

# 2017 Q4 INVESTMENT SUMMARY: BOARD REPORT

## MODOT & PATROL EMPLOYEES' RETIREMENT SYSTEM

January, 2018

Kevin Leonard, Partner

Will Forde, CAIA, Consultant

Jake Mallinson, Analyst



BOSTON | ATLANTA | CHARLOTTE | CHICAGO | DETROIT | LAS VEGAS | PORTLAND | SAN FRANCISCO

# TABLE OF CONTENTS

	<u>Tab</u>
<b>NEPC Update</b>	<b>1</b>
<b>Market Thoughts &amp; Education</b>	<b>2</b>
<b>Executive Summary</b>	<b>3</b>
<b>Total Fund Performance</b>	<b>4</b>
<b>Appendix</b>	<b>5</b>

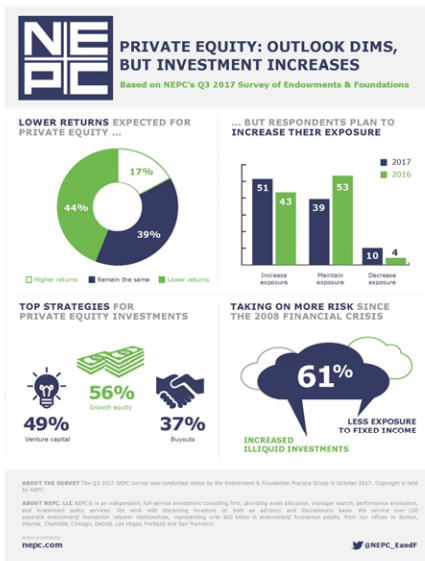


# NEPC UPDATE

NEPC, LLC

---

# HIGHLIGHTS OF FOURTH QUARTER HAPPENINGS AT NEPC



## NEPC INSIGHTS

- White Paper: Terminated-Vested Lump Sum Payouts
- White Paper: Power Up Your Pension Plans
- Taking Stock: Could ESG Analysis Have Helped Equifax Investors?
- Taking Stock: Ten Years Since The Global Financial Crisis, Part 1: Then and Now
- Taking Stock: No Lull After the Storm for Puerto Rico Bonds
- Taking Stock: Tax Reform Update
- Market Chatter: It's Always Sunny on Sand Hill Road
- Market Chatter: The E-Commerce Grinch that Stole the US Storefront?
- Market Chatter: Endowment Tax Reform Leaves Less to be Thankful for
- NEPC's 2017 Hedge Fund Operational Due Diligence Survey Results
- NEPC's 2017 Defined Benefit Trends Survey Infographic
- NEPC's 2017 Defined Benefit Plan Trends Survey – Healthcare Highlights Infographic
- Taking Stock: What Do Revised Mortality Tables Mean for Terminated-Vested Lump Sum Payouts?
- 2017 Third Quarter Market Thoughts
- 2017 Q3 Endowment & Foundation Survey Results and Infographic

## WEBINAR REPLAYS

- NEPC's 2017 Defined Benefit Plan Trends Survey

To download NEPC's recent insights and webinar replays, visit: [www.NEPC.com/insights](http://www.NEPC.com/insights)

## RECENT UPDATES

- Our team continues to grow: Please join us in welcoming our senior consultant and insurance specialist, Andrew Coupe.
- NEPC was featured in over 35 news articles including *Bloomberg*, *Pensions & Investments* and *FundFire*, to name a few.
- NEPC's Chris Levell, ASA, CFA, CAIA, Partner, Client Strategy, was named a finalist in *Chief Investment Officer's* Consultant of the Year list.
- NEPC's Brandon Parrish, CFA, CAIA, Private Wealth Consultant, was featured in *Private Asset Management's* Top Read Stories for 2017 for his article "An Intuitive Approach for High Net Worth Clients."



# HIGHLIGHTS OF FOURTH QUARTER HAPPENINGS AT NEPC



## NEPC GIVES BACK

This quarter NEPC participated in four charity events: The Greater Boston Food Bank, American Cancer Society Denim Day, the Movember Movement and our Annual United Way Campaign.

- NEPC helped sort through 12,988 pounds of donated food from local grocery store donation bins. GBFB is the largest hunger-relief organization in New England and among the largest food banks in the country.
- ACS's Denim Day is one of the largest single-day fundraisers supporting the American Cancer Society's breast cancer programs. NEPC employees showed their support and raised a total of \$2,310!
- NEPC's Movember Team, "You Demand Mo!" got involved in this year's Movember movement - a charity dedicated to help change the face of men's health on a global scale - raising \$4,480.
- As part of NEPC's Annual United Way Campaign, our firm donated over \$28,000 and held a volunteer event to assemble Literacy Kits. Literacy kits inspire creativity among volunteers and bring books to life to deepen children's reading experience.

## SAVE THE DATE!

We will be hosting our 23<sup>rd</sup> Annual Investment Conference on May 14-15, 2018. More details to come!





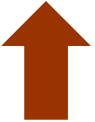









# MARKET THOUGHTS & EDUCATION

NEPC, LLC

---

# PERFORMANCE OVERVIEW

## Q4 Market Summary

Macro			Equity			Credit			Real Assets		
US Dollar	VIX	US 10-Yr	S&P 500	MSCI EAFE	MSCI EM	US Agg.	High Yield	Dollar EMD	Oil	Gold	REITS
											
-1.0%	1.5	7 bps	6.6%	4.2%	7.4%	0.4%	0.5%	0.5%	16.9%	1.8%	2.3%

- **Equities ended the year on a high note with another strong quarter of returns on the back of accelerating global growth, a robust earnings season, and continued accommodative monetary policy**
  - Emerging markets continued their outperformance with a weaker dollar, rebounding earnings, and a significant rally in tech shares
- **Long-term US Treasury yields increased, but an additional Fed rate hike pushed up short-term yields even more, causing the curve to flatten**
- **Reflecting the pro-risk environment, volatility remained subdued and the US dollar continued to decline – ending the year down nearly 10%**

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



# MACRO PERFORMANCE OVERVIEW

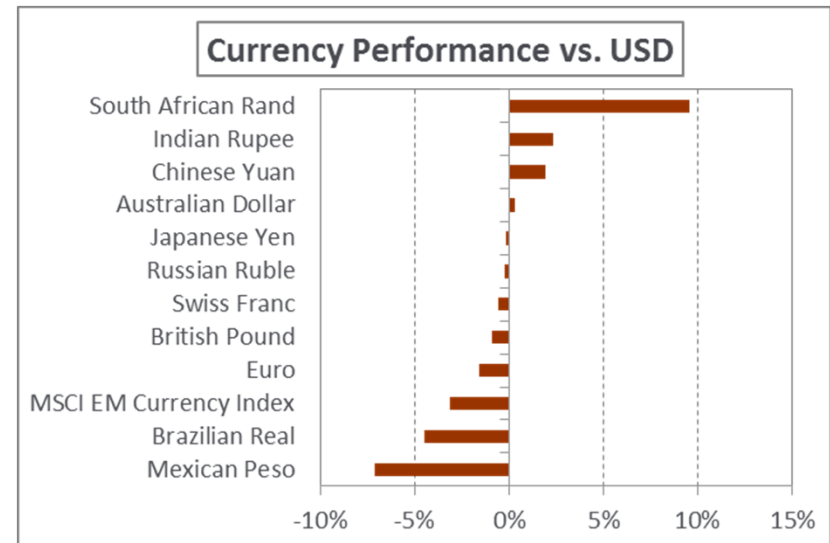
## Q4 Macro Market Summary

- **US, Europe, Japan, and China continue to experience improving synchronized growth**
- **The US Treasury curve continued to flatten with short-term rates rising from another Fed rate hike**
- **Whereas long-term rates declined, with the 30-year falling 12 basis points during the quarter**

	Yield 9/30/17	Yield 12/31/17	Δ
US 10-Yr	2.33%	2.41%	+0.08%
US 30-Yr	2.86%	2.74%	-0.12%
US Real 10-Yr	0.49%	0.43%	-0.06%
German 10-Yr	0.46%	0.43%	-0.03%
Japan 10-Yr	0.06%	0.05%	-0.01%
China 10-Yr	3.62%	3.90%	+0.28%
EM Local Debt	5.99%	6.14%	+0.15%

Source: Bloomberg

Central Banks	Current Rate	CPI YOY	Notes from the Quarter
Federal Reserve	1.25% - 1.50%	2.1%	Fed holdings data indicates the balance sheet unwinding is happening at a slower pace than anticipated. Additionally, the Fed increased its benchmark interest rate a quarter point to 1.5%.
European Central Bank	0.0%	1.4%	In October, the ECB announced it would cut monthly bond purchases in half from €60 billion to €30 billion in January
Bank of Japan	-0.10%	0.6%	The BoJ will continue its ultra-easy QE program with inflation remaining well below the 2% target



Source: Bloomberg





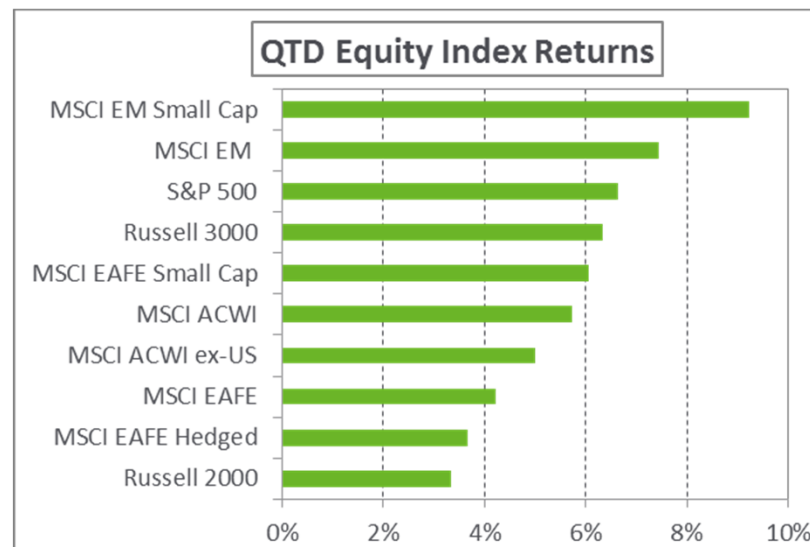
# EQUITY PERFORMANCE OVERVIEW

## Q4 Equity Market Summary

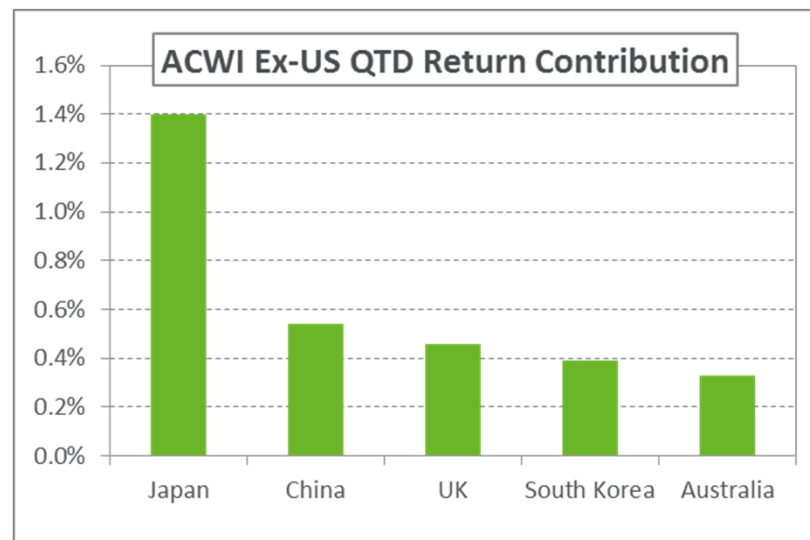
- **US large cap stocks rallied with strong earnings growth and hopes the tax reform would provide an additional tailwind for equities**
- **Despite strong economic growth, improving corporate earnings, and accommodative monetary policy, European equities continue to lag other markets**

Russell 3000 QTD Sector Return Contribution	
Information Technology	1.85%
Consumer Discretionary	0.97%
Financials	0.92%
Industrials	0.57%
Consumer Staples	0.43%
Energy	0.39%
Materials	0.27%
Health Care	0.17%
Real Estate	0.16%
Telecommunication	0.04%
Utilities	-0.01%

Source: Russell, Bloomberg



Source: MSCI, Russell, S&P, Bloomberg



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



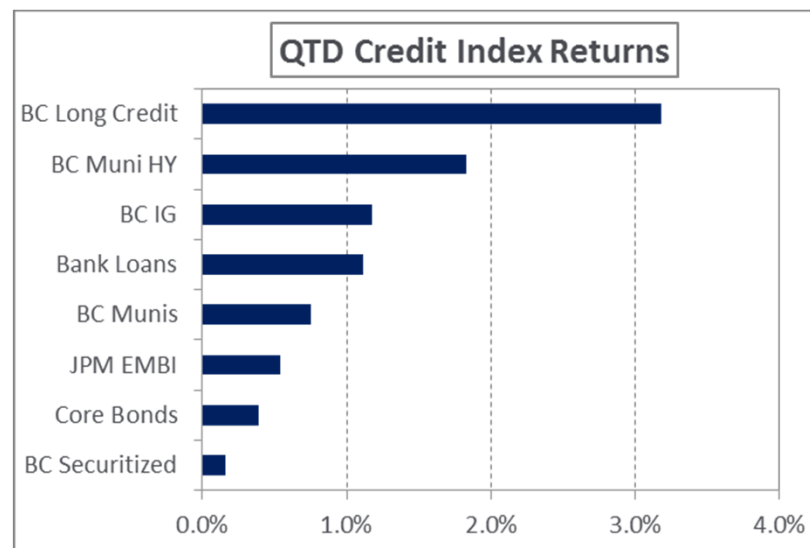
# CREDIT PERFORMANCE OVERVIEW

## Q4 Credit Market Summary

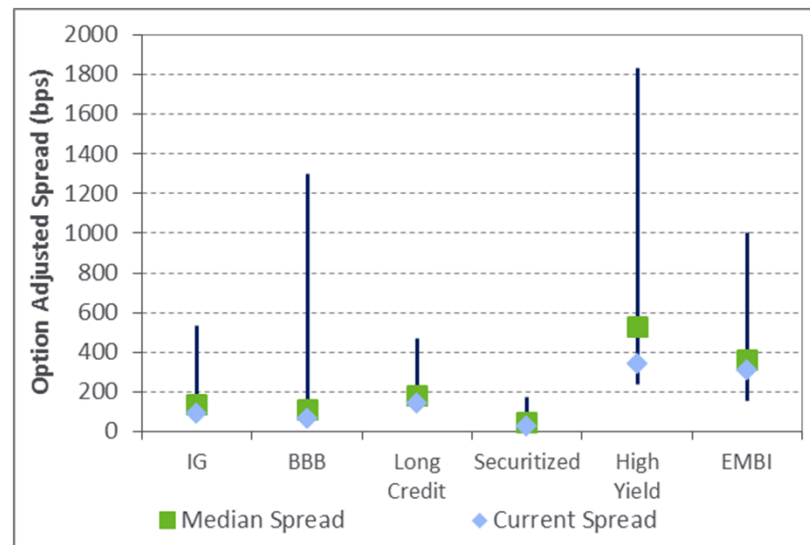
- Credit spreads continue to grind lower across most areas of the credit markets
- High yield spreads remain below medians, supporting a broad reduction in exposure
- Long credit continues to benefit from strong demand from duration-seeking investors

Credit Spread (Basis Points)	9/30/17	12/29/17	Δ
BC IG Credit	96	89	-7
BC Long Credit	149	139	-10
BC Securitized	22	25	+3
BC High Yield	347	343	-4
Muni HY	309	275	-34
JPM EMBI	308	311	+3
Bank Loans - Libor	349	330	-19

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



Source: Barclays, JPM, S&P, Bloomberg



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



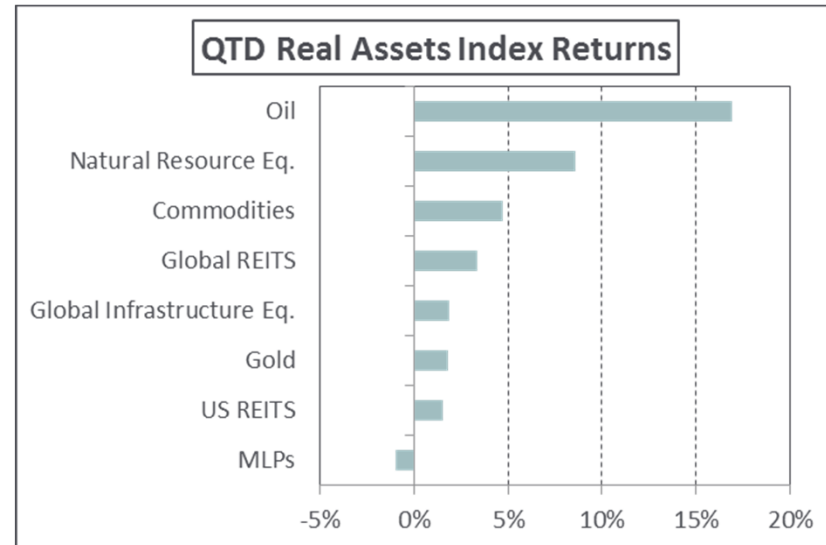
# REAL ASSETS PERFORMANCE OVERVIEW

## Q4 Real Assets Market Summary

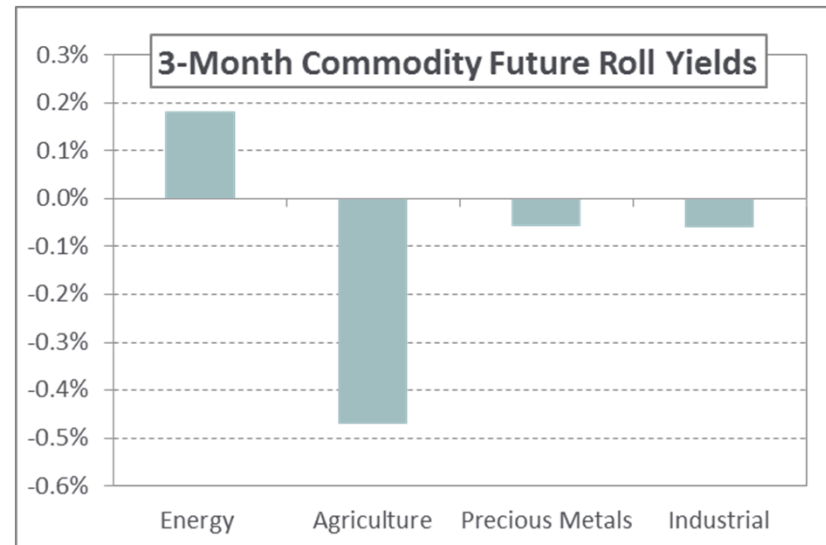
- **Oil prices had another strong quarter – ending the month around \$60/barrel**
- **The agriculture sector declined, lead by a significant decline in wheat as a result of record inventory levels**
- **Commodity index roll yield is less negative than the previous quarter, with the energy sector having a positive contribution**

Real Asset Yields	9/30/17	12/29/17
MLPs	7.8%	7.8%
Core Real Estate	4.7%	4.4%
US REITs	4.0%	4.1%
Global REITs	3.4%	3.6%
Global Infrastructure Equities	3.9%	3.9%
Natural Resource Equities	3.3%	3.1%
US 10-Yr Breakeven Inflation	1.9%	2.0%
Commodity Index Roll Yield	-1.5%	-0.4%

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



Source: S&P, NAREIT, Alerian, Bloomberg



Source: Bloomberg, NEPC Calculated as of 01/16/2018

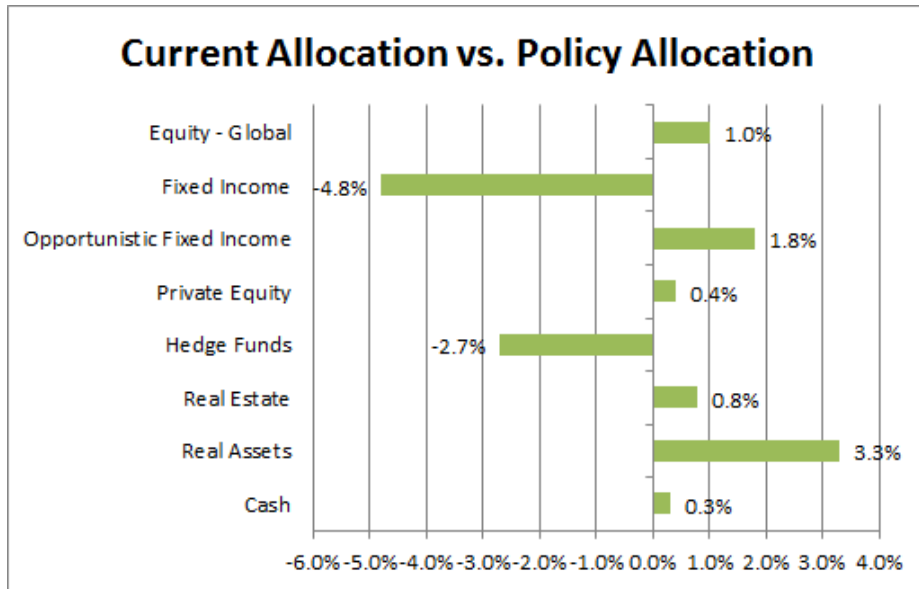


# EXECUTIVE SUMMARY

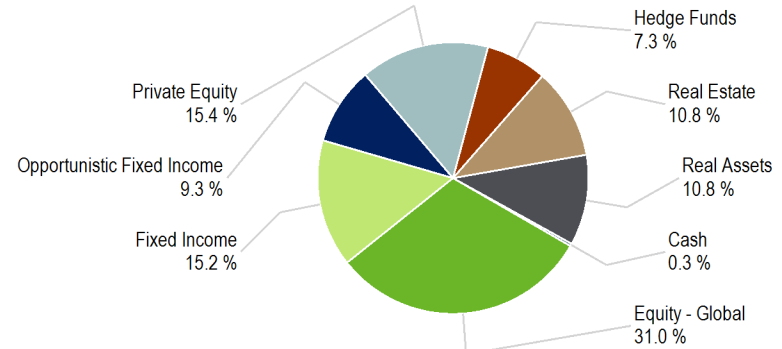
NEPC, LLC

---

# FUND ASSET ALLOCATION VS. CURRENT ALLOCATION



### Current Asset Allocation



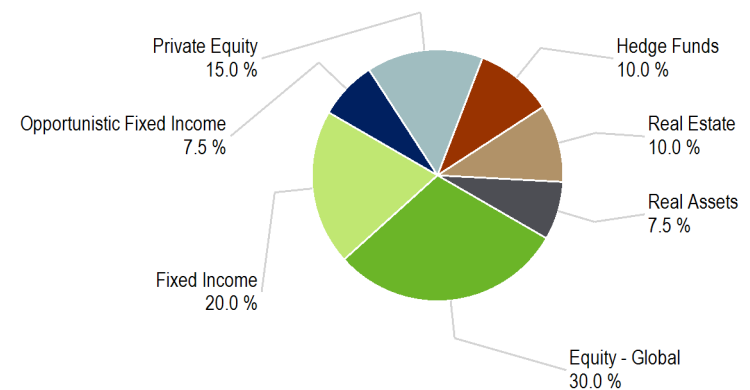
### Current Asset Allocation vs. Policy Asset Allocation

	Current	Policy	Current Difference*	
Equity - Global	\$706,885,891	30.0%	31.0%	1.0%
Fixed Income	\$346,400,892	20.0%	15.2%	-4.8%
Opportunistic Fixed Income	\$213,222,097	7.5%	9.3%	1.8%
Private Equity	\$352,047,093	15.0%	15.4%	0.4%
Hedge Funds	\$166,115,378	10.0%	7.3%	-2.7%
Real Estate	\$245,420,998	10.0%	10.8%	0.8%
Real Assets	\$245,462,471	7.5%	10.8%	3.3%
Cash	\$5,750,476	--	0.3%	0.3%
<b>Total</b>	<b>\$2,281,305,296</b>	<b>100.0%</b>	<b>100.0%</b>	

\*Difference between Policy and Current Allocation

Allocations may not add to 100% due to rounding.

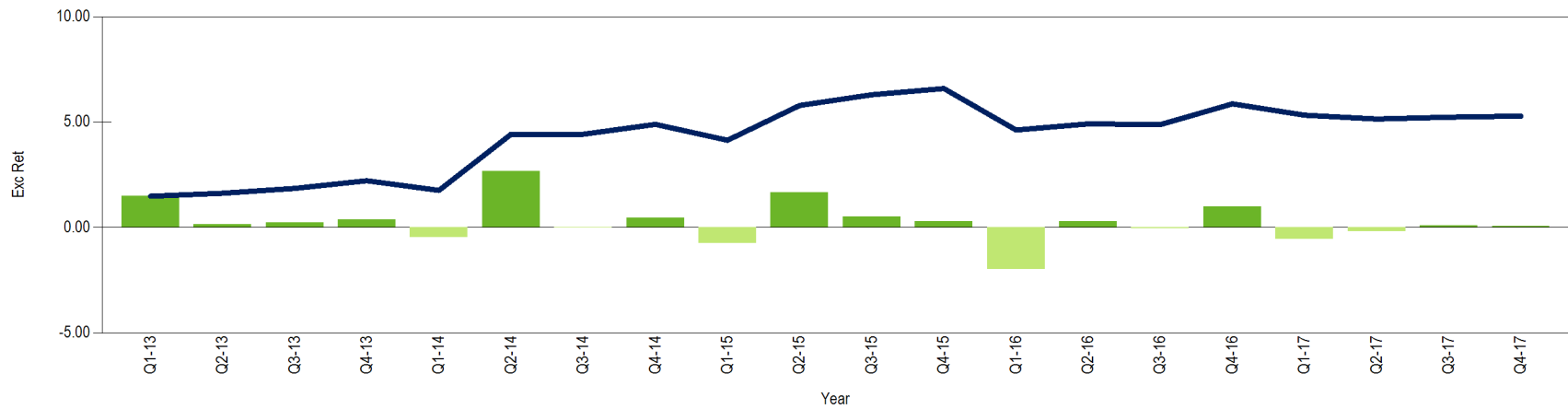
### Policy Asset Allocation



# TOTAL FUND PERFORMANCE SUMMARY

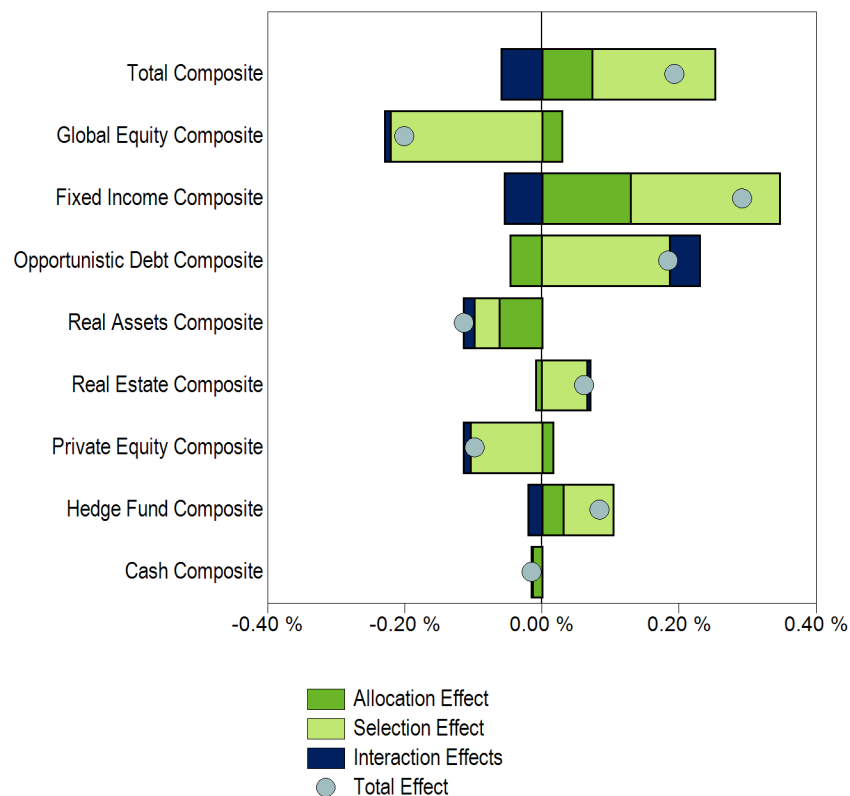
	Market Value	3 Mo	1 Yr	3 Yrs	5 Yrs	10 Yrs
<b>Total Composite</b>	<b>\$2,281,305,296</b>	<b>3.27%</b>	<b>13.13%</b>	<b>7.65%</b>	<b>9.70%</b>	<b>5.72%</b>
<i>Policy Index</i>		3.22%	13.77%	7.50%	8.58%	5.60%
<i>InvestorForce Public DB Net Median</i>		3.48%	14.54%	6.99%	8.27%	5.57%

Quarterly and Cumulative Excess Performance



# TOTAL FUND ATTRIBUTION ANALYSIS

## Attribution Effects 3 Months Ending December 31, 2017



Attribution Summary 3 Months Ending December 31, 2017							
	Wtd. Actual Return	Wtd. Index Return	Excess Return	Selection Effect	Allocation Effect	Interaction Effects	Total Effects
Global Equity Composite	5.0%	5.7%	-0.7%	-0.2%	0.0%	0.0%	-0.2%
Fixed Income Composite	1.6%	0.5%	1.1%	0.2%	0.1%	-0.1%	0.3%
Opportunistic Debt Composite	2.9%	0.5%	2.5%	0.2%	0.0%	0.0%	0.2%
Real Assets Composite	0.4%	0.9%	-0.5%	0.0%	-0.1%	0.0%	-0.1%
Real Estate Composite	2.6%	1.9%	0.7%	0.1%	0.0%	0.0%	0.1%
Private Equity Composite	4.5%	5.2%	-0.7%	-0.1%	0.0%	0.0%	-0.1%
Hedge Fund Composite	2.6%	1.9%	0.7%	0.1%	0.0%	0.0%	0.1%
Cash Composite	0.3%	0.3%	0.0%	0.0%	0.0%	0.0%	0.0%
<b>Total</b>	<b>3.3%</b>	<b>3.1%</b>	<b>0.2%</b>	<b>0.2%</b>	<b>0.1%</b>	<b>-0.1%</b>	<b>0.2%</b>

Note: Plan attribution calculations are returns based and the results shown reflect the composites shown. As a result, the total returns shown may vary from the calculated return shown on the performance summary.

The target return shown for each composite is a custom index, based on aggregated policy indices. This policy index asset weights the underlying policy indices of each option in the plan and the respective benchmark return.

The allocation, selection, and interaction effects are calculated using the custom index described above along with the policy or target weight of each composite.

May not add due to rounding

Allocation Effect - The return attributable to the asset allocation of the portfolio

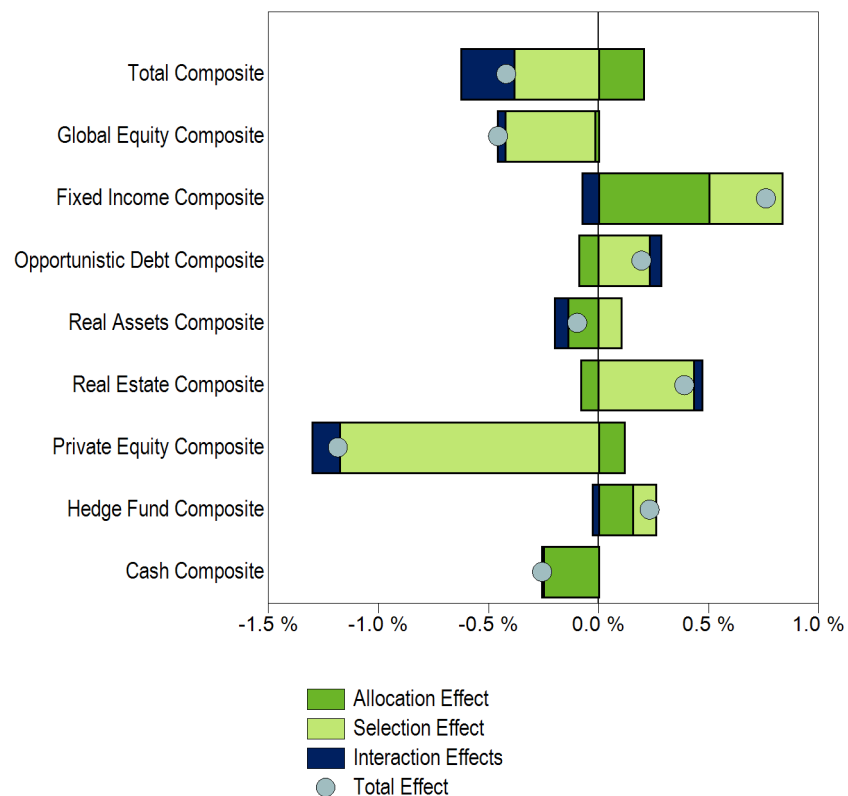
Selection Effect - The return attributable to the managers' security selection

Interaction Effect - The return attributable to the interaction between the Allocation and Selection Effects



# TOTAL FUND ATTRIBUTION ANALYSIS

**Attribution Effects Relative to Policy Index  
1 Year Ending December 31, 2017**



Attribution Summary 1 Year Ending December 31, 2017							
	Wtd. Actual Return	Wtd. Index Return	Excess Return	Selection Effect	Allocation Effect	Interaction Effects	Total Effects
Global Equity Composite	22.5%	24.0%	-1.5%	-0.4%	0.0%	0.0%	-0.5%
Fixed Income Composite	5.5%	4.0%	1.5%	0.3%	0.5%	-0.1%	0.8%
Opportunistic Debt Composite	10.5%	7.5%	3.0%	0.2%	-0.1%	0.0%	0.2%
Real Assets Composite	7.1%	6.2%	0.9%	0.1%	-0.1%	-0.1%	-0.1%
Real Estate Composite	11.1%	6.9%	4.2%	0.4%	-0.1%	0.0%	0.4%
Private Equity Composite	14.0%	22.1%	-8.1%	-1.2%	0.1%	-0.1%	-1.2%
Hedge Fund Composite	8.5%	7.6%	0.9%	0.1%	0.2%	0.0%	0.2%
Cash Composite	0.7%	0.9%	-0.2%	0.0%	-0.3%	0.0%	-0.3%
<b>Total</b>	<b>13.1%</b>	<b>13.5%</b>	<b>-0.5%</b>	<b>-0.4%</b>	<b>0.2%</b>	<b>-0.2%</b>	<b>-0.4%</b>

Note: Plan attribution calculations are returns based and the results shown reflect the composites shown. As a result, the total returns shown may vary from the calculated return shown on the performance summary.

The target return shown for each composite is a custom index, based on aggregated policy indices. This policy index asset weights the underlying policy indices of each option in the plan and the respective benchmark return.

The allocation, selection, and interaction effects are calculated using the custom index described above along with the policy or target weight of each composite.

May not add due to rounding

Allocation Effect - The return attributable to the asset allocation of the portfolio

Selection Effect - The return attributable to the managers' security selection

Interaction Effect - The return attributable to the interaction between the Allocation and Selection Effects





MPERS

# TOTAL COMPOSITE

	Policy %	% of Portfolio	Market Value (\$)	3 Mo (%)	Rank	1 Yr (%)	Rank	3 Yrs (%)	Rank	5 Yrs (%)	Rank	10 Yrs (%)	Rank
<b>Total Composite</b>	<b>100.00</b>	<b>100.00</b>	<b>2,281,305,296</b>	<b>3.27</b>	<b>65</b>	<b>13.13</b>	<b>84</b>	<b>7.65</b>	<b>19</b>	<b>9.70</b>	<b>7</b>	<b>5.72</b>	<b>43</b>
<i>Policy Index</i>				3.22	69	13.77	70	7.50	24	8.58	41	5.60	50
<b>Global Equity Composite</b>	<b>30.00</b>	<b>30.99</b>	<b>706,885,891</b>	<b>4.98</b>	<b>53</b>	<b>22.50</b>	<b>57</b>	<b>9.83</b>	<b>35</b>	<b>12.35</b>	<b>25</b>	<b>5.67</b>	<b>45</b>
<i>MSCI ACWI</i>				5.73	37	23.97	46	9.30	43	10.80	58	4.65	66
<b>Fixed Income Composite</b>	<b>20.00</b>	<b>15.18</b>	<b>346,400,892</b>	<b>1.55</b>	<b>13</b>	<b>5.46</b>	<b>80</b>	<b>5.30</b>	<b>20</b>	<b>5.77</b>	<b>11</b>	<b>6.16</b>	<b>24</b>
<i>Fixed Income Custom Benchmark</i>				0.49	73	4.00	89	2.77	61	2.48	57	4.32	57
<b>Opportunistic Debt Composite</b>	<b>7.50</b>	<b>9.35</b>	<b>213,222,097</b>	<b>2.93</b>	<b>1</b>	<b>10.46</b>	<b>3</b>	<b>--</b>	<b>--</b>	<b>--</b>	<b>--</b>	<b>--</b>	<b>--</b>
<i>BBgBarc US High Yield TR</i>				0.47	55	7.50	40	6.35	26	5.78	27	8.03	16
<b>Real Assets Composite</b>	<b>7.50</b>	<b>10.76</b>	<b>245,462,471</b>	<b>0.38</b>	<b>--</b>	<b>7.07</b>	<b>--</b>	<b>0.19</b>	<b>--</b>	<b>5.02</b>	<b>--</b>	<b>--</b>	<b>--</b>
<i>CPI + 4% (Unadjusted)</i>				0.87	--	6.19	--	5.70	--	5.48	--	5.68	--
<b>Real Estate Composite</b>	<b>10.00</b>	<b>10.76</b>	<b>245,420,998</b>	<b>2.61</b>	<b>--</b>	<b>11.13</b>	<b>--</b>	<b>10.15</b>	<b>--</b>	<b>12.73</b>	<b>--</b>	<b>4.95</b>	<b>--</b>
<i>NFI-ODCE Eq Wtd Net Non Lag</i>				1.94	--	6.92	--	9.77	--	10.62	--	3.94	--
<b>Private Equity Composite</b>	<b>15.00</b>	<b>15.43</b>	<b>352,047,093</b>	<b>4.51</b>	<b>--</b>	<b>13.97</b>	<b>--</b>	<b>11.05</b>	<b>--</b>	<b>13.45</b>	<b>--</b>	<b>6.94</b>	<b>--</b>
<i>MO Hwy Priv. Equ. Index - Lagged</i>				5.24	--	22.12	--	14.11	--	17.61	--	10.91	--
<b>Hedge Fund Composite</b>	<b>10.00</b>	<b>7.28</b>	<b>166,115,378</b>	<b>2.63</b>	<b>--</b>	<b>8.48</b>	<b>--</b>	<b>3.02</b>	<b>--</b>	<b>4.57</b>	<b>--</b>	<b>4.02</b>	<b>--</b>
<i>HFRI Fund of Funds Composite Index</i>				1.91	--	7.61	--	2.56	--	3.97	--	1.07	--
<b>Cash Composite</b>	<b>0.00</b>	<b>0.25</b>	<b>5,750,476</b>	<b>0.25</b>	<b>--</b>	<b>0.72</b>	<b>--</b>	<b>0.33</b>	<b>--</b>	<b>0.24</b>	<b>--</b>	<b>0.38</b>	<b>--</b>
<i>91 Day T-Bills</i>				0.30	--	0.92	--	0.42	--	0.27	--	0.31	--

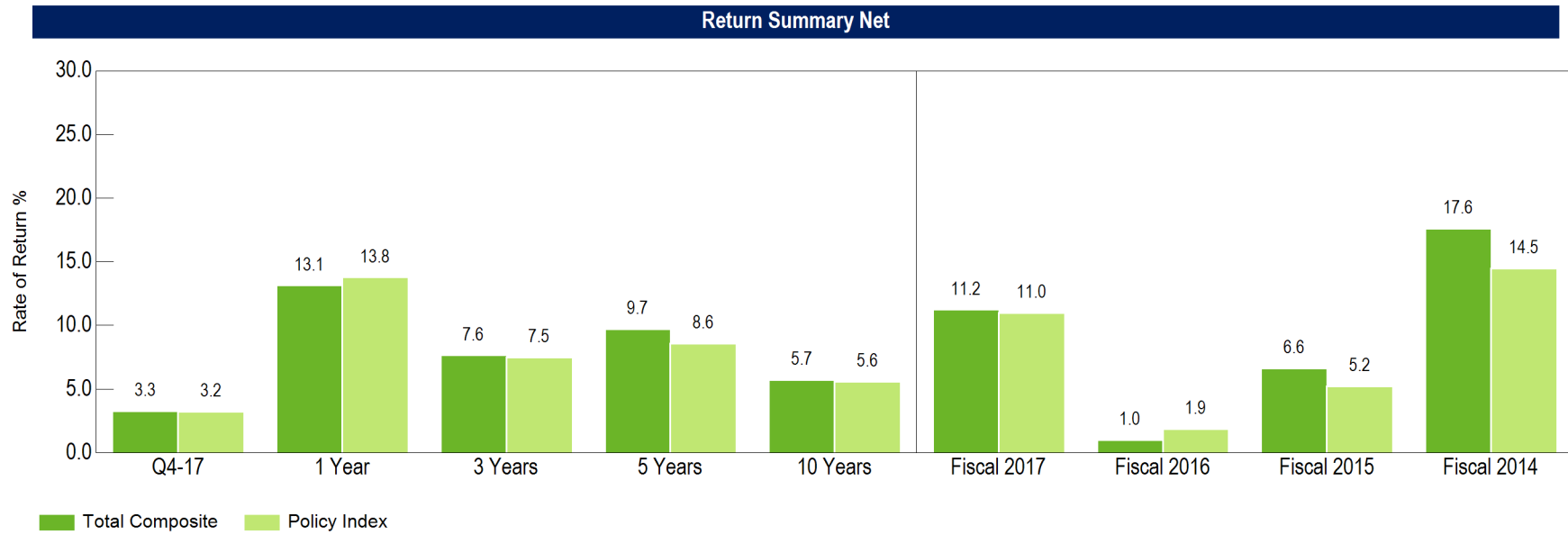
Total Composite is ranked in the IFx Public DB (peer) Net + Universe

Global Equity Composite is ranked in the eA Global All Cap Equity Net Universe

Fixed Income Composite is ranked in the eA All Global Fixed Inc Net Universe

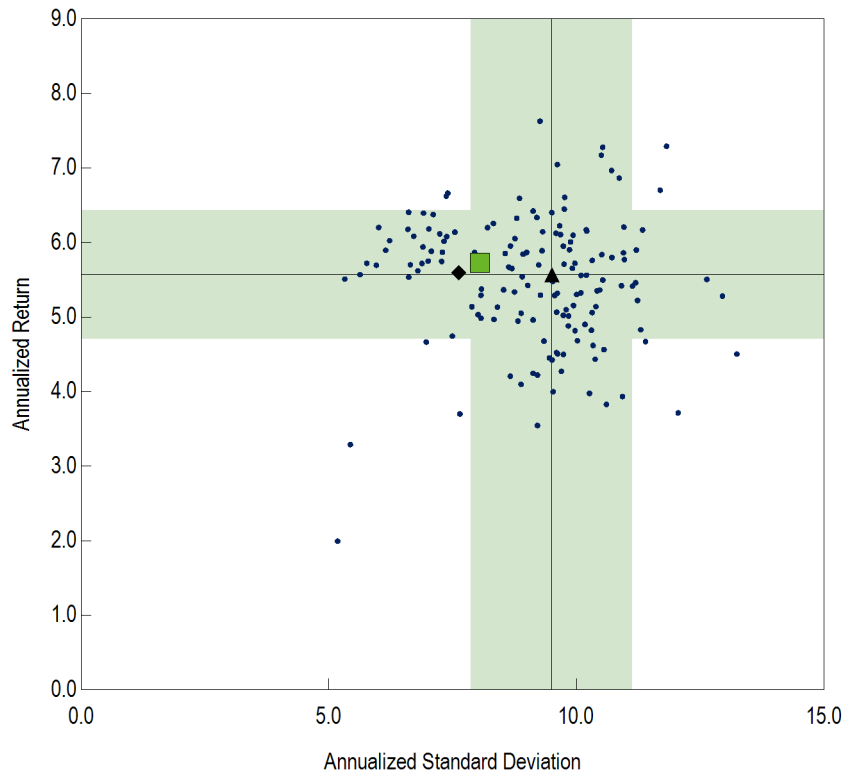


# TOTAL FUND RETURN SUMMARY



# TOTAL FUND RISK/RETURN - 10 YEARS

10 Years Ending December 31, 2017



- Total Composite
- ◆ Policy Index
- ▲ Universe Median
- 68% Confidence Interval
- InvestorForce Public DB Net

Statistics Summary				
10 Years Ending December 31, 2017				
	Anlzd Ret	Rank	Anlzd Std Dev	Rank
Total Composite	5.72%	43	8.05%	25
Policy Index	5.60%	50	7.63%	22

Statistics Summary		
10 Years Ending December 31, 2017		
	Sharpe Ratio	Rank
Total Composite	0.67	24
Policy Index	0.69	23



# TOTAL FUND PERFORMANCE

NEPC, LLC

---

## TOTAL FUND PERFORMANCE DETAIL

	Market Value (\$)	% of Portfolio	Policy %	3 Mo (%)	1 Yr (%)	3 Yrs (%)	5 Yrs (%)	10 Yrs (%)
<b>Total Composite</b>	<b>2,281,305,296</b>	<b>100.00</b>	<b>100.00</b>	<b>3.27</b>	<b>13.13</b>	<b>7.65</b>	<b>9.70</b>	<b>5.72</b>
<i>Policy Index</i>				3.22	13.77	7.50	8.58	5.60
<b>Global Equity Composite</b>	<b>706,885,891</b>	<b>30.99</b>	<b>30.00</b>	<b>4.98</b>	<b>22.50</b>	<b>9.83</b>	<b>12.35</b>	<b>5.67</b>
<i>MSCI ACWI</i>				5.73	23.97	9.30	10.80	4.65
Tortoise	68,292,382	2.99		-0.64	-3.41	-6.77	4.89	--
<i>Alerian MLP Index</i>				-0.95	-6.52	-9.33	-0.06	6.04
<b>Domestic Equity Composite</b>	<b>386,584,269</b>	<b>16.95</b>	<b>--</b>	<b>5.07</b>	<b>22.64</b>	<b>11.23</b>	<b>15.91</b>	<b>8.38</b>
<i>Russell 3000</i>				6.34	21.13	11.12	15.58	8.60
<b>Large Cap Composite</b>	<b>304,456,125</b>	<b>13.35</b>	<b>--</b>	<b>5.90</b>	<b>23.15</b>	<b>11.63</b>	<b>15.80</b>	<b>8.91</b>
Cash/S&P Futures	304,456,125	13.35		5.90	23.15	11.55	14.58	--
<i>S&amp;P 500</i>				6.64	21.83	11.41	15.79	8.50
<b>Small/Mid Cap Composite</b>	<b>82,128,144</b>	<b>3.60</b>	<b>--</b>	<b>1.58</b>	<b>21.07</b>	<b>11.07</b>	<b>15.68</b>	<b>9.54</b>
Kennedy Capital	31,354,910	1.37		2.89	16.03	13.24	--	--
Kennedy Small-Cap Banking	19,422,313	0.85						
Pinnacle	31,350,921	1.37		1.33	24.89	9.25	14.15	9.35
<i>Russell 2500</i>				5.24	16.81	10.07	14.33	9.22
<b>International Equity Composite</b>	<b>252,009,240</b>	<b>11.05</b>	<b>--</b>	<b>6.47</b>	<b>32.04</b>	<b>11.85</b>	<b>9.76</b>	<b>3.56</b>
<i>MSCI ACWI ex USA</i>				5.00	27.19	7.83	6.80	1.84
Silchester	146,371,975	6.42		5.58	27.29	11.66	12.11	7.99
Acadian Int'l Small Cap	45,165,322	1.98		6.09	37.84	16.65	--	--
<i>MSCI EAFE</i>				4.23	25.03	7.80	7.90	1.94
GMO EM	26,787,905	1.17		8.16	37.47	9.41	--	--
<i>MSCI Emerging Markets</i>				7.44	37.28	9.10	4.35	1.68
MPERS-Acadian Non-US Microcap	33,277,236	1.46		9.77	--	--	--	--
<i>MSCI EAFE Small Cap</i>				6.05	33.01	14.20	12.85	5.77
Transition Account	406,802	0.02						

MPERS - Acadian Non-US Microcap was funded on 03/20/2017.



## TOTAL FUND PERFORMANCE DETAIL

	Market Value (\$)	% of Portfolio	Policy %	3 Mo (%)	1 Yr (%)	3 Yrs (%)	5 Yrs (%)	10 Yrs (%)
<b>Fixed Income Composite</b>	<b>346,400,892</b>	<b>15.18</b>	<b>20.00</b>	<b>1.55</b>	<b>5.46</b>	<b>5.30</b>	<b>5.77</b>	<b>6.16</b>
<i>Fixed Income Custom Benchmark</i>				0.49	4.00	2.77	2.48	4.32
<b>Core Fixed Income Composite</b>	<b>153,483,833</b>	<b>6.73</b>	<b>10.00</b>	<b>0.75</b>	<b>3.50</b>	<b>3.03</b>	<b>3.10</b>	<b>3.79</b>
Aberdeen	15,568,159	0.68		0.99	10.28	6.36	5.77	5.81
<i>BBgBarc US Aggregate TR</i>				0.39	3.54	2.24	2.10	4.01
Internal Fixed - Core	96,645,078	4.24		0.95	2.21	1.91	2.22	--
<i>BBgBarc US Govt/Credit TR</i>				0.49	4.00	2.38	2.13	4.08
Octagon Senior Debt	27,562,191	1.21		1.38	4.30	--	--	--
<i>BBgBarc US Aggregate TR</i>				0.39	3.54	2.24	2.10	4.01
Principal CMBS Fixed	13,708,405	0.60		-1.99	2.09	2.83	--	--
<i>BBgBarc US CMBS ERISA Eligible TR</i>				0.35	3.35	2.54	2.34	4.84
<b>Long Duration Composite</b>	<b>156,266,799</b>	<b>6.85</b>	<b>5.00</b>	<b>2.33</b>	<b>8.37</b>	<b>4.64</b>	<b>4.61</b>	<b>--</b>
Internal Fixed - Long Duration	156,266,799	6.85		2.33	8.37	4.64	4.61	6.51
<i>BBgBarc US Govt/Credit Long TR</i>				2.84	10.71	4.52	4.43	7.26
<b>Inflation Protection Securities Composite</b>	<b>36,650,260</b>	<b>1.61</b>	<b>5.00</b>	<b>1.96</b>	<b>4.44</b>	<b>2.95</b>	<b>0.69</b>	<b>--</b>
Internal US TIPS	36,650,260	1.61		1.96	4.44	2.95	0.69	--
<i>BBgBarc US TIPS TR</i>				1.26	3.01	2.05	0.13	3.53
<b>Opportunistic Debt Composite</b>	<b>213,222,097</b>	<b>9.35</b>	<b>7.50</b>	<b>2.93</b>	<b>10.46</b>	<b>--</b>	<b>--</b>	<b>--</b>
<i>BBgBarc US High Yield TR</i>				0.47	7.50	6.35	5.78	8.03
ABRY ASF	146,043	0.01		-0.99	3.06	10.72	17.93	--
Anchorage Capital III	3,787,529	0.17		0.00	8.69	7.82	10.63	--
Anchorage Illiquid Opps V	11,840,977	0.52		0.00	4.43	--	--	--
Audax Mezzanine II	103,444	0.00		-9.90	-23.63	-5.16	1.35	4.65
CVI Credit Value	4,008,573	0.18		2.00	10.74	12.87	19.41	--
CVI Credit Value Fund III	13,794,813	0.60		3.19	12.60	--	--	--
CVI Global Value	3,712,516	0.16		0.94	2.69	2.68	8.46	7.71
GOLUB Capital	27,059,968	1.19		2.57	8.50	8.13	7.34	--
GSO Credit Alpha Fund	18,867,937	0.83		4.95	10.40	5.25	--	--
GSO Energy Select Opps	3,949,277	0.17		5.78	11.12	--	--	--
GSO I	422,639	0.02		-2.30	-15.59	-4.24	5.86	--
GSO II	5,039,447	0.22		5.29	11.64	4.79	13.14	--
GSO III	5,157,666	0.23		3.62	8.18	--	--	--
Internal Fixed - Nonrated	2,049,683	0.09		1.78	7.23	5.57	--	--

Fixed Income Custom Benchmark was BBgBarc US Universal TR preceding 01/01/2017. As of 01/01/2017 the benchmark is BBgBarc US Agg Govt/Credit.



MPERS

# TOTAL FUND PERFORMANCE DETAIL

	Market Value (\$)	% of Portfolio	Policy %	3 Mo (%)	1 Yr (%)	3 Yrs (%)	5 Yrs (%)	10 Yrs (%)
M&G III	4,705,666	0.21		3.74	18.67	1.86	--	--
Northern Shipping II	9,286,770	0.41		2.55	7.54	7.38	--	--
Northern Shipping III	7,564,156	0.33		2.12	1.43	--	--	--
Och-Ziff Struct Products II	3,295,927	0.14		3.54	13.60	15.07	15.74	--
OCP Asia	18,233,874	0.80		2.57	13.49	15.39	--	--
Octagon Opportunistic	39,554,095	1.73		4.10	12.67	--	--	--
Owl Rock	6,569,569	0.29		2.90	12.38	--	--	--
Riverstone Credit Partners	16,864,209	0.74		1.17	13.31	--	--	--
Siguler Guff Sec Opps	7,207,318	0.32		3.52	14.93	--	--	--
<i>BBgBarc US High Yield TR</i>				0.47	7.50	6.35	5.78	8.03
<b>Real Assets Composite</b>	<b>245,462,471</b>	<b>10.76</b>	<b>7.50</b>	<b>0.38</b>	<b>7.07</b>	<b>0.19</b>	<b>5.02</b>	<b>--</b>
<i>CPI + 4% (Unadjusted)</i>				0.87	6.19	5.70	5.48	5.68
American Infrastructure I MLP	15,342,697	0.67		2.33	11.38	7.91	1.94	8.27
American Infrastructure II MLP	8,590,809	0.38		-7.69	-7.62	2.74	--	--
Apollo Aviation III	6,959,196	0.31		-4.55	31.37	--	--	--
Blue Road	5,907,020	0.26		7.56	12.80	--	--	--
Corrum Capital Aviation	4,000,479	0.18						
EIF - US Power III	6,435,981	0.28		-3.93	-7.40	12.34	9.61	5.31
EMG I	6,207,006	0.27		-4.86	-9.37	-17.42	2.26	11.97
EMG II	10,912,869	0.48		4.40	14.73	4.64	18.83	--
EMG III	20,323,448	0.89		2.08	17.91	-0.53	--	--
EMG IV	13,049,351	0.57		4.89	19.25	--	--	--
Grey Rock Energy Fund II	6,682,162	0.29		2.55	3.83	--	--	--
NGP IX	676,431	0.03		8.39	6.26	-19.30	1.48	0.88
NGP X	5,897,775	0.26		2.86	4.92	-0.30	7.39	--
NGP XI	10,735,644	0.47		0.72	19.35	9.08	--	--
Orion II	5,778,894	0.25		6.86	--	--	--	--
Orion Mine Finance Fund I	11,184,725	0.49		1.49	31.91	21.74	--	--
Quantum VII	2,702,896	0.12		-14.72	--	--	--	--
Ridgewood Energy	8,940,235	0.39		5.28	4.74	7.35	--	--
Ridgewood III	1,698,581	0.07		-1.56	-4.74	--	--	--
Sciens Marine Investments	3,543,414	0.16		4.49	56.63	-26.43	--	--
<i>CPI + 4% (Unadjusted)</i>				0.87	6.19	5.70	5.48	5.68



## TOTAL FUND PERFORMANCE DETAIL

	Market Value (\$)	% of Portfolio	Policy %	3 Mo (%)	1 Yr (%)	3 Yrs (%)	5 Yrs (%)	10 Yrs (%)
<b>Timber Composite</b>	<b>89,892,858</b>	<b>3.94</b>	<b>--</b>	<b>-1.75</b>	<b>-7.29</b>	<b>-3.03</b>	<b>-1.70</b>	<b>--</b>
RMK - Timberland	359,834	0.02		-8.84	-78.86	-38.94	-25.52	-11.73
MP Timber	39,914,922	1.75		-3.70	-5.38	--	--	--
MPATC	29,452,983	1.29		0.29	--	--	--	--
MPCTT	10,369,861	0.45		-0.40	--	--	--	--
MPMCB	8,649,956	0.38		0.13	--	--	--	--
MPERS - MP Battlefield	0	0.00		0.00	--	--	--	--
<i>NCREIF Timberland 1 Qtr Lag</i>				0.60	3.28	5.27	7.15	5.22
RUSSELLVILLE LAND TIMBER	1,145,302	0.05		-0.03	--	--	--	--
<b>Real Estate Composite</b>	<b>245,420,998</b>	<b>10.76</b>	<b>10.00</b>	<b>2.61</b>	<b>11.13</b>	<b>10.15</b>	<b>12.73</b>	<b>4.95</b>
<i>NFI-ODCE Eq Wtd Net Non Lag</i>				1.94	6.92	9.77	10.62	3.94
<b>Core Real Estate Composite</b>	<b>130,105,222</b>	<b>5.70</b>	<b>--</b>	<b>1.54</b>	<b>8.57</b>	<b>10.52</b>	<b>13.63</b>	<b>4.58</b>
<i>NCREIF Property Index</i>				1.80	6.98	9.39	10.19	6.08
Clarion Partners Lion Prop Fd	43,486,908	1.91		0.49	7.87	9.81	10.58	2.80
Principal CMBS	7,633,105	0.33		1.79	-2.99	4.14	15.91	--
Principal Enhanced Property	52,773,892	2.31		2.23	13.51	14.84	15.03	3.47
<i>NCREIF Property Index</i>				1.80	6.98	9.39	10.19	6.08
Principal U.S. Property Fund	26,126,063	1.15		1.83	8.03	10.15	11.33	4.31
<i>NCREIF ODCE</i>				2.07	7.62	10.42	11.53	5.03
<b>Non-Core Real Estate Composite</b>	<b>98,766,721</b>	<b>4.33</b>	<b>--</b>	<b>3.83</b>	<b>15.59</b>	<b>10.49</b>	<b>11.87</b>	<b>3.39</b>
Apollo European III	1,560,442	0.07		0.58	3.52	-4.44	1.46	--
Apollo Real Estate	5,096,966	0.22		-1.70	1.45	7.87	11.58	-0.08
Centersquare III	35,864,644	1.57		6.19	11.75	--	--	--
Clarion Part Lion Mexico Fund	1,469,367	0.06		-1.38	-26.85	-21.52	-15.17	-9.52
Colony Capital VIII	199,339	0.01		1.92	-9.68	-3.89	1.91	-13.99
M&G II	7,639,438	0.33		3.77	21.33	4.12	--	--
Oak Street IV	725,638	0.03						
Och Ziff RE Credit FD LP	1,354,634	0.06		6.57	11.67	--	--	--
Och-Ziff	1,796,666	0.08		7.96	32.25	35.25	36.14	22.82
Och-Ziff RE III	3,844,884	0.17		5.24	23.46	-10.25	--	--
Torchlight Debt Opp II	7,998,553	0.35		0.73	-2.64	6.85	--	--
Torchlight Debt Opp III	1,669,511	0.07		2.40	9.32	21.83	--	--
Torchlight Debt Opps V	9,562,747	0.42		1.85	12.61	--	--	--
Tristan EPIISO	3,348,081	0.15		3.81	15.83	18.00	10.23	--





## TOTAL FUND PERFORMANCE DETAIL

	Market Value (\$)	% of Portfolio	Policy %	3 Mo (%)	1 Yr (%)	3 Yrs (%)	5 Yrs (%)	10 Yrs (%)
Tristan EPISO 3	8,962,451	0.39		5.91	83.54	16.68	--	--
Tristan EPISO 4	7,669,765	0.34		3.10	13.36	--	--	--
Urdang Value Added Fund II	3,594	0.00						
<i>NCREIF Property Index</i>								
<b>REITS Composite</b>	<b>16,549,055</b>	<b>0.73</b>	<b>--</b>	<b>4.60</b>	<b>10.40</b>	<b>2.18</b>	<b>4.81</b>	<b>--</b>
CBRE Investors	16,549,055	0.73		4.60	10.40	2.18	4.81	--
<i>FTSE EPRA/NAREIT Developed</i>								
<b>Private Equity Composite</b>	<b>352,047,093</b>	<b>15.43</b>	<b>15.00</b>	<b>4.51</b>	<b>13.97</b>	<b>11.05</b>	<b>13.45</b>	<b>6.94</b>
<i>MO Hwy Priv. Equ. Index - Lagged</i>								
Abry Partners VI	266,835	0.01		3.39	30.38	38.09	35.39	--
Abry Partners VII	1,887,598	0.08		-1.03	28.04	19.43	15.84	--
Capital Partners II	10,434,304	0.46		11.34	32.19	16.36	--	--
DC Capital Partners	2,015,866	0.09		-2.37	-19.97	--	--	--
Grove Street - MP Ventures	91,706,494	4.02		3.89	2.84	5.93	9.80	6.68
Grove Street - MP Ventures II	189,872,567	8.32		4.44	19.71	13.70	15.64	--
KPS IV	2,794,218	0.12		-0.48	--	--	--	--
Longford II	1,289,153	0.06		-2.65	-21.56	--	--	--
Monomoy Capital Partners III	917,833	0.04						
Newquest Fund	1,372,996	0.06		-12.83	-49.82	--	--	--
Opengate Capital Partners	4,539,999	0.20		43.46	40.25	--	--	--
Pfingsten Fund V	2,478,619	0.11		-2.33	-6.47	--	--	--
Shore Capital Partners GP I LP	6,232,296	0.27		-0.16	42.32	0.20	--	--
Shoreline China Valu III	6,131,399	0.27		5.91	15.80	--	--	--
Turnbridge Capital Partners I	6,392,668	0.28		-2.82	-12.84	-16.91	--	--
Vectis H & L II	8,953,707	0.39		5.48	33.01	21.51	20.73	--
Aisling	5,209,886	0.23		23.53	18.70	--	--	--
Arrowroot Capital III	5,384,991	0.24		1.19	--	--	--	--
Long Ridge II	4,165,663	0.18		17.53	4.05	--	--	--
BLACKSTONE ASIA	0	0.00						
Capital Partners III	0	0.00						



## TOTAL FUND PERFORMANCE DETAIL

	Market Value (\$)	% of Portfolio	Policy %	3 Mo (%)	1 Yr (%)	3 Yrs (%)	5 Yrs (%)	10 Yrs (%)
<b>Hedge Fund Composite</b>	<b>166,115,378</b>	<b>7.28</b>	<b>10.00</b>	<b>2.63</b>	<b>8.48</b>	<b>3.02</b>	<b>4.57</b>	<b>4.02</b>
<i>HFRI Fund of Funds Composite Index</i>				1.91	7.61	2.56	3.97	1.07
Alpstone Capital	10,306,359	0.45		2.18	--	--	--	--
Alyeska Fund	15,817,850	0.69		1.98	5.04	--	--	--
BlueTrend	9,573,494	0.42		9.31	1.81	-2.13	-1.39	--
Bridgewater Pure Alpha	18,468,361	0.81		3.54	1.47	2.96	3.56	9.33
Cevian	15,468,161	0.68		4.06	15.48	8.77	9.43	--
Indus Pacific Opp. Fund	14,959,552	0.66		5.75	28.38	12.62	--	--
Koppenburg Commodity Fund	9,728,735	0.43		-7.00	-8.26	--	--	--
Luxor Capital	2,259,336	0.10		-0.06	31.29	-7.34	-2.42	--
Metacapital	10,940,739	0.48		-4.29	-3.34	0.05	--	--
Millenium USA LP	19,637,954	0.86		0.90	7.71	8.63	--	--
Pentwater	12,494,821	0.55		4.11	22.03	--	--	--
PFM	601,696	0.03		0.00	1.64	0.56	5.26	--
RK Tessera	12,128,949	0.53		3.24	9.27	4.59	--	--
Shepherd International Fund	274,236	0.01		-12.89	-12.39	-6.81	-6.45	-4.79
ValueAct	13,455,135	0.59		8.68	17.21	5.57	12.22	--
<i>HFRI Fund of Funds Composite Index</i>				1.91	7.61	2.56	3.97	1.07
<b>Cash Composite</b>	<b>5,750,476</b>	<b>0.25</b>	<b>0.00</b>	<b>0.25</b>	<b>0.72</b>	<b>0.33</b>	<b>0.24</b>	<b>0.38</b>
<i>91 Day T-Bills</i>				0.30	0.92	0.42	0.27	0.31



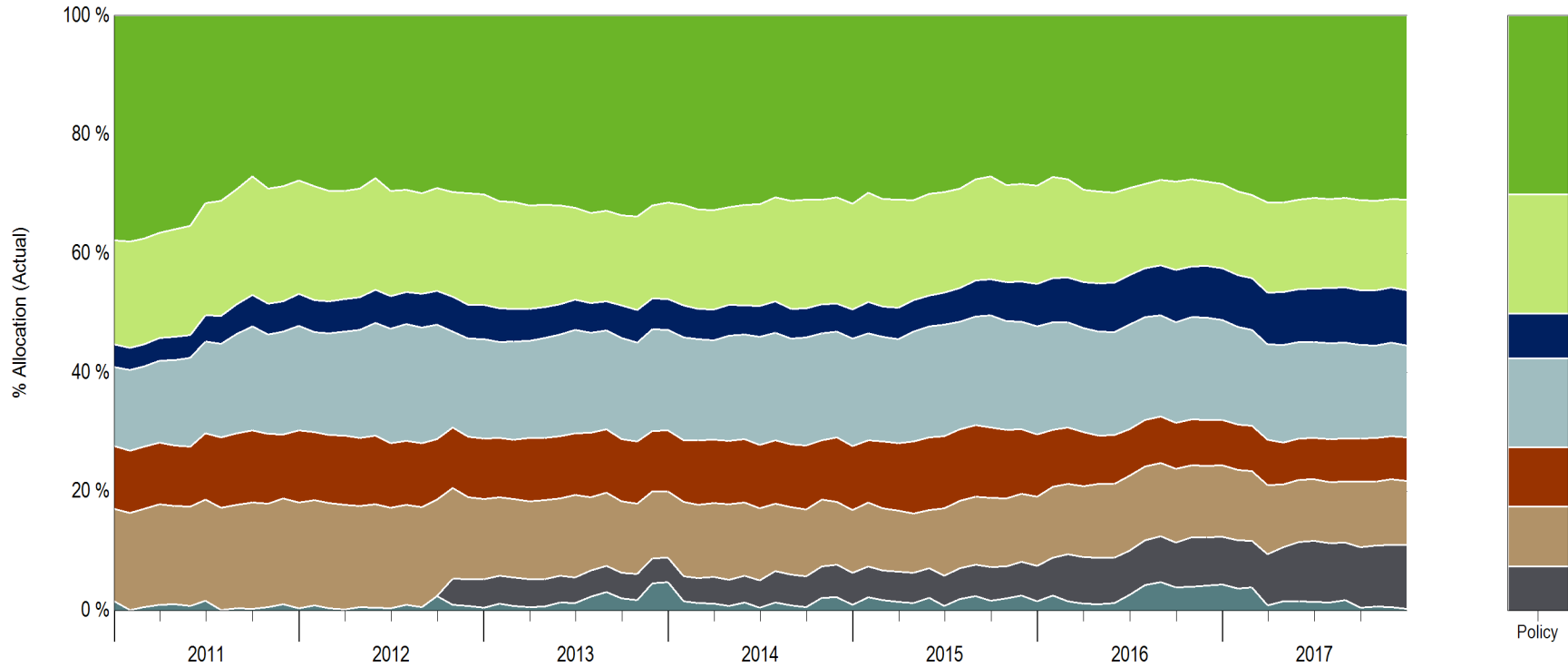
# APPENDIX

NEPC, LLC

---

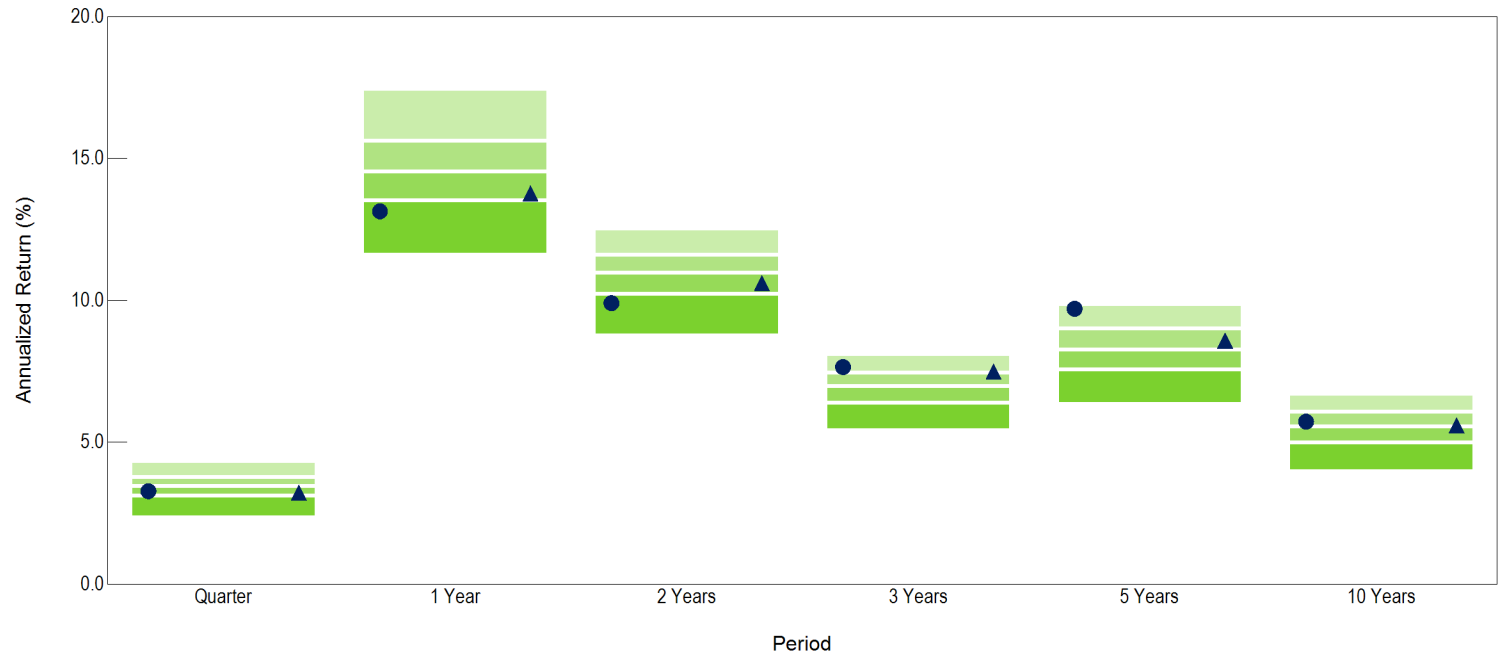
# TOTAL FUND ASSET ALLOCATION HISTORY

Asset Allocation History



# TOTAL FUND RETURN SUMMARY VS. PEER UNIVERSE

Total Composite vs. InvestorForce Public DB Net



	Quarter		1 Year		2 Years		3 Years		5 Years		10 Years	
<b>Return (Rank)</b>												
5th Percentile	4.3		17.4		12.5		8.1		9.8		6.7	
25th Percentile	3.8		15.6		11.6		7.5		9.0		6.1	
Median	3.5		14.5		11.0		7.0		8.3		5.6	
75th Percentile	3.1		13.5		10.2		6.4		7.6		5.0	
95th Percentile	2.4		11.6		8.8		5.4		6.4		4.0	
# of Portfolios	218		218		215		211		190		147	
● Total Composite	3.3	(65)	13.1	(84)	9.9	(85)	7.6	(19)	9.7	(7)	5.7	(43)
▲ Policy Index	3.2	(69)	13.8	(70)	10.6	(64)	7.5	(24)	8.6	(41)	5.6	(50)



# TOTAL FUND RETURN SUMMARY VS. PEER UNIVERSE

Total Composite vs. InvestorForce Public DB Net



	Return (Rank)										
5th Percentile	17.4	9.0	1.7	7.7	20.4	14.3	3.6	15.3	26.8	-9.8	
25th Percentile	15.6	8.1	0.4	6.4	17.2	12.9	1.6	13.4	22.0	-15.2	
Median	14.5	7.4	-0.4	5.5	14.9	11.8	0.6	12.2	18.6	-24.4	
75th Percentile	13.5	6.6	-1.5	4.4	12.7	10.4	-0.5	10.9	14.5	-27.6	
95th Percentile	11.6	5.0	-3.2	2.7	8.4	7.6	-3.1	7.9	9.9	-30.5	
# of Portfolios	218	269	262	210	191	159	137	131	128	125	
● Total Composite	13.1 (84)	6.8 (70)	3.3 (1)	10.8 (1)	15.0 (49)	12.9 (26)	4.2 (3)	14.1 (14)	14.2 (77)	-28.4 (83)	
▲ Policy Index	13.8 (70)	7.5 (47)	1.5 (7)	8.0 (4)	12.5 (76)	13.4 (15)	1.7 (24)	9.8 (88)	15.7 (68)	-22.1 (38)	



# 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.

**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 Return of Risk Free) / Annualized Standard Deviation (Portfolio Returns)*

**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 benchmark 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.

*UpsideCapture = TotalReturn(FundReturns)/TotalReturns(BMReturn) when Period Benchmark Return is > = 0*

*DownsideCapture = TotalReturn(FundReturns)/TotalReturns(BMReturn) when Benchmark < 0*

Data Source: InvestorForce



# GLOSSARY OF INVESTMENT TERMINOLOGY

**# Of Portfolios/Observations<sup>1</sup>** - The total number of data points that make up a specified universe

**Allocation Index<sup>3</sup>** - The allocation index measures the value added (or subtracted) to each portfolio by active management. It is calculated monthly: The portfolio asset allocation to each category from the prior month-end is multiplied by a specified market index.

**Asset Allocation Effect<sup>2</sup>** - Measures an investment manager's ability to effectively allocate their portfolio's assets to various sectors. The allocation effect determines whether the overweighting or underweighting of sectors relative to benchmark contributes positively or negatively to the overall portfolio return. Positive allocation occurs when the portfolio is over weighted in a sector that outperforms the benchmark and underweighted in a sector that underperforms the benchmark. Negative allocation occurs when the portfolio is over weighted in a sector that underperforms the benchmark and under weighted in a sector that outperforms the benchmark.

**Agency Bonds (Agencies)<sup>3</sup>** - The full faith and credit of the United States government is normally not pledged to payment of principal and interest on the majority of government agencies issuing these bonds, with maturities of up to ten years. Their yields, therefore, are normally higher than government and their marketability is good, thereby qualifying them as a low risk-high liquidity type of investment. They are eligible as security for advances to the member banks by the Federal Reserve, which attests to their standing.

**Asset Backed Securities (ABS)<sup>3</sup>** - Bonds which are similar to mortgage-backed securities but are collateralized by assets other than mortgages; commonly backed by credit card receivables, auto loans, or other types of consumer financing.

**Attribution<sup>3</sup>** - Attribution is an analytical technique that allows us to evaluate the performance of the portfolio relative to the benchmark. A proper attribution tells us where value was added or subtracted as a result of the manager's decisions.

**Average Effective Maturity<sup>4</sup>** - For a single bond, it is a measure of maturity that takes into account the possibility that a bond might be called back to the issuer.

For a portfolio of bonds, average effective maturity is the weighted average of the maturities of the underlying bonds. The measure is computed by weighing each bond's maturity by its market value with respect to the portfolio and the likelihood of any of the bonds being called. In a pool of mortgages, this would also account for the likelihood of prepayments on the mortgages.

**Batting Average<sup>1</sup>** - A measurement representing an investment manager's ability to meet or beat an index.

*Formula: Divide the number of days (or months, quarters, etc.) in which the manager beats or matches the index by the total number of days (or months, quarters, etc.) in the period of question and multiply that factor by 100.*

**Brinson Fachler (BF) Attribution<sup>1</sup>** - The BF methodology is a highly accepted industry standard for calculating the allocation, selection, and interaction effects within a portfolio that collectively explains a portfolio's underlying performance. The main advantage of the BF methodology is that rather than using the overall return of the benchmark, it goes a level deeper than BHB and measures whether the benchmark sector, country, etc. outperformed/or underperformed the overall benchmark.

**Brinson Hood Beebower (BHB) Attribution<sup>1</sup>** - The BHB methodology shows that excess return must be equal to the sum of all other factors (i.e., allocation effect, selection effect, interaction effect, etc.). The advantage to using the BHB methodology is that it is a highly accepted industry standard for calculating the allocation, selection, and interaction effects within a portfolio that collectively explains a portfolio's underlying performance.

**Corporate Bond (Corp)<sup>4</sup>** - A debt security issued by a corporation and sold to investors. The backing for the bond is usually the payment ability of the company, which is typically money to be earned from future operations. In some cases, the company's physical assets may be used as collateral for bonds.

**Correlation<sup>1</sup>** - A range of statistical relationships between two or more random variables or observed data values. A correlation is a single number that describes the degree of relationship between variables.

Data Source: <sup>1</sup>InvestorForce, <sup>2</sup>Interaction Effect Performance Attribution, <sup>3</sup>NEPC, LLC, <sup>4</sup>Investopedia, <sup>5</sup>Hedgeco.net





# GLOSSARY OF INVESTMENT TERMINOLOGY

**Coupon<sup>4</sup>** – The interest rate stated on a bond when it is issued. The coupon is typically paid semiannually. This is also referred to as the “coupon rate” or “coupon percent rate.”

**Currency Effect<sup>1</sup>** – Is the effect that changes in currency exchange rates over time affect excess performance.

**Derivative Instrument<sup>2</sup>** – A financial obligation that derives its precise value from the value of one or more other instruments (or assets) at the same point of time. For example, the relationship between the value of an S&P 500 futures contract (the derivative instrument in this case) is determined by the value of the S&P 500 Index and the value of a U.S. Treasury bill that matures at the expiration of the futures contract.

**Downside Deviation<sup>1</sup>** – Equals the standard deviation of negative return or the measure of downside risk focusing on the standard deviation of negative returns.

*Formula:*

*Annualized Standard Deviation (Fund Return - Average Fund Return) where average fund return is greater than individual fund returns, monthly or quarterly.*

**Duration<sup>3</sup>** – Duration is a measure of interest rate risk. The greater the duration of a bond, or a portfolio of bonds, the greater its price volatility will be in response to a change in interest rates. A bond’s duration is inversely related to interest rates and directly related to time to maturity.

**Equity/Debt/Cash Ratio<sup>1</sup>** – The percentage of an investment or portfolio that is in Equity, Debt, and/or Cash (i.e. A 7/89/4 ratio represents an investment that is made up of 7% Equity, 89% Debt, and 4% Cash).

**Foreign Bond<sup>3</sup>** – A bond that is issued in a domestic market by a foreign entity, in the domestic market’s currency. A foreign bond is most often issued by a foreign firm to raise capital in a domestic market that would be most interested in purchasing the firm’s debt. For foreign firms doing a large amount of business in the domestic market, issuing foreign bonds is a common practice.

**Hard Hurdle<sup>5</sup>** – is a hurdle rate that once beaten allows a fund manager to charge a performance fee on only the funds above the specified hurdle rate.

**High-Water Mark<sup>4</sup>** – The highest peak in value that an investment fund/account has reached. This term is often used in the context of fund manager compensation, which is performance based. Some performance-based fees only get paid when fund performance exceeds the high-water mark. The high-water mark ensures that the manager does not get paid large sums for poor performance.

**Hurdle Rate<sup>4</sup>** – The minimum rate of return on an investment required, in order for a manager to collect incentive fees from the investor, which is usually tied to a benchmark.

**Interaction Effects<sup>2</sup>** – The interaction effect measures the combined impact of an investment manager’s selection and allocation decisions within a sector. For example, if an investment manager had superior selection and over weighted that particular sector, the interaction effect is positive. If an investment manager had superior selection, but underweighted that sector, the interaction effect is negative. In this case, the investment manager did not take advantage of the superior selection by allocating more assets to that sector. Since many investment managers consider the interaction effect to be part of the selection or the allocation, it is often combined with the either effect.

**Median<sup>3</sup>** – The value (rate of return, market sensitivity, etc.) that exceeds one-half of the values in the population and that is exceeded by one-half of the values. The median has a percentile rank of 50.

**Modified Duration<sup>3</sup>** – The percentage change in the price of a fixed income security that results from a change in yield.

**Mortgage Backed Securities (MBS)<sup>3</sup>** – Bonds which are a general obligation of the issuing institution but are also collateralized by a pool of mortgages.

**Municipal Bond (Muni)<sup>4</sup>** – A debt security issued by a state, municipality or county to finance its capital expenditures.

**Net Investment Change<sup>1</sup>** – Is the change in an investment after accounting for all Net Cash Flows.

**Performance Fee<sup>4</sup>** – A payment made to a fund manager for generating positive returns. The performance fee is generally calculated as a percentage of investment profits, often both realized and unrealized.

*Data Source: <sup>1</sup>InvestorForce, <sup>2</sup>Interaction Effect Performance Attribution, <sup>3</sup>NEPC, LLC, <sup>4</sup>Investopedia, <sup>5</sup>Hedgeco.net*



# GLOSSARY OF INVESTMENT TERMINOLOGY

**Policy Index<sup>3</sup>** - A custom benchmark designed to indicate the returns that a passive investor would earn by consistently following the asset allocation targets set forth in this investment policy statement.

**Price to Book (P/B)<sup>4</sup>** - A ratio used to compare a stock's market value to its book value. It is calculated by dividing the current closing price of the stock by the latest quarter's book value per share, also known as the "price-equity ratio".

**Price to Earnings (P/E)<sup>3</sup>** - The weighted equity P/E is based on current price and trailing 12 months earnings per share (EPS).

**Price to Sales (P/S)<sup>4</sup>** - A ratio for valuing a stock relative to its own past performance, other companies, or the market itself. Price to sales is calculated by dividing a stock's current price by its revenue per share for the trailing 12 months.

**Return on Equity (ROE)<sup>4</sup>** - The amount of net income returned as a percentage of shareholders equity. Return on equity measures a corporation's profitability by revealing how much profit a company generates with the money shareholders have invested.

**Selection (or Manager) Effect<sup>2</sup>** - Measures the investment manager's ability to select securities within a given sector relative to a benchmark. The over or underperformance of the portfolio is weighted by the benchmark weight, therefore, selection is not affected by the manager's allocation to the sector. The weight of the sector in the portfolio determines the size of the effect—the larger the sector, the larger the effect is, positive or negative.

**Soft Hurdle rate<sup>5</sup>** - is a hurdle rate that once beaten allows a fund manager to charge a performance fee based on the entire annualized return.

**Tiered Fee<sup>1</sup>** - A fee structure that is paid to fund managers based on the size of the investment (i.e. 1.00% fee on the first \$10M invested, 0.90% on the next \$10M, and 0.80% on the remaining balance).

**Total Effects<sup>2</sup>** - The active management (total) effect is the sum of the selection, allocation, and interaction effects. It is also the difference between the total portfolio return and the total benchmark return. You can use the active management effect to determine the amount the investment manager has added to a portfolio's return.

**Total Return<sup>1</sup>** - The actual rate of return of an investment over a specified time period. Total return includes interest, capital gains, dividends, and distributions realized over a defined time period.

**Universe<sup>3</sup>** - The list of all assets eligible for inclusion in a portfolio.

**Upside Deviation<sup>1</sup>** - Standard Deviation of Positive Returns

**Weighted Avg. Market Cap.<sup>4</sup>** - A stock market index weighted by the market capitalization of each stock in the index. In such a weighting scheme, larger companies account for a greater portion of the index. Most indexes are constructed in this manner, with the best example being the S&P 500.

**Yield (%)<sup>3</sup>** - The current yield of a security is the current indicated annual dividend rate divided by current price.

**Yield to Maturity<sup>3</sup>** - The discount rate that equates the present value of cash flows, both principal and interest, to market price.

Data Source: <sup>1</sup>InvestorForce, <sup>2</sup>Interaction Effect Performance Attribution, <sup>3</sup>NEPC, LLC, <sup>4</sup>Investopedia, <sup>5</sup>Hedgeco.net



### **Information Disclaimer**

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

### **Reporting Methodology**

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

