

**North Carolina Retirement Systems**  
**Investment Cost Effectiveness Analysis - Summary of Results**  
For the 5 year period ending December 31, 2015



# Key takeaways

## Returns

- Your 5-year net total return was 6.4%. This was below the U.S. Public median of 7.2% and below the peer median of 7.4%.
- Your 5-year policy return was 5.7%. This was below the U.S. Public median of 7.3% and below the peer median of 7.1%.

## Value added

- Your 5-year net value added was 0.7%. This was above the U.S. Public median of 0.0% and above the peer median of 0.1%.

## Cost and cost effectiveness

- Your investment cost of 47.4 bps was below your benchmark cost of 57.2 bps. This suggests that your fund was low cost compared to your peers.
- Your fund was low cost because you paid less than peers for similar services.
- Your 5-year performance placed in the positive value added, low cost quadrant of the cost effectiveness chart.

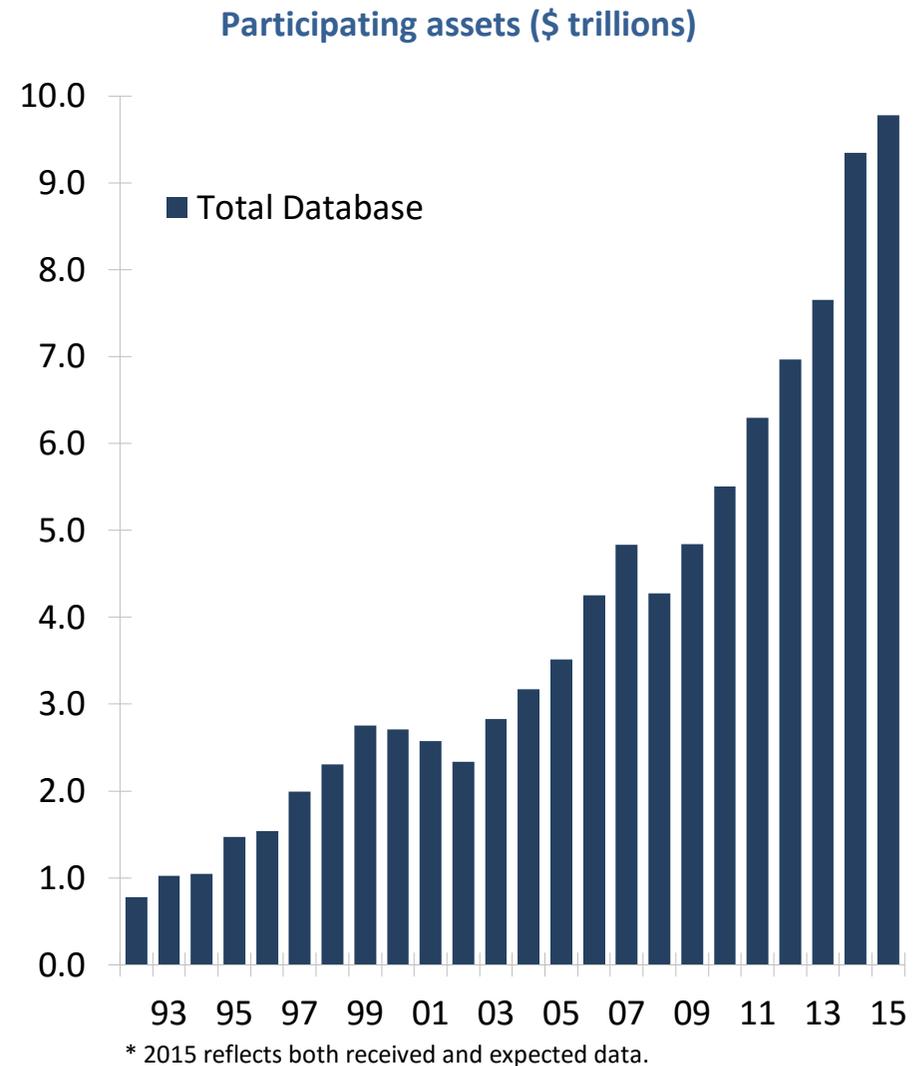
## Risk

- Your asset risk of 9.1% was below the U.S. Public median of 9.9%.

## This benchmarking report compares your cost and return performance to CEM's extensive pension database.

- 151 U.S. pension funds participate. The median U.S. fund had assets of \$7.7 billion and the average U.S. fund had assets of \$20.8 billion. Total participating U.S. assets were \$3.1 trillion.
- 70 Canadian funds participate with assets totaling \$1,165 billion.
- 50 European funds participate with aggregate assets of \$2.6 trillion. Included are funds from the Netherlands, Norway, Sweden, Finland, Ireland, Denmark and the U.K.
- 6 Asia-Pacific funds participate with aggregate assets of \$185 billion. Included are funds from Australia, New Zealand, China and South Korea.

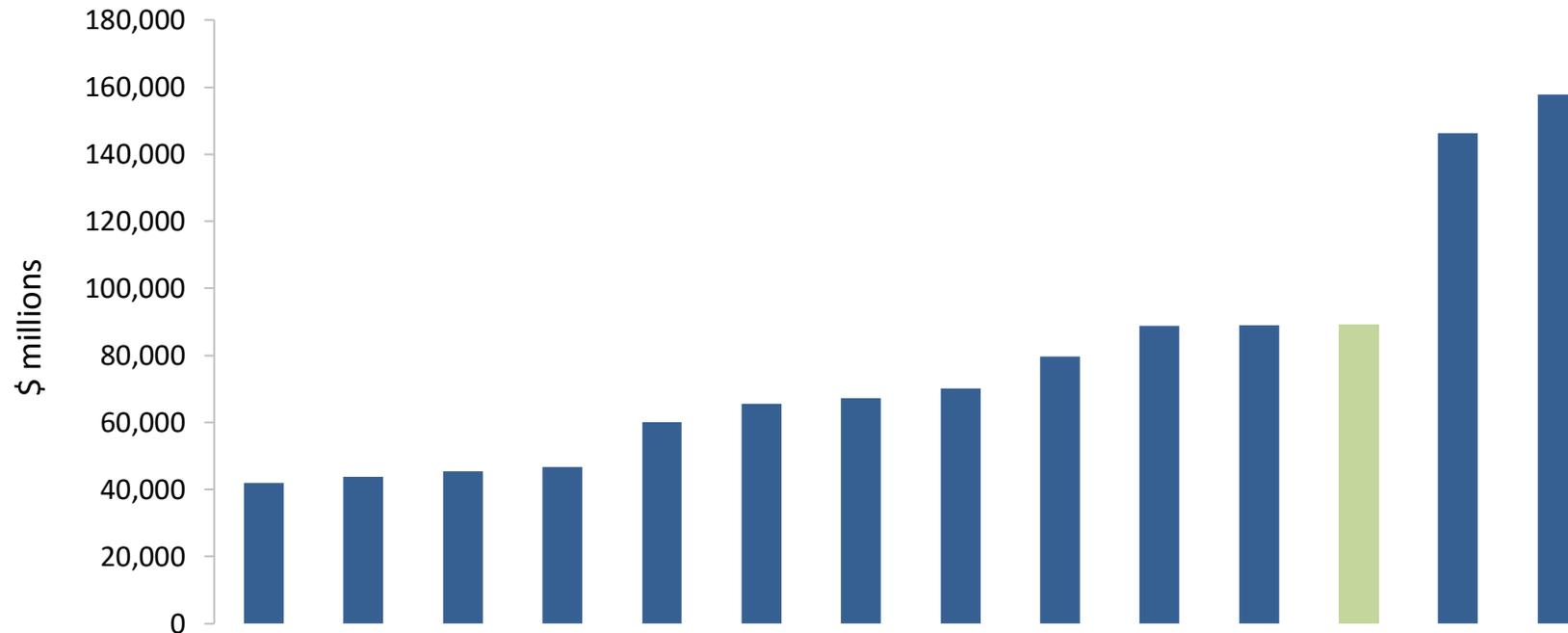
The most meaningful comparisons for your returns and value added are to the U.S. Public universe which consists of 54 funds.



# The most valuable comparisons for cost performance are to your custom peer group because size impacts costs.

## Peer group for North Carolina Retirement Systems

- 14 U.S. public sponsors from \$42 billion to \$158 billion
- Median size of \$69 billion versus your \$89 billion



To preserve client confidentiality, given potential access to documents as permitted by the Freedom of Information Act, we do not disclose your peers' names in this document.

# What gets measured gets managed, so it is critical that you measure and compare the right things:

## 1. Returns

Why do total returns differ from other funds? What was the impact of your policy mix decisions versus implementation decisions?

## 2. Net value added

Are your implementation decisions (i.e., the amount of active versus passive management) adding value?

## 3. Costs

Are your costs reasonable? Costs matter and can be managed.

## 4. Cost effectiveness

Net implementation value added versus excess cost. Does paying more get you more?

## 5. Risk

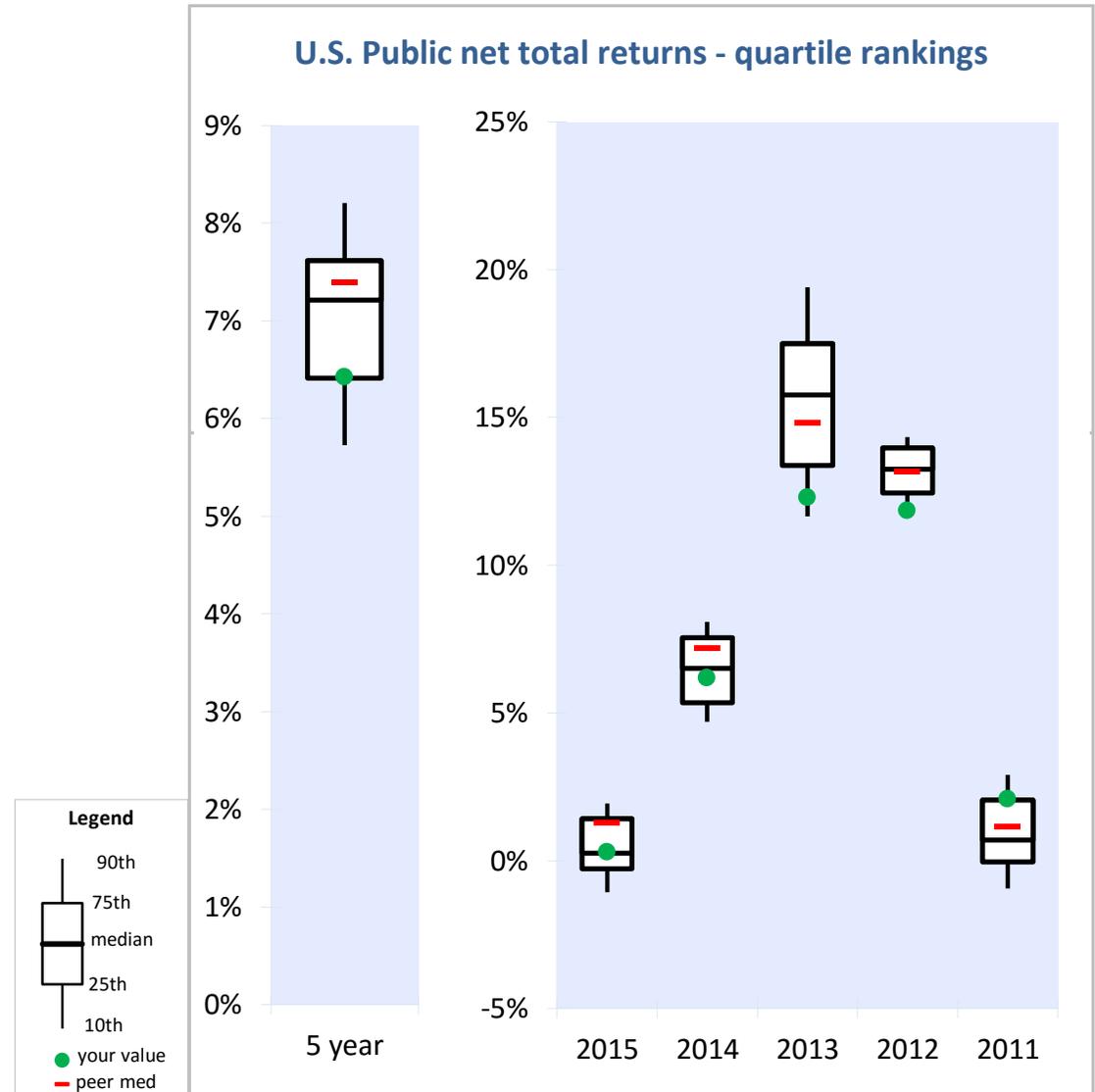
How much risk was taken to obtain your value added?  
What is the risk of your policy mix?

## Your 5-year net total return of 6.4% was below both the U.S. Public median of 7.2% and the peer median of 7.4%.

Total returns, by themselves, provide little insight into the reasons behind relative performance. Therefore, we separate total return into its more meaningful components: policy return and value added.

	Your 5-year
Net total fund return	6.4%
- Policy return	5.7%
= Net value added	0.7%

This approach enables you to understand the contribution from both policy mix decisions (which tend to be the board's responsibility) and implementation decisions (which tend to be management's responsibility).



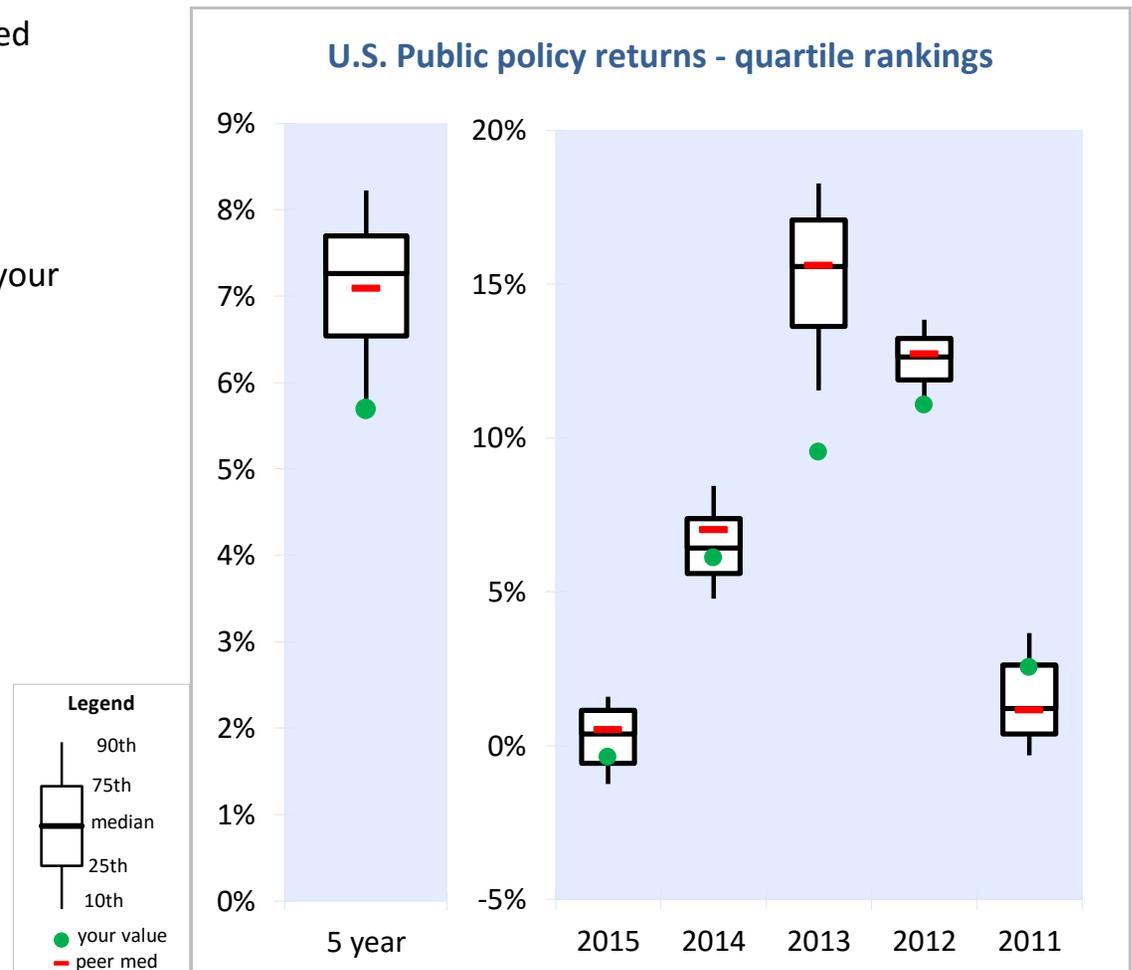
## Your 5-year policy return of 5.7% was below both the U.S. Public median of 7.3% and the peer median of 7.1%.

Your policy return is the return you could have earned passively by indexing your investments according to your policy mix.

Having a higher or lower relative policy return is not necessarily good or bad. Your policy return reflects your investment policy, which should reflect your:

- Long term capital market expectations
- Liabilities
- Appetite for risk

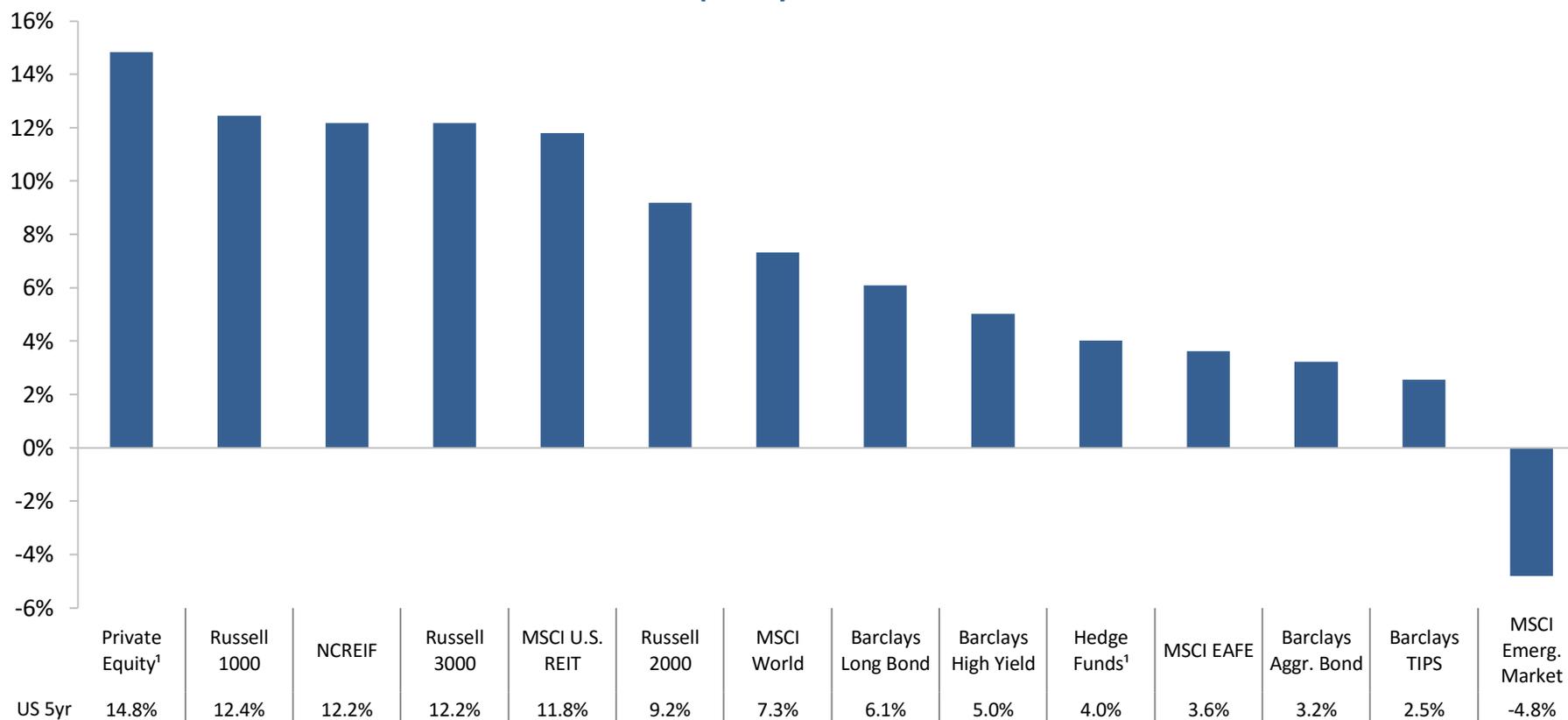
Each of these three factors is different across funds. Therefore, it is not surprising that policy returns often vary widely between funds.



To enable fairer comparisons, the policy returns of all participants except your fund were adjusted to reflect private equity benchmarks based on lagged, investable, public-market indices. If CEM used this same adjustment for your fund, your 5-year policy return would be 5.9%, 0.2% higher than your actual 5-year policy return of 5.7%. Mirroring this, your 5-year total fund net value added would be 0.2% lower. Refer to the Research section pages 6-7 for details.

Differences in policy returns are caused by differences in benchmarks and policy mix. The two best performing asset classes for the 5 years ending 2015 were private equity<sup>1</sup> and large cap stock (Russell 1000).

5-Year returns for frequently used benchmark indices



1. The private equity benchmark is the average of the default private equity benchmark returns applied to U.S. Public participants. The hedge fund benchmark is the average benchmark return reported by U.S. Public participants.

## Your 5-year policy return was below the U.S. Public median.

Your 5-year policy return of 5.7% was below the U.S. Public median of 7.3% primarily because of the negative impact of:

- Your lower weight in U.S. Stock, one of the better performing asset classes of the past 5 years. Your 5-year average weight of 20% compares to a U.S. Public average of 24%.
- Your higher weight in U.S. Bonds, one of the poorer performing asset classes. Your 5-year average weight of 32% compares to a U.S. Public average of 18%.
- Differences in choice of Private Equity benchmarks. Your 5-year average benchmark return of 12.5% compares to a U.S. Public average of 14.8%.

### 5-Year average policy mix

	Your Fund	Peer Avg.	U.S. Public Avg.
U.S. Stock	20%	20%	24%
EAFE Stock	5%	7%	6%
Emerging Market Stock	2%	2%	2%
ACWIxUS Stock	12%	6%	9%
Global Stock	2%	11%	8%
Other Stock	2%	0%	0%
<b>Total Stock</b>	<b>42%</b>	<b>47%</b>	<b>49%</b>
U.S. Bonds	32%	18%	18%
Inflation Indexed Bonds	1%	2%	2%
High Yield Bonds	0%	2%	2%
Global Bonds	0%	3%	2%
Cash	2%	1%	0%
Other Fixed Income	0%	2%	3%
<b>Total Fixed Income</b>	<b>34%</b>	<b>27%</b>	<b>27%</b>
Global TAA	1%	1%	1%
Hedge Funds	3%	3%	4%
Commodities	2%	1%	1%
Natural Resources	2%	0%	1%
Real Estate incl. REITS	8%	9%	7%
Other Real Assets	0%	1%	1%
Private Equity	8%	11%	8%
<b>Total</b>	<b>100%</b>	<b>100%</b>	<b>100%</b>

Your policy asset mix has changed over the past 5 years. At the end of 2015 your policy mix compared to your peers and the U.S. universe as follows:

Policy asset mix

Asset class	2011	Your fund	2015	
	Your fund		Peer avg.	U.S. Public avg.
U.S. Stock	21%	20%	18%	23%
EAFE Stock	6%	0%	6%	5%
Emerging Market Stock	2%	0%	2%	2%
ACWIxUS Stock	11%	19%	6%	10%
Global Stock	4%	0%	14%	9%
Other Stock	0%	3%	1%	1%
<b>Total Stock</b>	<b>43%</b>	<b>42%</b>	<b>46%</b>	<b>49%</b>
U.S. Bonds	37%	25%	18%	18%
Inflation Indexed Bonds	0%	2%	2%	3%
High Yield Bonds	0%	0%	1%	1%
Global Bonds	0%	0%	2%	2%
Cash	0%	4%	0%	-1%
Other Fixed Income	1%	0%	2%	3%
<b>Total Fixed Income</b>	<b>38%</b>	<b>31%</b>	<b>26%</b>	<b>26%</b>
Global TAA	0%	2%	1%	1%
Hedge Funds	3%	3%	4%	5%
Commodities	3%	1%	1%	1%
Natural Resources	1%	3%	0%	1%
Real Estate incl. REITS	7%	8%	10%	8%
Other Real Assets	0%	0%	1%	1%
Private Equity	6%	10%	11%	9%
<b>Total</b>	<b>100%</b>	<b>100%</b>	<b>100%</b>	<b>100%</b>

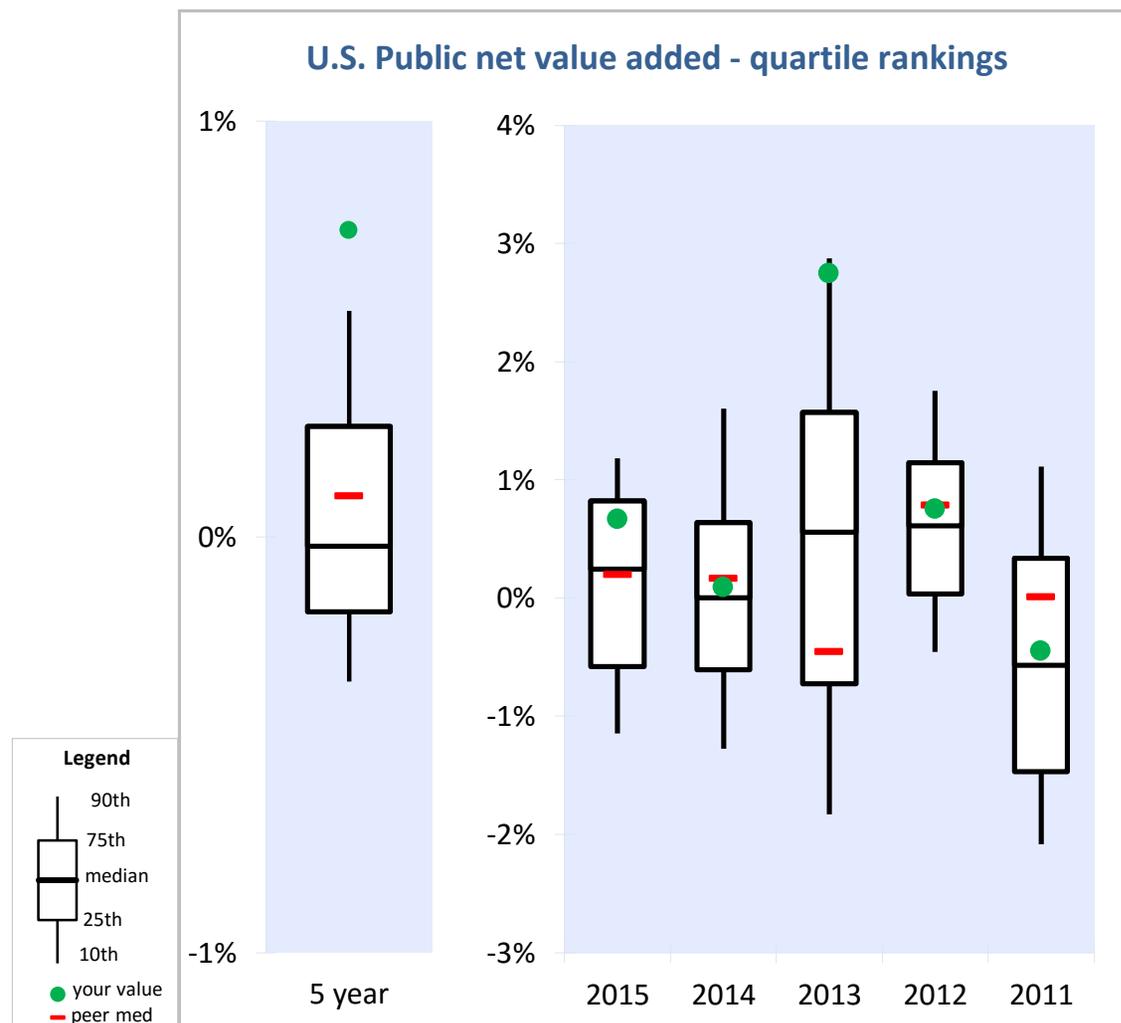
## Net value added is the component of total return from active management. Your 5-year net value added was 0.7%.

Net value added equals total net return minus policy return.

### Value added for North Carolina Retirement Systems

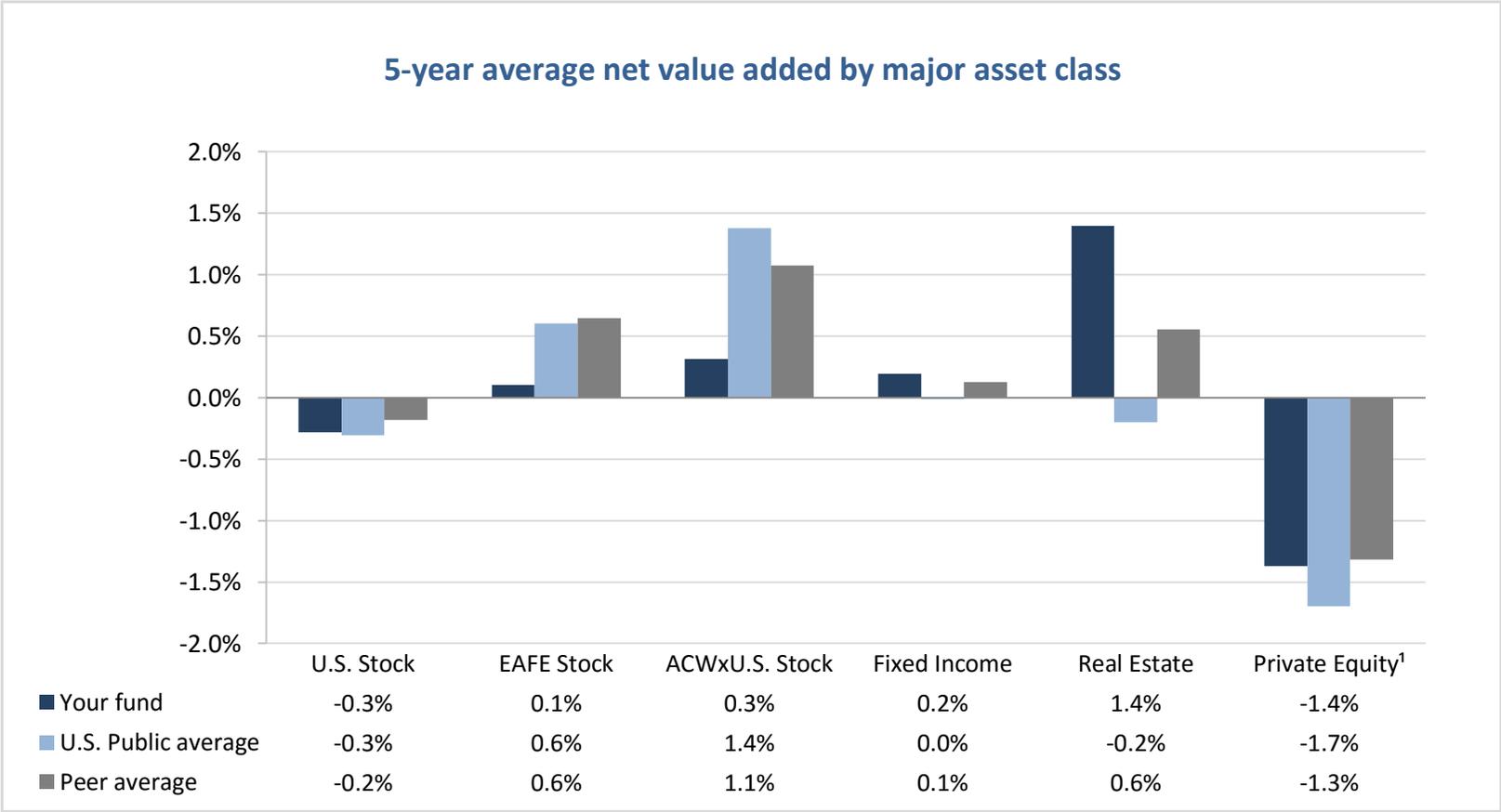
Year	Net Return	Policy Return	Net value Added
2015	0.3%	(0.4%)	0.7%
2014	6.2%	6.1%	0.1%
2013	12.3%	9.5%	2.8%
2012	11.8%	11.1%	0.8%
2011	2.1%	2.5%	(0.4%)
5-year	6.4%	5.7%	0.7%

Your 5-year net value added of 0.7% compares to a median of 0.1% for your peers and 0.0% for the U.S. Public universe.



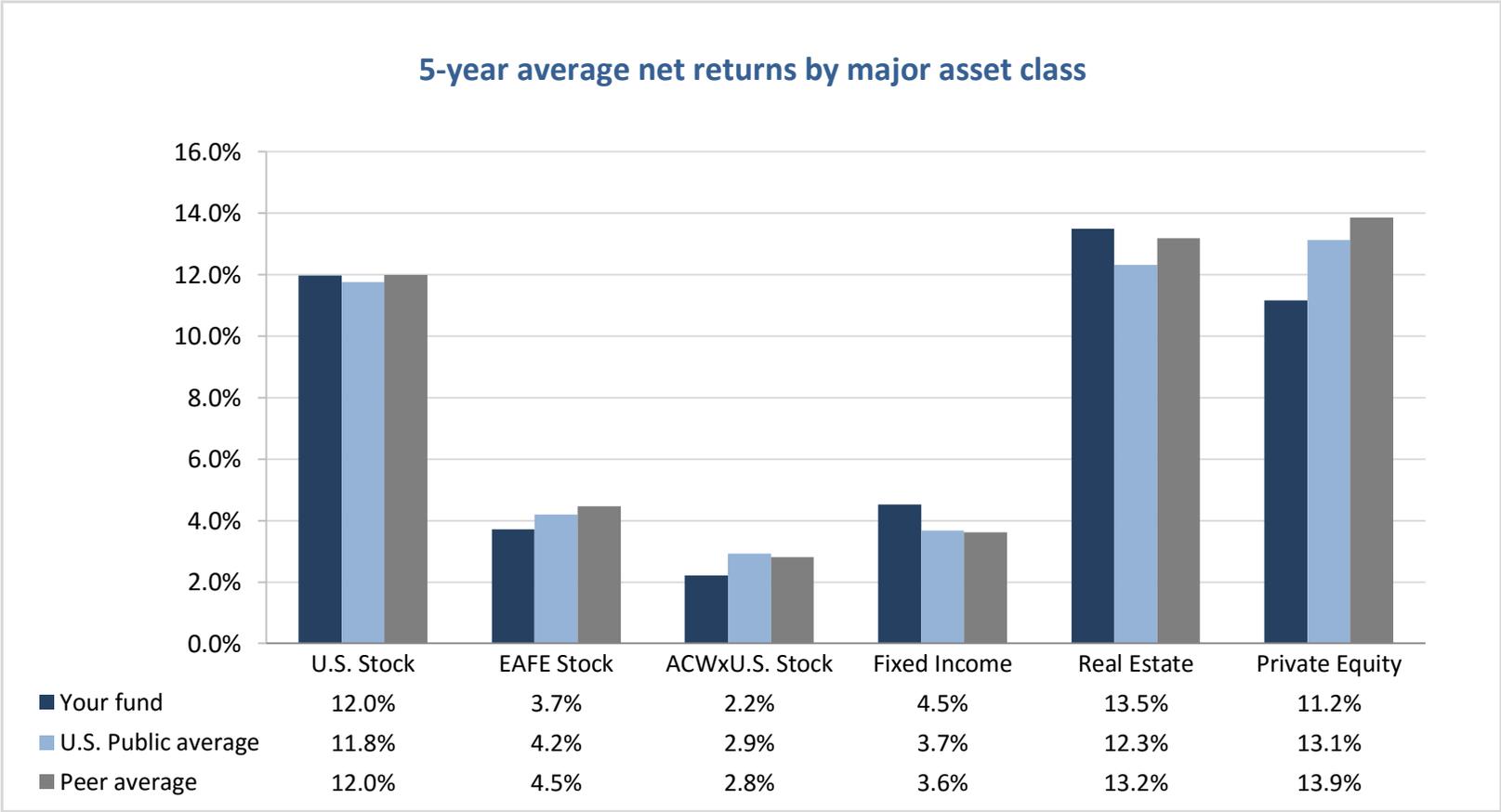
Your value added was impacted by your choice of benchmarks for private equity. CEM suggests using lagged, investable benchmarks for private equity (see Research section, pages 6-7, for reasons why). If your fund used the private equity benchmark suggested by CEM, your 5-year total fund value added would have been 0.2% lower.

# You had positive 5-year net value added in EAFE Stock, ACWxU.S. Stock, Fixed Income and Real Estate.



1. To enable fairer comparisons, the private equity benchmarks of all participants, except your fund, were adjusted to reflect lagged, investable, public-market indices. If your fund used the private equity benchmark suggested by CEM, your fund's 5-year private equity net value added would have been -4.4%. Refer to the Research section, pages 6-7, for details as to why this adjustment makes for better comparisons. It is also useful to compare total returns. Your 5-year total return of 11.2% for private equity was below the U.S. average of 13.1%.

# You had higher 5-year net returns in U.S. Stock, Fixed Income and Real Estate relative to the U.S. Public average.



## Your investment costs were \$422.2 million or 47.4 basis points in 2015.

Asset management costs by asset class and style (\$000s)	Internal Mgmt		External Management			Total
	Active	Overseeing of external	Passive fees	Active base fees	Perform. fees <sup>1</sup>	
U.S. Stock - Large Cap		1,246	759	27,362		29,367
U.S. Stock - Mid Cap		250	50	5,943		6,243
U.S. Stock - Small Cap		282		8,029		8,311
Stock - EAFE		770		10,790		11,560
Stock - Emerging		411		12,712		13,123
Stock - ACWIxU.S.		1,127	1,640	18,136		20,902
Stock - Global		565		11,135		11,699
Stock - Other		15				15
Fixed Income - U.S.	3,542					3,542
Fixed Income - Inflation Indexed		166	63			229
Fixed Income - Other		5		33	1,075	1,114
Cash	605					605
Global TAA		783		1,941		2,724
Hedge Funds - Direct		841		33,703	1,021	35,565
Hedge Funds - Fund of Funds		486		23,498	8,943	32,927
Commodities		420		4,569		4,988
REITs		196		2,837	58	3,092
Real Estate		968		22,065	1,040 <sup>1</sup>	23,032
Real Estate - LPs		1,212		51,817	115,358 <sup>1</sup>	53,029
Infrastructure - LPs		125		6,105	138 <sup>1</sup>	6,230
Natural Resources - LPs		971		41,930	1,360 <sup>1</sup>	42,900
Diversified Private Equity		925		35,114	16,856 <sup>1</sup>	36,039
Diversified Priv. Eq. - Fund of Funds		608		22,064	808 <sup>1</sup>	22,672
Diversified Priv. Eq. - Co-investments		20		899		919
LBO		908		31,274	26,360 <sup>1</sup>	32,182
Venture Capital		482		15,747	10,583 <sup>1</sup>	16,230
Total excluding private asset performance fees						419,240 47.1bp
<b>Oversight, custodial and other costs <sup>2</sup></b>						
Oversight of the fund						1,363
Trustee & custodial						1,550
Consulting and performance measurement						
Total oversight, custodial & other costs						2,913 0.3bp
Total investment costs (excl. transaction costs & private asset performance fees)						422,153 47.4bp

### Footnotes

<sup>1</sup> Total cost excludes carry/performance fees for real estate, infrastructure, natural resources and private equity. Performance fees are included for the public market asset classes and hedge funds.

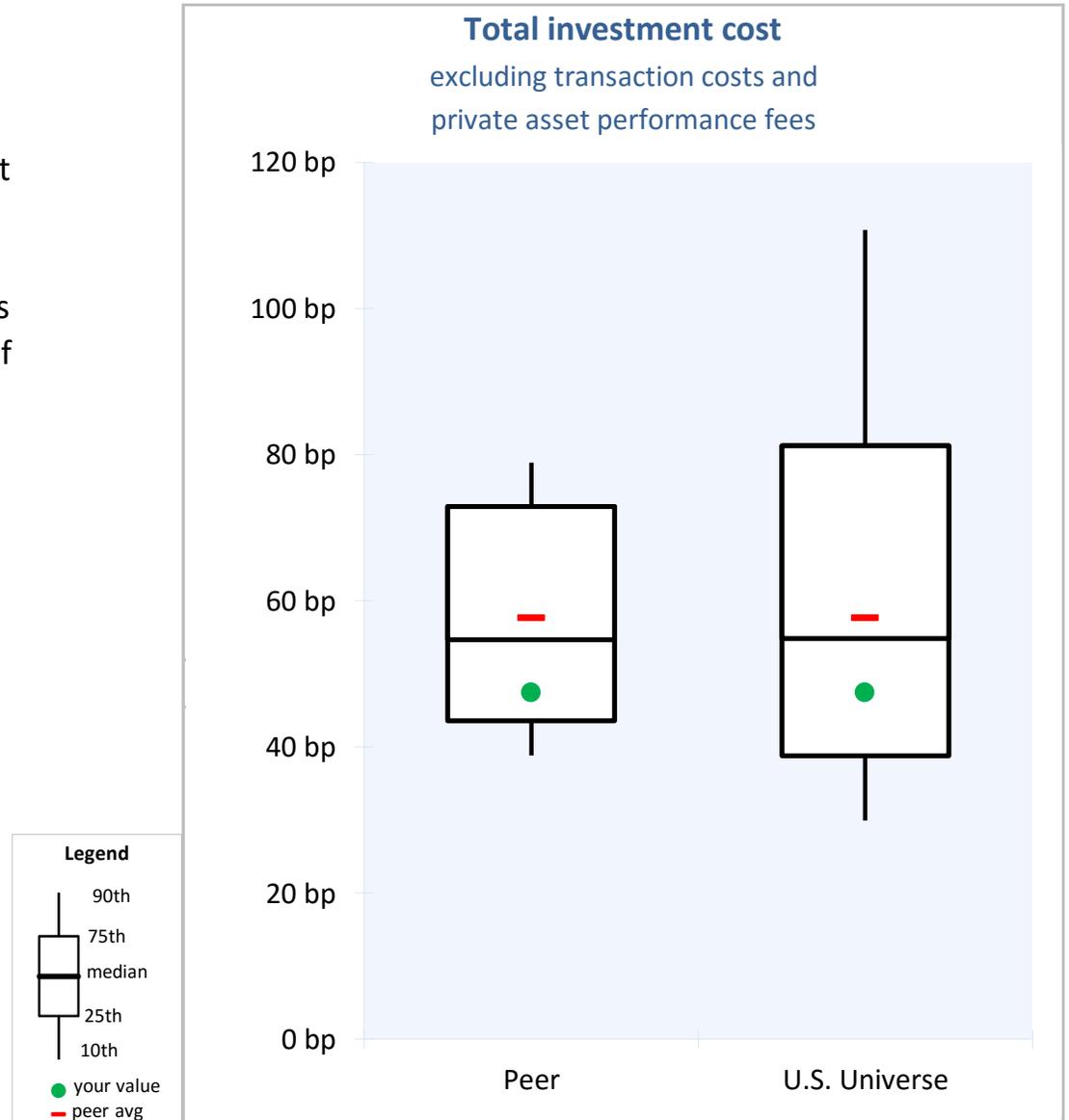
<sup>2</sup> Excludes non-investment costs, such as PBGC premiums and preparing checks for retirees.

## Your total investment cost of 47.4 bps was below the peer median of 54.7 bps.

Differences in total investment cost are often caused by two factors that are often outside of management's control:

- Asset mix, particularly holdings of the highest cost asset classes: real estate (excl REITS), infrastructure, hedge funds and private equity. These high cost assets equaled 23% of your fund's assets at the end of 2015 versus a peer average of 26%.
- Fund size. Bigger funds have advantages of scale.

Therefore, to assess whether your costs are high or low given your unique asset mix and size, CEM calculates a benchmark cost for your fund. This analysis is shown on the following page.



## Benchmark cost analysis suggests that, after adjusting for fund size and asset mix, your fund was low cost by 9.7 basis points in 2015.

Your benchmark cost is an estimate of what your cost would be given your actual asset mix and the median costs that your peers pay for similar services. It represents the cost your peers would incur if they had your actual asset mix.

Your total cost of 47.4 bp was below your benchmark cost of 57.2 bp. Thus, your cost savings was 9.7 bp.

### Your cost versus benchmark

	\$000s	basis points
Your total investment cost	422,153	47.4 bp
Your benchmark cost	508,908	57.2 bp
Your excess cost	(86,755)	(9.7) bp

## Your fund was low cost because you paid less than peers for similar services.

### Reasons for your low cost status

	Excess Cost/ (Savings)	
	\$000s	bps
1. Higher cost implementation style		
• More fund of funds	7,302	0.8
• Use of external active management (vs. lower cost passive and internal)	14,226	1.6
• Less overlays	(1,287)	(0.1)
• Other style differences	(1,734)	(0.2)
	<u>18,506</u>	<u>2.1</u>
2. Paying less than peers for similar services		
• External investment management costs	(95,161)	(10.7)
• Internal investment management costs	(2,377)	(0.3)
• Oversight, custodial & other costs	(7,722)	(0.9)
	<u>(105,261)</u>	<u>(11.8)</u>
<b>Total savings</b>	<b>(86,755)</b>	<b>(9.7)</b>

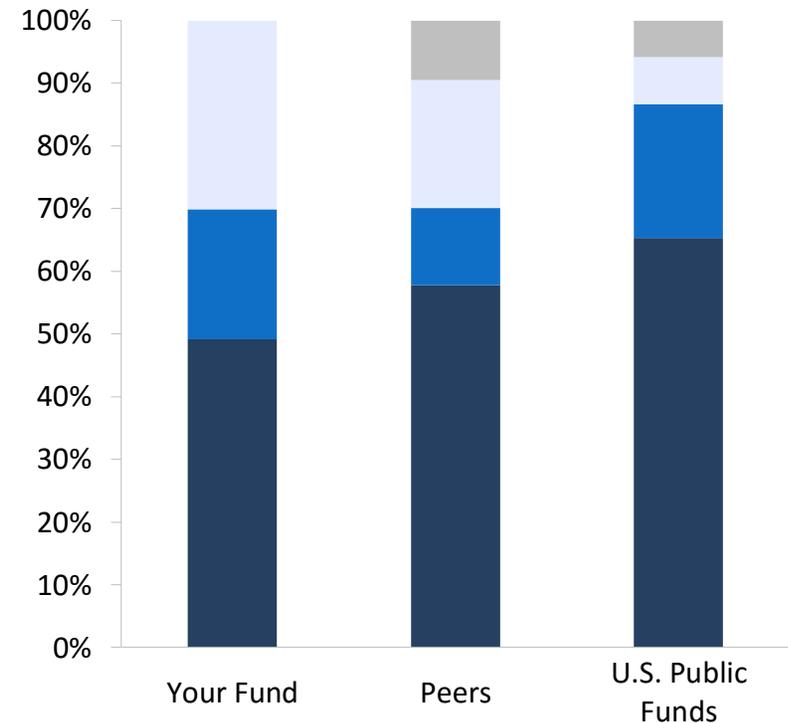
## Differences in cost performance are often caused by differences in implementation style.

Implementation style is defined as the way in which your fund implements asset allocation. It includes internal, external, active, passive and fund of funds styles.

The greatest cost impact is usually caused by differences in the use of:

- External active management because it tends to be much more expensive than internal or passive management. You used less external active management than your peers (your 49% versus 58% for your peers).
- Within external active holdings, fund of funds usage because it is more expensive than direct fund investment. You had more in fund of funds. Your 10% of hedge funds, real estate and private equity in fund of funds compared to 6% for your peers.

Implementation style<sup>1</sup>



■ Internal passive	0%	10%	6%
■ Internal active	30%	20%	8%
■ External passive	21%	12%	21%
■ External active	49%	58%	65%

1. The graph above does not take into consideration the impact of derivatives.

## Differences in implementation style cost you 2.1 bp relative to your peers.

### Calculation of the cost impact of differences in implementation style

Asset class	Your avg holdings in \$mils (A)	% External active			Premium vs passive & internal <sup>1</sup> (C)	Cost/ (savings)	
		You	Peer average	More/ (less) (B)		\$000s (A X B X C)	bps
U.S. Stock - Large Cap	14,408	31.8%	15.4%	16.4%	22.5 bp	5,298	
U.S. Stock - Mid Cap	1,812	59.5%	51.4%	8.0%	51.4 bp	749	
U.S. Stock - Small Cap	1,320	100.0%	59.6%	40.4%	56.6 bp	3,019	
Stock - EAFE	3,713	96.8%	52.8%	44.0%	35.4 bp	5,793	
Stock - Emerging	1,927	100.0%	69.4%	30.6%	46.0 bp	2,712	
Stock - ACWIxU.S.	11,174	39.5%	67.4%	(27.9%)	41.2 bp	(12,840)	
Stock - Global	2,648	100.0%	75.3%	24.7%	31.5 bp	2,057	
Stock - Other	528	0.5%	0.1%	0.4%	36.3 bp	8	
Fixed Income - U.S.	22,874	0.0%	33.6%	(33.6%)	11.3 bp	(8,636)	
Fixed Income - Inflation Indexed	498	0.0%	32.8%	(32.8%)	11.0 bp	(180)	
Fixed Income - Other	34	100.0%	93.2%	6.8%	9.7 bp	2	
Global TAA	1,397	100.0%	92.7%	7.3%	Insufficient <sup>2</sup>	0	
Commodities	1,262	100.0%	84.8%	15.2%	Insufficient <sup>2</sup>	0	
REITs	608	100.0%	73.4%	26.6%	Insufficient <sup>2</sup>	0	
Infrastructure*	600	100.0%	100.0%	0.0%		0	
Partnerships, as a proportion of external:	600	100.0%	78.8%	21.2%	Insufficient <sup>2</sup>	0	
Real Estate ex-REITs*	8,705	100.0%	90.9%	9.1%	54.4 bp	4,290	
Partnerships, as a proportion of external:	8,705	66.5%	52.3%	14.2%	39.6 bp	4,912	
Natural Resources*	5,126	100.0%	97.2%	2.8%	Insufficient <sup>2</sup>	0	
Partnerships, as a proportion of external:	5,126	100.0%	66.5%	33.5%	41.0 bp	7,041	
Diversified Private Equity*	4,175	100.0%	99.9%	0.1%	Insufficient <sup>2</sup>	0	
LBO*	2,350	100.0%	100.0%	0.0%		0	
Venture Capital*	998	100.0%	100.0%	0.0%		0	
Impact of less/more external active vs. lower cost styles						14,226	1.6 bp
					<u>Fund of funds % of LPs vs. direct LP<sup>1</sup></u>		
Hedge Funds	4,755	28.4%	16.9%	11.5%	45.8 bp	2,504	
Infrastructure - LPs*	600	0.0%	8.5%	(8.5%)	Insufficient <sup>2</sup>	0	
Real Estate ex-REITs - LPs*	5,791	0.0%	0.0%	0.0%		0	
Natural Resources - LPs*	5,126	0.0%	0.0%	0.0%		0	
Diversified Private Equity - LPs*	4,175	21.9%	4.9%	17.0%	88.2 bp	6,249	
LBO - LPs*	2,350	0.0%	4.9%	(4.9%)	88.2 bp	(1,019)	
Venture Capital - LPs*	998	0.0%	4.9%	(4.9%)	88.2 bp	(433)	
Impact of less/more fund of funds vs. direct LPs						7,302	0.8 bp
					<u>Overlays and other</u>		
Impact of lower use of portfolio level overlays						(1,287)	(0.1) bp
Impact of mix of internal passive, internal active, and external passive <sup>3</sup>						(1,734)	(0.2) bp
Total impact of differences in implementation style						18,506	2.1 bp

#### Footnotes

1. The cost premium is the additional cost of external active management relative to the average of other lower cost implementation styles - internal passive, internal active and external passive.

2. A cost premium listed as 'Insufficient' indicates that there was not enough peer data to calculate the premium.

3. The 'Impact of mix of internal passive, internal active and external passive' quantifies the net cost impact of differences in cost between, and your relative use of, these 'low-cost' styles.

\* The amount fees are based on is used for this asset class and not NAV.

# The net impact of paying more/less for external asset management costs saved 10.7 bps.

## Cost impact of paying more/(less) for external asset management

	Your avg holdings in \$mils (A)	Cost in bps			Cost/ (savings) in \$000s (A X B)
		Your Fund	Peer median	More/ (less) (B)	
U.S. Stock - Large Cap - Passive	9,828	1.0	1.0	0.0	0
U.S. Stock - Large Cap - Active	4,580	61.9	25.5	36.4	16,663
U.S. Stock - Mid Cap - Passive	734	1.0	3.6*	(2.7)	(195)
U.S. Stock - Mid Cap - Active	1,078	57.3	55.1*	2.2	238
U.S. Stock - Small Cap - Active	1,320	63.0	60.3	2.7	355
Stock - EAFE - Passive	117	0.3	1.8	(1.5)	(18)
Stock - EAFE - Active	3,596	32.1	37.3	(5.2)	(1,859)
Stock - Emerging - Active	1,927	68.1	56.3	11.7	2,263
Stock - ACWIxU.S. - Passive	6,760	2.7	2.9	(0.2)	(162)
Stock - ACWIxU.S. - Active	4,414	43.2	44.1	(0.9)	(404)
Stock - Global - Active	2,648	44.2	36.8	7.4	1,949
Stock - Other - Passive	525	0.3	5.0*	(4.8)	(250)
Stock - Other - Active	3	2.1	41.3*	(39.2)	(10)
Fixed Income - Inflation Indexed - Passive	498	4.6	1.1	3.5	174
Fixed Income - Other - Active	34	331.9 <sup>1</sup>	43.8	288.1	967
Global TAA - Active	1,397	19.5	38.0	(18.5)	(2,591)
Hedge Funds - Active***	3,403	104.5 <sup>1</sup>	242.8	(138.3)	(47,085)
Hedge Funds - Fund of Fund***	1,351	243.7 <sup>1</sup>	288.6	(44.9)	(6,072)
Commodities - Active	1,262	39.5	71.3	(31.7)	(4,004)
Infrastructure - Limited Partnership**	600	103.8	156.5	(52.6)	(3,159)
REITs - Active	608	50.8 <sup>1</sup>	41.1	9.7	593
Real Estate ex-REITs - Active**	2,914	79.0 <sup>1</sup>	64.6	14.5	4,217
Real Estate ex-REITs - Limited Partnership**	5,791	91.6 <sup>1</sup>	104.2	(12.6)	(7,301)
Natural Resources - Limited Partnership**	5,126	83.7	144.5	(60.8)	(31,146)
Diversified Private Equity - Active**	3,262	113.3 <sup>1</sup>	149.3	(36.0)	(11,735)
Diversified Private Equity - Fund of Fund**	913	248.2 <sup>1</sup>	237.5	10.7	979
LBO - Active**	2,350	136.9 <sup>1</sup>	152.2	(15.3)	(3,597)
Venture Capital - Active**	998	162.6 <sup>1</sup>	202.4	(39.8)	(3,974)
Total impact of paying more/less for external management					(95,161)
Total in bps					(10.7) bp

\*Universe median used as peer data was insufficient.

<sup>1</sup> You paid performance fees in these asset classes.

\*\* The amount fees are based on is used for this asset class and not the NAV.

\*\*\* Your base fees for direct hedge funds were 99bps compared to a peer median of 141bps and your performance fees were 3bps compared to a peer median of 89bps.

For fund of funds hedge funds your top layer base fees were 74bps versus the peer median of 67bps, top layer performance fees were both about 3bps. The underlying base fees were 100 bps versus the peer median of 141bps and performance fees were 63bps versus a peer median of 89bps.

## The net impact of paying more/less for internal asset management costs saved 0.3 bps.

### Cost impact of paying more/(less) for internal asset management

	Your avg holdings in \$mils (A)	Cost in bps			Cost/ (savings) in \$000s (A X B)
		Your Fund	Peer median	More/ (less) (B)	
Fixed Income - U.S. - Active	22,874	1.5	2.6	(1.0)	(2,377)
Total impact of paying more/less for internal management					(2,377)
Total in bps					(0.3) bp

## The net impact of differences in oversight, custodial & other costs saved 0.9 bps.

### Cost impact of differences in oversight, custodial & other costs

	Your avg holdings in \$mils (A)	Cost in bps			Cost/ (savings) in \$000s (A X B)
		Your fund	Peer median	More/ (less) (B)	
Oversight	89,015	0.2	0.5	(0.4)	(3,454)
Consulting	89,015	0.0	0.2	(0.2)	(2,225)
Custodial	89,015	0.2	0.3	(0.1)	(946)
Audit	89,015	0.0	0.0	(0.0)	(196)
Other	89,015	0.0	0.1	(0.1)	(903)
<b>Total</b>					<b>(7,722)</b>
<b>Total in bps</b>					<b>(0.9) bp</b>

**In summary, your fund was low cost because you paid less than peers for similar services.**

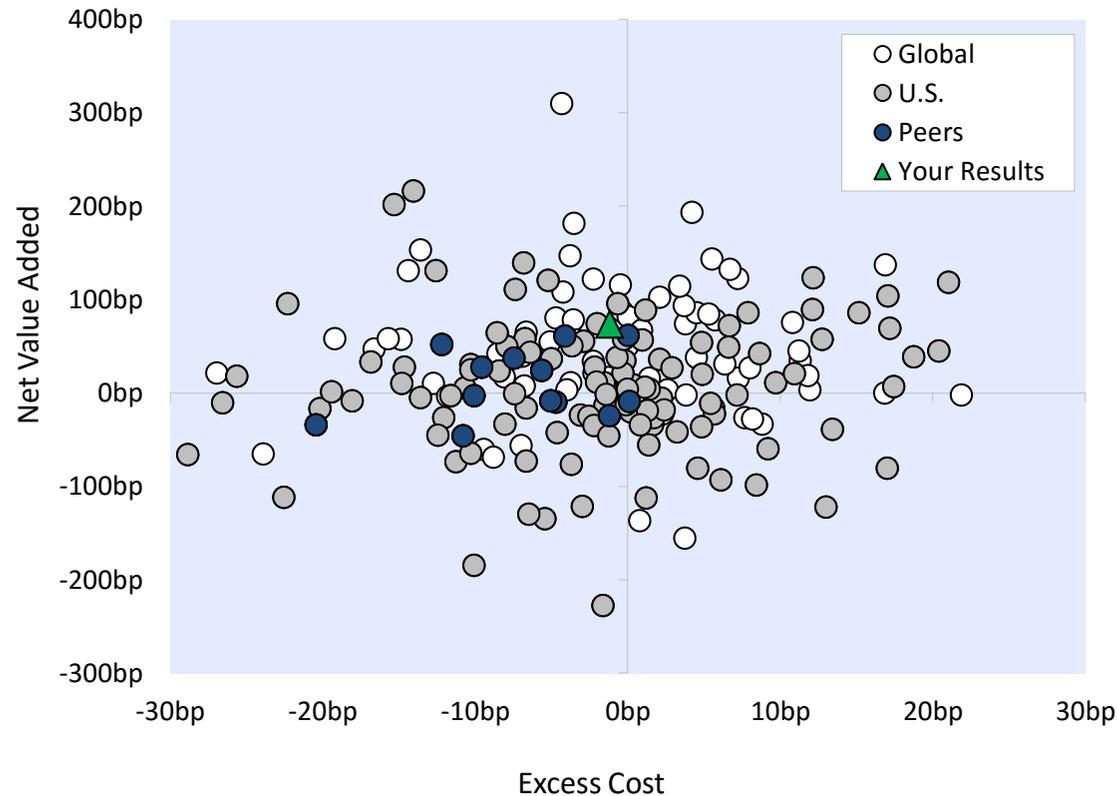
**Reasons for your low cost status**

	Excess Cost/ (Savings)	
	\$000s	bps
1. Higher cost implementation style		
• More fund of funds	7,302	0.8
• Use of external active management (vs. lower cost passive and internal)	14,226	1.6
• Less overlays	(1,287)	(0.1)
• Other style differences	(1,734)	(0.2)
	<u>18,506</u>	<u>2.1</u>
2. Paying less than peers for similar services		
• External investment management costs	(95,161)	(10.7)
• Internal investment management costs	(2,377)	(0.3)
• Oversight, custodial & other costs	(7,722)	(0.9)
	<u>(105,261)</u>	<u>(11.8)</u>
<b>Total savings</b>	<b>(86,755)</b>	<b>(9.7)</b>

# Your 5-year performance placed in the positive value added, low cost quadrant of the cost effectiveness chart.

## 5-Year net value added versus excess cost

(Your 5-year: net value added 73.6 bps, cost savings 1.2 bps <sup>1</sup>)

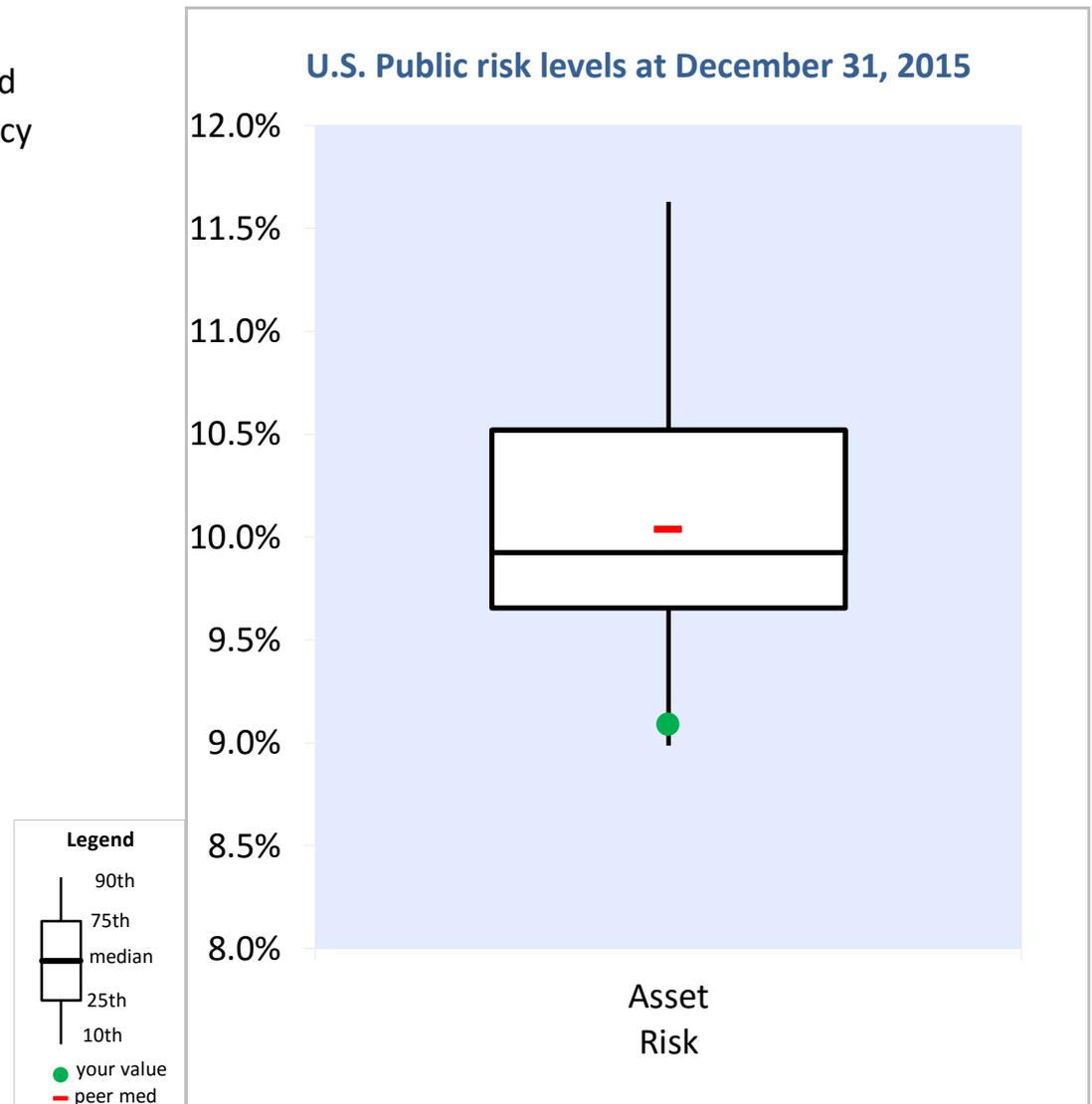


	2015	2014	2013	2012	2011	5-year
Net value added	66.6 bp	9.0 bp	275.0 bp	75.3 bp	-44.7 bp	73.6 bp
Excess Cost	-9.7 bp	-1.5 bp	2.6 bp	4.0 bp	n/a	-1.2 bp

1. Your 5-year cost savings of -1.2 basis points is the average of your excess cost for the past 4 years because a peer-based benchmark was not calculated for your fund in 2011.

## Your asset risk of 9.1% was below the U.S. Public median of 9.9%.

Asset risk is the standard deviation of your policy return. It is based on the historical variance of, and covariance between, the asset classes in your policy mix.



# Key takeaways

## Returns

- Your 5-year net total return was 6.4%. This was below the U.S. Public median of 7.2% and below the peer median of 7.4%.
- Your 5-year policy return was 5.7%. This was below the U.S. Public median of 7.3% and below the peer median of 7.1%.

## Value added

- Your 5-year net value added was 0.7%. This was above the U.S. Public median of 0.0% and above the peer median of 0.1%.

## Cost and cost effectiveness

- Your investment cost of 47.4 bps was below your benchmark cost of 57.2 bps. This suggests that your fund was low cost compared to your peers.
- Your fund was low cost because you paid less than peers for similar services.
- Your 5-year performance placed in the positive value added, low cost quadrant of the cost effectiveness chart.

## Risk

- Your asset risk of 9.1% was below the U.S. Public median of 9.9%.

# 2

## Research and Trends

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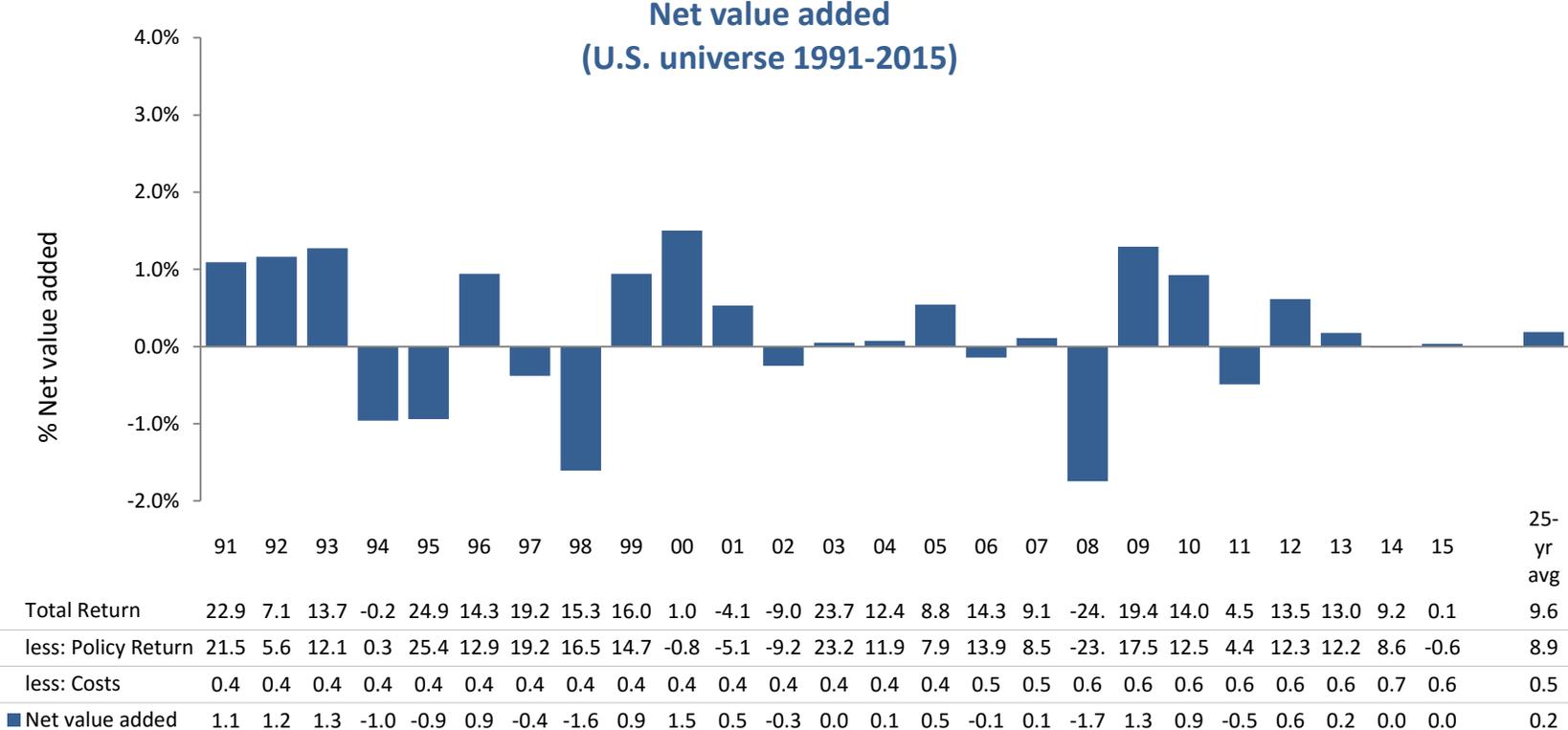
## The region with the highest net value added was Europe.

### Value added by region<sup>1</sup> (period ending December 31, 2015)

	All funds	U.S. funds	Canadian funds	European funds	Asia-Pacific funds
	25-year average <sup>3</sup>	25-year average <sup>3</sup>	25-year average <sup>3</sup>	22-year <sup>2</sup> average <sup>3</sup>	16-year <sup>2</sup> average <sup>3</sup>
Total return	8.93%	9.55%	7.93%	7.02%	7.94%
- Policy return	8.33%	8.89%	7.40%	6.27%	7.61%
- <u>Costs</u>	<u>0.42%</u>	<u>0.47%</u>	<u>0.37%</u>	<u>0.30%</u>	<u>0.48%</u>
= Net value added	0.17%	0.19%	0.16%	0.44%	-0.15%
# of annual observations	7,658	4,244	2,358	922	118
Median fund size (\$ billion)	6.7	8.0	2.9	16.6	29.2

1. Only regions with more than four participating funds are separately disclosed. Funds from regions with fewer than four participating funds are included in Global/ All Funds.
2. The shorter time periods for European and Asia-Pacific funds reflect the dates that CEM started collecting data in those regions.
3. Averages are the arithmetic average of annual averages.

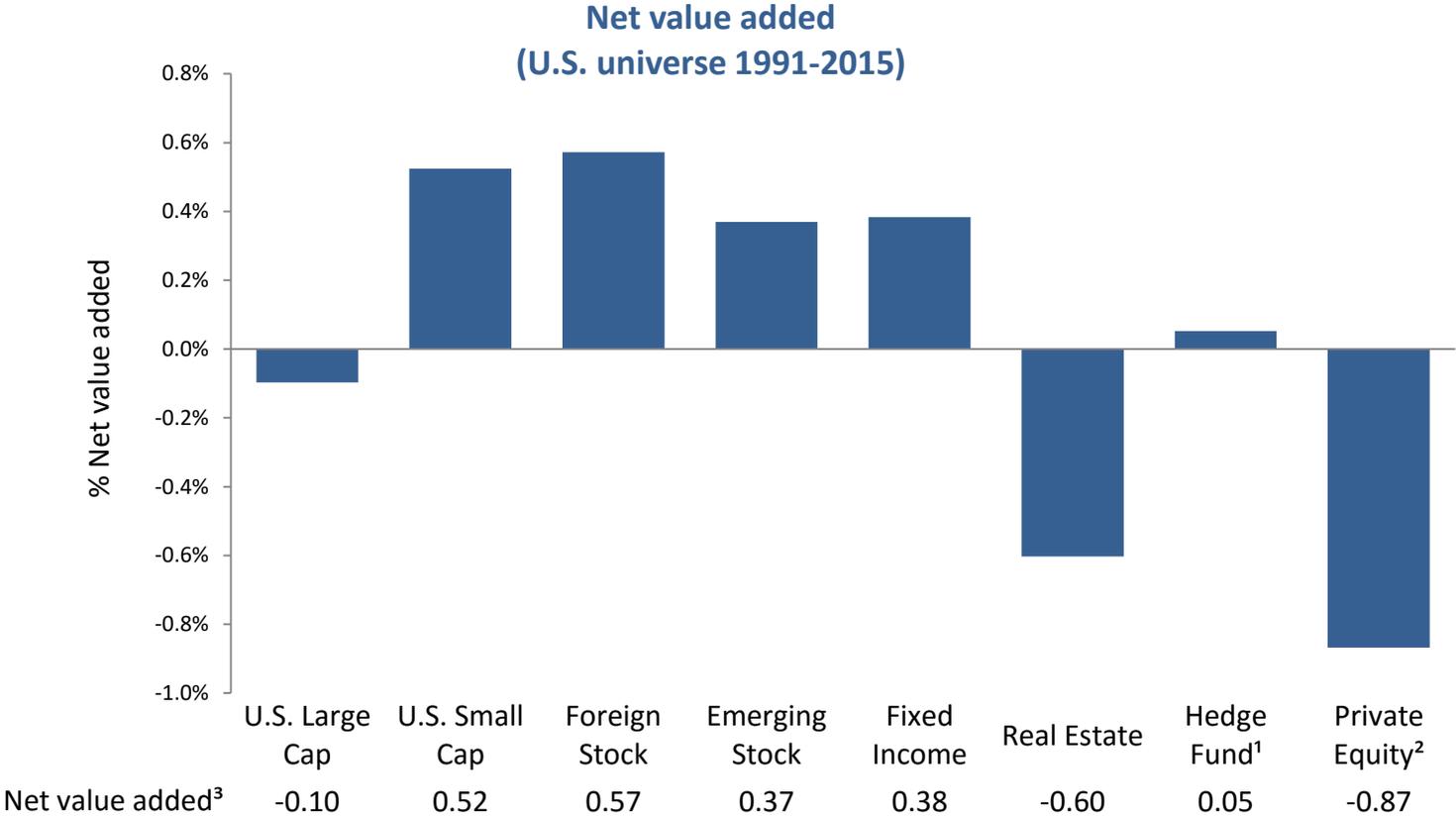
# In the U.S., net value added averaged 0.2% over the past 25 years ending 2015.



Total Return	22.9	7.1	13.7	-0.2	24.9	14.3	19.2	15.3	16.0	1.0	-4.1	-9.0	23.7	12.4	8.8	14.3	9.1	-24.	19.4	14.0	4.5	13.5	13.0	9.2	0.1	9.6
less: Policy Return	21.5	5.6	12.1	0.3	25.4	12.9	19.2	16.5	14.7	-0.8	-5.1	-9.2	23.2	11.9	7.9	13.9	8.5	-23.	17.5	12.5	4.4	12.3	12.2	8.6	-0.6	8.9
less: Costs	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.5	0.5	0.6	0.6	0.6	0.6	0.6	0.6	0.7	0.6	0.5
■ Net value added	1.1	1.2	1.3	-1.0	-0.9	0.9	-0.4	-1.6	0.9	1.5	0.5	-0.3	0.0	0.1	0.5	-0.1	0.1	-1.7	1.3	0.9	-0.5	0.6	0.2	0.0	0.0	0.2

Value added analysis is based on 4,244 annual fund total performance observations from the CEM U.S. universe for the 25-year period ending 2015. The 25-year average is an arithmetic average of the annual averages.

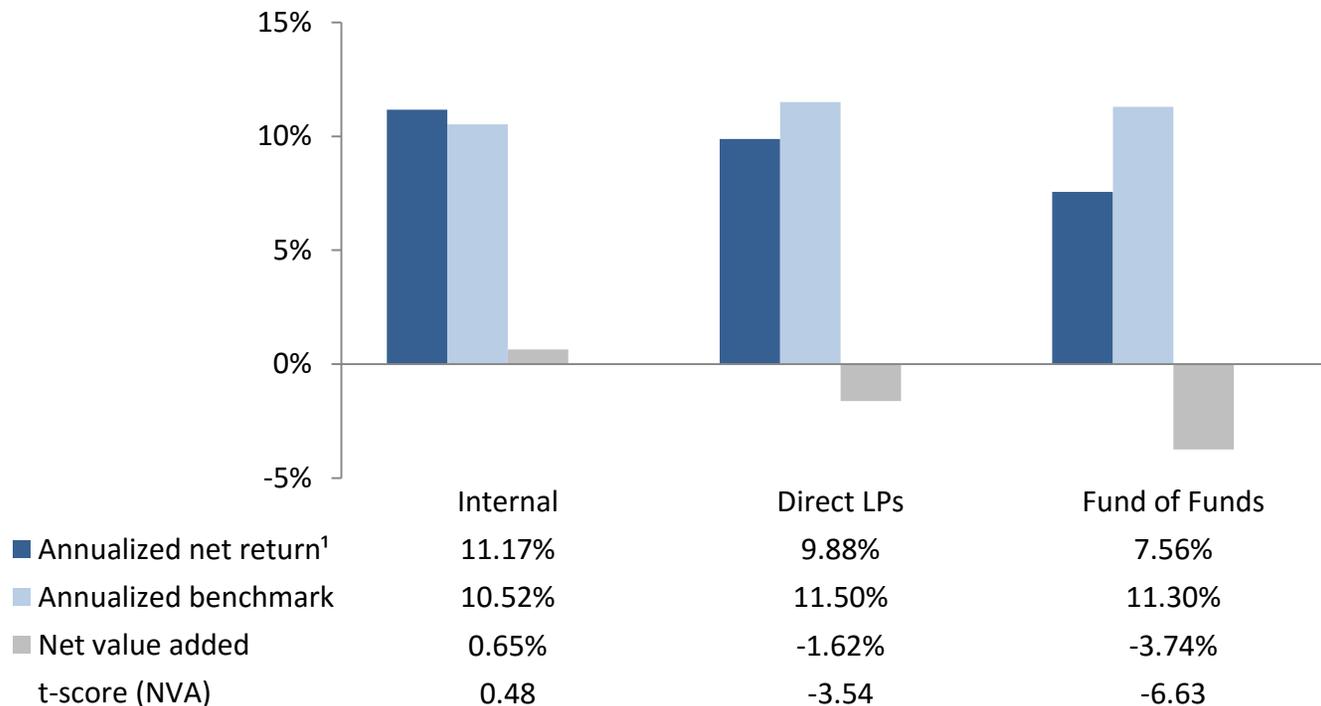
# The asset class that had the highest net value added in the U.S. universe over the past 25 years was Foreign Stock.



1. Hedge Fund gross value added performance reflect data for the 16 year period from 2000 to 2015.  
 2. The net value added calculation for private equity uses the average benchmark of all U.S. participants.  
 3. Value added analysis is from 4,244 annual fund performance observations from the CEM U.S. universe for the 25-year period ending 2015. Value added reflects the asset weighted value added of all mandates in each asset category including indexed holdings. Averages shown above are the arithmetic average of the annual averages of all observations of funds with holdings in the asset category for each year.

## Costs matter - Lower cost internal investment in private equity outperformed direct LPs. Direct LPs outperformed fund of funds.

Private equity net returns and value added<sup>1</sup> (1996-2015)



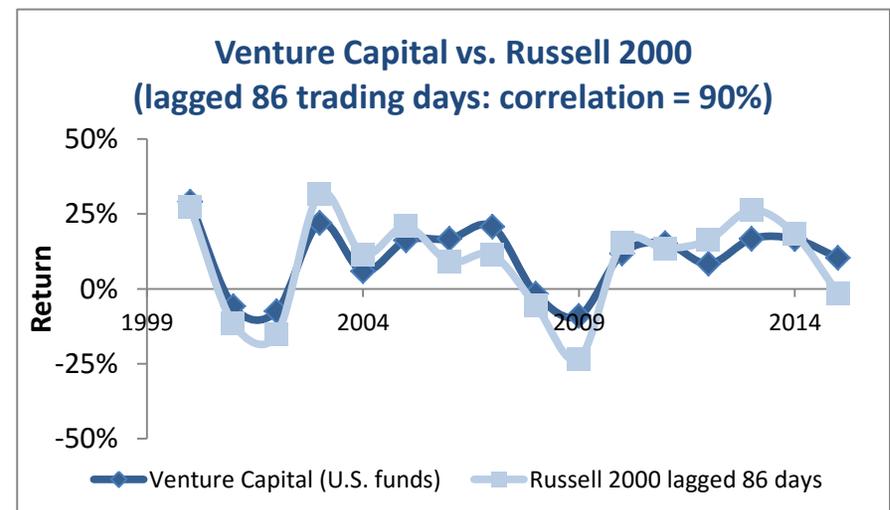
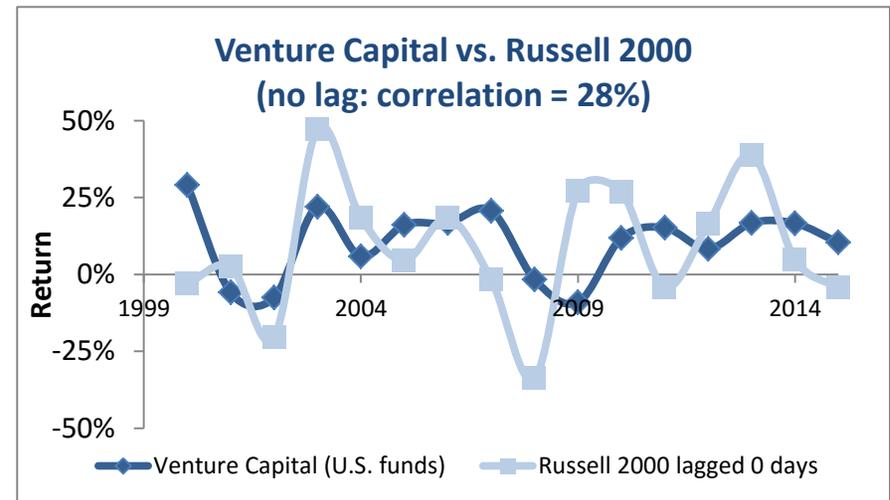
1. Private equity performance by investment style research was updated on July 1 2016. Net value added has dropped by a significant margin since the original research which covered 1996-2012 due to the 2013 bull market in small cap equities which is the basis of the benchmark.

2. To compare the performance of private equity implementation styles over long periods, Monte Carlo simulations were used to capture differences in risk between styles. For details, see "How Implementation Style and Costs Affect Private Equity Performance", Alex Beath, Chris Flynn, and Jody MacIntosh, International Journal of Pension Management pp. 50, vol. 7, issue 1, Spring 2014.

## Private equity benchmarks used by most funds are flawed.

A high proportion of the benchmarks used for illiquid assets by participants in the CEM universe are flawed. Flaws include:

- Timing mismatches due to lagged reporting. For example, as the graphs on the right demonstrate, reported venture capital returns clearly lag the returns of stock indices. Yet most funds that use stock indices to benchmark their private equity do not use lagged benchmarks. The result is substantial noise when interpreting performance. For example, for 2008 the Russell 2000 index return was 27.2% versus -23.4% if lagged 86 trading days. Thus if a fund earned the average reported venture capital return for 2008 of -1.6%, they would have mistakenly believed that their value added from venture capital was -28.8% using the un-lagged benchmarks versus 21.8% using the same benchmark lagged to match the average 86 day reporting lag of venture capital funds.
- Un-investable peer-based benchmarks. Peer based benchmarks reflect the reporting lags in peer portfolios so they have much better correlations than un-lagged investable benchmarks. But their relationship statistics are not as good as for lagged investable benchmarks.
- Aspirational premiums (i.e., benchmark + 2%). Premiums cannot be achieved passively, and evidence suggests that a fund has to be substantially better than average to attain them. More importantly, when comparing performance to other funds, they need to be excluded to ensure a level playing field.



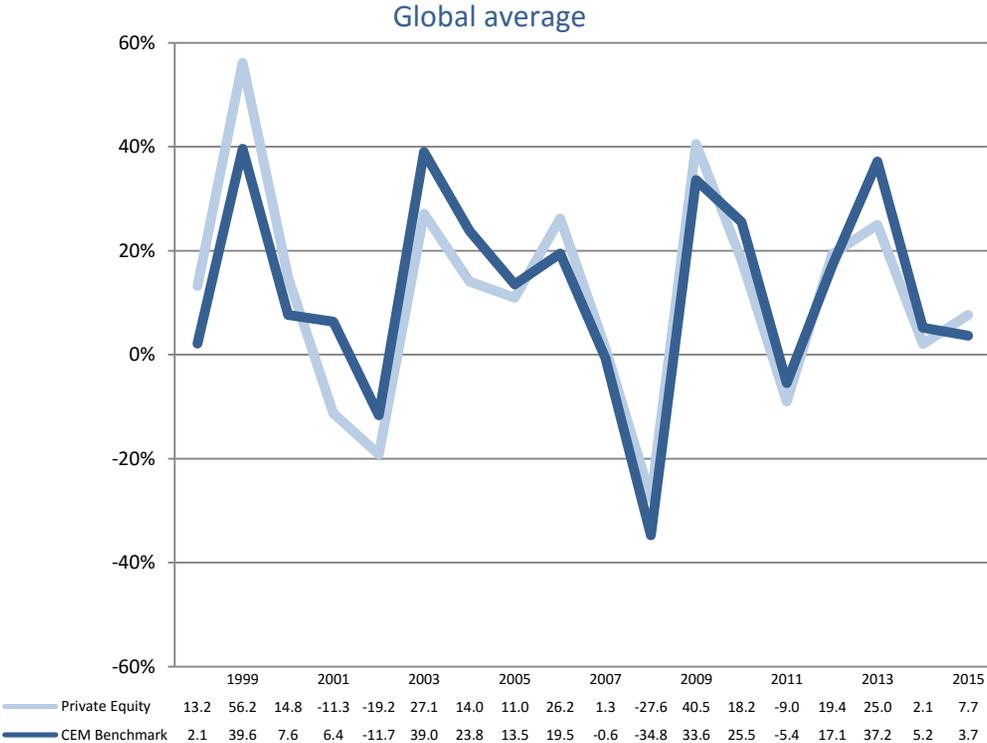
# To enable fairer comparisons, CEM uses default private equity benchmarks.

Benchmarks used for private equity by most participants in the CEM universe are flawed (see previous page). So to enable fairer comparisons, CEM replaced the reported private equity benchmarks of all funds except yours with defaults. The defaults are:

- Investable. They are comprised of lagged small cap benchmarks.
- Custom lagged for each participant. Your default benchmark had a lag of 88 trading days. Different portfolios had different lags. CEM estimated the lag on private equity portfolios with multi-year histories by comparing annual private equity returns to public market proxies with 1 day of lag, 2 days of lag, 3 days of lag, etc. At some number of days lag, correlation between the two series is maximized. The median lag was 102 trading days (i.e., approximately 143 calendar days or 4.7 calendar months)
- Regional mix adjusted based on the average estimated mix of regions in private equity portfolios for a given country.

The result is the default benchmarks are superior to most self-reported benchmarks. Correlations improve to a median of 84% for the default benchmarks versus 48% for self-reported benchmarks. Other statistics such as volatility were also much better.

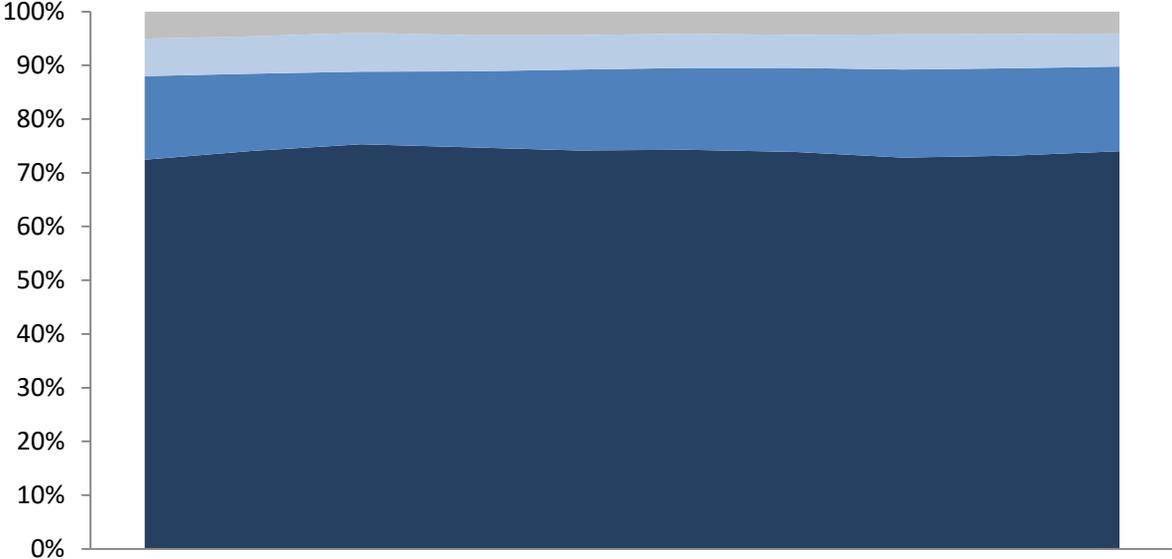
Private equity returns versus default benchmark returns<sup>1</sup>



1. To enable better comparison between lagged returns and lagged benchmarks, lags have been removed from both. See "Asset allocation and fund performance of defined benefit pension funds in the United States, 1998-2014" by Alexander D. Beath and Chris Flynn for details.

**For U.S. plans, external active management increased from 72% to 74% over the past 10 years.**

**Implementation style by year - U.S.**

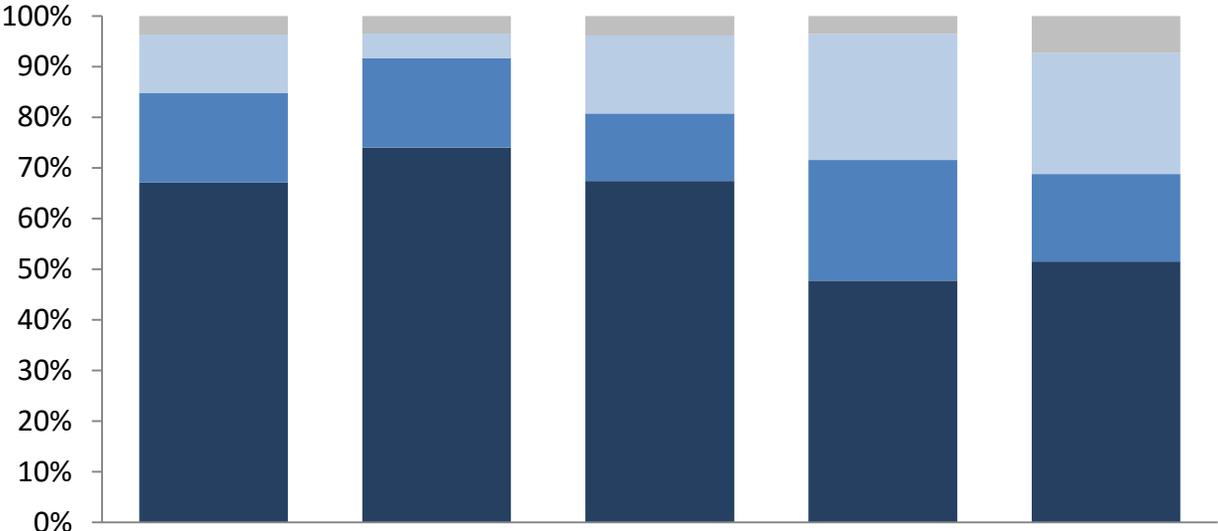


	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
■ % Internal passive	5%	5%	4%	4%	4%	4%	4%	4%	4%	4%
■ % Internal active	7%	7%	7%	7%	6%	6%	6%	7%	6%	6%
■ % External passive	16%	14%	14%	14%	15%	15%	16%	16%	16%	16%
■ % External active	72%	74%	75%	75%	74%	74%	74%	73%	73%	74%

• This analysis is based on 67 U.S. funds with 10 consecutive years of data.

# U.S. funds have more externally managed active assets than funds in most other regions.

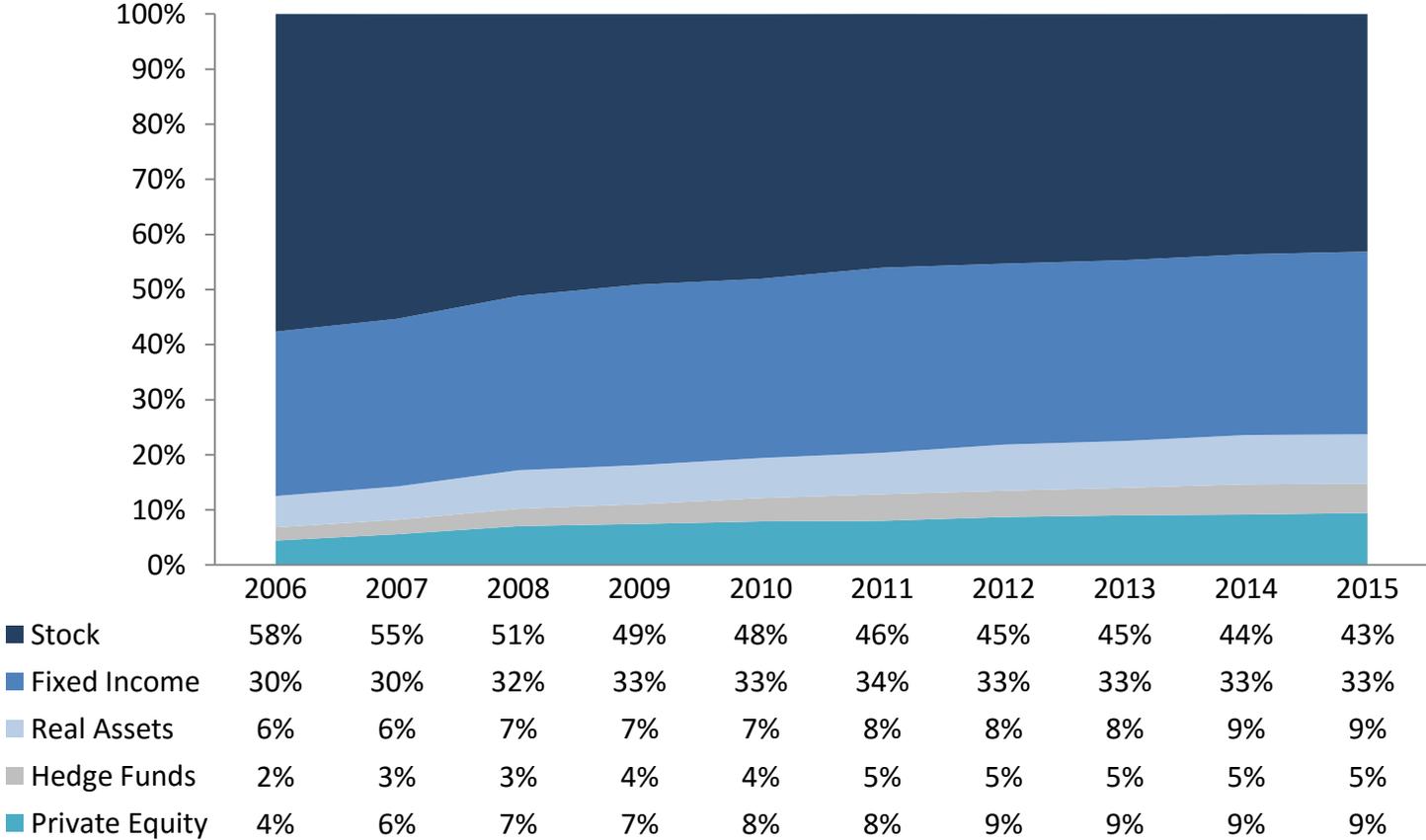
Implementation style by region - 2015 average



■ % Internal passive	4%	3%	4%	4%	7%
■ % Internal active	12%	5%	15%	25%	24%
■ % External passive	18%	18%	13%	24%	17%
■ % External active	67%	74%	67%	48%	51%
Number of funds	277	151	70	50	6
Median fund in \$ billions	6.7	8.0	2.9	16.6	29.2

**For U.S. plans, combined policy weights for real assets, private equity and hedge funds increased from 12.5% in 2006 to 23.7% in 2015.**

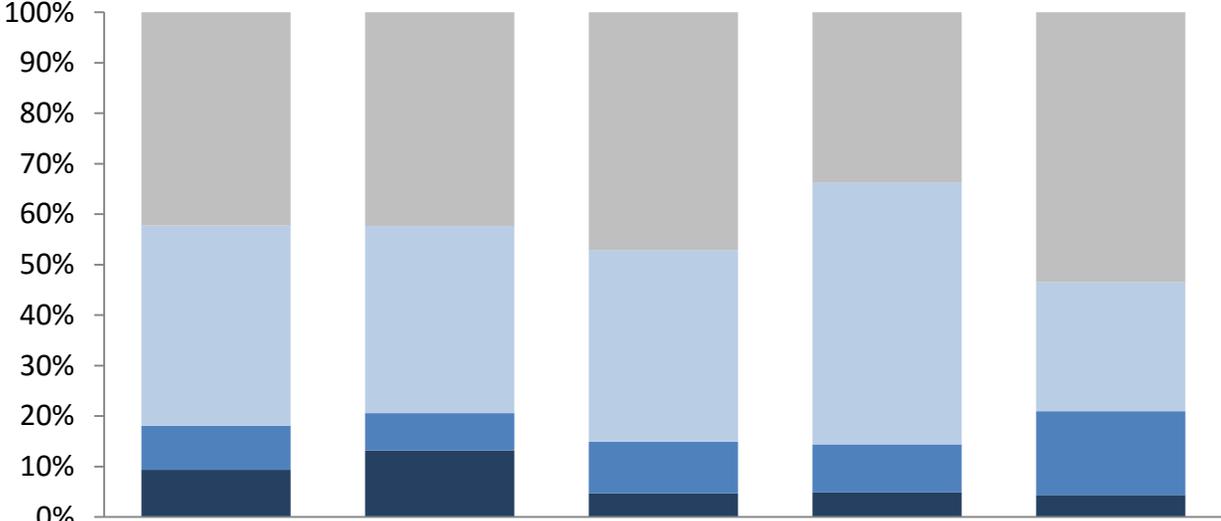
**Policy mix by year - U.S.**



• This analysis is based on 67 U.S. funds with 10 consecutive years of data.

# U.S. funds have less fixed income but more private equity than funds in other regions.

Policy asset mix by region - 2015 average



Stock	42%	42%	47%	34%	53%
Fixed Income	40%	37%	38%	52%	26%
Real Assets	9%	7%	10%	9%	17%
Priv. Equity & Hedge Funds	9%	13%	5%	5%	4%
Number of funds	277	151	70	50	6
Median fund in \$ billions	6.7	8.0	2.9	16.6	29.2

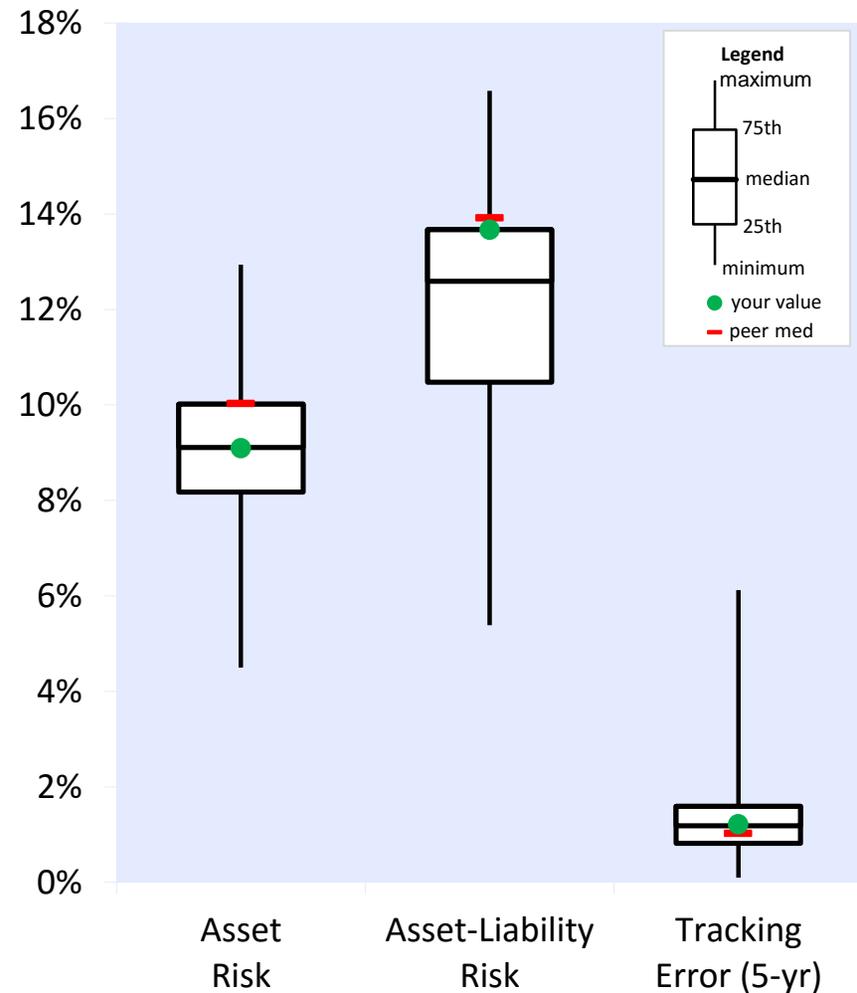
## Risk by type

Your asset risk of 9.1% was the same as the U.S. median of 9.1%. Asset risk is the standard deviation of your policy return. It is based on the historical variance of, and covariance between, the asset classes in your policy mix.

Asset-liability risk is the standard deviation of funded status caused by market factors. It is a function of the standard deviations of your asset risk, your marked-to-market liabilities and the correlation between the two.

Your tracking error of 1.2% was equal to the U.S. median of 1.2%. Tracking error is the risk of active management. It equals the standard deviation of your annual net value added.

U.S. risk levels at December 31, 2015

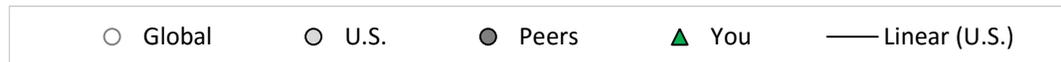
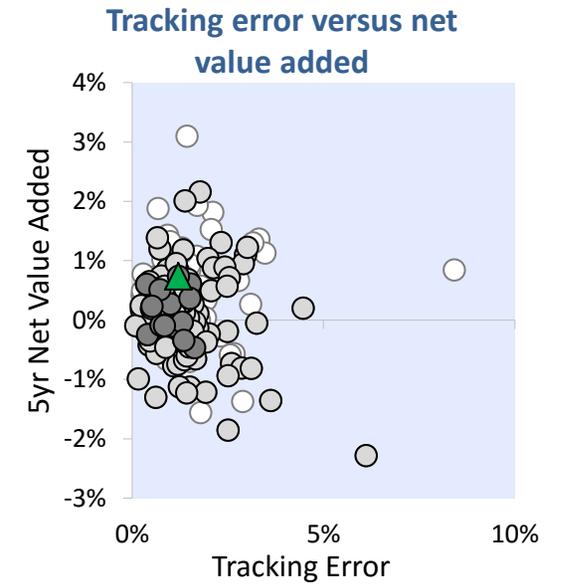
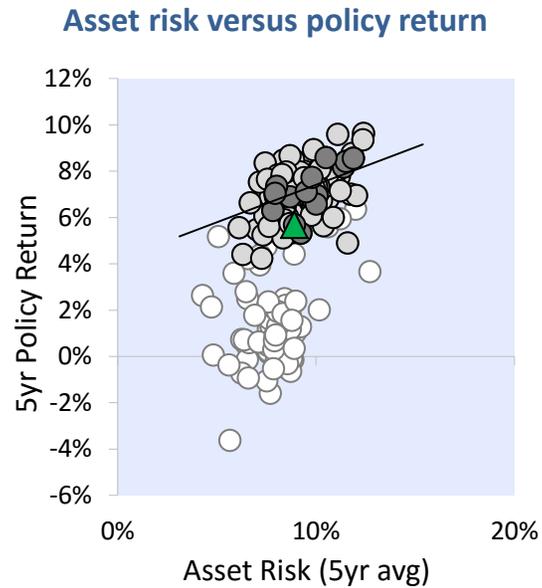
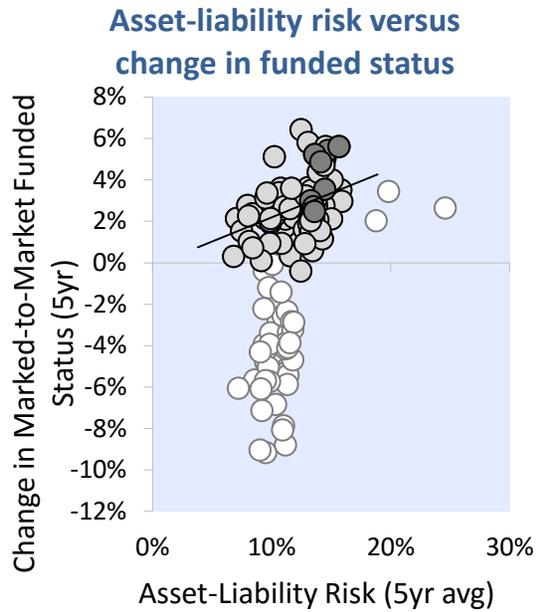


# Risk versus return

Higher asset-liability risk was associated with positive changes in marked-to-market funded status.

Higher asset risk was associated with higher policy returns.

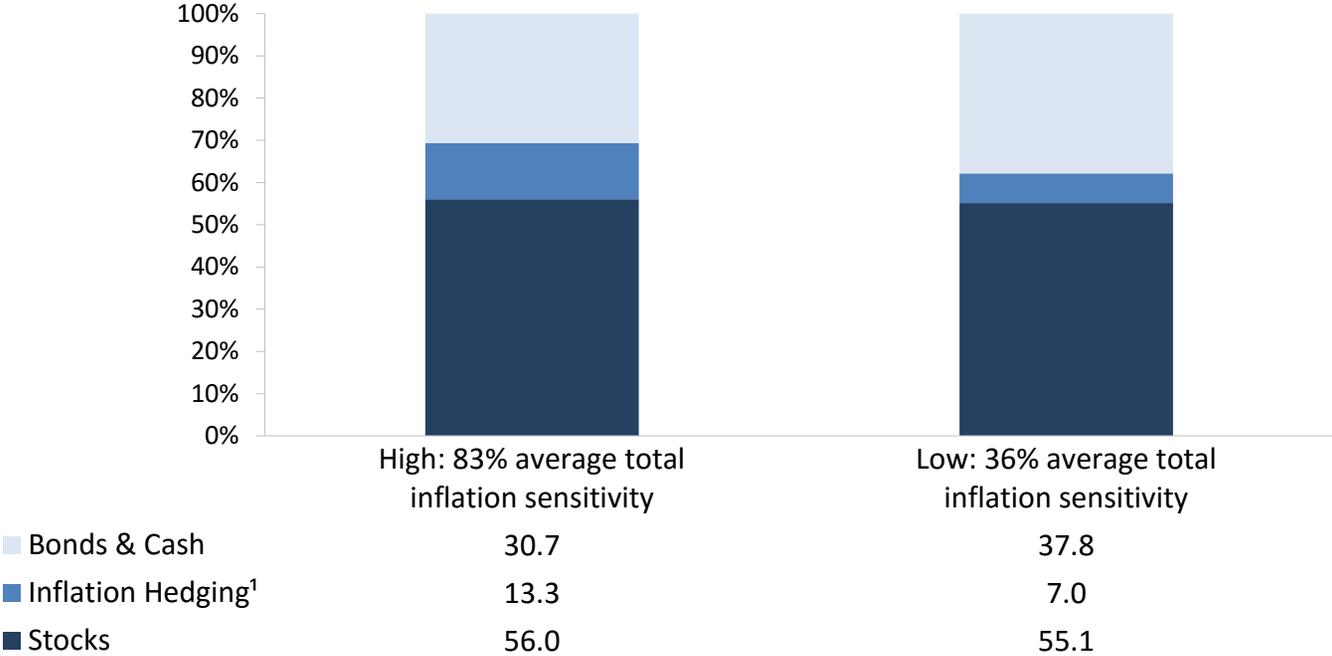
There was no meaningful relationship between tracking error and net value added.



# Impact of inflation sensitivity on policy asset mix decisions

One would expect plans with more inflation sensitivity to have more inflation hedging assets and fewer nominal bonds than plans with less inflation sensitivity. Although this is true, the difference is small: inflation hedging assets represent 13.3% of assets at plans with high inflation sensitivity versus 7.0% at plans with lower inflation sensitivity.

**Average policy asset mix:  
Plans with above vs. below average inflation sensitivity**

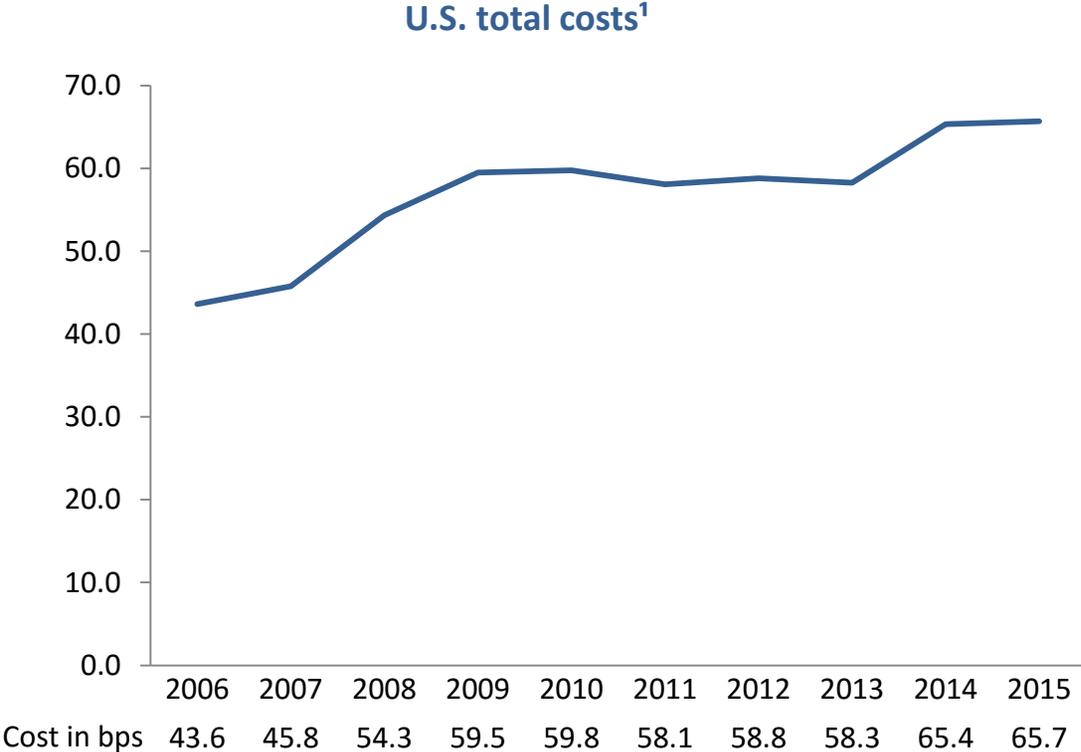


1. Inflation hedge assets include inflation-indexed bonds, commodities, real estate & REITs, infrastructure and natural resources.

# U.S. fund costs have grown by 22 basis points on average over the last 10 years.

Reasons for the increase in costs include:

- Allocation to the more expensive asset classes - hedge funds, real assets and private equity- increased from 7% to 13% on average.
- Use of the most expensive implementation style, external active management, increased from 72% to 74% on average.



1. This analysis is based on 67 U.S. funds with 10 consecutive years of data.

## U.S. defined benefit plans have outperformed defined contribution plans.

U.S. defined benefit plans have outperformed defined contribution plans.

### DB versus DC return and value added - U.S.

	19-yr average ending 2015 <sup>2</sup>		
	DB	DC	Difference
Total return	7.57%	6.44%	1.13%
- Policy return <sup>1</sup>	6.99%	6.06%	0.93%
- Costs	0.49%	0.40%	0.09%
= Net value added	0.08%	-0.02%	0.10%
Number of observations	3,419	2,289	

Differences in asset mix have been the primary reason for the outperformance of U.S. defined benefit plans.

### DB versus DC asset mix - U.S.

Asset class (Ranked by returns)	Asset mix <sup>3</sup>		Returns <sup>4</sup>	
	DB	DC	DB	DC
Private Equity	4%	n/a	12.2%	n/a
Real Assets	5%	n/a	9.6%	n/a
Small Cap Stock	6%	8%	8.9%	9.1%
Employer Stock	0%	20%	n/a	9.5%
Fixed Income	32%	10%	6.5%	5.7%
Hedge Funds	3%	n/a	6.9%	n/a
Stock U.S. Large Cap or Broad	25%	30%	7.7%	7.5%
Stock Non U.S. or Global	24%	8%	6.1%	6.0%
Stable Value/GICs	n/a	17%	n/a	4.5%
Cash	2%	7%	2.8%	2.7%
Total	100%	100%	7.6%	6.4%
Number of observations	3,419	2,143		

1. DC policy return = weights of holdings X benchmarks

2. Returns are the geometric average of annual averages.

3. 19 years ending 2015. Equals arithmetic average of annual asset mix weights.

4. 19 years from 1997 to 2015. Returns are the geometric average of the annual averages for each asset class. Hedge funds were not treated as a separate asset class until 2000, so 60% stock, 40% bond returns were used as a proxy for 1997-1999.

n/a= insufficient data.