactical Net Median			--		--		--		--		--		--		--	Jan-04	
Operating Cash (Assetized)	493,726,435	1.2	0.5	--	0.9	--	8.4	--	3.4	--	--	--	--	--	4.1	Feb-15	
ASRS Cash Assetization Custom Benchmark			0.5	--	0.6	--	8.0	--	1.3	--	--	--	--	--	2.0	Feb-15	
Over/Under			0.0		0.3		0.4		2.1						2.1		

¹Performance of ASRS Total Domestic and International Equity includes the performance of the ASRS Domestic and International Equity asset classes and the Equity Risk Factor Portfolio with an inception date of 6/1/2013. NEPC began calculating Total Domestic and International Equity performance in January 2009. Monthly performance data from January 1998 - December 2008 was provided by State Street.

Note: Performance, ranks and medians are based on net of fee performance data. Rankings are from highest (1) to lowest (100) in the eVestment Universe.

Universe shown for Total Public Markets Fixed Income includes all U.S. fixed income strategies and does not accurately represent the exposures of the ASRS Public Markets Fixed Income allocation, which has included allocations ranging from 10% - 25% to emerging markets debt historically.

Composition of Interim SAA Policy and ASRS Custom Asset Class Benchmarks can be found in the appendix.



Source: State Street

Arizona State Retirement System

ASSET CLASS PERFORMANCE SUMMARY - PRIVATE MARKETS

	Market Value (\$)	% of Portfolio	3 Mo (%)	1 Yr (%)	3 Yrs (%)	5 Yrs (%)	Inception (%)	Since
Total Fund	39,624,554,200	100.0	1.3	9.4	7.8	8.9	9.7	Jul-75
Interim SAA Policy			0.9	8.4	7.1	8.0	9.4	Jul-75
Over/Under			0.4	1.1	0.7	0.9	0.3	
Actual Benchmark			0.6	8.0	6.7	7.5	--	Jul-75
Total Private Equity	3,473,738,187	8.8	2.1	14.6	12.2	12.6	12.1	Oct-07
Russell 2000 1 QTR Lagged			-1.8	10.4	8.1	11.3	12.5	Oct-07
Over/Under			3.9	4.2	4.1	1.3	-0.4	
Total Private Opportunistic Equity¹	282,984,850	0.7	-0.3	3.3	9.5	19.3	20.8	Apr-11
			-	-	-	-	-	
Total Private Debt	4,651,378,142	11.7	3.3	10.4	10.8	11.0	11.2	Jul-12
S&P LSTA/Leveraged Loan Index + 2.5%			2.1	7.1	7.4	7.1	7.2	Jul-12
Over/Under			1.2	3.3	3.4	3.9	4.0	
Total Opportunistic Debt¹	1,637,282,781	4.1	0.5	6.1	5.7	6.6	9.4	Jan-08
			-	-	-	-	-	
Total Real Estate	3,644,699,581	9.2	2.0	7.6	10.9	11.9	8.4	Oct-05
NCREIF ODCE 1 QTR Lagged (net)			1.9	6.7	9.4	10.5	7.2	Oct-05
Over/Under			0.1	0.9	1.5	1.4	1.2	
Total Farmland and Timber	189,668,246	0.5	-0.1	2.2	2.6	--	2.9	Jul-13
CPI Less Food & Energy 1 Qtr Lagged + 350 Bps			1.6	5.7	5.7	--	5.6	Jul-13
Over/Under			-1.7	-3.5	-3.1	--	-2.7	
Total Infrastructure	378,117,145	1.0	8.6	21.9	13.7	--	11.7	Dec-14
CPI Less Food & Energy 1 Qtr Lagged + 350 Bps			1.6	5.7	5.7	--	5.6	Dec-14
Over/Under			7.0	16.3	8.0	--	6.1	

¹Net absolute rate of return expectations range from 10-14% per annum.

Note: Performance in private markets asset classes is based on net of fee dollar-weighted performance data.

Due to the drawdown nature of private markets portfolios in which the investment managers call capital over time, dollar-weighted performance, or internal rate of return (IRR), is a more appropriate measure of the performance of ASRS private markets portfolios.

Performance of private markets portfolios and corresponding benchmarks is reported on a one quarter lag. Performance shown as of March 31, 2018. Performance data and market values provided by State Street.

Prior to 3Q 2012, performance of the Total Private Debt and Total Opportunistic Debt asset classes was reported in aggregate. Effective 6/30/2012, the Fund's allocations to Private Debt and Opportunistic Debt were separated and will be reported separately going forward.

Composition of Interim SAA Policy can be found in the appendix.



Source: State Street

Arizona State Retirement System

PUBLIC MARKET ASSET CLASS ANALYSIS

	3 Years Ending June 30, 2018												
	% of Tot	Anlzd Ret	Rank	Anlzd Std Dev	Rank	Tracking Error	Rank	Info Ratio	Rank	Anlzd AJ	Rank	Beta	Sharpe Ratio
Total Domestic and International Equity	47.0%	8.7%	45	10.2%	39	0.6%	6	-0.6	79	0.0%	55	1.0	0.8
ASRS Custom Total Equity Benchmark	--	9.0%	27	10.6%	90	--	--	--	--	--	55	--	0.8
Total Domestic Equity	25.2%	11.5%	32	9.9%	4	0.6%	10	-1.0	91	-0.2%	40	1.0	1.1
ASRS Custom Domestic Equity Benchmark	--	12.1%	14	10.3%	34	--	--	--	--	--	23	--	1.1
Total International Equity	21.7%	5.2%	83	12.0%	80	0.9%	3	-0.3	94	-0.2%	85	1.0	0.4
ASRS Custom Int'l Equity Benchmark	--	5.5%	66	12.3%	85	--	--	--	--	--	80	--	0.4
Total Public Markets Fixed Income	10.5%	2.6%	69	2.6%	34	0.8%	9	0.0	92	0.2%	90	0.9	0.7
ASRS Custom Public Markets Fixed Income Benchmark	--	2.6%	69	2.7%	38	--	--	--	--	--	93	--	0.7
Total Inflation-Linked Assets	0.6%	-3.0%	99	12.2%	93	2.3%	8	0.7	29	1.7%	81	1.0	-0.3
ASRS Custom Inflation-Linked Benchmark	--	-4.5%	99	11.7%	79	--	--	--	--	--	99	--	-0.4
Total Multi-Asset Class Strategies	3.1%	0.9%	89	6.8%	53	6.5%	52	0.1	89	2.2%	78	4.9	0.0
Multi-Asset Class Strategies Custom Benchmark	--	0.3%	90	0.7%	1	--	--	--	--	--	91	--	-0.6

Note: Performance is reported net of fees.

Underlying composites do not add up to 100% because the chart excludes private market composites.

Ranks for statistics shown above are based on the respective universe against which the portfolio is ranked on the asset class performance summary that precedes this section of the analysis.

Rankings are from highest (1) to lowest (100) in the eVestment Universe.

Composition of Interim SAA Policy and ASRS Custom Benchmarks can be found in the appendix.



Arizona State Retirement System

PUBLIC MARKET ASSET CLASS ANALYSIS

	5 Years Ending June 30, 2018												
	% of Tot	Anlzd Ret	Rank	Anlzd Std Dev	Rank	Tracking Error	Rank	Info Ratio	Rank	Anlzd AJ	Rank	Beta	Sharpe Ratio
Total Domestic and International Equity	47.0%	10.1%	34	9.8%	46	0.5%	4	-0.6	82	-0.1%	61	1.0	1.0
ASRS Custom Total Equity Benchmark	--	10.5%	11	10.1%	65	--	--	--	--	--	53	--	1.0
Total Domestic Equity	25.2%	13.1%	47	9.8%	7	0.5%	8	-1.0	94	-0.2%	33	1.0	1.3
ASRS Custom Domestic Equity Benchmark	--	13.5%	14	10.0%	32	--	--	--	--	--	20	--	1.3
Total International Equity	21.7%	6.4%	73	11.5%	76	0.8%	2	-0.3	92	-0.1%	87	1.0	0.5
ASRS Custom Int'l Equity Benchmark	--	6.6%	62	11.7%	85	--	--	--	--	--	86	--	0.5
Total Public Markets Fixed Income	10.5%	2.7%	67	3.0%	58	0.7%	10	0.5	47	0.4%	70	1.0	0.8
ASRS Custom Public Markets Fixed Income Benchmark	--	2.3%	82	3.0%	60	--	--	--	--	--	99	--	0.6
Total Inflation-Linked Assets	0.6%	-5.2%	99	12.2%	88	2.4%	6	0.5	44	1.2%	81	1.0	-0.5
ASRS Custom Inflation-Linked Benchmark	--	-6.4%	99	11.9%	84	--	--	--	--	--	95	--	-0.6
Total Multi-Asset Class Strategies	3.1%	4.9%	46	7.2%	62	5.2%	37	0.2	45	0.5%	69	1.2	0.6
Multi-Asset Class Strategies Custom Benchmark	--	3.7%	58	4.3%	11	--	--	--	--	--	79	--	0.8

Note: Performance is reported net of fees.

Underlying composites do not add up to 100% because the chart excludes private market composites.

Ranks for statistics shown above are based on the respective universe against which the portfolio is ranked on the asset class performance summary that precedes this section of the analysis.

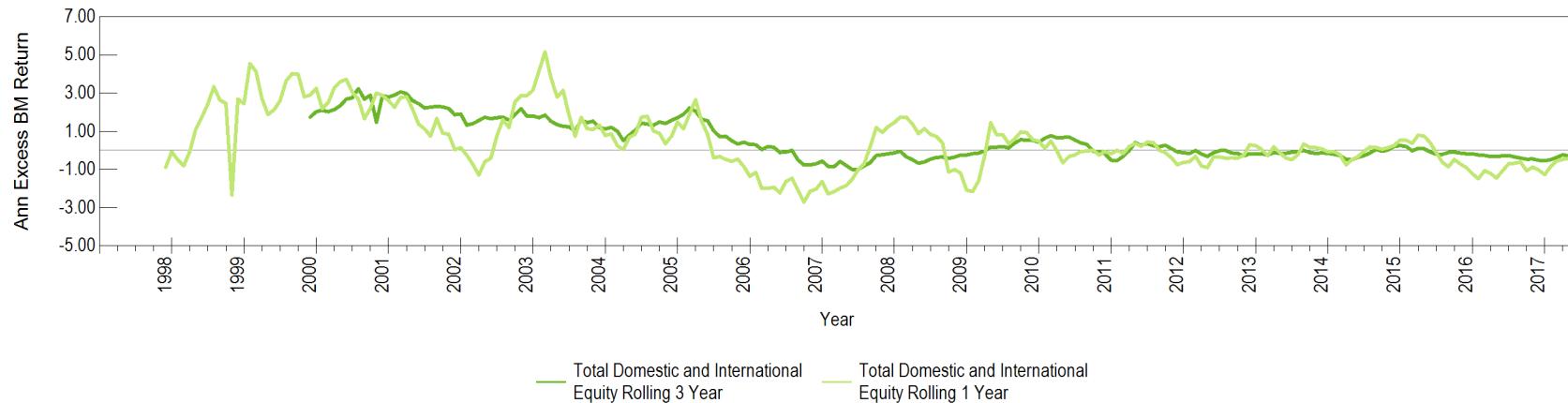
Rankings are from highest (1) to lowest (100) in the eVestment Universe.

Composition of Interim SAA Policy and ASRS Custom Benchmarks can be found in the appendix.

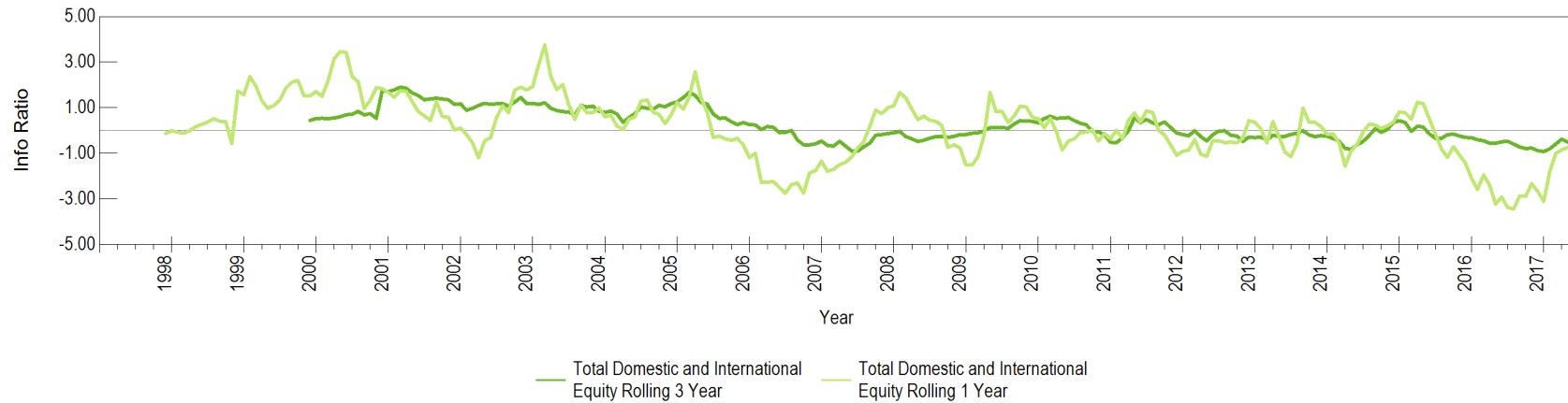


ASSET CLASS ANALYSIS - TOTAL DOMESTIC AND INTERNATIONAL EQUITY

Rolling Annual Excess Benchmark Return



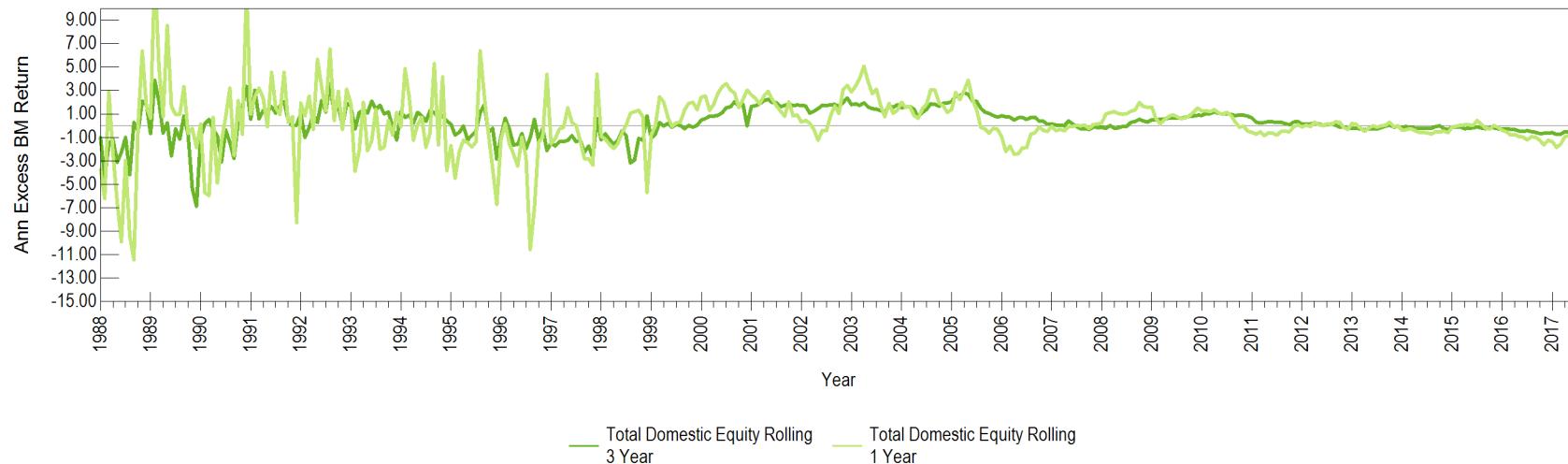
Rolling Information Ratio



Arizona State Retirement System

ASSET CLASS ANALYSIS - TOTAL DOMESTIC EQUITY

Rolling Annual Excess Benchmark Return

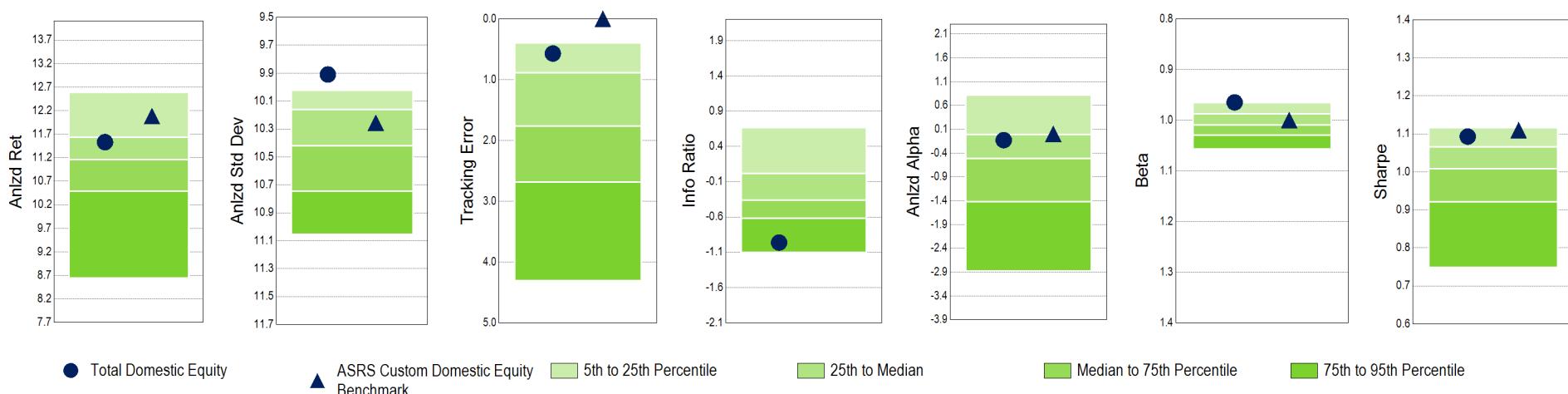
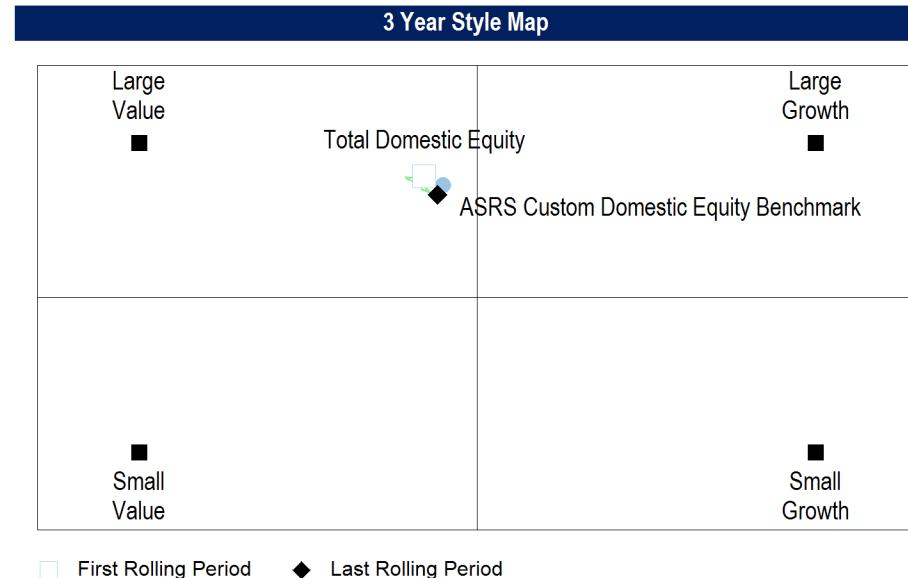
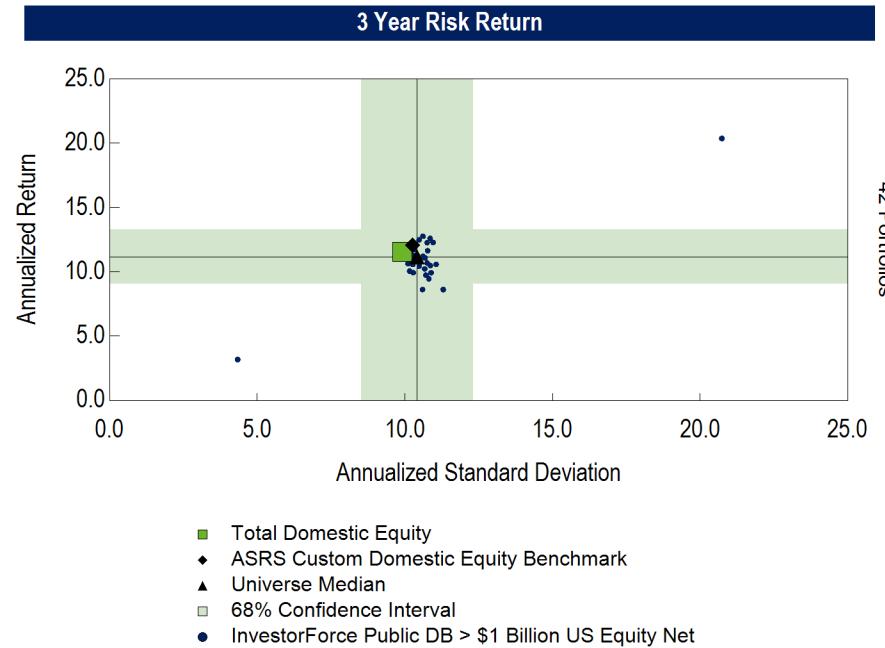


InvestorForce Public DB > \$1 Billion US Equity Net Accounts

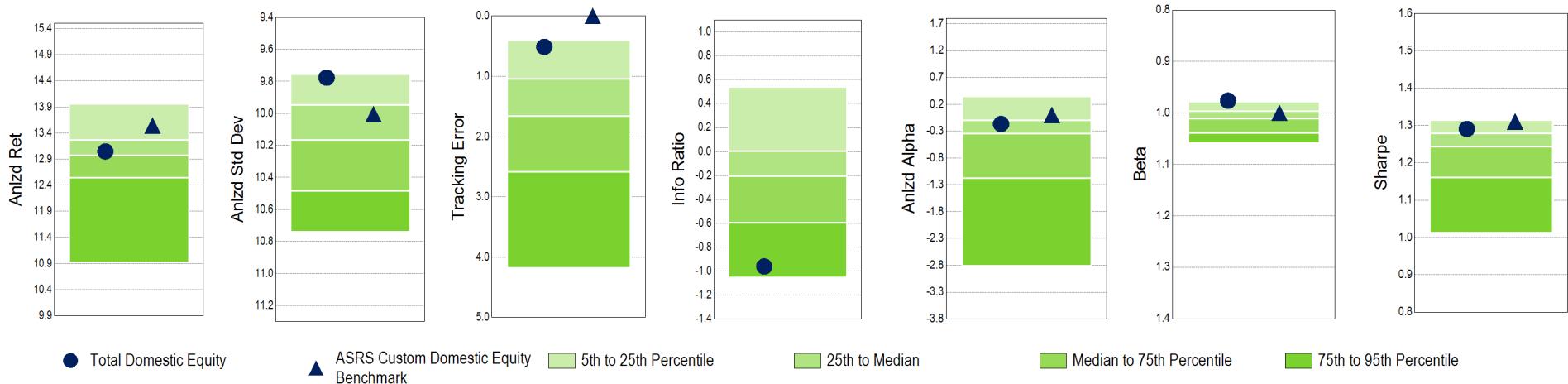
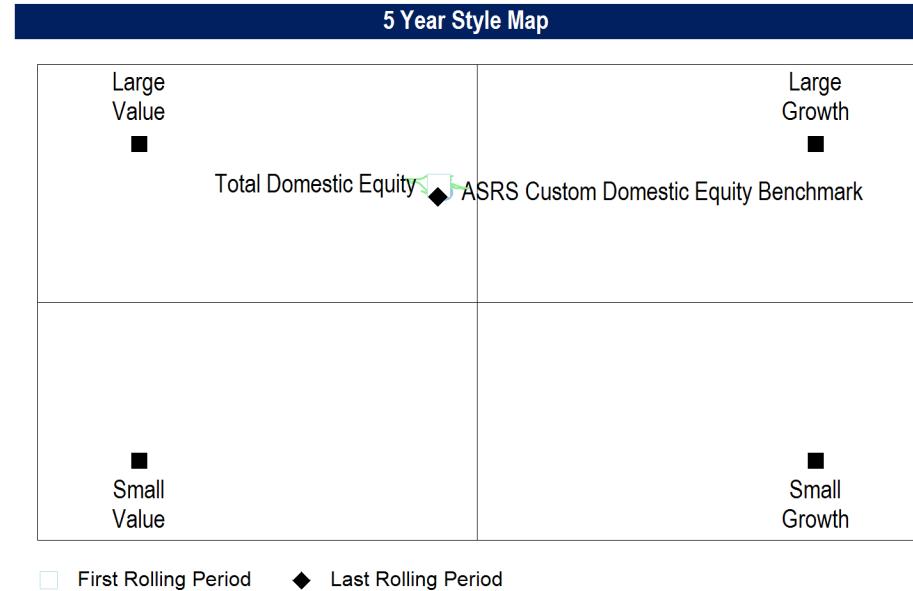
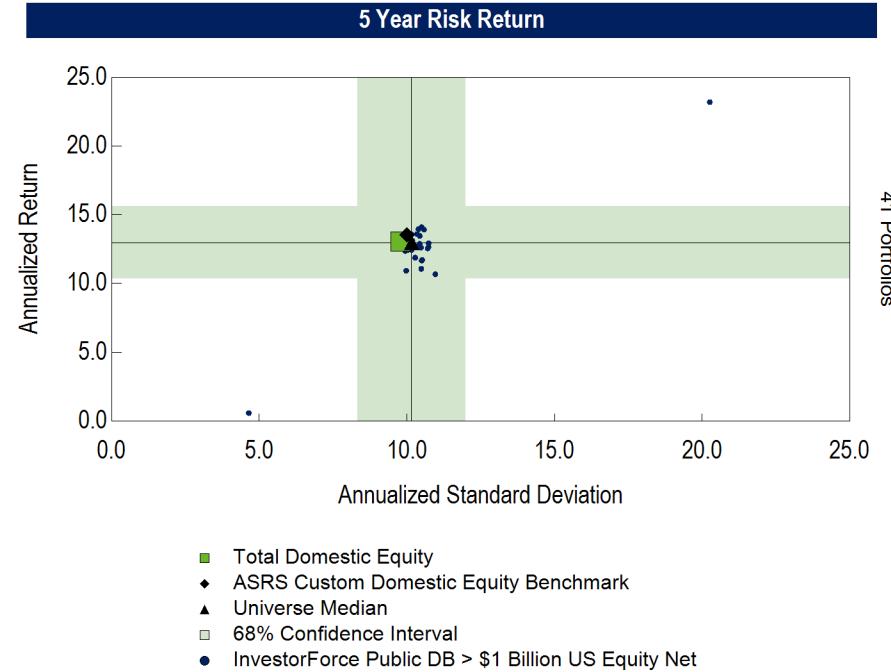


June 30, 2018

ASSET CLASS ANALYSIS - TOTAL DOMESTIC EQUITY

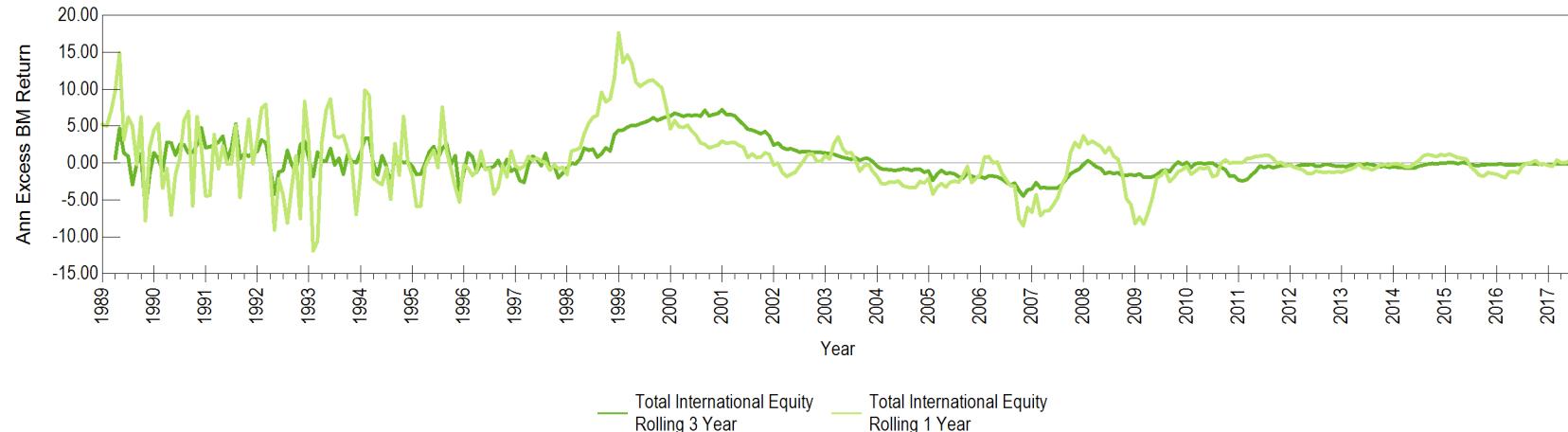


ASSET CLASS ANALYSIS - TOTAL DOMESTIC EQUITY

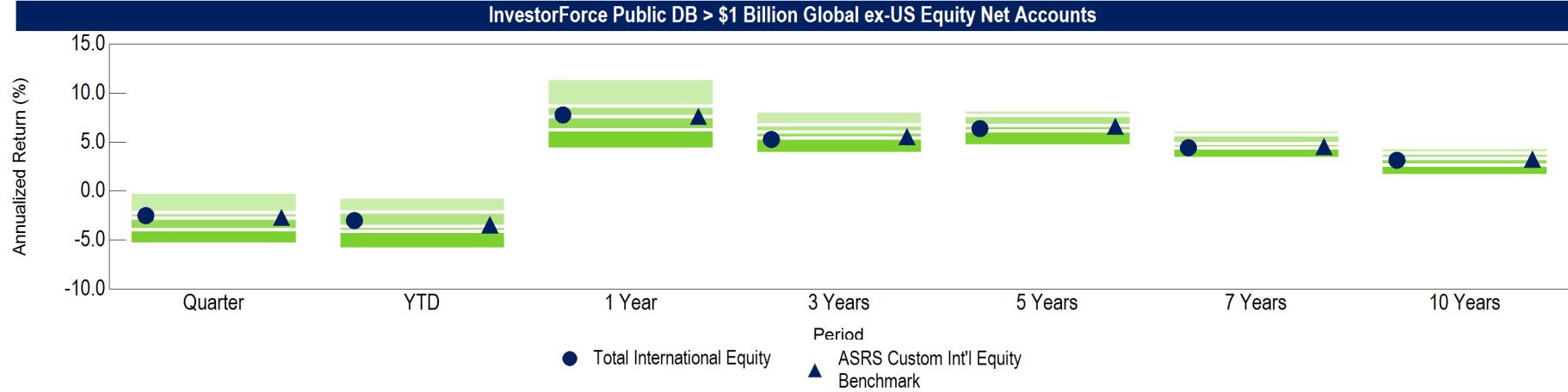


ASSET CLASS ANALYSIS - TOTAL INTERNATIONAL EQUITY

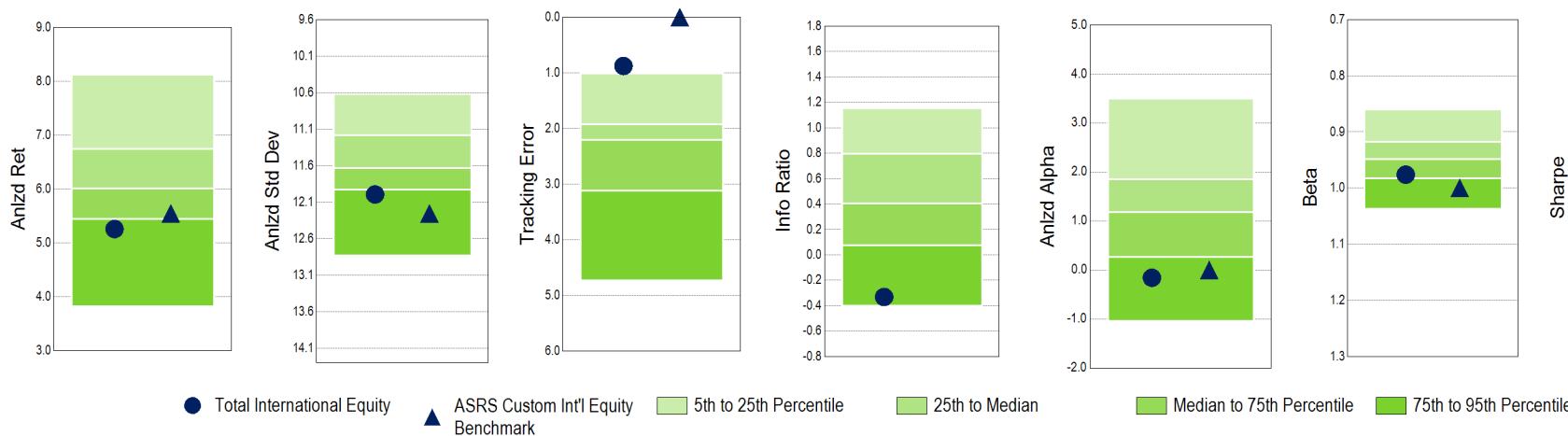
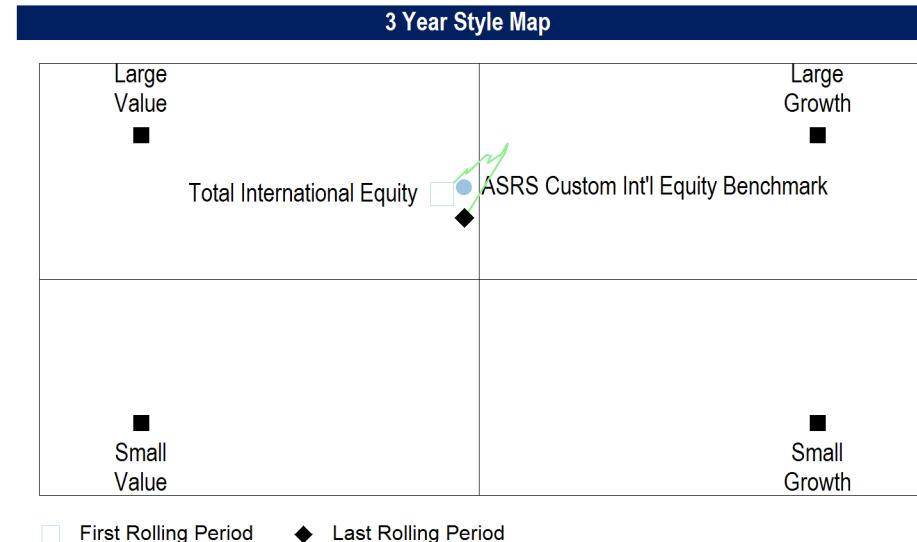
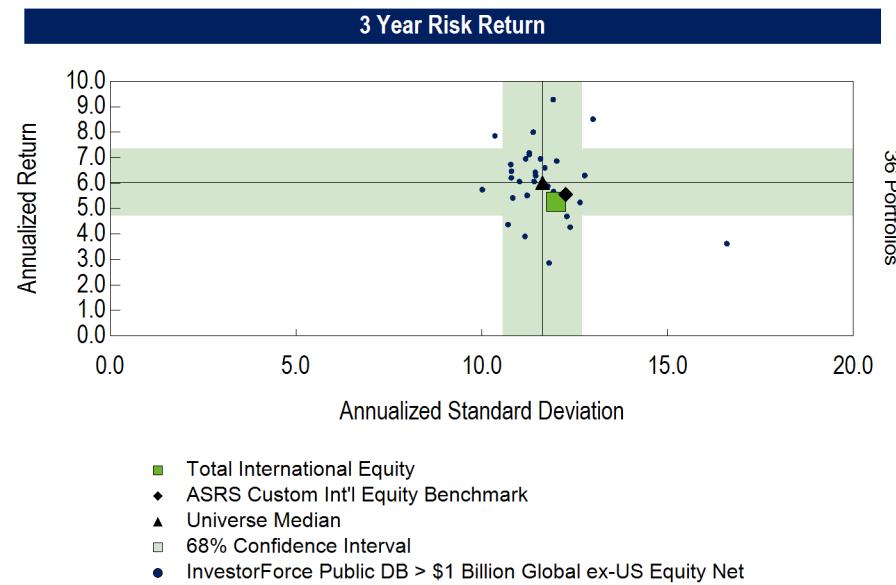
Rolling Annual Excess Benchmark Return



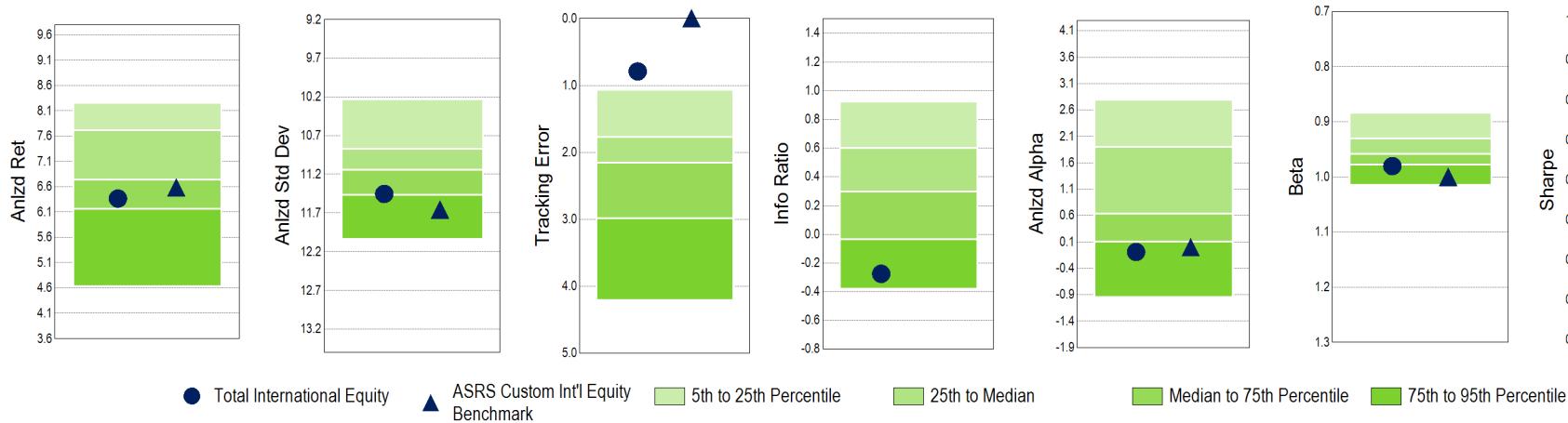
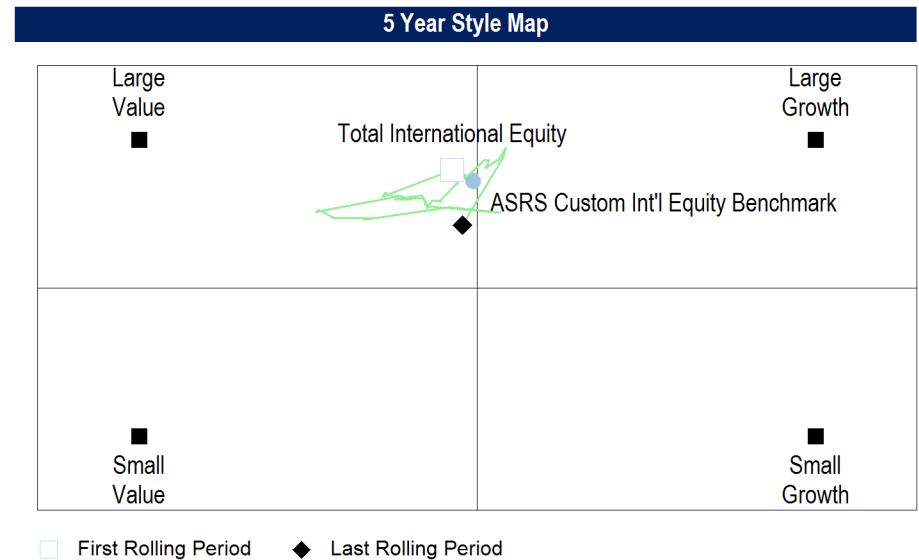
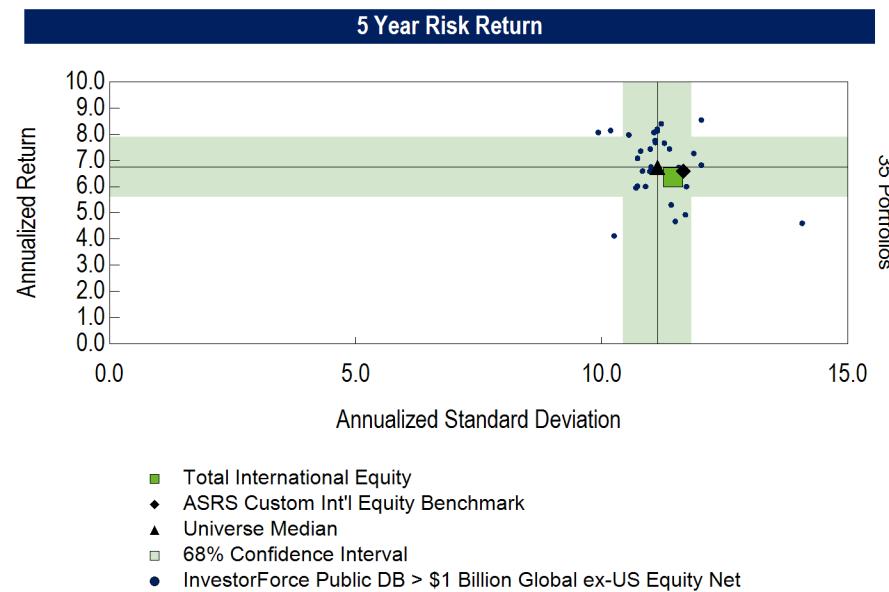
InvestorForce Public DB > \$1 Billion Global ex-US Equity Net Accounts



ASSET CLASS ANALYSIS - TOTAL INTERNATIONAL EQUITY

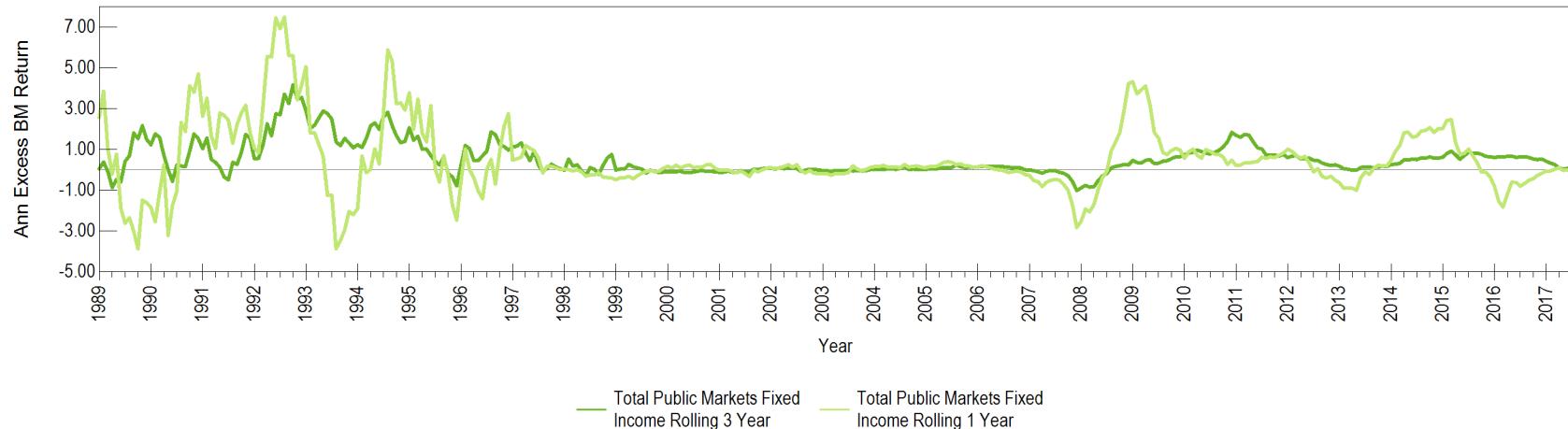


ASSET CLASS ANALYSIS - TOTAL INTERNATIONAL EQUITY

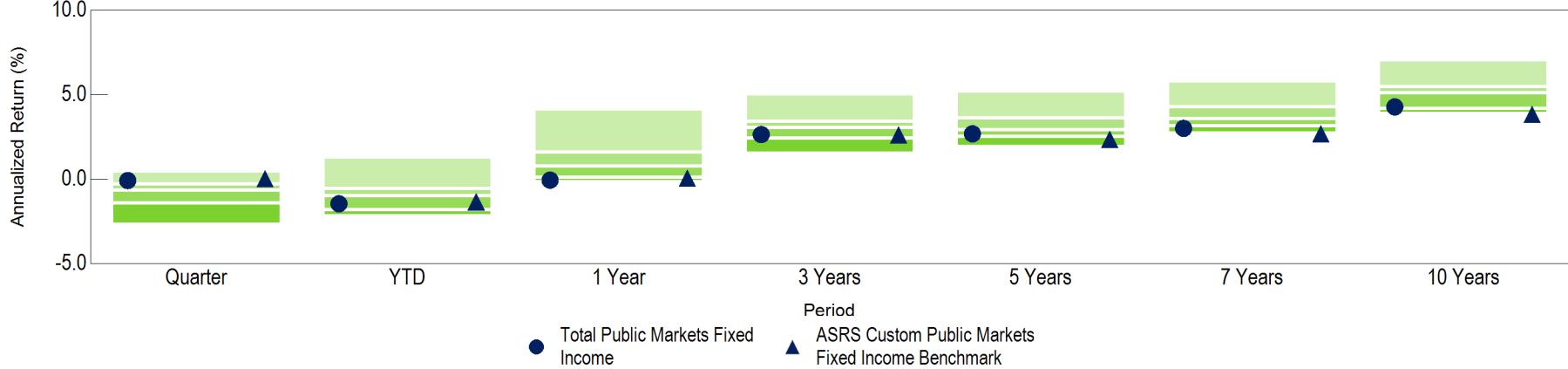


ASSET CLASS ANALYSIS - TOTAL PUBLIC MARKETS FIXED INCOME

Rolling Annual Excess Benchmark Return



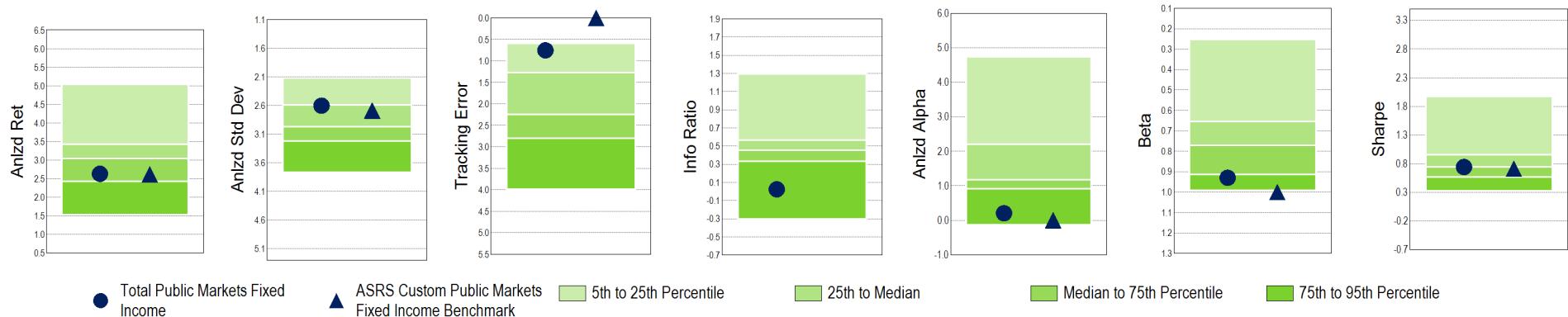
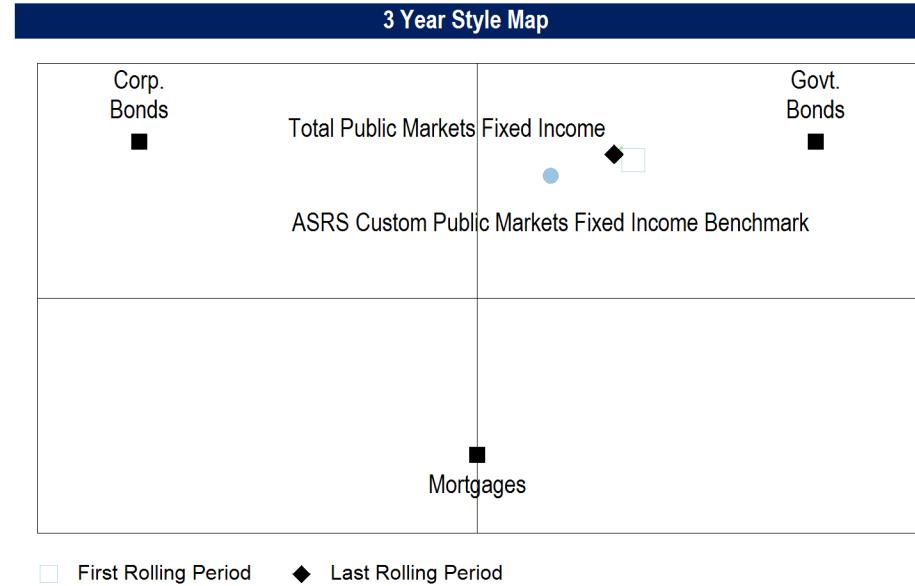
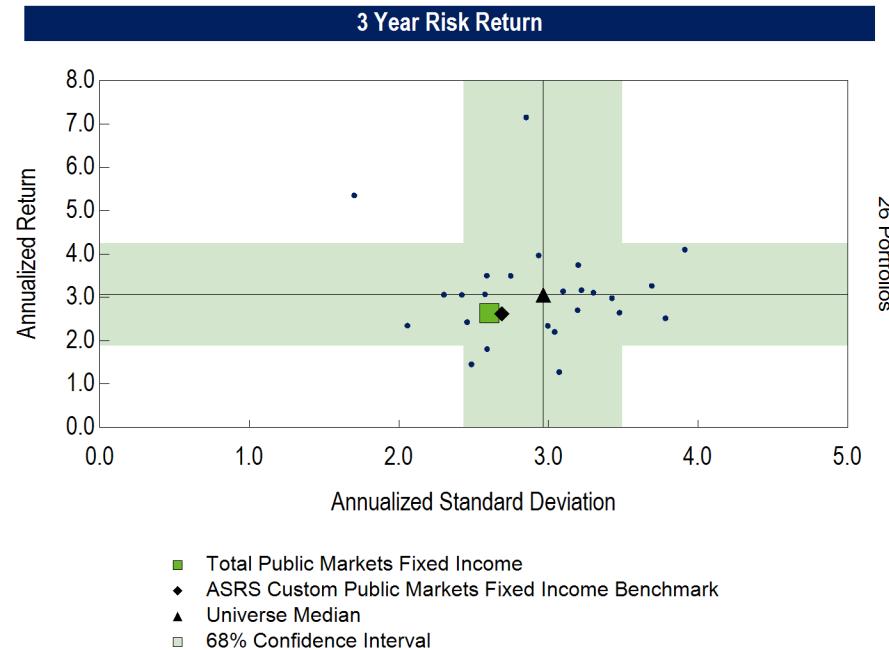
InvestorForce Public DB > \$1 Billion Fixed Income Net Accounts



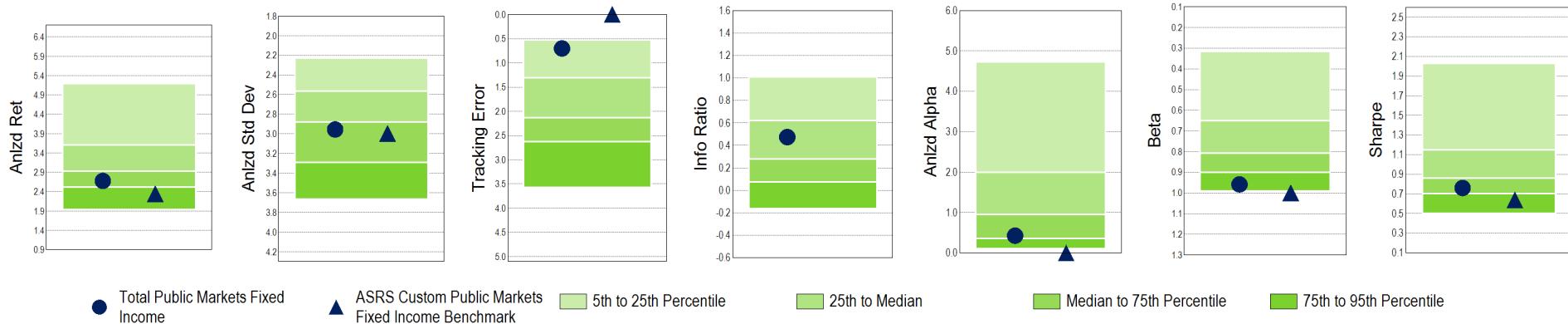
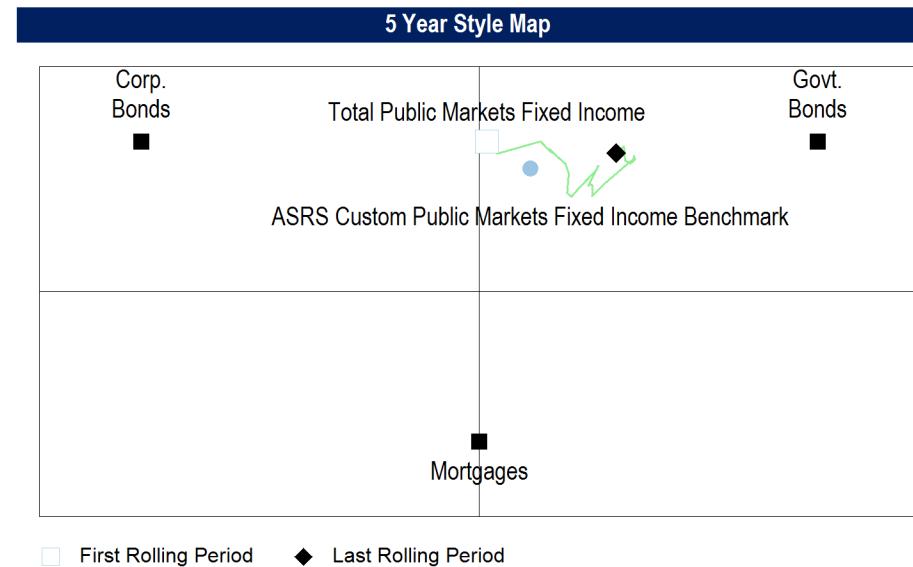
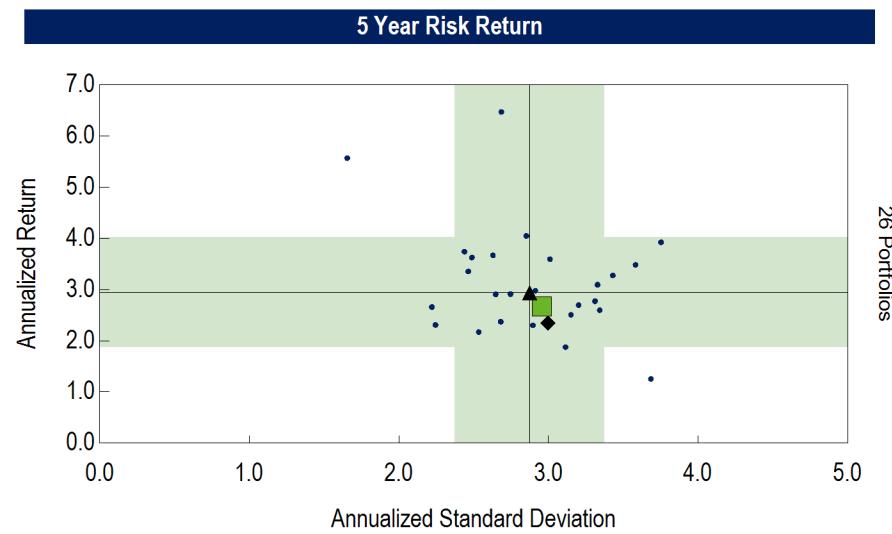
June 30, 2018

Arizona State Retirement System

ASSET CLASS ANALYSIS - TOTAL PUBLIC MARKETS FIXED INCOME



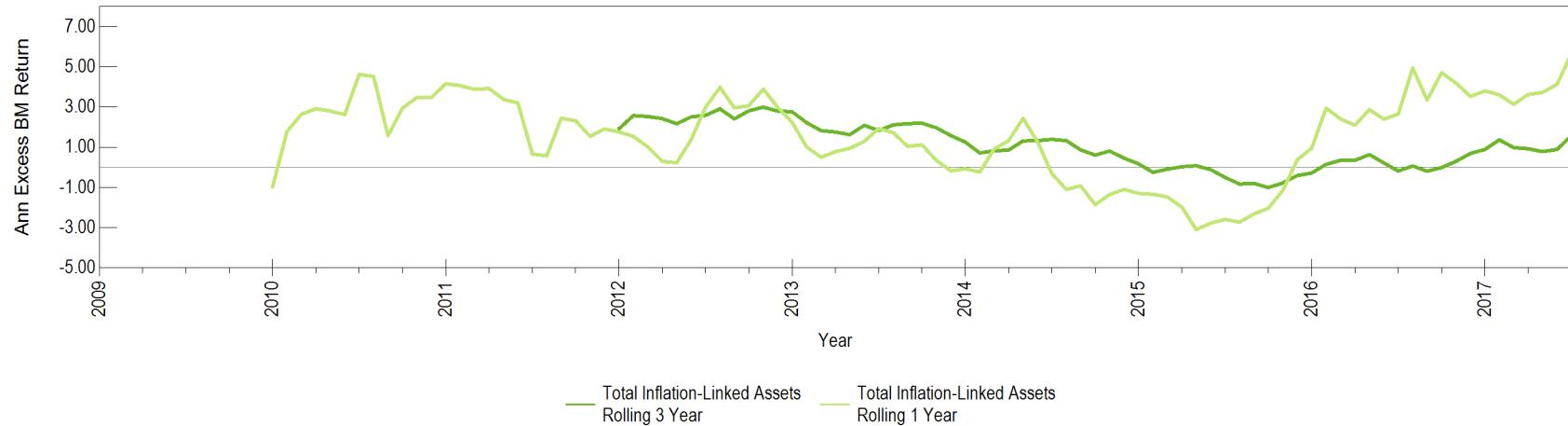
ASSET CLASS ANALYSIS - TOTAL PUBLIC MARKETS FIXED INCOME



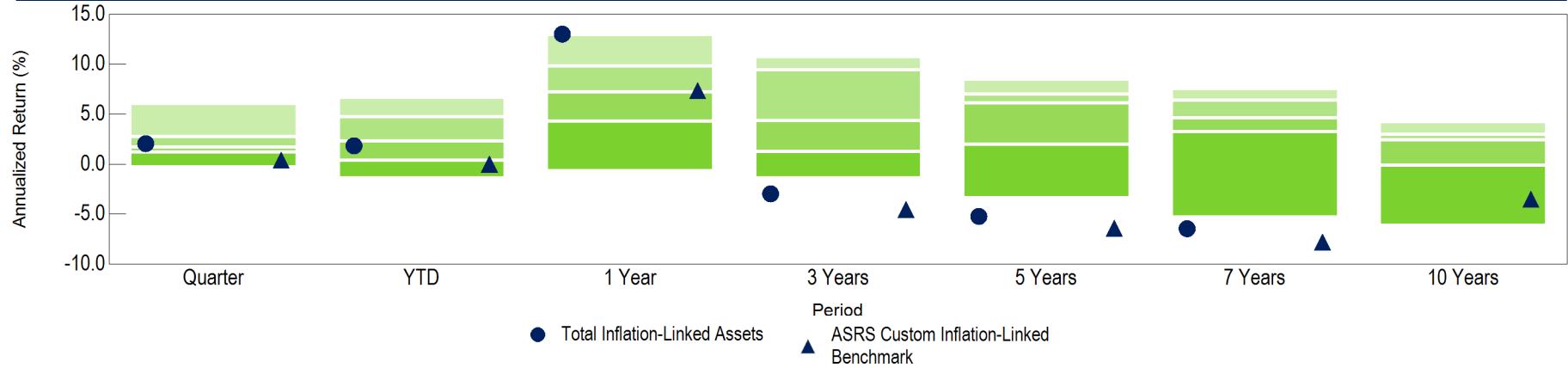
Arizona State Retirement System

ASSET CLASS ANALYSIS - TOTAL INFLATION-LINKED ASSETS

Rolling Annual Excess Benchmark Return

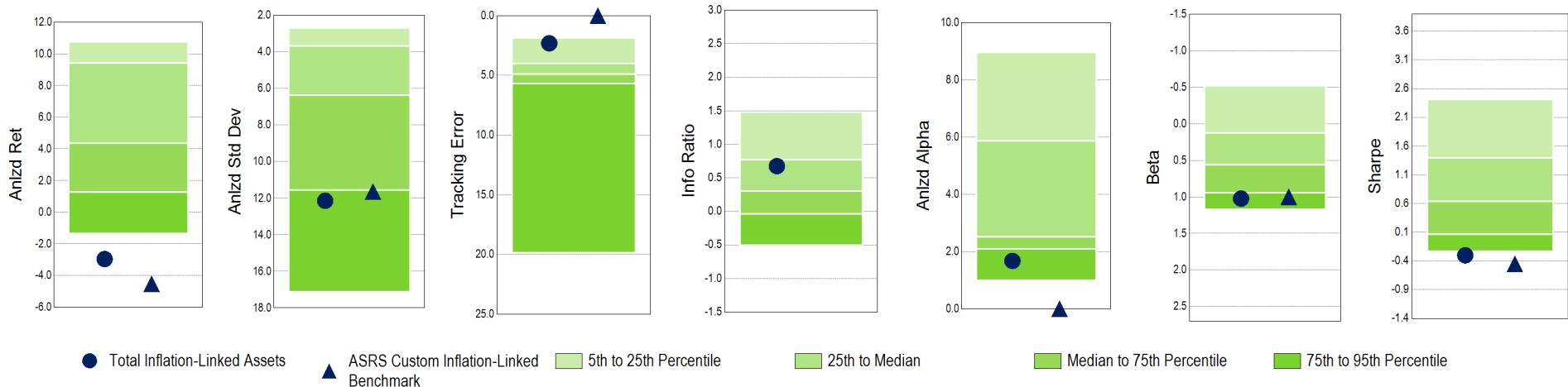
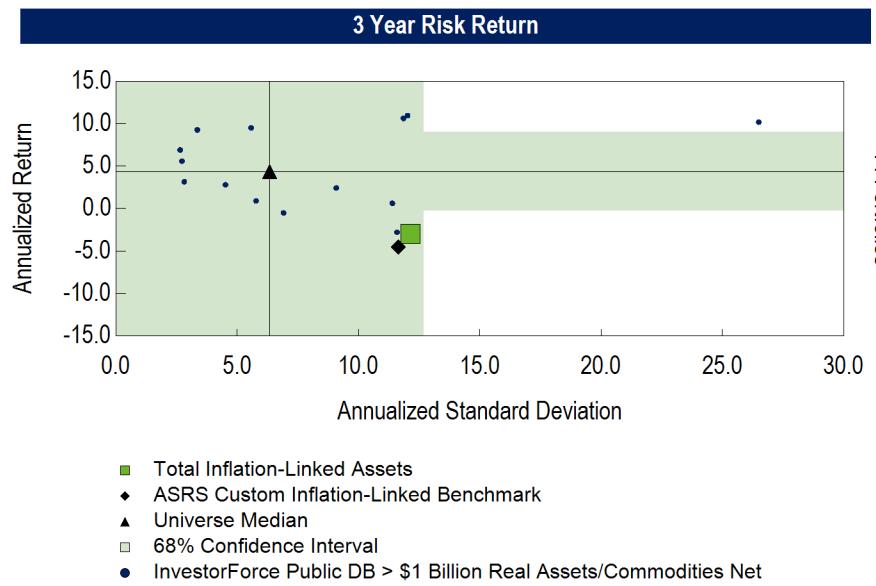


InvestorForce Public DB > \$1 Billion Real Assets/Commodities Net Accounts

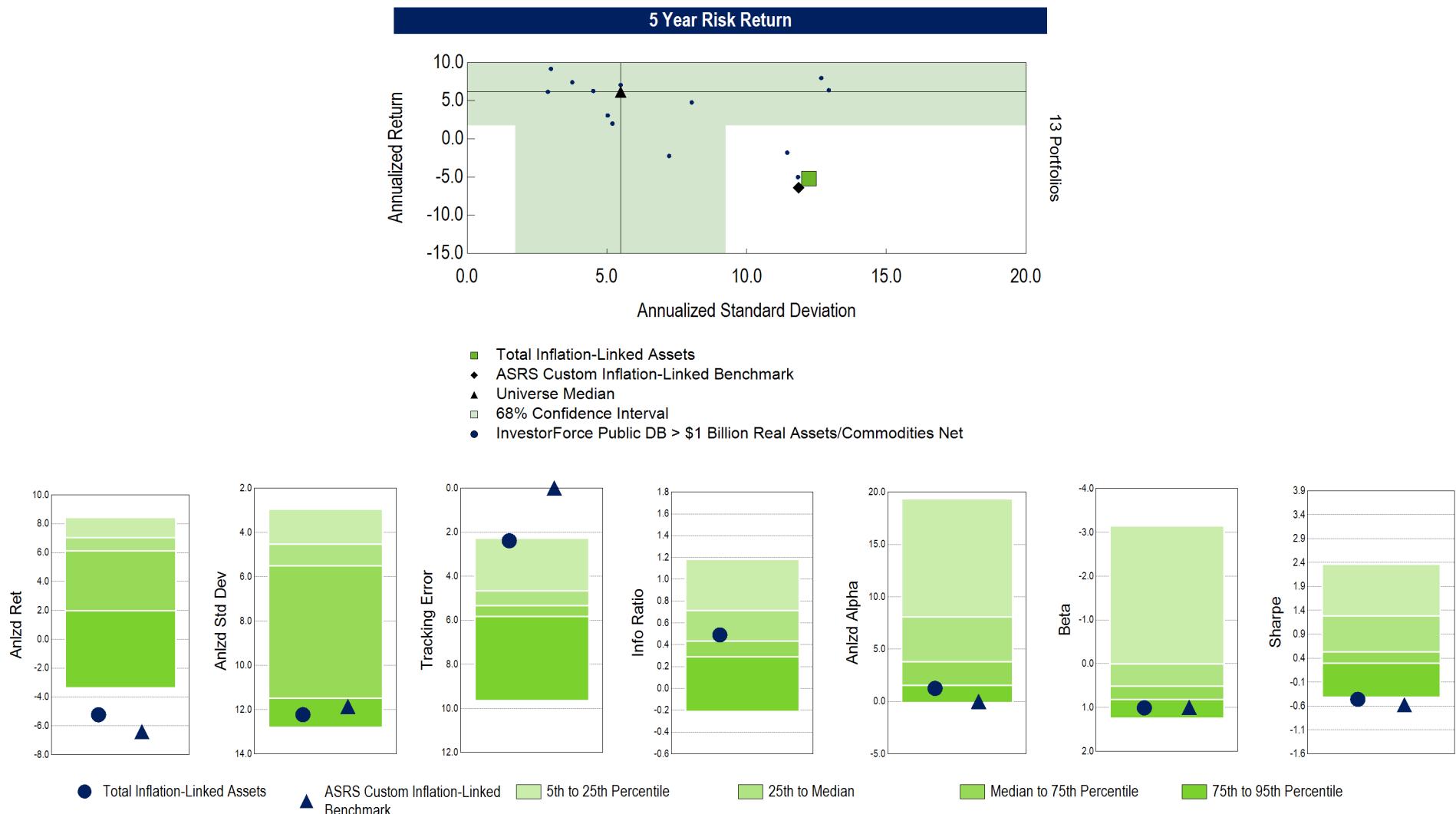


June 30, 2018

ASSET CLASS ANALYSIS - TOTAL INFLATION-LINKED ASSETS

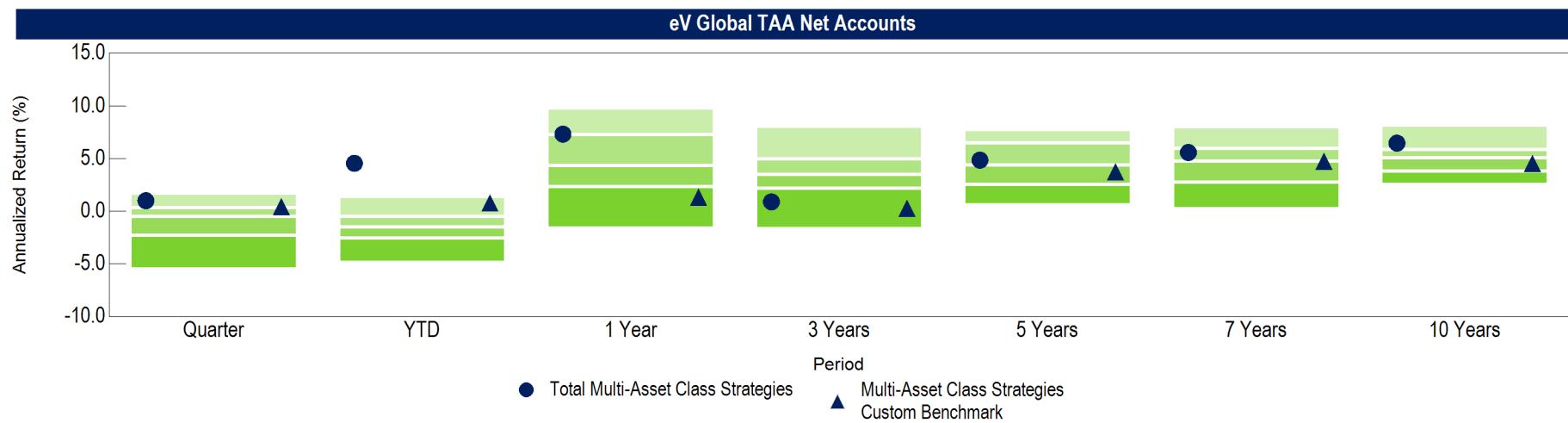
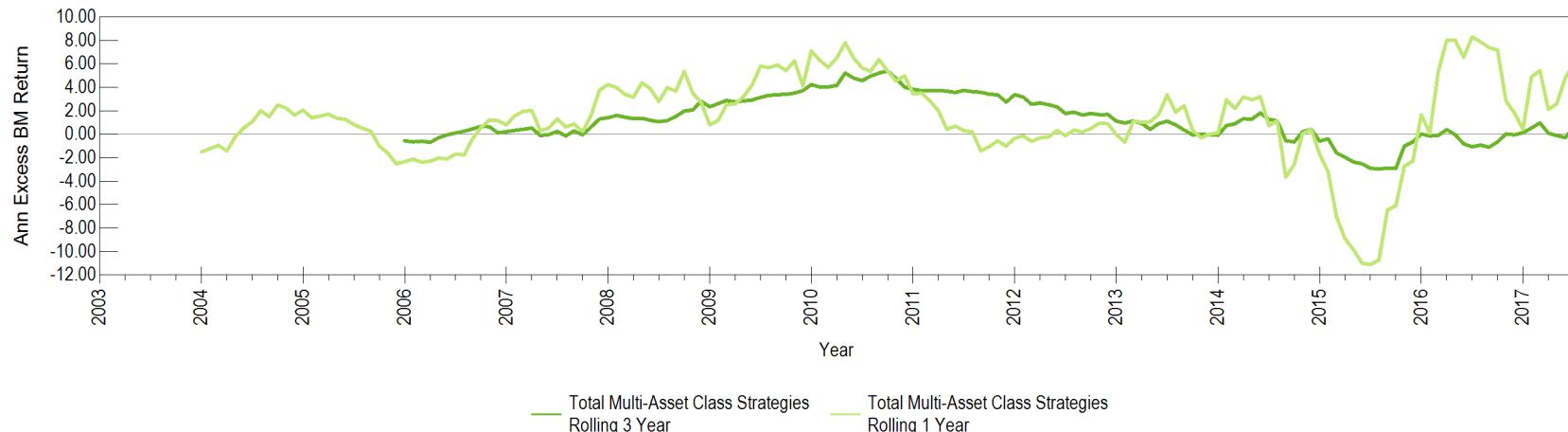


ASSET CLASS ANALYSIS - TOTAL INFLATION-LINKED ASSETS



ASSET CLASS ANALYSIS - TOTAL MULTI-ASSET CLASS STRATEGIES

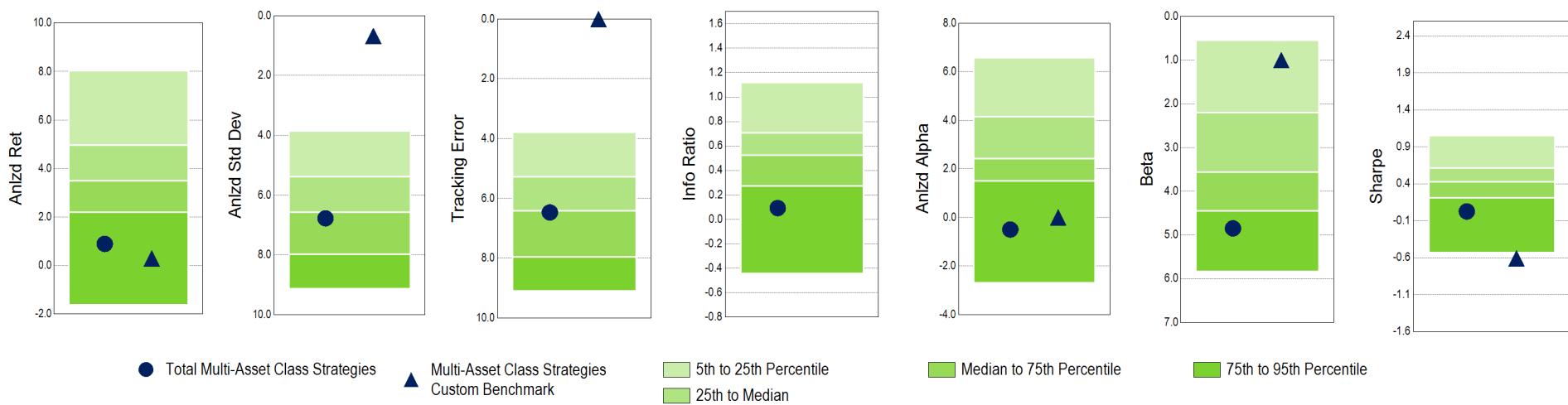
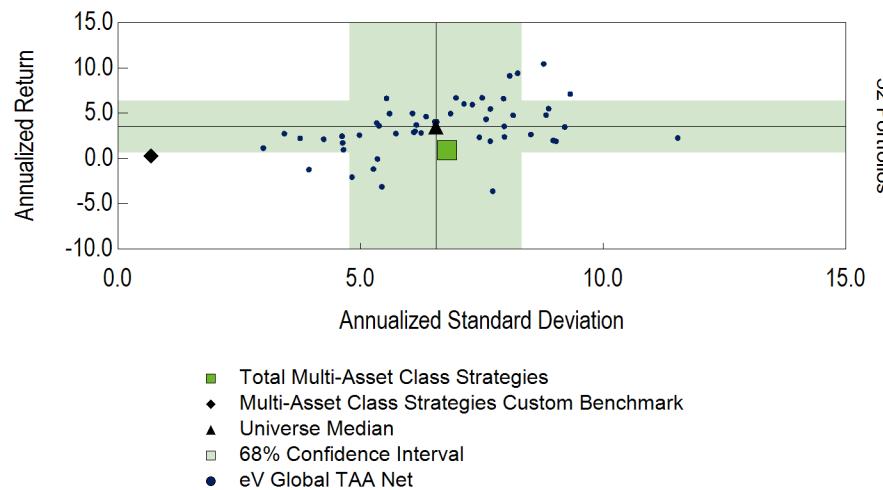
Rolling Annual Excess Benchmark Return



June 30, 2018

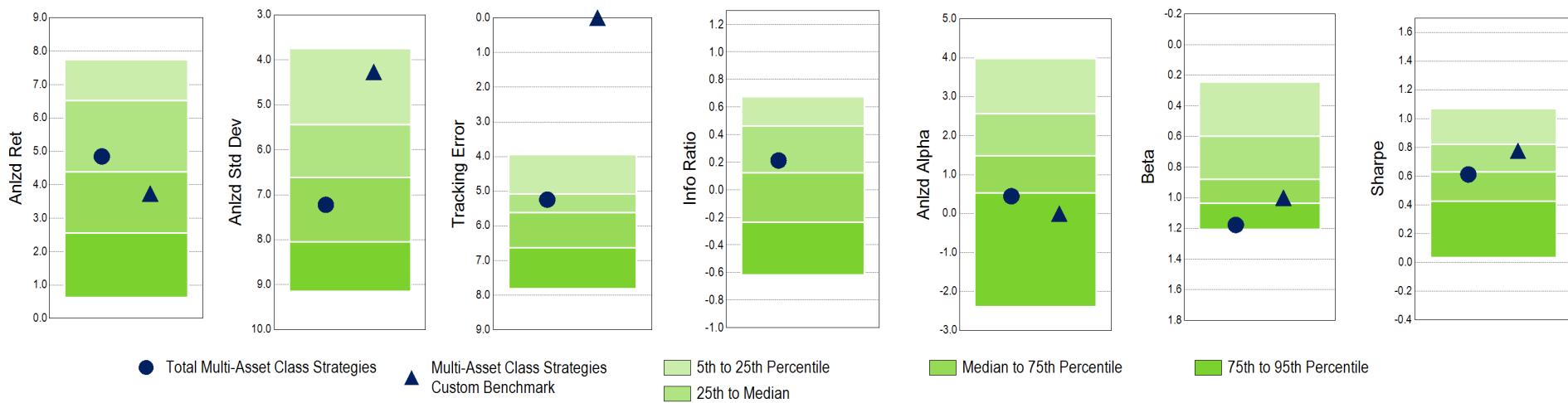
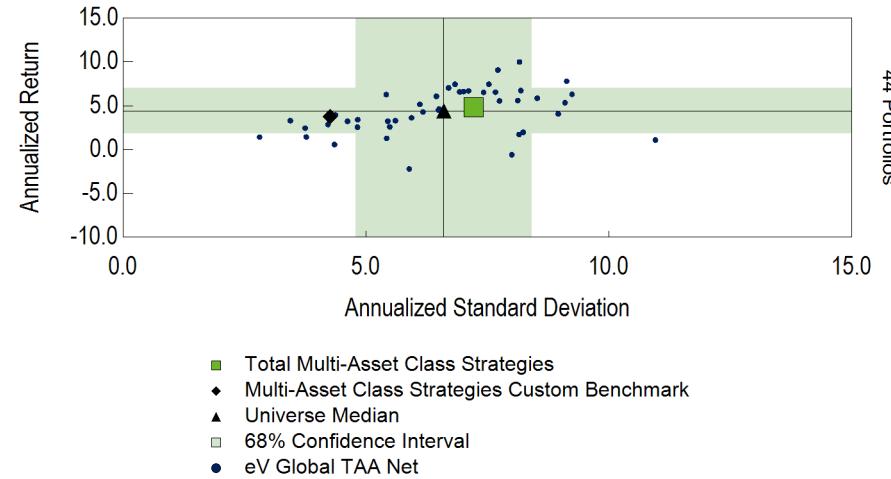
ASSET CLASS ANALYSIS - TOTAL MULTI-ASSET CLASS STRATEGIES

3 Years Ending June 30, 2018



ASSET CLASS ANALYSIS - TOTAL MULTI-ASSET CLASS STRATEGIES

5 Years Ending June 30, 2018



ASSET CLASS COMMITTEE MEETING

- **Three meetings have been held since the last time we provided an update on the ASRS Combined Asset Class Committee Meetings.**
- **June 19, 2018 – Combined Asset Class Committee**
 - Private Equity manager recommendation (\$16mm)
 - Staff recommendation to participate in a follow-on investment with an existing investment manager
 - Due diligence process was followed in accordance with SIP 006 – Investment Manager, Partner, and Co-Investment Selection and Oversight
 - Committee approved the recommendation
- **July 6, 2018 - Combined Asset Class Committee**
 - Private Equity manager recommendation (\$12mm)
 - Staff recommendation to participate in a follow-on investment with an existing investment manager
 - Due diligence process was followed in accordance with SIP 006 – Investment Manager, Partner, and Co-Investment Selection and Oversight
 - Committee approved the recommendation



ASSET CLASS COMMITTEE MEETING

- **July 27, 2018 – Combined Asset Class Committee**
 - Real Estate monthly report and risk report review and deal flow discussion
 - Real Estate manager variance request
 - Staff and outside consultant recommended a variance to investment guidelines with an existing investment manager
 - Due diligence process was followed in accordance with SIP 006 – Investment Manager, Partner, and Co-Investment Selection and Oversight
 - Committee approved the recommendation
 - Real Estate manager variance request
 - Staff and outside consultant recommended a variance to investment guidelines with an existing investment manager
 - Due diligence process was followed in accordance with SIP 006 – Investment Manager, Partner, and Co-Investment Selection and Oversight
 - Committee approved the recommendation
 - Real Estate manager recommendation (\$400mm)
 - Staff and outside consultant recommended a new commitment to an existing investment manager relationship
 - Due diligence process was followed in accordance with SIP 006 – Investment Manager, Partner, and Co-Investment Selection and Oversight
 - Committee approved the recommendation



GENERAL OBSERVATIONS

- **The Investment Committee has approved a new Strategic Asset Allocation Policy (SAAP)**
 - The approved SAAP, effective July 1, 2018, increases private markets asset classes providing opportunity to take advantage of illiquidity premiums and investment manager skill to produce expected returns in excess of what we believe can be achieved in the public markets
- **The active manager Public Equity program has contributed negatively to performance over the past five years**
 - Longer-term (5 year) Domestic Equity and International Equity relative performance contributing negatively
 - Domestic Equity manager selection is driving shorter-term relative underperformance within asset class
 - Implementation of factor-based strategies across domestic and international equities has been completed
- **Private markets contributing to positive longer-term results**
 - Real Estate is contributing positively to relative performance over the past five years
 - The Plan has purchased an interest in a real estate operating company
 - Private Equity program has contributed positively over the past five years
 - Private Debt NAV plus outstanding commitment is approximately 16.1% of Total Fund NAV.
- **Current positioning is consistent with IMD House Views.**



INDEPENDENT OVERSIGHT/COMPLIANCE: LTD

Note: All of the data shown on the following pages is as of June 30, 2018 and reflects the deduction of investment manager fees, unless otherwise noted.

NEPC, LLC

LONG TERM DISABILITY PERFORMANCE

	Quarter	1 Year	3 Years	5 Years	10 Years	Since Inception (July-02)
Long Term Disability	1.2%	9.5%	7.3%	8.2%	6.5%	6.7%
LTD SAA Policy ¹	0.9%	8.8%	7.2%	8.0%	6.7%	7.0%
Excess Return	0.3%	0.7%	0.1%	0.2%	-0.2%	-0.3%



¹LTD SAA Policy composition can be found in the appendix.

MARKET ENVIRONMENT UPDATE AND OUTLOOK

NEPC, LLC

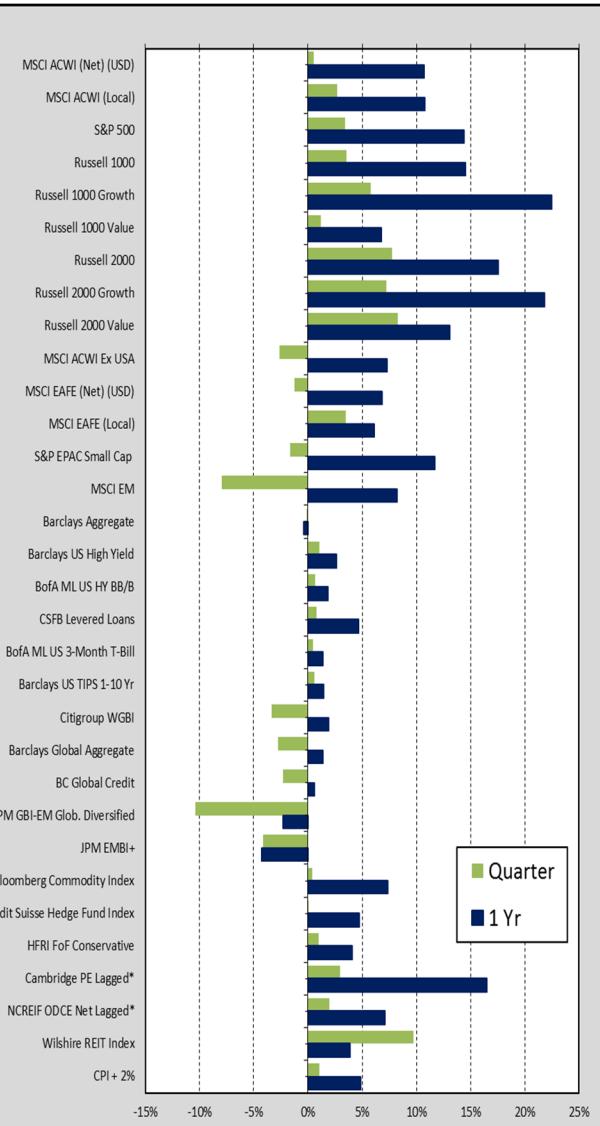
ECONOMIC ENVIRONMENT

- **Second quarter GDP growth rate (advance estimate) increased at a robust 4.1%.**
 - Retail sales ended May at +6.0% on a YoY basis. In the same period last year the YoY growth rate was 3.1%.
 - Corporate profits (ended January) as a percent of GDP increased to 9.3% from 8.5% (in October) and remain elevated relative to historical levels.
 - The inventory-to-sales ratio ended May down at 1.3 from 1.4 and has remained relatively flat since early 2010.
 - The U.S. trade deficit narrowed to the smallest deficit since October 2016.
- **The unemployment rate decreased to 4.0% ended Q2 from 4.1%; U-6, a broader measure of unemployment, decreased to 7.8% from 8.0% during the first quarter.**
- **The Case-Shiller Home Price Index (ended April) increased to 200.9 from 196.3 and remains at levels higher than that of pre-financial crisis levels of 150.9.**
- **Rolling 12-month seasonally-adjusted CPI saw an up-tick to 2.9% from 2.4% at the end of June; Capacity Utilization increased to 78.0% from 77.5% in Q2.**
- **Fed Funds rate was increased 0.25% to a targeted range of 1.75% - to – 2.00%. The 10-year Treasury Yield (constant maturity) finished Q2 at 2.9% up from 2.8% in June.**
- **The Fed balance sheet decreased slightly during Q2 2018, while the European Central Bank balance sheet continues to increase.**
 - ECB held its benchmark refinance rate at 0%, deposit rates -0.4% and signaled that asset purchases may end in December
- **S&P valuations increased slightly in Q2, remaining above the 10-year and long-term averages.**
 - Cyclically adjusted Shiller PE ratio (32.0x) is above the long-term average of 16.9x and above the 10-year average of 23.5x.



MARKET ENVIRONMENT – Q2 2018 OVERVIEW

		Qtr.	1 Yr.	3 Yr.	5 Yr.	10 Yr.
World Equity Benchmarks						
MSCI ACWI (Net) (USD)	World	0.5%	10.7%	8.2%	9.4%	5.8%
MSCI ACWI (Local)	World (Local Currency)	2.7%	10.8%	8.4%	10.8%	7.0%
Domestic Equity Benchmarks						
S&P 500	Large Core	3.4%	14.4%	11.9%	13.4%	10.2%
Russell 1000	Large Core	3.6%	14.5%	11.6%	13.4%	10.2%
Russell 1000 Growth	Large Growth	5.8%	22.5%	15.0%	16.4%	11.8%
Russell 1000 Value	Large Value	1.2%	6.8%	8.3%	10.3%	8.5%
Russell 2000	Small Core	7.8%	17.6%	11.0%	12.5%	10.6%
Russell 2000 Growth	Small Growth	7.2%	21.9%	10.6%	13.6%	11.2%
Russell 2000 Value	Small Value	8.3%	13.1%	11.2%	11.2%	9.9%
International Equity Benchmarks						
MSCI ACWI Ex USA	World ex-US	-2.6%	7.3%	5.1%	6.0%	2.5%
MSCI EAFE (Net) (USD)	Int'l Developed	-1.2%	6.8%	4.9%	6.4%	2.8%
MSCI EAFE (Local)	Int'l Developed (Local Currency)	3.5%	6.1%	5.2%	8.9%	5.0%
S&P EPAC Small Cap	Small Cap Int'l	-1.6%	11.7%	9.6%	11.5%	6.5%
MSCI EM	Emerging Equity	-8.0%	8.2%	5.6%	5.0%	2.3%
Domestic Fixed Income Benchmarks						
Barclays Aggregate	Core Bonds	-0.2%	-0.4%	1.7%	2.3%	3.7%
Barclays US High Yield	High Yield	1.0%	2.6%	5.5%	5.5%	8.2%
BofA ML US HY BB/B	High Yield	0.7%	1.8%	4.9%	5.3%	7.3%
CSFB Levered Loans	Bank Loans	0.8%	4.7%	4.3%	4.2%	5.0%
BofA ML US 3-Month T-Bill	Cash	0.5%	1.4%	0.7%	0.4%	0.4%
Barclays US TIPS 1-10 Yr	Inflation	0.6%	1.5%	1.5%	1.2%	2.3%
Global Fixed Income Benchmarks						
Citigroup WGBI	World Gov. Bonds	-3.4%	1.9%	2.8%	1.1%	2.1%
Barclays Global Aggregate	Global Core Bonds	-2.8%	1.4%	2.6%	1.5%	2.6%
BC Global Credit	Global Bonds	-2.3%	0.6%	2.8%	2.5%	3.6%
JPM GBI-EM Glob. Diversified	Em. Mkt. Bonds (Local Currency)	-10.4%	-2.3%	2.0%	-1.4%	2.6%
JPM EMBI+	Em. Mkt. Bonds	-4.1%	-4.3%	4.0%	4.0%	6.2%
Alternative Benchmarks						
Bloomberg Commodity Index	Commodities	0.4%	7.3%	-4.5%	-6.4%	-9.0%
Credit Suisse Hedge Fund Index	Hedge Fund	0.1%	4.8%	2.0%	3.6%	3.3%
HFRI FoF Conservative	Fund of Hedge Funds	1.0%	4.1%	1.9%	3.0%	1.2%
Cambridge PE Lagged*	Private Equity	3.0%	16.5%	12.1%	13.2%	10.4%
NCREIF ODCE Net Lagged*	Real Estate	2.0%	7.1%	9.0%	10.4%	4.2%
Wilshire REIT Index	REIT	9.7%	3.9%	7.8%	8.4%	7.8%
CPI + 2%	Inflation/Real Assets	1.1%	4.8%	3.9%	3.6%	3.5%



* As of 3/31/2018



PERFORMANCE OVERVIEW

Q2 Market Summary

Macro			Equity			Credit			Real Assets		
US Dollar	VIX	US 10-Yr	S&P 500	MSCI EAFE	MSCI EM	US Agg.	High Yield	Dollar EMD	Oil	Gold	REITS

Performance details:

Market Segment	Change (%)
US Dollar	5.0%
VIX	-3.9
US 10-Yr	12 bps
S&P 500	3.4%
MSCI EAFE	-1.2%
MSCI EM	-8.0%
US Agg.	-0.2%
High Yield	1.0%
Dollar EMD	-3.5%
Oil	14.2%
Gold	-5.4%
REITS	8.3%

- US stocks increased on the quarter, supported by strong earnings growth**
- Emerging market equities and currencies weakened this quarter as trade concerns and Federal Reserve interest rate increases weighed on markets**
 - The US dollar reversed its first quarter decline and increased relative to a basket of major developed market currencies
- The US yield curve continued to flatten as the second Fed rate hike of 2018 pushed short-term interest rates higher**

Market segment (index representation) as follows: US Dollar (DXY Index), VIX (CBOE Volatility Index), US 10-Year (US 10-Year Treasury Yield), S&P 500 (US Equity), MSCI EAFE Index (International Developed Equity), MSCI Emerging Markets (Emerging Markets Equity), US Agg (Barclays US Aggregate Bond Index), High Yield (Barclays US High Yield Index), Dollar EMD (JPM Emerging Market Bond Index), Crude Oil (WTI Crude Oil Spot), Gold (Gold Price Spot), and REITs (NAREIT Composite Index).



MACRO PERFORMANCE OVERVIEW

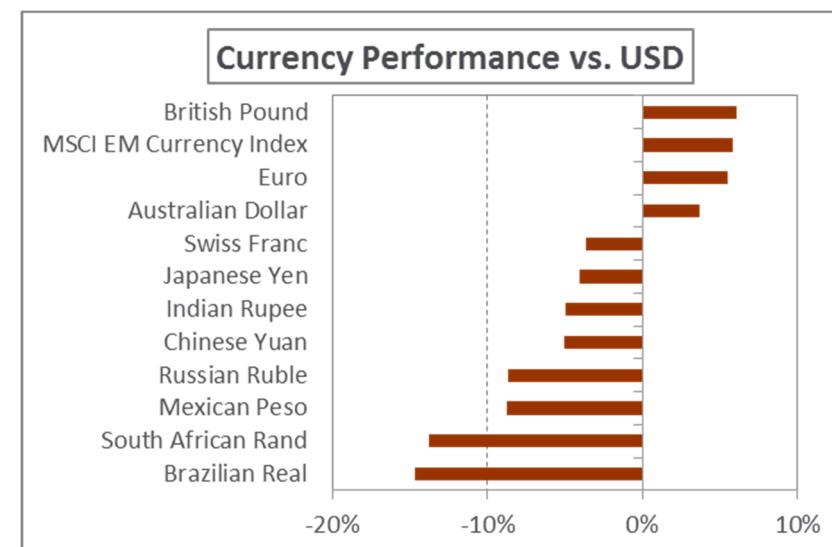
Q2 Macro Market Summary

- The global growth outlook remains strong, particularly in the US**
- Global equity market volatility fell, despite escalating tensions related to the US-China trade dispute**
- The US Treasury curve continued to flatten raising concerns of an inverted curve should the Fed hike rates beyond market expectations**

	Yield 03/31/18	Yield 06/30/18	Δ
US 10-Yr	2.74%	2.86%	0.12%
US 30-Yr	2.97%	2.99%	0.02%
US Real 10-Yr	0.68%	0.74%	0.05%
German 10-Yr	0.50%	0.30%	-0.20%
Japan 10-Yr	0.05%	0.04%	-0.01%
China 10-Yr	3.75%	3.48%	-0.27%
EM Local Debt	6.00%	6.59%	0.59%

Source: Bloomberg

Central Banks	Current Rate	CPI YOY	Notes from the Quarter
Federal Reserve	1.75% - 2.00%	2.9%	The Fed increased its benchmark interest rate to 1.75% - 2.00% in June and is expected to hike rates two more times in 2018
European Central Bank	0.0%	1.7%	The ECB maintained its current benchmark interest rate, while indicating rates would remain steady at least through mid-2019.
Bank of Japan	-0.1%	1.3%	The BoJ will continue its ultra-easy QE program with inflation remaining well below target.



Source: Bloomberg



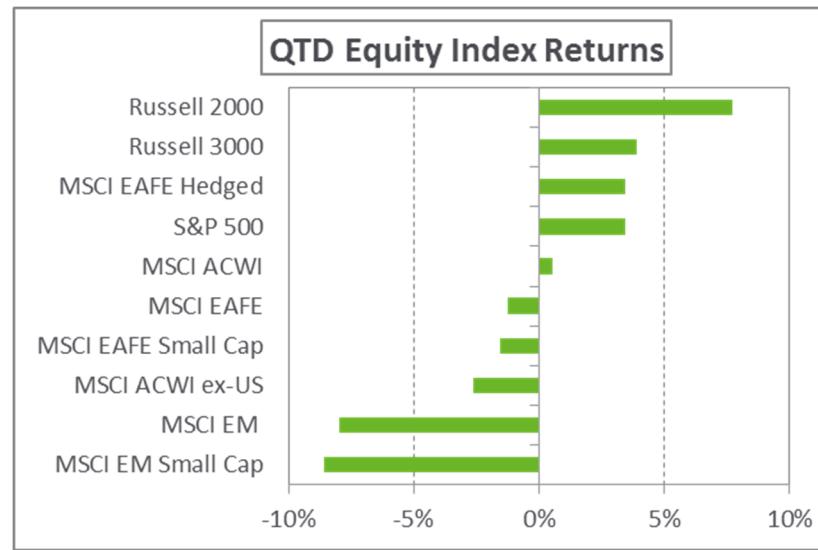
EQUITY PERFORMANCE OVERVIEW

Q2 Equity Market Summary

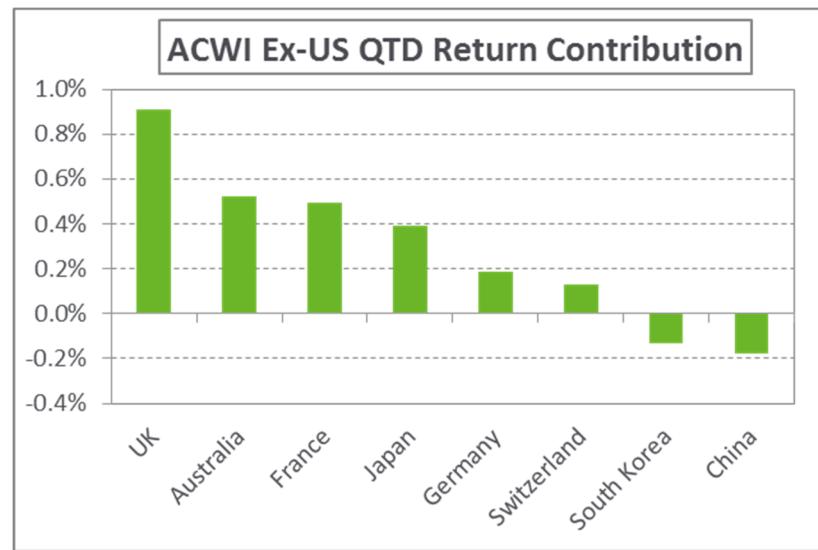
- US small cap outperformed large cap as tax reform benefits helped boost earnings**
- Trade concerns and yuan weakness weighed on Chinese returns as equity markets neared bear market territory**

Russell 3000 QTD Sector Return Contribution	
Information Technology	1.5%
Consumer Discretionary	0.0%
Financials	0.1%
Industrials	0.4%
Consumer Staples	0.9%
Energy	0.4%
Materials	0.1%
Health Care	0.2%
Real Estate	0.0%
Telecommunication	-0.0%
Utilities	-0.1%

Source: Russell, Bloomberg



Source: MSCI, Russell, S&P, Bloomberg



Source: MSCI, Bloomberg. QTD top country contributors to index return



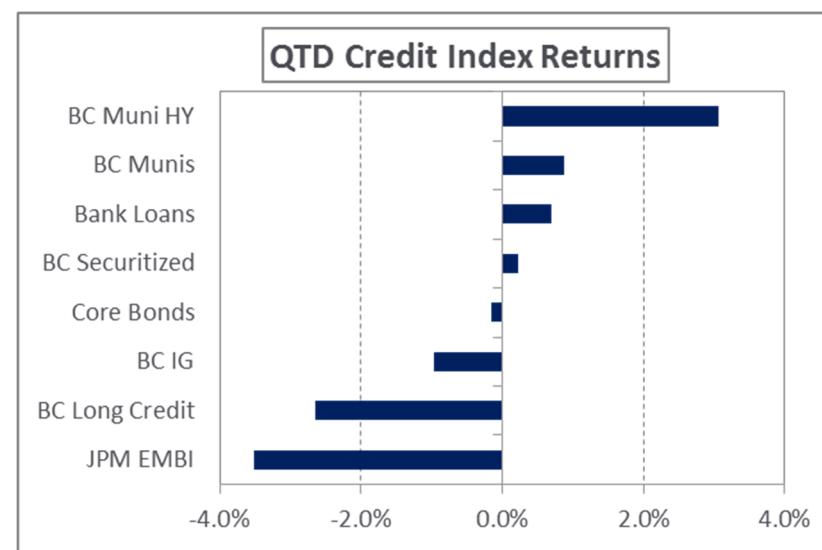
CREDIT PERFORMANCE OVERVIEW

Q2 Credit Market Summary

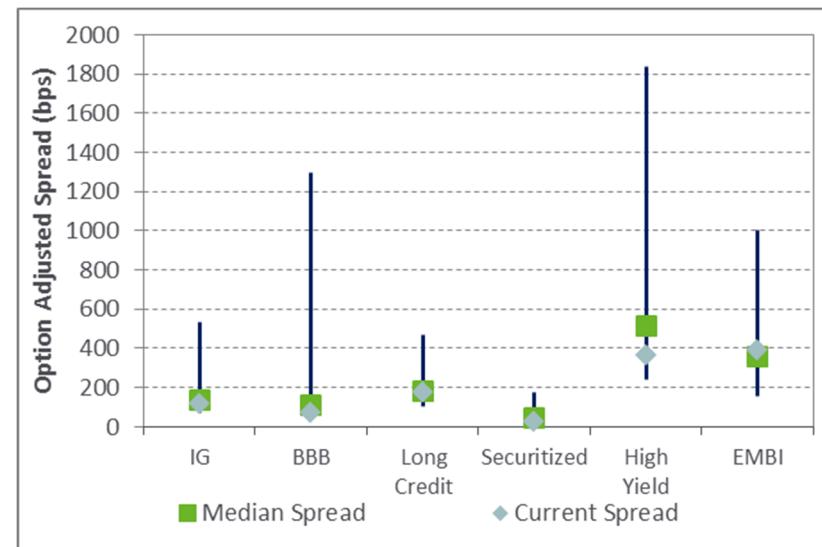
- Credit spreads increased slightly, but remain below medians in most areas of the credit market**
- Dollar-denominated EMD spreads increased 62 bps during the quarter, resulting in a decline of 3.5%**
- Local currency EMD declined 10.4% as currency weakness weighed on returns**

Credit Spread (Basis Points)	03/31/18	06/30/18	Δ
BC IG Credit	103	116	13
BC Long Credit	148	174	26
BC Securitized	29	28	-1
BC High Yield	354	363	9
Muni HY	253	198	-55
JPM EMBI	326	388	62
Bank Loans - Libor	257	303	46

Source: Barclays, Merrill Lynch, JPM, Bloomberg, NEPC



Source: Barclays, JPM, S&P, Bloomberg



Source: Barclays, JPM, S&P, Bloomberg. As of 01/31/2000



REAL ASSETS PERFORMANCE OVERVIEW

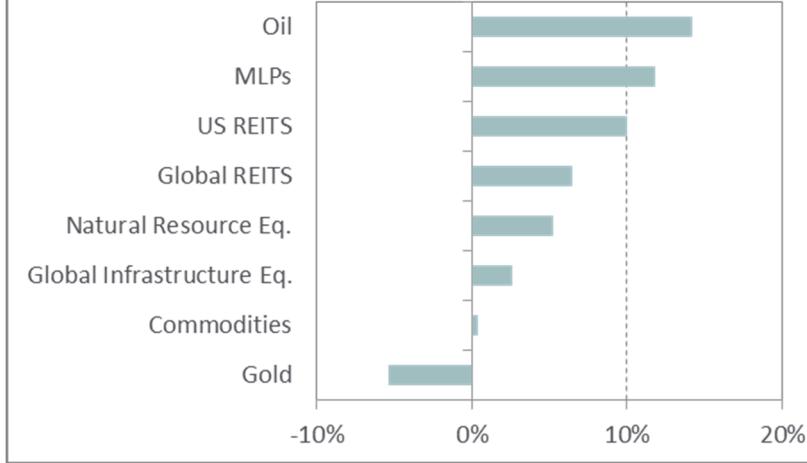
Q2 Real Assets Market Summary

- Crude oil increased 14.2% during the quarter as a result of tighter global supply and US-imposed sanctions on Iran**
- Agricultural commodities broadly declined, as Chinese tariffs specifically targeted soybeans**
- MLPs reversed steep losses from earlier in the year as industry consolidation and simplification continues**

Real Asset Yields	03/31/18	06/30/18
MLPs	8.9%	8.1%
Core Real Estate	4.5%	4.2%
US REITs	4.6%	4.4%
Global REITs	4.0%	3.7%
Global Infrastructure Equities	3.9%	4.4%
Natural Resource Equities	3.6%	3.5%
US 10-Yr Breakeven Inflation	2.1%	2.1%
Commodity Index Roll Yield	-1.6%	0.1%

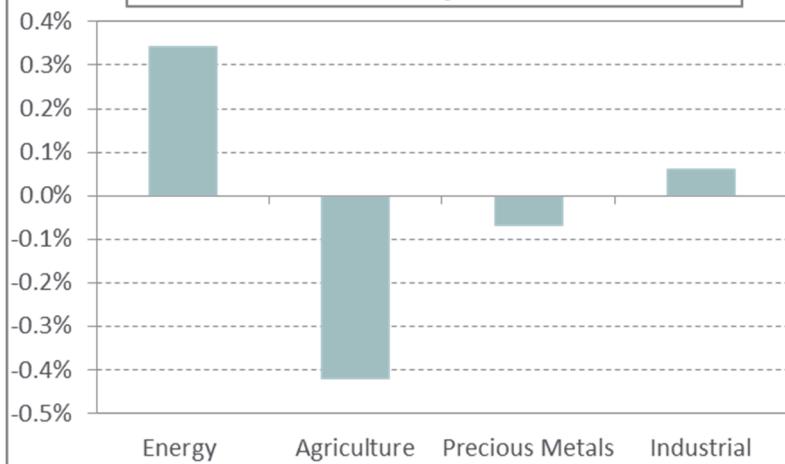
Source: NCREIF, Alerian, NAREIT, S&P, Bloomberg

QTD Real Assets Index Returns



Source: S&P, NAREIT, Alerian, Bloomberg

3-Month Commodity Future Roll Yields



Source: Bloomberg, NEPC Calculated as of 07/11/2018



KEY MARKET THEMES

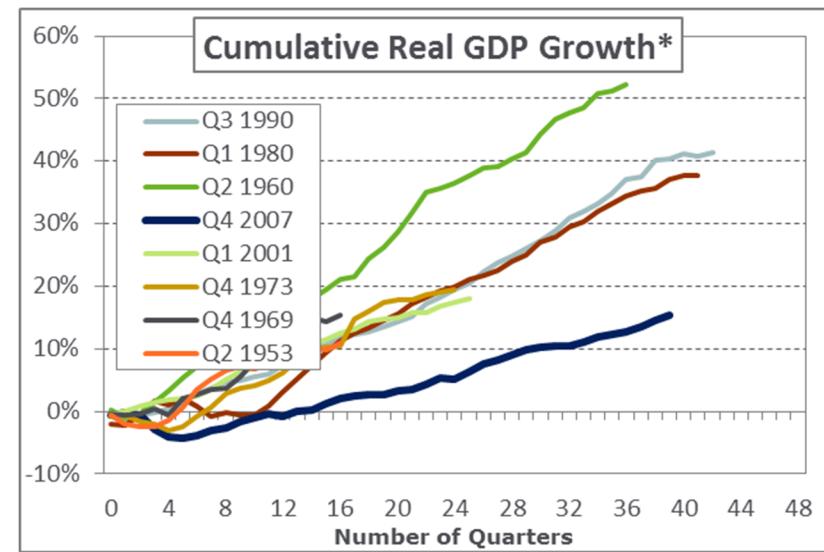
Extended US Economic Cycle

Economic cycles do not die of old age

The US economy is in an extended expansionary cycle despite being nine years removed from the last recession

Fiscal stimulus, health of US consumers, and ongoing recovery of the housing market continue to drive economic growth

A prolonged US economic expansion can support a continued rally for US equities despite elevated valuation levels

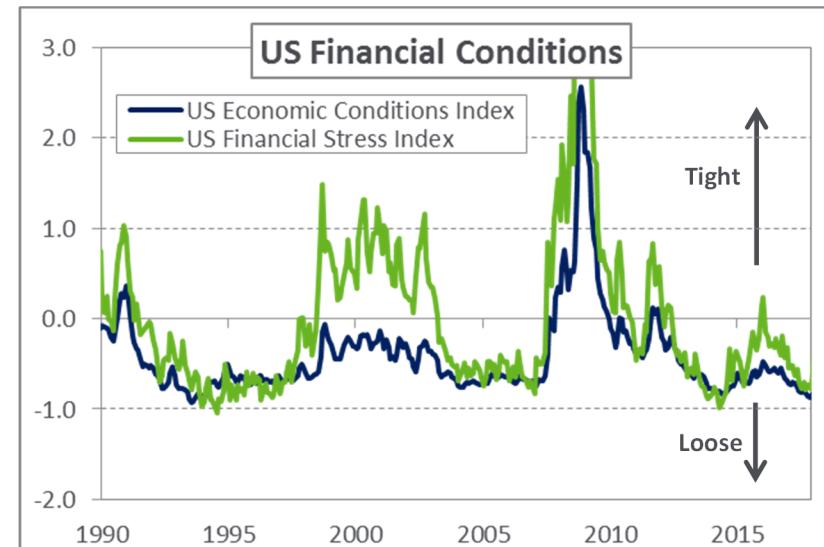


US financial conditions remain loose and support steady economic gains

An acceleration in inflation leading to Fed tightening has historically been a catalyst to end economic expansions

US recession concerns are muted as strong global economic conditions and growth rates reinforce an expansion of the US economy

Reversal in these easy conditions may be fueled from a misstep by the Fed, strong dollar, and/or increased volatility in the Chinese yuan

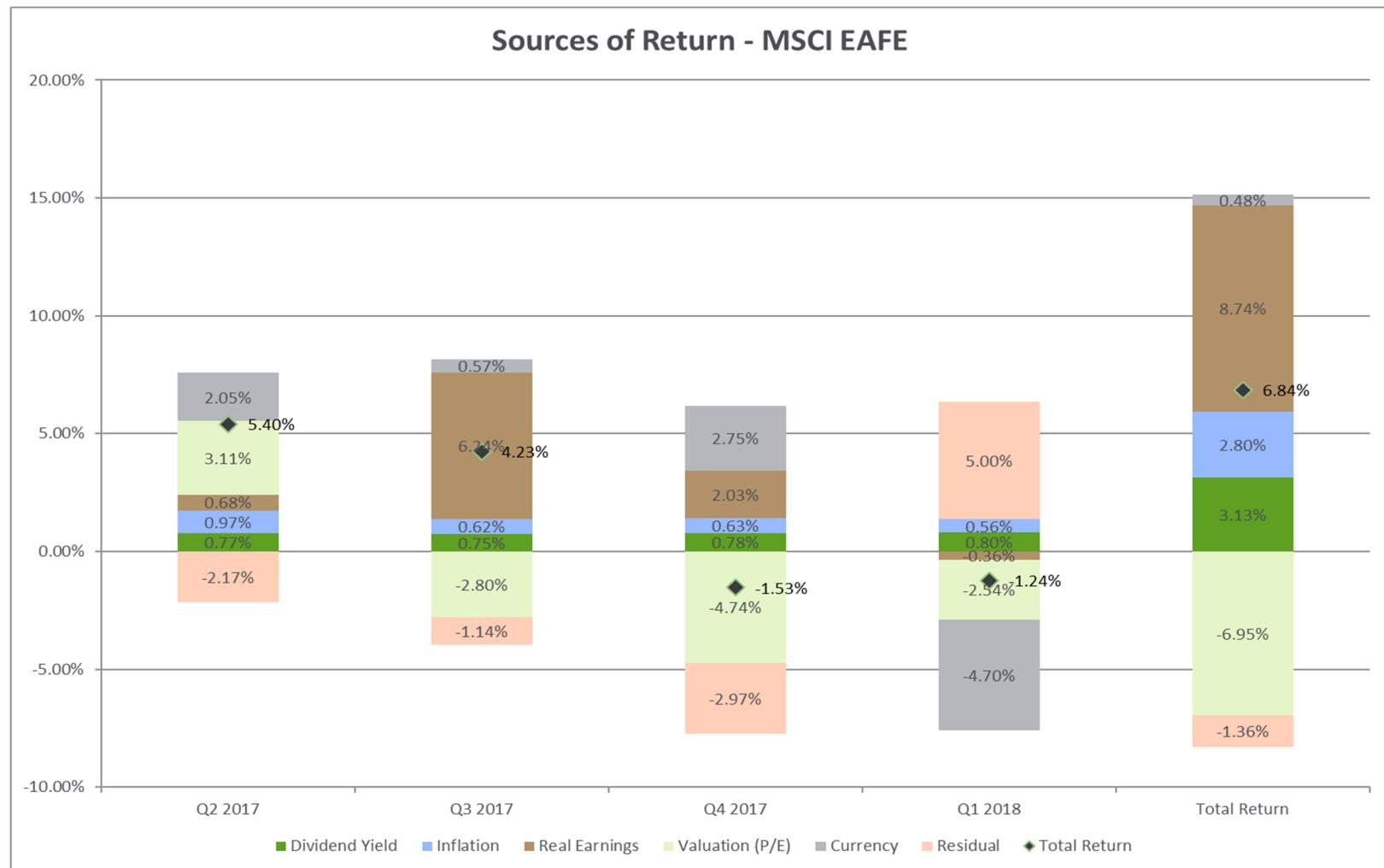


Source: (Top) Bloomberg, *Cumulative GDP growth from prior cycle peak

Source: (Bottom) Federal Reserve Bank of Chicago and Kansas City



1 YEAR ATTRIBUTION OF MSCI EAFE RETURNS



Spot Rates

1 USD = 0.846 Euro

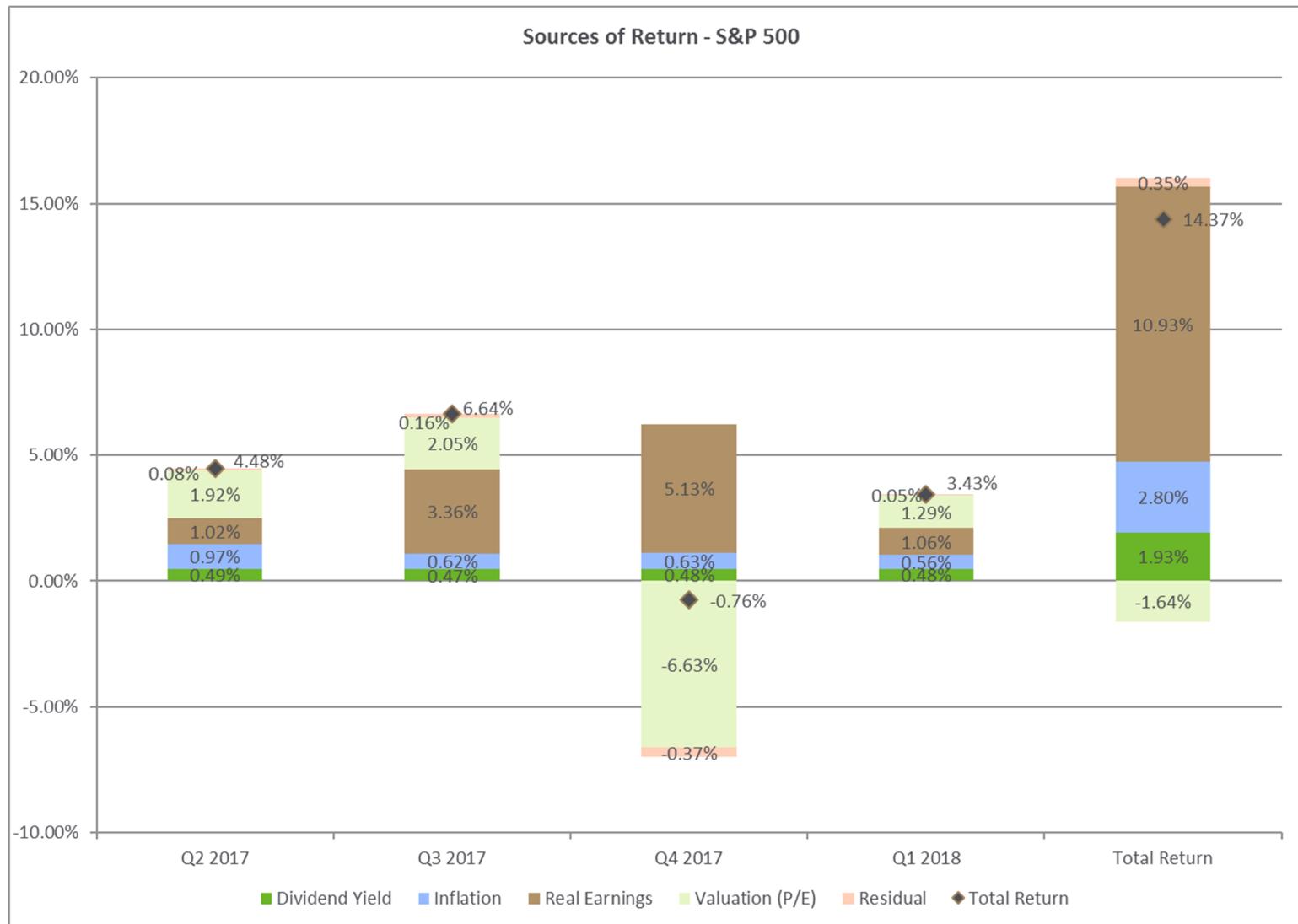
1 USD = 0.833 Euro

1 USD = 0.811 Euro

1 USD = 0.858 Euro



1 YEAR ATTRIBUTION OF S&P 500 RETURNS



US-CHINA TRADE ESCALATION



The US proposes 25% tariffs on \$50B of Chinese goods totaling 1300 products (Implemented in July)	April	Retaliatory tariffs of ~\$3B worth of US exports. In response to implementation of US tariffs in Q1 on solar panels, washing machines, steel, and aluminum
US appears to reach broad agreement with China and holds off on additional tariffs. Agreement is never finalized.	May	China offers to cut import duties on cars and remove tariffs on US farm products
US restricts Chinese acquisition of US firms with sensitive technology US threatens tariffs on another \$200 billion worth of Chinese goods	June	China details tariff on \$50 billion worth of exports on 659 US goods in response to the US April announcement (Implemented in July)
25% tariff levied on \$34 billion of imports from China with tariffs expected on another \$16 billion in two weeks. Potential tariffs on \$200B worth of imports from China is announced with possible implementation in late Q3	July	China responds with tariffs of 25% on \$34 billion worth of US exports with soybeans being a sizable target. Tariffs on \$16 billion worth of goods dependent on US response. Micro Technology ordered to temporarily halt sales in China due to a patent dispute

US-CHINA TRADE: POTENTIAL OUTCOMES

Outcome	Description	Implications
Base Case: Elevated Tariffs and/or Trade Limitations	A “cold war” in the ongoing “trade battle” between the US and China	<ul style="list-style-type: none"> - Tariffs and restrictions on trade are implemented – leading to marginally higher inflation and marginally lower growth rates - Equity and currency volatility is elevated, but valuations may provide attractive investment opportunities
Favorable Case: Negotiated Settlement	The US and China agree to a mutually beneficial pact	<ul style="list-style-type: none"> - Some tariffs or trade limitations may be implemented, but the pact allows for broader access to local China and US markets for each nation - Volatility may persist throughout negotiations, though this is the most appealing outcome for global equities
Tail Risks: US – China Trade War	The countries escalate to implementing more severe protectionist policies	<ul style="list-style-type: none"> - Results in destabilization of global equity markets and the global economy - It would likely result in a global recession as economic growth rates are hampered with the potential for stagflation
Full-Blown Trade War	Other countries become involved levying additional tariffs and materially reducing global trade flows (e.g. 1930s style global trade restrictions)	<ul style="list-style-type: none"> - Investors are encouraged to rebalance to “safe haven” fixed-income exposure, such as TIPS and government debt



BEYOND US-CHINA TRADE

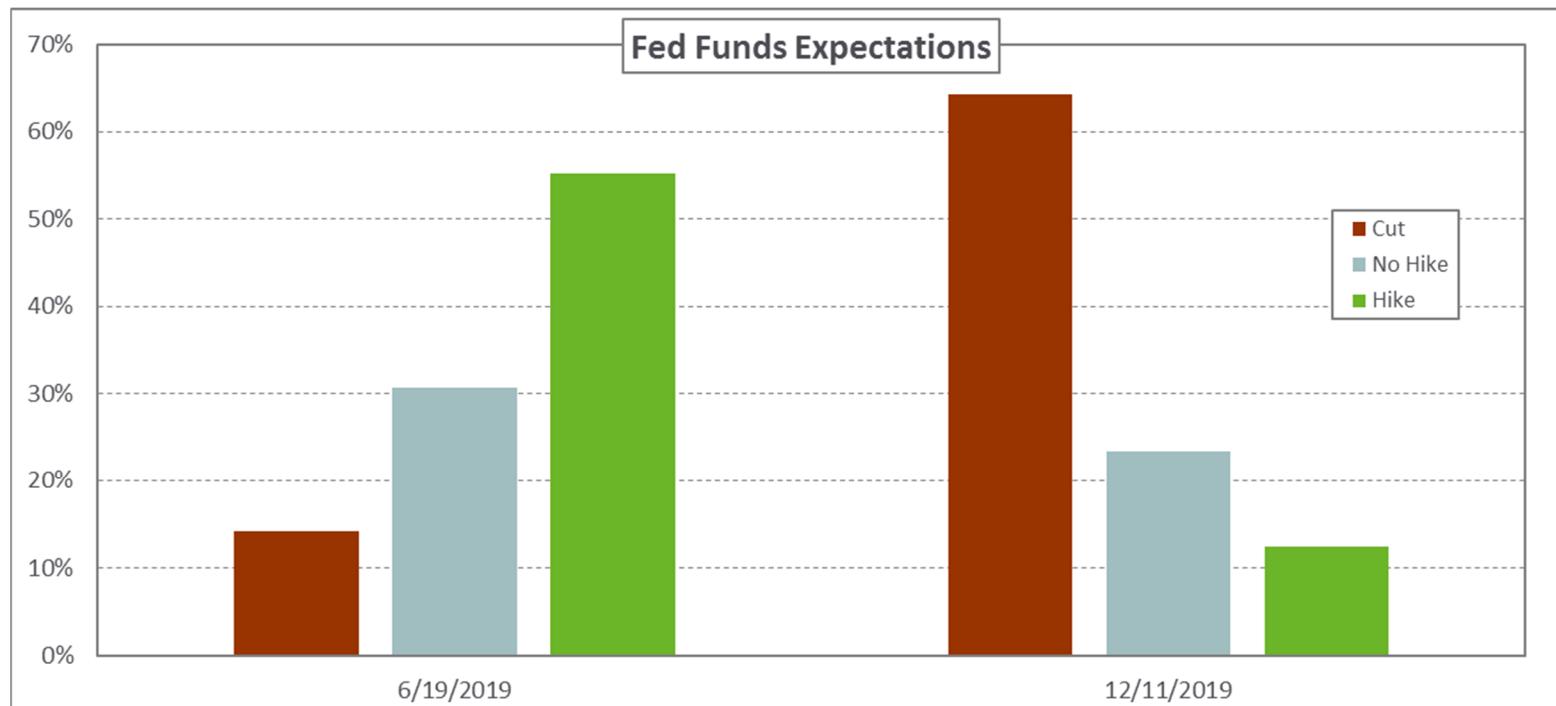
- **Should dynamics shift toward the tail-risk outcomes, there are other important aspects of the United States' role in the global economy that should be considered:**

<h3>Chinese Ownership of US Treasuries</h3> <p>Measured about \$1.2T at the end of 2017</p> <p>Provides some leverage if China threatened to sell</p> <p>However, materially reducing Treasuries could negatively impact the Yuan</p>	<h3>Degree of Political Control</h3> <p>Known political stability affords China the opportunity to take a harsher negotiation posture</p> <p>China can effectively control local sentiment if needed – for example, to implement boycotts on American goods</p>	<h3>Yuan Devaluation</h3> <p>Competitiveness of goods and exports would increase</p> <p>However, could trigger large capital outflows from China. Likely requires capital controls, which runs counter to goal of opening local financial markets</p>
<h3>Currency Reserves</h3> <p>The USD status as a reserve currency allows it to benefit from safe-haven flows that could result from a reduction in trade</p> <p>This status could be jeopardized if other key countries shift reserves elsewhere</p>	<h3>US Companies Operating Internationally</h3> <p>Companies such as Apple, Disney, or Nike could face additional hurdles from the Chinese government to operate locally</p> <p>China's manufacturing base could allow them to cut off key parts of the global supply chain</p>	<h3>Europe</h3> <p>The US and the EU have a trade partnership worth over \$1.1T annually</p> <p>Tensions have escalated – leading the EU to respond with retaliatory measures on American products such as motorcycles and denim</p>



THE PATH OF FEDERAL RESERVE HIKES

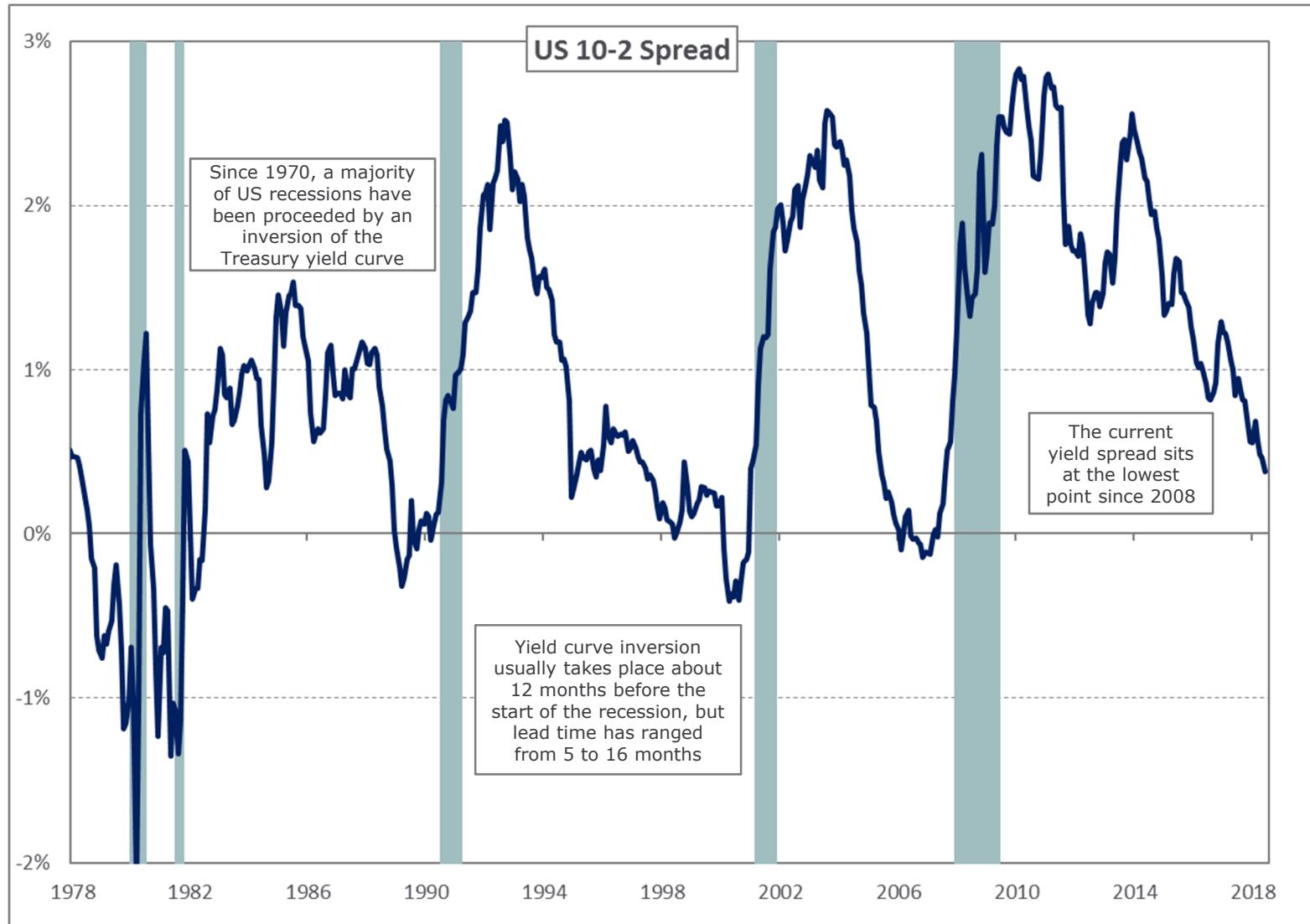
- **The current target federal funds level is 1.75%-2.00%, following two rate increases in March and June of 2018**
 - Fed funds expectations imply a minimum of one additional hike and potentially a second in 2018 based on both market expectations and Fed policy makers estimates
- **New Fed Chair Jerome Powell has promised greater transparency but market expectations highlight a large disconnect in the back half of 2019 for the Fed Funds target level**



Data as of 7/13/2018; Data assumes Fed Funds rate at 6/19/2019 is 2.25-2.50 and Fed Funds rate at 12/11/2019 is 2.75-3.00
Source: Fed, Bloomberg, NEPC



THE YIELD CURVE IS A STRONG SIGNAL

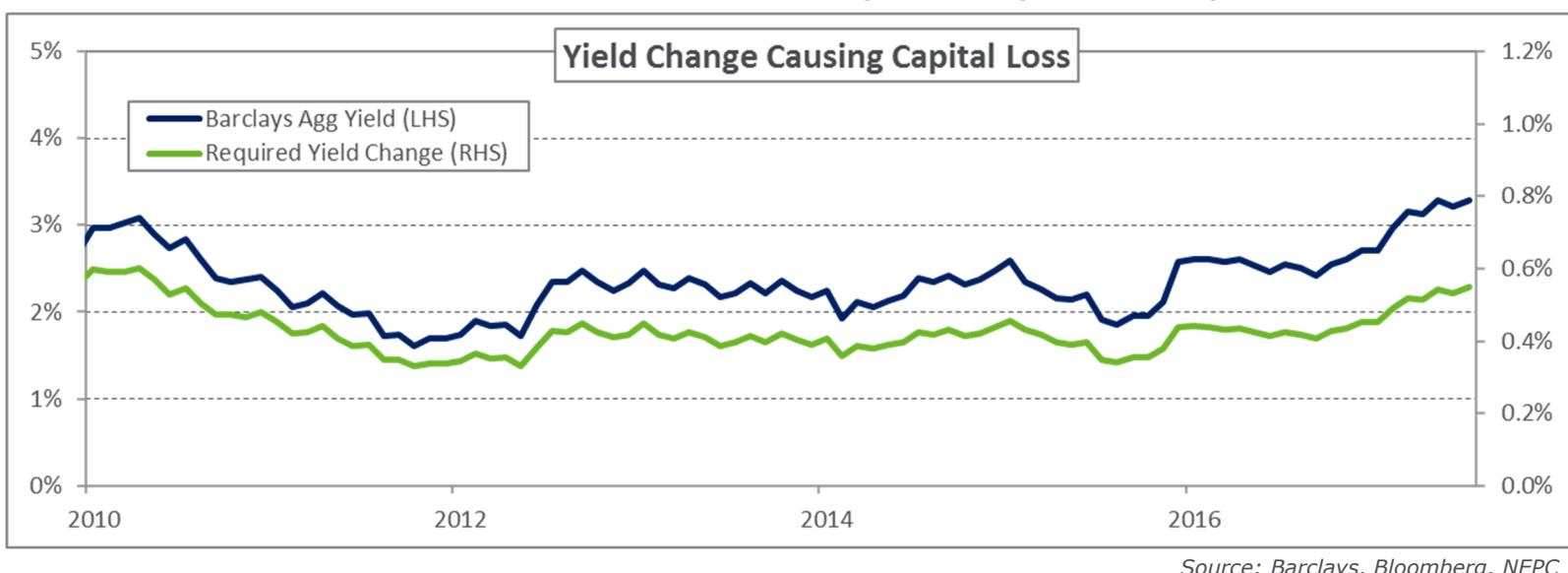
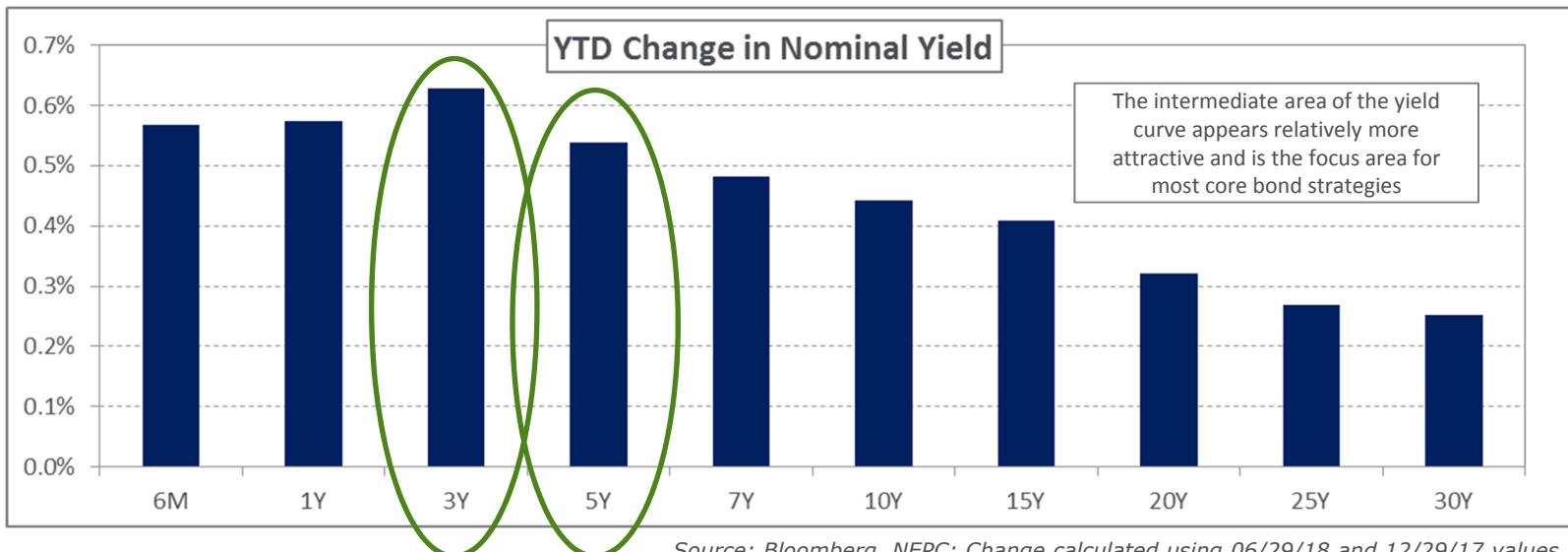


Source: FRED

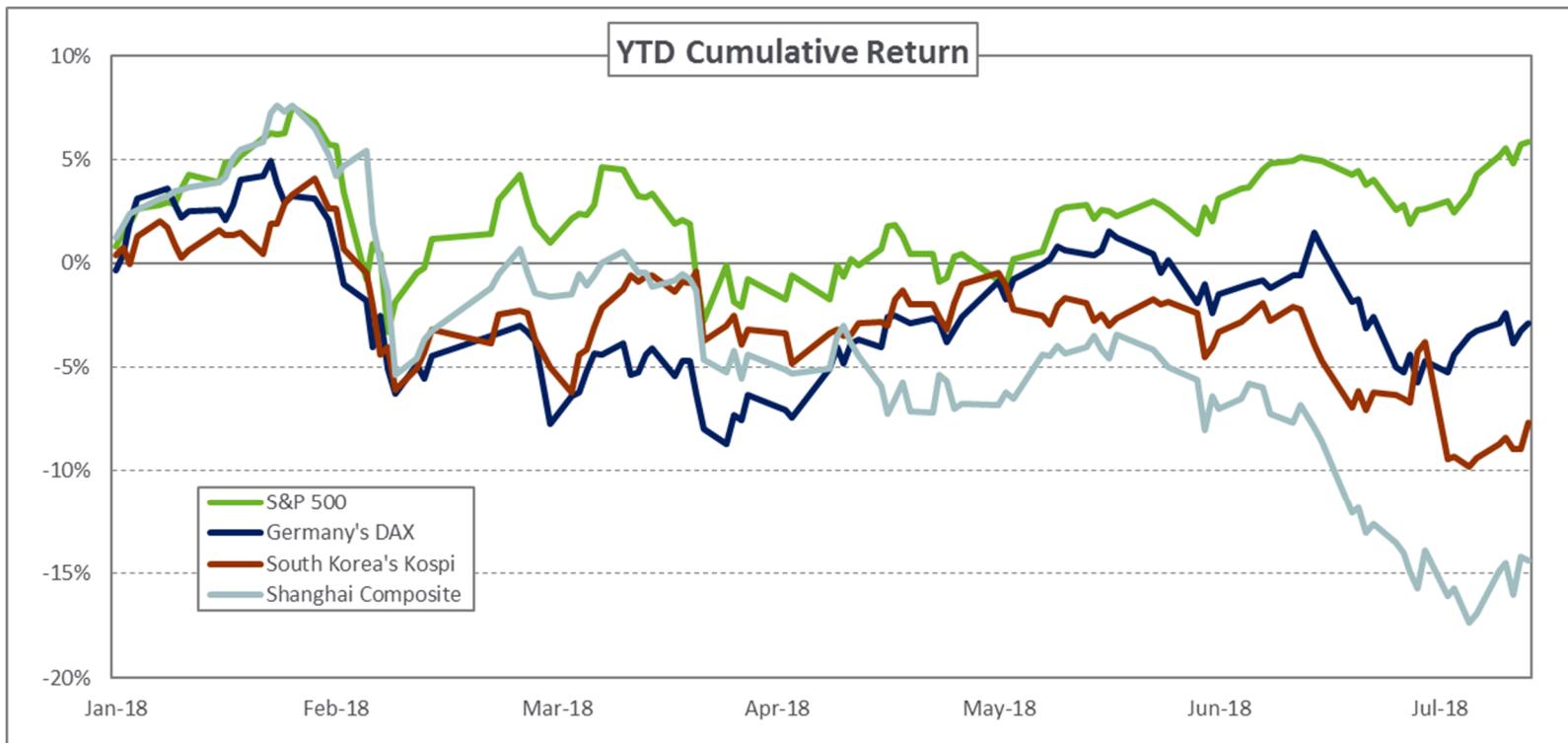
Light blue shading indicates recession; 10-2 spread is calculated as 10-year minus 2-year Treasury



US YIELDS ARE MORE ATTRACTIVE



GLOBAL EQUITIES IN 2018



Source: S&P, Russell, Bloomberg, NEPC; Cumulative return calculated through 07/16/2018

- **With the US economy performing well, 2018 was set to be a strong year for earnings even before the tax reform was enacted**
 - First quarter US corporate earnings reached near historic levels and earnings for 2018 are expected to increase 20% relative to the year prior as tax cuts offer a tailwind
- **International and emerging markets are also experiencing strong earnings growth, but have suffered from the negative sentiment associated with US-China trade tensions**



CHINA DRIVES EMERGING MARKET SENTIMENT



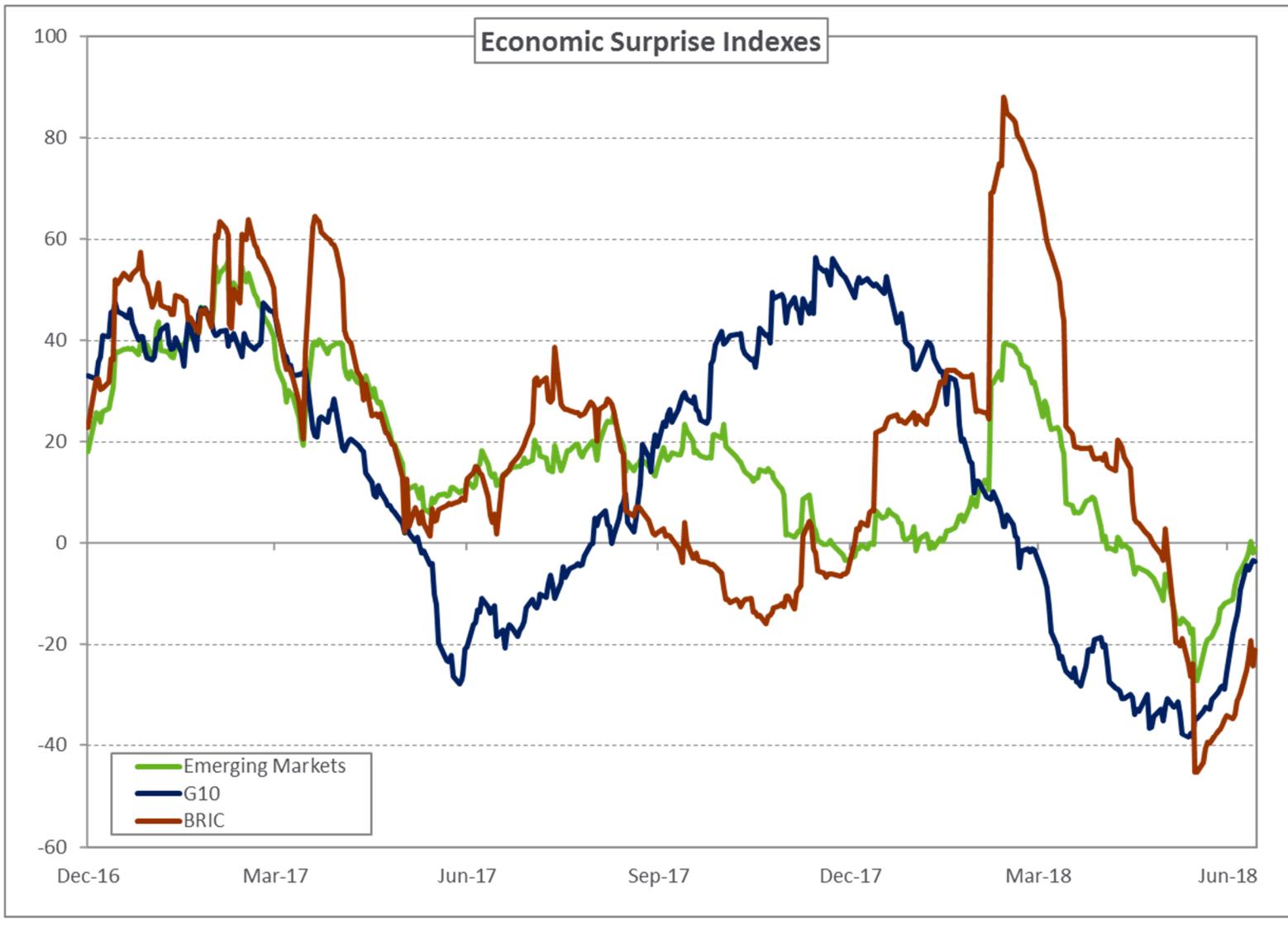
Source: MSCI, Bloomberg, NEPC



Source: MSCI, Bloomberg, NEPC



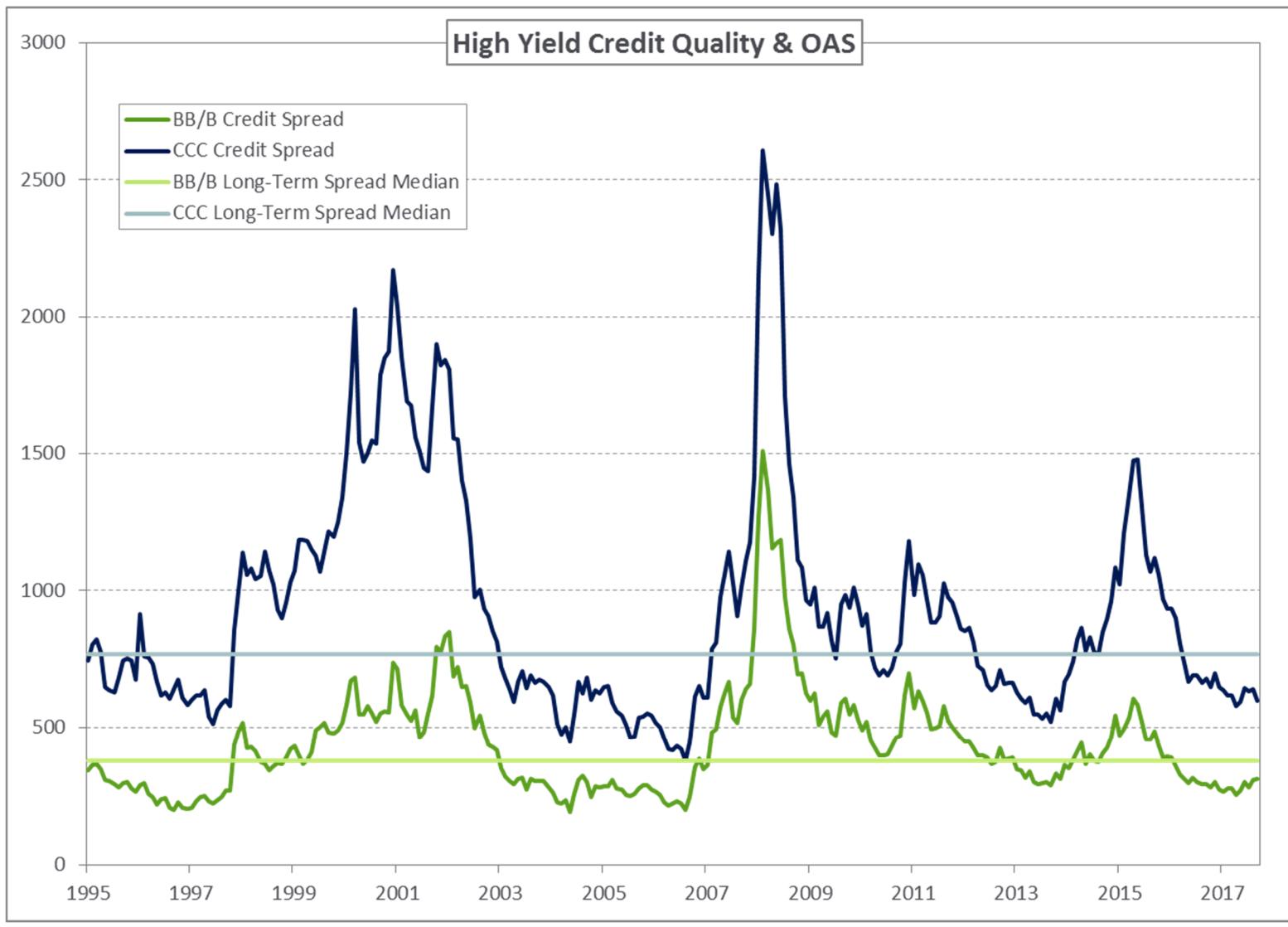
EMERGING ECONOMIES SHOW RESILIENCY



GLOBAL TRADE IS STILL EXPANDING



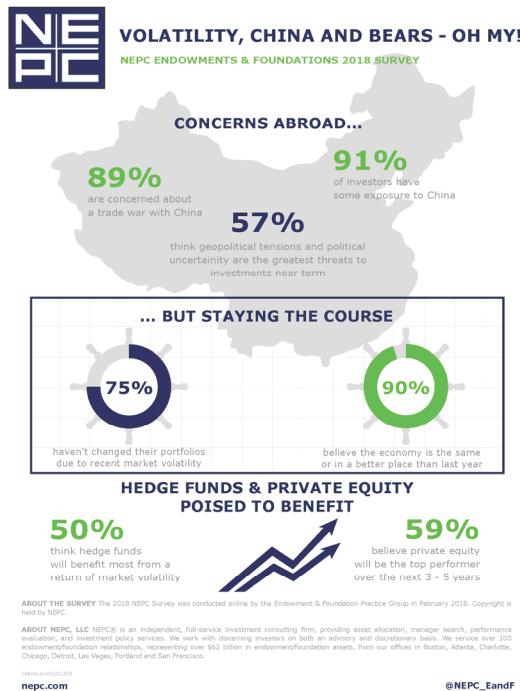
CREDIT SPREADS APPEAR UNATTRACTIVE



Source: Barclays, Bloomberg, NEPC



HIGHLIGHTS OF SECOND QUARTER HAPPENINGS AT NEPC



NEPC INSIGHTS

- Taking Stock: Globalization Backlash: Tariffs are a Dangerous Game
- Taking Stock: A Millennial's Take on ESG and Defined Contribution Plans
- The Need for Investment Discipline: Review, Revise and Repeat
- 2018 First Quarter Market Thoughts
- The State of Strategic Investing in Healthcare
- Taking Stock: Corporate Pension Plans: A Changing Yield Curve and Q1 Liability Performance
- Nothing Ventured, Nothing Gained: The European VC Opportunity
- Taking Stock: Megatrends – The Forces Driving Our Future
- May 2018 – Endowment & Foundation Survey Results & Infographic
- Taking Stock: A Roundup of NEPC's 2018 Investment Conference
- Taking Stock: Holding the Investment Industry to a Higher Standard
- Taking Stock: China's Demographic Solution: Too Little Too Late?
- Putting the Pieces Together: Equity Portfolio Construction for Private Wealth Clients
- Taking Stock: Is This the Ghost of Taper Tantrums Past?
- Taking Stock: What's 'Appening with Financial Wellness?

WEBINAR REPLAYS

- 8th Annual Investment Manager Webinar Replay
- NEPC Q1 2018 Quarterly Markets Call

To download NEPC's recent insights and webinar replays, visit: www.NEPC.com/insights



APPENDIX: SAA POLICY HISTORY

NEPC, LLC

STRATEGIC ASSET ALLOCATION POLICY HISTORY

- 7/1/75 – 12/31/79 – 40% S&P 500/60% Barclays Capital Aggregate
- 1/1/80 – 12/31/83 – 50% S&P 500/50% Barclays Capital Aggregate
- 1/1/84 – 12/31/91 – 60% S&P 500/40% Barclays Capital Aggregate
- 1/1/92 – 12/31/94 – 50% S&P 500/10% MSCI EAFE/40% Barclays Capital Aggregate
- 1/1/95 – 6/30/97 – 45% S&P 500/15% MSCI EAFE/40% Barclays Capital Aggregate
- 7/1/97 – 12/31/99 – 50% S&P 500/15% MSCI EAFE/35% Barclays Capital Aggregate
- 1/1/00 – 9/30/03 – 53% S&P 500/17% MSCI EAFE/30% Barclays Capital Aggregate
- 10/1/03 – 12/31/06 – 53% S&P 500/15% MSCI EAFE/ACWI ex-U.S.¹/26% Barclays Capital Aggregate/6% NCREIF ODCE (lagged one quarter)
- 1/1/07 – 10/31/2009 – 31% S&P 500/7% S&P 400/7% S&P 600/18% MSCI ACWI ex-U.S./5% Russell 2000 (lagged one quarter)/26% Barclays Capital Aggregate/6% NCREIF ODCE (lagged one quarter)
- 11/1/2009 – 6/30/2012 – 28% S&P 500/6% S&P 400/6% S&P 600/13% MSCI EAFE/2% MSCI EAFE Small Cap/3% MSCI Emerging Markets/7% Russell 2000 (lagged one quarter)/24% Barclays Capital Aggregate/2% Barclays Capital High Yield/6% NCREIF ODCE (lagged one quarter)/3% Dow Jones/UBS Commodities Index
- 7/1/2012 – 3/31/2015 – 23% S&P 500/5% S&P 400/5% S&P 600/14% MSCI EAFE/3% MSCI EAFE Small Cap/6% MSCI Emerging Markets/7% Russell 2000 (lagged one quarter)/13% Barclays Capital Aggregate/5% Barclays Capital High Yield/4% JP Morgan GBI-EM Global Diversified/3% S&P/LSTA Levered Loan Index + 250 basis points (lagged one quarter)/8% NCREIF ODCE (lagged one quarter)/4% Dow Jones/UBS Commodities Index
- 4/1/2015 – 3/31/2017 – 20% S&P 500/3% S&P 400/3% S&P 600/17% MSCI EAFE/2% MSCI EAFE Small Cap/5% MSCI Emerging Markets/8% Russell 2000 (lagged one quarter)/11% Barclays Capital Aggregate/4% Barclays Capital High Yield/10% S&P/LSTA Levered Loan Index + 250 basis points (lagged one quarter)/10% NCREIF ODCE (lagged one quarter)/2% Bloomberg Commodities Index TR/5% Multi-Asset Class Custom Index
- **4/1/2017 - present – 20% S&P 500/3% S&P 400/3% S&P 600/17% MSCI EAFE/2% MSCI EAFE Small Cap/5% MSCI Emerging Markets/8% Russell 2000 (lagged one quarter)/11% Barclays Capital Aggregate/2% Barclays Capital High Yield/12% S&P/LSTA Levered Loan Index + 250 basis points (lagged one quarter)/10% NCREIF ODCE (lagged one quarter)/2% Bloomberg Commodities Index TR/5% Multi-Asset Class Custom Index**
- ***Interim SAA Policy:** 20% S&P 500/3% S&P 400/3% S&P 600/17% MSCI EAFE/2% MSCI EAFE Small Cap/5% MSCI Emerging Markets/8% Russell 2000 (lagged one quarter)/12% Barclays Capital Aggregate/2% Barclays Capital High Yield/11% S&P/LSTA Levered Loan Index + 250 basis points (lagged one quarter)/2% Bloomberg Commodity Index/5% Multi-Asset Class Custom Index/10% NCREIF ODCE (lagged one quarter)
- Note: Interim SAA Policy includes proration of 1% Private Debt which is unfunded. Recently approved Strategic Asset Allocation Policy effective July 1, 2018.

¹MSCI EAFE/ACWI ex-U.S. Benchmark is the MSCI EAFE Index prior to 10/1/2005 and the MSCI ACWI ex-U.S. thereafter.

Note: All MSCI indices changed from Gross to Net dividend withholding taxes effective 1/1/2014.



CUSTOM ASSET CLASS BENCHMARK HISTORY

- **ASRS Custom Total Equity Benchmark** was 77% S&P 500, 23% MSCI EAFE through 12/31/1999; 76% S&P 500, 24% MSCI EAFE through 9/30/2003; 78% S&P 500, 22% MSCI EAFE/ACWI ex-U.S.¹ through 12/31/2006; 49% S&P 500, 11% S&P 400, 11% S&P 600, 29% MSCI ACWI ex-U.S. through 10/31/2009; 48% S&P 500, 10% S&P 400, 10% S&P 600, 23% MSCI EAFE, 4% MSCI EAFE Small Cap, 5% MSCI Emerging Markets through 6/30/2012; 41% S&P 500, 9% S&P 400, 9% S&P 600, 25% MSCI EAFE, 5% MSCI EAFE Small Cap, 11% MSCI Emerging Markets through 3/31/2015; 40% S&P 500, 6% S&P 400, 6% S&P 600, 34% MSCI EAFE, 4% MSCI EAFE Small Cap, 10% MSCI Emerging Markets thereafter.
- **ASRS Custom Domestic Equity Benchmark** was S&P 500 through 12/31/2006; 74% S&P 500, 13% S&P 400, 13% S&P 600 through 12/31/2010; 70% S&P 500, 15% S&P 400, 15% S&P 600 through 3/31/2015.; 77% S&P 500, 11.5% S&P 400, 11.5% S&P 600 thereafter.
- **ASRS Custom International Equity Benchmark** was MSCI EAFE through 9/30/2005; MSCI ACWI ex-U.S. through 12/31/2010; 72% MSCI EAFE, 11% MSCI EAFE Small Cap and 17% MSCI Emerging Markets through 6/30/2012; 61% MSCI EAFE, 13% MSCI EAFE Small Cap and 26% MSCI Emerging Markets through 3/31/2015; 71% MSCI EAFE, 8% MSCI EAFE Small Cap and 21% MSCI Emerging Markets thereafter.
- **ASRS Custom Public Markets Fixed Income Benchmark** was Barclays Capital U.S. Aggregate Index through 12/31/2010; 93% Barclays Capital U.S. Aggregate Index, 7% Barclays Capital U.S. High Yield Bond Index through 12/31/2012; 59% Barclays Capital U.S. Aggregate Index, 23% Barclays Capital U.S. High Yield Bond Index, 18% JP Morgan GBI-EM Global Diversified through 3/31/2015; 73% Barclays Capital U.S. Aggregate Index, 27% Barclays Capital U.S. High Yield Bond Index through 3/31/2017; 85% Barclays Capital U.S. Aggregate Index, 15% Barclays Capital U.S. High Yield Bond Index thereafter.
- **ASRS Custom Inflation-Linked Benchmark** was 100% Barclays Capital U.S. TIPS through 7/31/2010; 50% Barclays Capital U.S. TIPS, 50% Bloomberg Commodity Index through 8/31/2010; 30% Barclays Capital U.S. TIPS, 70% Bloomberg Commodity Index through 5/31/2011; 100% Bloomberg Commodity Index thereafter.
- **Multi-Asset Class Strategies Custom Benchmark** was 56% S&P 500, 16% MSCI EAFE, 28% Barclays Capital Aggregate through 9/30/2011; 50% S&P 500, 19% MSCI EAFE, 28% Barclays Capital Aggregate, and 3% Bloomberg Commodity Index through 06/30/2012; 43% S&P 500, 25% MSCI EAFE, 28% Barclays Capital Aggregate, and 4% Bloomberg Commodity Index through 3/31/2015; market value weighted average of the benchmarks for Bridgewater (91 Day T-Bill) and Windham (52% MSCI ACWI net, 30% Citi WGBI, 9% DJ US REIT, and 9% Bloomberg Commodities Index) thereafter.

¹MSCI EAFE/ACWI ex-U.S. Benchmark is the MSCI EAFE Index prior to 10/1/2005 and the MSCI ACWI ex-U.S. thereafter.

Note: All MSCI indices changed from Gross to Net of dividend withholding taxes effective 1/1/2014.



CUSTOM ASSET CLASS BENCHMARK HISTORY

- **ASRS Custom Small Cap Equity Blended Benchmark** was the Russell 2000 Index through 12/31/2006; S&P 600 Index thereafter.
- **ASRS Custom Int'l Developed Markets Equity Index** was MSCI EAFE through 9/30/2005; MSCI ACWI ex-U.S. through 12/31/2010; 87% MSCI EAFE and 13% MSCI EAFE Small Cap through 6/30/2012; 82% MSCI EAFE and 18% MSCI EAFE Small Cap through 3/31/2015; 89% MSCI EAFE and 11% MSCI EAFE Small Cap thereafter.
- **Brandes Custom Benchmark** was MSCI EAFE through 9/30/2005; MSCI ACWI ex-U.S. through 2/28/2011; MSCI EAFE thereafter.
- **ASRS Cash Assetization Custom Benchmark** is 33% S&P 500, 14% Russell 2000, 25% MSCI EAFE, 28% Barclays Treasury Index through 8/24/2015; 100% Barclays US Long Treasury Index through 11/13/2015; 15% S&P 500, 15% Russell 2000, 16% MSCI EAFE, 4% MSCI Emerging Markets Index, 50% Barclays US Treasury Index through 4/29/2016; 52% S&P 500, 18% Russell 2000, 30% Barclays US Long Treasury Index through 6/28/2016; 100% Barclays US Long Treasury Index through 9/15/2016; NYSE US 2 Year Treasury Futures Index through 12/21/2016; 30% S&P 500, 10% Russell 2000, 30% MSCI EAFE, 30% Barclays Treasury Index thereafter.
- **ASRS Bridgewater Custom Benchmark** was 56% S&P 500, 16% MSCI EAFE, 28% Barclays Capital Aggregate through 9/30/2011; 50% S&P 500, 19% MSCI EAFE, 28% Barclays Capital Aggregate, and 3% Bloomberg Commodity Index through 06/30/2012; 43% S&P 500, 25% MSCI EAFE, 28% Barclays Capital Aggregate, and 4% Bloomberg Commodity Index through 3/31/2015; Citigroup 3-Month Treasury Bill Index thereafter.

¹MSCI EAFE/ACWI ex-U.S. Benchmark is the MSCI EAFE Index prior to 10/1/2005 and the MSCI ACWI ex-U.S. thereafter.

Note: All MSCI indices changed from Gross to Net of dividend withholding taxes effective 1/1/2014.



LONG TERM DISABILITY STRATEGIC ASSET ALLOCATION POLICY HISTORY

- 7/1/2002 – 12/31/2004 - 53% S&P 500/17% MSCI EAFE/30% Barclays Capital Aggregate Bond Index
- 1/1/2005 – 2/28/2007 - 53% Russell 3000/15% MSCI EAFE/26% Barclays Capital Aggregate Bond Index/6% DJ Wilshire Real Estate Securities Index
- 3/1/2007 – 12/31/2010 - 50% Russell 3000/18% MSCI EAFE/26% Barclays Capital Aggregate Bond Index/6% DJ Wilshire Real Estate Securities Index
- 1/1/2011 – 12/31/2012 - 40% Russell 1000/7% Russell 2000/13% MSCI EAFE/2% MSCI EAFE Small Cap/3% MSCI Emerging Markets/24% Barclays Capital Aggregate/2% Barclays Capital High Yield/6% DJ Wilshire Real Estate Securities Index/3% Bloomberg Commodity Index
- 1/1/2013 – 2/28/2016 - 34% Russell 1000/6% Russell 2000/14% MSCI EAFE/3% MSCI EAFE Small Cap/6% MSCI Emerging Markets/13% Barclays Capital Aggregate/8% Barclays Capital High Yield/4% JP Morgan GBI-EM Global Diversified/8% DJ Wilshire Real Estate Securities Index/4% Bloomberg Commodity Index
- 2/29/2016 – 7/26/2017 - 24% Russell 1000/12% Russell 2000/18% MSCI EAFE/2% MSCI EAFE Small Cap/5% MSCI Emerging Markets/19% Barclays Capital Aggregate/7% Barclays Capital High Yield/11% DJ Wilshire Real Estate Securities Index/2% Bloomberg Commodity Index
- **7/27/2017 – present – 20% S&P 500/3% S&P 400/3% S&P 600/17% MSCI EAFE/2% MSCI EAFE Small Cap/5% MSCI Emerging Markets/8% Russell 2000 (lagged one quarter)/11% Barclays Capital Aggregate/2% Barclays Capital High Yield/12% S&P/LSTA Levered Loan Index + 250 basis points (lagged one quarter)/10% NCREIF ODCE (lagged one quarter)/2% Bloomberg Commodities Index TR/5% Multi-Asset Class Custom Index**
- ***Interim SAA Policy:** 20% S&P 500/3% S&P 400/3% S&P 600/17% MSCI EAFE/2% MSCI EAFE Small Cap/5% MSCI Emerging Markets/8% Russell 2000 (lagged one quarter)/12% Barclays Capital Aggregate/2% Barclays Capital High Yield/11% S&P/LSTA Levered Loan Index + 250 basis points (lagged one quarter)/2% Bloomberg Commodity Index/5% Multi-Asset Class Custom Index/10% NCREIF ODCE (lagged one quarter)



Note: All MSCI indices changed from Gross to Net of dividend withholding taxes effective 1/1/2014.

Information Disclaimer

- Past performance is no guarantee of future results.
- All investments carry some level of risk. Diversification and other asset allocation techniques are not guaranteed to ensure profit or protect against losses.
- NEPC's source for portfolio pricing, calculation of accruals, and transaction information is the plan's custodian bank. Information on market indices and security characteristics is received from other sources external to NEPC. While NEPC has exercised reasonable professional care in preparing this report, we cannot guarantee the accuracy of all source information contained within.
- Some index returns displayed in this report or used in calculation of a policy, allocation or custom benchmark may be preliminary and subject to change.
- This report is provided as a management aid for the client's internal use only. Information contained in this report does not constitute a recommendation by NEPC.
- This report may contain confidential or proprietary information and may not be copied or redistributed to any party not legally entitled to receive it.

Reporting Methodology

- The client's custodian bank is NEPC's preferred data source unless otherwise directed. NEPC generally reconciles custodian data to manager data. If the custodian cannot provide accurate data, manager data may be used.
- Trailing time period returns are determined by geometrically linking the holding period returns, from the first full month after inception to the report date. Rates of return are annualized when the time period is longer than a year. Performance is presented gross and/or net of manager fees as indicated on each page.
- For managers funded in the middle of a month, the "since inception" return will start with the first full month, although actual inception dates and cash flows are taken into account in all Composite calculations.
- This report may contain forward-looking statements that are based on NEPC's estimates, opinions and beliefs, but NEPC cannot guarantee that any plan will achieve its targeted return or meet other goals.

