



# Board Presentation/Executive Summary

## Texas Municipal Retirement System

Period Ended: December 31, 2019



# Capital Markets Update

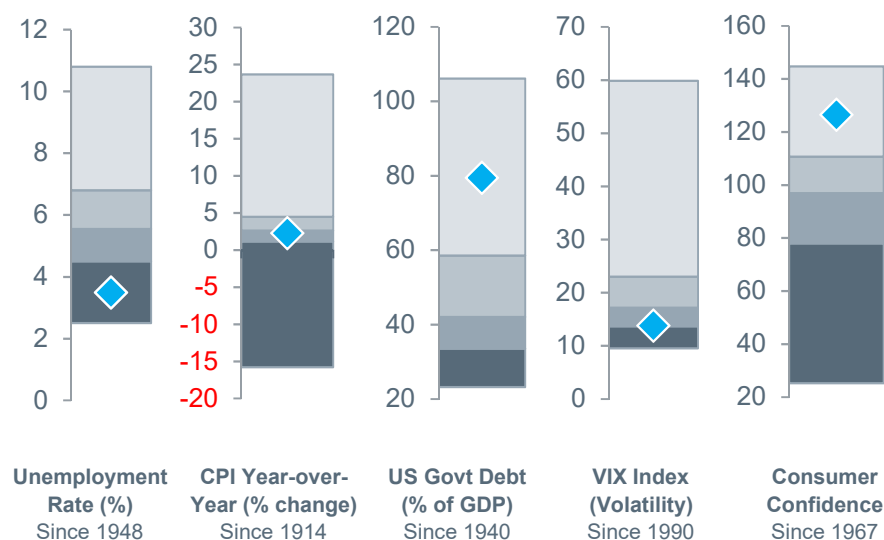


## Fourth Quarter Economic Environment

## Key Economic Indicators

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

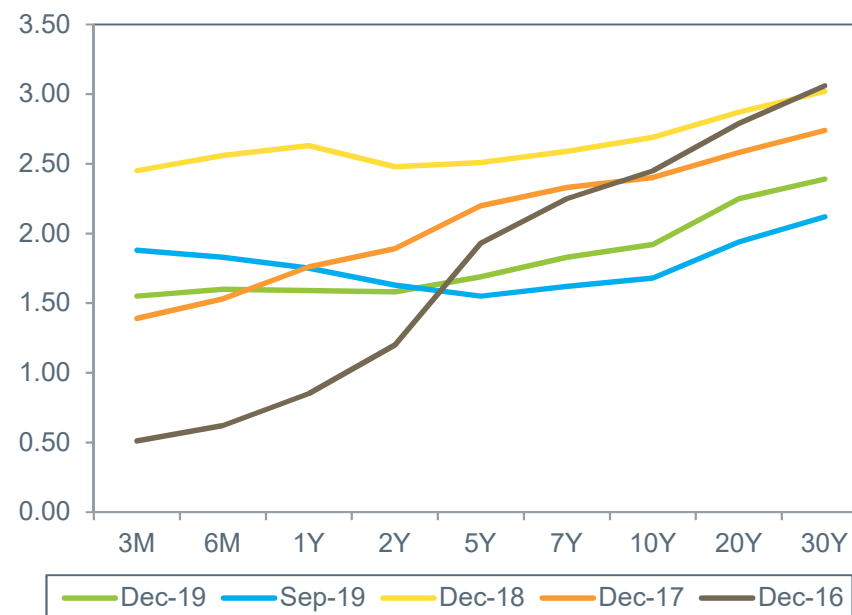
## Key Economic Indicators



Economic Indicators	Dec-19	Sep-19	Dec-18	Dec-16	20 Yr
Federal Funds Rate (%)	1.55 ▼	1.90	2.40	0.55	1.79
Breakeven Infl. - 5 Yr (%)	1.70 ▲	1.35	1.49	1.86	1.85
Breakeven Infl. - 10 Yr (%)	1.79 ▲	1.52	1.71	1.97	2.03
CPI YoY (Headline) (%)	2.3 ▲	1.7	1.9	2.1	2.2
Unemployment Rate (%)	3.5 —	3.5	3.9	4.7	5.9
Real GDP YoY (%)	N/A	2.1	2.5	2.0	2.1
PMI - Manufacturing	47.2 ▼	47.8	54.3	54.3	52.6
USD Total Wtd Idx	90.82 ▼	93.25	91.79	95.72	86.07
WTI Crude Oil per Barrel (\$)	61.1 ▲	54.1	45.4	53.7	61.9
Gold Spot per Oz (\$)	1,517 ▲	1,472	1,282	1,148	935

Market Performance (%)	QTD	CYTD	1 Yr	5 Yr	10 Yr
S&P 500 (Cap Wtd)	9.07	31.49	31.49	11.70	13.56
Russell 2000	9.94	25.53	25.53	8.23	11.83
MSCI EAFE (Net)	8.17	22.01	22.01	5.67	5.50
MSCI EAFE SC (Net)	11.52	24.96	24.96	8.85	8.74
MSCI Emg Mkts (Net)	11.84	18.44	18.44	5.61	3.68
Bloomberg US Agg Bond	0.18	8.72	8.72	3.05	3.75
ICE BofAML 3 Mo US T-Bill	0.46	2.28	2.28	1.07	0.58
NCREIF ODCE (Gross)	1.52	5.35	5.35	8.97	11.42
FTSE NAREIT Eq REIT (TR)	-0.76	26.00	26.00	7.21	11.94
HFRI FOF Comp	3.04	8.34	8.34	2.36	2.83
Bloomberg Cmtty (TR)	4.42	7.69	7.69	-3.92	-4.73

## Treasury Yield Curve (%)

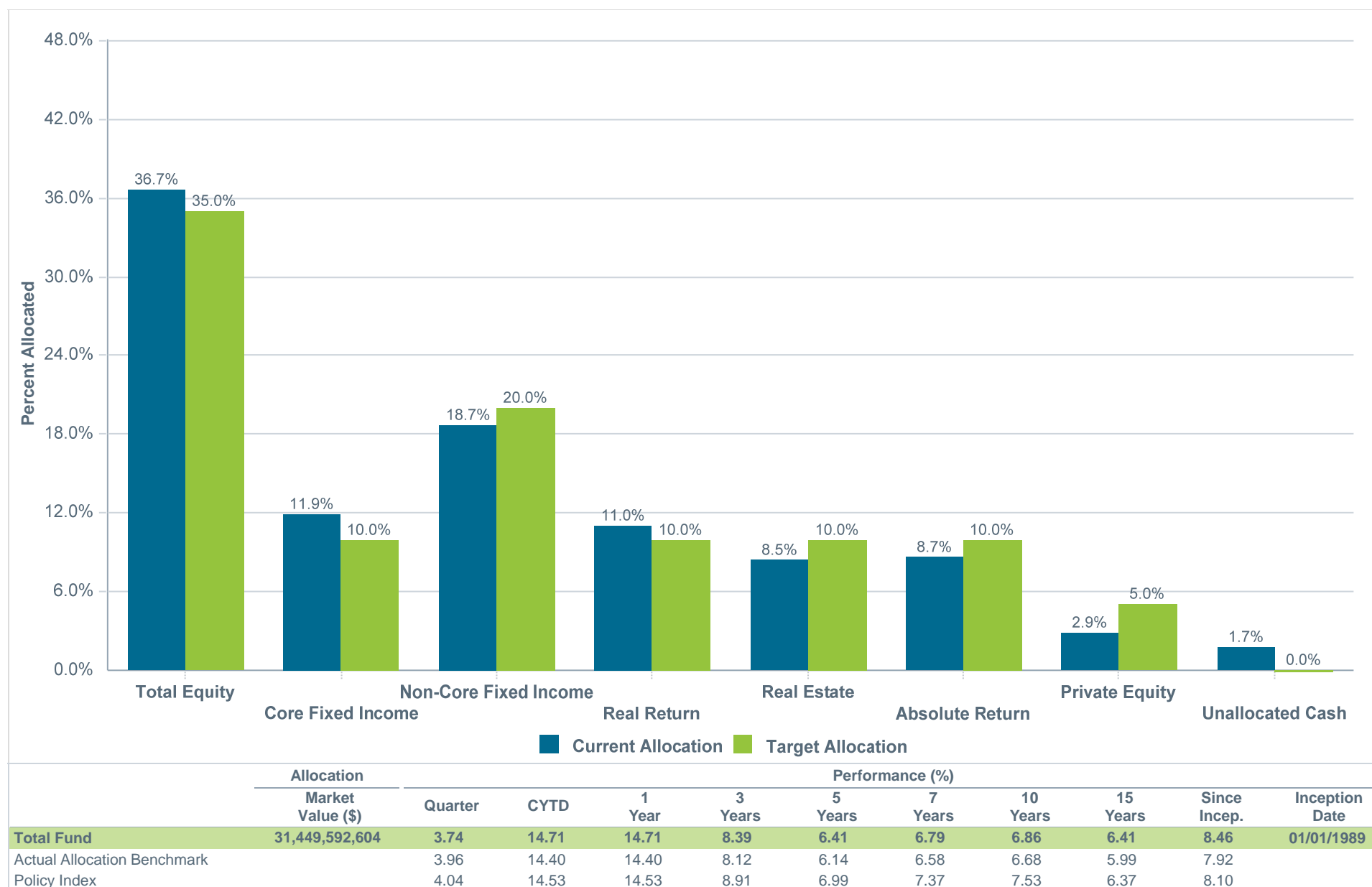


# TMRS Total Fund



# TMRS Asset Allocation and Performance

As of December 31, 2019

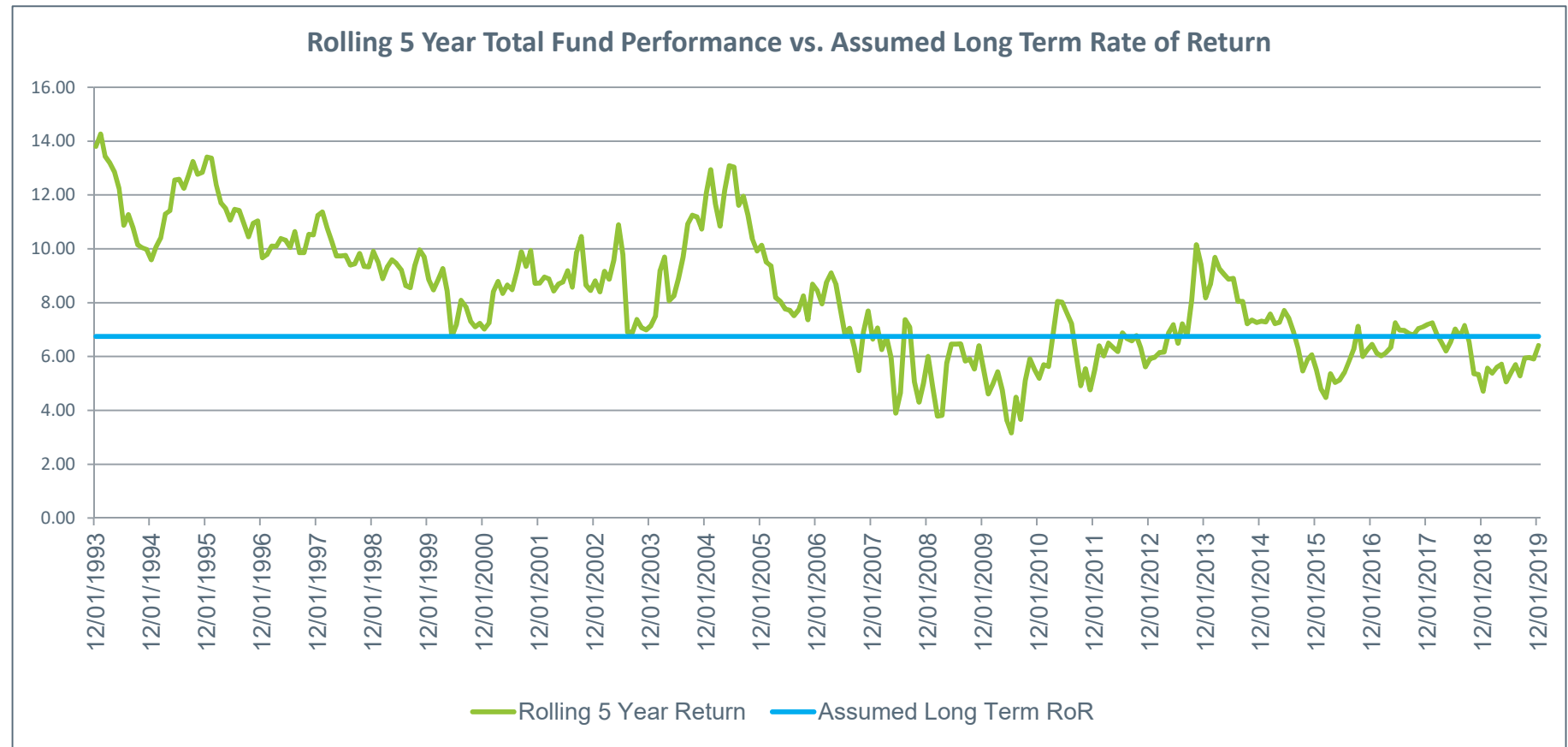


Performance shown is net of fees and provided by State Street. Performance is annualized for periods greater than one year. Please see Board Presentation/Executive Summary Report Addendum for custom benchmark definitions. Allocations shown may not sum to 100% exactly due to rounding.

# Total Fund Objectives and Performance

As of December 31, 2019

Total Fund Return Objectives				
<b>Objective #1:</b>	Achieve a total rate of return over rolling five-year periods consistent with the assumed long term rate of return on TMRS assets established by the actuary.			
<b>Objective #2:</b>	Exceed an appropriate benchmark reflective of asset class participation over rolling five-year periods.			
TMRS Composite	5 Year Total Fund Return	5 Year Benchmark Return	Benchmark Description	Meets Rank Objective
Total Fund Composite (Net)	6.41	6.75	Assumed Long Term Rate of Return	✗
Total Fund Composite (Net)	6.41	6.14	Actual Allocation Benchmark	✓
Total Fund Composite (Net)	6.41	6.99	Policy Index	✗



Performance shown is net of fees.

# Asset Class Composite Performance (Net)

As of December 31, 2019

	Allocation		Performance (%)									
	Market Value (\$)	%	Quarter	CYTD	1 Year	3 Years	5 Years	7 Years	10 Years	15 Years	Since Incep.	Inception Date
<b>Total Fund</b>	<b>31,449,592,604</b>	<b>100.00</b>	<b>3.74</b>	<b>14.71</b>	<b>14.71</b>	<b>8.39</b>	<b>6.41</b>	<b>6.79</b>	<b>6.86</b>	<b>6.41</b>	<b>8.46</b>	<b>01/01/1989</b>
Actual Allocation Benchmark			3.96	14.40	14.40	8.12	6.14	6.58	6.68	5.99	7.92	
Difference			-0.22	0.31	0.31	0.27	0.27	0.21	0.18	0.42	0.54	
<b>Total Equity</b>	<b>11,534,798,927</b>	<b>36.68</b>	<b>8.42</b>	<b>26.41</b>	<b>26.41</b>	<b>12.03</b>	<b>8.67</b>	<b>10.35</b>	<b>9.39</b>	<b>N/A</b>	<b>6.29</b>	<b>02/01/2008</b>
Total Equity Benchmark			9.05	26.35	26.35	12.22	8.81	10.39	9.41	N/A	6.28	
Difference			-0.63	0.06	0.06	-0.19	-0.14	-0.04	-0.02	N/A	0.01	
<b>Core Fixed Income</b>	<b>3,748,026,855</b>	<b>11.92</b>	<b>0.25</b>	<b>9.08</b>	<b>9.08</b>	<b>4.25</b>	<b>3.26</b>	<b>2.83</b>	<b>3.89</b>	<b>4.42</b>	<b>7.47</b>	<b>01/01/1989</b>
Fixed Income Benchmark			0.18	8.72	8.72	4.03	3.05	2.72	3.75	4.04	6.95	
Difference			0.07	0.36	0.36	0.22	0.21	0.11	0.14	0.38	0.52	
<b>Non-Core Fixed Income</b>	<b>5,869,680,676</b>	<b>18.66</b>	<b>1.31</b>	<b>7.85</b>	<b>7.85</b>	<b>5.88</b>	<b>4.70</b>	<b>N/A</b>	<b>N/A</b>	<b>N/A</b>	<b>4.61</b>	<b>10/01/2014</b>
Non-Core Fixed Income Benchmark			1.23	7.19	7.19	5.12	3.92	N/A	N/A	N/A	3.88	
Difference			0.08	0.66	0.66	0.76	0.78	N/A	N/A	N/A	0.73	
<b>Real Return</b>	<b>3,461,080,833</b>	<b>11.01</b>	<b>1.76</b>	<b>15.54</b>	<b>15.54</b>	<b>6.11</b>	<b>3.80</b>	<b>2.68</b>	<b>N/A</b>	<b>N/A</b>	<b>4.04</b>	<b>02/01/2011</b>
Real Return Benchmark			1.46	14.27	14.27	6.36	4.22	2.86	4.13	4.22	4.11	
Difference			0.30	1.27	1.27	-0.25	-0.42	-0.18	N/A	N/A	-0.07	
<b>Real Estate</b>	<b>2,661,331,472</b>	<b>8.46</b>	<b>1.88</b>	<b>7.26</b>	<b>7.26</b>	<b>9.47</b>	<b>10.73</b>	<b>11.73</b>	<b>N/A</b>	<b>N/A</b>	<b>10.87</b>	<b>01/01/2012</b>
Real Estate Benchmark			1.31	5.59	5.59	7.30	9.33	10.29	10.86	7.87	10.45	
Difference			0.57	1.67	1.67	2.17	1.40	1.44	N/A	N/A	0.42	
<b>Absolute Return</b>	<b>2,726,490,580</b>	<b>8.67</b>	<b>0.12</b>	<b>5.14</b>	<b>5.14</b>	<b>6.04</b>	<b>4.31</b>	<b>N/A</b>	<b>N/A</b>	<b>N/A</b>	<b>4.11</b>	<b>08/01/2014</b>
Absolute Return Benchmark			0.49	4.82	4.82	3.61	2.04	3.33	2.79	2.83	2.09	
Difference			-0.37	0.32	0.32	2.43	2.27	N/A	N/A	N/A	2.02	
<b>Private Equity</b>	<b>898,218,240</b>	<b>2.86</b>	<b>6.52</b>	<b>12.39</b>	<b>12.39</b>	<b>23.25</b>	<b>N/A</b>	<b>N/A</b>	<b>N/A</b>	<b>N/A</b>	<b>17.46</b>	<b>01/01/2016</b>
Private Equity Benchmark			6.52	12.39	12.39	23.25	N/A	N/A	N/A	N/A	17.46	
Difference			0.00	0.00	0.00	0.00	N/A	N/A	N/A	N/A	0.00	
<b>TMRs Unallocated Cash</b>	<b>549,965,020</b>	<b>1.75</b>	<b>0.88</b>	<b>2.29</b>	<b>2.29</b>	<b>1.55</b>	<b>1.21</b>	<b>0.91</b>	<b>0.66</b>	<b>N/A</b>	<b>0.67</b>	<b>06/01/2008</b>
FTSE 30 Day T-Bill Index			0.43	2.20	2.20	1.61	1.01	0.72	0.52	1.25	0.51	
Difference			0.45	0.09	0.09	-0.06	0.20	0.19	0.14	N/A	0.16	

Performance shown is net of fees and provided by State Street. Performance is annualized for periods greater than one year. Market value for the Total Equity Composite includes assets held in the Transition Account. Real Estate and Private Equity fund returns are calculated by Private Edge. Private Real Estate fund returns are lagged 1 quarter. Inception dates shown for Real Estate and Private Equity composite represent the first full quarter following initial funding. Inception dates for all other composites represents the first full month following initial funding. Please see Board Presentation/Executive Summary Report Addendum for custom benchmark definitions.

# TMRS Composites Objectives and Performance

As of December 31, 2019

TMRS Composites Objective			
<b>Objective:</b> Exceed its benchmark performance net of fees over rolling five year periods.			
TMRS Composites	5 Year Composite Return	5 Year Benchmark Return	Meets Objective
Total Equity	8.67	8.81	✗
Core Fixed Income	3.26	3.05	✓
Non-Core Fixed Income	4.70	3.92	✓
Real Return	3.80	4.22	✗
Real Estate	10.73	9.33	✓
Absolute Return	4.31	2.04	✓
Private Equity	N/A	N/A	N/A

# TMRS Asset Class Composites

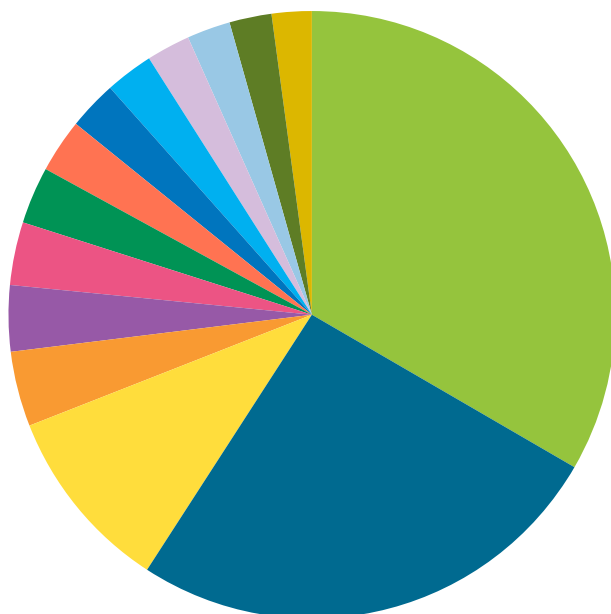


# Total Equity Performance & Allocation

As of December 31, 2019

## Asset Allocation by Manager

\$11,534,798,927



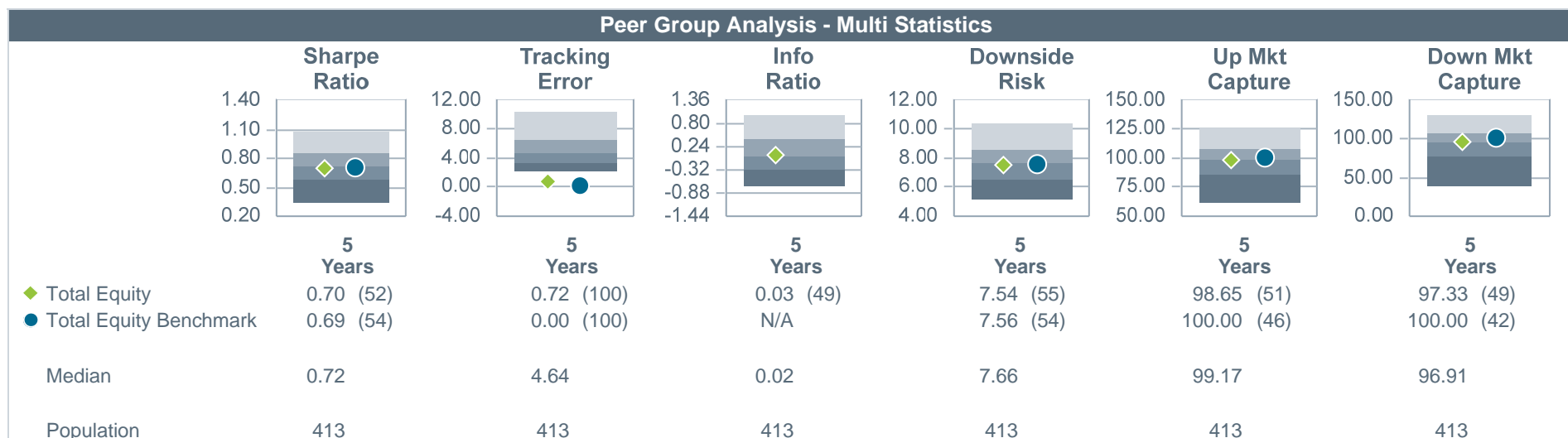
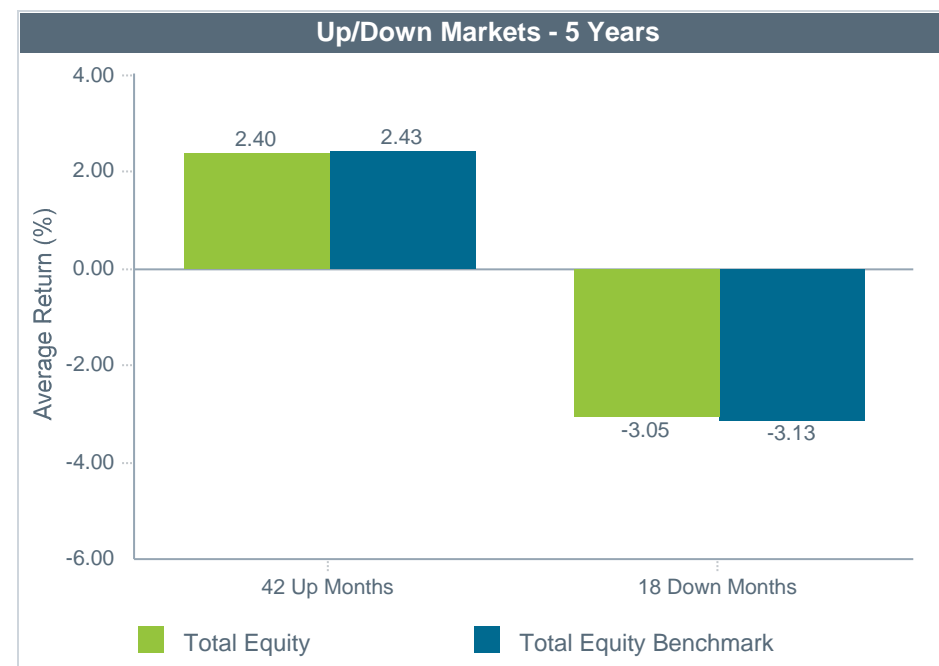
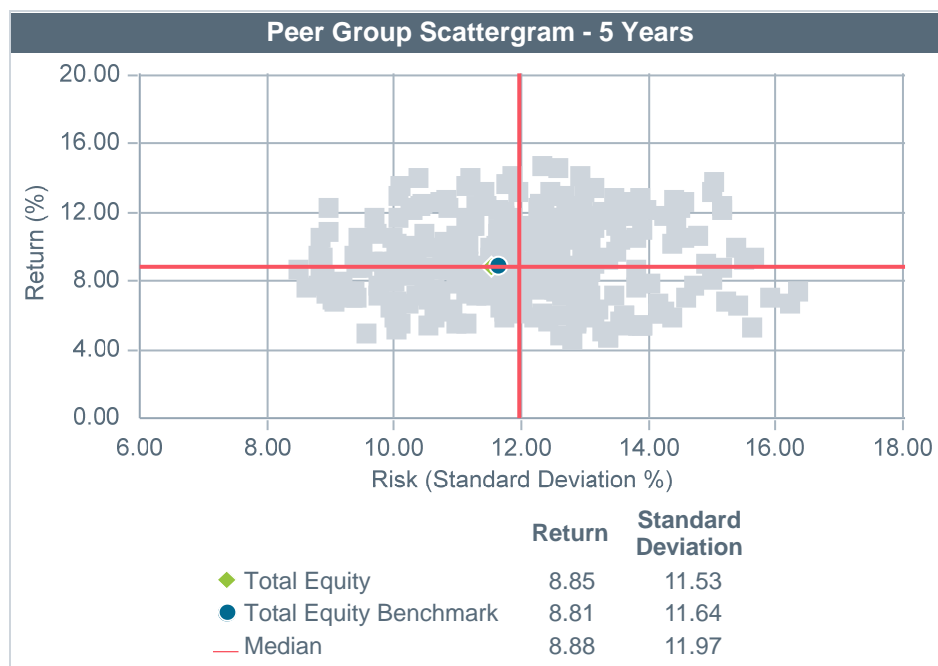
## Comparative Performance

	1 Quarter	CYTD	1 Year	3 Years	5 Years	10 Years	2018	2017	2016	2015	2014	Since Incep.	Inception Date
Total Equity	8.42	26.41	26.41	12.03	8.67	9.39	-10.28	23.97	9.39	-1.47	5.33	6.29	02/01/2008
Total Equity Benchmark	9.05	26.35	26.35	12.22	8.81	9.41	-9.69	23.84	9.54	-1.47	4.95	6.28	
Difference	-0.63	0.06	0.06	-0.19	-0.14	-0.02	-0.59	0.13	-0.15	0.00	0.38	0.01	

Performance shown is net of fees. Allocations shown may not sum up to 100% exactly due to rounding. Market value shown for The Boston Company Small Cap Opp Value (SA) represents residual assets from liquidation.

# Total Equity vs. IM Global Equity

As of December 31, 2019



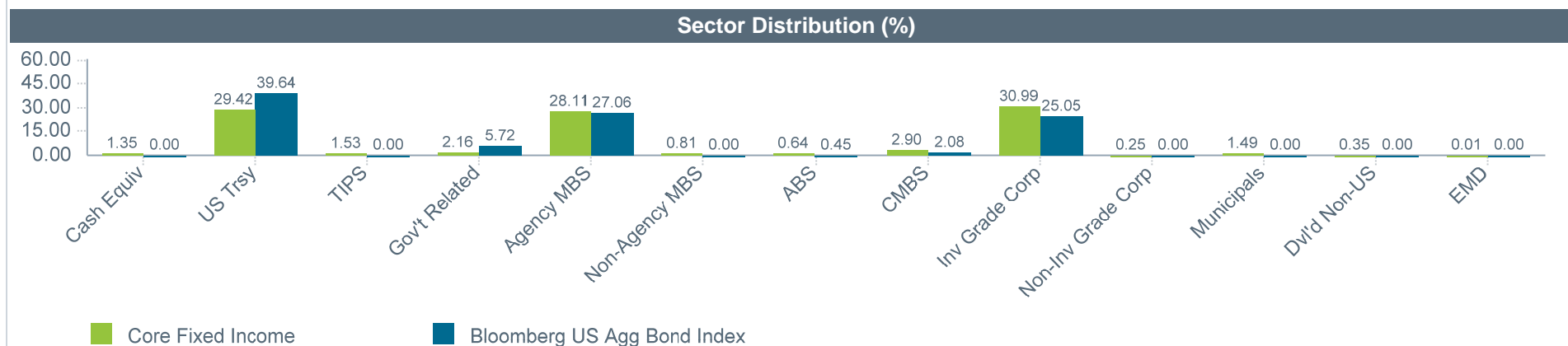
Performance shown is gross of fees. Calculations based on monthly periodicity. Parenthesis contain percentile ranks. Please see Board Presentation/Executive Summary Report Addendum for custom benchmark definitions.

# Core Fixed Income Performance and Allocation

As of December 31, 2019

Asset Allocation by Manager		
	Market Value (\$)	Allocation (%)
BlackRock, Inc. Core (SA)	3,015,446,942	80.45
PIMCO Core Plus Fixed Income (SA)	732,579,913	19.55
<b>Total Core Fixed Income</b>	<b>3,748,026,855</b>	<b>100.00</b>

Portfolio Characteristics		
	Portfolio	Benchmark
Effective Duration	5.66	5.87
Spread Duration	3.62	6.08
Convexity	0.31	0.20
Avg. Maturity	7.79	8.06
Avg. Quality	Aa2	Aa1/Aa2
Yield To Maturity (%)	2.40	2.32
Coupon Rate (%)	3.24	3.17
Current Yield (%)	3.05	N/A

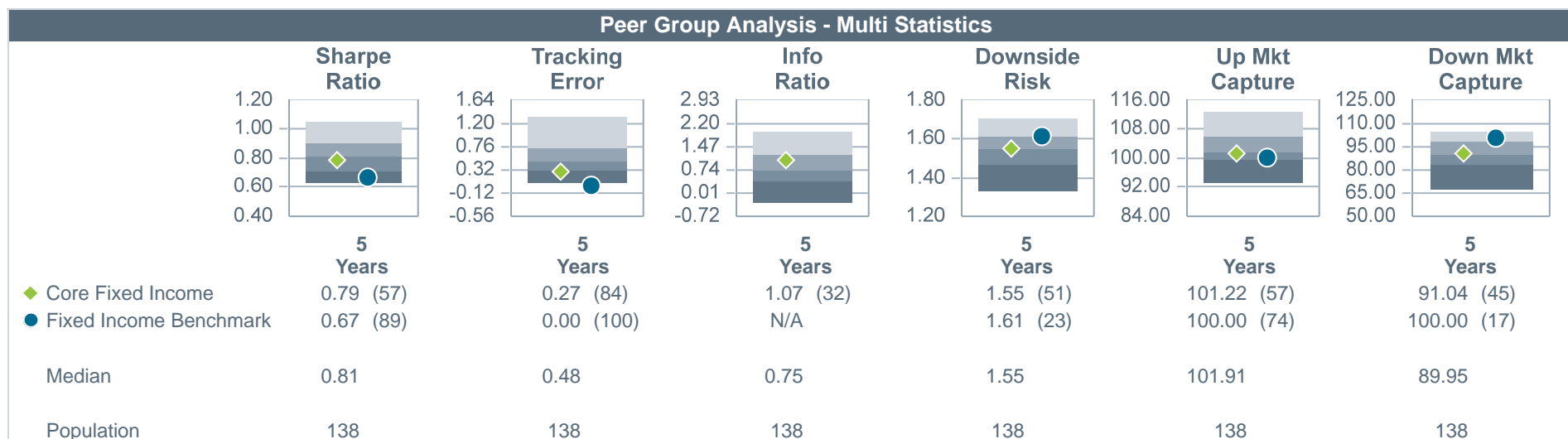
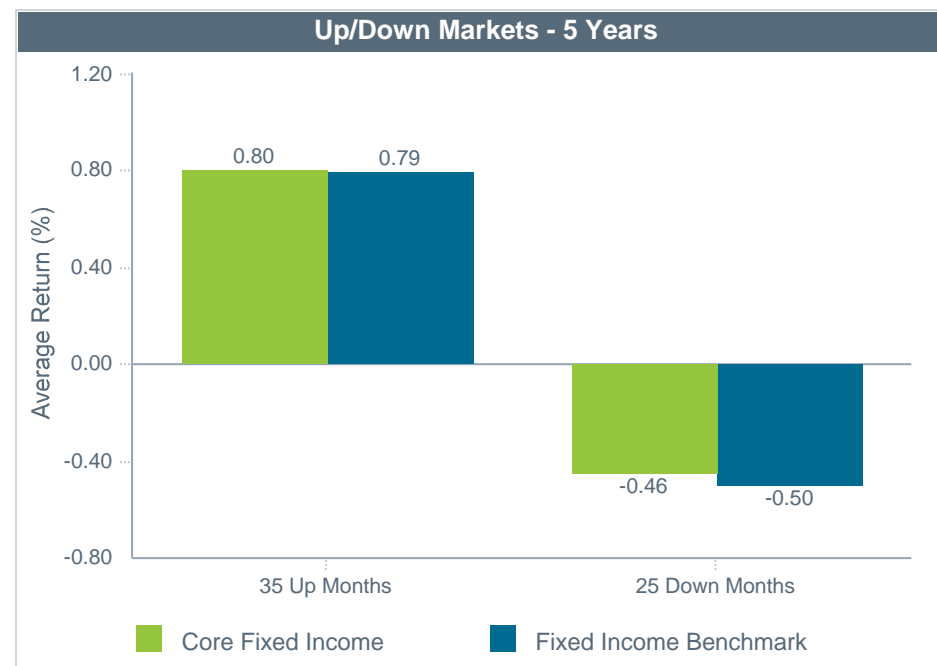
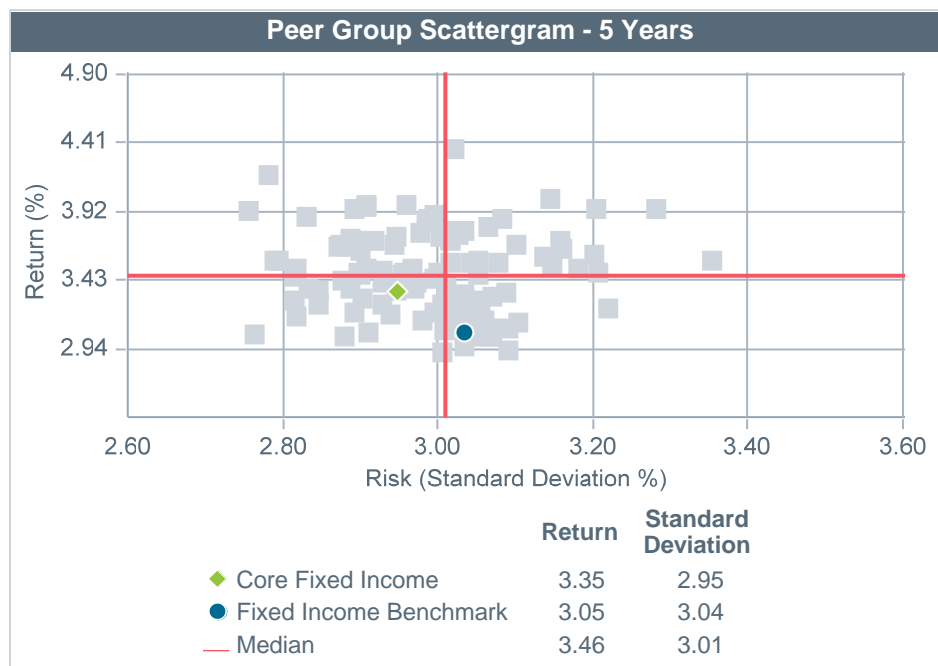


Comparative Performance													
	1 Quarter	CYTD	1 Year	3 Years	5 Years	10 Years	2018	2017	2016	2015	2014	Since Incep.	Inception Date
<b>Core Fixed Income</b>	<b>0.25</b>	<b>9.08</b>	<b>9.08</b>	<b>4.25</b>	<b>3.26</b>	<b>3.89</b>	<b>0.02</b>	<b>3.83</b>	<b>2.89</b>	<b>0.72</b>	<b>5.69</b>	<b>7.47</b>	<b>01/01/1989</b>
Fixed Income Benchmark	0.18	8.72	8.72	4.03	3.05	3.75	0.01	3.54	2.65	0.55	5.97	6.95	
Difference	0.07	0.36	0.36	0.22	0.21	0.14	0.01	0.29	0.24	0.17	-0.28	0.52	

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# Core Fixed Income vs. IM U.S. Broad Market Core Fixed Income

As of December 31, 2019



Performance shown is gross of fees. Calculations based on monthly periodicity. Parenthesis contain percentile ranks. Please see Board Presentation/Executive Summary Report Addendum for custom benchmark definitions.

# Non-Core Fixed Income Performance & Allocation

As of December 31, 2019

Asset Allocation by Manager													
Manager	Strategy			Market Value (\$)		% of Composite		Allocated/Committed		Drawn/Invested			
Public Securities													
Alliance Bernstein Emerging Mkt Debt (SA)	EMD			398,154,077		6.78%							
BlueBay Emerging Mkt Debt (SA)	EMD			395,275,794		6.73%							
Columbia Management Investment Advisers, LLC	High Yield			356,713,170		6.08%							
Ellington RMBS/CMBS (SA)	Structured Credit			483,399,932		8.24%							
GSO Capital Advisors	Bank Loans and CLO			481,918,094		8.21%							
Neuberger Berman Investment Advisers, LLC	High Yield			336,848,700		5.74%							
Octagon Credit Advisors	Bank Loans and CLO			456,574,109		7.78%							
GoldenTree Guadalupe Fund, LP	Opportunistic			220,215,504		3.75%							
Bain Capital Credit Managed Account (Blanco), LP	Opportunistic			106,375,138		1.81%							
Beach Point Total Return Fund II, LP	Opportunistic			230,269,625		3.92%							
Waterfall Eden Fund, LP	Structured Credit			238,547,445		4.06%							
Voya RMBS/CMBS (SA)	Structured Credit			485,429,859		8.27%							
Public Securities Total				4,189,721,447									
Private Investments													
Adams Street Private Credit Fund-A, LP	Direct Lending			130,464,654		2.22%		200,000,000		113,565,051			
AG Direct Lending Fund III (Unlevered), LP	Direct Lending			192,822,075		3.29%		250,000,000		151,250,000			
BlackRock Global Credit Opportunities, LP	Opportunistic			138,147,467		2.35%		300,000,000		109,048,900			
Golub Capital PEARLS Direct Lending Program, LP	Direct Lending			37,453,315		0.64%		300,000,000		107,044,300			
H.I.G. Whitehorse Trinity, LP	Direct Lending			187,587,952		3.20%		300,000,000		172,730,876			
Marathon CLO Equity Fund, LP	Opportunistic			29,884,155		0.51%		50,000,000		35,941,061			
Marathon European Credit Opportunity Fund III, LP	Opportunistic			87,318,350		1.49%		100,000,000		63,700,000			
Marathon Structure Product Strategies Fund, LP	Opportunistic			117,451,254		2.00%		150,000,000		148,500,000			
PIMCO Corporate Opportunities Fund II Onshore Feeder, LP	Opportunistic			186,108,362		3.17%		200,000,000		155,000,000			
TCW Brazos Fund, LLC	Direct Lending			263,245,571		4.48%		300,000,000		245,520,000			
Varde Private Debt Opportunities Fund (Onshore), LP	Opportunistic			109,289,631		1.86%		200,000,000		103,045,455			
White Oak Summit Fund, LP	Direct Lending			200,186,443		3.41%		200,000,000		234,585,448			
Private Investments Total				1,679,959,229				2,550,000,000		1,639,931,090			
Comparative Performance													
	1 Quarter	CYTD	1 Year	3 Years	5 Years	10 Years	2018	2017	2016	2015	2014	Since Incep.	Inception Date
Non-Core Fixed Income	1.31	7.85	7.85	5.88	4.70	N/A	2.37	7.51	5.60	0.37	N/A	4.61	10/01/2014
Non-Core Fixed Income Benchmark	1.23	7.19	7.19	5.12	3.92	N/A	2.73	5.49	6.82	-2.31	N/A	3.88	
Difference	0.08	0.66	0.66	0.76	0.78	N/A	-0.36	2.02	-1.22	2.68	N/A	0.73	

Performance shown is net of fees. Allocations shown may not sum up to 100% exactly due to rounding. Market values shown are as of 12/31/2019. Commitment and drawdown information shown is as of 09/30/2019. Drawn/Invested values represent the funded commitment. Please see Board Presentation/Executive Summary Report Addendum for custom benchmark definitions.

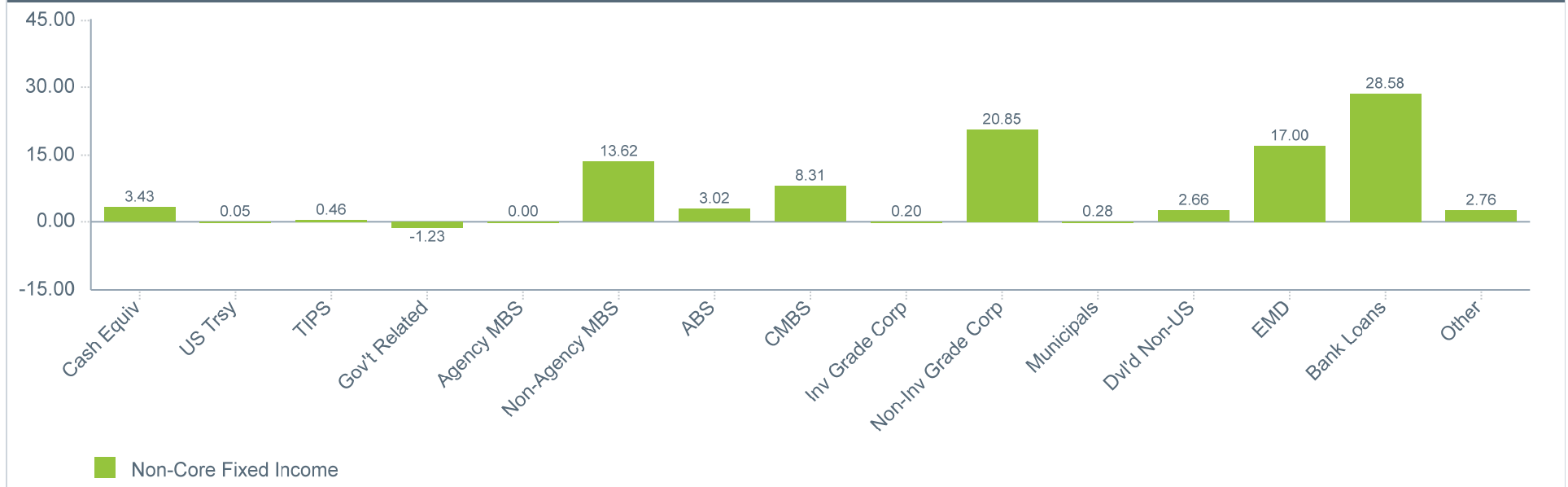
# Non-Core Fixed Income

As of December 31, 2019

## Portfolio Characteristics

	Portfolio
Effective Duration	2.61
Spread Duration	2.58
Avg. Maturity	8.36
Avg. Quality	B1
Yield To Maturity (%)	5.75
Coupon Rate (%)	5.40
Current Yield (%)	5.66

## Sector Distribution (%)



Bond characteristics exclude Private Credit and Waterfall Eden. Allocation to "Other" consists of interest rate derivatives, derivative offsets, equity, private equity, hedges, real estate, and structured.

# Real Return Performance and Allocation

As of December 31, 2019

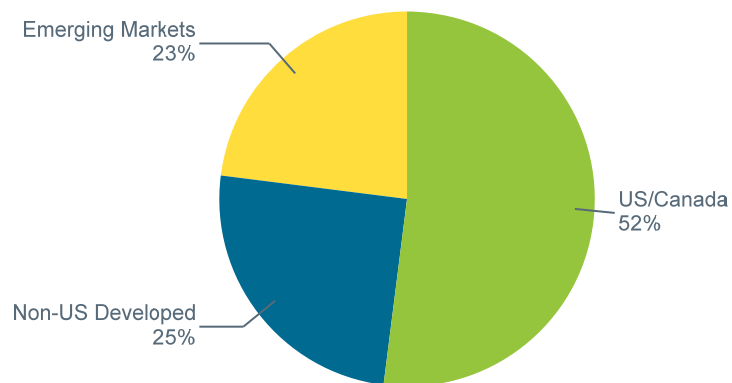
Asset Allocation by Manager													
Manager	Strategy						Market Value (\$)		% of Composite	Allocated/Committed		Drawn/Invested	
Public Securities													
Chickasaw Capital Management	MLPs						232,905,527	6.73%					
Cohen & Steers	Real Asset Multi Strategy						853,532,039	24.66%					
Colchester Global Investors Limited	Active Global Linkers						554,386,002	16.02%					
Nuveen Real Asset Income Fund	Real Asset Income - Public Securities						969,877,652	28.02%					
Public Securities Total							2,610,701,219						
Private Investments													
Actis Energy IV, LP	Infrastructure						55,254,014	1.60%	75,000,000	43,092,864			
Amerra Agriculture Fund III	Agriculture						69,829,895	2.02%	100,000,000	80,458,829			
Appian Natural Resources Fund II	Infrastructure						4,951,802	0.14%	75,000,000	6,239,851			
Blue Sky Strategic Australian Agriculture Fund, LP	Agriculture						47,970,504	1.39%	AUD 66,000,000	AUD 58,410,000			
Brookfield Infrastructure Fund III-B	Infrastructure						113,832,536	3.29%	150,000,000	113,340,856			
*GIP Capital Solutions	Energy						-	0.00%	75,000,000	-			
*GIP Capital Solutions Co-Invest	Energy						-	0.00%	50,000,000	-			
*GIP Spectrum Fund	Energy						-	0.00%	75,000,000	-			
Harrison Street Social Infrastructure Fund, L.P.	Infrastructure						66,336,667	1.92%	200,000,000	66,336,667			
I Squared Global Infrastructure Fund II, LP	Infrastructure						66,454,401	1.92%	150,000,000	60,362,079			
InstarAGF Essential Infrastructure Co-Fund II	Infrastructure						10,000,000	0.29%	50,000,000	10,000,000			
InstarAGF Essential Infrastructure Fund II	Infrastructure						23,876,875	0.69%	100,000,000	25,000,000			
MTP Energy Opportunities Fund II, LP	Energy						92,339,975	2.67%	100,000,000	93,168,043			
MTP Energy Opportunities Fund III, LP	Energy						18,801,543	0.54%	125,000,000	18,801,543			
NGP Natural Resources XII	Energy						57,987,276	1.68%	125,000,000	58,954,663			
Orion Mine Finance Co-Fund II, LP	Mining						9,421,045	0.27%	25,000,000	9,375,000			
Orion Mine Finance Fund II	Mining						85,666,501	2.48%	100,000,000	73,098,081			
Orion Mineral Finance III	Mining						14,033,037	0.41%	100,000,000	14,280,416			
Orion Mineral Royalty Fund	Mining						0	0.00%	50,000,000	1,139,341			
Sprott Resource Lending Fund LP	Agriculture						21,824,775	0.63%	70,000,000	19,955,721			
Sprott Resource Lending II	Agriculture						13,090,043	0.38%	100,000,000	12,697,389			
Stonepeak Infrastructure Fund III LP	Infrastructure						78,708,725	2.27%	150,000,000	70,363,224			
Private Investments Total							850,379,614		2,111,000,000	835,074,567			
Comparative Performance													
	1 Quarter	CYTD	1 Year	3 Years	5 Years	10 Years	2018	2017	2016	2015	2014	Since Incep.	Inception Date
Real Return	1.76	15.54	15.54	6.11	3.80	N/A	-4.30	8.04	6.95	-5.71	4.28	4.04	02/01/2011
Real Return Benchmark	1.46	14.27	14.27	6.36	4.22	4.13	-3.97	9.64	7.25	-4.70	4.08	4.11	
Difference	0.30	1.27	1.27	-0.25	-0.42	N/A	-0.33	-1.60	-0.30	-1.01	0.20	-0.07	

Performance shown is net of fees. Allocations shown may not sum up to 100% exactly due to rounding. Market values shown are as of 12/31/2019. Commitment and drawdown information shown is as of 12/31/2019 and is provided by TMRS staff. Please see Board Presentation/Executive Summary Report Addendum for custom benchmark definitions. \*Represents approved investments that have not been funded and/or are pending legal documents.

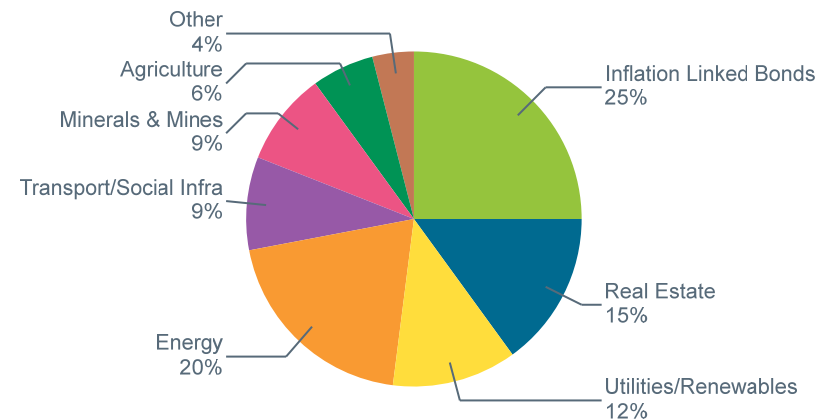
# Real Return Portfolio Diversification

As of December 31, 2019

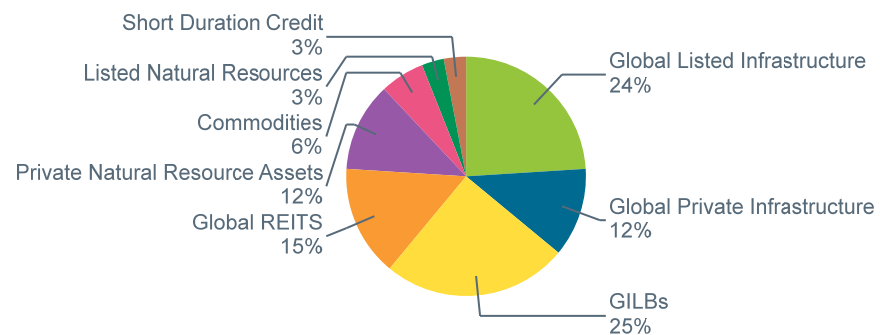
Portfolio Exposure by Geography



Portfolio Exposure by Sector



Portfolio Exposure by Asset Type



Allocations may not sum up to 100% exactly due to rounding. Allocation information is provided by TMRS and is as of 09/30/2019.

# Real Estate Performance and Allocation

As of December 31, 2019

## Asset Allocation by Manager

Manager	Strategy	Market Value (\$)	% of Composite	Allocated/Committed	Drawn/Invested
Abacus Core Income Fund, LP	Core	83,537,267	3.14%	75,000,000	66,015,441
Blackstone Property Partners	Core	375,776,299	14.12%	300,000,000	300,000,000
H/2 CP Core RE Debt Fund, LP	Core	1,831,627	0.07%	75,000,000	75,000,000
H/2 CP, LP	Core	70,932,903	2.67%	125,000,000	50,732,119
Harrison St. Real Estate	Core	282,180,443	10.60%	150,000,000	150,000,000
INVESCO Advisers, Inc.	Core	252,759,325	9.50%	150,000,000	150,000,000
Stockbridge Smart Markets Fund, LP	Core	382,138,775	14.36%	200,000,000	200,000,000
*Transwestern Core	Core	-	0.00%	45,000,000	-
USAA Eagle Real Estate Fund, LP	Core	289,120,750	10.86%	250,000,000	250,000,000
Walton St Real Estate Debt Fund	Core	33,557,838	1.26%	100,000,000	55,521,793
Abacus Multi-Family Partners II, LP	Value Add	9,869	0.00%	50,000,000	47,488,426
Abacus Multi-Family Partners III, LP	Value Add	3,421,536	0.13%	75,000,000	69,797,309
Abacus Multi-Family Partners IV, LP	Value Add	35,680,319	1.34%	75,000,000	33,659,193
Alcion RE Part Fund III-B, LP	Value Add	34,405,550	1.29%	50,000,000	36,784,768
DivcoWest V	Value Add	52,704,055	1.98%	75,000,000	49,633,153
Greenfield Acquisition Partners VI, LP	Value Add	2,830,284	0.11%	75,000,000	71,948,697
Greenfield Acquisition Partners VII, LP	Value Add	67,886,386	2.55%	100,000,000	85,568,845
IC Berkeley Partners IV, LP	Value Add	35,787,283	1.34%	50,000,000	35,092,317
Madison Realty Capital Debt Fund IV, LP	Value Add	69,822,742	2.62%	100,000,000	62,406,369
Miller Global Fund VII	Value Add	3,712,328	0.14%	75,000,000	60,068,315
Rubenstein Properties Fund II	Value Add	59,018,363	2.22%	75,000,000	69,356,796
Rubenstein Properties Fund III	Value Add	61,750,129	2.32%	75,000,000	61,991,150
Stockbridge Value Fund, LLC	Value Add	-	0.00%	75,000,000	58,983,571
Stockbridge Value Fund II, LP	Value Add	25,732,393	0.97%	75,000,000	68,822,152
Stockbridge Value Fund III, LP	Value Add	31,158,958	1.17%	50,000,000	31,880,282
Torchlight Debt Opp Fund V, LP	Value Add	25,330,647	0.95%	75,000,000	60,000,000
Torchlight Debt Opp Fund VI, LP	Value Add	28,565,169	1.07%	75,000,000	27,889,980
Transwestern Core Plus	Value Add	12,430,951	0.47%	50,000,000	13,000,000
*TSP Value and Income Fund II Co-Invest	Value Add	-	0.00%	30,000,000	-
European Property Inv Special	Opportunistic	28,610,169	1.08%	€ 30,000,000	€ 23,223,432
Kildare European Partners II	Opportunistic	33,262,607	1.25%	100,000,000	41,661,337
Lubert-Adler Fund VII	Opportunistic	82,472,045	3.10%	100,000,000	91,281,785
Moorfield Real Estate III	Opportunistic	53,135,111	2.00%	€50,000,000	€50,000,000
*Pennybacker V, LP	Opportunistic	-	0.00%	75,000,000	-
TPG Real Estate Part II, LP	Opportunistic	63,384,791	2.38%	100,000,000	73,361,945
TPG Real Estate Part III, LP	Opportunistic	6,891,667	0.26%	100,000,000	8,965,027
Transwestern Development	Opportunistic	22,795,505	0.86%	50,000,000	22,344,000
Tristan European Property Inv Sp Opp 5	Opportunistic	723,855	0.03%	€ 50,000,000	€ 1,414,740
Walton St Real Estate Fund VII	Opportunistic	22,748,731	0.85%	75,000,000	14,281,519
Transwestern Strategic Relationship	Multi-Strat	25,224,802	0.95%	75,000,000	26,704,244
<b>Total</b>		<b>2,661,331,472</b>		<b>3,580,000,000</b>	<b>2,594,878,706</b>

## Comparative Performance

	1 Quarter	CYTD	1 Year	3 Years	5 Years	10 Years	2018	2017	2016	2015	2014	Since Incep.	Inception Date
<b>Real Estate</b>	<b>1.88</b>	<b>7.26</b>	<b>7.26</b>	<b>9.47</b>	<b>10.73</b>	<b>N/A</b>	<b>10.62</b>	<b>10.56</b>	<b>12.33</b>	<b>12.97</b>	<b>18.36</b>	<b>10.87</b>	<b>01/01/2012</b>
Real Estate Benchmark	1.31	5.59	5.59	7.30	9.33	10.86	8.67	7.65	9.97	15.00	12.40	10.45	
Difference	0.57	1.67	1.67	2.17	1.40	N/A	1.95	2.91	2.36	-2.03	5.96	0.42	

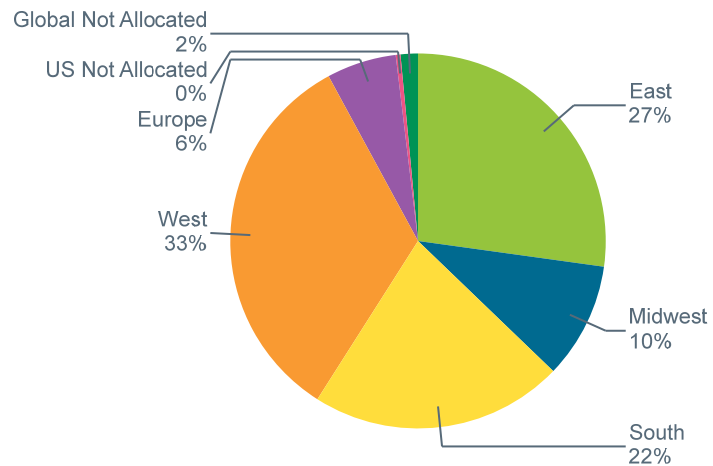
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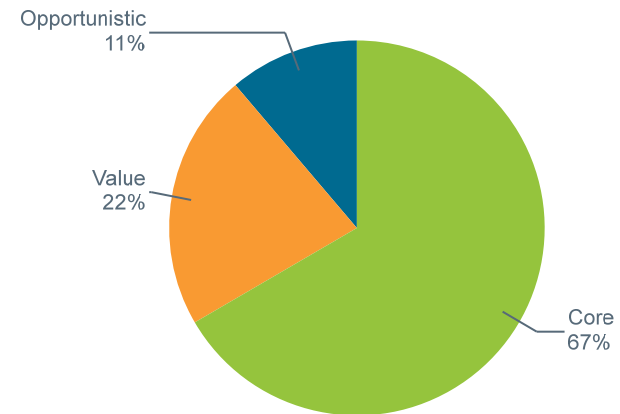
# Real Estate Portfolio Diversification

As of December 31, 2019

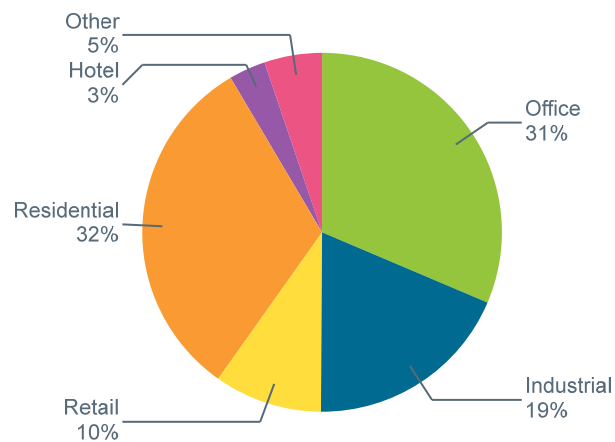
Portfolio Exposure by Geography



Portfolio Exposure by Sector



Portfolio Exposure by Property Type



Allocations may not sum up to 100% exactly due to rounding. Allocation information shown for sector, property type, and geography is provided by TMRS on a 3 month lag and is as of 09/30/2019.

# Absolute Return Performance and Allocation

As of December 31, 2019

## Asset Allocation by Manager

Manager	Strategy	Market Value (\$)	% of Composite	Allocated/Committed	Drawn/Invested
Blackstone Treaty Oak Fund		16,231,180	0.60%	-	-
L/S Equity Manager 1	L/S Equity	125,265,741	4.59%	110,000,000	110,000,000
L/S Equity Manager 2	L/S Equity	126,822,106	4.65%	90,000,000	90,000,000
L/S Equity Manager 3	L/S Equity	129,663,003	4.76%	80,000,000	80,000,000
L/S Equity Manager 4	L/S Equity	123,426,575	4.53%	115,000,000	115,000,000
Credit Manager 1	Credit	160,295,686	5.88%	120,000,000	120,000,000
Credit Manager 2	Credit	11,189,220	0.41%	120,000,000	120,000,000
Credit Manager 3	Credit	159,083,345	5.83%	115,000,000	115,000,000
Credit Manager 4	Credit	11,841,078	0.43%	50,000,000	11,937,750
Credit Manager 5	Credit	49,328,380	1.81%	45,300,000	45,300,000
Credit Manager 6	Credit	18,374,688	0.67%	25,100,000	25,100,000
Credit Manager 7	Credit	124,828,082	4.58%	125,000,000	125,000,000
Relative Value Manager 1	Relative Value	5,116,342	0.19%	100,000,000	100,000,000
Relative Value Manager 2	Relative Value	160,223,190	5.88%	150,000,000	150,000,000
Relative Value Manager 3	Relative Value	96,612,744	3.54%	73,000,000	73,000,000
Relative Value Manager 4	Relative Value	103,802,987	3.81%	90,000,000	90,000,000
Relative Value Manager 5	Relative Value	173,164,567	6.35%	150,000,000	150,000,000
Relative Value Manager 6	Relative Value	126,867,392	4.65%	125,000,000	125,000,000
Event Driven Manager 1	Event Driven	3,824,314	0.14%	60,000,000	60,000,000
Global Macro Manager 1	Global Macro	128,714,022	4.72%	125,000,000	125,000,000
Global Macro Manager 2	Global Macro	164,490,057	6.03%	150,000,000	150,000,000
Global Macro Manager 3	Global Macro	145,724,727	5.34%	100,000,000	100,000,000
Global Macro Manager 4	Global Macro	0	0.00%	-	-
Global Macro Manager 5	Global Macro	24,934,127	0.91%	23,700,000	23,700,000
Global Macro Manager 6	Global Macro	70,267,699	2.58%	75,000,000	75,000,000
Global Macro Manager 7	Global Macro	124,215,947	4.56%	125,000,000	125,000,000
Multi-Strat Manager 1	Multi-Strat	107,089,153	3.93%	100,000,000	100,000,000
Multi-Strat Manager 2	Multi-Strat	103,130,569	3.78%	100,000,000	100,000,000
Multi-Strat Manager 3	Multi-Strat	118,361,762	4.34%	250,000,000	112,869,961
Multi-Strat Manager 4	Multi-Strat	13,601,898	0.50%	100,000,000	13,411,892
<b>Total</b>		<b>2,726,490,580</b>		<b>2,892,100,000</b>	<b>2,630,319,603</b>

## Comparative Performance

	1 Quarter	CYTD	1 Year	3 Years	5 Years	10 Years	2018	2017	2016	2015	2014	Since Incep.	Inception Date
<b>Absolute Return</b>	<b>0.12</b>	<b>5.14</b>	<b>5.14</b>	<b>6.04</b>	<b>4.31</b>	<b>N/A</b>	<b>1.51</b>	<b>11.72</b>	<b>0.22</b>	<b>3.34</b>	<b>N/A</b>	<b>4.11</b>	<b>08/01/2014</b>
Absolute Return Benchmark	0.49	4.82	4.82	3.61	2.04	2.79	-0.93	7.11	-1.34	0.79	4.72	2.09	
Difference	-0.37	0.32	0.32	2.43	2.27	N/A	2.44	4.61	1.56	2.55	N/A	2.02	
<b>Absolute Return Direct Composite</b>	<b>0.14</b>	<b>5.16</b>	<b>5.16</b>	<b>6.14</b>	<b>N/A</b>	<b>N/A</b>	<b>1.07</b>	<b>12.51</b>	<b>0.35</b>	<b>N/A</b>	<b>N/A</b>	<b>4.66</b>	<b>01/01/2016</b>
Absolute Return Benchmark	0.49	4.82	4.82	3.61	2.04	2.79	-0.93	7.11	-1.34	0.79	4.72	2.35	
Difference	-0.35	0.34	0.34	2.53	N/A	N/A	2.00	5.40	1.69	N/A	N/A	2.31	

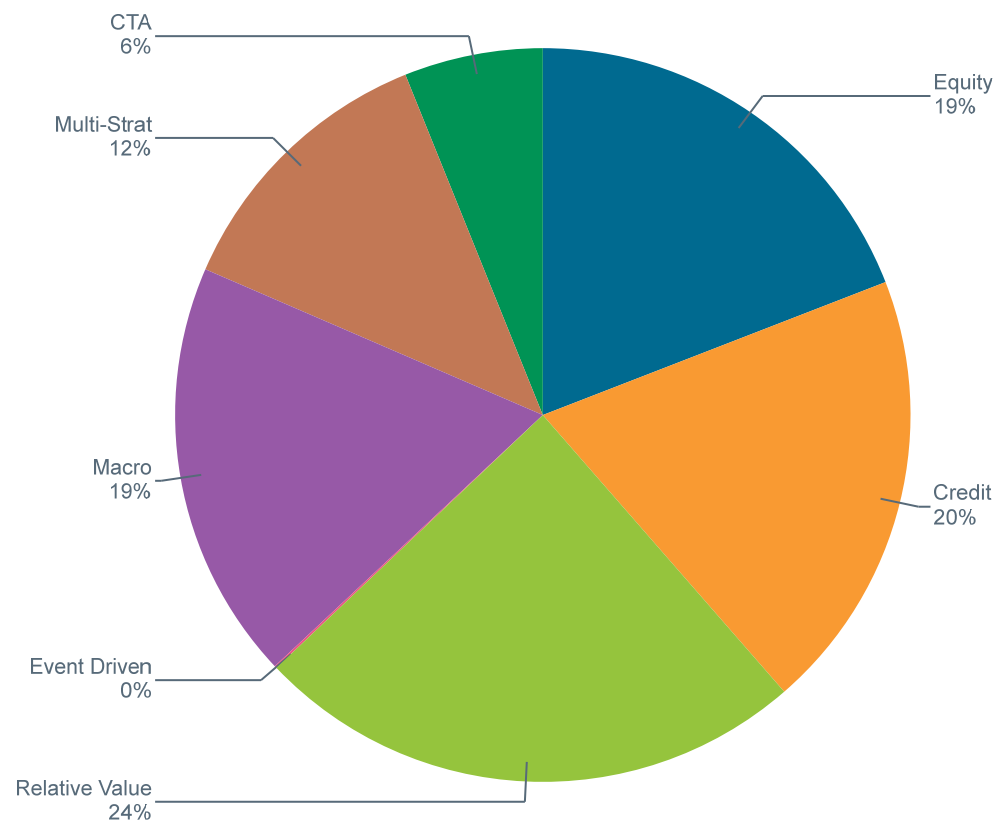
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# Absolute Return Strategy Exposures

As of December 31, 2019

## Direct Portfolio Manager Exposures



Allocations shown may not sum up to 100% exactly due to rounding. Allocation information is provided by TMRS and is as of 12/31/2019. The BlackStone Treaty Oak Fund is in the process of winding down the portfolio.

# Private Equity Performance and Allocation

As of December 31, 2019

## Asset Allocation by Manager

Manager	Strategy	Market Value (\$)	% of Composite	Allocated/Committed	Drawn/Invested
Altaris Constellation Partners IV, LP	Buy-out	4,838,617	0.54%	12,500,000	3,851,071
Altaris Health Partners IV, LP	Buy-out	27,862,367	3.10%	50,000,000	24,329,950
Arcline Capital Partners	Buy-out	9,834,615	1.09%	50,000,000	10,805,120
Capital Partners Private Equity Income Fund III, LP	Buy-out	15,429,360	1.72%	58,000,000	18,013,989
*CapVest Equity Partners IV SCSp	Buy-out	-	0.00%	46,600,000	-
Dunes Point Capital Fund II, LP	Buy-out	9,874,161	1.10%	50,000,000	11,153,312
GTCR Fund XII, LP	Buy-out	14,811,319	1.65%	50,000,000	15,505,000
Harvest Partners VII	Buy-out	18,678,849	2.08%	20,000,000	17,070,537
H.I.G. Capella	Buy-out	33,976,682	3.78%	100,000,000	26,351,648
H.I.G. Strategic Partners Fund	Buy-out	8,419,311	0.94%	200,000,000	8,308,247
Incline Equity Partner IV, LP	Buy-out	22,859,105	2.54%	40,000,000	21,642,658
Kainos Capital Partners II, LP	Buy-out	26,562,279	2.96%	35,000,000	23,831,007
Marlin Equity V, LP	Buy-out	23,201,150	2.58%	57,000,000	19,797,298
Marlin Heritage II, LP	Buy-out	8,136,324	0.91%	14,250,000	8,015,956
*Northlane Capital Partners II LP	Buy-out	-	0.00%	60,000,000	-
*Parthenon Investors VI	Buy-out	-	0.00%	45,000,000	-
One Rock Capital Partners II, LP	Buy-out	35,871,541	3.99%	45,000,000	32,319,382
Providence Equity Partners VIII, LP	Buy-out	9,344,883	1.04%	55,000,000	9,897,709
Reverence Capital Partners II	Buy-out	17,809,776	1.98%	50,000,000	18,371,295
Searchlight Capital II	Buy-out	38,661,195	4.30%	47,000,000	34,370,600
*Searchlight Capital III	Buy-out	-	0.00%	50,000,000	-
Tritium I, LP	Buy-out	56,295,287	6.27%	50,000,000	42,757,535
Tritium II, LP	Buy-out	5,155,445	0.57%	60,000,000	5,155,445
FGN 2018 Partner Fund	Venture/Growth	6,858,318	0.76%	100,000,000	7,125,000
Foundry Group Next Fund, LP	Venture/Growth	30,069,638	3.35%	30,000,000	24,900,000
Foundry Group 2018	Venture/Growth	11,894,765	1.32%	45,000,000	12,150,000
FTV V, LP	Venture/Growth	54,634,704	6.08%	46,000,000	40,020,000
*FTV VI	Venture/Growth	-	0.00%	75,000,000	-
Main Post Growth Capital II, LP	Venture/Growth	5,990,468	0.67%	40,000,000	4,612,240
Mercato Partners Growth, LP	Venture/Growth	36,140,493	4.02%	40,000,000	30,400,000
Providence Strategic Growth II, LP	Venture/Growth	72,550,678	8.08%	60,000,000	42,127,431
Providence Strategic Growth III, LP	Venture/Growth	50,745,160	5.65%	70,000,000	40,750,475
*Providence Strategic Growth IV, LP	Venture/Growth	-	0.00%	50,000,000	-
Updata Partners V, LP	Venture/Growth	72,713,913	8.10%	50,000,000	46,375,000
Updata Partners VI, LP	Venture/Growth	7,125,000	0.79%	75,000,000	7,125,000
Carlyle Energy Mezzanine Fund II	Special Situations	29,415,078	3.27%	65,000,000	33,948,479
GSO Capital Opportunities Fund III, LP	Special Situations	38,039,050	4.23%	75,000,000	35,484,850
GSO COF III Co-investment Fund, LP	Special Situations	7,215,470	0.80%	18,750,000	6,851,171
H.I.G. Bayside Fund IV	Special Situations	19,664,290	2.19%	60,000,000	24,174,534
LightBay Investment Partners, LP	Special Situations	9,757,656	1.09%	40,000,000	11,807,250
TPG Opportunities Partners IV, LP	Special Situations	4,249,121	0.47%	25,000,000	4,045,217
TSSP Adjacent Opportunities Fund III	Special Situations	53,491,179	5.96%	75,000,000	41,917,285
TSSP Adjacent Opportunities (D), LP	Special Situations	40,994	0.00%	50,000,000	-
<b>Total</b>		<b>898,218,240</b>		<b>2,335,100,000</b>	<b>765,361,690</b>

## Comparative Performance

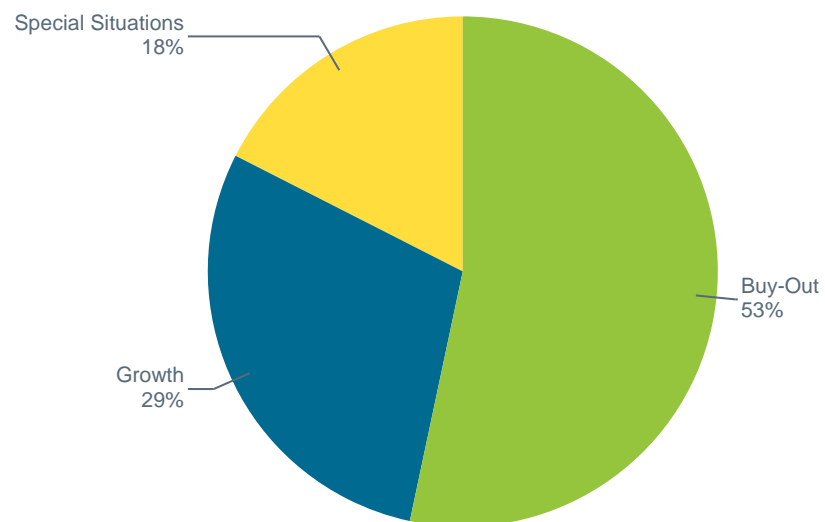
	1 Quarter	CYTD	1 Year	3 Years	5 Years	10 Years	2018	2017	2016	2015	2014	Since Incep.	Inception Date
Private Equity	6.52	12.39	12.39	23.25	N/A	N/A	39.18	19.69	1.68	N/A	N/A	17.46	01/01/2016
Private Equity - Buy Out	16.15	2.14	2.14	11.57	N/A	N/A	26.96	7.09	23.91	N/A	N/A	14.53	01/01/2016
Private Equity - Venture/Growth	4.15	26.51	26.51	39.19	N/A	N/A	58.25	34.71	N/A	N/A	N/A	26.85	07/01/2016
Private Equity - Special Situations	-0.08	1.01	1.01	9.39	N/A	N/A	15.17	12.52	N/A	N/A	N/A	7.84	04/01/2016

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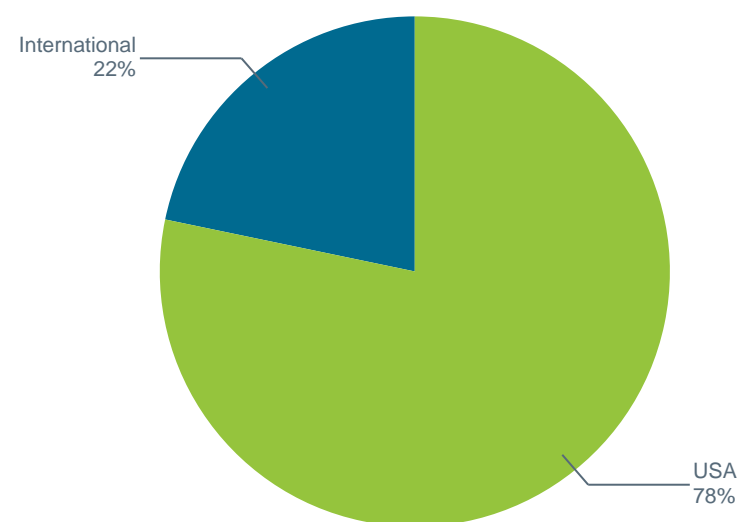
# Private Equity Strategic Allocation

As of December 31, 2019

Private Equity Strategy Diversification by Commitment



Private Equity Geographic Diversification by Commitment



## Policy Strategy Ranges

Control/Buy-out	40% to 75%
Venture/Growth/Minority	10% to 40%
Special Situations/Opportunistic	5% to 35%

## Policy Geography Ranges

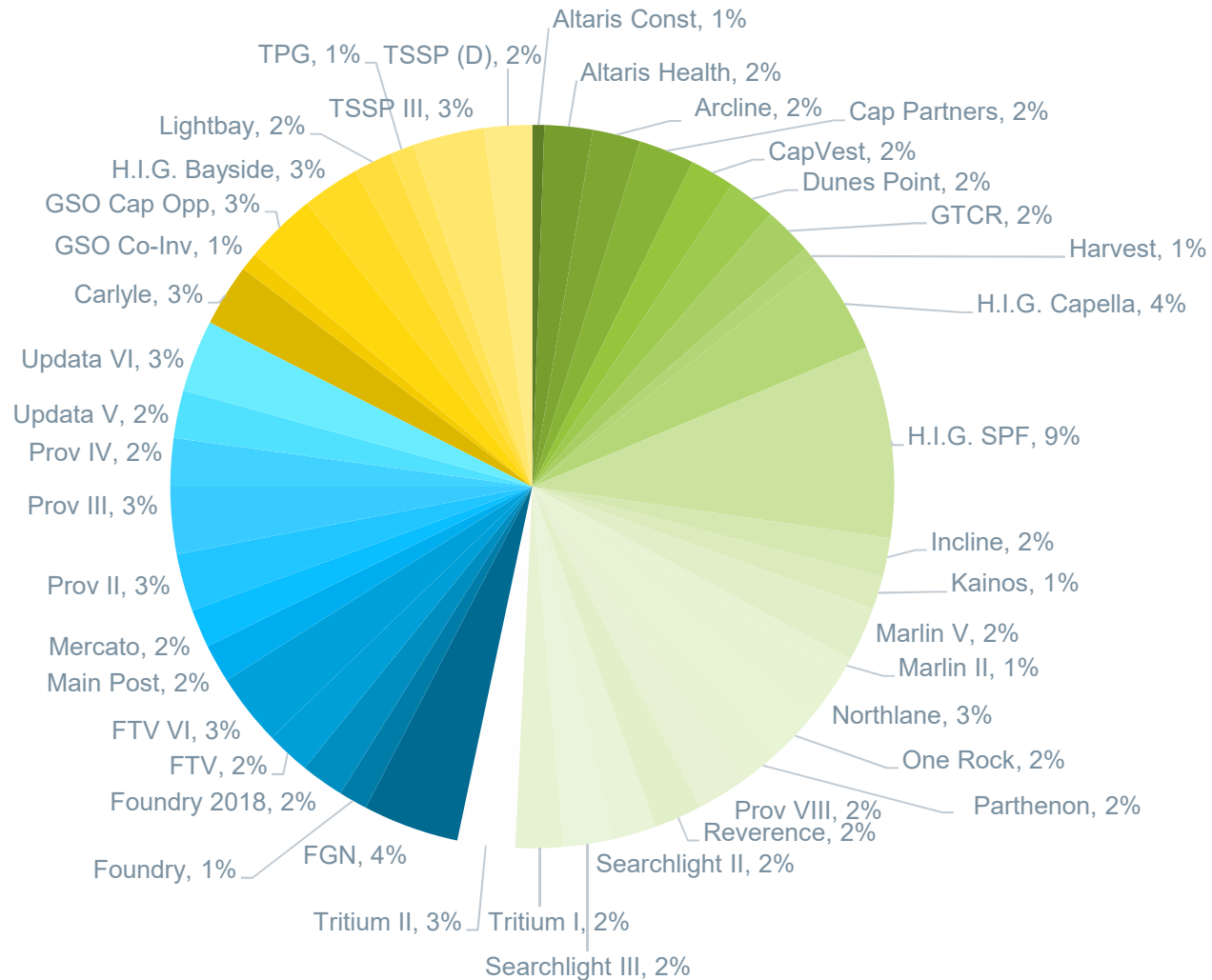
No less than 75% in USA  
No more than 25% in International

Allocations may not sum up to 100% exactly due to rounding. Allocation information is provided by TMRS and is as of 12/31/2019.

# Private Equity Strategic Allocation

As of December 31, 2019

## Private Equity Manager Diversification by Commitment



### Policy Guidelines

No more than 35% with any one investment manager; No more than 25% in any one investment vehicle.

**Additional Information**

- For additional information on investment managers, please see the RVK quarterly performance report, or materials provided by a specialty consultant.

**Composite Benchmark Comments**

The **Actual Allocation Benchmark** is calculated monthly using beginning of month asset class weights applied to each corresponding benchmark return and currently consists of the following:

- Total Equity Benchmark
- Fixed Income Benchmark
- Non-Core Fixed Income Benchmark
- Real Return Benchmark
- Real Estate Benchmark
- Absolute Return Benchmark
- Private Equity Benchmark
- FTSE 30 Day T-Bill Index

**Asset Class Composite Benchmarks:**

The **Total Equity Benchmark** is calculated monthly and consists of 50% Russell 3000 Index and 50% MSCI EAFE Index (USD) (Net) through 07/31/2010; a blend of the Russell 3000 Index, MSCI ACW Ex US IM Index (USD) (Net) and MSCI EAFE Index (USD) (Net) at beginning of month investment weights through 11/30/2012; and a blend of the Russell 3000 Index and MSCI ACW Ex US IM Index (USD) (Net) at beginning of the month weights through 12/31/2018; and MSCI ACW IM Index (USD) (Net) thereafter.

The **Fixed Income Benchmark** is calculated monthly and consists of the Bloomberg US Gov't Crdt Lng Trm Bond Index through 06/30/2009; Bloomberg US Agg Bond Index thereafter.

The **Non-Core Fixed Income Benchmark** is calculated monthly using beginning of the month sub-asset class weights within the Non-Core Fixed Income Composite applied to each sub-asset class primary benchmark return.

The **Real Return Benchmark** is calculated monthly using beginning of the month sub-asset class weights within the Real Return Composite applied to each sub-asset class primary benchmark return.

The **Real Estate Benchmark** is calculated monthly and consists of the NCREIF ODCE Index (AWA) (Gross); interim months assume a 0.00% return. The return is composed of lagged and un-lagged returns in the same proportion as the market value of managers whose returns are being reported on a lagged versus non-lagged basis.

The **Absolute Return Benchmark** is calculated monthly and consists of the HFRI FOF: Dvf'd Index (1 Mo Lag).

The **Private Equity Benchmark** is set equal to the Composite return.

**Real Estate Performance Comments**

"Privately held real estate fund returns are one-quarter lagged and are provided by Private Edge. Quarterly returns are incorporated in the last month of that particular quarter. The returns for the first two months are zero.

Market values are previous quarter-end values as reported, rolled forward with current cash flows. Returns and market values provided by Private Edge are rolled into their respective Real Estate composite and the Total Plan composite.

Publicly traded real estate fund performance is non-lagged, reflecting monthly fluctuations. Detailed information regarding methodology can be found in the internal TMRS Performance Reporting Policy statement" (State Street Performance Team).

H/2 CP, LP is a publicly traded real estate fund, previously classified as non-public. Performance from 10/2015 - 12/2015 is revised to reflect the change in calculation methodology.

## Glossary

**Active Return** - The difference between the investment manager/composite performance relative to the performance of an appropriate market benchmark.

**Active Share** - Measures the degree to which the holdings of a fund differ from the holdings of the benchmark. Active share is calculated by taking the sum of the absolute value of the differences of the weight of each holding in the fund versus the weight of each holding in the benchmark and dividing by two.

**Alpha** - A measure of the difference between a portfolio's actual returns and its expected performance, given its level of risk as measured by beta. It is a measure of the portfolio's historical performance not explained by movements of the market or a portfolio's non-systematic return.

**Alpha Ratio** - A measure of a portfolio's non-systematic return per unit of downside risk. It is measured by dividing the alpha of a portfolio by the downside risk. The non-systematic return is a measure of a portfolio's historical performance not explained by movements of the market.

**Average Quality** - Bond quality ratings are reported using the investment managers' and the index providers' preferred rating agency. *Average Quality for managers unable to provide this statistic is instead provided by Morningstar; if unavailable on Morningstar, it has been estimated using a credit quality distribution provided by the manager.* There are two primary rating agencies in the US. *Moody's* assigns ratings on a system that employs up to four symbols (consisting of letters and numbers) such as, Aaa, Aa2, etc., with Aaa being the highest or safest rating. *Standard & Poor's (S&P)* employs a system that uses + and - along with letters such as AAA, AA+, etc. The two rating agencies' systems are summarized below:

<u>S&amp;P</u>	<u>Moody's</u>	<u>Explanation</u>	<u>S&amp;P</u>	<u>Moody's</u>	<u>Explanation</u>
<b>Higher Credit Quality – Investment Grade</b>			<b>Lower Credit Quality – Below Investment Grade</b>		
AAA	Aaa	Prime/Highest credit quality	BB+	Ba1	Speculative/Low credit quality
AA+	Aa1	High credit quality	BB	Ba2	
AA	Aa2		BB-	Ba3	
AA-	Aa3		B+	B1	Highly speculative
A+	A1	Upper-medium credit quality	B	B2	
A	A2		B-	B3	
A-	A3		CCC+	Caa1	Substantial credit/default risk
BBB+	Baa1	Lower-medium credit quality	CCC	Caa2	Extremely speculative
BBB	Baa2		CCC-	Caa3	
BBB-	Baa3		CC	Ca	Vulnerable to default
			C	Ca	
			D	C	In default

**Benchmark Effect** - The difference between the blended return of each respective managers' benchmark within a composite and the composite's benchmark return.

**Beta** - A measure of the sensitivity of a portfolio to the movements in the market. It is a measure of a portfolio's non-diversifiable or systematic risk.

**Box Plots** - A graphical representation of the distribution of observations. From top to bottom, the four boxes represent the spread between the maximum value and the minimum value in each quartile. A quartile represents the values that divide the observations into four quarters (i.e., 1<sup>st</sup> quartile, 2<sup>nd</sup> quartile, 3<sup>rd</sup> quartile, and 4<sup>th</sup> quartile). The median observation is where the 2<sup>nd</sup> quartile and 3<sup>rd</sup> quartile meet.

**Buy and Hold Attribution** - At the beginning of the time period under analysis, the manager and benchmark portfolios are broken down into segments (i.e., styles, sectors, countries, and regions) based on the desired type of attribution. The formula assumes zero turn-over to the manager and benchmark portfolios throughout the period and calculates the segment returns ("buy and hold returns") to arrive at performance attribution. Due to portfolio turnover, buy and hold attribution may not accurately represent quarterly performance relative to the benchmark. Country, region, sector, and style allocations are as of the date one quarter prior to the reporting date, and the returns shown are for those segments throughout the quarter reported. Due to disclosure guidelines set by each investment manager, equity characteristics shown are as of the most recent date available. The following is the methodology for segment classification:

**Sector** - Attribution is calculated using the Global Industry Classification Standard (GICS) which is a detailed and comprehensive structure for sector and industry analysis. Stocks are classified by their primary sector, as defined by S&P Capital IQ data.

**Country/Region** - Attribution is calculated using the Morgan Stanley Capital International (MSCI) region standards. Stocks are classified by their domicile country/region, as defined by S&P Capital IQ data.

**Style** - Stocks are classified into the following style boxes: large/mid/small vs. growth/neutral/value. Stocks are classified along large/mid/small categories at the time of the Russell index rebalancing, using the index market cap boundaries as cutoff points. Stocks are classified along growth/neutral/value categories at the time of the Russell index rebalancing, using the price/book ratio as supplied by S&P Capital IQ. Stocks in the Russell 3000 Index portfolio are sorted by price/book ratio; names with the highest price/book ratio that make up 1/3 of the total market capitalization are assigned to the growth category, names that make up the subsequent 1/3 of the total market capitalization are assigned to the neutral category, while the balance of the names are assigned to the value category.

Portfolio Characteristics and Buy and Hold Attribution reports utilize product-specific data for all mutual funds and commingled funds.

### Capital Markets Review -

**Breakeven Inflation** - Measures the expected inflation rate at each stated maturity by taking the difference between the real yield of the inflation-linked maturity curve and the yield of the closest nominal Treasury maturity.

**Consumer Confidence** - Measures domestic consumer confidence as defined by the degree of optimism on the state of the economy that consumers express through saving and spending.

**Consumer Price Index (CPI)** - Measures the change in the price level of consumer goods and services.

**Federal Funds Rate** - The interest rate at which a depository institution lends funds maintained at the Federal Reserve to another depository institution overnight. It is one of the most influential interest rates in the US economy, since it affects monetary and financial conditions, which in turn have a bearing on key aspects of the broad economy including employment, growth and inflation.

**Option-Adjusted Spread** - Measures the flat spread of an index or bond to the Treasury yield curve after removing the effect of any embedded options.



## Glossary

- Purchasing Managers Index (PMI)** - Measures economic activity by surveying purchasing managers on a monthly basis as to whether business conditions have improved, worsened, or stayed the same.
- Real Gross Domestic Product (Real GDP)** - An inflation-adjusted measure that reflects the value of all goods and services produced by an economy in a given year.
- US Dollar Total Weighted Index** - Measures the value of the US Dollar relative to a basket of other world currencies. It is calculated as the weighted geometric mean of the dollar's value versus the EUR, GBP, CAD, SEK, CHF, and JPY.
- Unemployment Rate** - The percentage of the total labor force that is unemployed but actively seeking employment.
- VIX** - Measures the implied volatility of S&P 500 Index options by looking at the market's expectation of the S&P 500 Index volatility over the next 30 day period. Commonly referred to as the "fear index" or the "fear gauge."
- Cash Flow Effect** - The composite's active return minus the sum of each managers' active return minus the benchmark effect.
- Consistency** - The percentage of quarters that a product achieved a rate of return higher than that of its benchmark. The higher the consistency figure, the more value a manager has contributed to the product's performance.
- Convexity** - A measure of the shape of the curve that describes the relationship between bond prices and bond yields.
- Correlation** - A statistical measure of the relationship between asset class returns. A value of 1.00 is a perfect correlation; that is, the asset classes always move in the same direction. A value of -1.00 indicates a perfect negative correlation, in which the asset classes always move in opposite directions of each other. A value of 0 indicates there is no relationship between the direction of returns of the two asset classes. Correlation calculations only consider the direction of changes relative to two variables and not the magnitude of those changes.
- Coupon Rate** - The percentage rate of interest paid on a bond or fixed income security; it is typically paid twice per year.
- Current Yield** - The annual income of a security divided by the security's current price.
- Down Market Capture** - Down market by definition is negative benchmark return and down market capture represents the ratio in % terms of the average portfolios return over the benchmark during the down market period. The lower the value of the down market capture the better the product's performance.
- Downside Risk** - A measure similar to standard deviation, but focuses only on the negative movements of the return series. It is calculated by taking the standard deviation of the negative monthly returns. The higher the factor, the riskier the product.
- Earnings Per Share** - It is backward looking, calculated using the one year current EPS divided by the one year EPS five years ago.
- Effective Duration** - The approximate percentage change in a bond's price for a 100 basis point change in yield.
- Excess Return vs. Market** - Average of the monthly arithmetic difference between the manager's return and the benchmark return over a specified time period, shown on an annualized basis.
- Excess Return vs. Risk Free** - Average of the monthly arithmetic difference between the manager's return and the risk-free return (i.e., ICE BofAML 3 Mo US T-Bill Index unless specified otherwise) over a specified time period, shown on an annualized basis.
- Excess Risk** - A measure of the standard deviation of a portfolio's performance relative to the risk free return.
- Expense Ratios** - Morningstar is the source for mutual fund expense ratios.
- Gain/Loss** - The net increase or decrease in the market value of a portfolio excluding its Net Cash Flow for a given period.
- Indices** - All indices and related information are considered intellectual property and are licensed by each index provider. The indices may not be copied, used or distributed without the index provider's prior written approval. Index providers make no warranties and bear no liability with respect to the indices, any related data, their quality, accuracy, suitability and/or completeness.
- Information Ratio** - Measured by dividing the active rate of return by the tracking error. The higher the information ratio, the more value-added contribution by the manager.
- Liability Driven Investing (LDI)** - A method to optimally structure asset investments relative to liabilities. The change in liabilities is estimated by the Ryan Labs Generic PPA Index of appropriate duration for that Plan. This benchmark is based on generic data and is therefore an approximation. RVK is not an actuarial firm, and does not have actuarial expertise.
- Estimated Funded Status** - The estimated ratio of a Plan's assets relative to its future liabilities. This is calculated by dividing the Plan's asset market value by the estimated present value of its liabilities. The higher the estimated funded status, the better the Plan's ability to cover its projected benefit obligations. An estimated funded status of 100% indicates a Plan that is fully funded.
- Estimated PV of Liabilities** - An estimate of a Plan's future liabilities in present value terms. The beginning of the period liability is provided by the Plan's actuary. The period-end present value liability estimate provided in this report is derived by applying the estimated percentage change generated using the Ryan Labs Generic PPA Index with duration similar to that reported on the most recent actuarial valuation report.
- Duration of Liabilities** - The sensitivity of the value of a Plan's liabilities to changes in interest rates, as calculated by the Plan's actuary.
- Duration of Assets** - The dollar-weighted average duration of all the individual Plan assets.
- Estimated Plan Hedge Ratio** - The estimate of how well a Plan's investment portfolio is hedged against changes in interest rates - a primary driver of funded status movements. This is calculated by dividing the dollar-weighted values of both the Plan asset duration by the liability duration and multiplying by the estimated funded status. An estimated plan hedge ratio of zero indicates that the Plan's liabilities have not been hedged, whereas a value of one indicates fully hedged.
- Modified Duration** - The approximate percentage change in a bond's price for a 100 basis point change in yield, assuming the bonds' expected cash flows do not change.

## Glossary

**Mutual Fund Performance** - Whenever possible, manager performance is extended for any share class that does not have 10 years of history. Using Morningstar's methodology, a single ticker within the same fund family (often the oldest share class) is chosen to append historical performance.

**Net Cash Flow** - The sum, in dollars, of a portfolio's contributions and withdrawals. This includes all management fees and expenses only when performance shown is gross of fees.

### Peer Groups -

**Plan Sponsor Peer Groups** - RVK utilizes the Mellon Analytical Solutions Trust Universe along with the Investment Metrics Plan Sponsor Universe. The combined Mellon Analytical Solutions Trust Universe and Investment Metrics Plan Sponsor Universe is used for comparison of total fund composite results and utilizes actual client performance compiled from consultant and custodian data. The Plan Sponsor Peer Group database includes performance and other quantitative data for over 2,100 plans which include corporate, endowment, foundation, public, and Taft Hartley plans. Plan Sponsor Peer Groups are gross of fees.

**Investment Manager Peer Groups** - RVK utilizes Investment Metrics' Peer Groups for investment manager peer comparison and ranking. The Investment Metrics Peer Group database includes performance and other quantitative data for over 840 investment management firms and 29,000 investments products, across more than 160 standard peer groups. Mutual Fund Peer Groups are net of fees.

**Percentile Rankings** - Percentile rank compares an individual fund's performance with those of other funds within a defined peer group of managers possessing a similar investment style. Percentile rank identifies the percentage of a fund's peer group that has a higher return (or other comparative measurement) than the fund being ranked. Conversely, 100 minus the individual fund's ranking will identify the percentage of funds within the peer group that have a lower return than the fund being ranked.

1 - Highest Statistical Value

100 - Lowest Statistical Value

*Example: American Funds AMCP;R-4 (RAFEX) is ranked in the 4<sup>th</sup> percentile within the IM US Equity Large-Cap Growth Funds (MF) Peer Group for the Sharpe Ratio. Within the IM US Equity Large-Cap Growth Funds peer group, 4% of the other funds performed better than American Funds AMCP;R-4 (RAFEX), while 96% of the funds performed worse.*

**Performance Methodology** - RVK calculates performance for investment managers and composites using different methodologies.

**Investment Managers** - Performance is calculated for interim periods between all large external cash flows for a given month and geometrically linked to calculate period returns. An external cash flow is defined as cash, securities, or assets that enter or exit a portfolio. RVK defines a "large cash flow" as a net aggregate cash flow of  $\geq 10\%$  of the beginning-period portfolio market value or any cash flow that causes RVK calculated performance to deviate from manager/custodian reported performance in excess of 5 basis points for a given month.

**Composites** - The Modified Dietz methodology is utilized to calculate asset class, sub-asset class, and total fund composite performance. The Modified Dietz method calculates a time-weighted total rate of return that considers the timing of external cash flows; however, it does not utilize interim period performance to mitigate the impact of significant cash in- and outflows to the composite.

RVK calculates performance beginning with the first full month following inception. Since inception performance may vary from manager reported performance due to RVK using the first full month of returns as the inception date. Performance for both managers and composites is annualized for periods greater than one year.

**Portfolio Characteristics** - Due to disclosure guidelines set by each investment manager, portfolio characteristics shown are as of the most recent date available.

**Price to Earnings Ratio** - The ratio of a company's share price to its per-share earnings

**Private Equity Quartile Ranks** - Private Equity quartile ranks are generated using vintage year peer group data provided by Thomson Reuters, and are based on each fund's annualized, since inception internal rate of return (IRR). Three Private Equity peer groups are available via Thomson Reuters: Buyout, Venture, and All Private Equity. Ranks are available quarterly, at a one-quarter lag.

**Return** - Compounded rate of return for the period.

**% Return** - The time-weighted rate of return of a portfolio for a given period.

**R-Squared** - The percentage of a portfolio's performance explained by the behavior of the appropriate benchmark. High R-Squared means a higher correlation of the portfolio's performance to the appropriate benchmark.

**Risk Free Benchmark** - ICE BofAML 3 Mo US T-Bill Index unless specified otherwise.

## Glossary

**RVK Liquidity Rating** - A qualitative method for determining the relative amount of liquidity in a portfolio. The characteristics considered when determining relative liquidity include trading volume, gates for redemption, leverage, nature of transactions, and pricing mechanisms. The RVK Liquidity Rating is calculated using beginning of month investment weights applied to each corresponding asset class liquidity rating.

<u>Asset Class</u>	<u>RVK Liquidity Rating</u>	<u>Asset Class</u>	<u>RVK Liquidity Rating</u>
<u>Liquid Investments</u>		<u>Less Liquid Investments</u>	
T-Bills and Treasuries	100	Fixed Income Plus Sector	50
Cash Equivalents	98	Bank Loans	50
TIPS	95	Stable Value (Plan Sponsor Directed)	50
US Large Cap Equity	95	Absolute Return Strategies	35
Diversified Real Return	93		
Stable Value (Participant Directed)	91		
Non-US Large Cap Equity	90	<u>Not Liquid Investments</u>	
Global Tactical Asset Allocation	88	Core Real Estate	25
US Small Cap Equity	85	Core Plus Real Estate	15
REITS	85	Non-Core Real Estate	5
Non-US Small Cap Equity	85	Private Equity Funds of Funds	5
Emerging Markets Equity	85		
Core Fixed Income	85		
Core Plus Fixed Income	80		

**Sector Allocation** - Negative fixed income sector allocation reflects manager's use of derivatives, short selling, or interest rate swaps.

**Sharpe Ratio** - Represents the excess rate of return over the risk-free return (i.e., ICE BofAML 3 Mo US T-Bill Index unless specified otherwise), divided by the standard deviation of the excess return to the risk free asset. The result is the absolute rate of return per unit of risk. The higher the value, the better the product's historical risk-adjusted performance.

**Simple Alpha** - The difference between the manager's return and the benchmark's return.

**Spread Duration** - The approximate percentage change in a bond's price for a 100 basis point change in its spread over a Treasury of the same maturity.

**Standard Deviation** - A statistical measure of the range of a portfolio's performance. The variability of a return around its average return over a specified time period.

**Time Period Abbreviations** - **QTD** - Quarter-to-Date. **CYTD** - Calendar Year-to-Date. **FYTD** - Fiscal Year-to-Date. **YOY** - Year Over Year.

**Thematic Classification** - Represents dedicated manager allocations; as such, thematic allocations are approximations. RVK categorizes the following asset classes as Alpha, Capital Appreciation, Capital Preservation, and Inflation:

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

**Total Fund Attribution** - The Investment Decision Process (IDP) model provides an approach to evaluating investment performance that applies to all asset classes and investment styles. The IDP model is based on a top-down hierarchy framework of investment decisions, with each decision contributing to the overall profit or loss. The IDP approach starts from the strategic asset allocation and follows the flow of the investments down to the manager's skill.

**Strategic Asset Allocation (SAA)** - The percentage return gained or lost from the long-term strategic asset allocation decision, the most significant determinant of long-term performance. SAA is the product of the target asset allocation multiplied by the corresponding benchmark returns.

**Tactical Asset Allocation (TAA)** - The percentage return gained or lost from not having been precisely allocated at the target asset allocation mix, whether by deviations that are tactical in nature or a by-product of moving towards the target mix. TAA is the product of the actual asset allocation multiplied by the broad asset class benchmarks, less the SAA.

**Style Selection (SS)** - The percentage return gained or lost from intentional style biases within each asset class (e.g. value rather than core or overweight to emerging markets relative to benchmark). SS is the product of the actual manager allocation within each asset class multiplied by their specific benchmark, less TAA.

**Manager's Skill (MS)** - The percentage return gained or lost from manager value added relative to their specific benchmark. MS is the product of the actual manager allocation multiplied by their achieved excess return.

**Total Fund Beta** - Total Fund Beta is calculated using the S&P 500 as the benchmark. It represents a measure of the sensitivity of the total fund to movements in the S&P 500 and is a measure of the Total Fund's non-diversifiable or systematic risk.

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

## Glossary

**Treynor Ratio** - Similar to Sharpe ratio, but focuses on beta rather than excess risk (standard deviation). Treynor ratio represents the excess rate of return over the risk-free rate (i.e., ICE BofAML 3 Mo US T-Bill Index unless specified otherwise) divided by the beta. The result is the absolute rate of return per unit of risk. The higher the value, the better historical risk-adjusted performance.

**Unit Value** - The dollar value of a portfolio, assuming an initial nominal investment of \$100, growing at the compounded rate of %Return for a given period.

**Up Market Capture** - Up market by definition is positive benchmark return and up market capture represents the ratio in % terms of the average portfolios return over the benchmark during the up market period. The higher the value of the up market capture the better the product's performance.

**Yield to Maturity** - The rate of return achieved on a bond or other fixed income security assuming the security is bought and held to maturity and that the coupon interest paid over the life of the bond will be reinvested at the same rate of return. The 30-Day SEC Yield is similar to the Yield to Maturity and is reported for mutual funds.

**Yield to Worst** - The bond yield calculated by using the worst possible yield taking into consideration all call, put, and optional sink dates.

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