

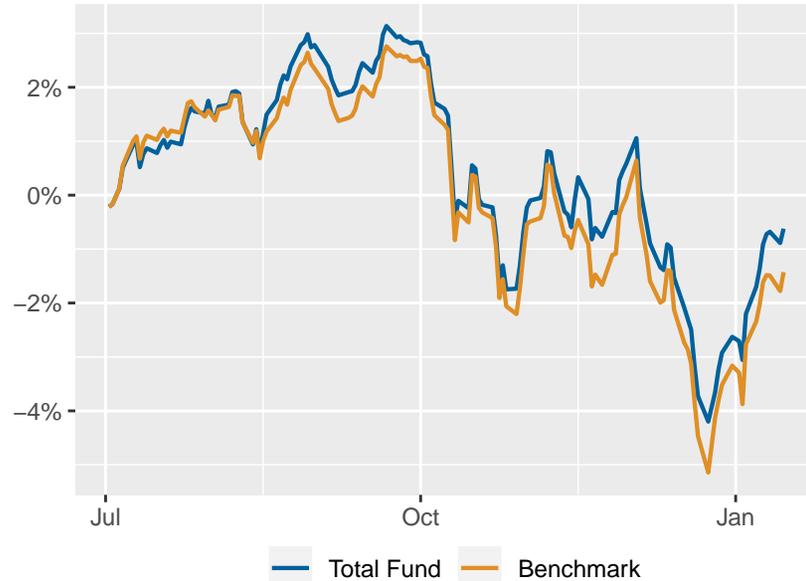
# CIO Board Report

Arizona State Retirement System

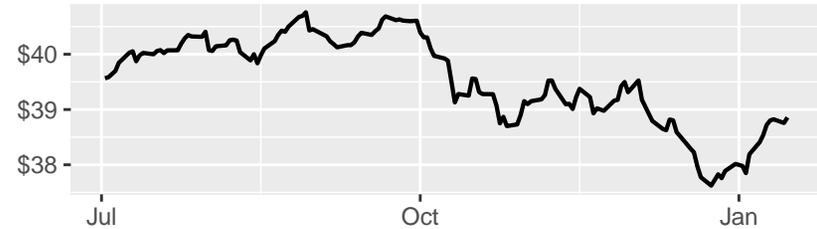
January 25, 2019

# Total Fund FYTD Return & Current Positioning

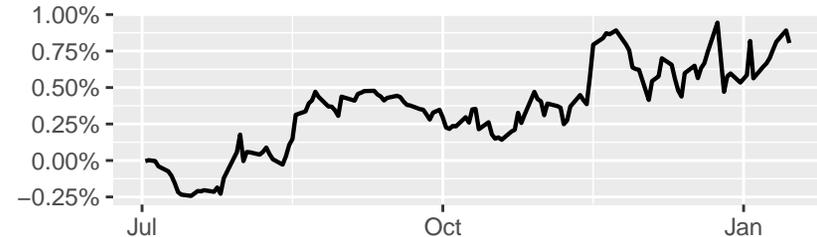
Return FYTD through 01/15/2019



Total Fund Market Value (Billions)



Excess Return FYTD as of 01/15/2019



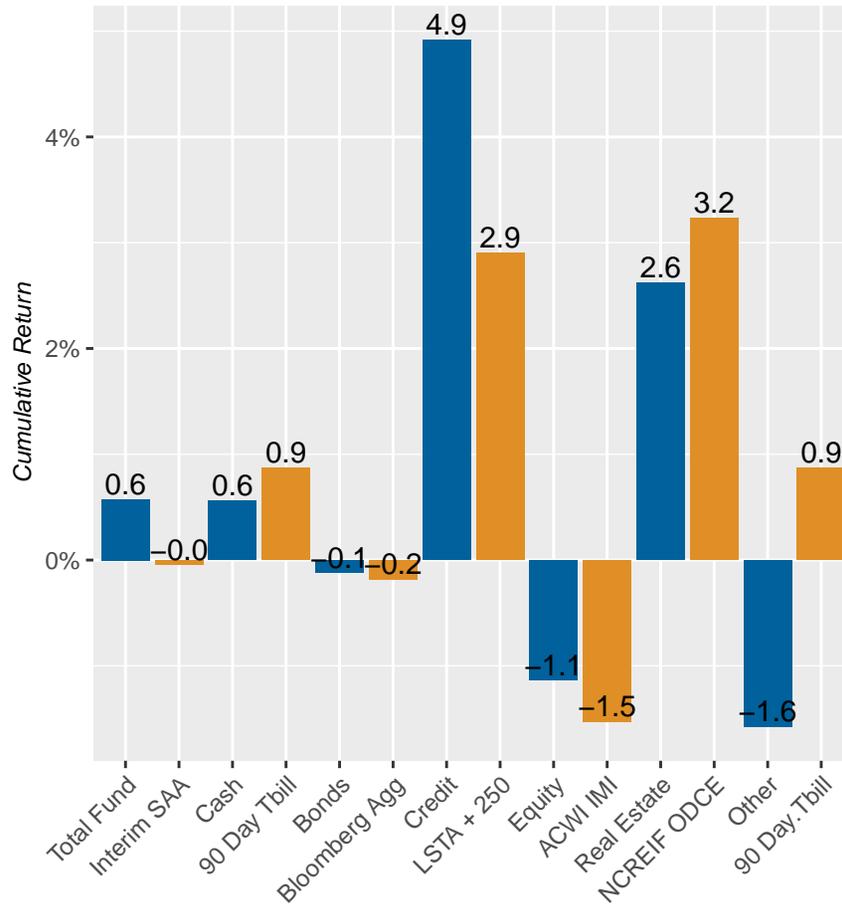
## Total Fund Exposure

	NAV (\$ mm)	NAV (%)	Notional (\$ mm)	Exposure (%)	Target (%)	Active Weight (%)	Active Weight (\$ mm)
Cash	705.8	1.8	964.7	2.5	0.0	2.5	964.7
Bonds	3926.5	10.1	3926.5	10.2	11.9	-1.7	-666.6
Credit	6882.3	17.7	6882.3	17.8	16.6	1.2	475.0
Equity	22227.1	57.2	21968.2	56.9	59.6	-2.7	-1036.1
Real Estate	5021.8	12.9	5021.8	13.0	11.9	1.1	428.7
Other	93.1	0.2	93.1	0.2	0.0	0.2	93.1
<b>Total Fund</b>	<b>38856.7</b>	<b>100.0</b>	<b>38597.8</b>	<b>100.0</b>	<b>100.0</b>	<b>0.0</b>	<b>0.0</b>

# FYTD Total Fund Returns & Dollar Value Add

## Asset Class and Benchmark

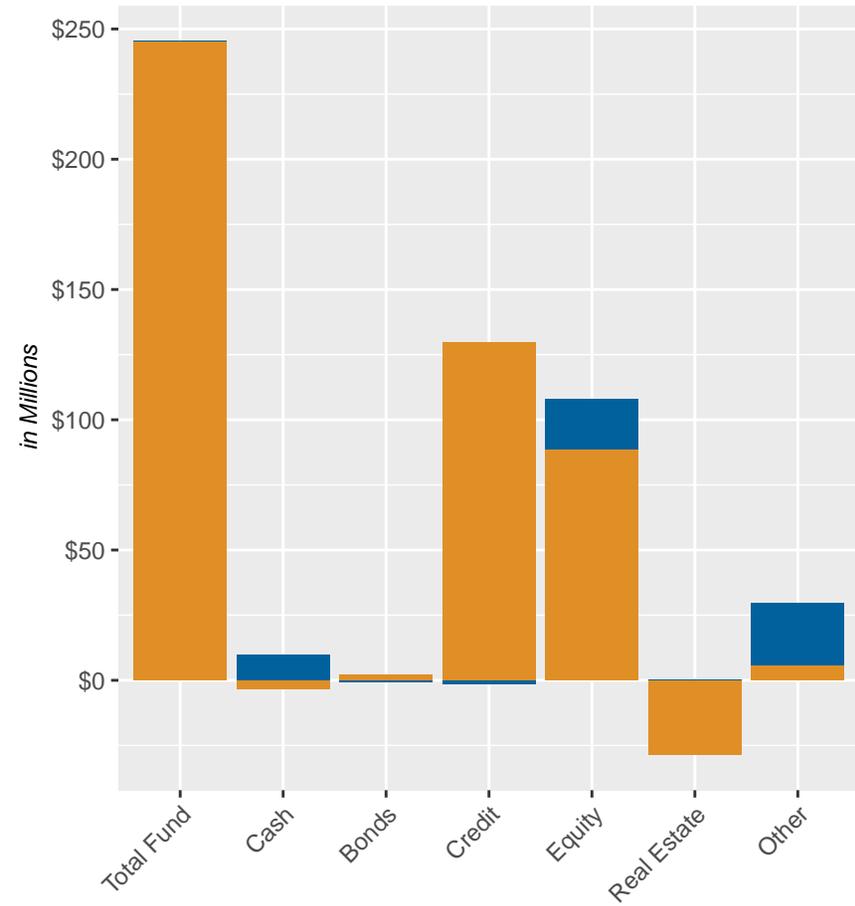
FYTD Returns as of 11/30/2018



Asset Class Benchmark

## Dollar Value Add

FYTD DVA as of 11/30/2018

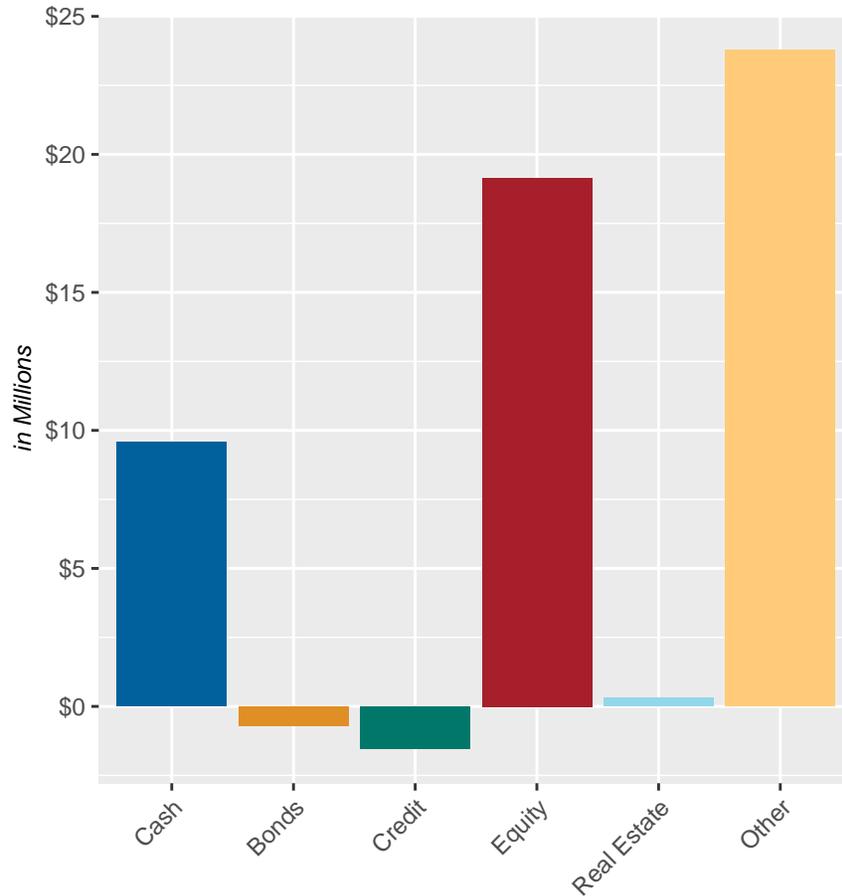


Allocation Selection Residual

# FYTD Allocation Effect by Asset Class

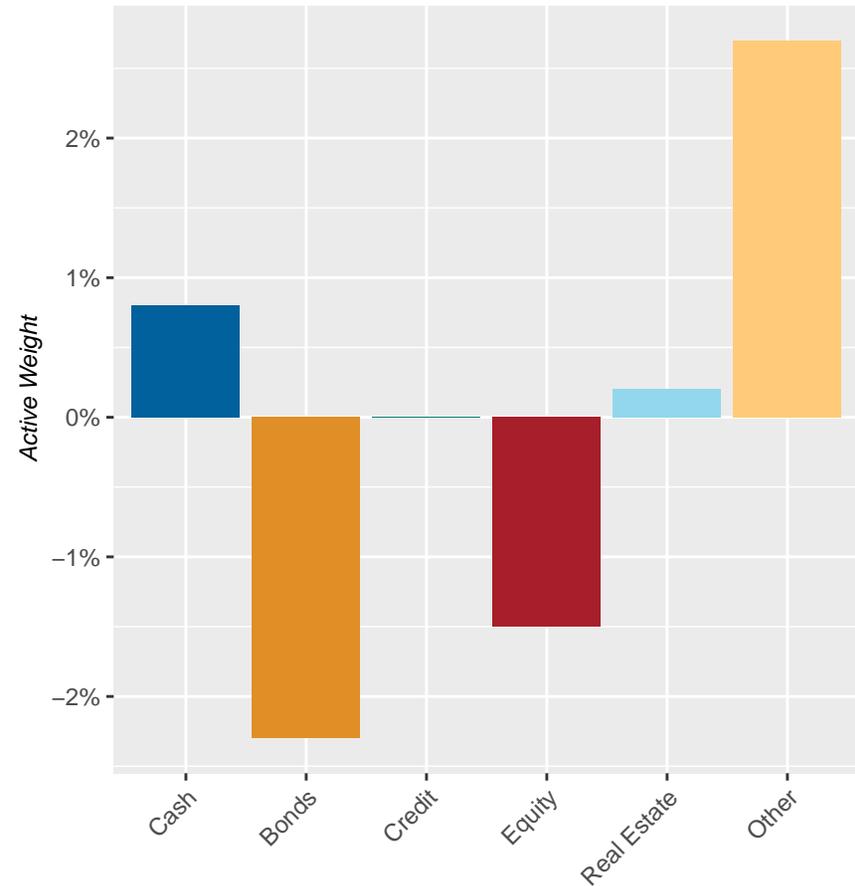
**Allocation Effect by Asset Class**

Relative to SAA Benchmark as of 11/30/2018



**Asset Class Average Active Weights**

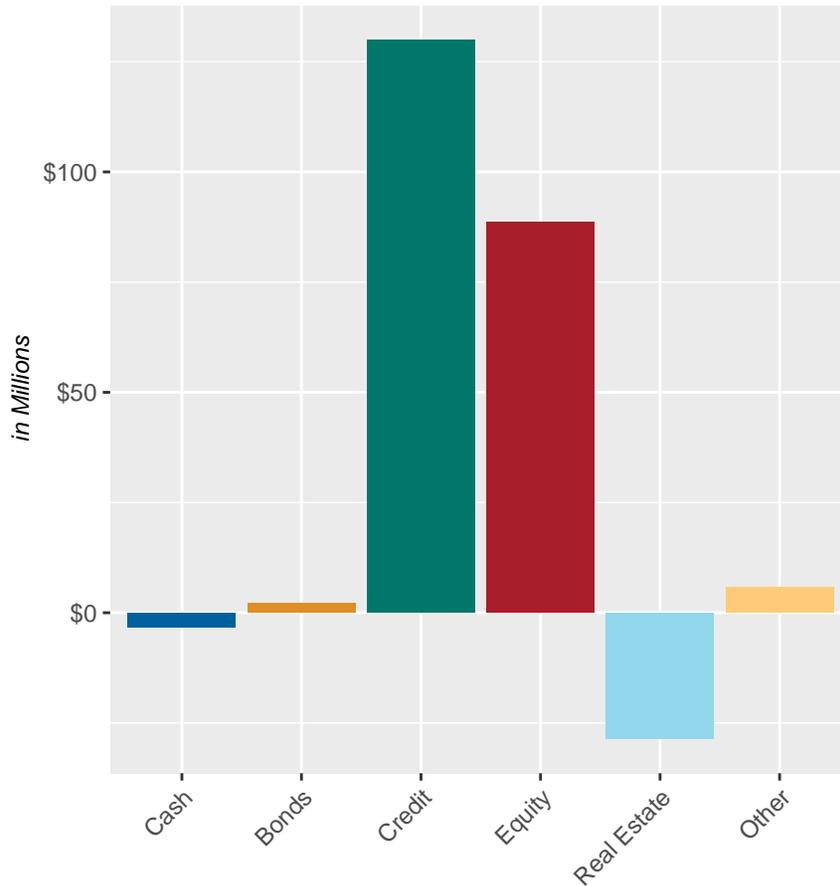
Relative to SAAP as of 11/30/2018



# FYTD Selection Effect by Asset Class

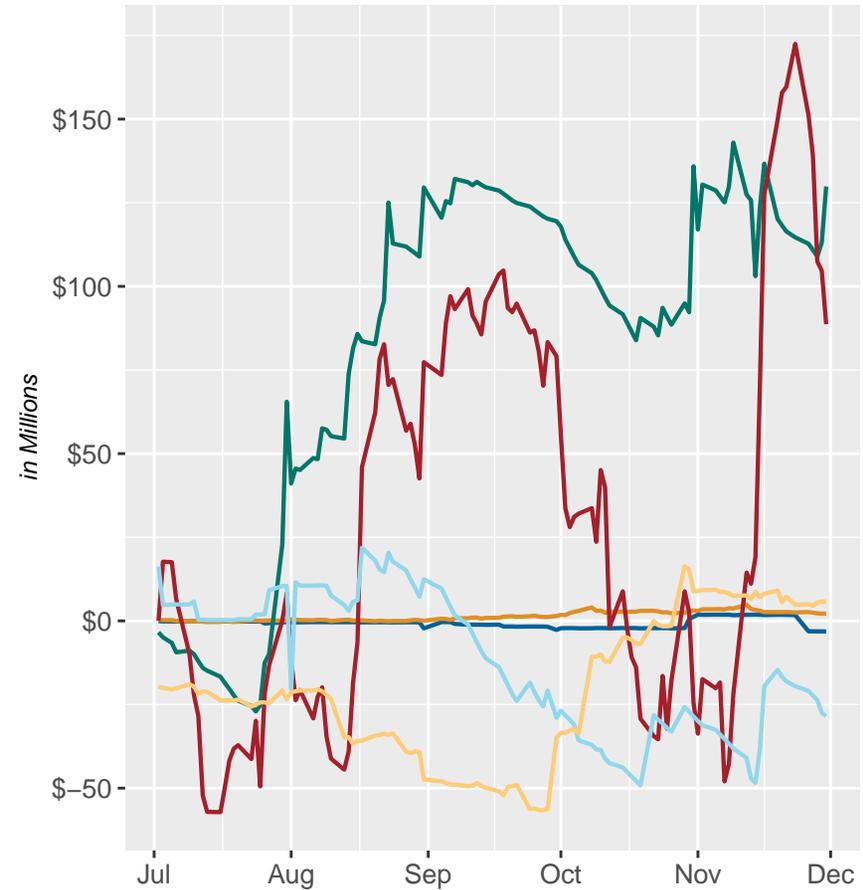
**Selection Effect by Asset Class**

Relative to Benchmark as of 11/30/2018



**Cumulative Selection Effect by Asset Class**

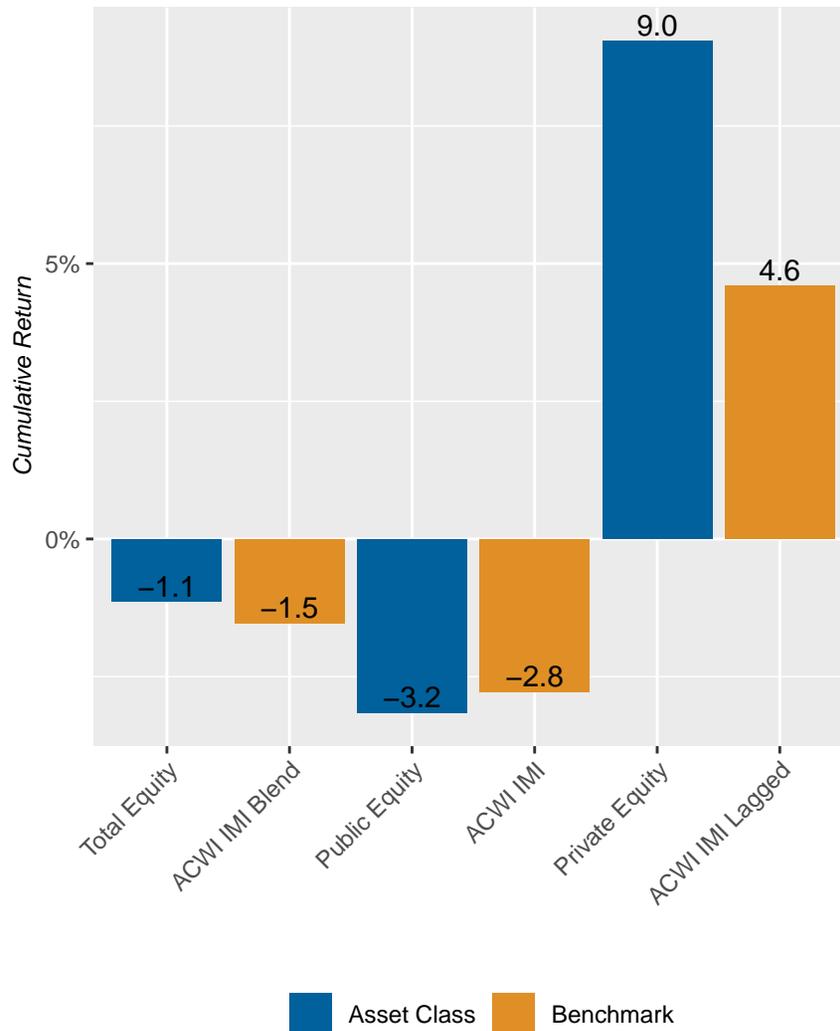
Relative to Benchmark as of 11/30/2018



# FYTD Total Equity Returns & Dollar Value Add

## Total Equity and Benchmark

FYTD Returns as of 11/30/2018



## Total Equity Dollar Value Add

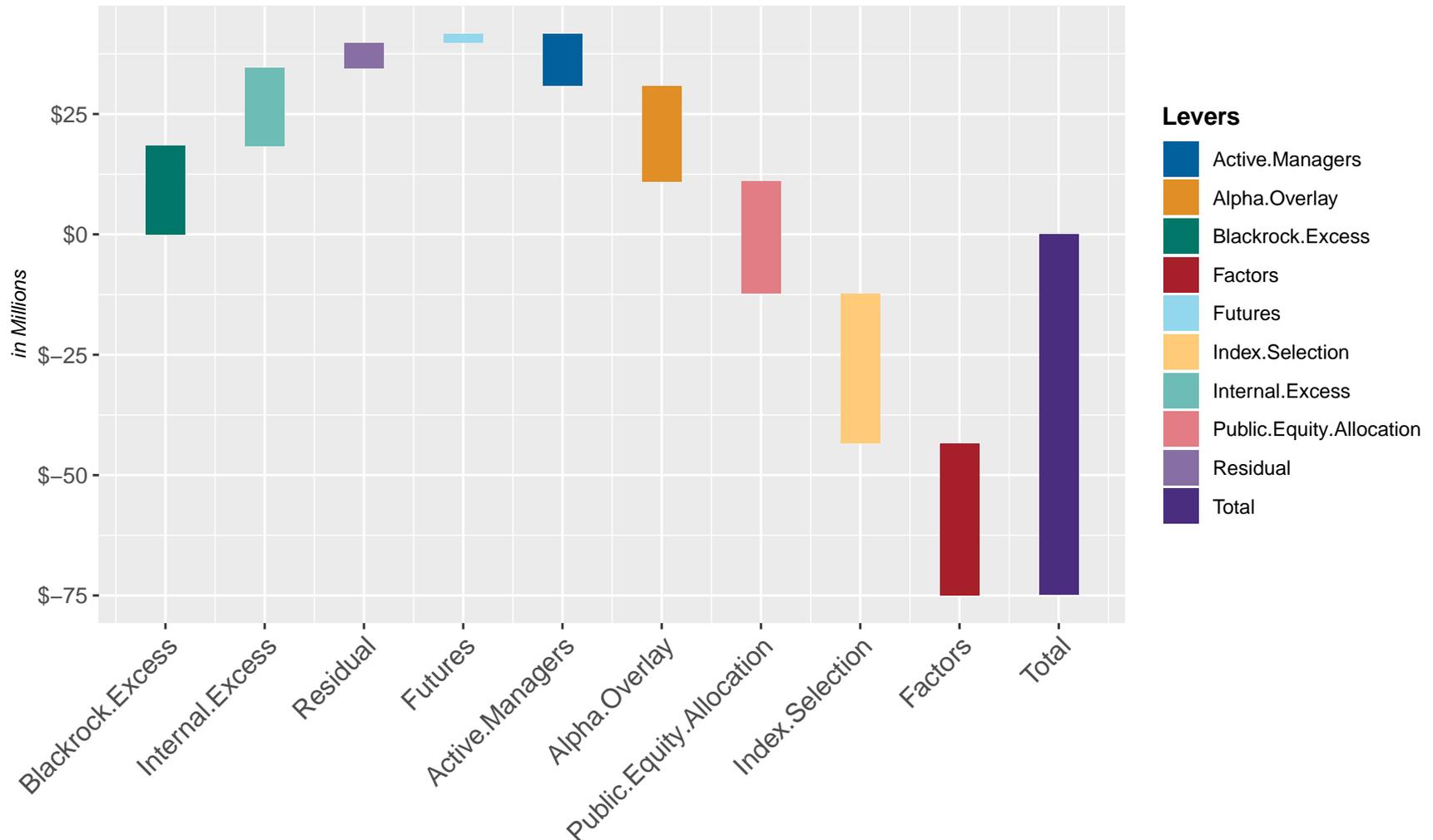
FYTD DVA as of 11/30/2018



# FYTD Public Equity "Levers"

## Public Equity Dollar Value Add

FYTD DVA as of 11/30/2018



# State Street Performance Summary - 9/30/2018

ARIZONA STATE RETIREMENT SYSTEM  
 Investment Management Division  
 Sep-30-2018  
 Net Returns  
 Final

ASRS Performance Summary

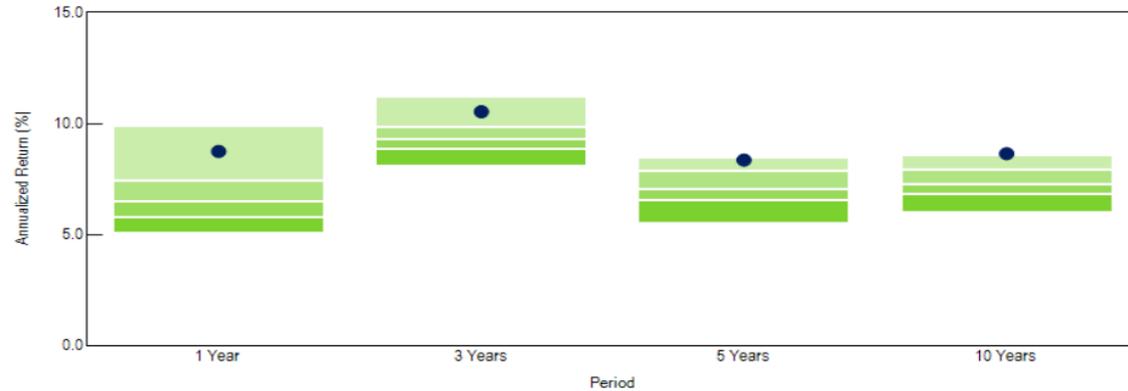


	Benchmark	Market Value (\$mil.)	1 Mth	3 Mth	FYTD	1 Year	3 Year	5 Year	ITD	Inception Date
<b>TOTAL PLAN</b>	<b>INTERIM SAA POLICY</b>	<b>40,607</b>	<b>0.05</b>	<b>2.84</b>	<b>2.84</b>	<b>8.74</b>	<b>10.54</b>	<b>8.36</b>	<b>9.74</b>	<b>07-01-1975</b>
Excess			-0.09	0.35	0.35	1.77	2.09	1.75	0.40	
<b>TOTAL EQUITY</b>	<b>LEGACY Total Equity BM</b>	<b>23,357</b>	<b>0.06</b>	<b>3.78</b>	<b>3.78</b>	<b>10.36</b>	<b>13.23</b>	<b>9.72</b>	<b>10.70</b>	<b>07-01-2013</b>
Excess			0.01	0.36	0.36	0.31	-0.20	-0.16	-0.23	
<b>US EQUITY</b>	<b>COMBINED DOMESTIC EQUITY INDEX</b>	<b>10,640</b>	<b>-0.17</b>	<b>6.45</b>	<b>6.45</b>	<b>16.66</b>	<b>16.57</b>	<b>13.09</b>	<b>11.40</b>	<b>07-01-1975</b>
Excess			-0.32	-0.62	-0.62	-1.17	-0.90	-0.59	-0.13	
<b>INTERNATIONAL EQUITY</b>	<b>INTERNATIONAL EQUITY INDEX</b>	<b>8,818</b>	<b>0.46</b>	<b>0.65</b>	<b>0.65</b>	<b>1.93</b>	<b>9.64</b>	<b>4.45</b>	<b>6.09</b>	<b>04-01-1987</b>
Excess			0.25	0.26	0.26	0.11	-0.46	-0.09	0.26	
<b>PRIVATE EQUITY</b>	<b>MSCI ACWI IMI w/USA GROSS (NET) LAGGED</b>	<b>3,899</b>	<b>0.00</b>	<b>4.54</b>	<b>4.54</b>	<b>16.05</b>	<b>12.59</b>	<b>13.04</b>	<b>7.28</b>	<b>09-01-2007</b>
Excess			0.58	3.75	3.75	6.07	4.06	2.07	0.28	
<b>INTEREST RATE SENSITIVE</b>	<b>BBG BARC Agg (Dly)</b>	<b>3,860</b>	<b>-0.61</b>	<b>0.06</b>	<b>0.06</b>	<b>-1.06</b>	<b>1.71</b>	<b>2.47</b>	<b>7.82</b>	<b>07-01-1975</b>
Excess			0.04	0.04	0.04	0.15	0.40	0.30		
<b>CREDIT</b>	<b>LEGACY Total Credit BM</b>	<b>6,721</b>	<b>0.17</b>	<b>3.15</b>	<b>3.15</b>	<b>9.88</b>	<b>9.00</b>	<b>7.54</b>	<b>7.44</b>	<b>07-01-2013</b>
Excess			-0.16	1.83	1.83	3.69	1.53	2.86		
<b>PRIVATE DEBT</b>	<b>S&amp;P LEVERAGED LOAN INDEX LAGGED + 250BPS</b>	<b>4,891</b>	<b>0.22</b>	<b>2.75</b>	<b>2.75</b>	<b>10.78</b>	<b>10.79</b>	<b>11.19</b>	<b>12.28</b>	<b>10-01-2012</b>
Excess			-0.10	1.43	1.43	3.82	3.98	4.60	5.14	
<b>DISTRESSED DEBT</b>	<b>S&amp;P LEVERAGED LOAN INDEX LAGGED + 250BPS</b>	<b>1,388</b>	<b>-0.00</b>	<b>3.46</b>	<b>3.46</b>				<b>3.46</b>	<b>07-01-2018</b>
Excess			-0.32	2.14	2.14				2.14	
<b>OTHER CREDIT</b>	<b>S&amp;P LEVERAGED LOAN INDEX LAGGED + 250BPS</b>	<b>384</b>	<b>-0.00</b>	<b>5.82</b>	<b>5.82</b>				<b>5.82</b>	<b>07-01-2018</b>
Excess			-0.33	4.50	4.50				4.50	
<b>REAL ESTATE</b>	<b>Custom ASRS ODCE (Net)</b>	<b>4,847</b>	<b>0.20</b>	<b>1.36</b>	<b>1.36</b>	<b>7.36</b>	<b>11.23</b>	<b>12.15</b>	<b>6.38</b>	<b>12-01-2005</b>
Excess			-0.87	-0.62	-0.62	-0.28	2.80	2.08	-0.15	
<b>CASH</b>	<b>CASH CUSTOM INDEX</b>	<b>498</b>	<b>-2.85</b>	<b>-0.10</b>	<b>-0.10</b>	<b>4.16</b>	<b>4.79</b>	<b>2.44</b>	<b>4.08</b>	<b>04-01-1990</b>
Excess			-3.00	-0.59	-0.59	-0.53	-1.39	-0.74	0.69	
<b>OTHER</b>	<b>91 DAY TREASURY BILL (DAILY)</b>	<b>1,324</b>	<b>1.13</b>	<b>-1.99</b>	<b>-1.99</b>	<b>5.45</b>	<b>2.58</b>	<b>1.67</b>	<b>2.77</b>	<b>07-01-2013</b>
Excess			0.97	-2.48	-2.48	3.86	1.74	1.15	2.27	

# ASRS Returns Compared to Public Fund Universe - 9/30/2018

## TOTAL FUND NET OF FEE UNIVERSE COMPARISON

InvestorForce Public DB > \$1B Net Return Comparison  
 Ending September 30, 2018



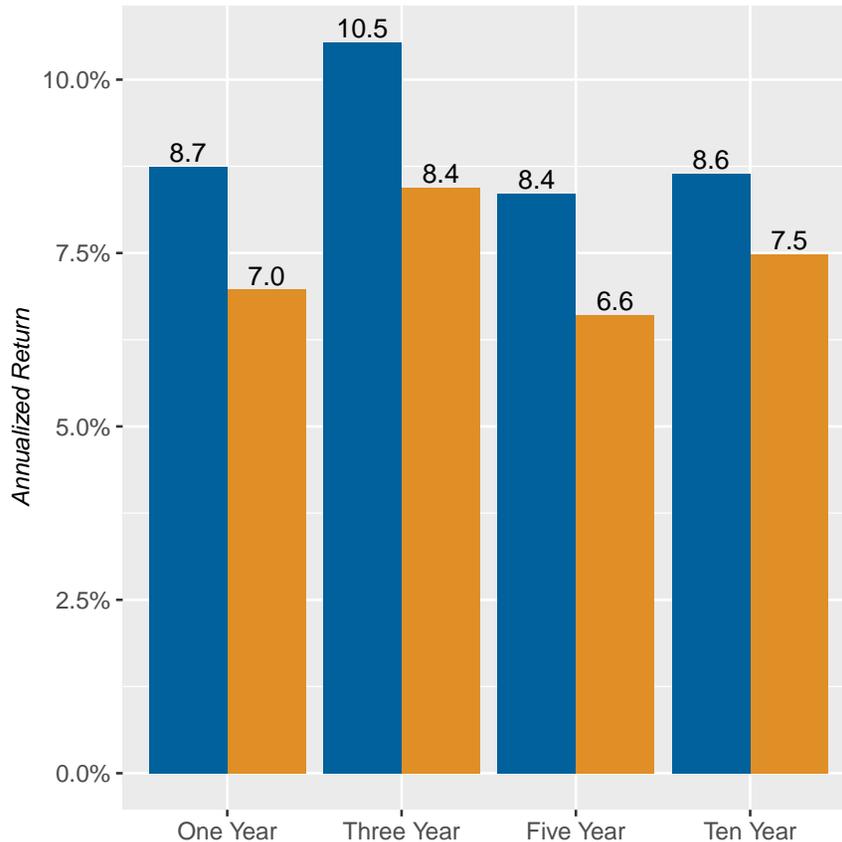
	Return (Rank)			
	1 Year	3 Years	5 Years	10 Years
5th Percentile	9.8	11.2	8.5	8.6
25th Percentile	7.5	9.9	7.9	7.9
Median	6.5	9.3	7.1	7.3
75th Percentile	5.8	8.9	6.6	6.9
95th Percentile	5.1	8.1	5.5	6.0
# of Portfolios	62	62	60	53
● Total Fund	8.7 (7)	10.5 (9)	8.4 (8)	8.6 (4)



# Total Fund Returns & Dollar Value Add - 9/30/2018

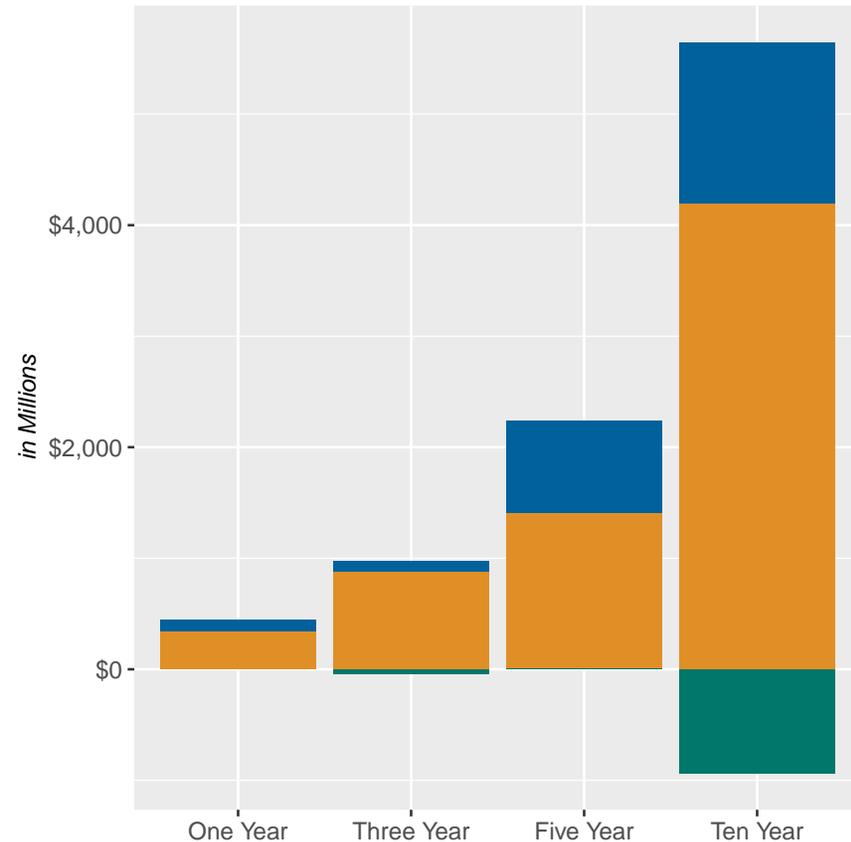
**Total Fund and SAA Benchmark**

Trailing Period Returns as of 9/30/18



**Total Fund Dollar Value Add**

Relative to SAA Benchmark as of 9/30/18

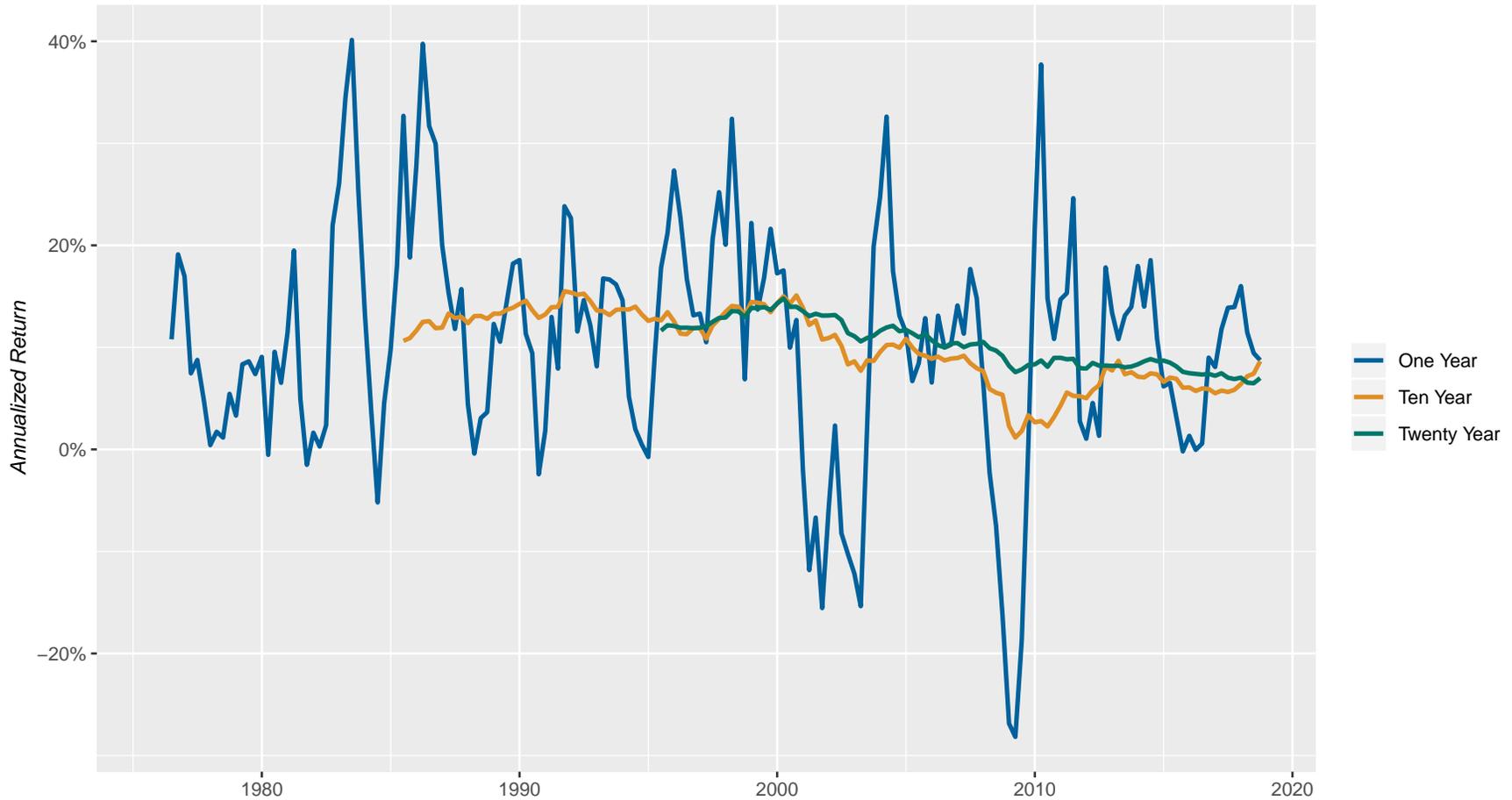


■ Total Fund ■ SAA Benchmark

# Total Fund Returns - 9/30/2018

## Total Fund Rolling Returns

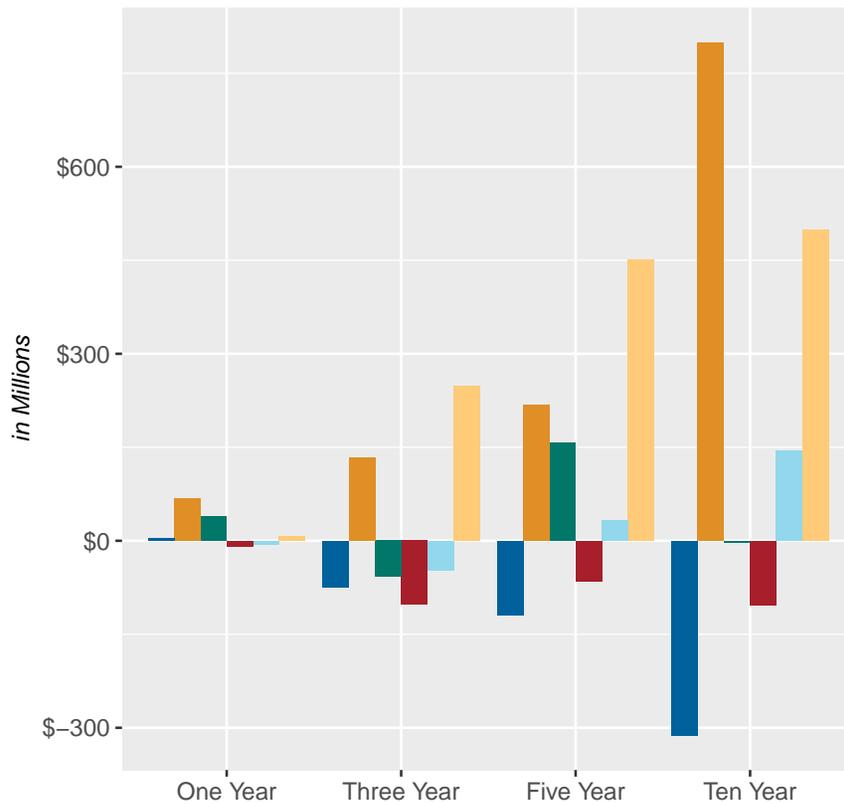
Trailing Period Returns as of 9/30/18



# Allocation Effect - 9/30/2018

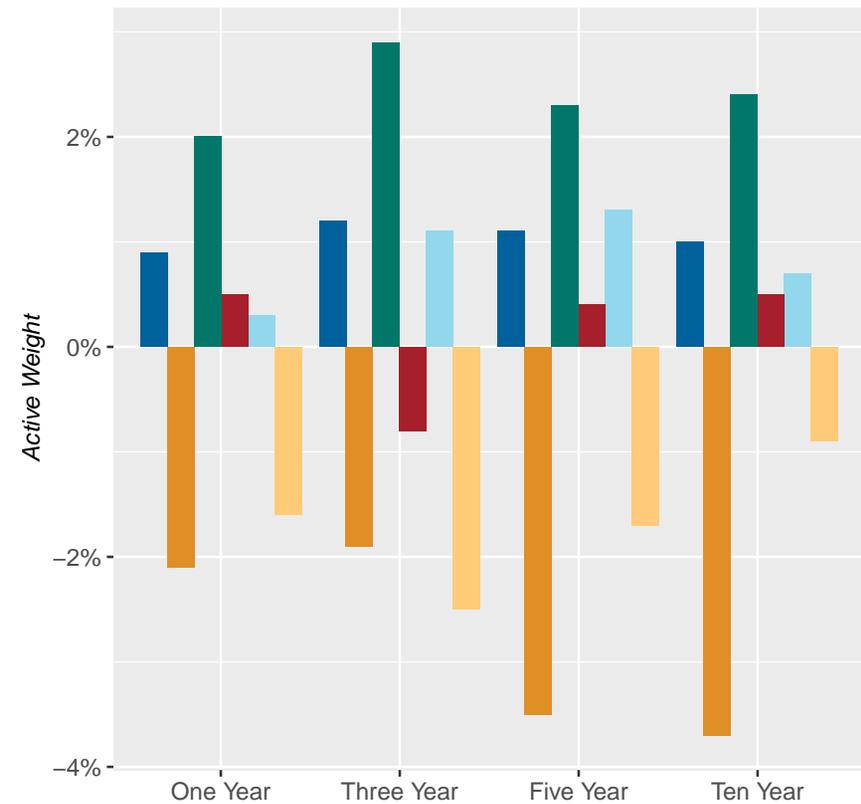
**Allocation Effect by Asset Class**

Relative to SAA Benchmark as of 9/30/18



**Asset Class Average Active Weights**

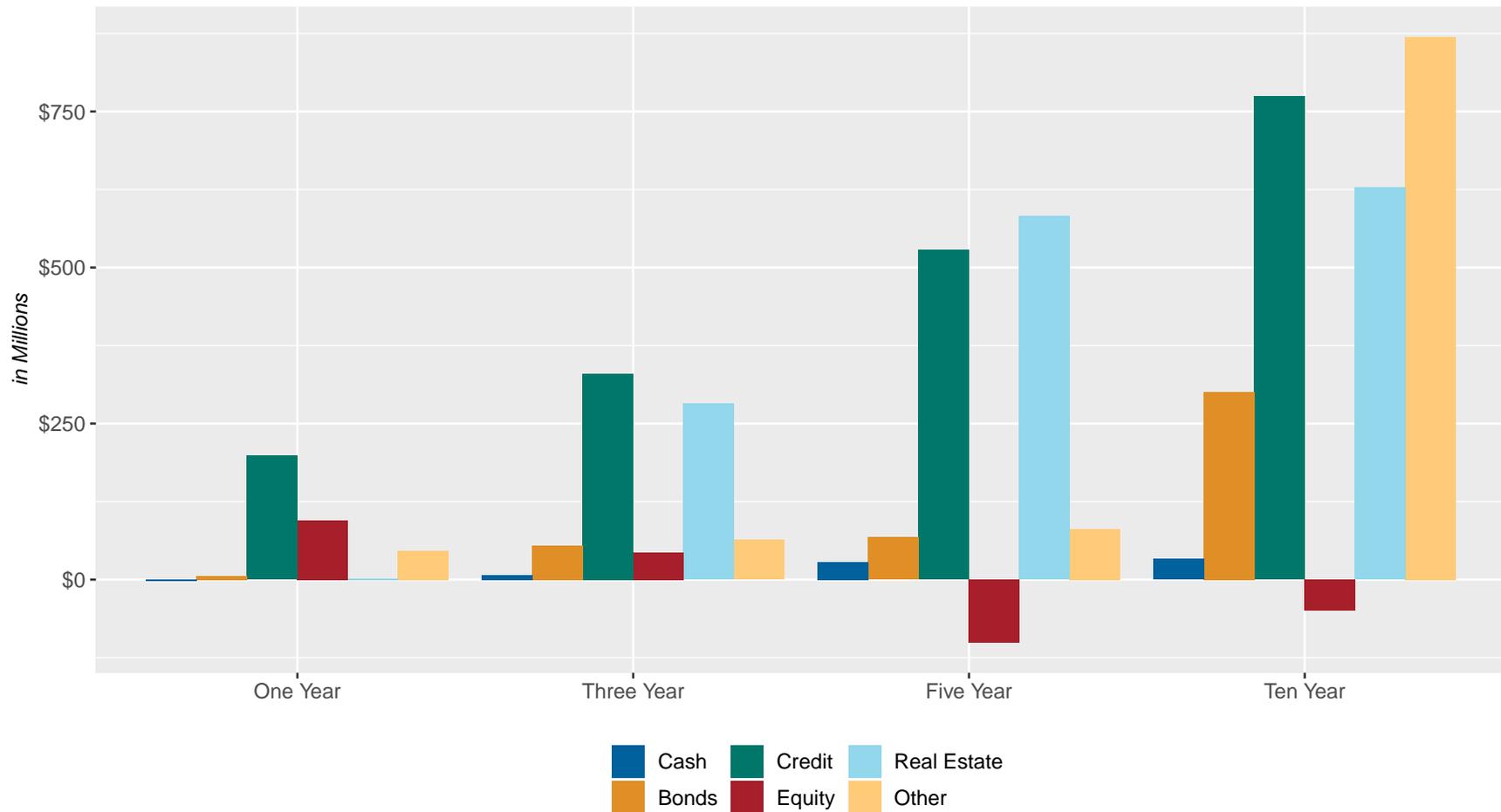
Relative to SAAP as of 9/30/18



# Selection Effect - 9/30/2018

## Selection Effect by Asset Class

Relative to SAA Benchmark as of 9/30/18



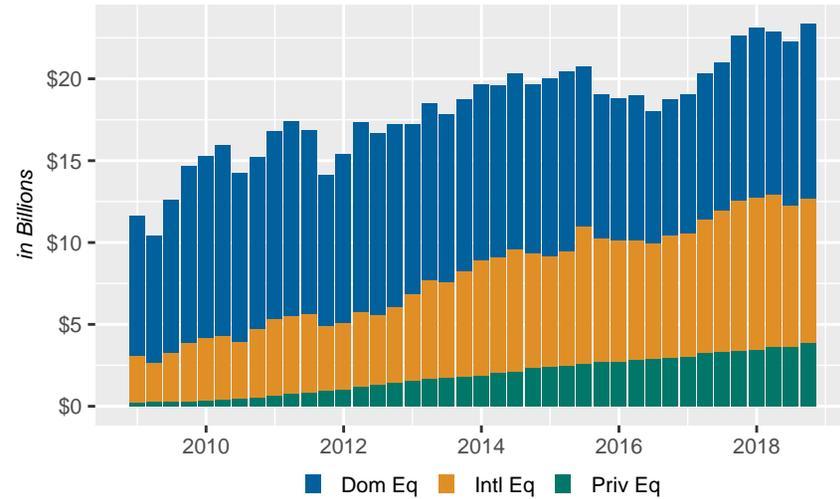
# Total Equity - 9/30/2018

## Annualized Returns

	Composite	One Year	Three Year	Five Year
Equity	10.36%	10.36%	13.23%	9.72%
Benchmark	10.05%	10.05%	13.43%	9.88%
Excess	0.31%	0.31%	-0.2%	-0.16%
Public Equity	9.41%	9.41%	13.3%	9.27%
Benchmark	10.08%	10.08%	14.01%	9.59%
Excess	-0.66%	-0.66%	-0.72%	-0.31%
US Equity	16.66%	16.66%	16.57%	13.09%
Benchmark	17.83%	17.83%	17.47%	13.68%
Excess	-1.17%	-1.17%	-0.9%	-0.59%
Intl Equity	1.93%	1.93%	9.64%	4.45%
Benchmark	1.82%	1.82%	10.11%	4.54%
Excess	0.11%	0.11%	-0.46%	-0.09%
Private Equity	15.56%	15.56%	12.46%	12.82%
Benchmark	8.9%	8.9%	8.29%	10.36%
Excess	6.66%	6.66%	4.17%	2.47%

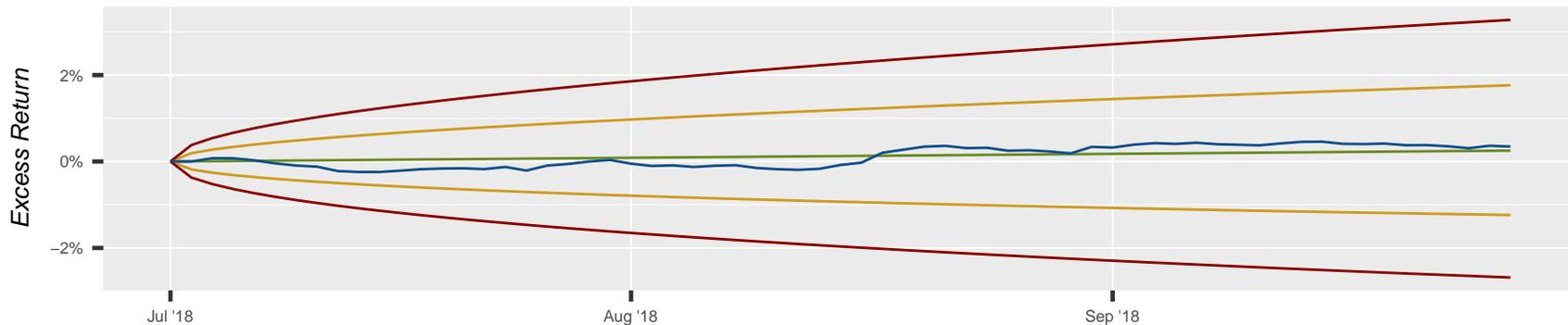
Note: Private Equity Returns are IRRs height

## Market Values



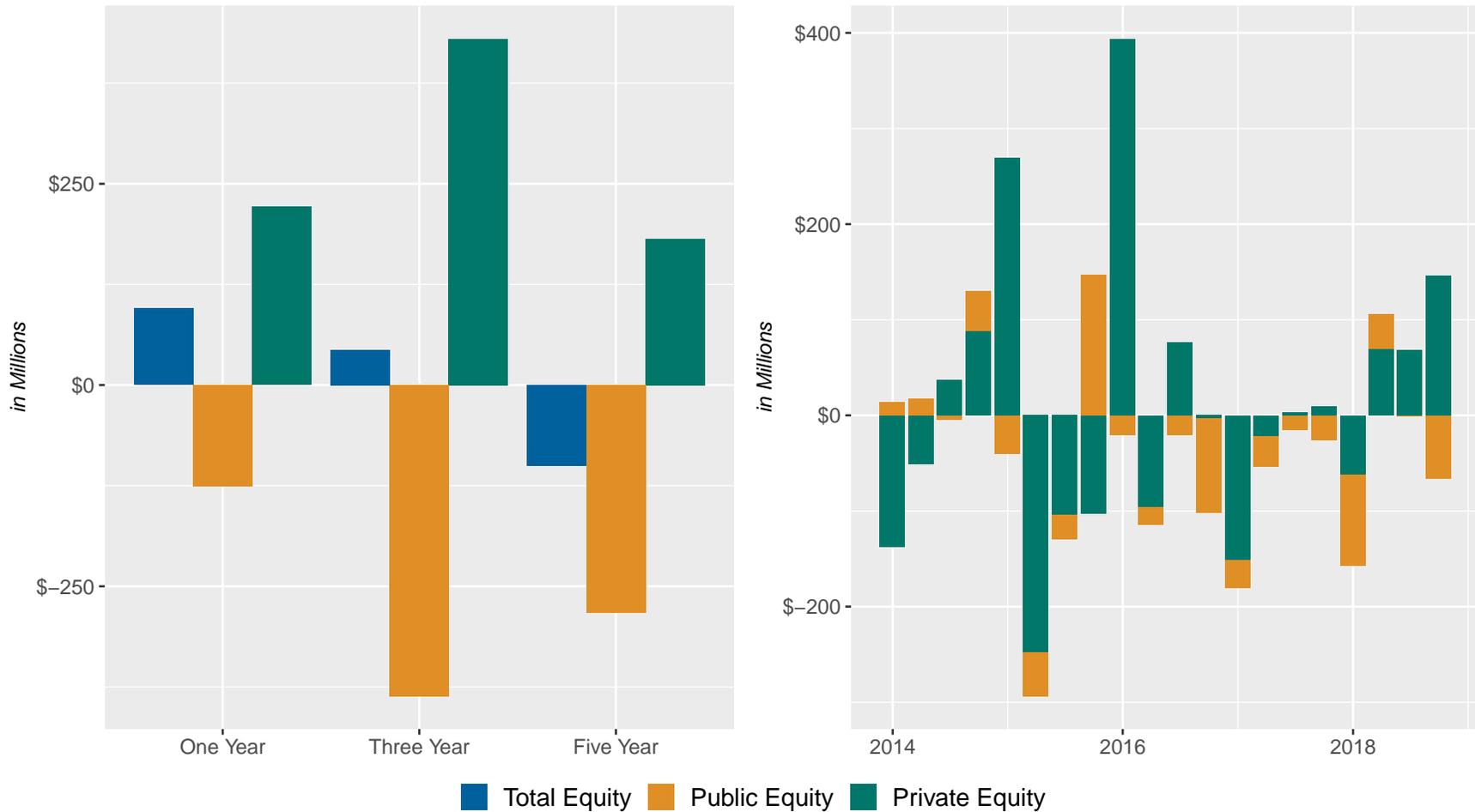
## Total Equity Portfolio Performance versus Expectations

100bps Expected Excess Return with 300bps Tracking Error



# Total Equity & DVA - 9/30/2018

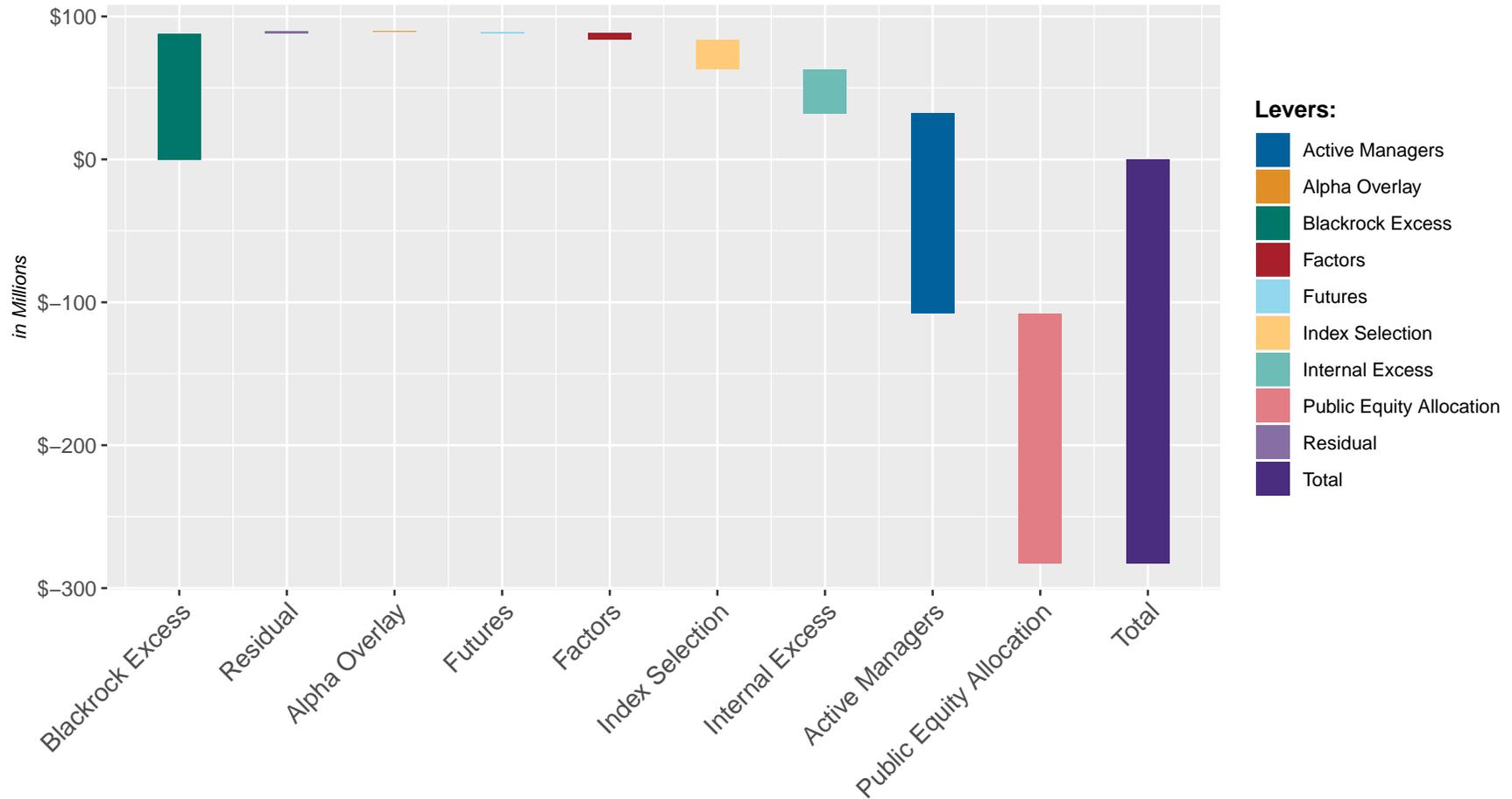
Total Equity Dollar Value Added



# Public Equity "Levers" - 9/30/2018

## Public Equity Dollar Value Add

Trailing 5 Years as of 9/30/18

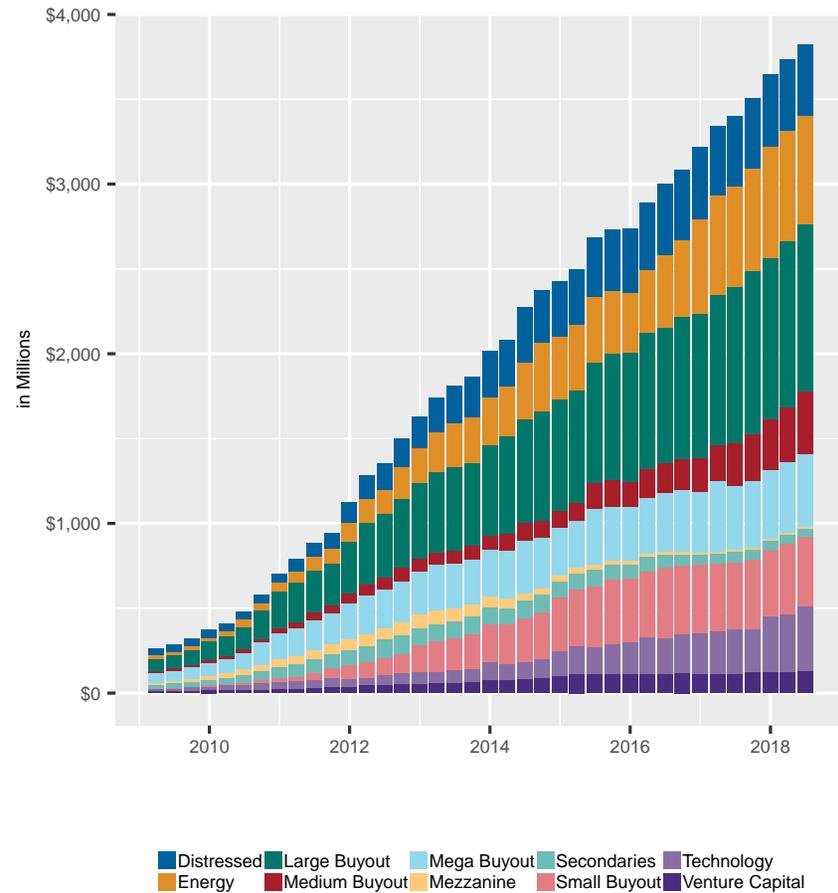


# Private Equity - 9/30/2018

## Private Equity IRRs

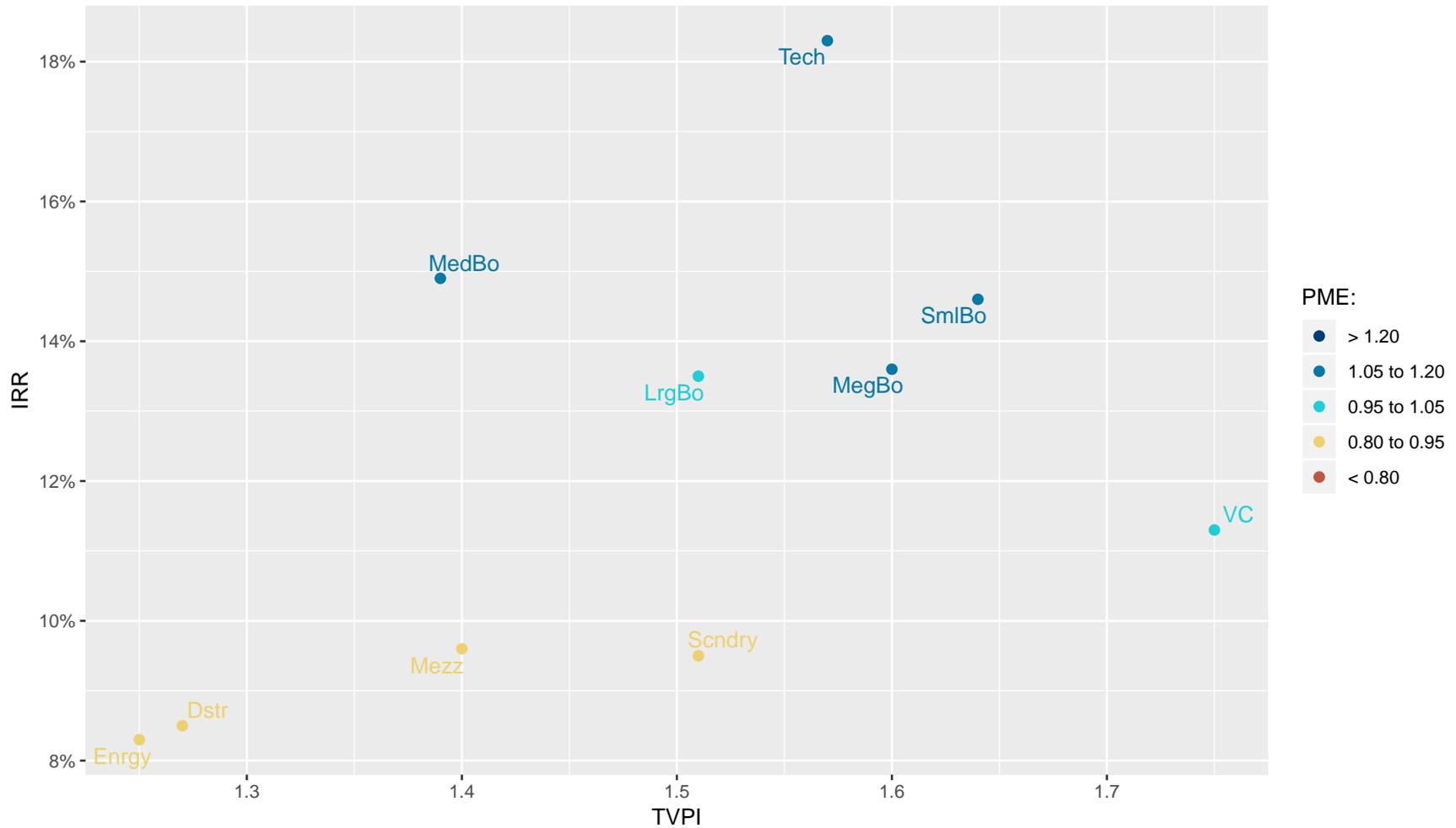
Category	Qtr	1 Year	3 Year	5 Year	ITD
Private Equity	4.4%	15.6%	12.5%	12.8%	12.8%
Benchmark	1.1%	8.9%	8.3%	10.4%	10.4%
Excess	3.3%	6.7%	4.2%	2.5%	2.5%
Technology	6.5%	27.4%	20%	21.2%	18.3%
Mega Buyout	6.7%	18.2%	16.9%	16.7%	13.6%
Medium Buyout	3.9%	20.6%	15.4%	18.6%	14.9%
Small Buyout	8.4%	18.7%	18.6%	17.9%	14.6%
Energy	2%	5.4%	6.1%	6.3%	8.3%
Venture Capital	5.3%	21.5%	10.4%	15.3%	11.3%
Distressed	2.9%	11.3%	4.8%	6.3%	8.5%
Secondaries	-0.7%	11.2%	4.9%	9%	9.5%
Large Buyout	3.5%	16.3%	13.8%	12.9%	13.5%
Mezzanine	6.3%	13.2%	7%	8%	9.6%

NAV by Strategy



# Private Equity - 9/30/2018

Comparison of Strategies

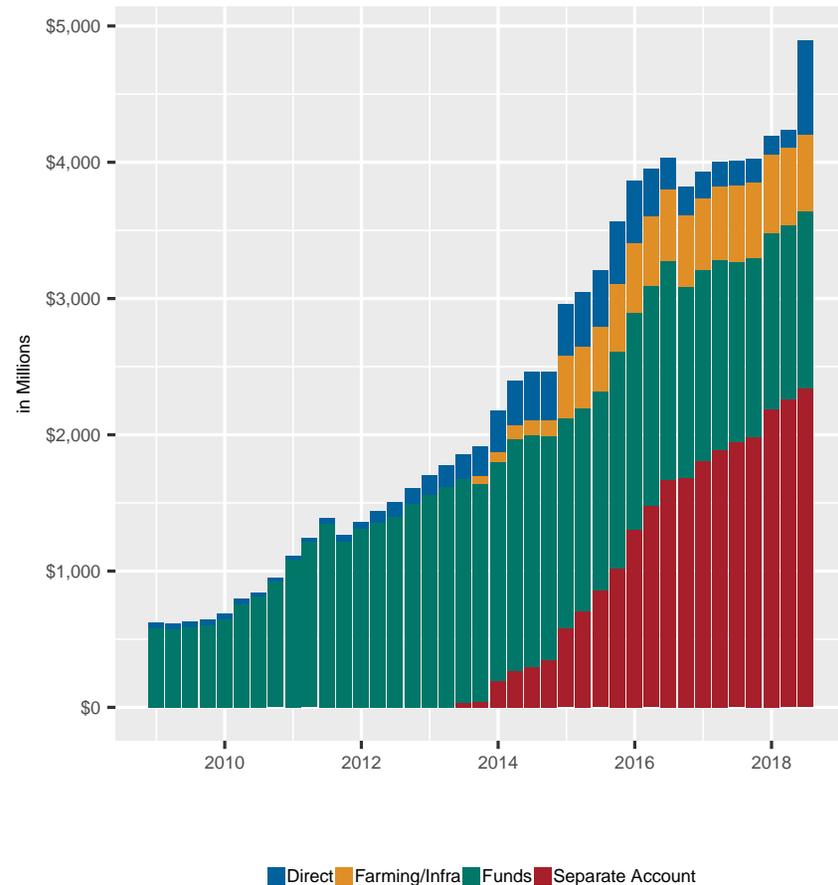


# Real Estate - 9/30/2018

## Real Estate IRRs

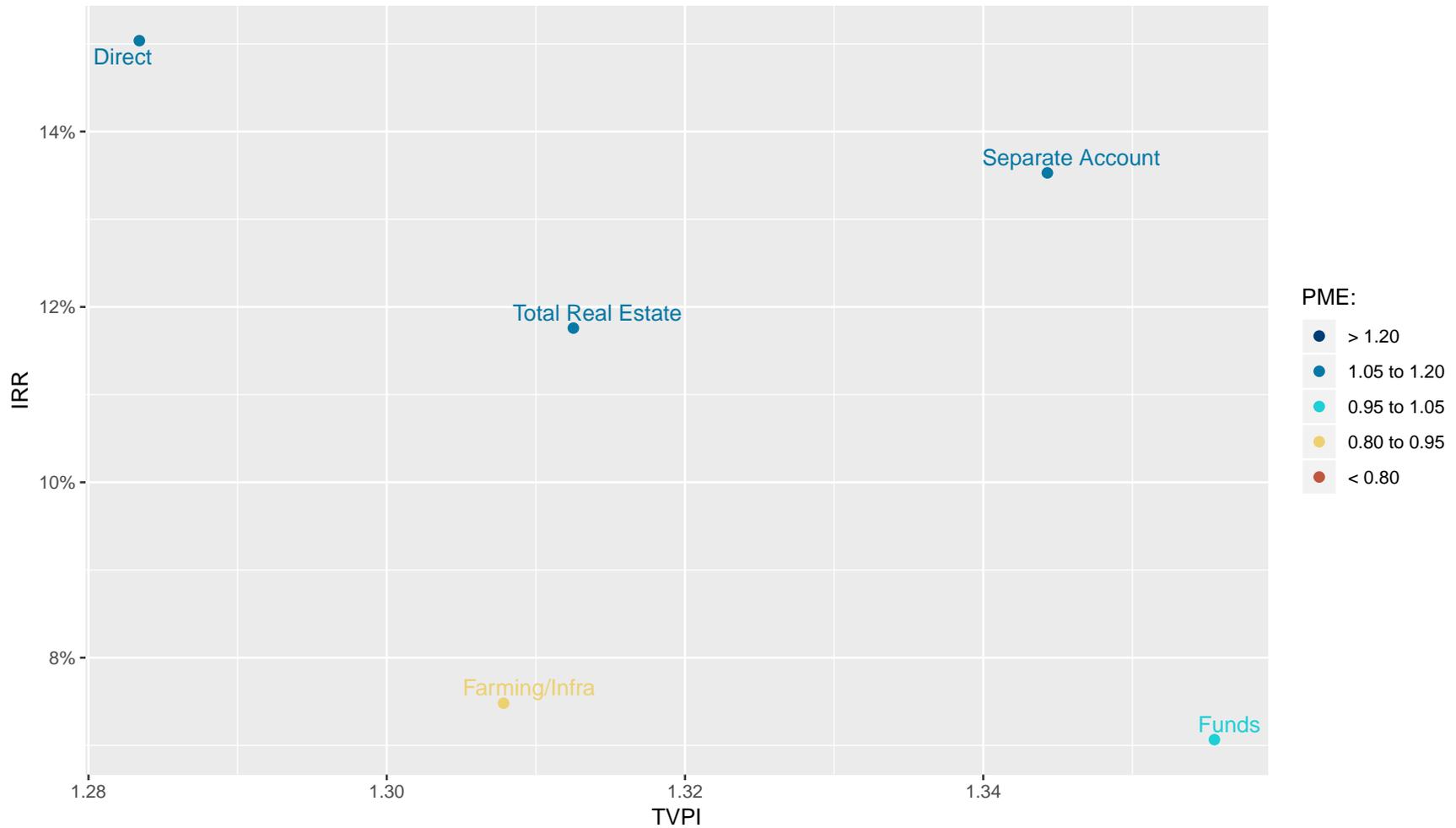
Category	Qtr	1 Year	3 Year	5 Year	ITD
Real Estate	1.29%	7.9%	10.5%	11.8%	11.8%
Benchmark	1.97%	7.1%	8.4%	9.5%	8.6%
Excess	-0.68%	0.9%	2%	2.2%	3.2%
Separate Account	1.22%	9%	13.4%	13.6%	13.5%
Direct	1.35%	-3.9%	6.2%	16%	15%
Farming/Infra	-0.8%	10.6%	8.5%	7.5%	7.5%
Funds	2.32%	7.7%	8.7%	10.9%	7.1%

NAV by Strategy



# Real Estate - 9/30/2018

### Comparison of Strategies

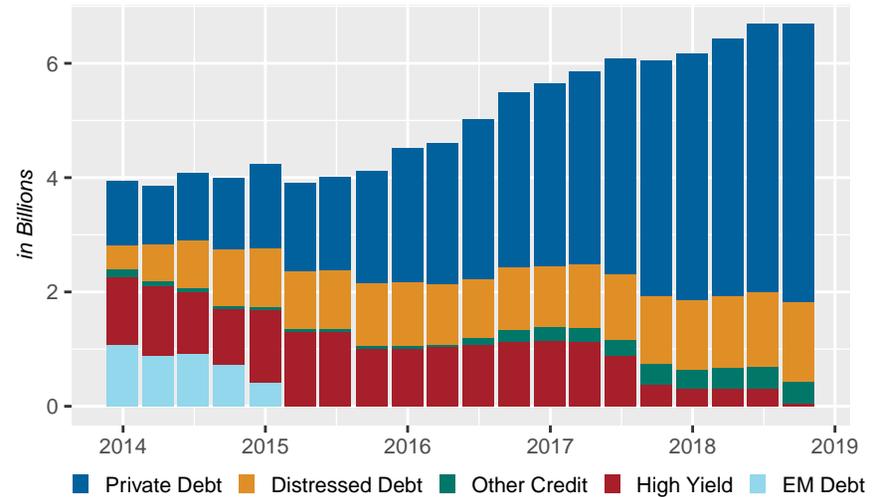


# Total Credit - 9/30/2018

## Annualized Returns

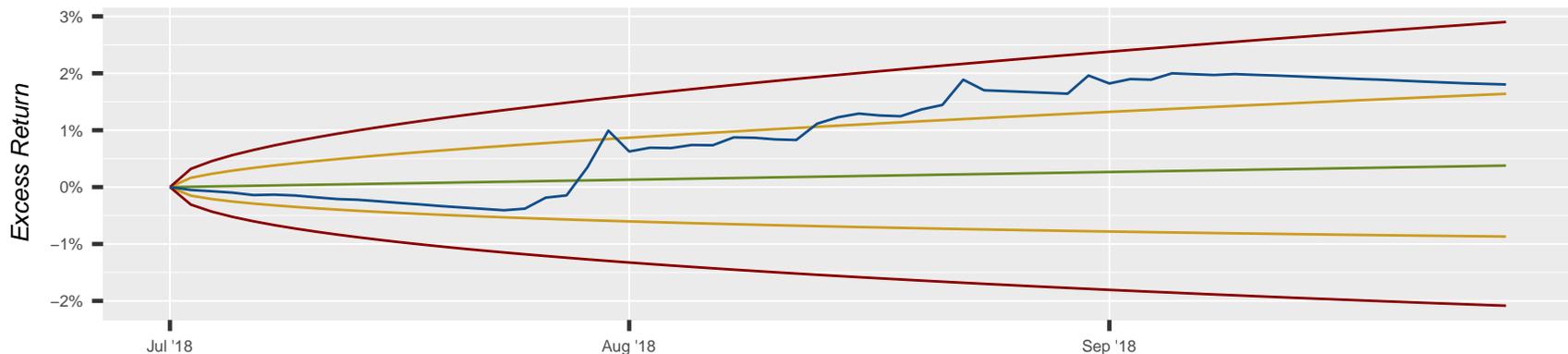
	1 Year	3 Year	5 Year
Total Credit	9.88	9.00	7.54
Blended Benchmark	6.18	7.47	4.68
Total Credit Excess	3.69	1.53	2.86
Private Debt	10.78	10.79	11.19
S&P/LSTA Leveraged Loan + 250bps	6.97	6.80	6.60
Private Debt Excess	3.82	3.98	4.60
Distressed Debt	10.22	6.35	6.87
Fixed 8% Return/LSTA Blend	7.33	7.78	7.85
Distressed Debt Excess	2.89	-1.43	-0.98
Other Credit	4.22	8.55	8.77
Fixed 8% Return/LSTA Blend	7.32	7.64	7.74
Other Credit Excess	-3.10	0.91	1.02
High Yield	2.39	7.13	5.49
Barclay's High Yield Index	3.05	8.15	5.54
High Yield Excess	-0.66	-1.02	-0.05

## Total Credit Market Values



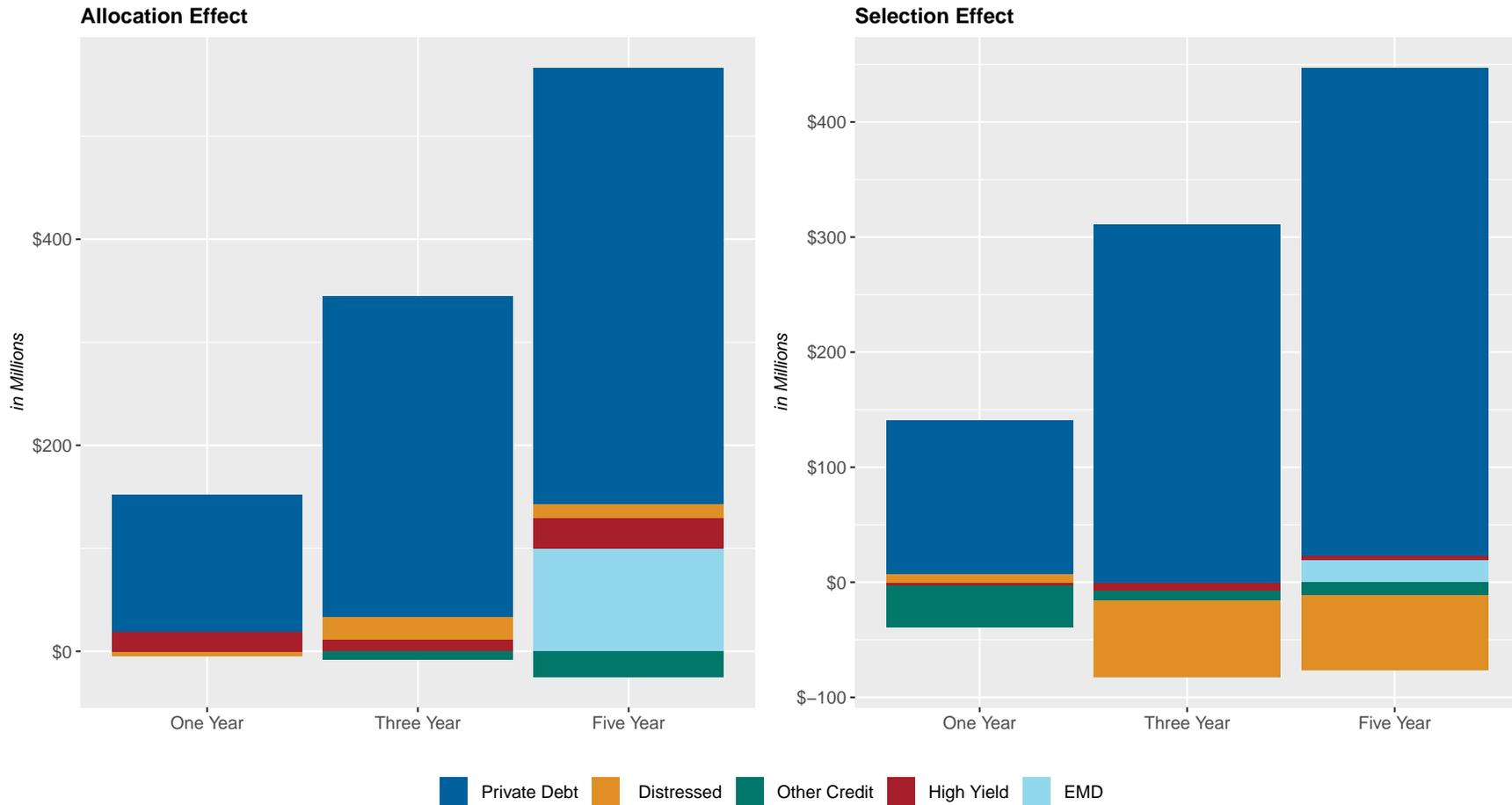
## Total Credit Portfolio Performance versus Expectations

150bps Expected Excess Return with 250bps Tracking Error



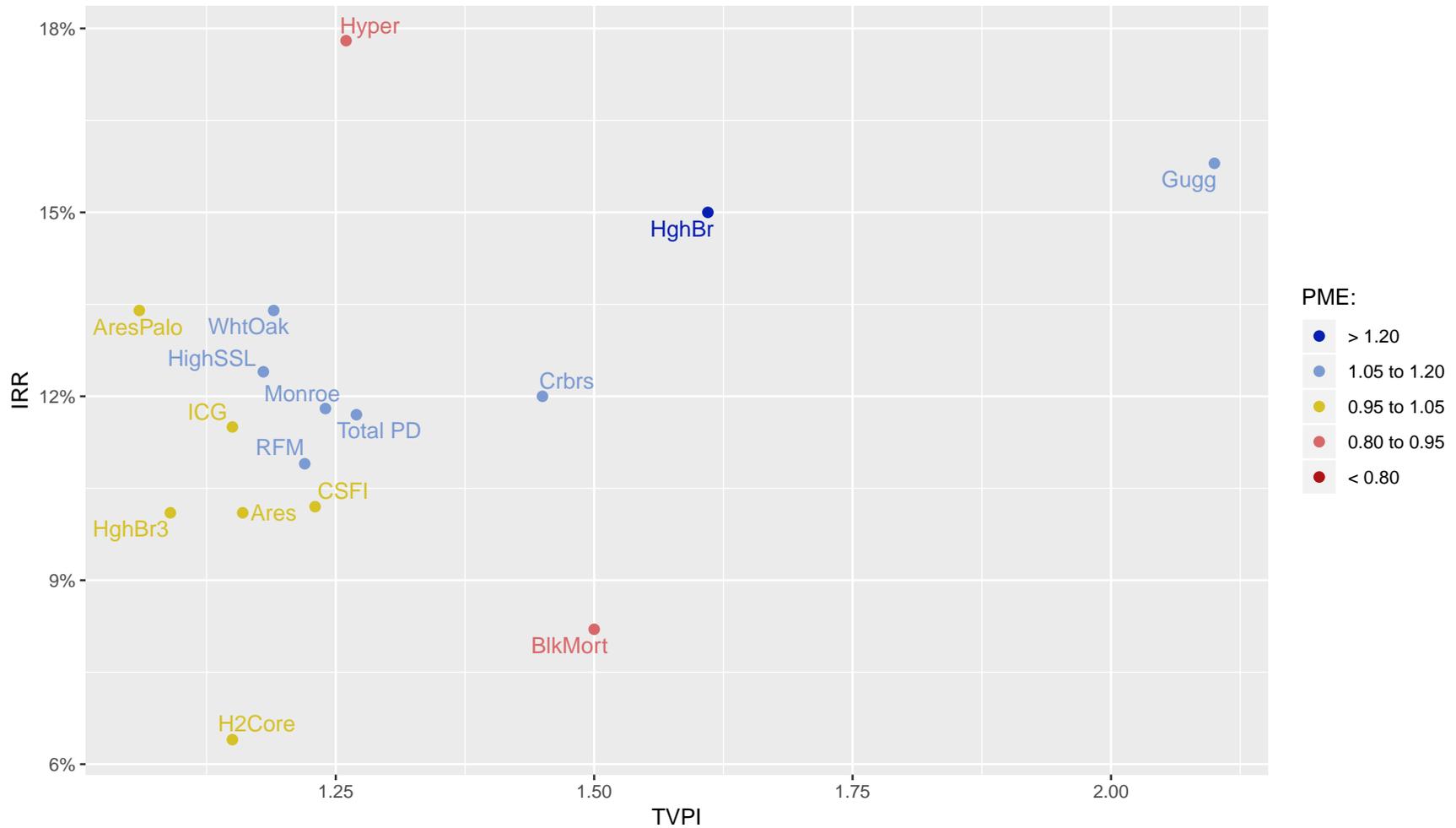
# Credit Dollar Value Added - 9/30/2018

## Credit Dollar Value Added Relative to Total Fund Benchmark



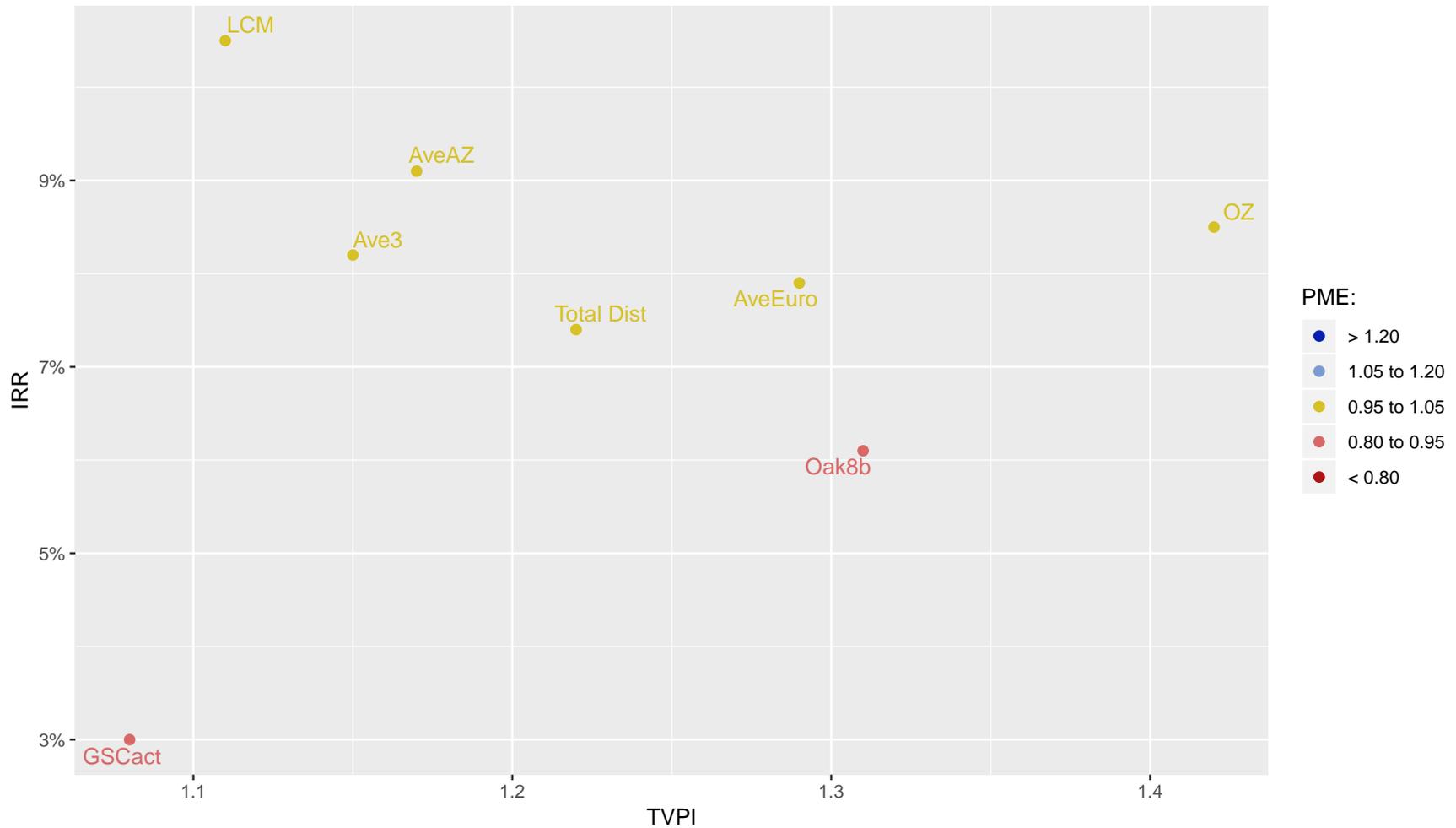
# Private Debt: TVPI and PME - 9/30/2018

**Comparison of Private Debt Strategies**



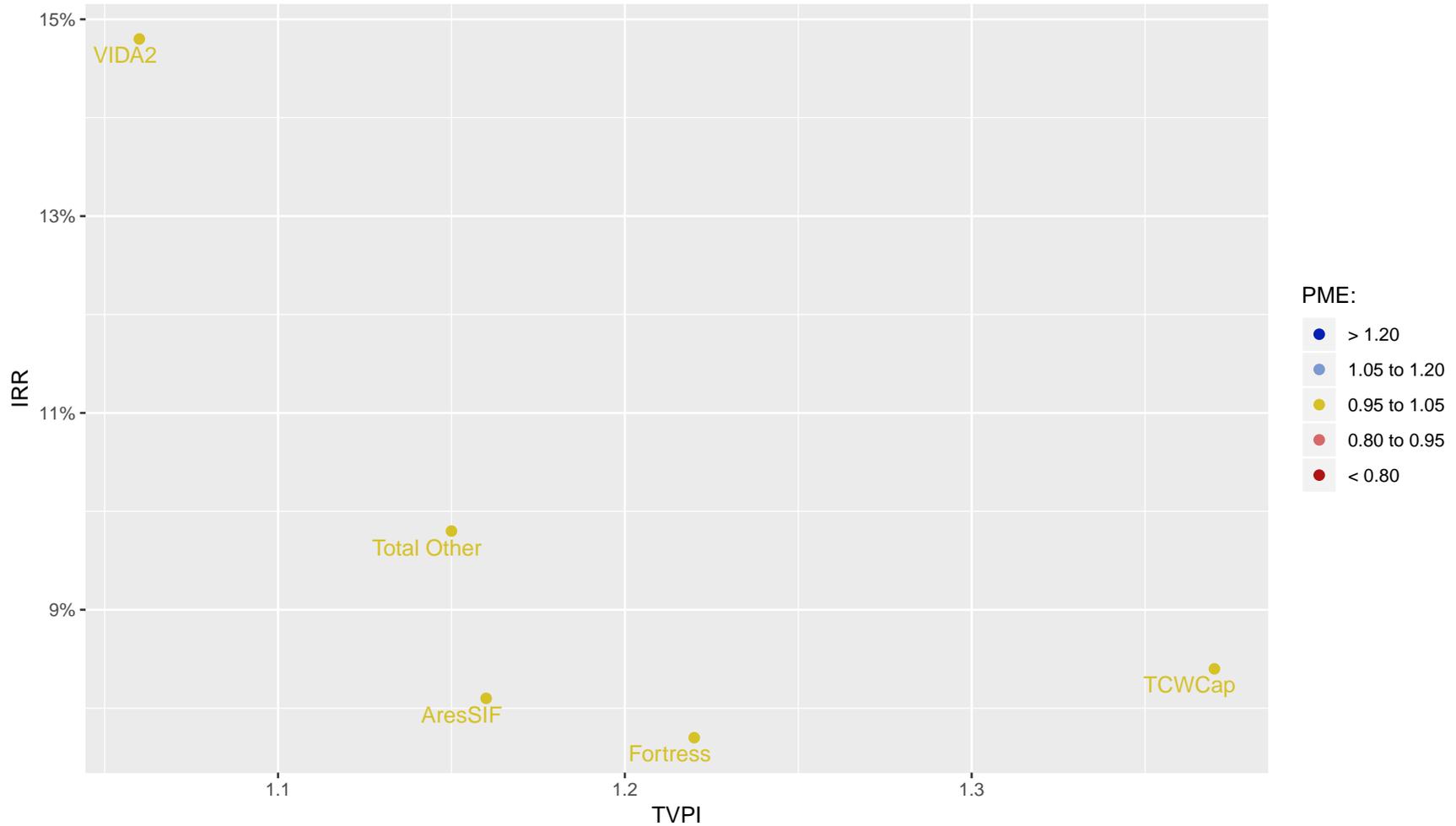
# Distressed Debt: TVPI and PME - 9/30/2018

Comparison of Distressed Debt Strategies



# Other Credit: TVPI and PME - 9/30/2018

Comparison of Other Credit Strategies

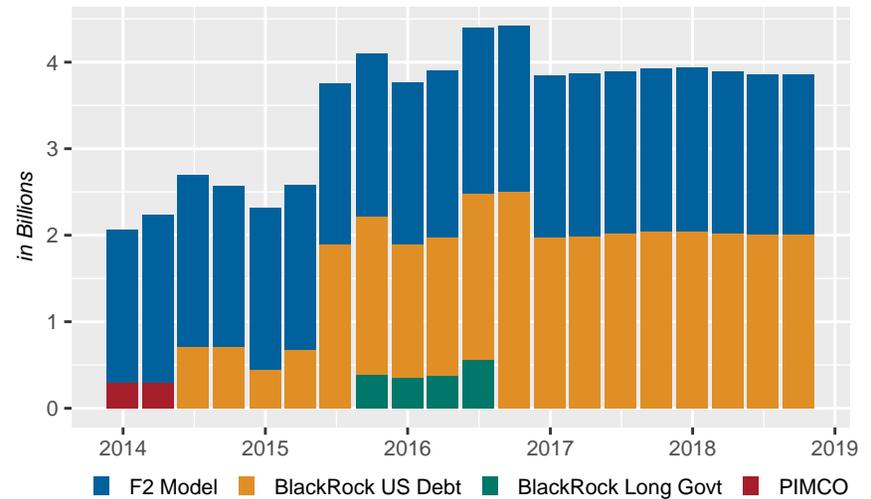


# Core Fixed Income - 9/30/2018

## Annualized Returns

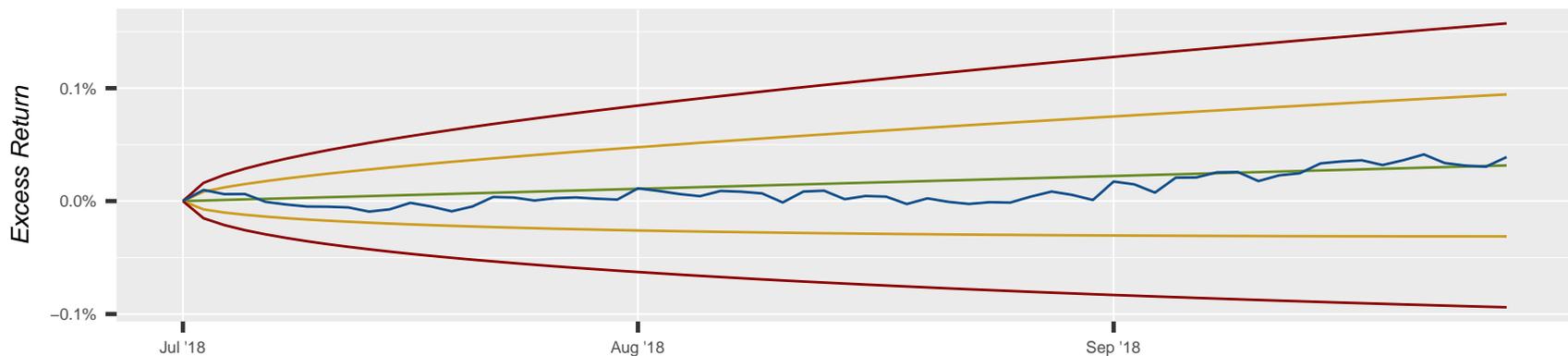
	1 Year	3 Year	5 Year
Core Bond Composite	-1.06	1.71	2.47
Barclay's Aggregate	-1.22	1.31	2.16
Core Composite Excess	0.15	0.40	0.30
F2 Model	-0.98	1.44	2.36
Barclay's Aggregate	-1.22	1.31	2.16
F2 Excess	0.24	0.13	0.20
BlackRock US Debt Fund	-1.14	1.41	
Barclay's Aggregate	-1.22	1.31	
BlackRock Excess	0.08	0.09	

## Core Bonds Market Values



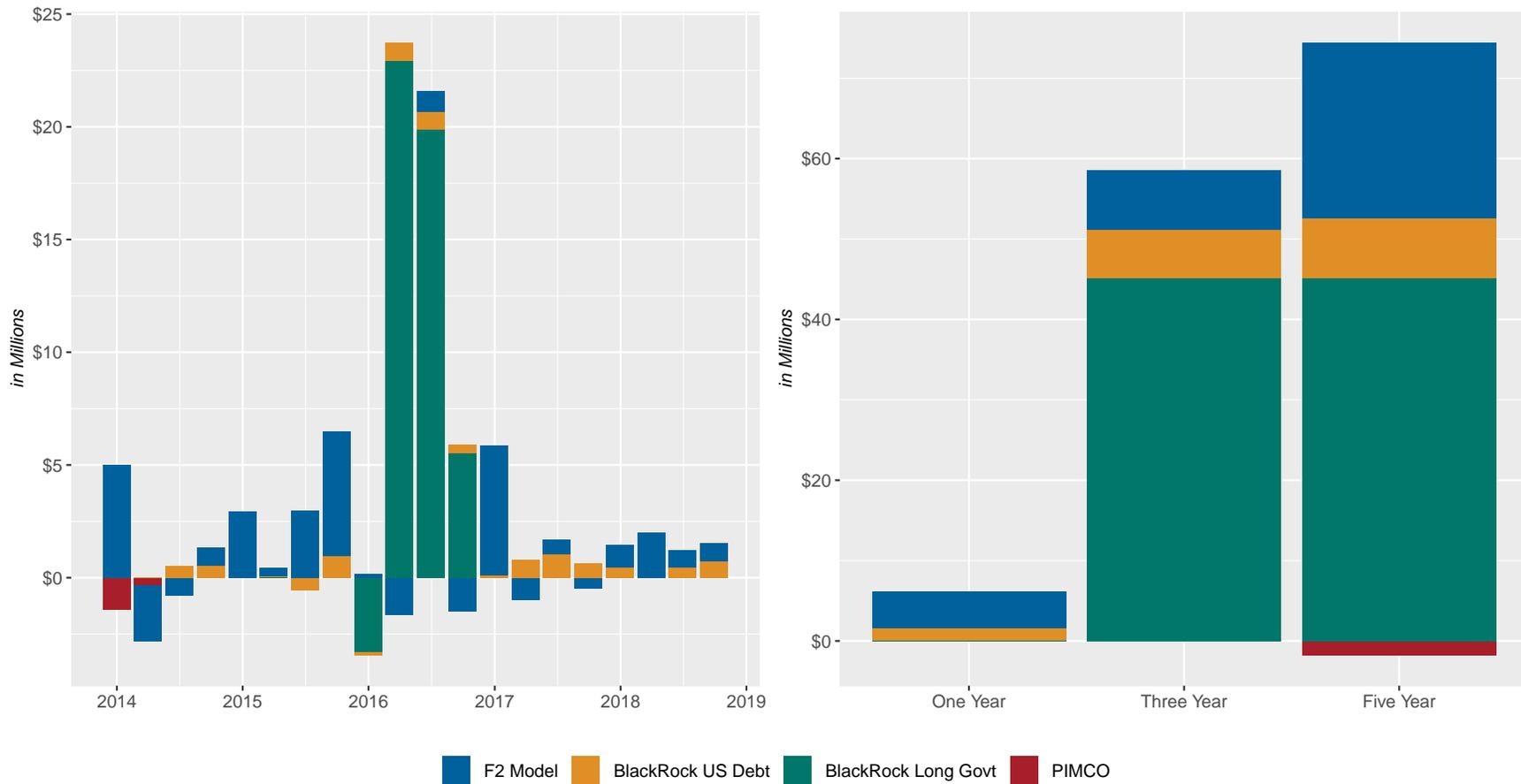
## Core Bond Portfolio Performance versus Expectations

12.5bps Expected Excess Return with 12.5bps Tracking Error



# Core Fixed Income Dollar Value Added - 9/30/2018

**Core Fixed Income Dollar Value Added  
 Relative to Barclay's Aggregate Benchmark**



# Total Portfolio Value-At-Risk 11/30/2018

## TOTAL PORTFOLIO VALUE-AT-RISK (VAR)

As of November 30, 2018, total VaR for ASRS Portfolio was 12.95%, indicating that there is a 5% chance that portfolio could lose ~\$4.7B in a given year. Note that a 5% event is expected to occur every 20 years

