

Montana Board of Investments

CEM Benchmarking Results

(for the 5-year period ending December 31, 2019)



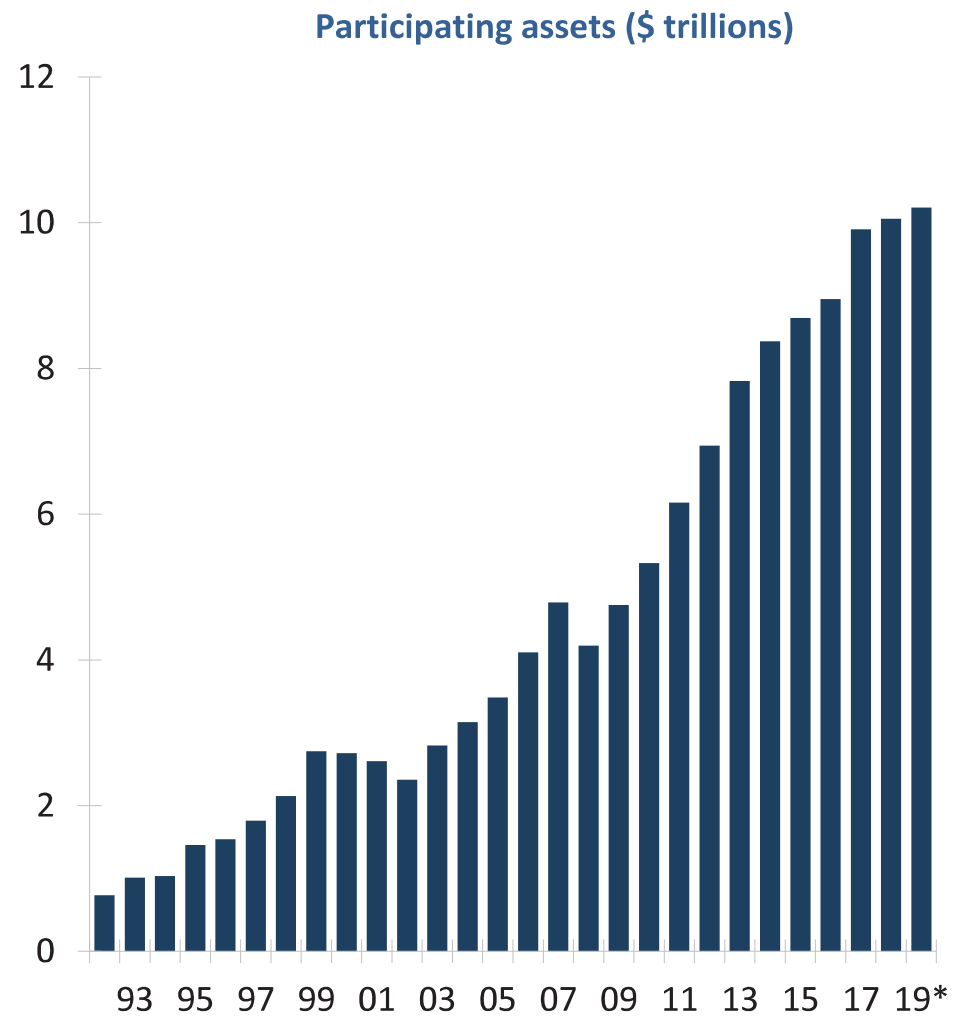
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August 18, 2020

This benchmarking report compares your cost and return performance to the 190 funds in CEM's extensive pension database.

- 114 U.S. pension funds participate. The median U.S. fund had assets of \$12.5 billion and the average U.S. fund had assets of \$28.5 billion. Total participating U.S. assets were \$3.2 trillion.
- 49 Canadian funds participate with assets totaling \$1.2 trillion.
- 27 European and Asia-Pacific funds participate with aggregate assets of \$2.1 trillion.

The most meaningful comparisons for your returns and implementation impacts are to the U.S. Public universe which consists of 42 funds.

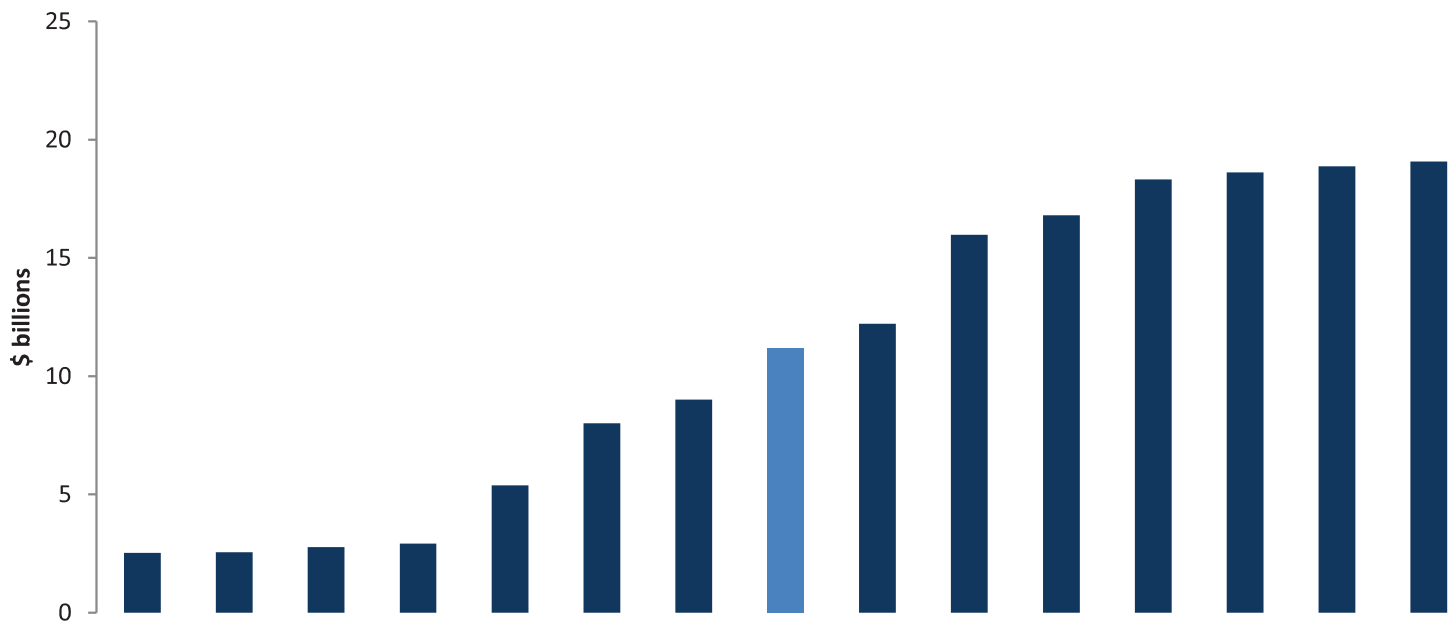


*2019 assets includes both received and expected data.

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

Peer group for Montana Board of Investments

- 15 U.S. Public sponsors from \$2.5 billion to \$19.1 billion
- Median size of \$11.2 billion versus your \$11.2 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.

Peers are selected based on best-fit in terms of total fund size as well as maximum commonality in asset classes.

Your 5-year net total return of 7.37% was close to the U.S. Public median of 7.46% and equal to the peer median of 7.37%

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 implementation impacts.

	Your 5-year
Net total fund return	7.37%
- Policy return	7.75%
= Implementation impacts	-0.38%

This approach enables you to understand the contribution from both policy mix decisions (by far the most important driver of total return) and implementation impacts.

U.S. Public net total returns - quartile rankings



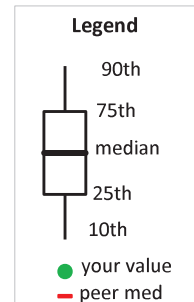
Your 5-year policy return of 7.7% was above both the U.S. Public median of 6.9% and the peer median of 6.9%.

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

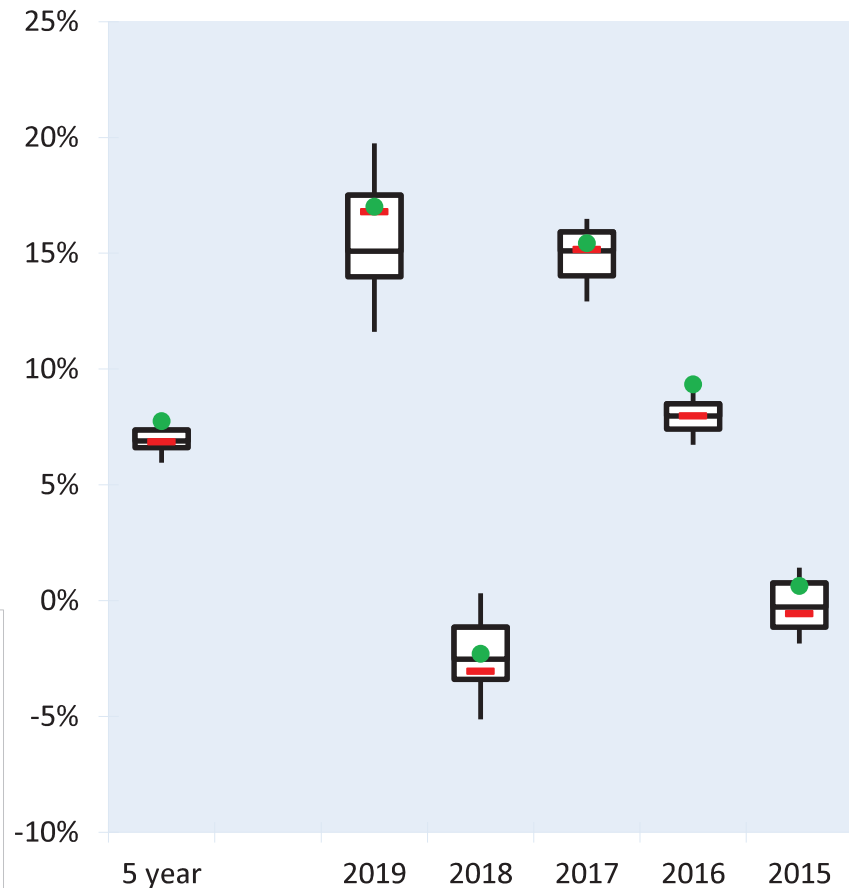
Having a higher or lower relative policy return is not necessarily good or bad. Your policy return reflects your investment policy, which should reflect your:

- 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.



U.S. Public policy returns - quartile rankings



To enable fairer comparisons, the policy returns of all participants, including your fund, were adjusted to reflect private equity benchmarks based on lagged, investable, public-market indices. Your custom benchmark is composed of 20% Europe ex-UK, 10% Global, and 70% U.S. small cap equity with a lag of 82 days. Prior to this adjustment, your 5-year policy return was 8.0%, 0.3% higher than your adjusted 5-year policy return of 7.7%. Mirroring this, your 5-year total fund implementation impact would be 0.3% lower.

Your 5-year policy return of 7.7% was above the U.S. Public median of 6.9% primarily because of:

- The positive impact of your higher weight and better benchmark return in one of the better performing asset classes of the past 5 years: U.S. Stock (your 35% 5-year average weight versus a U.S. Public average of 21%).
- The positive impact of your lower weight in one of the worse performing asset classes of the past 5 years: Hedge Funds (your 0% 5-year average weight versus a U.S. Public average of 4%).

	5-year average policy mix ¹			5-year bmk. return	
	Your Fund	U.S. Pub Avg.	More/ Less	Your Fund	U.S. Pub Avg.
U.S. Stock	35%	21%	14%	11.6%	11.0%
EAFE/Global/Emerging	18%	28%	-11%	n/a ³	n/a ³
Total Stock	53%	49%	3%	9.6%	8.8%
U.S. Bonds	22%	17%	5%	3.0%	3.2%
Inflation Indexed Bonds	0%	3%	-3%	n/a ³	2.7%
High Yield Bonds	3%	2%	1%	6.1%	5.9%
Fixed Income - Emerging	0%	1%	-1%	n/a ³	5.0%
Fixed Income - Global	0%	1%	-2%	n/a ³	3.8%
Other Fixed Income	3%	1%	2%	n/a ³	n/a ³
Total Fixed Income	27%	25%	2%	3.2%	3.8%
Hedge Funds	0%	4%	-4%	n/a ³	3.0%
Real Estate incl. REITS	7%	8%	-1%	0.0%	0.0%
Other Real Assets ²	1%	3%	-1%	n/a ³	n/a ³
Private Equity	11%	8%	3%	7.8%	7.6%
Private Debt	0%	2%	-2%	n/a ³	5.1%
Total	100%	100%	0%		

1. 5-year weights are based only on plans with 5 years of continuous data.

2. Other real assets includes commodities, natural resources and infrastructure.

3. A value of 'n/a' is shown if asset class return are not available for the full 5 years or if they are broad and incomparable.

Implementation impact is the difference between total net return and policy return. Your 5-year implementation impact of -0.38% compares to a peer median of 0.10% and a U.S. Public median of 0.40%.

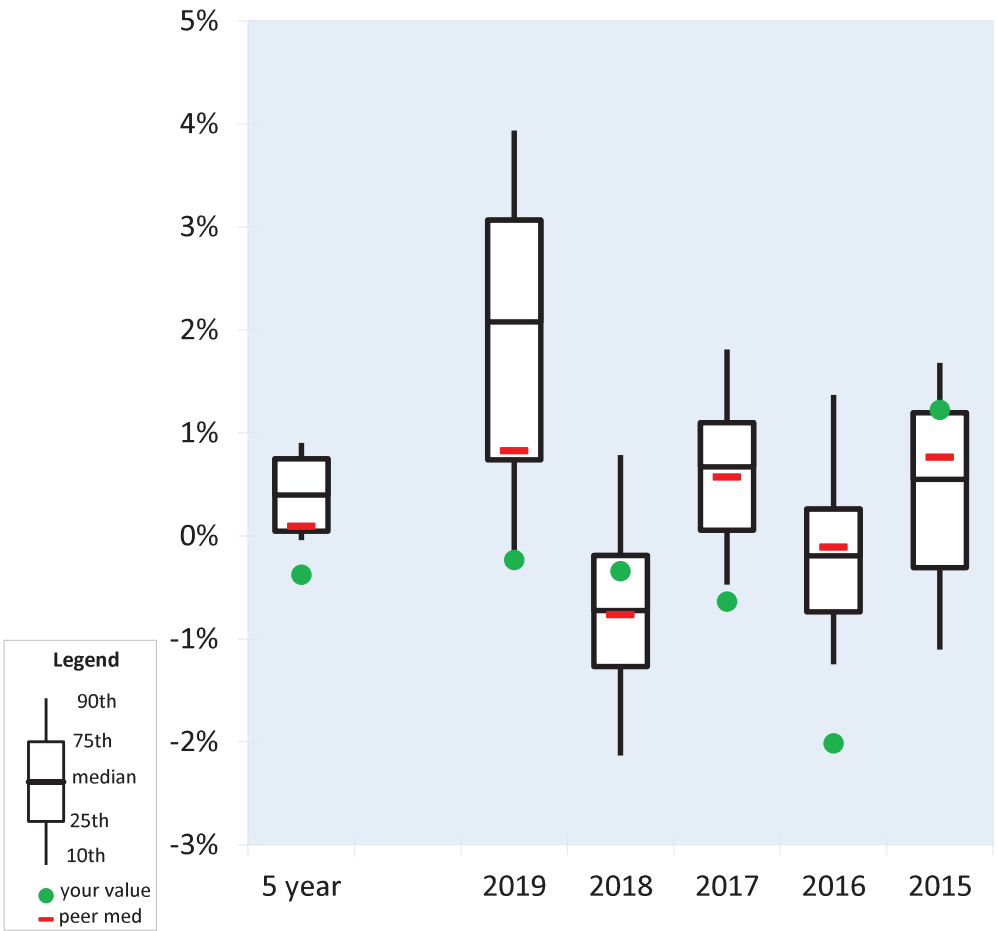
Implementation impact for Montana Board of Investments

Year	Net Return	Policy Return	Impl. Impact
2019	16.78%	17.01%	-0.23%
2018	-2.63%	-2.29%	-0.34%
2017	14.80%	15.44%	-0.64%
2016	7.32%	9.34%	-2.02%
2015	1.86%	0.64%	1.22%
5-Year	7.37%	7.75%	-0.38%

Implementation typically has a modest impact on total fund returns. Implementation impacts are mainly due to:

- Differences in asset class benchmarks across funds.
- Differences between actual holdings and policy weights for asset classes. These differences may be due to tactical asset allocation or rebalancing policies.
- Net return relative to benchmark returns within asset classes.

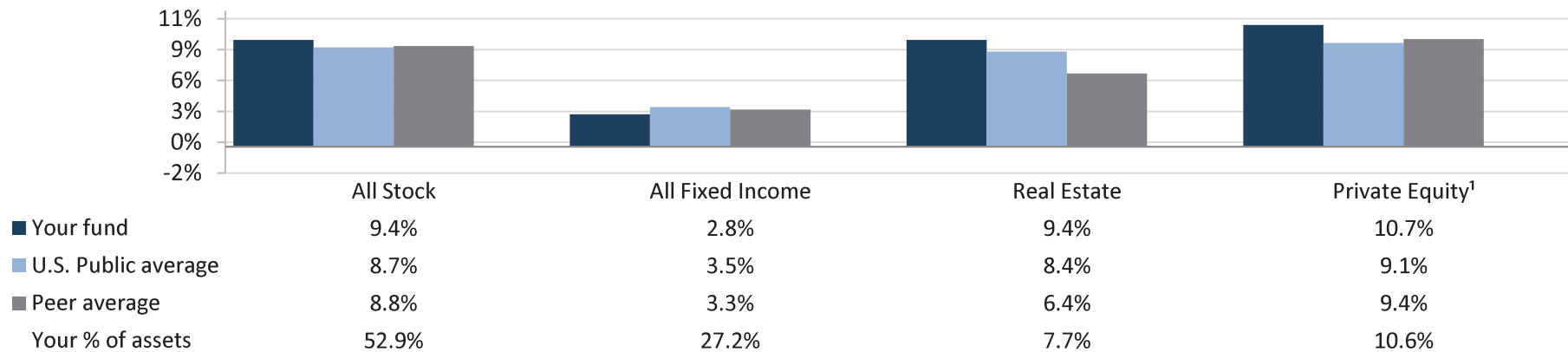
U.S. Public implementation impact - quartile rankings



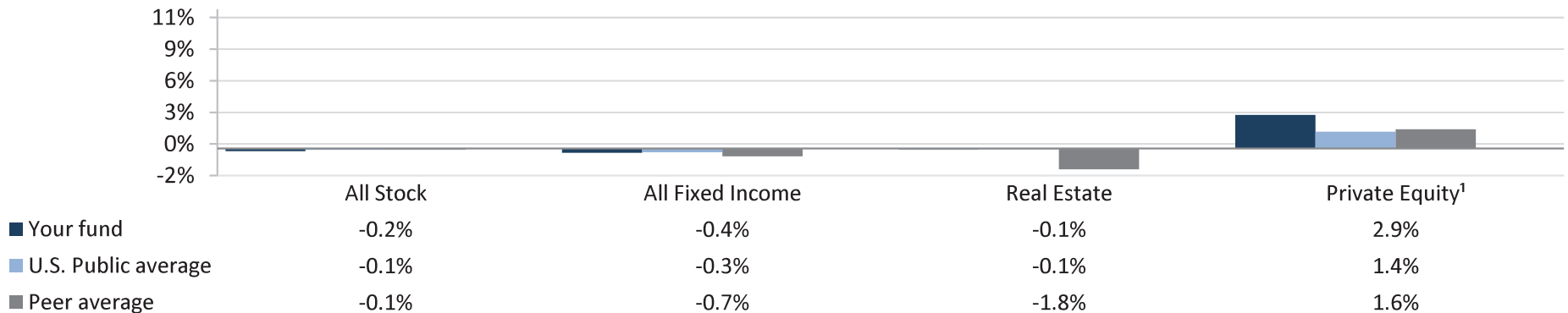
To enable fairer comparisons, the implementation impact for each participant including your fund was adjusted to reflect private equity benchmarks based on investable public market indices. Your custom benchmark is composed of 20% Europe ex-UK, 10% Global, and 70% U.S. small cap equity with a lag of 82 days. Prior to this adjustment, your fund's 5-year total fund implementation impact was -0.7%.

Comparisons of your 5-year net return and implementation impacts by major asset class:

5-year average net return by major asset class



5-year average net return relative to benchmark² by major asset class



1. To enable fairer comparisons, the private equity benchmarks of all participants, including your fund were adjusted to reflect lagged, investable, public-market indices. Your custom benchmark is composed of 20% Europe ex-UK, 10% Global, and 70% U.S. small cap equity with a lag of 82 days. Prior to this adjustment, your fund's 5-year private equity implementation impact was 0.1%.

2. For the U.S. Public universe and your peers, the difference shown is the difference between their average net return and their average benchmark return.

Your investment costs were \$62.2 million or 55.7 basis points in 2019.

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 ¹	
Stock - U.S. Broad/All		304	391	6,428		7,123
Stock - ACWI x U.S.		363	1,253	5,168		6,784
Fixed Income - U.S.	278	15		276		568
Fixed Income - High Yield		140		1,705		1,846
Cash	66					66
Global TAA		225		587		812
Real Estate ex-REITs ¹		89		3,527	653	3,616
Real Estate ex-REITs - LP ¹		356		7,350	2,776	7,705
Natural Resources - LP ¹		324		6,887	446	7,212
Diversified Private Equity - LP ¹		467		17,356	4,900	17,823
Diversified Private Equity - FoFs ¹		52		6,203	5,220	6,255
Total excluding private asset performance fees						59,810 53.5bp
Oversight, custodial and other costs ²						
Oversight of the fund						1,120
Trustee & custodial						1,068
Consulting and performance measurement						199
Audit						48
Other						0
Total oversight, custodial & other costs						2,435 2.2bp
Total investment costs (excl. transaction costs & private asset performance fees)						62,245 55.7bp

Footnotes

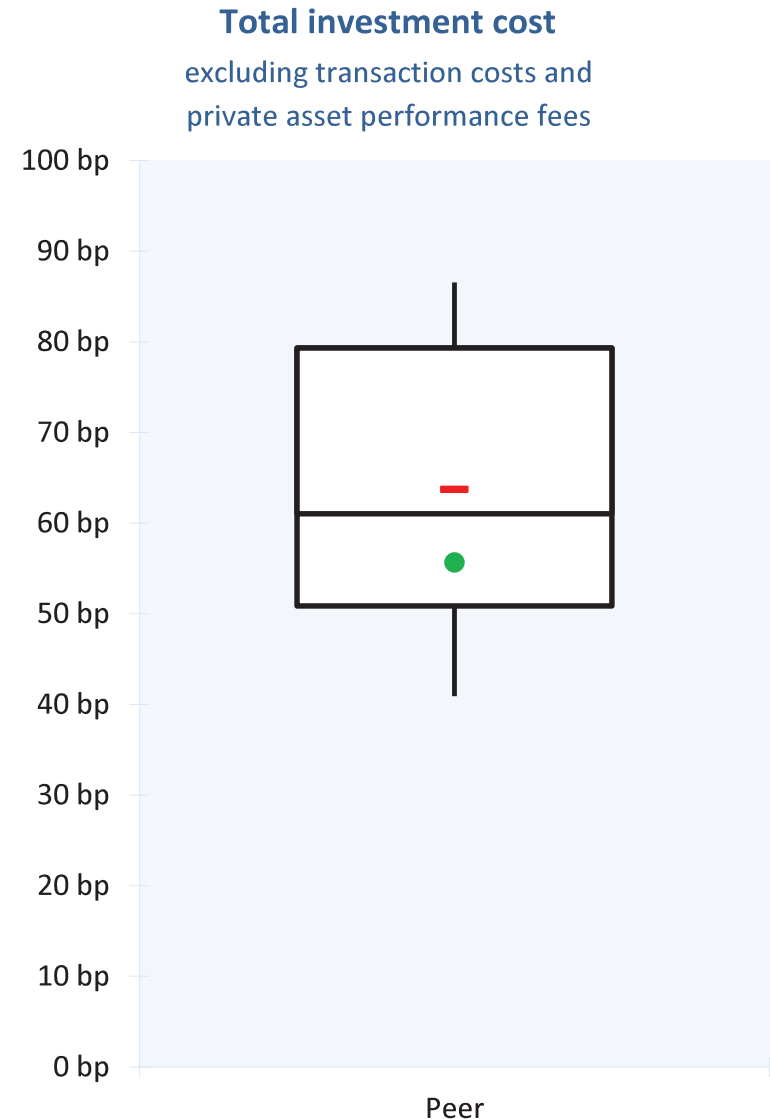
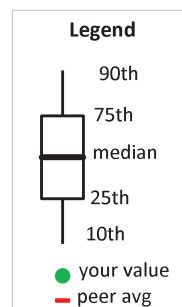
1. Total cost and subsequent benchmarking analysis excludes carry/performance fees for real estate, infrastructure, natural resources and private equity. Performance fees are included for the public market asset classes and hedge funds.
2. Excludes non-investment costs, such as benefit insurance premiums and preparing cheques for retirees.

Your total investment cost of 55.7 bps was below the peer median of 61.0 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 21% of your funds assets at the end of 2019 versus a peer average of 20%.
- 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 slightly low cost by 0.5 basis points in 2019.

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 55.7 bp was slightly below your benchmark cost of 56.2 bp. Thus, your cost savings were 0.5 bp.

Your cost versus benchmark

	\$000s	basis points
Your total investment cost	62,245	55.7 bp
Your benchmark cost	62,841	56.2 bp
Your excess cost	(596)	(0.5) bp

Your fund was slightly low cost because you had a lower cost implementation style.

Explanation of your cost status

	Excess Cost/ (Savings)	
	\$000s	bps
1. Lower cost implementation style		
• Less active management, more lower cost passive	(349)	(0.3)
• Less external management, more lower cost internal	(2,604)	(2.3)
• More LPs as a percentage of external	1,937	1.7
• Less fund of funds	(1,377)	(1.2)
• Less overlays	(477)	(0.4)
	(2,871)	(2.6)
2. Paying more than peers for some services		
• External investment management costs	4,443	4.0
• Internal investment management costs	(362)	(0.3)
• Oversight, custodial & other costs	(1,807)	(1.6)
	2,275	2.0
Total savings	(596)	(0.5)

Differences in implementation style saved you 2.6 bp relative to your peers.

Calculation of the cost impact of differences in implementation style

Asset class by implementation choice*	Assets by style (\$mils) ¹	Your fund	Style % Peer average	More/ (less)	Benchmark cost	More/ (less) ²	Cost/ (savings) in \$000s	bps
	A			B		C	A X B X C	
<u>Passive vs. Active</u>	Total assets		Passive % of total assets		Passive	Active		
Stock - U.S. Broad/All	3,426	63.2%	71.7%	(8.4%)	1.1 bp	38.9 bp	(37.8) bp	1,094
Stock - ACWI x U.S.	1,938	53.7%	24.9%	28.8%	7.1 bp	45.2 bp	(38.2) bp	(2,131)
Fixed Income - U.S.	2,581	0.0%	21.7%	(21.7%)	2.0 bp	14.3 bp	(12.3) bp	687
Mix of passive vs. active							(349)	(0.3) bp
<u>Internal active vs. external active</u>	Active assets		Internal active % of active assets		Internal active	External active		
Fixed Income - U.S.	2,581	94.2%	22.4%	71.8%	2.6 bp	17.6 bp	(15.0) bp	(2,776)
Real Estate ex-REITs	926	0.0%	2.3%	(2.3%)	24.4 bp	104.1 bp	(79.7) bp	172
More int. active as % of total active							(2,604)	(2.3) bp
<u>Evergreen vs. LP/Co/FoF</u>	External assets		Evergreen fund % of external		Ever-green	LP/Co/ FoF		
Real Estate ex-REITs	926	44.1%	59.1%	(15.0%)	85.1 bp	131.6 bp	(46.4) bp	645
Natural Resources	487	0.0%	43.4%	(43.4%)	86.9 bp	148.0 bp	(61.0) bp	1,292
Less evergreen % of external							1,937	1.7 bp
<u>LP/Co vs. Fund of funds</u>	LP/Co/ FoF assets		LP and Co % of LP/Co/Fund of funds		LP/Co	FoF		
Real Estate ex-REITs	517	100.0%	96.6%	3.4%	130.2 bp	170.6 bp	(40.4) bp	(71)
Diversified Private Equity	1,487	81.4%	70.8%	10.7%	157.0 bp	239.5 bp	(82.5) bp	(1,307)
More fund of funds % of LP/Co/FoF							(1,377)	(1.2) bp
<u>Overlays</u>								
Impact of higher use of portfolio level overlays							(477)	(0.4) bp
Total impact of differences in implementation style							(2,871)	(2.6) bp

* Implementation styles where you are exactly the same as your peers (i.e. style impact is zero) are not shown.

1. 'Amount fees are based on' is the basis for calculating costs for private assets.

2. The 'style premium' is calculated as the difference between the style-weighted peer-median cost of the two styles being compared.

The net impact of paying more/less for external asset management costs added 4.0 bps.

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

	Style	Your avg holdings in \$mils	Cost in bps			Cost/ (savings) \$000s
			Your Fund	Peer median	More/ (less)	
External asset management		(A)	(B)			(A X B)
Stock - U.S. Broad/All	passive	2,166	1.9	1.1	0.8	176
Stock - U.S. Broad/All*	active	1,260	53.2	38.9	14.3	1,796
Stock - ACWI x U.S.	passive	1,040	12.4	7.1	5.3	555
Stock - ACWI x U.S.	active	897	61.2	45.2	16.0	1,435
Fixed Income - U.S.	active	150	19.4	17.6	1.8	26
Fixed Income - High Yield	active	362	51.0	37.3	13.7	496
Real Estate ex-REITs	active	408	88.6	85.1	3.5	141
Real Estate ex-REITs	LP	517	148.9	130.2	18.7	969
Natural Resources	LP	487	148.0	148.0	0.0	0
Global TAA	active	68	120.0	63.1	56.9	385
Diversified Private Equity	FoF	276	86.9	82.5	4.4	122
Underlying base fees	FoF	276	139.8	157.0	(17.2)	(474)
Diversified Private Equity	LP	1,211	147.2	157.0	(9.8)	(1,184)
Total impact of paying more/less for external management						4,443
Total in bps						4.0 bp

*Universe median used as peer data was insufficient.

1. 'Amount fees are based on' is the basis for calculating costs for private assets.

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

	Style	Your avg holdings in \$mils	Cost in bps			Cost/ (savings) \$000s
			Your Fund	Peer median	More/ (less)	
<i>Internal asset management</i>		(A)	(B)			(A X B)
Fixed Income - U.S.	active	2,431	1.1	2.6	(1.5)	(362)
Cash	active	435	1.5	Excluded	--	--
Total for internal management						(362)
Total in bps						(0.3) bp

'Excluded' indicates that the asset class was excluded from this analysis due to comparability concerns with peers.

The net impact of differences in oversight, custodial & other costs saved 1.6 bps.

Cost impact of differences in oversight, custodial & other costs

	Your avg holdings in \$mils (A)	Cost in bps			Cost/ (savings) \$000s (A X B)
		Your Fund	Peer median	More/ (less)	
Oversight	11,184	1.0	1.3	(0.3)	
Consulting	11,184	0.2	0.9	(0.8)	
Custodial ²	11,184	1.0	0.6	0.4	
Audit	11,184	0.0	0.1	(0.1)	
Other ³	11,184	0.0	0.2	(0.2)	
Total for oversight, custodial, other ¹		2.2	3.8	(1.6)	(1,807)
Total in bps					(1.6) bp

- Oversight, custodial, and other costs are benchmarked using the peer median cost for the total of the pieces. The individual line items are shown for comparison but not used in the benchmark.
- Important additional information about your custodial fees relative to peers:
 - The peer median of 0.6 bps is low. The U.S. universe median custodial cost was 0.8 bps.
 - You have a more complex structure than your peers. You have 9 plans on your platform, most peers have less than 2 plans.
 - Specific services provided by custodians for funds vary somewhat. CEM does not collect detailed data related to specific custodial arrangements.
- 'Other' typically includes legal fees and fiduciary manager fees that apply to the plan as a whole and cannot be allocated to specific asset classes.

The table below provides a summary of why you are high/low cost relative to the peer-median by asset class.

Why are you high/(low) cost by asset class?

Asset class/category	Impl. style \$000s	Paying more/(less) \$000s	Total \$000s	Total bps
Stock - U.S. Broad/All	1,094	1,971	3,066	8.9 bp
Stock - ACWI x U.S.	(2,131)	1,990	(141)	(0.7) bp
Fixed Income - U.S.	(2,089)	(335)	(2,424)	(9.4) bp
Fixed Income - High Yield	0	496	496	13.7 bp
Cash	--	--	Excluded	Excluded
Real Estate ex-REITs	747	1,110	1,857	20.1 bp
Natural Resources	1,292	0	1,292	26.5 bp
Global TAA	0	385	385	56.9 bp
Diversified Private Equity	(1,307)	(1,536)	(2,843)	(19.1) bp
Derivatives and overlays	(477)	0	(477)	(0.4) bp
Oversight, custodial & other	n/a	(1,807)	(1,807)	(1.6) bp
Total	(2,871)	2,275	(596)	(0.5) bp

Key takeaways

Returns

- Your 5-year net total return was 7.4%. This was close to the U.S. Public median of 7.5% and equal to the peer median of 7.4%.
- Your 5-year policy return was 7.7%. This was above the U.S. Public median of 6.9% and above the peer median of 6.9%.

Implementation impact

- Your 5-year implementation impact was -0.38%. This was below the U.S. Public median of 0.40% and below the peer median of 0.10%.

Cost and cost effectiveness

- Your investment cost of 55.7 bps was below your benchmark cost of 56.2 bps. This suggests that your fund was slightly low cost compared to your peers.
- Your fund was slightly low cost because you had a lower cost implementation style.