



QUARTERLY PERFORMANCE REPORT

CITY OF FRESNO RETIREMENT
SYSTEMS

DECEMBER 31, 2021

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FOURTH QUARTER 2021 SUMMARY

- **The US economy expanded at an annual rate of 6.9% in the fourth quarter**
- **The Fed kept rates unchanged, and the target Fed Funds rate remains 0.00% - 0.25%**
- **US stocks outperformed Non-US stocks with Emerging Market stocks lagging Developed Markets**
- **US bonds were relatively flat during the quarter as yields rose modestly**
- **Net performance over the last 25 years is 7.9%, ahead of the assumed rate of 7.00%**
 - Performance is just above the policy index over the last 25 years but trails since inception
- **Manager selection remains a positive contributor to relative performance long-term**



FOURTH QUARTER 2021 SUMMARY

- **In the one-year ended December 31, 2021, the Total Fund returned 14.9%, outperforming the benchmark (net of fees) and ranking near the median of peers**
 - Overweight positioning to Large Cap Equity contributed to relative performance
 - Private Real Estate and Private Credit manager selection contributed to relative performance
 - Public Equity, Midstream Energy, and Private Equity performance has contributed to overall plan returns over the trailing 1-year period

- **Over the most recent quarter, the Total Fund returned 4.3%, outperforming the policy benchmark (net of fees) and ranking in the second quartile of peers**
 - Overweight positioning to Domestic Equity contributed to relative performance
 - Small Cap Equity and Private Equity outperformance contributed to relative performance

- **Total fund volatility remained elevated relative to peers**



ECONOMIC ENVIRONMENT

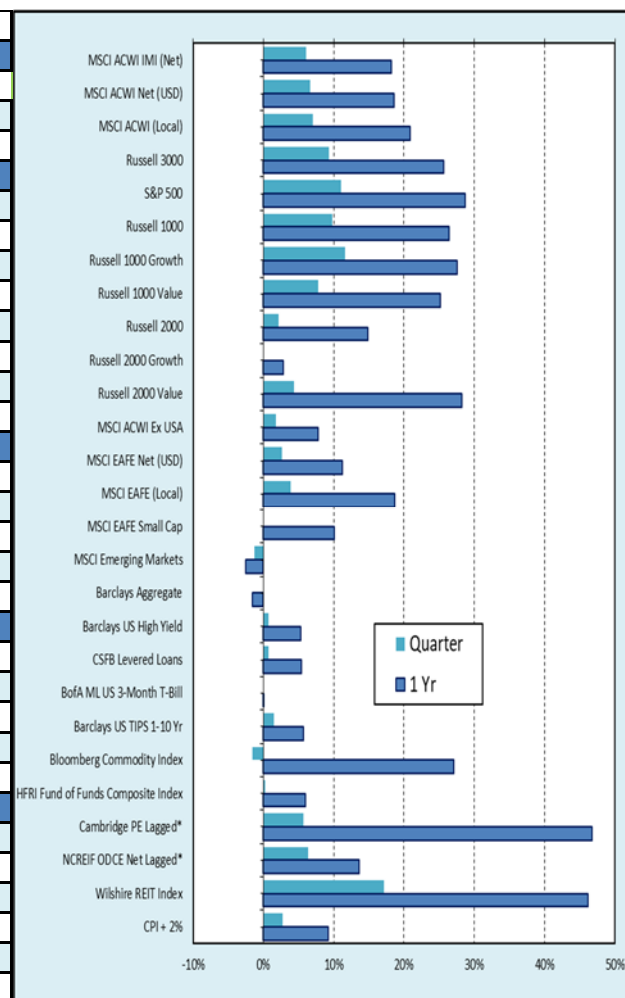
- **Q4 Real GDP (advanced estimate) grew at an annual rate of +6.9%.**
 - Retail sales ended November at +16.8% on a YoY basis. In the same period last year the YoY growth rate was +6.3%.
 - Corporate profits as a percent of GDP ended Q2 2021 at 11.7%, up from 8.9% on a YoY basis and remain elevated relative to historical levels.
 - The inventory-to-sales ratio ended November was 1.3. Levels have remained relatively constant since early 2010 with a spike to 1.7 in April 2020.
 - The U.S. trade deficit widened sharply on record imports; the trade gap jumped 19.4% in November.
- **The unemployment rate was 3.9% in Q4, down from 4.7% in Q3; U-6, a broader measure of unemployment, decreased to 7.3% in Q4 from 8.5% in Q3.**
 - The labor force participation rate ended Q4 at 61.9%, up from Q3 at 61.6% after declining to 60.2% in April 2020 and is at levels below the 10 year pre-pandemic average of 63.0%.
- **The Case-Shiller Home Price Index (ended November) increased to 276.12 from 271.44 (in September) and remains at levels higher than that of pre-financial crisis levels of 150.9.**
- **Rolling 12-month seasonally-adjusted CPI spiked to 7.12% in Q4 from 5.44% in Q3, in the same period last year it was 1.29%; Capacity Utilization increased to 76.5% in Q4 from 75.2% in Q3.**
- **Fed Funds rate remains at a targeted range of 0.00%-to-0.25%. The 10-year Treasury Yield (constant maturity) finished Q4 at 1.5% up from Q3 at 1.4%.**
- **The Fed has begun scaling back asset purchases in November. The Fed's balance sheet continues to grow in the wake of the pandemic.**
- **S&P valuations increased in Q4 to 38.66 from 37.62 in Q3 and remains higher than the 10-year average of 27.97x.**
 - Cyclically adjusted Shiller PE ratio remains above the long-term average of 16.9x.



MARKET ENVIRONMENT

Q4 2021 OVERVIEW

		Qtr.	1 Yr.	3 Yr.	5 Yr.	10 Yr.
World Equity Benchmarks						
MSCI ACWI IMI (Net)	World with Small Cap	6.10%	18.22%	20.20%	14.12%	11.84%
MSCI ACWI Net (USD)	World W/O Small Cap	6.68%	18.54%	20.38%	14.40%	11.85%
MSCI ACWI (Local)	World (Local Currency)	7.03%	20.90%	20.65%	13.90%	12.90%
Domestic Equity Benchmarks						
Russell 3000	Domestic All Cap	9.28%	25.66%	25.79%	17.97%	16.30%
S&P 500	Large Core	11.03%	28.70%	26.07%	18.47%	16.55%
Russell 1000	Large Core	9.78%	26.45%	26.21%	18.43%	16.54%
Russell 1000 Growth	Large Growth	11.64%	27.60%	34.08%	25.32%	19.79%
Russell 1000 Value	Large Value	7.77%	25.16%	17.64%	11.16%	12.97%
Russell 2000	Small Core	2.14%	14.82%	20.02%	12.02%	13.23%
Russell 2000 Growth	Small Growth	0.01%	2.83%	21.16%	14.53%	14.14%
Russell 2000 Value	Small Value	4.36%	28.27%	17.99%	9.07%	12.03%
International Equity Benchmarks						
MSCI ACWI Ex USA	World ex-US	1.82%	7.82%	13.18%	9.61%	7.28%
MSCI EAFE Net (USD)	Int'l Developed	2.69%	11.26%	13.54%	9.55%	8.03%
MSCI EAFE (Local)	Int'l Developed (Local Currency)	3.91%	18.70%	13.35%	8.36%	10.09%
MSCI EAFE Small Cap	Small Cap Int'l	0.07%	10.10%	15.62%	11.04%	10.80%
MSCI Emerging Markets	Emerging Equity	-1.31%	-2.54%	10.94%	9.87%	5.49%
Domestic Fixed Income Benchmarks						
Barclays Aggregate	Core Bonds	0.01%	-1.54%	4.79%	3.57%	2.90%
Barclays US High Yield	High Yield	0.71%	5.28%	8.83%	6.30%	6.83%
CSFB Levered Loans	Bank Loans	0.71%	5.40%	5.43%	4.32%	4.83%
BofA ML US 3-Month T-Bill	Cash	0.01%	0.05%	0.99%	1.14%	0.63%
Barclays US TIPS 1-10 Yr	Inflation	1.54%	5.68%	6.97%	4.46%	2.57%
Alternative Benchmarks						
Bloomberg Commodity Index	Commodities	-1.56%	27.11%	9.86%	3.66%	-2.85%
HFRI Fund of Funds Composite Index	Fund of Hedge Funds	0.29%	6.03%	8.41%	5.68%	4.54%
Cambridge PE Lagged*	Private Equity	5.73%	46.76%	21.33%	19.78%	16.40%
NCREIF ODCE Net Lagged*	Real Estate	6.41%	13.65%	6.13%	6.56%	8.92%
Wilshire REIT Index	REIT	17.14%	46.19%	19.19%	10.92%	11.47%
CPI + 2%	Inflation/Real Assets	2.71%	9.25%	5.60%	4.98%	4.17%



* As of 9/30/2021

EXECUTIVE SUMMARY

	Market Value (\$)	3 Mo (%)	1 Yr (%)	3 Yrs (%)	5 Yrs (%)	7 Yrs (%)	10 Yrs (%)	15 Yrs (%)	25 Yr (%)	Inception (%)	Inception Date
Total Fund	3,914,508,841	4.3 (39)	14.9 (51)	15.5 (24)	11.3 (33)	9.3 (29)	10.1 (20)	7.0 (41)	7.9 (21)	9.2	Oct-85
<i>Policy Index</i>		3.3 (79)	13.9 (61)	14.2 (57)	10.5 (61)	8.6 (47)	9.5 (49)	6.9 (43)	7.7 (28)	9.5	
<i>60 MSCI World (Gross)/40 CITI WGBI</i>		3.6 (75)	8.0 (100)	13.7 (69)	10.3 (62)	7.8 (86)	7.9 (95)	6.1 (88)	6.6 (100)		
<i>InvMetrics Public DB > \$1 Billion Median</i>		4.0	14.9	14.6	10.7	8.5	9.4	6.8	7.5		

5 Years Ending December 31, 2021

	Return	Standard Deviation	Sharpe Ratio	Sortino Ratio
Total Fund	11.3 (33)	10.0 (84)	1.0 (63)	1.5 (62)
<i>Policy Index</i>	10.5 (61)	9.5 (73)	1.0 (73)	1.5 (70)
<i>60 MSCI World (Gross)/40 CITI WGBI</i>	10.3 (62)	9.3 (70)	1.0 (70)	1.6 (52)

7 Years Ending December 31, 2021

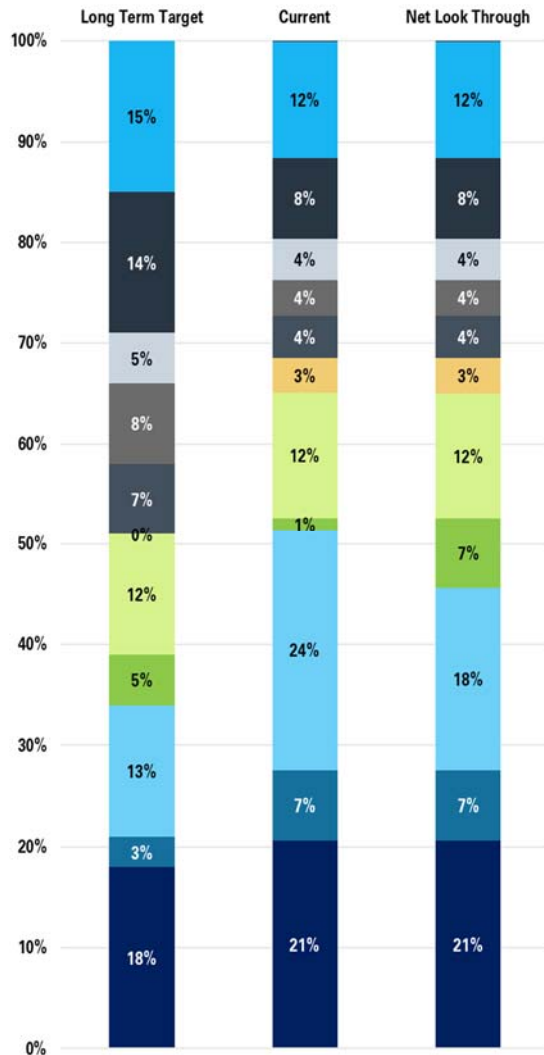
	Return	Standard Deviation	Sharpe Ratio	Sortino Ratio
Total Fund	9.3 (29)	9.5 (88)	0.9 (63)	1.4 (61)
<i>Policy Index</i>	8.6 (47)	9.2 (78)	0.9 (72)	1.3 (67)
<i>60 MSCI World (Gross)/40 CITI WGBI</i>	7.8 (86)	9.0 (72)	0.8 (88)	1.3 (75)

Over the past five years, the Fund returned 11.3% per annum, ranking in the 33rd percentile of the Investment Metrics Public Funds > \$1 Billion net of fee universe. The Fund's return outperformed the actuarial rate of 7.0% and outperformed the policy index by 0.8%. The Fund's volatility was 10.0%, which ranks in the 84th percentile of its peers over this period. The Fund's risk-adjusted performance, as measured by the Sharpe Ratio, ranks in the 63rd percentile of its peers.

Over the past three years, the Fund returned 15.5% per annum, outperforming the policy index by 1.3% and ranking in the 24th percentile of its peer group. Over the past three years, the Fund's Sharpe Ratio of 0.77 ranks in the 67th percentile.

For the year ending December 31, 2021, the Fund returned 14.9%, outperforming the policy index by 1.0% and ranking in the 51st percentile of its peers.

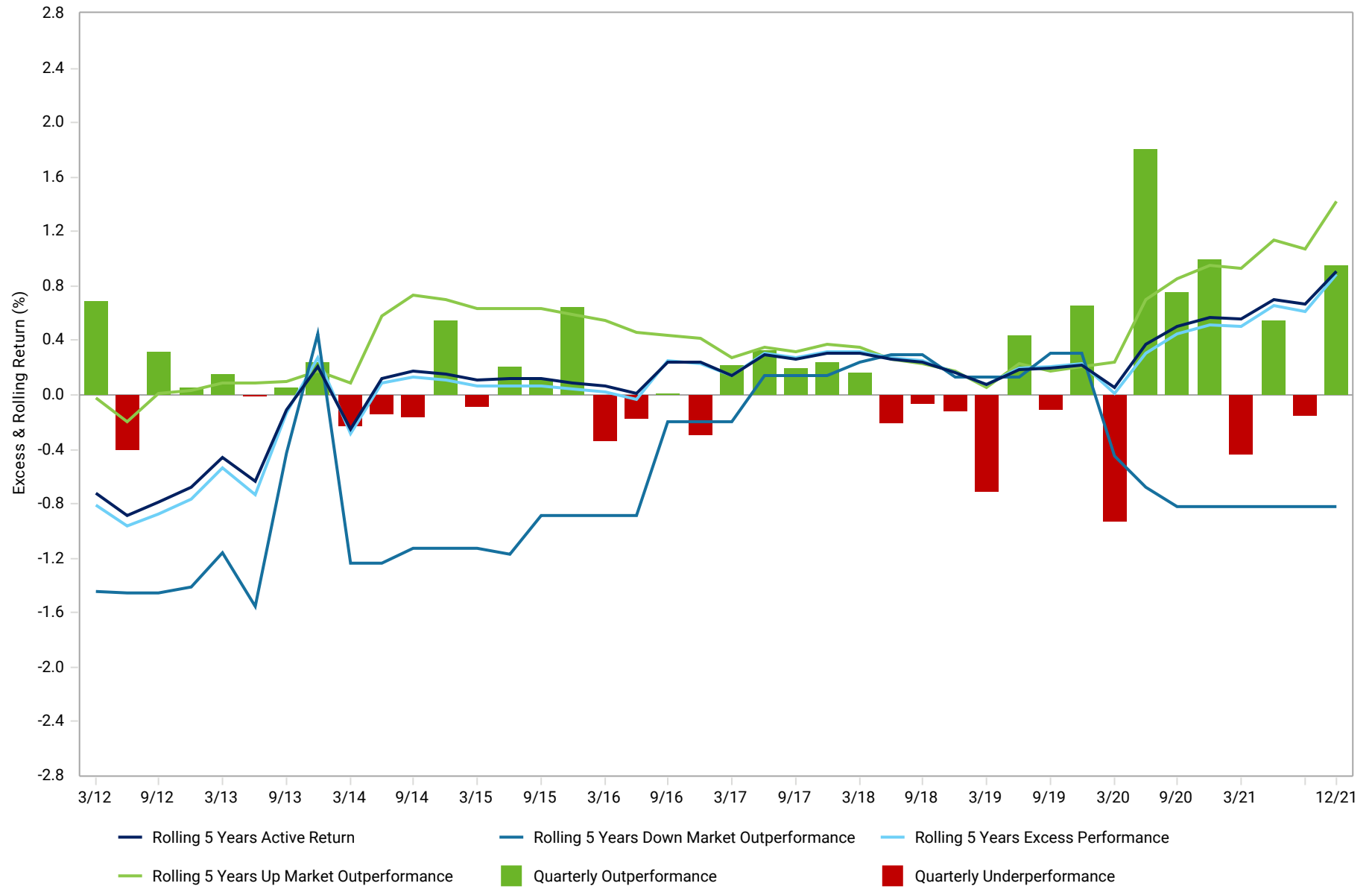
ASSET ALLOCATION VS. POLICY



	Current (\$)	Current (%)	Long Term Target (%)	Net Look Through (%)	Difference (%)	Policy Range (%)	Within Range
Large Cap Equity	808,595,864	20.7	18.0	20.7	2.7	15.0 - 30.0	Yes
Small Cap Equity	270,360,119	6.9	3.0	6.9	3.9	2.0 - 10.0	Yes
Developed International Equity	931,415,612	23.8	13.0	18.0	5.0	10.0 - 25.0	Yes
Emerging Markets Equity	49,762,669	1.3	5.0	7.0	2.0	10.0 - 25.0	Yes
Core Fixed Income	485,650,752	12.4	12.0	12.4	0.4	5.0 - 20.0	Yes
High Yield	136,111,560	3.5	0.0	3.5	3.5	0.0 - 5.0	Yes
Infrastructure	165,868,304	4.2	7.0	4.2	-2.8	2.0 - 10.0	Yes
Private Equity	138,518,756	3.5	8.0	3.5	-4.5	0.0 - 10.0	Yes
Diversifying/Thematic	160,683,422	4.1	5.0	4.1	-0.9	0.0 - 7.0	Yes
Private Credit	312,960,971	8.0	14.0	8.0	-6.0	0.0 - 7.0	Yes
Real Estate - Private	453,202,599	11.6	15.0	11.6	-3.4	7.0 - 23.0	Yes
Cash	1,378,213	0.0	0.0	0.0	0.0	0.0 - 2.0	Yes
Total	3,914,508,841	100.0	100.0	100.0	0.0		Yes



ROLLING 5 YEAR EXCESS RETURNS - NET OF FEES

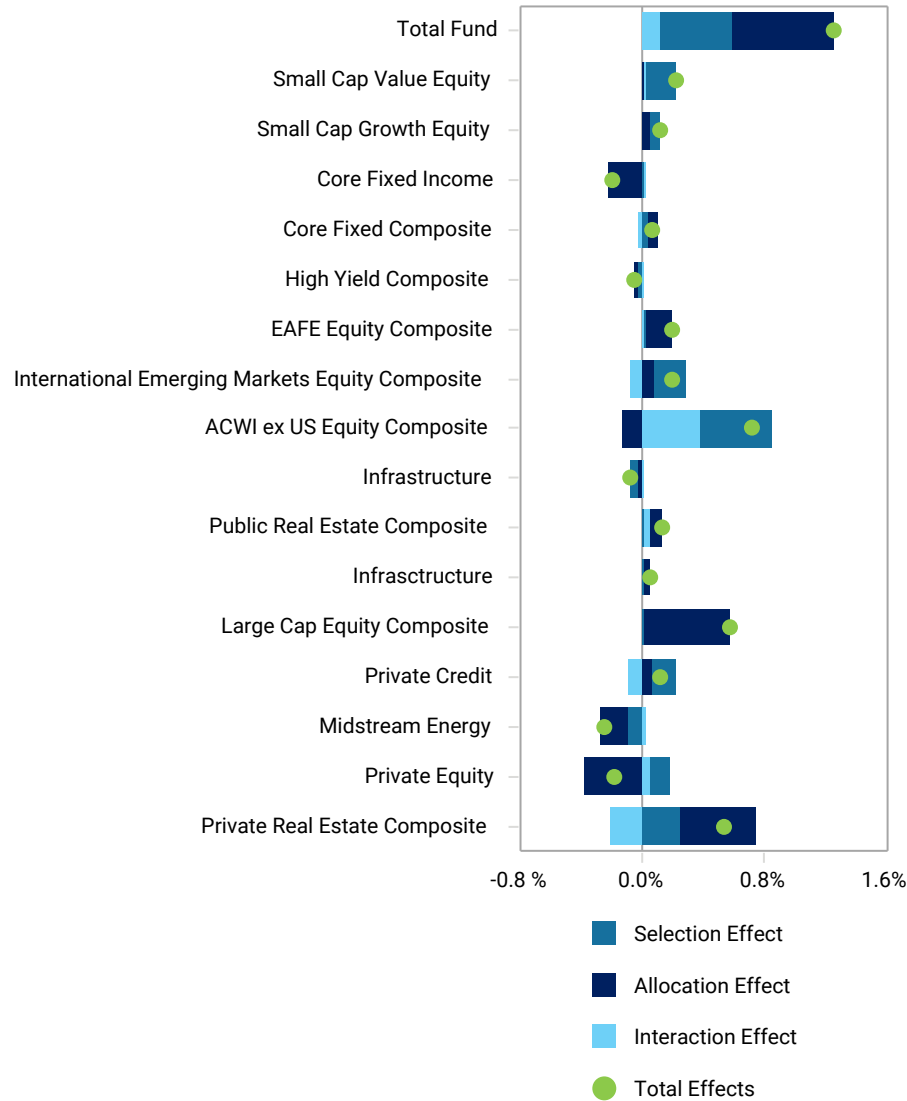


City of Fresno Retirement Systems

ATTRIBUTION ANALYSIS

December 31, 2021

Attribution Effects 3 Years Ending December 31, 2021



Attribution Summary 3 Years Ending December 31, 2021

	Wtd. Actual Return (%)	Wtd. Index Return (%)	Excess Return (%)	Selection Effect (%)	Allocation Effect (%)	Interaction Effects (%)	Total Effects (%)
Small Cap Value Equity	23.2	18.0	5.2	0.2	0.0	0.0	0.2
Small Cap Growth Equity	23.1	21.2	1.9	0.1	0.0	0.0	0.1
Core Fixed Income	2.1	2.0	0.1	0.0	-0.2	0.0	-0.2
Core Fixed Composite	3.3	2.7	0.6	0.0	0.1	0.0	0.1
High Yield Composite	8.5	8.8	-0.4	0.0	0.0	0.0	-0.1
EAFE Equity Composite	7.4	2.9	4.4	0.0	0.2	0.0	0.2
International Emerging Markets Equity Composite	10.6	11.3	-0.7	0.1	0.1	-0.1	0.2
ACWI ex US Equity Composite	17.3	13.7	3.6	0.8	-0.1	0.4	0.7
Infrastructure	5.0	6.3	-1.3	-0.1	0.0	0.0	-0.1
Public Real Estate Composite	6.3	5.6	0.7	0.0	0.1	0.0	0.1
Infrasructure	0.0	1.3	-1.3	0.0	0.1	0.0	0.1
Large Cap Equity Composite	26.2	26.2	0.0	0.0	0.6	0.0	0.6
Private Credit	9.2	11.0	-1.8	0.1	0.1	-0.1	0.1
Midstream Energy	0.3	7.3	-7.0	-0.1	-0.2	0.0	-0.2
Private Equity	19.5	22.1	-2.6	0.2	-0.4	0.1	-0.2
Private Real Estate Composite	10.0	8.5	1.5	0.0	0.5	-0.2	0.5
Total Fund	15.5	14.2	1.3	1.5	0.7	0.1	1.3



TOTAL FUND PERFORMANCE DETAIL - SHORT - TERM - NET OF FEES

	Allocation		Performance (%)								Inception Date
	Market Value (\$)	% of Portfolio	3 Mo (%)	1 Yr (%)	3 Yrs (%)	5 Yrs (%)	7 Yrs (%)	10 Yrs (%)	Inception (%)		
Total Fund	3,914,508,841	100.0	4.3 (54)	14.9 (31)	15.5 (50)	11.3 (44)	9.3 (29)	10.1 (29)	9.2 (49)	Oct-85	
Policy Index			<u>3.3</u> (86)	<u>13.9</u> (47)	<u>14.2</u> (74)	<u>10.5</u> (70)	<u>8.6</u> (57)	<u>9.5</u> (55)	<u>9.5</u> (39)		
Over/Under			1.0	1.0	1.3	0.8	0.7	0.6	-0.3		
60 MSCI World (Gross)/40 CITI WGBI			<u>3.6</u> (78)	<u>8.0</u> (99)	<u>13.7</u> (81)	<u>10.3</u> (72)	<u>7.8</u> (87)	<u>7.9</u> (96)			
Over/Under			0.7	6.9	1.8	1.0	1.5	2.2			
All Public DB Plans Median			4.4	13.9	15.5	11.2	8.8	9.6	9.1		
Total Equity Composite	2,060,134,265	52.6	5.0	14.8	21.0	14.5	11.3	12.4	8.9	Nov-95	
MSCI AC World Index (Net)			<u>6.7</u>	<u>18.5</u>	<u>20.4</u>	<u>14.4</u>	<u>10.9</u>	<u>11.9</u>	<u>7.8</u>		
Over/Under			-1.7	-3.7	0.6	0.1	0.4	0.5	1.1		
Domestic Equity Composite	1,078,955,983	27.6	8.6	24.7	25.2	17.1	14.0	15.8	11.8	Apr-03	
Domestic Equity Index			<u>7.4</u>	<u>22.9</u>	<u>24.3</u>	<u>16.5</u>	<u>13.7</u>	<u>15.6</u>	<u>11.8</u>		
Over/Under			1.2	1.8	0.9	0.6	0.3	0.2	0.0		
All Public Plans-US Equity Segment Median											
Large Cap Equity Composite	808,595,864	20.7	9.8 (33)	26.5 (44)	26.2 (35)	18.5 (36)	14.8 (31)	16.6 (29)	10.2 (60)	Nov-95	
Large Cap Equity Index			<u>9.8</u> (33)	<u>26.5</u> (45)	<u>26.2</u> (35)	<u>18.4</u> (36)	<u>14.9</u> (30)	<u>16.5</u> (29)	<u>10.4</u> (52)		
Over/Under			0.0	0.0	0.0	0.1	-0.1	0.1	-0.2		
eV US Large Cap Equity Median			8.7	25.6	23.3	16.3	12.9	14.9	10.4		
NTAM Russell 1000 Index Fund	808,595,864	20.7	9.8 (53)	26.5 (54)	26.2 (21)	18.5 (22)			18.4 (18)	Oct-16	
Russell 1000 Index			<u>9.8</u> (53)	<u>26.5</u> (54)	<u>26.2</u> (21)	<u>18.4</u> (23)	<u>14.8</u> (15)	<u>16.5</u> (11)	<u>18.3</u> (18)		
Over/Under			0.0	0.0	0.0	0.1		0.1			
eV US Large Cap Core Equity Median			9.9	26.8	23.6	16.8	13.3	15.1	16.7		

Fiscal year end: June 30



TOTAL FUND PERFORMANCE DETAIL - SHORT - TERM - NET OF FEES

	Allocation		Performance (%)								Inception Date
	Market Value (\$)	% of Portfolio	3 Mo (%)	1 Yr (%)	3 Yrs (%)	5 Yrs (%)	7 Yrs (%)	10 Yrs (%)	Inception (%)		
Small Cap Equity Composite	270,360,119	6.9	5.7 (48)	20.4 (60)	23.8 (36)	14.8 (37)	12.9 (34)	14.3 (42)	9.5 (96)	Nov-95	
<i>Russell 2000 Index</i>			<u>2.1</u> (79)	<u>14.8</u> (76)	<u>20.0</u> (62)	<u>12.0</u> (57)	<u>10.8</u> (57)	<u>13.2</u> (59)	<u>9.5</u> (96)		
Over/Under			3.6	5.6	3.8	2.8	2.1	1.1	0.0		
<i>eV US Small Cap Equity Median</i>			5.5	23.2	21.6	12.8	11.3	13.7	11.5		
Eagle Asset Management	128,956,510	3.3	-0.8 (69)	1.3 (87)	23.1 (74)	18.0 (65)	14.1 (64)	15.6 (71)	14.7 (69)	Nov-10	
<i>Russell 2000 Growth Index</i>			<u>0.0</u> (65)	<u>2.8</u> (83)	<u>21.2</u> (86)	<u>14.5</u> (89)	<u>11.7</u> (86)	<u>14.1</u> (89)	<u>13.4</u> (87)		
Over/Under			-0.8	-1.5	1.9	3.5	2.4	1.5	1.3		
<i>eV US Small Cap Growth Equity Median</i>			1.7	10.3	27.7	19.9	15.1	16.5	15.6		
Kennedy Capital Mgmt	141,403,610	3.6	11.3 (2)	41.2 (7)	22.9 (14)	10.9 (32)	11.1 (20)	13.2 (31)	12.5 (17)	May-03	
<i>Russell 2000 Value Index</i>			<u>4.4</u> (85)	<u>28.3</u> (52)	<u>18.0</u> (67)	<u>9.1</u> (62)	<u>9.5</u> (49)	<u>12.0</u> (61)	<u>10.4</u> (79)		
Over/Under			6.9	12.9	4.9	1.8	1.6	1.2	2.1		
<i>eV US Small Cap Value Equity Median</i>			6.6	28.6	19.1	9.9	9.4	12.4	11.2		

TOTAL FUND PERFORMANCE DETAIL - SHORT - TERM - NET OF FEES

	Allocation		Performance (%)							
	Market Value (\$)	% of Portfolio	3 Mo (%)	1 Yr (%)	3 Yrs (%)	5 Yrs (%)	7 Yrs (%)	10 Yrs (%)	Inception (%)	Inception Date
International Equity Composite	981,178,282	25.1	1.2	5.2	16.8	12.0	8.6	9.1		Apr-94
International Equity Index			<u>1.0</u>	<u>5.4</u>	<u>13.2</u>	<u>9.8</u>	<u>6.9</u>	<u>7.7</u>	<u>5.9</u>	
Over/Under			0.2	-0.2	3.6	2.2	1.7	1.4		
All Public Plans-Intl. Equity Segment Median										
ACWI ex US Equity Composite	931,415,610	23.8	1.5 (51)	5.8 (72)	17.3 (51)	12.5 (48)	9.0 (47)	9.4 (60)	7.8 (51)	Oct-08
MSCI AC World ex USA index			<u>1.9 (45)</u>	<u>8.3 (53)</u>	<u>13.7 (73)</u>	<u>10.1 (70)</u>	<u>7.1 (74)</u>	<u>7.8 (79)</u>	<u>6.3 (78)</u>	
Over/Under			-0.4	-2.5	3.6	2.4	1.9	1.6	1.5	
eV ACWI ex-US All Cap Equity Median			1.5	8.6	17.3	12.4	8.9	9.8	7.8	
Baillie Gifford	288,851,821	7.4	-0.6 (81)	-0.1 (92)	19.3 (30)	14.0 (30)	10.4 (28)	10.7 (28)	9.0 (34)	Oct-08
MSCI AC World ex USA index			<u>1.9 (49)</u>	<u>8.3 (60)</u>	<u>13.7 (70)</u>	<u>10.1 (65)</u>	<u>7.1 (67)</u>	<u>7.8 (72)</u>	<u>6.3 (73)</u>	
Over/Under			-2.5	-8.4	5.6	3.9	3.3	2.9	2.7	
eV All ACWI ex-US Equity Median			1.8	10.1	16.6	11.6	8.5	9.4	7.7	
Baillie Gifford Smaller Cos.	82,218,465	2.1	2.0 (27)						2.7 (29)	Jul-21
MSCI EAFE + Canada Small Cap Index			<u>0.4 (53)</u>	<u>11.5 (62)</u>	<u>16.7 (62)</u>	<u>11.5 (64)</u>	<u>9.7 (62)</u>	<u>10.4 (79)</u>	<u>1.2 (43)</u>	
Over/Under			1.6						1.5	
eV ACWI ex-US Small Cap Equity Median			0.6	13.5	19.2	13.9	11.0	12.0	0.5	
BlackRock ACWI ex US	262,446,356	6.7	1.7 (52)	8.3 (60)	13.5 (72)	9.9 (67)	6.9 (72)	7.6 (78)	5.2 (78)	Mar-11
MSCI AC World ex USA index			<u>1.9 (49)</u>	<u>8.3 (60)</u>	<u>13.7 (70)</u>	<u>10.1 (65)</u>	<u>7.1 (67)</u>	<u>7.8 (72)</u>	<u>5.4 (75)</u>	
Over/Under			-0.2	0.0	-0.2	-0.2	-0.2	-0.2	-0.2	
eV All ACWI ex-US Equity Median			1.8	10.1	16.6	11.6	8.5	9.4	7.0	
Principal Global	297,898,969	7.6	3.2 (28)	8.9 (55)	16.3 (51)	10.9 (56)	7.9 (56)	9.4 (51)	6.9 (43)	Sep-08
MSCI AC World ex USA index			<u>1.9 (49)</u>	<u>8.3 (60)</u>	<u>13.7 (70)</u>	<u>10.1 (65)</u>	<u>7.1 (67)</u>	<u>7.8 (72)</u>	<u>5.0 (74)</u>	
Over/Under			1.3	0.6	2.6	0.8	0.8	1.6	1.9	
eV All ACWI ex-US Equity Median			1.8	10.1	16.6	11.6	8.5	9.4	6.4	

TOTAL FUND PERFORMANCE DETAIL - SHORT - TERM - NET OF FEES

	Allocation		Performance (%)							
	Market Value (\$)	% of Portfolio	3 Mo (%)	1 Yr (%)	3 Yrs (%)	5 Yrs (%)	7 Yrs (%)	10 Yrs (%)	Inception (%)	Inception Date
International Emerging Markets Equity Composite	49,762,669	1.3	-1.0	0.8	14.6	11.9	7.9	6.5	8.7	Apr-99
<i>MSCI Emerging Markets Index</i>			<u>-1.2</u>	<u>-2.2</u>	<u>11.3</u>	<u>10.3</u>	<u>6.5</u>	<u>5.9</u>	<u>8.7</u>	
Over/Under			0.2	3.0	3.3	1.6	1.4	0.6	0.0	
<i>All Public Plans-Intl. Equity Segment Median</i>										
Acadian Emerging Market	26,445,263	0.7	0.3 (30)	6.8 (26)	13.7 (39)	11.3 (37)	7.9 (30)		6.3 (27)	Aug-14
<i>MSCI Emerging Markets Index</i>			<u>-1.2</u> (56)	<u>-2.2</u> (64)	<u>11.3</u> (61)	<u>10.3</u> (49)	<u>6.5</u> (49)	<u>5.9</u> (58)	<u>4.7</u> (50)	
Over/Under			1.5	9.0	2.4	1.0	1.4		1.6	
<i>eV Emg Mkts Equity Median</i>			<u>-0.9</u>	0.4	12.5	10.1	6.4	6.1	4.7	
Axiom Intl Investors	23,317,407	0.6	-2.6 (75)	-5.3 (76)	15.2 (30)	12.3 (27)	7.9 (30)		6.5 (26)	Aug-14
<i>MSCI Emerging Markets Index</i>			<u>-1.2</u> (56)	<u>-2.2</u> (64)	<u>11.3</u> (61)	<u>10.3</u> (49)	<u>6.5</u> (49)	<u>5.9</u> (58)	<u>4.7</u> (50)	
Over/Under			-1.4	-3.1	3.9	2.0	1.4		1.8	
<i>eV Emg Mkts Equity Median</i>			<u>-0.9</u>	0.4	12.5	10.1	6.4	6.1	4.7	



TOTAL FUND PERFORMANCE DETAIL - SHORT - TERM - NET OF FEES

	Allocation		Performance (%)							
	Market Value (\$)	% of Portfolio	3 Mo (%)	1 Yr (%)	3 Yrs (%)	5 Yrs (%)	7 Yrs (%)	10 Yrs (%)	Inception (%)	Inception Date
Total Fixed Income Composite	621,762,312	15.9	-0.2 (41)	0.5 (36)	6.6 (37)	5.1 (34)	4.5 (30)	4.7 (30)	5.0 (40)	Apr-03
Fixed Income Index			<u>0.3</u> (21)	<u>0.8</u> (35)	<u>6.3</u> (39)	<u>4.7</u> (40)	<u>4.3</u> (33)	<u>4.2</u> (41)	<u>5.0</u> (40)	
Over/Under			-0.5	-0.3	0.3	0.4	0.2	0.5	0.0	
eV All Global Fixed Inc Median			-0.3	-0.9	5.6	4.2	3.4	3.7	4.6	
Core Fixed Composite	485,650,752	12.4	-0.1	-1.0	5.5	4.3	3.7	3.8	4.4	Apr-03
Blmbg. U.S. Aggregate Index			<u>0.0</u>	<u>-1.5</u>	<u>4.8</u>	<u>3.6</u>	<u>3.0</u>	<u>2.9</u>	<u>4.0</u>	
Over/Under			-0.1	0.5	0.7	0.7	0.7	0.9	0.4	
Dodge & Cox	240,066,795	6.1	-0.3 (85)	-0.6 (16)	6.4 (2)	4.7 (2)	4.2 (2)	4.4 (2)	4.9 (7)	Jan-03
Blmbg. U.S. Aggregate Index			<u>0.0</u> (24)	<u>-1.5</u> (54)	<u>4.8</u> (79)	<u>3.6</u> (77)	<u>3.0</u> (76)	<u>2.9</u> (82)	<u>4.0</u> (68)	
Over/Under			-0.3	0.9	1.6	1.1	1.2	1.5	0.9	
eV US Core Fixed Inc Median			-0.1	-1.5	5.2	3.8	3.2	3.3	4.3	
PGIM	245,583,957	6.3	0.0 (21)	-1.4 (48)	5.1 (63)	3.8 (58)	3.2 (55)	3.1 (71)	4.2 (47)	Apr-03
Blmbg. U.S. Aggregate Index			<u>0.0</u> (24)	<u>-1.5</u> (54)	<u>4.8</u> (79)	<u>3.6</u> (77)	<u>3.0</u> (76)	<u>2.9</u> (82)	<u>4.0</u> (68)	
Over/Under			0.0	0.1	0.3	0.2	0.2	0.2	0.2	
eV US Core Fixed Inc Median			-0.1	-1.5	5.2	3.8	3.2	3.3	4.2	
High Yield Composite	136,111,560	3.5	-0.1	3.6	8.5	6.1	5.8	6.8	7.3	Sep-04
Blmbg. U.S. Corp: High Yield Index			<u>0.7</u>	<u>5.3</u>	<u>8.8</u>	<u>6.3</u>	<u>6.1</u>	<u>6.8</u>	<u>7.3</u>	
Over/Under			-0.8	-1.7	-0.3	-0.2	-0.3	0.0	0.0	
Loomis Sayles	136,111,560	3.5	-0.2 (99)	3.5 (88)	8.4 (44)	6.1 (31)	5.6 (50)	7.0 (19)	7.5 (11)	Sep-04
Blmbg. U.S. Corp: High Yield Index			<u>0.7</u> (39)	<u>5.3</u> (44)	<u>8.8</u> (32)	<u>6.3</u> (27)	<u>6.1</u> (25)	<u>6.8</u> (24)	<u>7.3</u> (15)	
Over/Under			-0.9	-1.8	-0.4	-0.2	-0.5	0.2	0.2	
eV US High Yield Fixed Inc Median			0.6	5.0	8.2	5.8	5.6	6.4	6.7	

TOTAL FUND PERFORMANCE DETAIL - SHORT - TERM - NET OF FEES

	Allocation		Performance (%)							
	Market Value (\$)	% of Portfolio	3 Mo (%)	1 Yr (%)	3 Yrs (%)	5 Yrs (%)	7 Yrs (%)	10 Yrs (%)	Inception (%)	Inception Date
Alternatives	778,031,453	19.9	3.8	25.2	8.2				8.5	Apr-18
<i>Alternatives Index</i>			<u>0.6</u>	<u>18.4</u>	<u>12.6</u>				<u>10.1</u>	
Over/Under			3.2	6.8	-4.4				-1.6	
Private Credit	312,960,971	8.0	1.8	14.9	9.2	9.1			8.5	Sep-15
<i>Private Credit Index</i>			<u>0.6</u>	<u>2.8</u>	<u>8.0</u>	<u>7.0</u>			<u>7.1</u>	
Over/Under			1.2	12.1	1.2	2.1			1.4	
Crescent Capital	45,673,617	1.2	-0.2	7.5	6.9	7.3			6.8	Sep-15
<i>Private Credit Index</i>			<u>0.6</u>	<u>2.8</u>	<u>8.0</u>	<u>7.0</u>			<u>7.1</u>	
Over/Under			-0.8	4.7	-1.1	0.3			-0.3	
Arcmont Euro Private Debt	58,366,230	1.5	0.0						5.8	Apr-21
<i>Private Credit Index</i>			<u>0.6</u>	<u>2.8</u>	<u>8.0</u>	<u>7.0</u>			<u>3.9</u>	
Over/Under			-0.6						1.9	
Monroe Capital	126,370,581	3.2	2.6	15.0	9.6	9.5			10.3	Apr-16
<i>Private Credit Index</i>			<u>0.6</u>	<u>2.8</u>	<u>8.0</u>	<u>7.0</u>			<u>7.1</u>	
Over/Under			2.0	12.2	1.6	2.5			3.2	
PIMCO COF II	20,365,142	0.5	4.0	20.3	8.8	10.6			10.7	Aug-16
<i>Private Credit Index</i>			<u>0.6</u>	<u>2.8</u>	<u>8.0</u>	<u>7.0</u>			<u>7.1</u>	
Over/Under			3.4	17.5	0.8	3.6			3.6	
PIMCO COF III	62,185,400	1.6	4.0	65.6					63.9	May-20
<i>Private Credit Index</i>			<u>0.6</u>	<u>2.8</u>	<u>8.0</u>	<u>7.0</u>			<u>7.9</u>	
Over/Under			3.4	62.8					56.0	

TOTAL FUND PERFORMANCE DETAIL - SHORT - TERM - NET OF FEES

	Allocation		Performance (%)							
	Market Value (\$)	% of Portfolio	3 Mo (%)	1 Yr (%)	3 Yrs (%)	5 Yrs (%)	7 Yrs (%)	10 Yrs (%)	Inception (%)	Inception Date
Infrastructure	165,868,304	4.2	2.2	6.2	5.6				5.1	Oct-18
CPI + 4% (Unadjusted)			<u>2.6</u>	<u>11.3</u>	<u>7.7</u>	<u>7.0</u>	<u>6.6</u>	<u>6.2</u>	<u>7.2</u>	
Over/Under			-0.4	-5.1	-2.1				-2.1	
JP Morgan IIF	103,048,555	2.6	2.5	7.4	6.7				6.2	Oct-18
CPI + 4% (Unadjusted)			<u>2.6</u>	<u>11.3</u>	<u>7.7</u>	<u>7.0</u>	<u>6.6</u>	<u>6.2</u>	<u>7.2</u>	
Over/Under			-0.1	-3.9	-1.0				-1.0	
Ullico UIF	62,819,749	1.6	1.9	4.8	4.3				4.2	Dec-18
CPI + 4% (Unadjusted)			<u>2.6</u>	<u>11.3</u>	<u>7.7</u>	<u>7.0</u>	<u>6.6</u>	<u>6.2</u>	<u>7.5</u>	
Over/Under			-0.7	-6.5	-3.4				-3.3	
Midstream Energy	160,683,422	4.1	1.9	41.2					0.4	Jul-19
Alerian Midstream Energy Index			-0.4	38.4	9.6	2.2	0.1		2.5	
Over/Under			2.3	2.8					-2.1	
Harvest	87,429,423	2.2	2.4	42.6					0.8	Jul-19
Alerian Midstream Energy Index			-0.4	38.4	9.6	2.2	0.1		2.5	
Over/Under			2.8	4.2					-1.7	
Tortoise	73,253,999	1.9	1.4	39.2					0.0	Aug-19
Alerian Midstream Energy Index			-0.4	38.4	9.6	2.2	0.1		3.2	
Over/Under			1.8	0.8					-3.2	
Private Equity	138,518,756	3.5	12.1	51.6					21.6	Apr-19
Pantheon PE Fund of 1	138,518,756	3.5	12.1	51.6					22.3	May-19
Private Equity Index			-0.7	30.9	14.5	16.6	14.3		19.4	
Over/Under			12.8	20.7					2.9	

TOTAL FUND PERFORMANCE DETAIL - SHORT - TERM - NET OF FEES

	Allocation		Performance (%)							
	Market Value (\$)	% of Portfolio	3 Mo (%)	1 Yr (%)	3 Yrs (%)	5 Yrs (%)	7 Yrs (%)	10 Yrs (%)	Inception (%)	Inception Date
Real Estate Composite	453,202,599	11.6	8.6	21.3	10.1	8.2	8.4	10.1	9.2	Jan-96
<i>Real Estate Index</i>										
<i>Over/Under</i>										
<i>All Public Plans-Real Estate Segment Median</i>										
Private Real Estate Composite	154,915,737	4.0	8.7	23.6	10.0	12.4	13.0	12.7	10.1	Jan-96
<i>NCREIF ODCE</i>										
<i>Over/Under</i>										
Oaktree Value Add	10,635,083	0.3	8.2	17.3	10.9	16.6			16.3	Dec-16
<i>NCREIF ODCE + 1%</i>										
<i>Over/Under</i>										
PCCP Value Add	23,850,991	0.6	12.7	31.2	15.3	16.1			18.2	Oct-16
<i>NCREIF ODCE + 1%</i>										
<i>Over/Under</i>										
PIMCO Bravo III	48,704,024	1.2	9.7	21.3	8.8	10.2			9.8	Nov-16
<i>NCREIF ODCE + 1%</i>										
<i>Over/Under</i>										
Alidade Capital V	6,058,841	0.2							0.0	Dec-21
<i>NCREIF ODCE + 1%</i>										
<i>Over/Under</i>										
Artemis AREPF III	11,261,611	0.3	14.1	40.1	10.8				10.8	Jan-19
<i>NCREIF ODCE + 1%</i>										
<i>Over/Under</i>										
Brookfield SREP III	39,889,353	1.0	4.1	19.3					4.5	May-19
<i>NCREIF ODCE + 1%</i>										
<i>Over/Under</i>										
Blue Vista BVREP V	9,211,811	0.2	10.0	35.0					4.3	Mar-20
<i>NCREIF ODCE + 1%</i>										
<i>Over/Under</i>										
Kayne Anderson VI	5,304,023	0.1							0.0	Nov-21
<i>NCREIF ODCE + 1%</i>										
<i>Over/Under</i>										



TOTAL FUND PERFORMANCE DETAIL - SHORT - TERM - NET OF FEES

	Allocation		Performance (%)							
	Market Value (\$)	% of Portfolio	3 Mo (%)	1 Yr (%)	3 Yrs (%)	5 Yrs (%)	7 Yrs (%)	10 Yrs (%)	Inception (%)	Inception Date
Cash & Equivalents Composite	1,378,213	0.0	4.2	4.6	2.4	2.0	1.5	1.1	1.7	Oct-03
<i>90 Day U.S. Treasury Bill</i>			<u>0.0</u>	<u>0.0</u>	<u>1.0</u>	<u>1.1</u>	<u>0.9</u>	<u>0.6</u>	<u>1.2</u>	
Over/Under			4.2	4.6	1.4	0.9	0.6	0.5	0.5	
Payroll Account	886,772	0.0	0.0	0.5	1.0	1.2	1.0	0.7	1.9	Apr-99
<i>90 Day U.S. Treasury Bill</i>			<u>0.0</u>	<u>0.0</u>	<u>1.0</u>	<u>1.1</u>	<u>0.9</u>	<u>0.6</u>	<u>1.7</u>	
Over/Under			0.0	0.5	0.0	0.1	0.1	0.1	0.2	
Operating Funds	491,441	0.0	0.0	0.1	0.9	1.1	0.9	0.7	1.4	Oct-03
<i>90 Day U.S. Treasury Bill</i>			<u>0.0</u>	<u>0.0</u>	<u>1.0</u>	<u>1.1</u>	<u>0.9</u>	<u>0.6</u>	<u>1.2</u>	
Over/Under			0.0	0.1	-0.1	0.0	0.0	0.1	0.2	

Fiscal year end: June 30

Composite rankings are used for Total Equity Composite (InvMetrics Public DB US Eq), Domestic Equity Composite (InvMetrics Public DB Total Eq), International Equity Composite (InvMetrics Public DB ex- US Eq), International Developed Equity Composite (InvMetrics Public DB Dev Mkt ex-US), International Emerging Markets Equity (InvMetrics Public DB Emg Mkt Eq), Total Fixed Income (InvMetrics Public DB Total Fix Inc), Core Fixed Composite (InvMetrics Public DB US Fix Inc), High Yield Composite (InvMetrics Public DB US Fix Inc) and Total Real Estate (InvMetrics Public DB Real Estate Pub+Priv).

Manager rankings are used for Large Cap Equity Composite (eA US Large Cap Equity), Small Cap Equity Composite (eA US Small Cap Equity), ACWi ex US Equity Composite (eA ACWI ex-US Equity), EAFE Equity Composite (eA All EAFE Equity) and Public Real Estate Composite (eA US REIT).



APPENDIX

CALENDAR YEAR INDEX PERFORMANCE

	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	Dec	QTD	2021
S&P 500	2.1%	16.0%	32.4%	13.7%	1.4%	12.0%	21.8%	-4.4%	31.5%	18.4%	4.5%	11.0%	28.7%
Russell 1000	1.5%	16.4%	33.1%	13.2%	0.9%	12.1%	21.7%	-4.8%	31.4%	21.0%	4.1%	9.8%	26.5%
Russell 2000	-4.2%	16.3%	38.8%	4.9%	-4.4%	21.3%	14.6%	-11.0%	25.5%	20.0%	2.2%	2.1%	14.8%
Russell 2500	-2.5%	17.9%	36.8%	7.1%	-2.9%	17.6%	16.8%	-10.0%	27.8%	20.0%	3.3%	3.8%	18.2%
MSCI EAFE	-12.1%	17.3%	22.8%	-4.9%	-0.8%	1.0%	25.0%	-13.8%	22.0%	7.8%	5.1%	2.7%	11.3%
MSCI EM	-18.4%	18.2%	-2.6%	-2.2%	-14.9%	11.2%	37.3%	-14.6%	18.4%	18.3%	1.9%	-1.3%	-2.5%
MSCI ACWI	-7.3%	16.1%	22.8%	4.2%	-2.4%	7.9%	24.0%	-9.4%	26.6%	16.3%	4.0%	6.7%	18.5%
Private Equity	9.5%	12.6%	22.3%	14.6%	10.4%	10.3%	21.0%	13.1%	17.2%	38.2%	-	-	23.2%
BBG TIPS	13.6%	7.0%	-8.6%	3.6%	-1.4%	4.7%	3.0%	-1.3%	8.4%	11.0%	0.3%	2.4%	6.0%
BBG Municipal	10.7%	6.8%	-2.6%	9.1%	3.3%	0.2%	5.4%	1.3%	7.5%	5.2%	0.2%	0.7%	1.5%
BBG Muni High Yield	9.2%	18.1%	-5.5%	13.8%	1.8%	3.0%	9.7%	4.8%	10.7%	4.9%	0.3%	1.2%	7.8%
BBG US Corporate HY	5.0%	15.8%	7.4%	2.5%	-4.5%	17.1%	7.5%	-2.1%	14.3%	7.1%	1.9%	0.7%	5.3%
BBG US Agg Bond	7.8%	4.2%	-2.0%	6.0%	0.5%	2.6%	3.5%	0.0%	8.7%	7.5%	-0.3%	0.0%	-1.5%
BBG Global Agg	5.6%	4.3%	-2.6%	0.6%	-3.2%	2.1%	7.4%	-1.2%	6.8%	9.2%	-0.1%	-0.7%	-4.7%
BBG Long Treasuries	29.9%	3.6%	-12.7%	25.1%	-1.2%	1.3%	8.5%	-1.8%	14.8%	17.7%	-1.4%	3.1%	-4.6%
BBG US Long Credit	17.1%	12.7%	-6.6%	16.4%	-4.6%	10.2%	12.2%	-6.8%	23.4%	13.3%	-0.4%	1.5%	-1.2%
BBG US STRIPS 20+ Yr	58.5%	3.0%	-21.0%	46.4%	-3.7%	1.4%	13.7%	-4.1%	20.9%	24.0%	-2.3%	5.4%	-5.2%
JPM GBI-EM Global Div	-1.8%	16.8%	-9.0%	-5.7%	-14.9%	9.9%	15.2%	-6.2%	13.5%	2.7%	1.6%	-2.5%	-8.7%
JPM EMBI Glob Div	7.3%	17.4%	-5.3%	7.4%	1.2%	10.2%	10.3%	-4.3%	15.0%	5.3%	1.4%	-0.4%	-1.8%
CS Hedge Fund	0.5%	5.9%	10.0%	5.4%	0.2%	-0.6%	7.2%	-1.1%	6.3%	4.1%	-2.2%	-1.0%	10.2%
BBG Commodity	-13.3%	-1.1%	-9.5%	-17.0%	-24.7%	11.8%	1.7%	-11.2%	7.7%	-3.1%	3.5%	-1.6%	27.1%
Alerian Midstream	-	-	-	16.4%	-37.3%	33.8%	-2.4%	-13.3%	24.0%	-23.4%	1.1%	-0.4%	38.4%
FTSE NAREIT Equity REITs	8.3%	18.1%	2.5%	30.1%	3.2%	8.5%	5.2%	-4.6%	26.0%	-8.0%	8.8%	16.3%	43.2%

*Private Equity return represents calendar year pooled IRR and is subject to a one quarter lag
Source: FactSet, Barclays, Thomson One



TRAILING ANNUAL INDEX PERFORMANCE

Equity						
	Dec-21	QTD	2021	3 YR	5 YR	10 YR
MSCI ACWI	4.0%	6.7%	18.5%	20.4%	14.4%	11.9%
S&P 500	4.5%	11.0%	28.7%	26.1%	18.5%	16.6%
Russell 1000	4.1%	9.8%	26.5%	26.2%	18.4%	16.5%
Russell 2000	2.2%	2.1%	14.8%	20.0%	12.0%	13.2%
Russell 2500	3.3%	3.8%	18.2%	21.9%	13.8%	14.1%
MSCI EAFE	5.1%	2.7%	11.3%	13.5%	9.5%	8.0%
MSCI EM	1.9%	-1.3%	-2.5%	10.9%	9.9%	5.5%

Credit						
	Dec-21	QTD	2021	3 YR	5 YR	10 YR
BBG Global Agg	-0.1%	-0.7%	-4.7%	3.6%	3.4%	1.8%
BBG US Agg	-0.3%	0.0%	-1.5%	4.8%	3.6%	2.9%
BBG Credit	-0.1%	0.2%	-1.1%	7.2%	5.1%	4.4%
BBG US HY	1.9%	0.7%	5.3%	8.8%	6.3%	6.8%
BBG Muni	0.2%	0.7%	1.5%	4.7%	4.2%	3.7%
BBG Muni HY	0.3%	1.2%	7.8%	7.8%	7.5%	6.7%
BBG TIPS	0.3%	2.4%	6.0%	8.4%	5.3%	3.1%
BBG 20+ STRIPS	-2.3%	5.4%	-5.2%	12.4%	9.2%	6.1%
BBG Long Treasuries	-1.4%	3.1%	-4.6%	8.8%	6.5%	4.5%
BBG Long Credit	-0.4%	1.5%	-1.2%	11.4%	7.6%	6.4%
BBG Govt/Credit 1-3 Yr	-0.2%	-0.6%	-0.5%	2.3%	1.9%	1.4%
JPM EMBI Glob Div	1.4%	-0.4%	-1.8%	5.9%	4.7%	5.3%
JPM GBI-EM Glob Div	1.6%	-2.5%	-8.7%	2.1%	2.8%	0.7%

Real Assets						
	Dec-21	QTD	2021	3 YR	5 YR	10 YR
BBG Commodity	3.5%	-1.6%	27.1%	9.9%	3.7%	-2.9%
Alerian Midstream Index	1.1%	-0.4%	38.4%	9.6%	2.2%	-
FTSE NAREIT Equity REITs	8.8%	16.3%	43.2%	18.4%	10.8%	11.4%



Source: S&P, MSCI, Russell, Bloomberg, JPM, Alerian, FTSE, FactSet

City of Fresno Retirement Systems

TOTAL FUND PERFORMANCE NOTES

Policy Index consists of 15.8% Russell 1000, 3.6% Russell 2000 Growth, 3.6% Russell 2000 Value, 19% MSCI ACWI ex USA Gross, 6% MSCI Emerging Markets Gross, 10% BBgBarc US Aggregate TR, 5% BBgBarc US High Yield TR, 8% 50% BBgBarc US Agg / 50% BBgBarc US High Yield + 1%, 11% NCREIF ODCE Net, 4% NCREIF ODCE + 1%, 5% Alerian Midstream Energy Index, 5% Private Equity Index, 4% CPI + 4% (Unadjusted).

Domestic Equity Index consists of 15.65% Russell 2000 Value, 15.65% Russell 2000 Growth, 68.7% Russell 1000.

Large Cap Equity Index consists of 100% Russell 1000.

International Equity Index consists of 73.08% MSCI ACWI ex USA Gross and 26.92% MSCI Emerging Markets Gross.

Fixed Income Index consists of 64.71% BBgBarc US Aggregate TR and 35.29% BBgBarc US High Yield TR.

Alternatives Index consists of 36.4% 50% BBgBarc US Agg / 50% BBgBarc US High Yield + 1%, 22.7% Private Equity Index, 22.7% Alerian Midstream Energy Index, 18.4% CPI + 4% (Unadjusted).

Private Credit Index consists of 100% 50% BBgBarc US Agg / 50% BBgBarc US High Yield + 1%.

Private Equity Index consists of ACWI IMI + 150 quarter lag.



GLOSSARY OF INVESTMENT TERMINOLOGY— RISK STATISTICS

- **Alpha**
 - Measures the relationship between the fund performance and the performance of another fund or benchmark index and equals the excess return while the other fund or benchmark index is zero.
- **Alpha Jensen**
 - The average return on a portfolio over and above that predicted by the capital asset pricing model (CAPM), given the portfolio's beta and the average market return. Also known as the abnormal return or the risk adjusted excess return.
- **Annualized Excess Return over Benchmark**
 - Annualized fund return minus the annualized benchmark return for the calculated return.
- **Annualized Return**
 - A statistical technique whereby returns covering periods greater than one year are converted to cover a 12 month time span.
- **Beta**
 - Measures the volatility or systematic risk and is equal to the change in the fund's performance in relation to the change in the assigned index's performance.
- **Information Ratio**
 - A measure of the risk adjusted return of a financial security, asset, or portfolio.
Formula:
(Annualized Return of Portfolio - Annualized Return of Benchmark) / Annualized Standard Deviation (Period Portfolio Return - Period Benchmark Return). To annualize standard deviation, multiply the deviation by the square root of the number of periods per year where monthly returns per year equals 12 and quarterly returns is four periods per year.
- **R-Squared**
 - Represents the percentage of a fund's movements that can be explained by movements in an index. R-Squared values range from 0 to 100. An R-Squared of 100 denotes that all movements of a fund are completely explained by movements in the index.
- **Sharpe Ratio**
 - A measure of the excess return or risk premium per unit of risk in an investment asset or trading strategy.
Formula:
(Annualized Return of Portfolio - Annualized Return of Risk Free) / Annualized Standard Deviation (Portfolio Returns)
- **Sortino Ratio**
 - A method to differentiate between good and bad volatility in the Sharpe Ratio. The differentiation of up and down volatility allows the calculation to provide a risk adjusted measure of a security or fund's performance without upward price change penalties.
Formula:
*Calculation Average (X-Y) / Downside Deviation (X-Y) * 2*
Where X=Return Series X Y = Return Series Y which is the risk free return (91 day T-bills)
- **Standard Deviation**
 - The standard deviation is a statistical term that describes the distribution of results. It is a commonly used measure of volatility of returns of a portfolio, asset class, or security. The higher the standard deviation the more volatile the returns are.
Formula:
(Annualized Return of Portfolio - Annualized Arithmetic Average of the Portfolio Returns) Squared / The number of periods - 1)

GLOSSARY OF INVESTMENT TERMINOLOGY— RISK STATISTICS

▪ Tracking Error

- Tracking error, also known as residual risk, is a measure of the degree to which a portfolio tracks its benchmark. It is also a measure of consistency of excess returns. Tracking error is computed as the annualized standard deviation of the difference between a portfolio's return and that of its benchmark.

Formula:

*Tracking Error = Standard Deviation (X-Y) * $\sqrt{\text{# of periods per year}}$*
Where X = periods portfolio return and Y = the period's BM return
For monthly returns, the periods per year = 12
For quarterly returns, the periods per year = 4

▪ Treynor Ratio

- A risk-adjusted measure of return based on systematic risk. Similar to the Sharpe ratio with the difference being the Treynor ratio uses beta as the measurement of volatility.

Formula:

(Portfolio Average Return - Average Return of Risk-Free Rate)/Portfolio Beta

▪ Up/Down Capture Ratio

- A measure of what percentage of a market's returns is "captured" by a portfolio. For example, if the market declines 10% over some period, and the manager declines only 9%, then his or her capture ratio is 90%. In down markets, it is advantageous for a manager to have as low a capture ratio as possible. For up markets, the higher the capture ratio the better. Looking at capture ratios can provide insight into how a manager achieves excess returns. A value manager might typically have a lower capture ratio in both up and down markets, achieving excess returns by protecting on the downside, whereas a growth manager might fall more than the overall market in down markets, but achieve above-market returns in a rising market.

Upside Capture:

Total Return (Fund Returns) / Total Returns (BM Return) when Period Benchmark Return is $> = 0$

Downside Capture:

Total Return (Fund Returns) / Total Returns (BM Return) when Benchmark Return < 0

Source: InvestorForce



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Past performance is no guarantee of future results.

Returns for pooled funds, e.g. mutual funds and collective investment trusts, are collected from third parties; they are not generally calculated by NEPC. Returns for separate accounts, with some exceptions, are calculated by NEPC. Returns are reported net of manager fees unless otherwise noted.

A “since inception” return, if reported, begins with the first full month after funding, although actual inception dates (e.g. the middle of a month) and the timing of cash flows are taken into account in Composite return calculations.

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Source of private fund performance benchmark data: Cambridge Associates, via Refinitiv

