

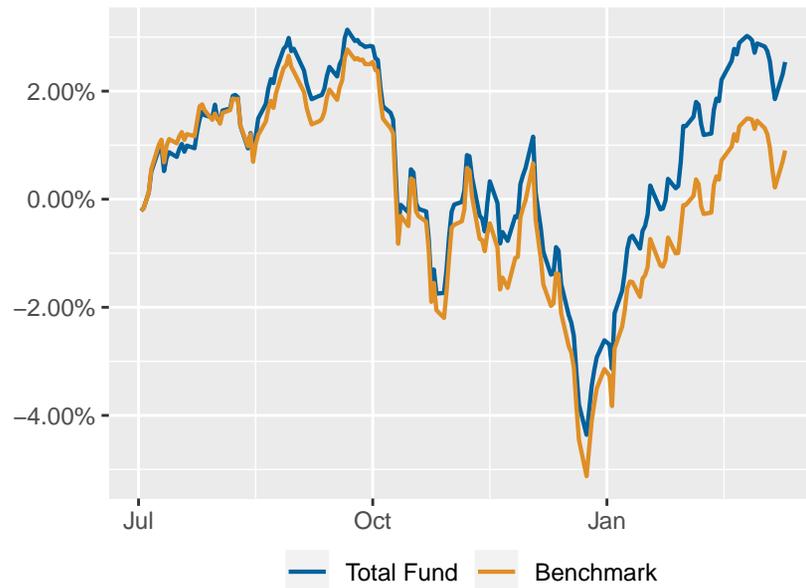
CIO Board Report

Arizona State Retirement System

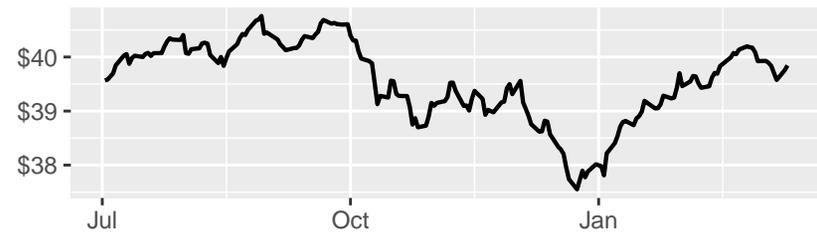
March 29, 2019

Total Fund Fiscal Year to Date Return & Current Positioning through 03/12/2019

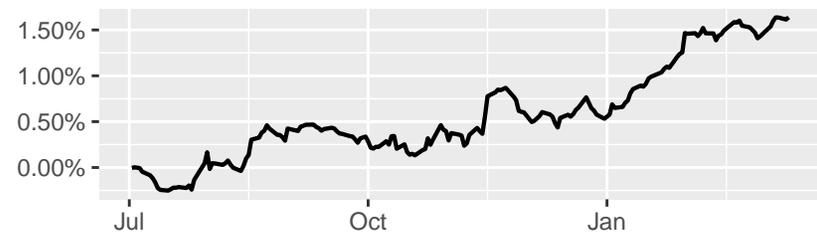
Return Fiscal Year to Date



Total Fund Market Value (Billions)



Excess Return Fiscal Year to Date



Total Fund Exposure

	NAV w/ Notional (\$ mm)	NAV Exposure (%)	Target (%)	Active Weight (%)	Active Weight (\$ mm)
Cash	1154.2	2.9	0.0	2.9	1154.2
Bonds	3987.8	10.0	11.5	-1.5	-582.4
Credit	6931.8	17.4	18.0	-0.6	-240.3
Equity	22441.6	56.3	57.3	-1.0	-401.4
Real Estate	5233.8	13.1	13.2	-0.1	-25.7
Other	95.6	0.2	0.0	0.2	95.6
Total Fund	39844.7	100.0	100.0	0.0	0.0

Implementation Plan Process

- As part of the Strategic Asset Allocation Plan annual implementation plans are created which focus IMD efforts based on current market context and most recent research.
- Each asset class will have an implementation plan approved by the asset class committee.
- Implementation plans will be reviewed and updated annually or more frequently at the request of the asset class committee.
- The CIO and Investment Consultant will report annually to the investment committee on the implementation plans and their expected returns.
- This is the first year the requirement is in place for the asset classes.
- Each implementation plan will include:
 - The near term strategy for the assets including goals ensuring portfolios are well diversified and expected performance from the strategies relative to benchmark
 - A review of the prior year plan and whether the outperformance goals were achieved
 - Any sub-allocations or benchmarks for internal performance measurement (but not modifying the overall SAA benchmarks)
 - Means of compliance with the SAA including liquidity and leverage constraints
 - Structures for implementing the plan including separate accounts, commingled funds, ETFs, etc.

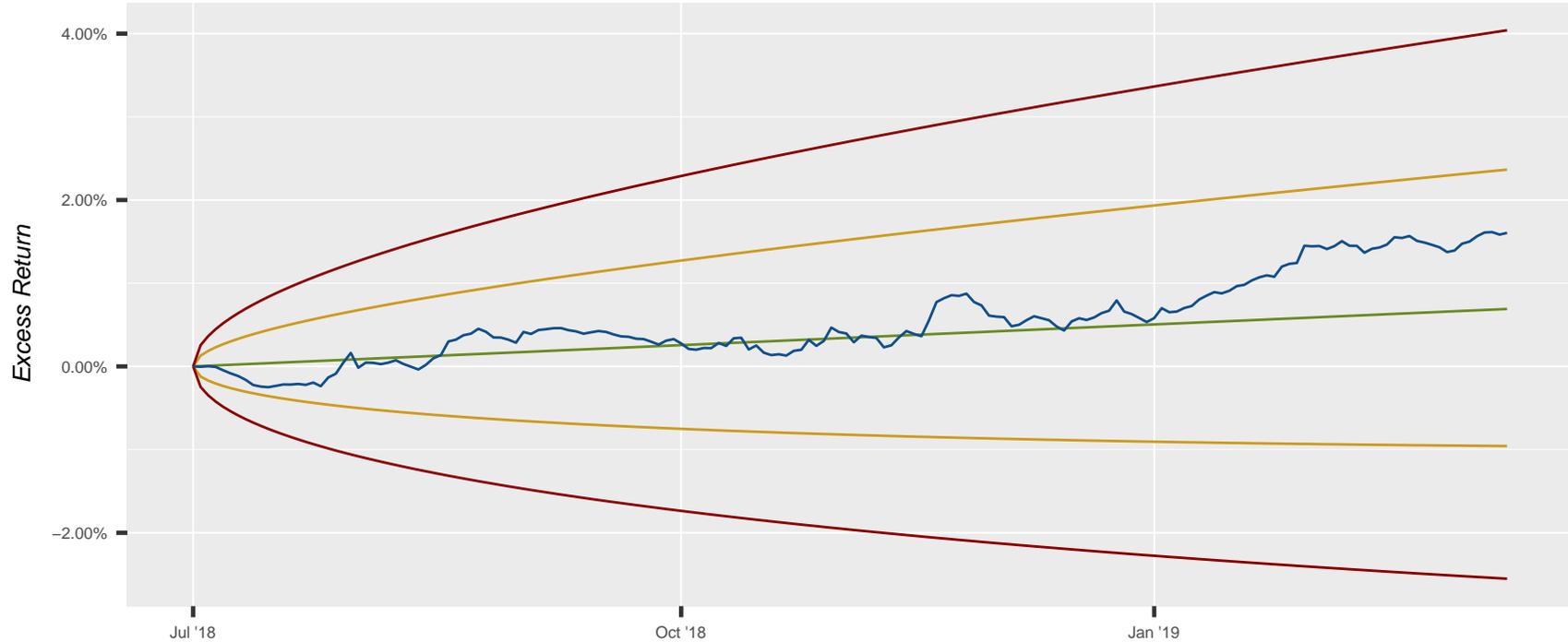
Implementation Plan Levers

Asset Class	Equities	Credit	Interest Rate Sensitive	Real Estate	Total Fund
Levers	<ul style="list-style-type: none"> ◦ S&P 1500 vs MSCI USA ◦ E Portfolios ◦ Securities Lending ◦ Factor Portfolios ◦ Alpha Overlay Strategies ◦ Private Equity 	<ul style="list-style-type: none"> ◦ Private Debt ◦ Distressed Debt ◦ High Yield ◦ Other Credit ◦ Separate Account 	<ul style="list-style-type: none"> ◦ US Treasuries & Agencies ◦ Agency Mortgage-Backed Securities ◦ Corporate Bonds ◦ Commercial Mortgage-Backed Securities ◦ Asset Backed Securities 	<ul style="list-style-type: none"> ◦ Property Type ◦ Life Cycle ◦ Operating Companies ◦ Debt ◦ Preferred Equity ◦ Real Assets ◦ Funds 	
Expected Excess Return	100 bps	150 bps	12.5 bps	120 bps	100 bps
Tracking Error	300 bps	250 bps	12.5 bps	240 bps	200 bps
Target Weight	50%	20%	10%	20%	100%

Total Fund Cone Chart through 03/12/2019

Total Fund Performance versus Expectations

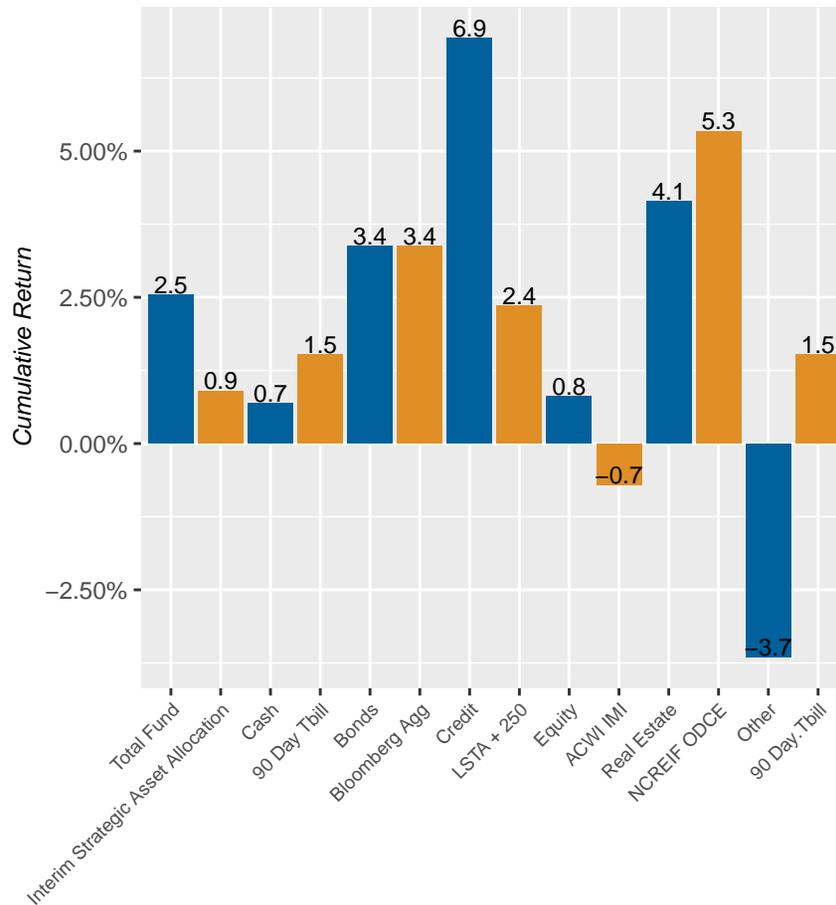
100 Basis Points Expected Excess Return with 200 Basis Points Tracking Error



Fiscal Year to Date Total Fund Returns & Dollar Value Add through 03/12/2019

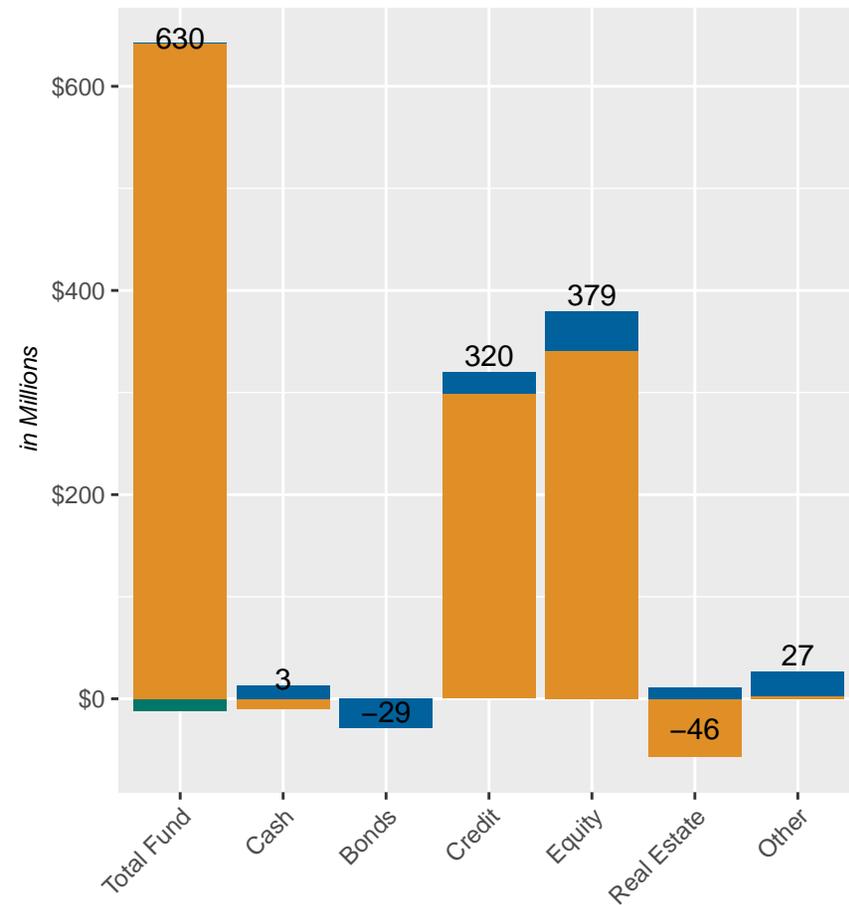
Asset Class and Benchmark

Fiscal Year to Date



Dollar Value Add

Fiscal Year to Date Dollar Value Add



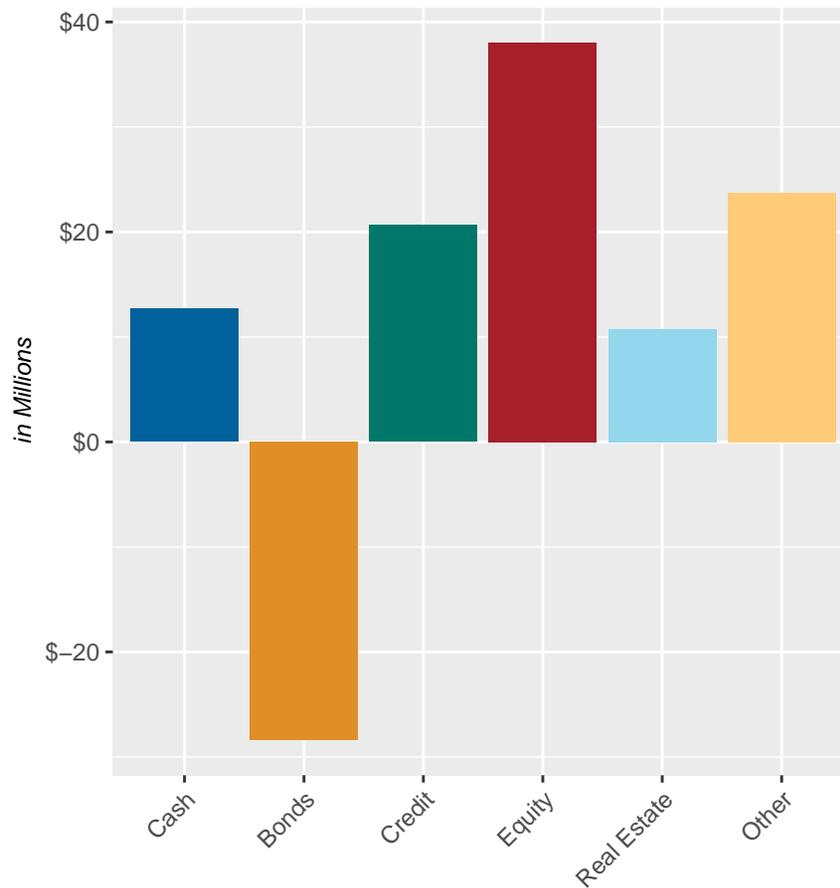
Asset Class Benchmark

Allocation Selection Residual

Fiscal Year to Date Allocation Effect by Asset Class through 03/12/2019

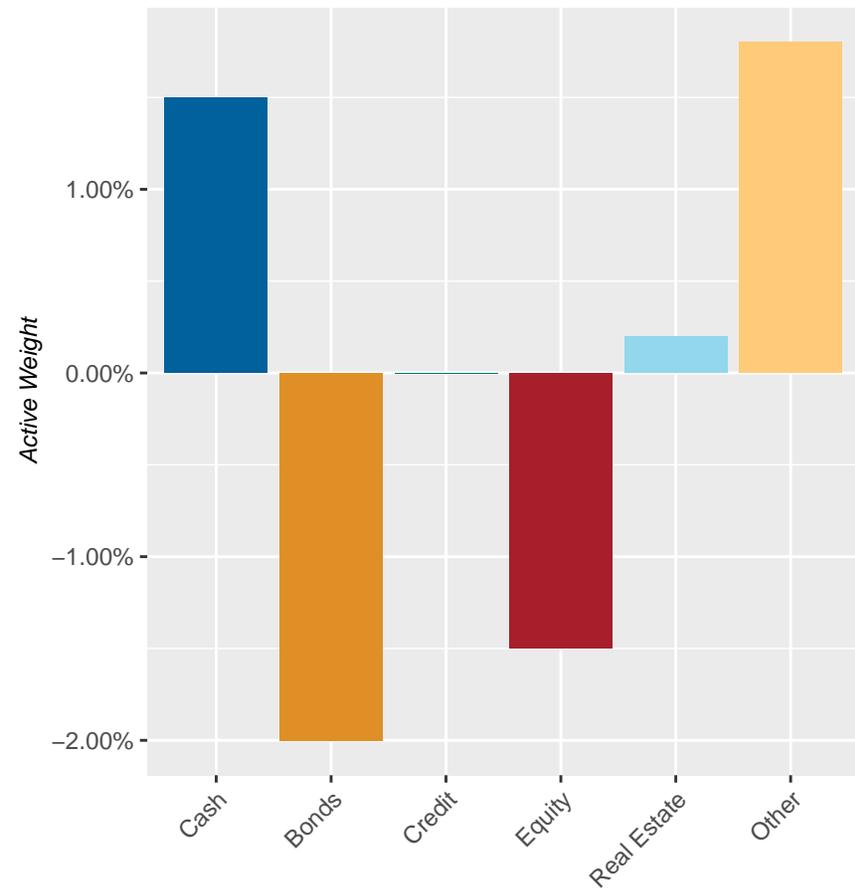
Allocation Effect by Asset Class

Relative to Strategic Asset Allocation Benchmark



Asset Class Average Active Weights

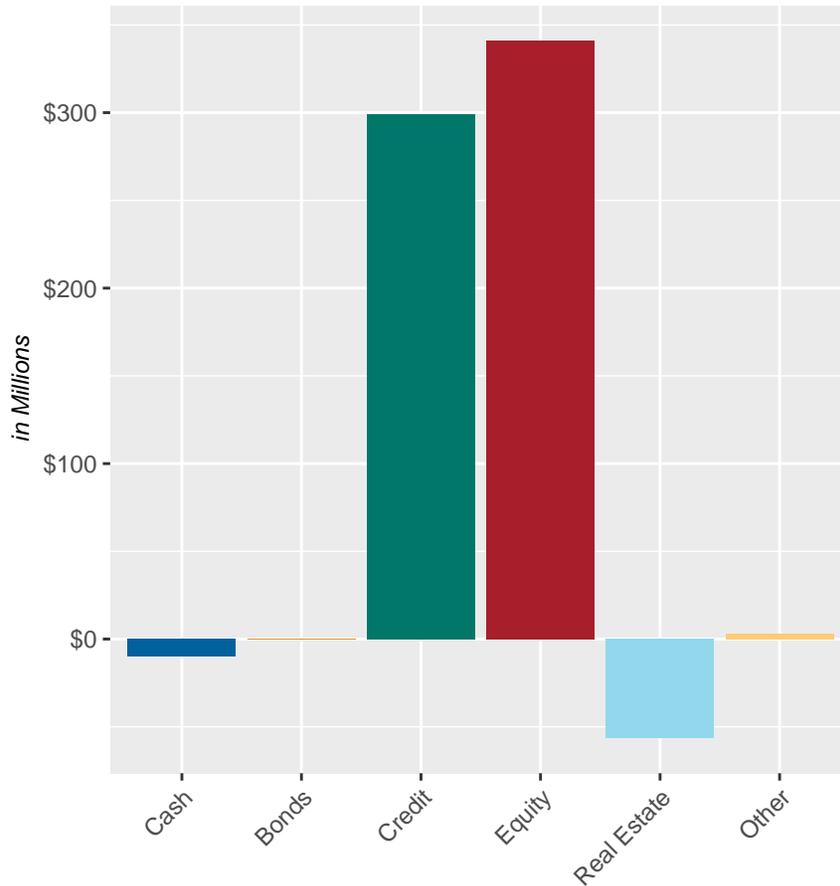
Relative to Strategic Asset Allocation Policy



Fiscal Year to Date Selection Effect by Asset Class through 03/12/2019

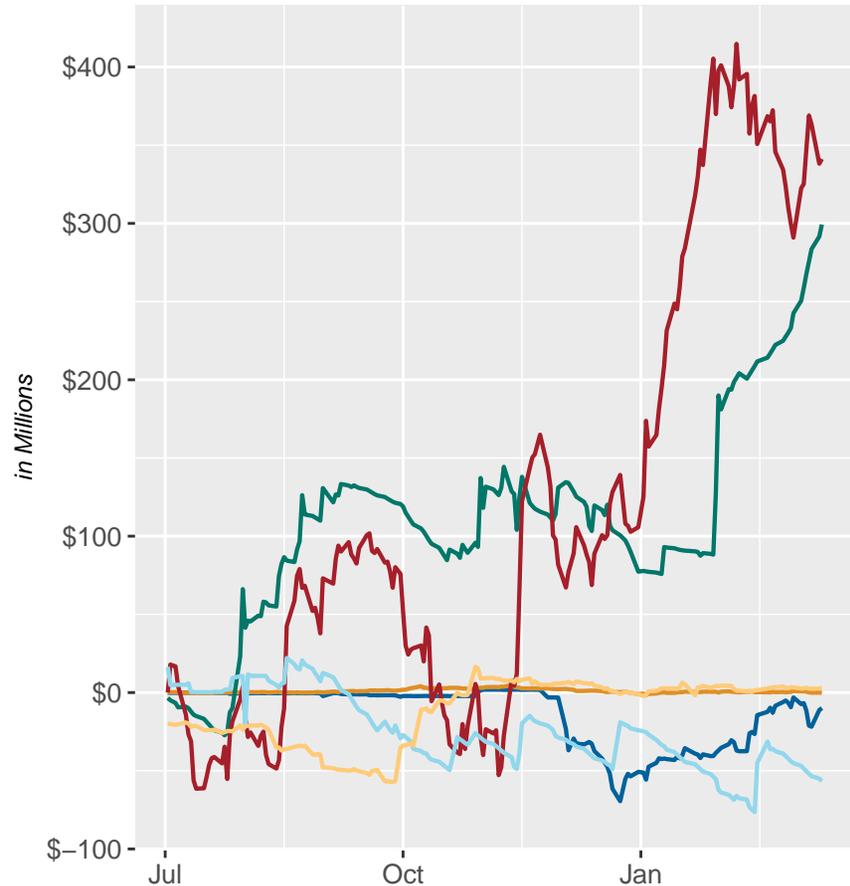
Selection Effect by Asset Class

Relative to Benchmark



Cumulative Selection Effect by Asset Class

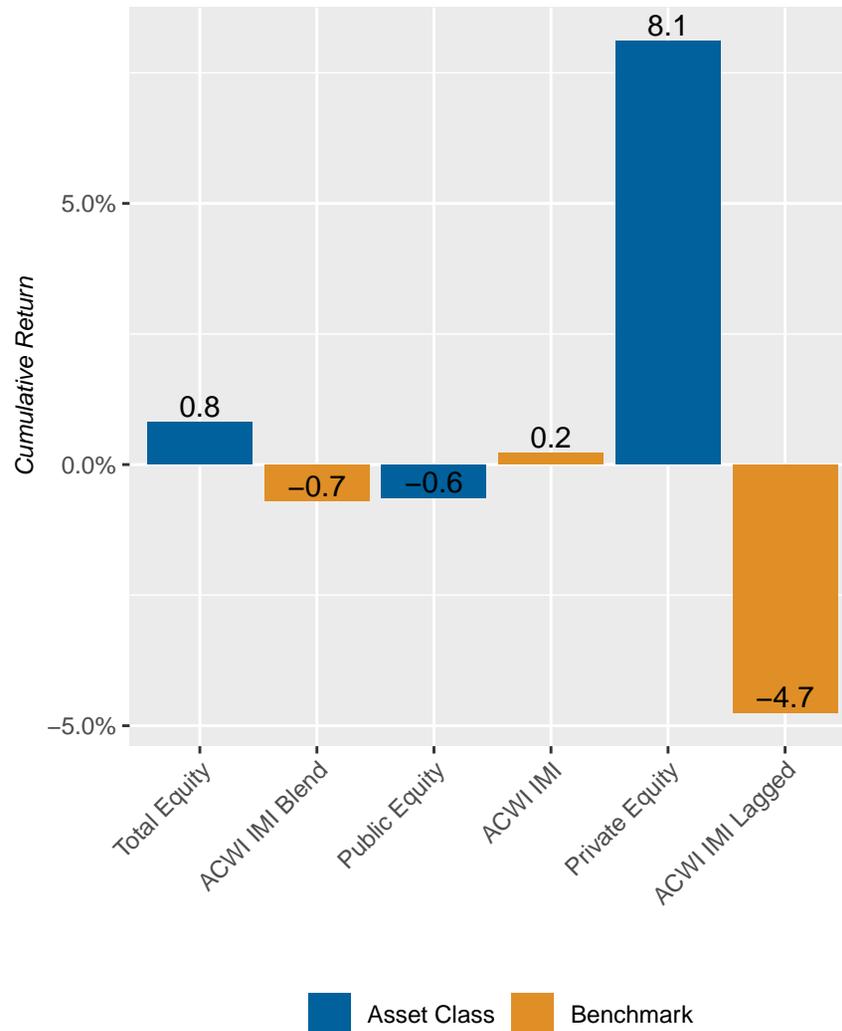
Relative to Benchmark



Fiscal Year to Date Total Equity Returns & Dollar Value Add through 03/12/2019

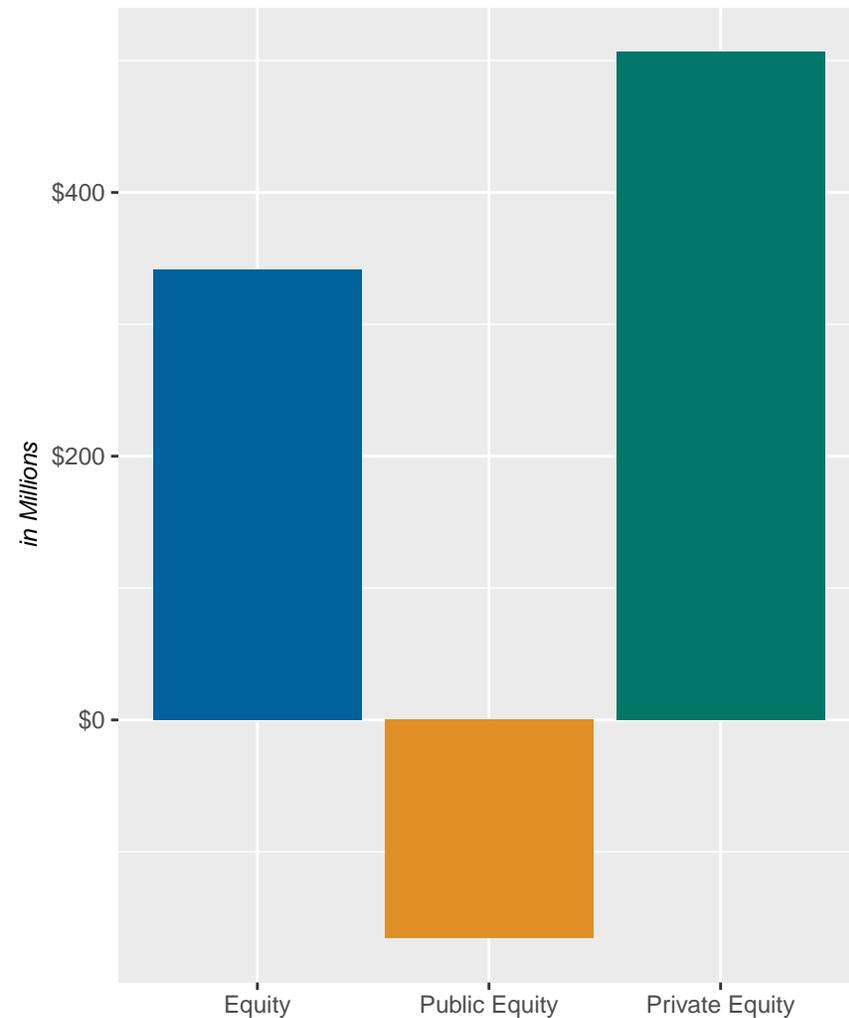
Total Equity and Benchmark

Fiscal Year to Date

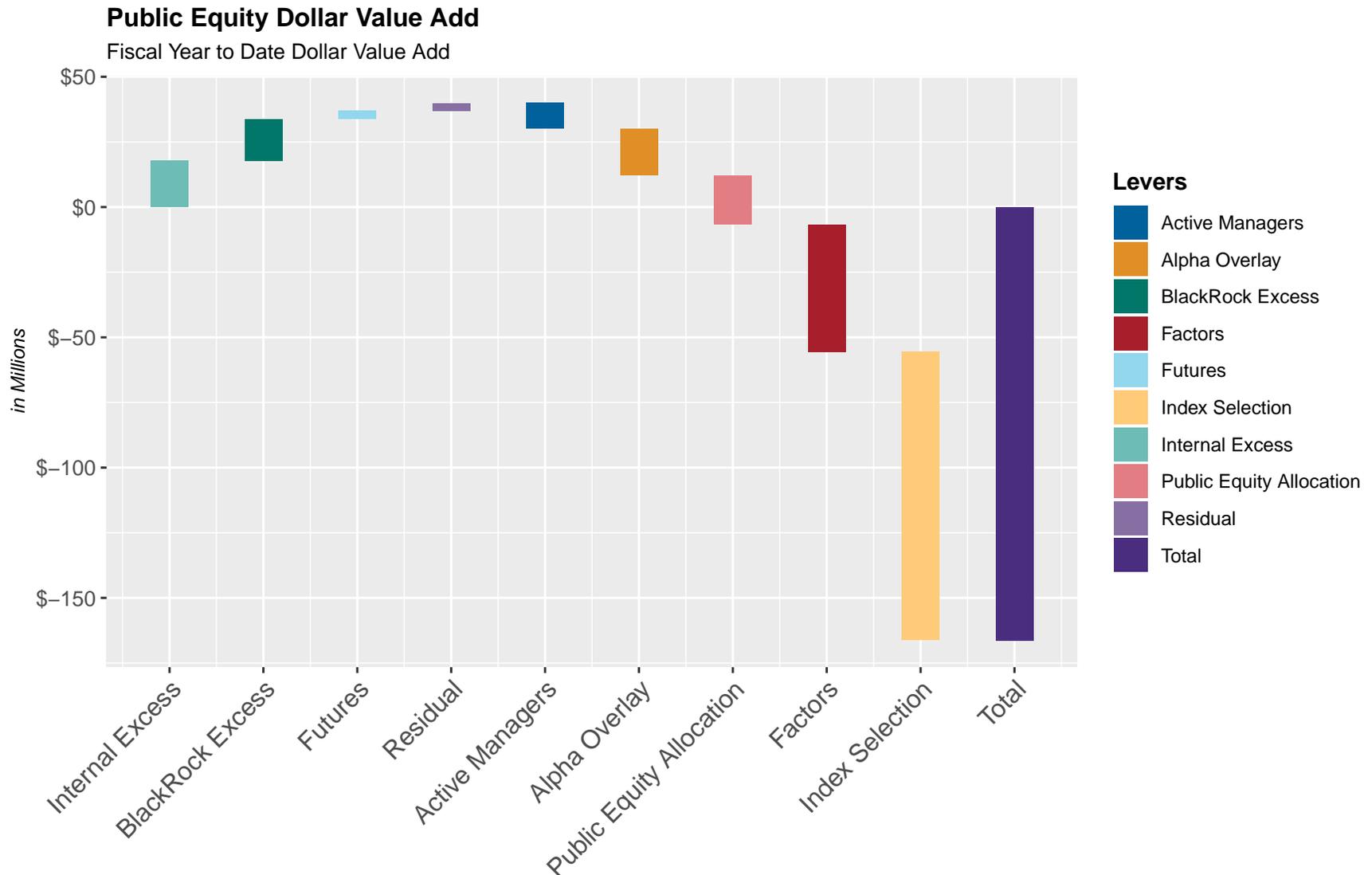


Total Equity Dollar Value Add

Fiscal Year to Date Dollar Value Add



Fiscal Year to Date Public Equity "Levers" through 03/12/2019



State Street Performance Summary for the period ended 12/31/2018

ARIZONA STATE RETIREMENT SYSTEM
Investment Management Division
Dec-31-2018
Net Returns
Final

ASRS Performance Summary

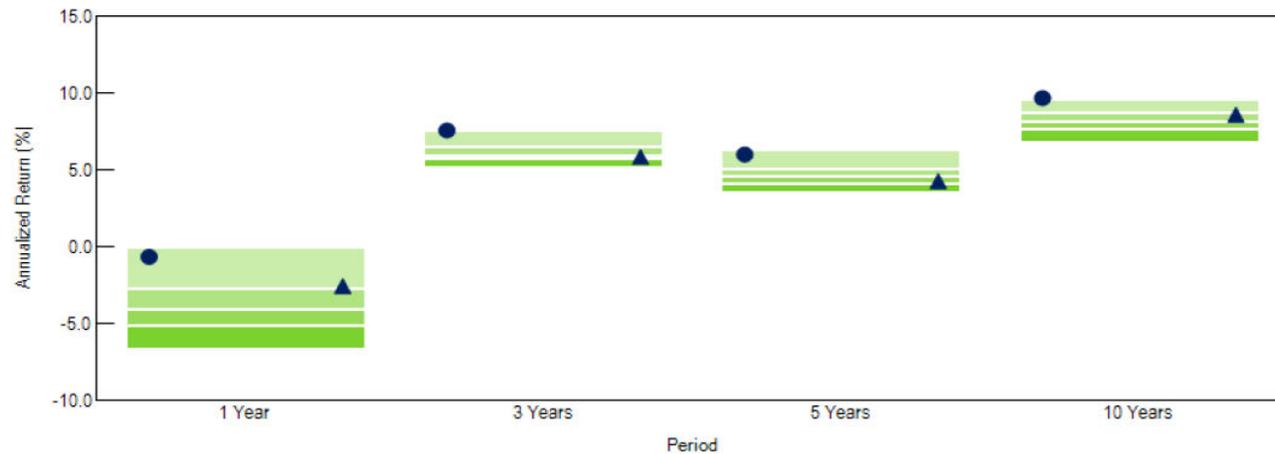


	Benchmark	Market Value (\$mil.)	1 Mth	3 Mth	FYTD	1 Year	3 Year	5 Year	ITD	Inception Date
TOTAL PLAN	INTERIM SAA POLICY	38,015	-3.17	-5.30	-2.61	-0.63	7.60	6.03	9.55	07-01-1975
Excess			-0.05	0.21	0.53	1.92	1.73	1.74	0.40	
TOTAL EQUITY W/PE and Opp	LEGACY Total Equity BM	21,247	-5.80	-10.26	-6.87	-5.64	7.78	5.82	8.04	07-01-2013
Excess			0.10	0.12	0.43	1.06	-0.60	0.00	-0.19	
US EQUITY	COMBINED DOMESTIC EQUITY INDEX	9,286	-9.21	-14.27	-8.73	-5.56	8.62	7.57	10.94	07-01-1975
Excess			0.08	0.06	-0.47	-0.54	-0.75	-0.55	-0.13	
INTERNATIONAL EQUITY	INTERNATIONAL EQUITY INDEX	7,939	-4.52	-11.88	-11.30	-14.00	3.81	0.95	5.62	04-01-1987
Excess			0.13	-0.00	0.23	0.58	-0.37	-0.03	0.26	
PRIVATE EQUITY	MSCI ACWI IMI w/USA GROSS (NET) LAGGED	4,022	0.26	4.58	9.33	16.84	14.55	13.14	7.53	09-01-2007
Excess			0.07	0.61	4.54	8.63	-0.14	3.46	0.33	
INTEREST RATE SENSITIVE	BBG BARC Agg (Dly)	3,921	1.76	1.58	1.64	0.08	2.46	2.79	7.81	07-01-1975
Excess			-0.08	-0.06	-0.02	0.06	0.40	0.27		
CREDIT	LEGACY Total Credit BM	6,858	0.14	1.86	5.07	9.52	9.71	7.56	7.44	07-01-2013
Excess			-0.75	-0.61	1.24	2.30	0.91	2.66		
PRIVATE DEBT	S&P LEVERAGED LOAN INDEX LAGGED + 250BPS	4,813	0.21	2.25	5.06	10.87	10.95	10.92	12.16	10-01-2012
Excess			-0.69	-0.22	1.24	3.06	3.01	4.19	4.89	
DISTRESSED DEBT	S&P LEVERAGED LOAN INDEX LAGGED + 250BPS	1,582	0.00	0.98	4.47				4.47	07-01-2018
Excess			-0.89	-1.49	0.65				0.65	
OTHER CREDIT	S&P LEVERAGED LOAN INDEX LAGGED + 250BPS	458	0.00	0.60	6.46				6.46	07-01-2018
Excess			-0.89	-1.87	2.63				2.63	
REAL ESTATE	Custom ASRS ODCE (Net)	5,024	0.63	1.89	3.27	7.57	10.61	11.94	6.41	12-01-2005
Excess			0.04	0.05	-0.57	-0.28	2.74	2.20	-0.14	
CASH	CASH CUSTOM INDEX	876	-4.05	-3.41	-3.51	-2.67	4.23	1.73	3.91	04-01-1990
Excess			-4.23	-3.97	-4.57	-4.29	-1.47	-1.56	0.54	
OTHER	91 DAY TREASURY BILL (DAILY)	89	-6.52	-6.12	-7.99	-4.01	0.83	-0.48	1.47	07-01-2013
Excess			-6.70	-6.69	-9.05	-5.88	-0.19	-1.10	0.89	

ASRS Returns Compared to Public Fund Universe for the period ended 12/31/2018

UNIVERSE COMPARISON

InvestorForce Public DB > \$1B Net Return Comparison
Ending December 31, 2018



	Return (Rank)			
	1 Year	3 Years	5 Years	10 Years
5th Percentile	-0.1	7.5	6.3	9.6
25th Percentile	-2.7	6.6	5.1	8.8
Median	-4.0	6.0	4.6	8.2
75th Percentile	-5.1	5.8	4.2	7.7
95th Percentile	-6.6	5.2	3.6	6.9

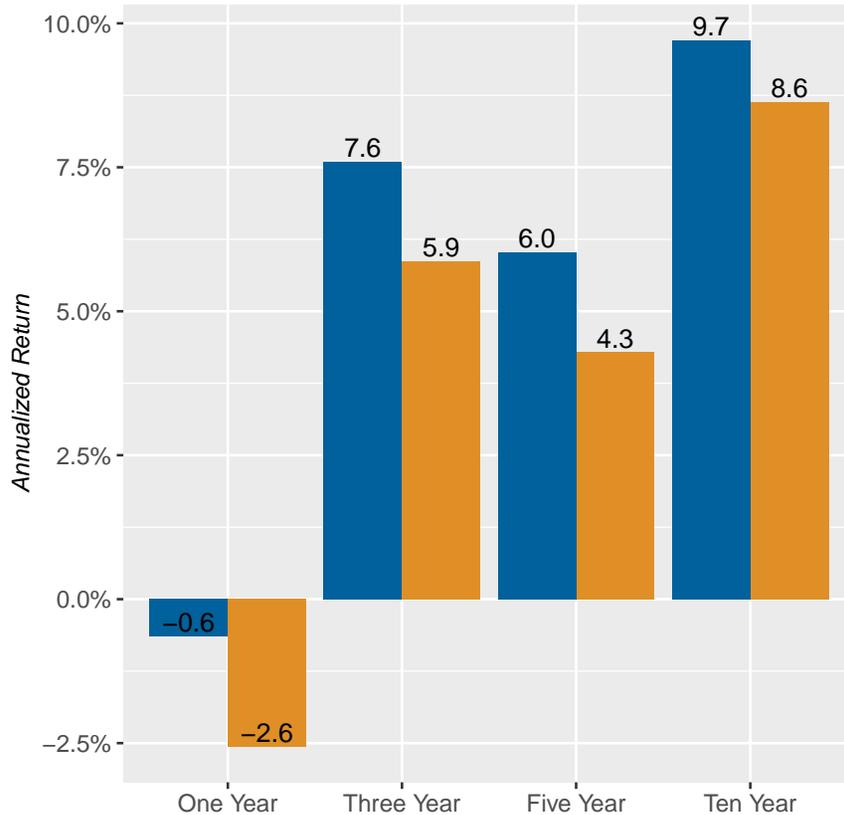
	1 Year	3 Years	5 Years	10 Years
● Total Fund	-0.6	7.6	6.0	9.7
Total Fund Percentile Rank	7	2	7	2
Total Fund Ordinal Rank	5	2	4	2
# of Funds in Universe	63	63	62	59
▲ Interim SAA Policy	-2.5	5.9	4.3	8.6



Total Fund Returns & Dollar Value Add for the period ended 12/31/2018

Total Fund and Strategic Asset Allocation Benchmark

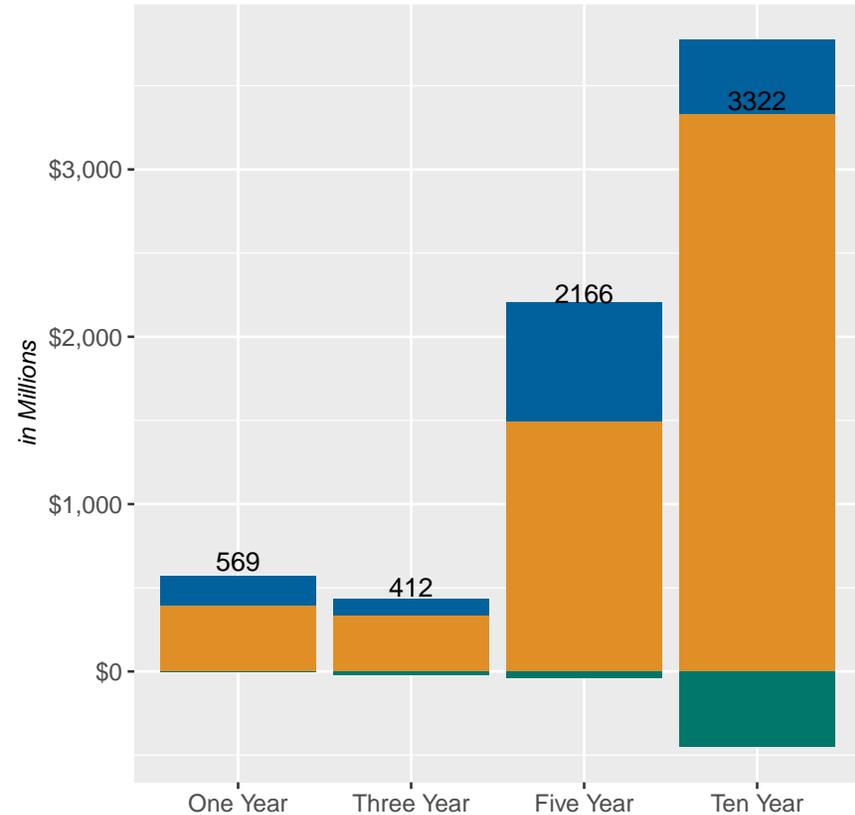
Trailing Period Returns



■ Total Fund ■ Strategic Asset Allocation Benchmark

Total Fund Dollar Value Add

Relative to Strategic Asset Allocation Benchmark

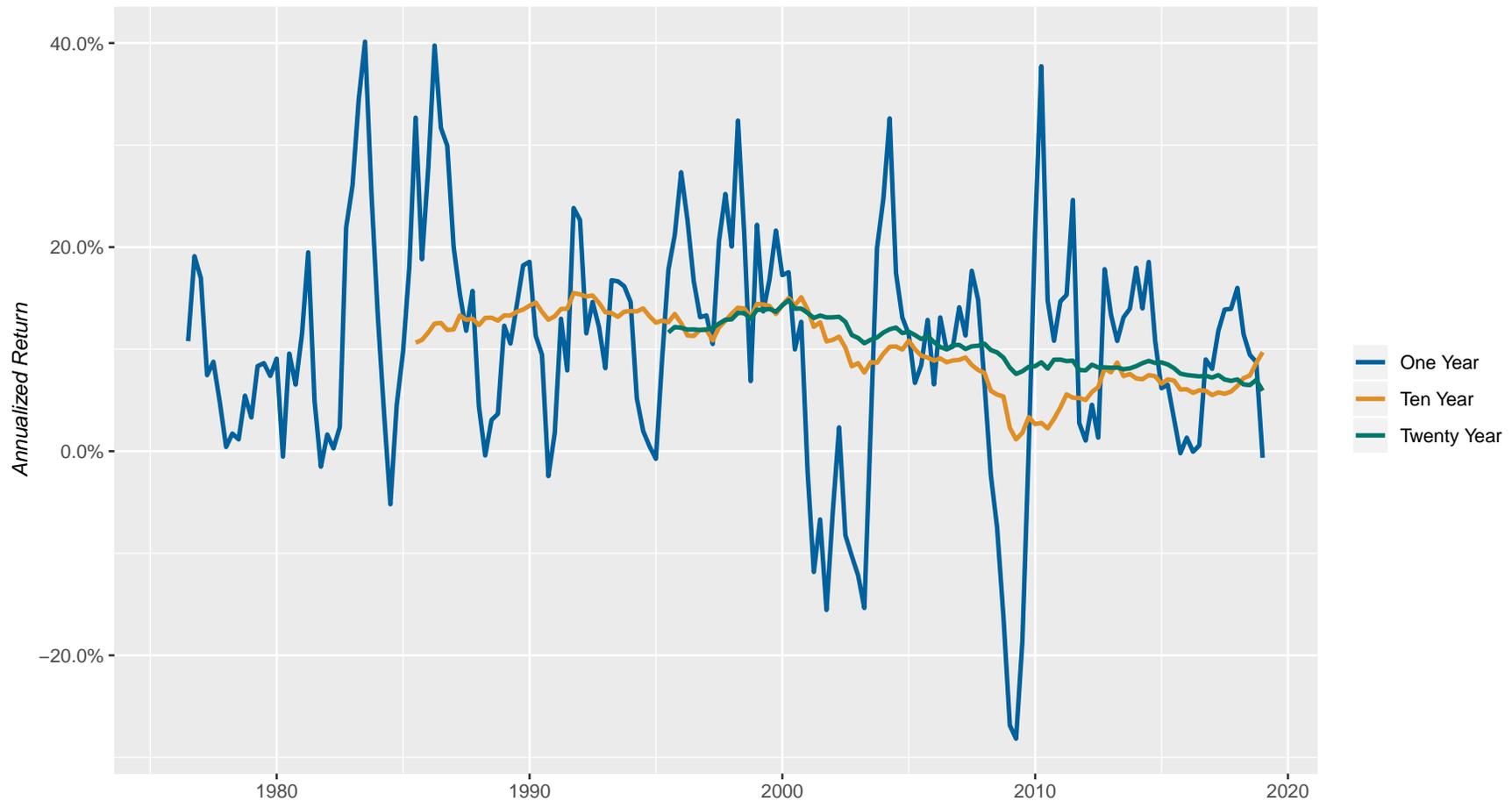


■ Allocation ■ Selection ■ Residual

Total Fund Returns for the period ended 12/31/2018

Total Fund Rolling Returns

Trailing Period Returns



Allocation Effect for the period ended 12/31/2018

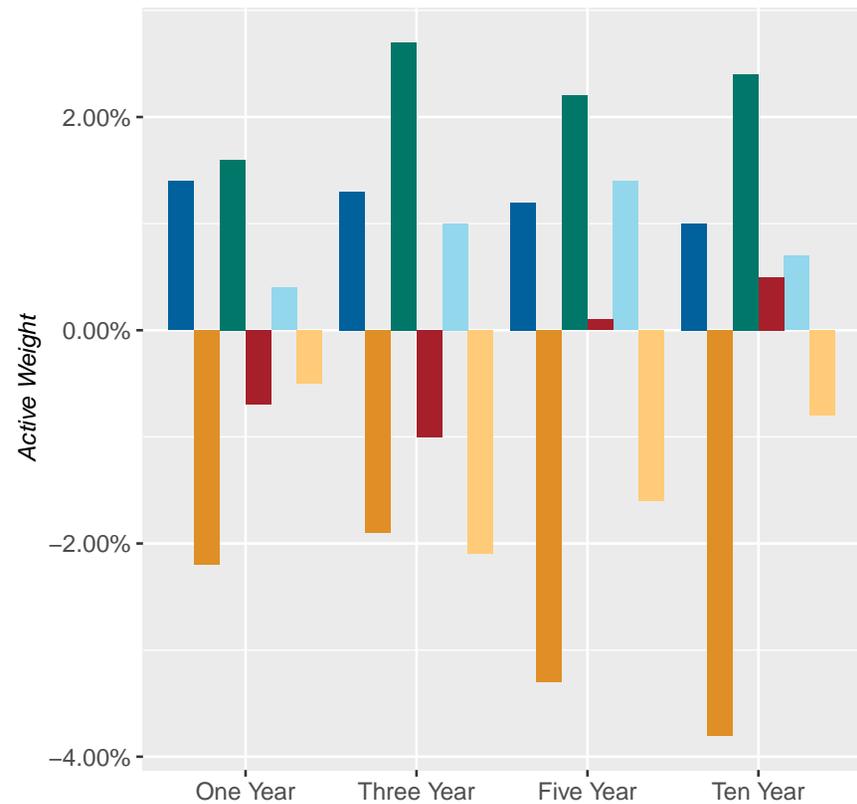
Allocation Effect by Asset Class

Relative to Strategic Asset Allocation Benchmark



Asset Class Average Active Weights

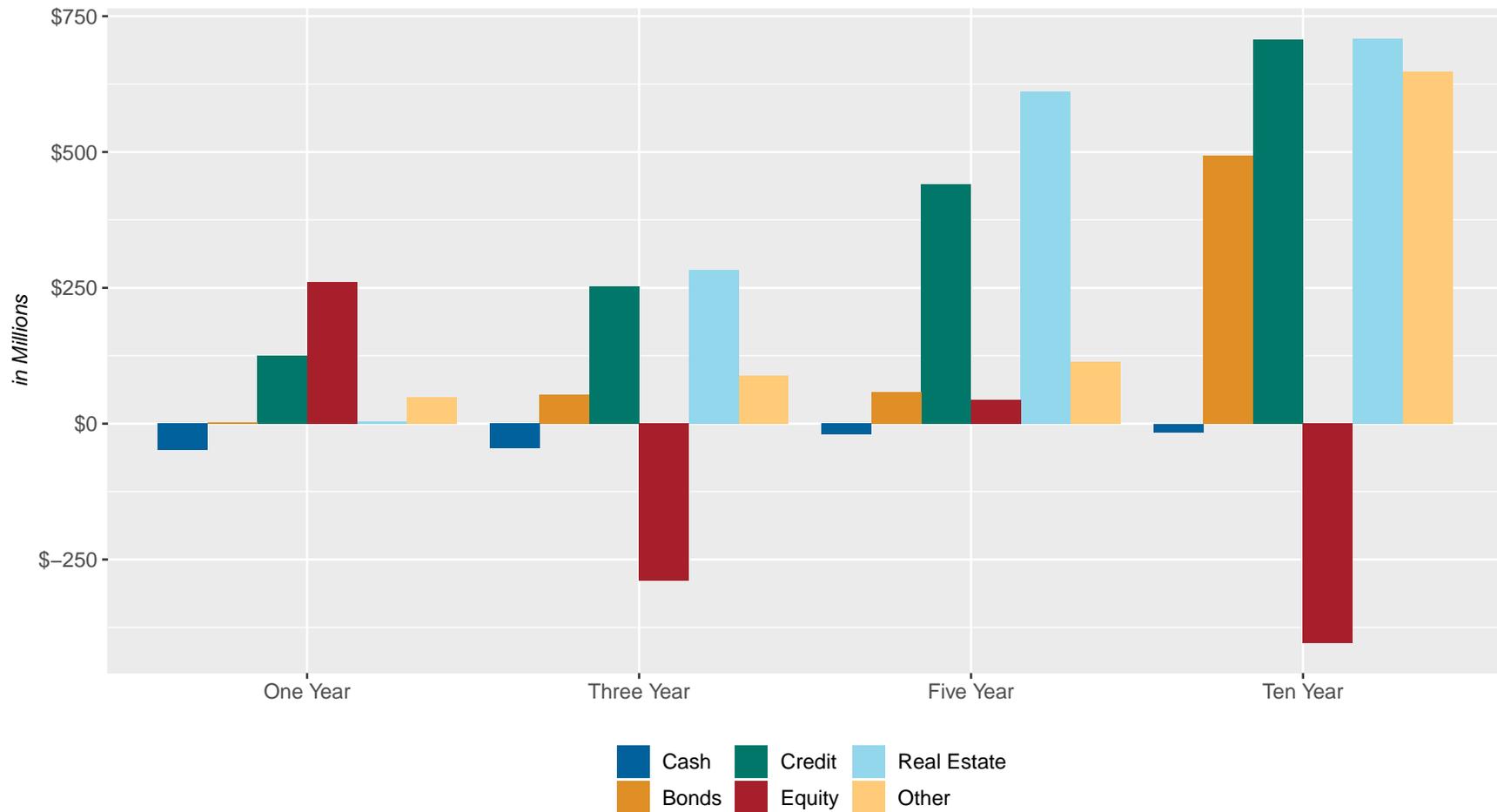
Relative to Strategic Asset Allocation Policy



Selection Effect for the period ended 12/31/2018

Selection Effect by Asset Class

Relative to Strategic Asset Allocation Benchmark



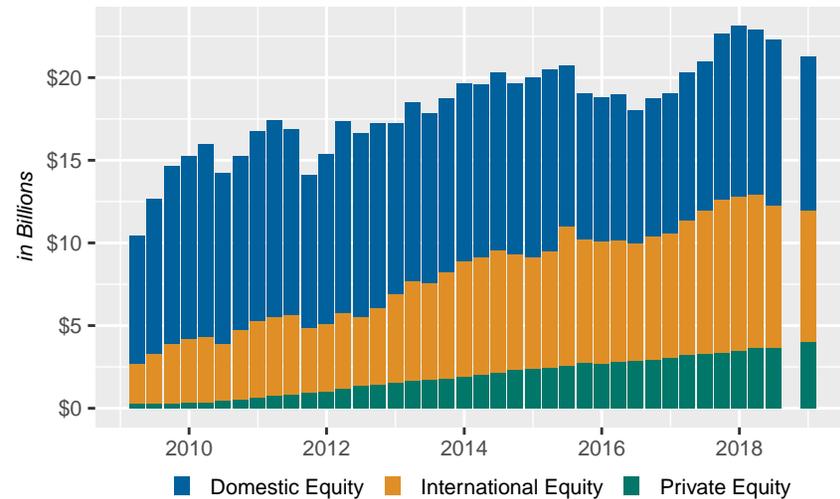
Total Equity for the period ended 12/31/2018

Annualized Returns

	FYTD	One Year	Three Year	Five Year
Composite Equity	-6.89%	-5.66%	7.77%	5.82%
Benchmark	-7.33%	-6.73%	8.36%	5.81%
Excess	0.44%	1.07%	-0.59%	0.01%
Public Equity	-10.06%	-9.73%	6.31%	4.61%
Benchmark	-9.78%	-9.62%	6.95%	4.92%
Excess	-0.28%	-0.11%	-0.64%	-0.31%
US Equity	-8.71%	-5.54%	8.63%	7.58%
Benchmark	-8.26%	-5.02%	9.37%	8.12%
Excess	-0.45%	-0.52%	-0.74%	-0.54%
International Equity	-11.38%	-14.08%	3.78%	0.94%
Benchmark	-11.53%	-14.58%	4.18%	0.98%
Excess	0.16%	0.51%	-0.4%	-0.04%
Private Equity	4.7%	16.8%	14.48%	13.03%
Benchmark	4.13%	7.09%	14.2%	9.52%
Excess	0.57%	9.71%	0.29%	3.51%

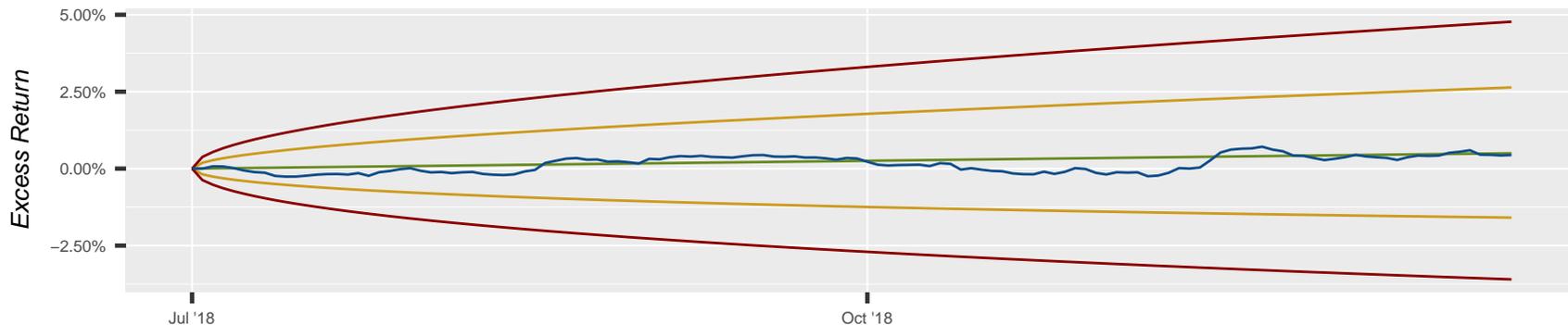
Note: Private Equity Returns are Internal Rates of Return

Market Values



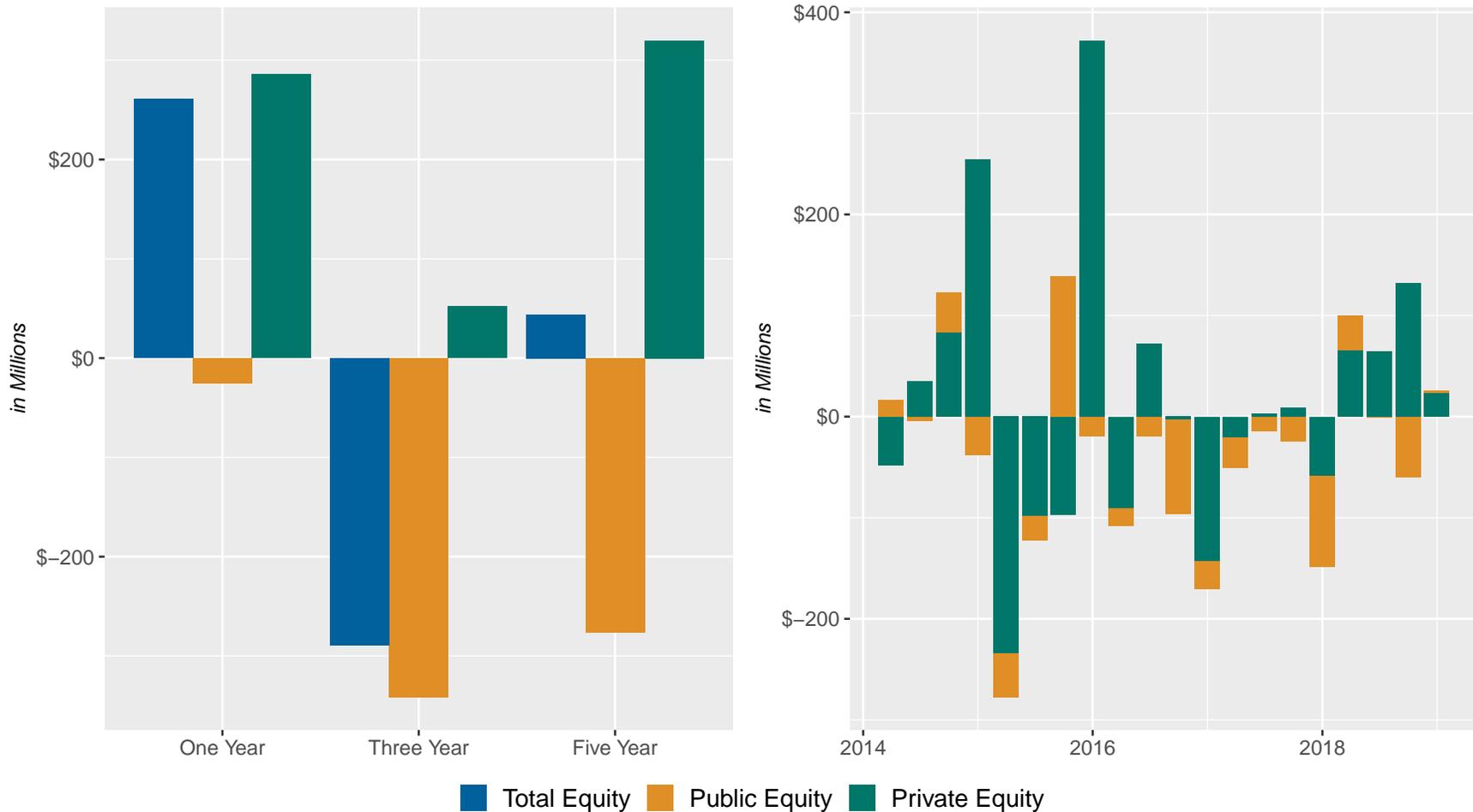
Total Equity Portfolio Performance versus Expectations

100 Basis Points Expected Excess Return with 300 Basis Points Tracking Error



Total Equity & Dollar Value Add for the period ended 12/31/2018

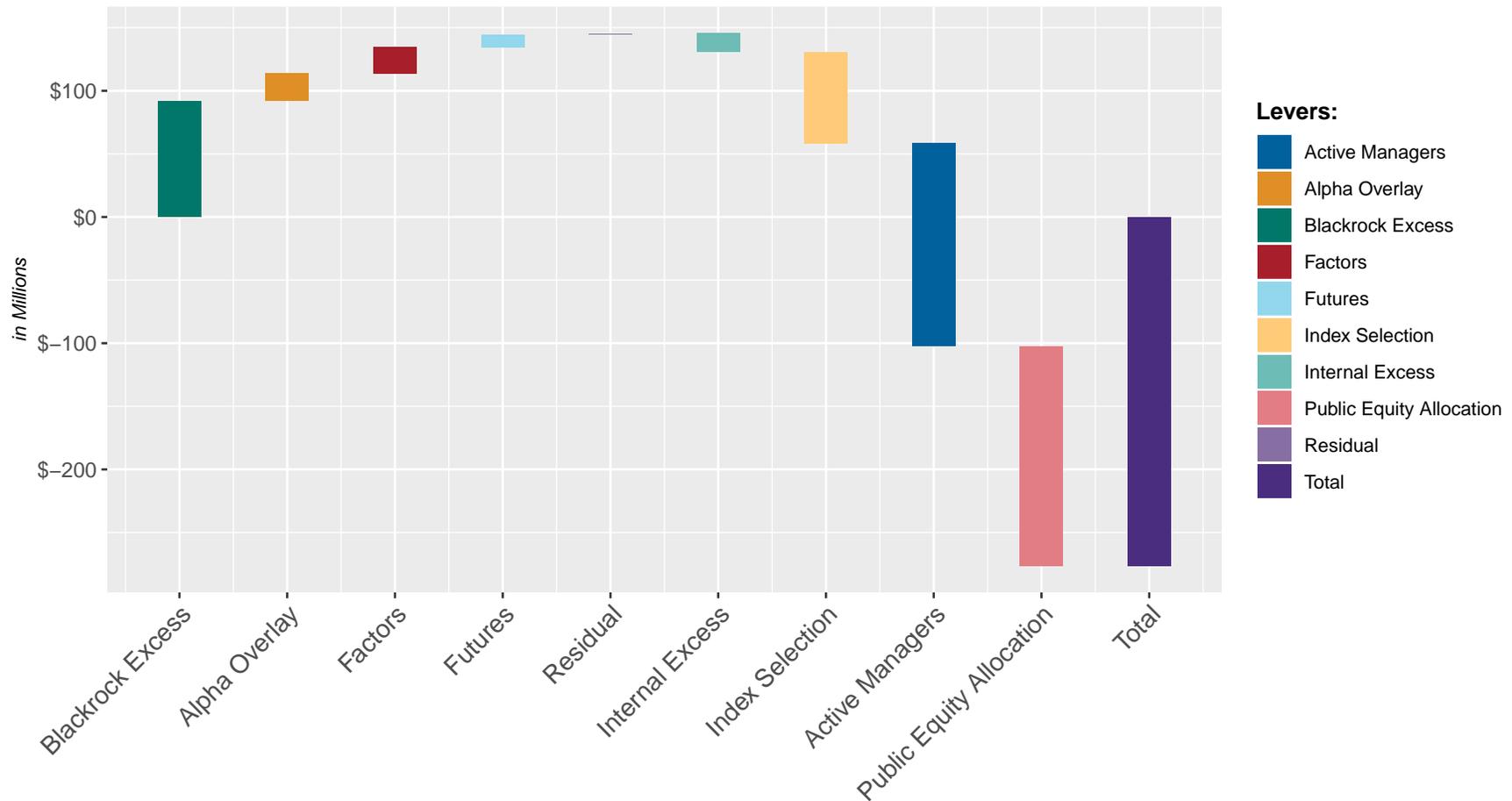
Total Equity Dollar Value Added



Public Equity “Levers” for the period ended 12/31/2018

Public Equity Dollar Value Add

Trailing 5 Years

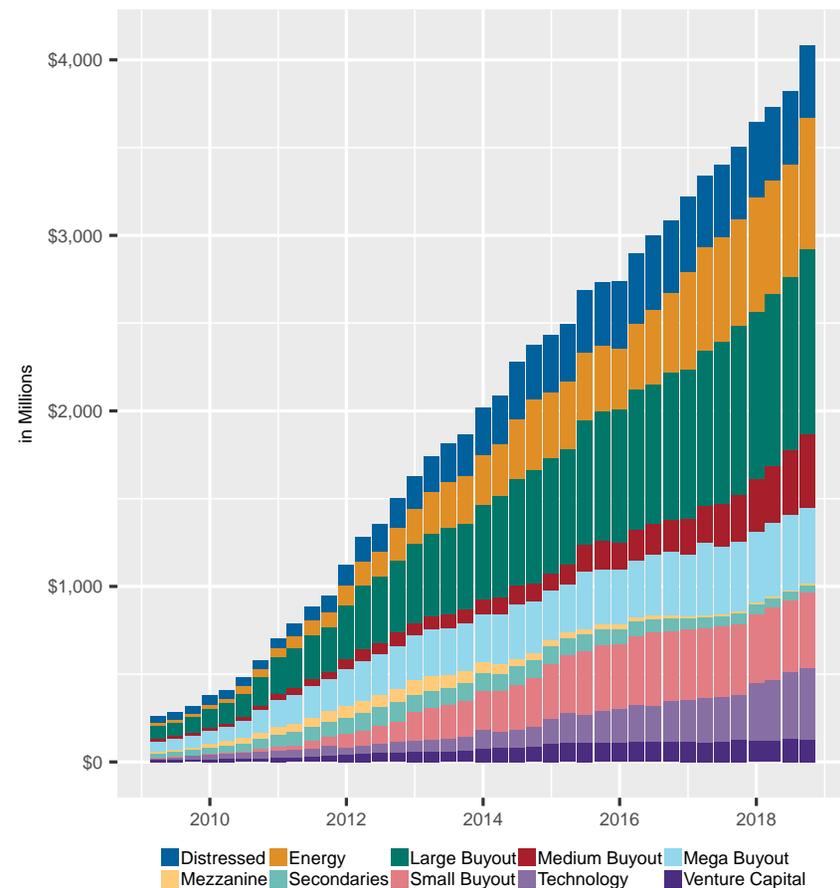


Private Equity for the period ended 12/31/2018

Private Equity Internal Rate of Returns

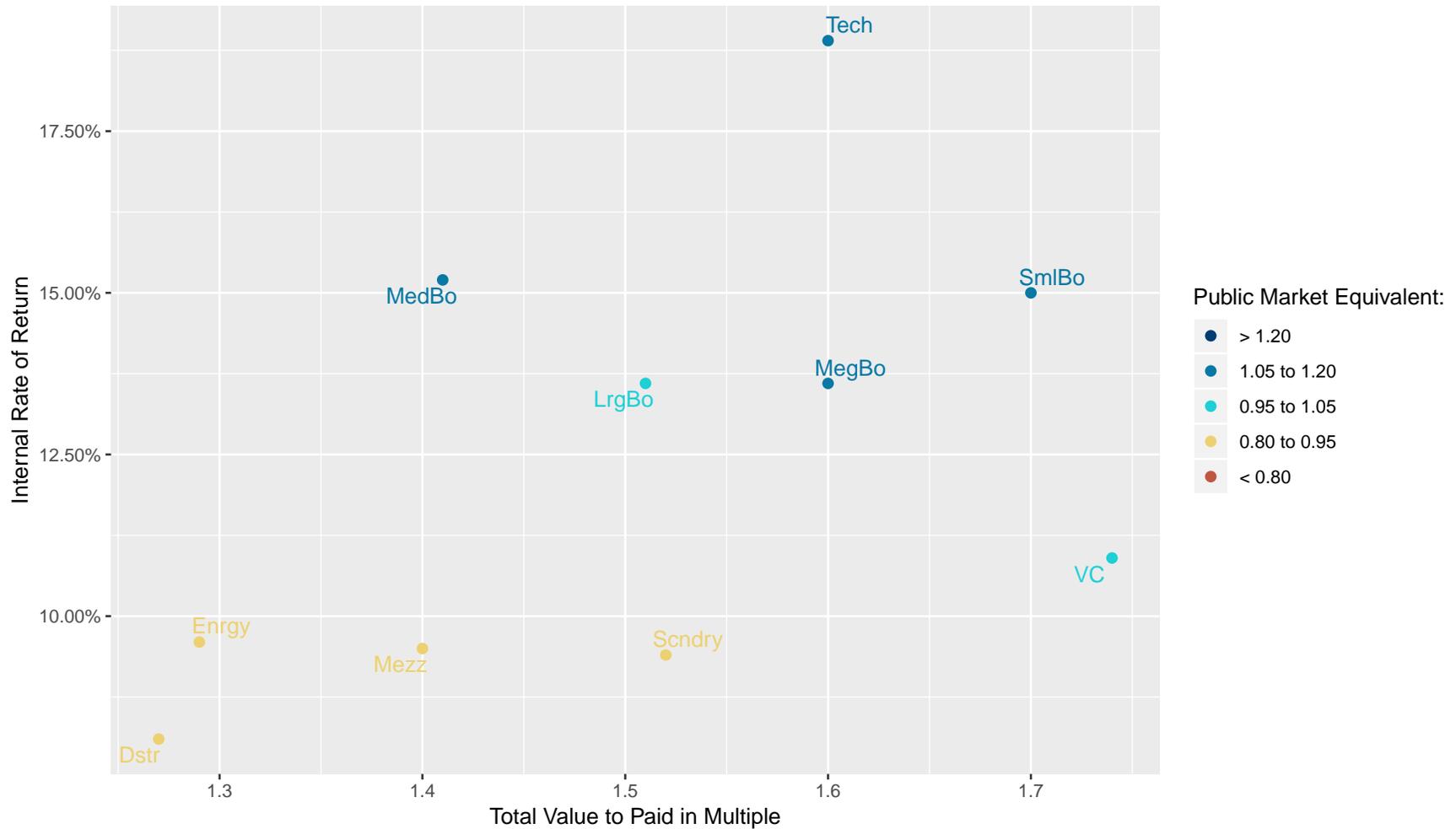
Category	Quarter	1 Year	3 Year	5 Year	Inception to Date
Private Equity	4.7%	16.8%	14.5%	13%	13%
Benchmark	4.1%	7.1%	14.2%	9.5%	9.5%
Excess	0.6%	9.7%	0.3%	3.5%	3.5%
Technology	7.6%	31.1%	21.6%	21.7%	18.9%
Mega Buyout	3.4%	18.3%	19%	16.3%	13.6%
Medium Buyout	4.9%	22.6%	15.6%	19.2%	15.2%
Small Buyout	7%	22.8%	19.6%	18.3%	15%
Energy	8.3%	13.7%	11.7%	7.5%	9.6%
Venture Capital	-0.7%	11.7%	10.2%	14.7%	10.9%
Distressed	-0.7%	6.2%	5.7%	5.8%	8.1%
Secondaries	0.5%	5.4%	6.2%	7.5%	9.4%
Large Buyout	3.9%	15.3%	15.3%	13.1%	13.6%
Mezzanine	0.6%	11.3%	7.6%	7.2%	9.5%

Net Asset Value by Strategy



Private Equity for the period ended 12/31/2018

Comparison of Strategies

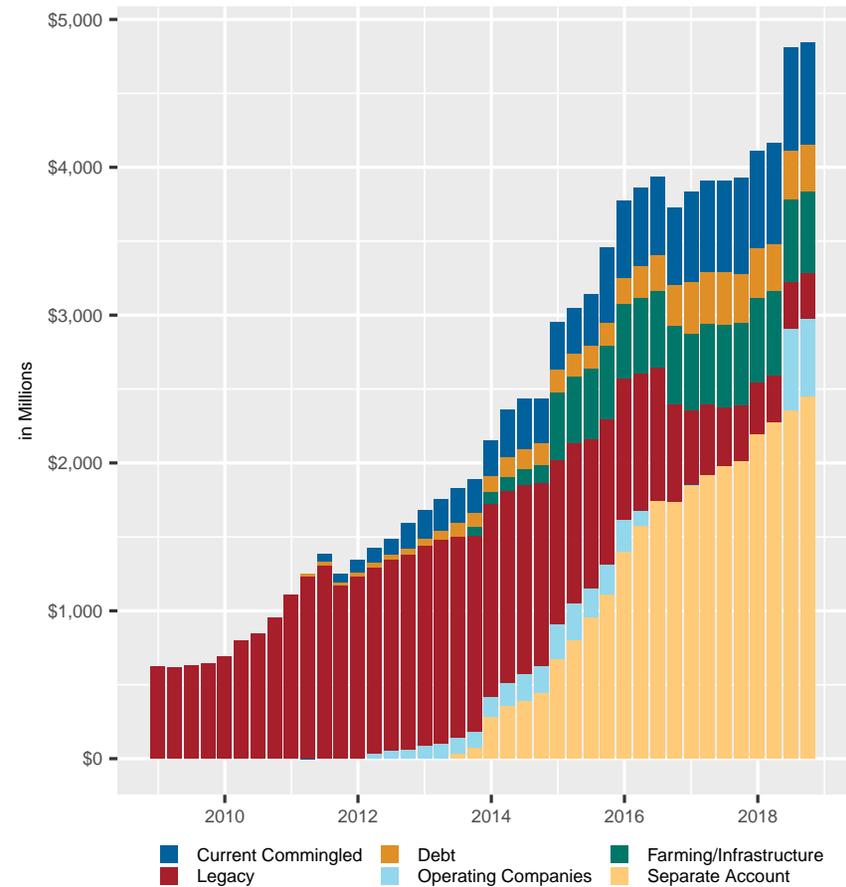


Real Estate for the period ended 12/31/2018

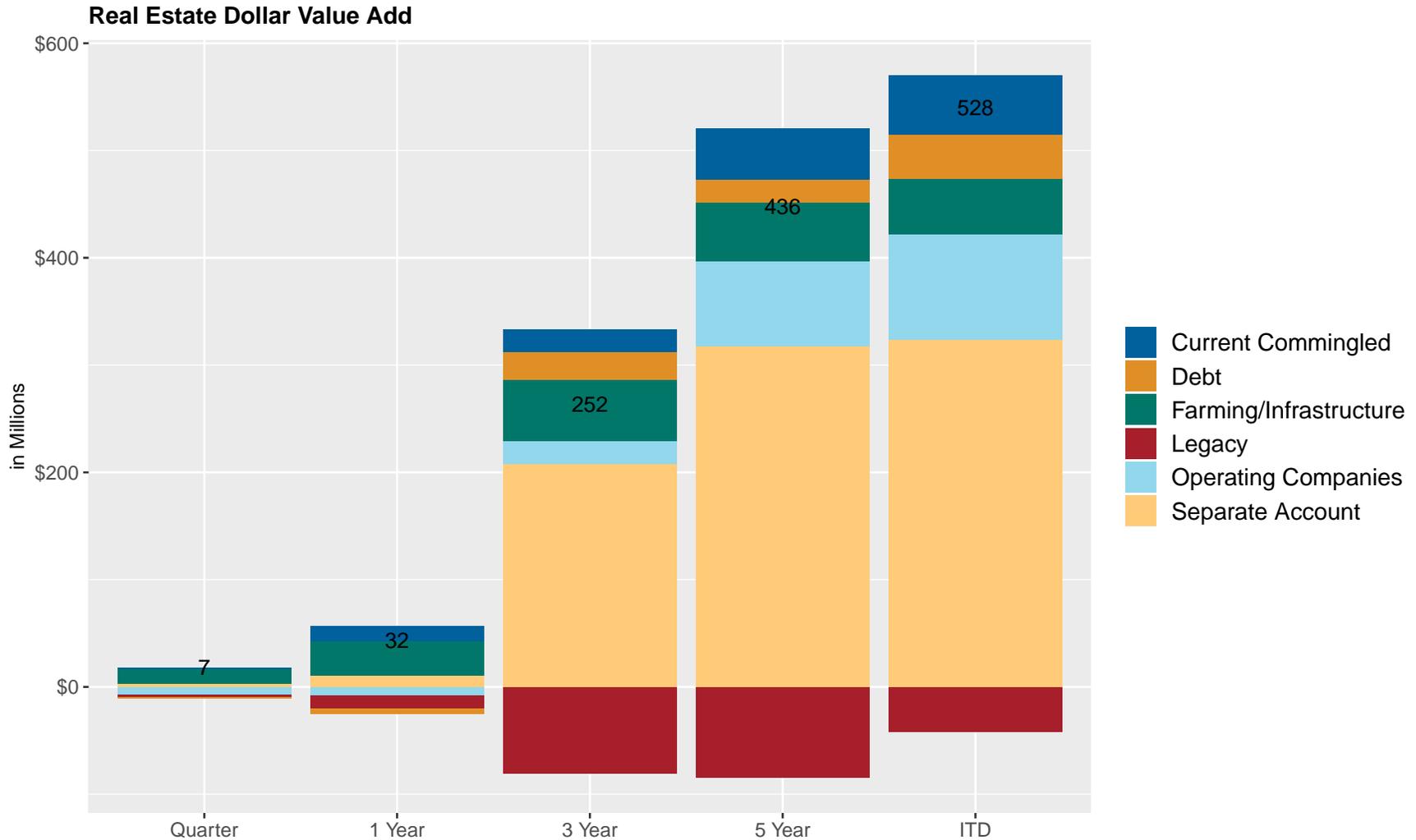
Real Estate Internal Rate of Returns

Category	Quarter	1 Year	3 Year	5 Year	Inception to Date
Real Estate	1.94%	8.2%	10%	11.6%	8.8%
Benchmark	1.81%	7.4%	8%	9.3%	7.2%
Excess	0.13%	0.7%	2%	2.3%	1.6%
Separate Account	2.09%	9.1%	12.9%	13.9%	13.8%
Operating Companies	0.41%	4.5%	14.9%	19.6%	19.3%
Farming/Infrastructure	4.3%	12.9%	9.4%	8.2%	8%
Legacy	1.11%	3.5%	4.8%	9.5%	5.9%
Current Commingled	2.01%	9.7%	9.4%	11.5%	11.7%
Debt	1.35%	6%	11%	11.2%	12.8%

Net Asset Value by Strategy

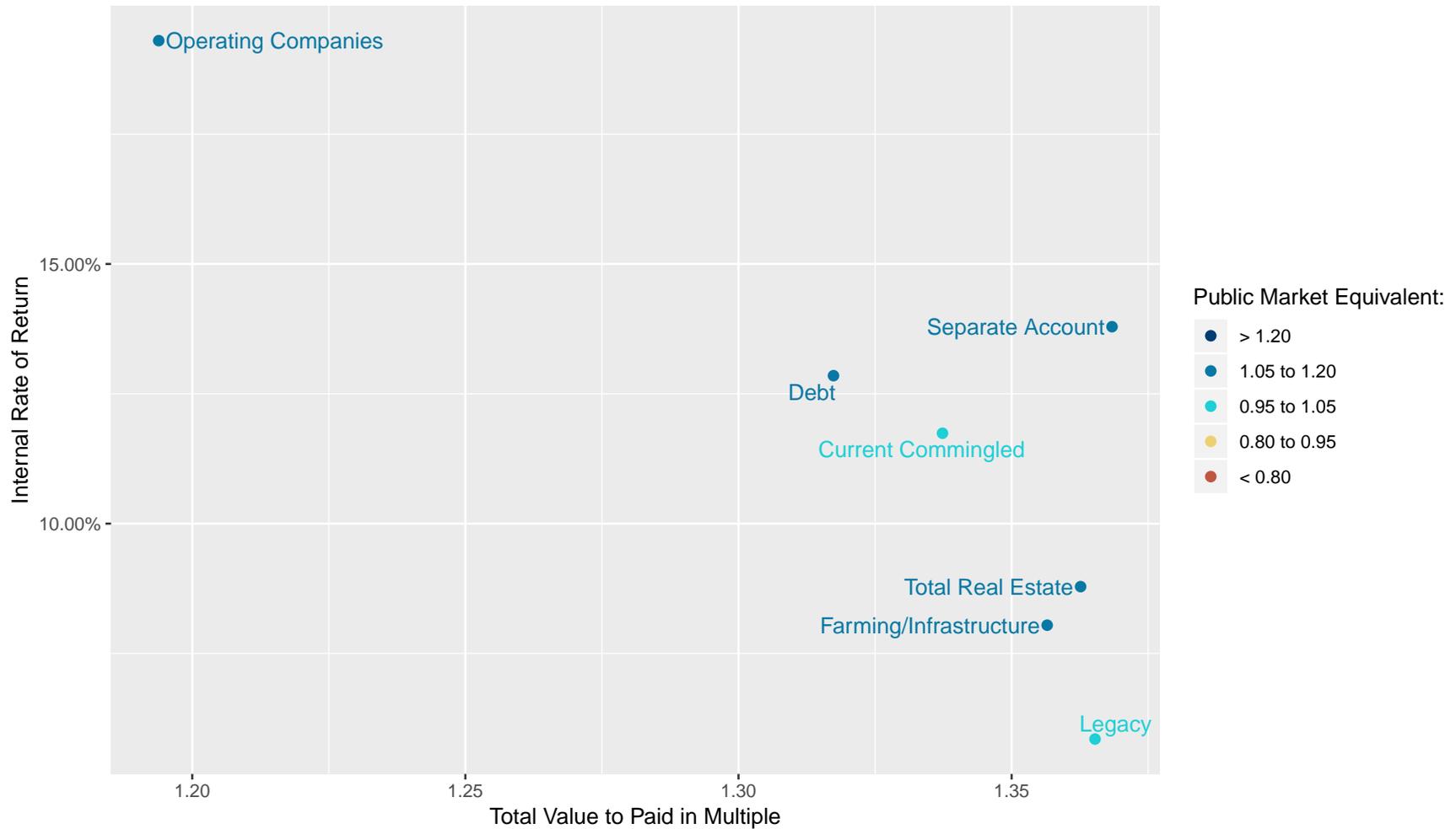


Real Estate Dollar Value Add for the period ended 12/31/2018



Real Estate Strategy Comparison for the period ended 12/31/2018

Comparison of Strategies

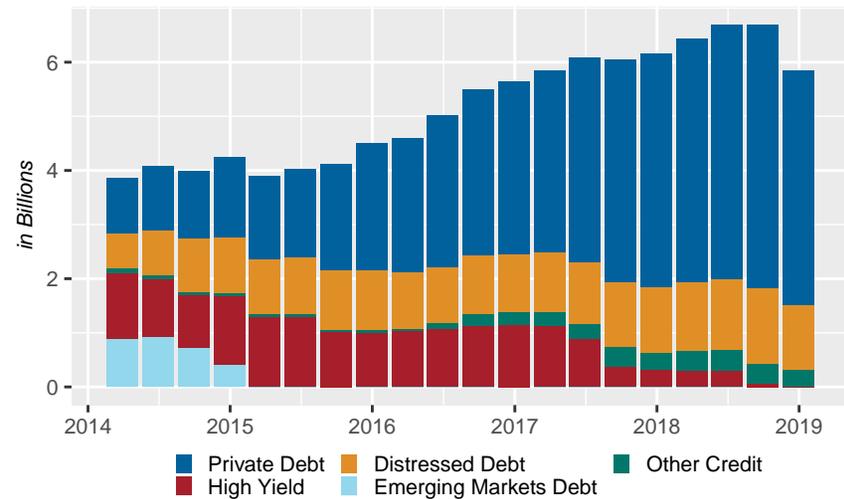


Total Credit for the period ended 12/31/2018

Annualized Returns

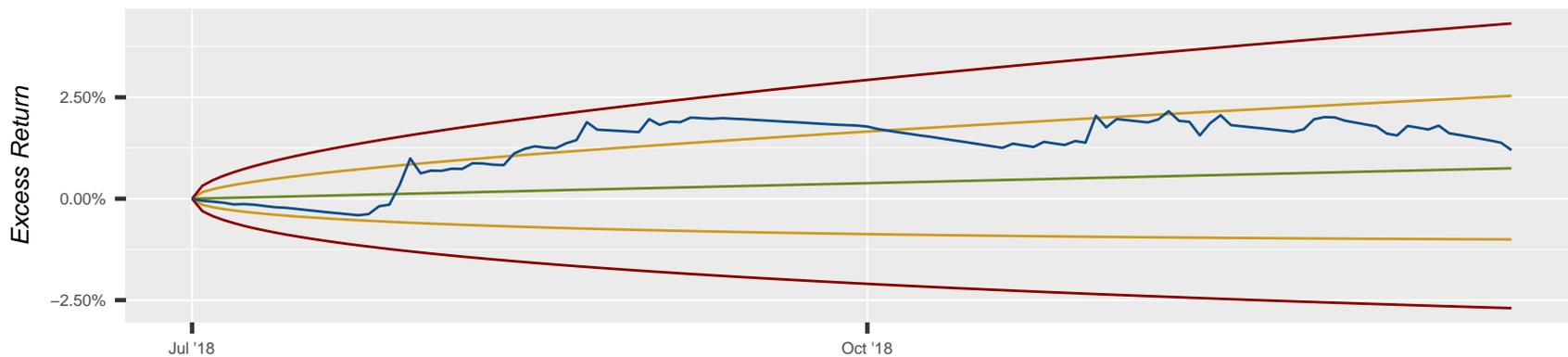
	FYTD	1 Year	3 Year	5 Year
Total Credit	5.07	9.52	9.71	7.56
Blended Benchmark	3.82	7.22	8.80	4.90
Total Credit Excess	1.24	2.30	0.91	2.66
Private Debt	5.06	10.87	10.95	10.92
S&P/LSTA Leveraged Loan + 250 Basis Points	3.82	7.82	7.94	6.73
Private Debt Excess	1.24	3.06	3.01	4.19
Distressed Debt	0.96	8.50	7.59	6.58
Fixed 8% Return/LSTA Blend	2.47	7.90	7.97	7.98
Distressed Debt Excess	-6.94	0.60	-0.38	-1.40
Other Credit	3.20	7.29	9.33	9.29
Fixed 8% Return/LSTA Blend	2.49	7.91	7.96	7.97
Other Credit Excess	-4.71	-0.63	1.37	1.32
High Yield	-0.34	-0.87	6.40	4.23
Barclay's High Yield Index	-2.24	-2.08	7.23	3.83
High Yield Excess	1.90	1.22	-0.83	0.40

Total Credit Market Values



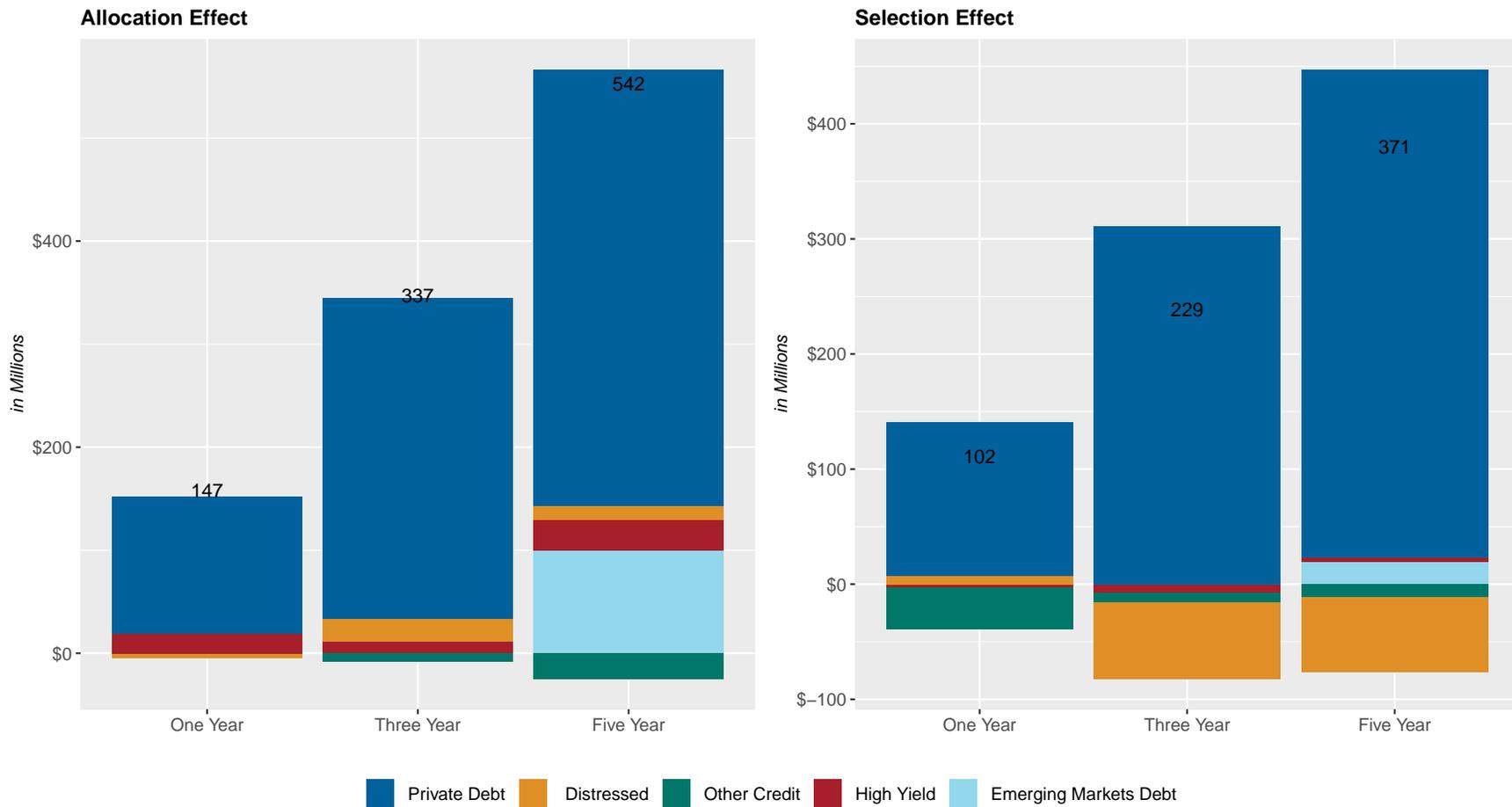
Total Credit Portfolio Performance versus Expectations

150 Basis Points Expected Excess Return with 250 Basis Points Tracking Error



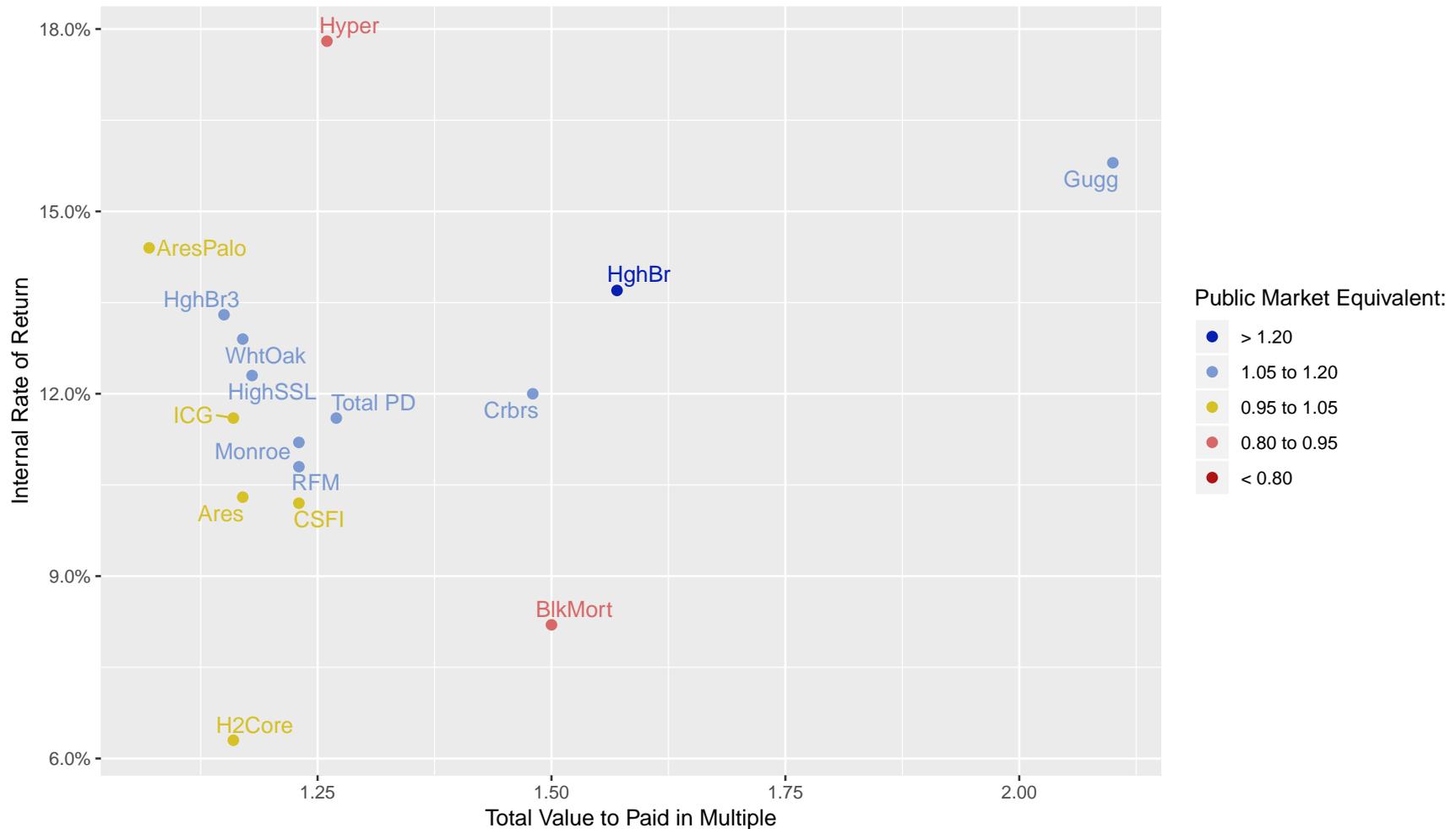
Credit Dollar Value Added for the period ended 12/31/2018

Credit Dollar Value Added Relative to Total Fund Benchmark



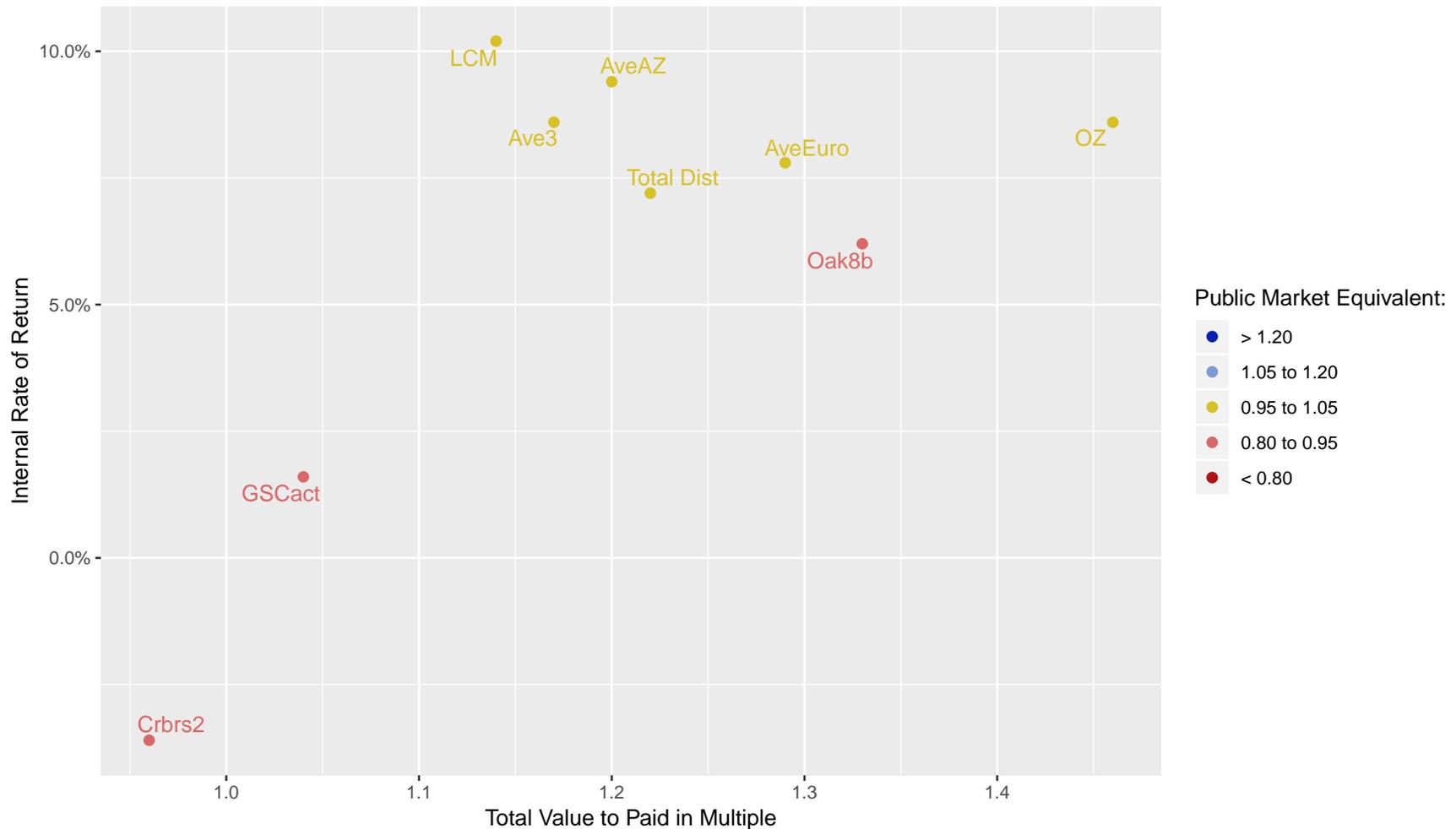
Private Debt: Total Value to Paid in Multiple & Public Market Equivalent for the period ended 12/31/2018

Comparison of Private Debt Strategies



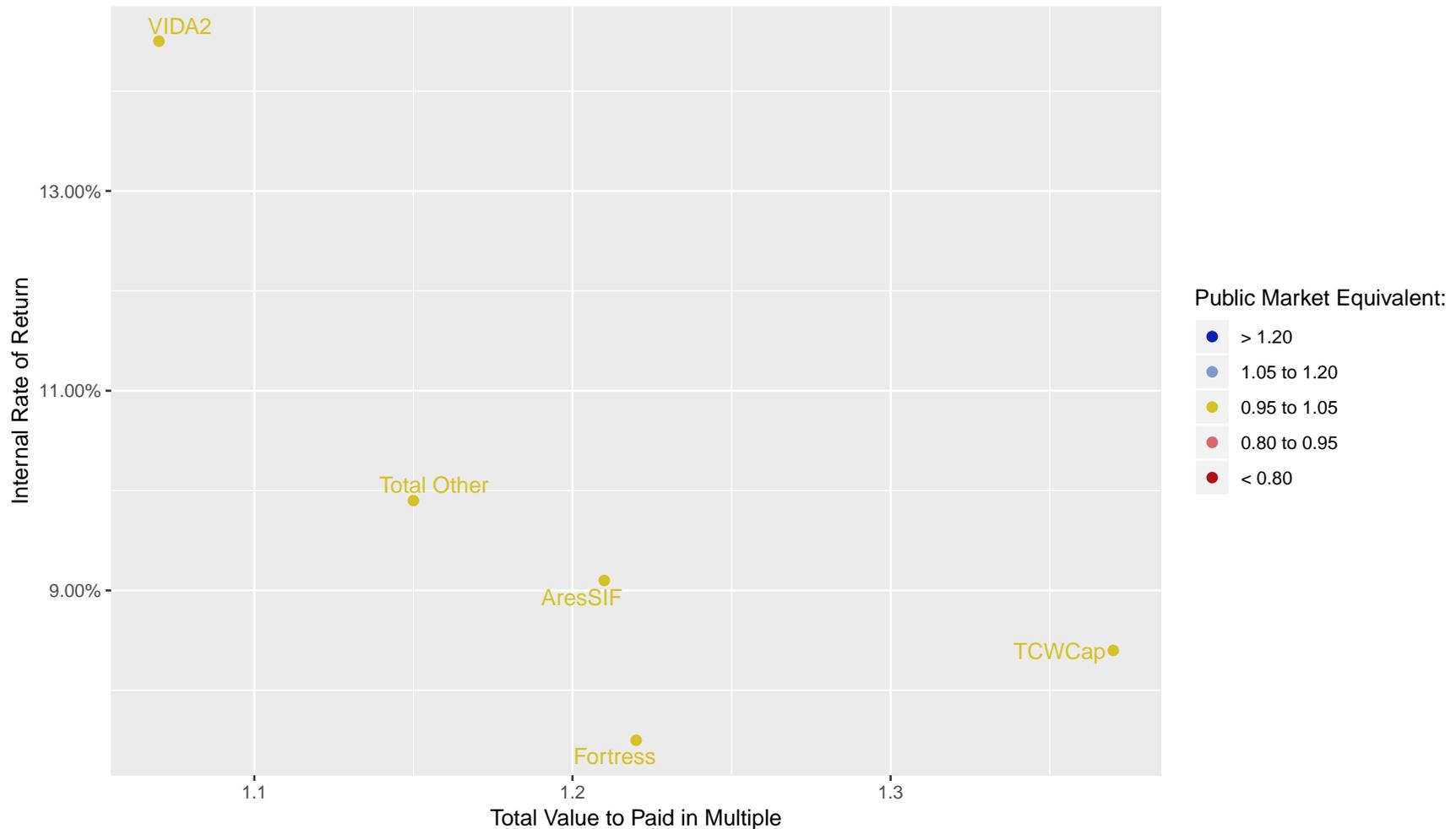
Distressed Debt: Total Value to Paid in Multiple & Public Market Equivalent for the period ended 12/31/2018

Comparison of Distressed Debt Strategies



Other Credit: Total Value to Paid in Multiple & Public Market Equivalent for the period ended 12/31/2018

Comparison of Other Credit Strategies

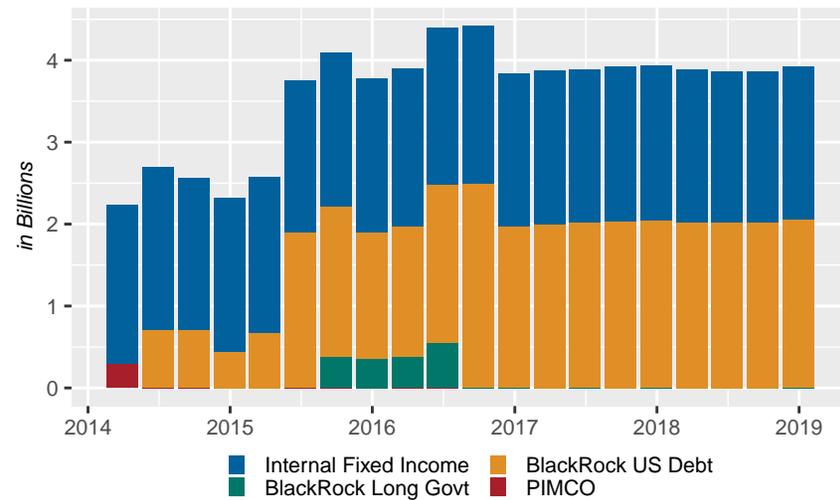


Core Fixed Income for the period ended 12/31/2018

Annualized Returns

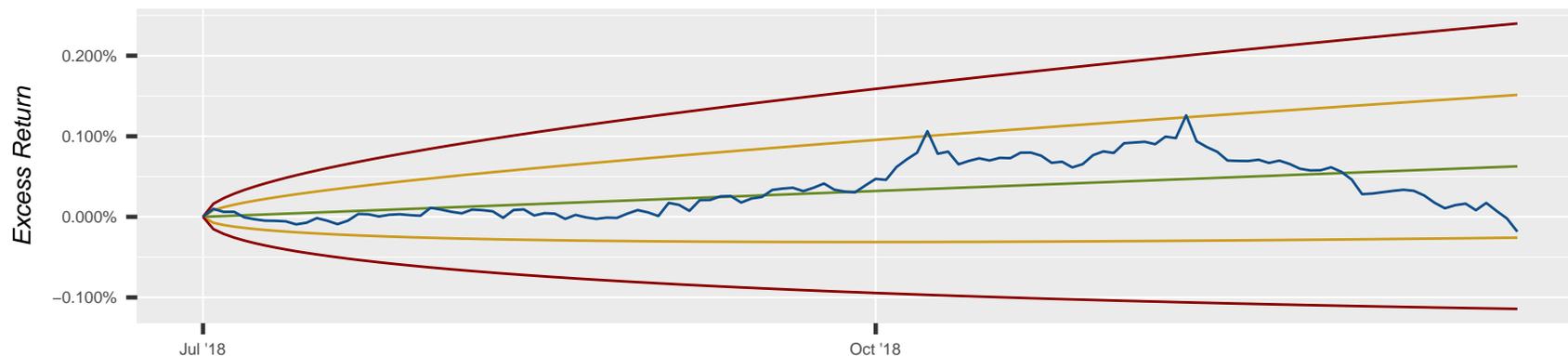
	FYTD	1 Year	3 Year	5 Year
Core Bond Composite	1.64	0.08	2.46	2.79
Barclay's Aggregate	1.65	0.01	2.06	2.52
Core Composite Excess	-0.02	0.06	0.40	0.27
Internal Fixed Income	1.58	0.08	2.14	2.66
Barclay's Aggregate	1.65	0.01	2.06	2.52
Internal Fixed Income Excess	-0.08	0.07	0.08	0.14
BlackRock US Debt Fund	1.69	0.07	2.15	
Barclay's Aggregate	1.65	0.01	2.06	
BlackRock Excess	0.04	0.06	0.10	

Core Bonds Market Values



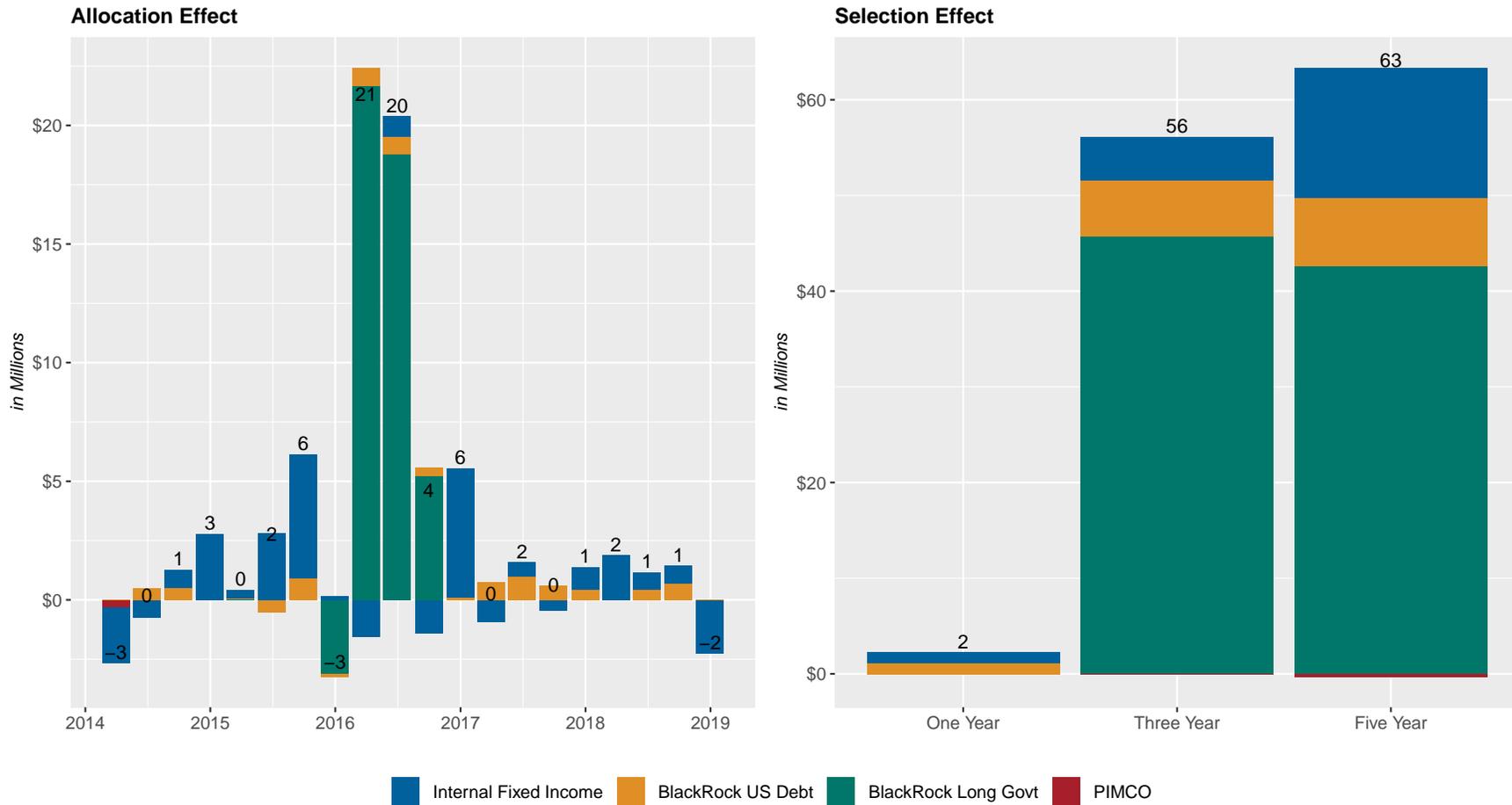
Core Bond Portfolio Performance versus Expectations

12.5 Basis Points Expected Excess Return with 12.5 Basis Points Tracking Error



Core Fixed Income Dollar Value Added for the period ended 12/31/2018

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



Total Portfolio Value-At-Risk 1/31/2019

TOTAL PORTFOLIO VALUE-AT-RISK (VAR)

As of January 31st, 2019, total VaR for ASRS Portfolio was 14.73%, indicating that there is a 5% chance that portfolio could lose ~\$5.8B in a given year. Note that a 5% event is expected to occur every 20 years



— GENERAL —