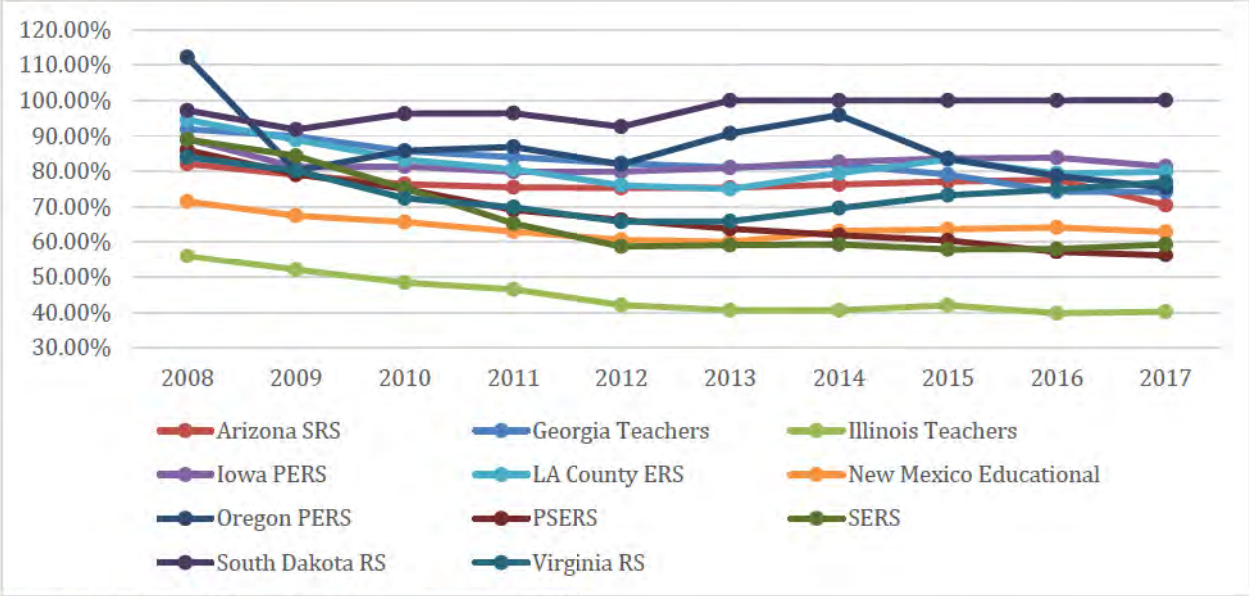
Table 2.9 Peer Group FY17 Funded Status

Plan	FY 17 Funded Status
Georgia Teachers	74%
Virginia RS	77%
Oregon PERS	75%
Pennsylvania PSERS	56%
LA County ERS	80%
Illinois Teachers	40%
Arizona SRS	71%
Iowa PERS	81%
Pennsylvania SERS	59%
New Mexico Educational	63%
South Dakota RS	100%
AVERAGE	71%

Source: Public Plans Database (2018)

A look at funded status across time reveals that while the funded status of pension funds has mostly moved in sync across time, large differences exist in the funded status of peers in the group. As per Figure 2.17, most funds have seen a decrease in their funded status across time, with ranges as high as 112% by Oregon PERS in 2008 to 29.8% from Illinois Teachers in 2016.

Figure 2.17 Peer Group Historical Funded Status



Source: Authors' analysis and Public Plans Database (2018)

This figure illustrates the historical (2008-2017) funded status of SERS (66%) and PSERS (67%) is lower than the group average of 74%.

Total Portfolio Benchmarks

Benchmarks allow pension funds to assess their performance against specific measures in the market and will influence a fund's investment strategy, including asset allocation and risk profile. For total fund performance, pension funds normally develop custom benchmarks that reflect the type and relative weight of assets within their portfolio. For example, SERS uses a custom, composite benchmark for its overall total fund portfolio, on a five- to ten-year rolling time horizon. The composite benchmark is composed of benchmarks of individual asset classes (equity, private equity, fixed income, hedge funds, infrastructure, real estate, and cash). The weight of each asset class is based on the asset allocation set forth in the investment plan approved by the board. PSERS also uses a custom Fund Policy Index for its overall portfolio benchmarking, based on the Board-established asset allocation structure that seeks to generate a return that meets the actuarial rate of return assumption.

As Table 2.10 below illustrates, for the most part, funds in the peer group follow similar approaches at the total portfolio (custom benchmark) level. An important exception within the peer group is Georgia Teachers, which uses a CPI benchmark that follows inflation rather than the weight of the equity and fixed income allocations in its portfolio.

Table 2.10 Peer Group Total Portfolio Benchmarks (2017)

Plan (2017)	Total Portfolio Benchmark
Arizona SRS	Interim SAA Policy Benchmark
Georgia Teachers	CPI
Illinois Teachers	TRS Policy Index
Iowa PERS	Policy Benchmark
LA County ERS	Policy Benchmark
Oregon PERS	Policy Benchmark
PSERS	Total Fund Policy Index
SERS	Total Fund Custom Benchmark
South Dakota RS	Markets Benchmarks Returns
Virgina RS	VRS Custom Benchmarks
New Mexico Educationa	Policy Index

Source: Individual Peer Fund 2017 Comprehensive Annual Financial Reports (CAFR)

Despite having similar approaches towards defining their total portfolio benchmarks, the performance of these benchmarks differs significantly between SERS, PSERS, and the peer group.

The performance of a benchmark is dependent on the performance of the assets that make up the benchmark. Therefore, benchmark performance will fluctuate over time. The concept of "beating the market" or "exceeding a benchmark" is therefore not a stagnant one. For pension funds, "beating the market" means producing higher returns in their investment portfolios than their benchmarks. Therefore, assessing the relative performance of benchmarks is helpful in understanding how ambitious pension funds must be in their investment strategies and how effective they are relative to peers. After all, selecting benchmarks that generally produce lower returns allows funds to construct narratives of high performance by beating their benchmarks when, in fact, those benchmarks to begin with set a relatively low bar.

Table 2.11 below illustrates the 1-year, 3-year, 5-year, and 10-year performance of the benchmarks selected by the funds in the peer group based on 2017 figures. In other words, these are the returns that the various custom benchmarks achieved over time based on 2017 figures. The discount rate of each fund has been included in the table, because it is a good indicator of relative benchmark performance against the rate that funds have determined is required to meet their liabilities and funding obligations. Therefore, benchmark performance that is significantly and consistently below a pension fund's discount rate could indicate that the benchmark may not necessarily be most suitable for the liabilities of the fund.

Table 2.11 Peer Group Total Portfolio Benchmark Performance (2017)

Peers	FY17 Discount Rate	2017 Benchmark Performance			
		Total Portfolio 1Y	Total Portfolio 3Y	Total Portfolio 5Y	Total Portfolio 10Y
Arizona SRS	7.50%	14.00%	4.80%	8.80%	5.20%
Georgia Teachers	7.50%	1.60%	0.90%	1.30%	1.60%
Illinois Teachers	7.50%	11.40%	6.10%	9.30%	5.30%
Iowa PERS	7.00%	11.17%	5.79%	8.61%	6.28%
LA County ERS	7.38%	11.20%	5.90%	8.80%	5.40%
Oregon PERS	7.20%	13.02%	6.59%	9.85%	N/A
Pennsylvania PSERS	7.25%	6.39%	3.49%	5.47%	2.80%
Pennsylvania SERS	7.25%	11.70%	5.10%	8.10%	5.30%
South Dakota RS	6.50%	10.96%	5.24%	9.07%	5.31%
Virginia RS	7.00%	11.80%	5.70%	8.50%	4.50%
New Mexico Educational	7.25%	12.10%	5.40%	7.80%	4.60%
Peer Group Average		10.49%	5.00%	7.78%	4.63%

Source: Individual Peer Fund 2017 Comprehensive Annual Financial Reports (CAFR)

The difference in performance in these benchmarks is inherent to the fact that they are custom built by peers to measure the performance of the assets within their portfolios. A look at the peer group average allows us to identify consistent returns and a downward trend across most benchmark returns for the peer group. For the most part, benchmarks had strong returns in the 1-year time frame with an average of 10.4% across the peer group. These returns, however, are almost cut in half when considering 3-year figures, where the average benchmark drops to 5%. After a slight increase to 7.7% for the 5-year peer group average, benchmark returns drop once again for the long-term 10-year figure of 4.6%.

These low return 10-year figures are important because long-term performance is key for pension funds and none of the 10-year benchmarks beat the discount rates for the various funds. One consideration is that the 10-year benchmark falls within a time frame that includes the Global Financial Crisis, which, as illustrated above, led to a period of low growth and low returns. Over the 5-year period, all fund benchmark returns, except for Georgia Teachers and PSERS, exceeded their fund's discount rate.

When compared to the peer group benchmark returns, the benchmark returns of SERS and PSERS illustrate two different outcomes. On one hand, SERS' benchmark returns are higher than the peer group average across all time periods. On the other hand, when isolating for Georgia Teachers' CPI benchmark, PSERS' benchmark performance is the lowest in the group for the 1-year, 3-year, 5-year, and 10-year period. Moreover, PSERS' benchmark returns never exceed the peer group average.

When assessed against individual discount rates, SERS' benchmark performance is in line with the peer group in exceeding its discount rate in the 1-year and 5-year periods, but its performance is below the discount rate in the 3-year and 10-year periods. PSERS' benchmark returns did not exceed the fund's discount rate of 7.25% across the time period.

Asset Class Benchmarks

The selection and performance of benchmarks across asset classes varies widely across the peer group (for more information on the specific asset class benchmarks selected by peers, please see appendix). A look at the performance of these benchmarks reveals important insights about how funds within the peer group look at returns for the assets they invest in.

Table 2.12 below illustrates the performance of peer group asset class benchmarks for the 1-year, 3-year, 5-year, and 10-year returns based on 2017 figures and available data. The highest average benchmark returns across the peer group and time frame come from private equity (12.49%), followed by equity (10.94%) and real estate (7.78%). The lowest benchmark returns can be observed for commodities, with a negative overall average of -1.8% across the peer group and period. This was followed by cash at 0.42% and fixed income with 2.6%.

Table 2.12 Peer Group Asset Class Benchmark Returns (2017)

	Equity				Fixed Income				Private Equity				Hedge Funds				Commodities				Real Estate				Cash			
	1Y	3Y	5Y	10Y	1Y	3Y	5Y	10Y	1Y	3Y	5Y	10Y	1Y	3Y	5Y	10Y	1Y	3Y	5Y	10Y	1Y	3Y	5Y	10Y	1Y	3Y	5Y	10Y
Pennsylvania PSERS	19.91%	7.79%	12.92%	5.59%	3.09%	2.69%	2.85%	6.10%	3.05%	0.55%	3.96%	5.61%	5.17%	3.72%	2.73%	3.34%	-6.41%	-10.45%	-6.49%	-5.08%	2.92%	7.38%	8.59%	5.20%	-	-	-	-
Pennsylvania SERS	23.90%	9.50%	11.00%	5.00%	3.50%	2.20%	2.10%	4.00%	22.30%	14.10%	17.70%	10.80%	11.30%	3.40%	7.10%	5.60%	-	-	-	-	5.60%	9.40%	10.40%	4.10%	0.90%	0.40%	0.30%	0.40%
Peer Group Average	19.60%	6.83%	11.81%	5.52%	0.93%	2.43%	2.39%	4.70%	17.51%	9.88%	13.44%	9.14%	8.11%	4.10%	6.51%	4.81%	-0.22%	-4.03%	-1.31%	-1.63%	5.60%	9.72%	10.32%	5.83%	0.60%	0.36%	0.22%	0.52%
Average Benchmarks Across 1,3,5,10y	10.94%				2.61%				12.49%				5.88%				-1.80%				7.87%				0.42%			

Source: Individual Peer Fund 2017 Comprehensive Annual Financial Reports (CAFR)

Benchmark returns were significantly different across asset classes. On average, both equity and hedge funds experienced a downward trend across time, which included a slight uplift from 3-years to 5-years, followed by a drop towards the 10-year mark. Fixed income and real estate both experienced steady average increases across the time period, although real estate saw a ~50% reduction from the 5-year to the 10-year period. Although private equity has the highest average benchmark returns, the average return decreases constantly across the time period and finishes at about 50% of the value when compared to the 1-year return. As expected, cash remains relatively stable across the time period, while commodities experience negative returns across every period in the time horizon and, despite a slight recovery between the 1-year and 3-year returns, all benchmark returns remain negative across the time period.

When looking at the benchmark performance of SERS and PSERS, performance is asset class dependent. For equity, all of PSERS' benchmark returns beat the peer group average across the time period, while SERS' benchmark performance is higher for the 1-year and 3-year returns, but lower for the 5-year and 10-year returns. Similar patterns can be

observed for fixed income, except SERS' 3-year benchmark (2.2%) also underperforms the peer group average of 2.4%.

Private equity and hedge fund benchmark returns had very different performance. For private equity, SERS' benchmark returns are above the peer group average for all years, while PSERS (1-year 3%; 5-year 0.5%; 5-year 3.9%; 10-year 3.6%) significantly underperforms the peer group averages (1-year 17%; 5-year 9.8%; 5-year 13.4%; 10-year 9.4%). The same applies for hedge fund benchmark returns, where SERS' benchmark returns outperform the peer group average, while PSERS underperforms across all years.

For commodities, PSERS' benchmark returns once again significantly underperform the peer group average, which already represents poor performance with negative returns across all years. (SERS does not invest in commodities as per available data.) For real estate, PSERS' benchmark returns are also below the peer group average across all years. Meanwhile, SERS' benchmarks outperform the peer group average across the 1-year, 3-year, and 5-year figures, but are lower in the 10-year time frame.

No cash benchmark returns were available for PSERS. For SERS, cash benchmark returns have similar performance than real estate, where the benchmarks outperform the peer group average in the 1-year, 3-year, and 5-year time frames, but produce lower figures for 10-year results.

At a high level, this indicates that while PSERS' benchmark returns are high for equity and fixed income, the fund's benchmarks significantly underperform in all other asset classes across the time period. This suggests that PSERS' performance is measured against benchmark returns that are generally lower than those of its peers. For SERS, one can observe that the fund's benchmarks generally perform better than the peer group average in the shorter term (1-year, 3-year and 5-year), but the fund benchmarks have generally underperformed in the long-term (10-year). This illustrates that SERS has established benchmarks that generally outperform those of its peers. Thereby, when assessing the relative performance of SERS' returns against its benchmarks, we must consider that these benchmarks are relatively higher and more ambitious than those of PSERS and the peer group.

Absolute Performance

To perform a comprehensive assessment of the absolute performance of SERS and PSERS against the peer group, the section will first look at their absolute return for their total portfolio (2017), followed by their "value added," which is the difference between their total absolute return and their benchmark returns (this is a measure of actual value produced over what could have been earned passively). Finally, it will reincorporate insights from the benchmark section to assess the relative strength of the benchmarks these funds were being measured against.

Absolute Returns

Table **2.13** below illustrates the 2017 absolute returns at the total portfolio level for the peer group across 1-year, 5-year, and 10-year annualized figures. The data shows that the peer group experienced a general trend of declining returns for longer time horizons, as shown by a declining trend in the peer group average from 12.3% for the 1-year, to 9% in 5-years, and 5.1% in 10-year returns.

Table 2.13 Peer Group Total Portfolio Returns (2017)

Plan (2017)	Total Portfolio Returns 2017		
	1Y	5Y	10Y
Arizona SRS	13.90%	9.60%	5.60%
Georgia Teachers	12.50%	9.40%	6.10%
Illinois Teachers	12.60%	9.20%	4.80%
Iowa PERS	11.70%	8.65%	5.89%
LA County ERS	12.70%	9.00%	5.20%
Oregon PERS	12.00%	9.19%	5.37%
Pennsylvania PSERS	10.14%	7.35%	3.80%
Pennsylvania SERS	12.00%	7.90%	3.90%
South Dakota RS	13.81%	10.97%	6.14%
Virginia RS	12.10%	9.10%	4.90%
New Mexico Educational	12.00%	8.70%	5.20%
Peer Group Average	**12.31%**	**9.01%**	**5.17%**

Source: Individual Peer Fund 2017 Comprehensive Annual Financial Reports (CAFR)

This table also illustrates that when compared to the peer group, SERS and PSERS experienced relatively lower total portfolio returns across most years. For example, SERS experienced high returns for the 1-year measure at 12%, but still below the peer group average of 12.3%. It underperformed the peer group average both in the 5-year time frame (SERS 7.9% vs. 9% peer group average) and the 10-year time frame (SERS 3.9% vs. 5% peer group average). PSERS had the lowest total portfolio returns among the peer group for the 1-year (10.1%), 5-year (7.3%), and 10-year (3.8%) measures.

It is particularly important to highlight the relative low performance of both SERS and PSERS in the long-term. As SERS indicates in its 2017 annual report, "while year-to-year returns are important, as long-term investors, a longer time horizon is a more appropriate view of returns."[lvi] With this lens in mind, we can see that in the 10-year time frame PSERS is the lowest performing fund with 3.8%, while SERS is the second lowest performer at 3.9%.

As we indicated above, the 10-year time frame includes the volatile 2008-2009 period of the Great Recession. When looking at 5-year figures, however, we see a similar performance from both SERS and PSERS. That is, PSERS is the lowest performing fund with 7.3%, while SERS is the second lowest with 7.9%. In contrast, South Dakota RS and Arizona SRS emerge as strongest performers across total portfolio returns. South Dakota had the highest returns across the 1-year (13.8%), 5-year (10.9%), and 10-year (6.1%)

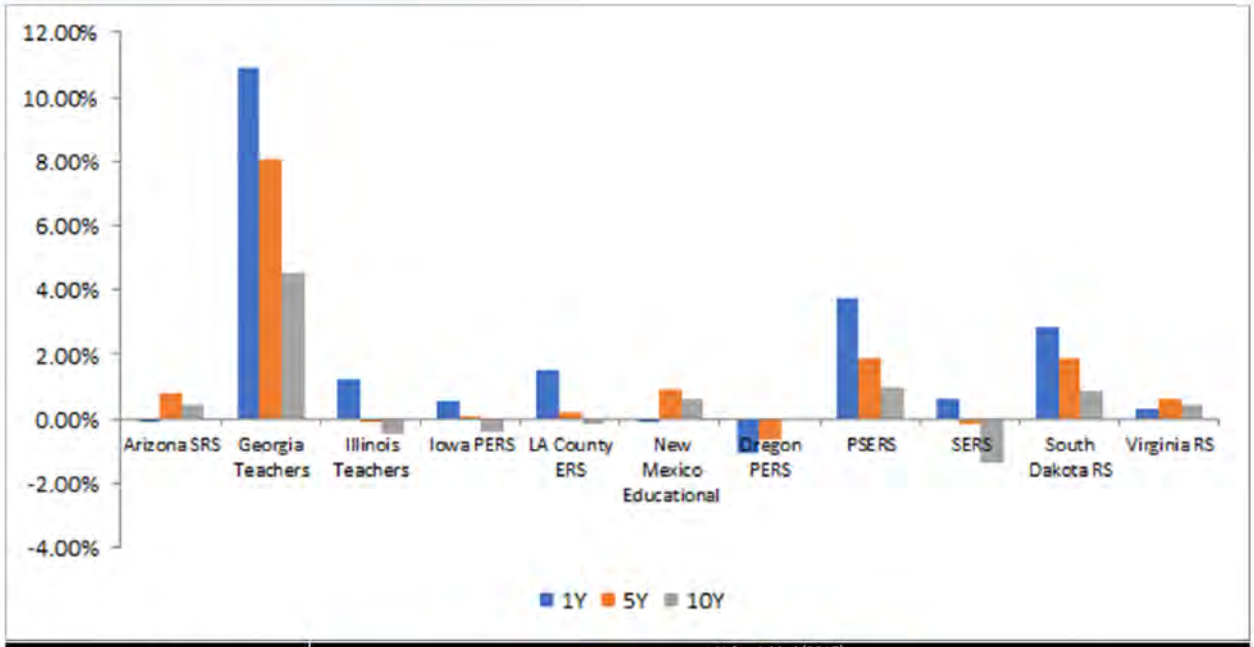
time frames, while Arizona had the second highest for the 1-year (13.9%) and 5-year (9.6%), and the fourth highest for the 10-year (5.6%) time frame.

Value Added

While returns are important indicators of performance, we can also assess the funds' ability to generate value over what could have been earned passively.

- Figure **2.18** below illustrates "value added" figures for the peer group based on 2017 data. A key insight from the data is that the peer group saw a declining trend in their ability to add value over the long-term. Most funds in the peer group experienced declines between 1-year and 5-year figures and between 5-year and 10-year figures. In general, the peer group is not very effective at adding value, with low averages across all three annualized figures and with various funds experiencing negative value (their benchmark returns were higher than their absolute returns) across time.

Figure 2.18 Peer Group Value Added (2017)



Plan	Value Added (2017)		
	1Y	5Y	10Y
Arizona SRS	-0.10%	0.80%	0.40%
Georgia Teachers	10.90%	8.10%	4.50%
Illinois Teachers	1.20%	-0.10%	-0.50%
Iowa PERS	0.53%	0.04%	-0.39%
LA County ERS	1.50%	0.20%	-0.20%
Oregon PERS	-1.10%	-0.66%	N/A
Pennsylvania PSERS	3.75%	1.88%	1.00%
Pennsylvania SERS	0.30%	-0.20%	-1.40%
South Dakota RS	2.85%	1.90%	0.83%
Virginia RS	0.30%	0.60%	0.40%
New Mexico Educational	-0.10%	0.90%	0.60%

Source: Authors' analysis and Individual Peer Fund 2017 Comprehensive Annual Financial Reports (CAFR)

Georgia Teachers is a clear outlier amongst the group, as it saw significantly higher value-added performance than the rest of the group with 10.9%, 8.1%, and 4.5% across the 1-year, 5-year, and 10-year marks respectively. As for SERS and PSERS, performance compared to peers changes slightly than when simply looking at investment returns. When considering "value added," PSERS does not emerge as the lowest performer. In fact, it beats the peer group average across all three time horizons with 3.7%, 1.8% and 1%. In contrast, SERS emerges as one of the funds with the lowest value-added figures across time. For 1-year figures, SERS' 0.30% is the third lowest amongst the group (ahead of Oregon PERS with -1.10% and Arizona SRS and New Mexico Educational, both with -0.10%). For 5-year figures, SERS is the second lowest with negative figures at -0.20% and just ahead of Oregon PERS at -0.66%. Finally, SERS is the lowest performer out of the group in the 10-year category with -1.4%.

A look at "value added," however, must also consider the relative performance of the benchmarks being used for comparison. If we simply look at the peers' ability to generate value against their self-chosen benchmarks, we see that SERS has not performed well over time, while it appears that PSERS has performed better than the peer group average. However, it is important to consider that "value added" is derived from the fund's ability to beat their benchmark returns, and if the benchmarks selected by these funds generate lower returns, then it is easier for funds to have the appearance of higher value-added figures.

A Benchmark Perspective

By reincorporating the benchmark lens, we can see that SERS' low value-added figures are in part due to the fact that they have benchmarks that are among the highest performers in the peer group. Therefore, even if SERS had generated strong returns, as they did for 1-year figures (12%), they still had to outperform a relatively high benchmark of 11.7%, leading to a low value-added figure of 0.3%.

A look at PSERS through this lens reveals different insights. The fund appears to perform well in the value-added category, but both the returns generated across time and the benchmarks it had to beat were low relative to the rest of the group. For example, its value-added figure of 3.7% in the 1-year mark beat the peer group average of 1.8%; however, it did so in part because its benchmark return was 6.39%, which was the lowest in the peer group for that year.

This perspective helps illustrate that SERS has high benchmark returns relative to the peer group and while it saw relatively strong performance in the 1-year time frame, it performed poorly in generating returns and "value added" in the long-term when compared to the group. For PSERS, the data shows that the fund was a low performer when compared to the rest of the peer group. This cannot be easily observed when looking only at PSERS' ability to generate value, in part because the fund's benchmarks are relatively low when compared to the rest of the peer group. Thus, even when the fund generates lower total portfolio returns, its "value added" performance may seem stronger simply because of the low returns of its benchmarks.

Performance and Discount Rates

Another important lens through which to assess the performance of SERS, PSERS, and funds in the peer group is how their returns compare against their individual discount rates. After all, this indicates the extent to which these funds are generating the returns required to help them meet their liabilities.

- As Table 2.14 illustrates, funds within the peer group generated returns above their discount rates across 1-year and 5-year returns. For the 10-year returns, however, all funds underperformed their discount rates.

Table 2.14 Peer Group Discount Rate vs. Total Portfolio Returns (2017)

Peers	FY17 Discount Rate	Total Portfolio Returns (2017)		
		1Y	5Y	10Y
Arizona SRS	7.50%	13.90%	9.60%	5.60%
Georgia Teachers	7.50%	12.50%	9.40%	6.10%
Illinois Teachers	7.50%	12.60%	9.20%	4.80%
Iowa PERS	7.00%	11.70%	8.65%	5.89%
LA County ERS	7.38%	12.70%	9.00%	5.20%
Oregon PERS	7.20%	12.00%	9.19%	5.37%
Pennsylvania PSERS	7.25%	10.14%	7.35%	3.80%
Pennsylvania SERS	7.25%	12.00%	7.90%	3.90%
South Dakota RS	6.50%	13.81%	10.97%	6.14%
Virginia RS	7.00%	12.10%	9.10%	4.90%
New Mexico Educational	7.25%	12.00%	8.70%	5.20%

Source: Individual Peer Fund 2017 Comprehensive Annual Financial Reports (CAFR)

Asset Class Performance

A look at performance at the asset class level reveals more about the overall performance of SERS and PSERS in relation to the peer group.

Equity Performance

We begin with equity, as this is an asset class that all funds in the peer group invest in. At the group level, equity had high average investment returns and benchmarks across the 1-year, 3-year, 5-year, and 10-year time horizons. In fact, although equity generated high returns for must funds across the time period, the figures for "value added" are relatively low (peer group average of 0.8%, -0.4%, 0.2%, and -0.56%) given the relatively strong performance of benchmarks. Thus, we can observe that the benchmarks selected across the peer group are appropriate measures to guide strong performance in this asset class.

Table 2.15 Equity Returns, Benchmarks and Value Added

Equity					
		1Y	3Y	5Y	10Y
Returns	PSERS	21.30%	8.12%	12.56%	5.20%
	SERS	20.40%	5.40%	11.40%	3.20%
	Peer Group Average	19.98%	6.37%	11.98%	4.91%
Benchmarks	PSERS	19.91%	7.79%	12.92%	5.59%
	SERS	19.00%	4.90%	10.70%	3.90%
	Peer Group Average	19.15%	6.41%	11.78%	5.41%
Value Added	PSERS	1.39%	0.32%	-0.36%	-0.39%
	SERS	1.40%	0.50%	0.70%	-0.70%
	Peer Group Average	0.83%	-0.04%	0.20%	-0.56%

Source: Individual Peer Fund 2017 Comprehensive Annual Financial Reports (CAFR)

On equity returns, PSERS had strong performance and beat the peer group average across all years. SERS had strong performance in 1-year figures, but underperformed in the 3-year, 5-year, and 10-year categories. The equity benchmark returns of SERS and PSERS were in line with the peer group average across the time period. PSERS' benchmark returns were higher across all time frames, while SERS' were lower across all years. In terms of "value added," PSERS only beat the peer group average in the 1-year and 3-year time frames, while SERS beat the peer group average for all except the 10-year time frame.

These figures indicate that PSERS had a relatively strong performance in this asset class as both its returns and benchmarks outperformed the peer group and its low figures for "value added" were consistent with results across the peer group. SERS' performance in this asset class was not as strong as PSERS', with lower returns and benchmark returns across most years and value-added figures that outperformed the peer group average given the relatively lower performance of its benchmark. It is important to note that PSERS has a lower allocation to this asset class than SERS.

Fixed Income

While all peers invest in Fixed Income, this asset class saw an overall lower performance across the peer group. The average returns and benchmark returns were lower than equity, but its value-added figures were higher. However, no funds recorded losses (negative returns) in equity, while both Georgia Teachers and South Dakota RS experienced losses of -1% and -0.39%, respectively, in the 1-year period.

PSERS' and SERS' performance in this asset class is similar to their performance in equity. PSERS outperformed the peer group average in both returns and benchmark returns, while SERS only outperformed the peer group average in returns for 1-year, and its benchmarks performed worse than the peer group average across all years. In terms of "value added," however, PSERS had better performance than in equity, outperforming

the peer group average across all years. SERS, on the other hand, only beat the peer group value added average for its 1-year figures. Thus, similar to equity, PSERS had overall strong performance in fixed income, while SERS saw positive but lower returns when compared to the peer group.

Table 2.16 Fixed Income, Returns, Benchmarks and Value Added

		1Y	3Y	5Y	10Y
Returns	PSERS	5.22%	4.51%	5.17%	7.36%
	SERS	2.70%	1.90%	3.10%	5.00%
	Peer Group Average	2.69%	3.11%	3.60%	5.70%
Benchmarks	PSERS	3.09%	2.69%	2.83%	6.10%
	SERS	-0.30%	2.50%	2.20%	4.50%
	Peer Group Average	0.58%	2.46%	2.40%	4.76%
Value Added	PSERS	2.13%	1.82%	2.34%	1.26%
	SERS	3.00%	-0.60%	0.90%	0.50%
	Peer Group Average	2.10%	0.65%	1.20%	0.96%

Source: Individual Peer Fund 2017 Comprehensive Annual Financial Reports (CAFR)

Private Equity

All funds except for Georgia Teachers invest in private equity. Returns for private equity were relatively high across the peer group (peer group average of 1-year 15.8%; 3-year 8.8%; 5-year 12.4%; and 10-year 8.9%). While no funds recorded losses, value added was relatively low or negative given high returns for most peer benchmarks. Both PSERS and SERS had returns lower than the peer group average across all years. However, SERS' returns were much more in line with the peer group average, while PSERS significantly underperformed across a few years (*e.g.*, 3-year PSERS 3.1% vs. peer group 8.8%). Looking at benchmarks, however, we can observe that SERS and PSERS are on opposite spectrums. On one hand, PSERS has very low benchmark performance when compared to the peer group (*e.g.*, 5-year PSERS 3.9% vs. peer group 13%), while SERS' benchmarks significantly outperform the peer group average across all years. This combination creates a misleading picture where PSERS appears to be a strong performer in this category due to a value added higher than the peer group average, although this is due to their comparatively low benchmark performance. The opposite is true for SERS, as it appears to be a low performer given negative value-added figures, when in fact it has strong returns, but the high performance of its benchmarks brings its value-added figures down.

Table 2.17 Private Equity Returns, Benchmarks, and Value Added

Private Equity					
		1Y	3Y	5Y	10Y
Returns	PSERS	12.04%	3.16%	8.51%	5.97%
	SERS	11.10%	7.20%	9.20%	8.40%
	Peer Group Average	15.83%	8.80%	12.45%	8.96%
Benchmarks	PSERS	3.05%	0.55%	3.96%	3.61%
	SERS	21.60%	13.00%	16.60%	10.80%
	Peer Group Average	17.44%	9.77%	13.33%	9.14%
Value Added	PSERS	8.99%	2.61%	4.55%	2.36%
	SERS	-10.50%	-5.80%	-7.40%	-2.40%
	Peer Group Average	-1.61%	-0.97%	-0.88%	-0.19%

Source: Individual Peer Fund 2017 Comprehensive Annual Financial Reports (CAFR)

Hedge Funds

With the exception of Georgia Teachers and South Dakota, all other funds invested in hedge funds. Overall returns and benchmarks for this asset class were relatively lower than other asset classes (lower than equity and private equity and more in line with fixed income). The trend on returns fluctuated over time, with a drop in average returns between 1 year and 3 years, followed by a slight increase in average returns to the 5-year mark, and followed by a modest decrease into the 10-year figures. SERS was the only fund that recorded losses of -1.1% in their 3-year returns. At the same time, value-added figures were low and negative across various peers and years given the relatively higher performance of benchmark returns to portfolio returns.

Comparatively, SERS and PSERS did not see strong performance in this asset class. Looking at returns, PSERS exceeded the peer group average in the short-term (1-year and 3-year), but underperformed in the long-term (5-year and 10-year). In terms of benchmarks, PSERS' benchmark returns underperformed the peer group across all years, while SERS' benchmarks outperformed the peer group with the exception of its 3-year figures. As a result, PSERS' ability to generate value added appears to be better than SERS' given its assessment against lower performing benchmarks. SERS' value-added figures should be qualified considering that its benchmarks are, for the most part, higher than PSERS and the peer group average.

Table 2.18 Hedge Funds Returns, Benchmarks, and Value Added

Hedge Funds					
		1Y	3Y	5Y	10Y
Returns	PSERS	8.09%	2.61%	2.06%	2.51%
	SERS	6.40%	-1.10%	2.80%	2.00%
	Peer Group Average	7.90%	0.78%	4.96%	4.22%
Benchmarks	PSERS	5.17%	3.72%	2.73%	3.34%
	SERS	9.40%	1.80%	6.90%	5.40%
	Peer Group Average	7.90%	3.92%	6.49%	4.77%
Value Added	PSERS	2.92%	-1.11%	-0.67%	-0.83%
	SERS	-3.00%	-2.90%	-4.10%	-3.40%
	Peer Group Average	-0.01%	-3.14%	-1.53%	-0.56%

Source: Individual Peer Fund 2017 Comprehensive Annual Financial Reports (CAFR)

Commodities

Commodities also represents a relatively low-performing asset class for the peer group, with low returns, benchmark returns, and value added. SERS and five other peers did not invest in this asset class; therefore, the peer group figures for this category represent figures from only 6 funds (n=6).

As the data illustrates, various funds recorded losses, including Arizona, LA county, and PSERS (across all years). The peer group average shows a mix of losses and small gains (between 1.4% and 2.0%) across the time frame. PSERS' benchmarks performed even lower than its returns, with significant losses across all years and a peak of -10.4% in its 3-year figures when compared to the peer group average of -4.0%.

Table 2.19 Commodities Returns, Benchmarks, and Value Added

Commodities					
		1Y	3Y	5Y	10Y
Returns	PSERS	-3.48%	-8.02%	-4.62%	-3.42%
	SERS	-	-	-	-
	Peer Group Average	2.08%	-4.57%	1.43%	-1.67%
Benchmarks	PSERS	-6.41%	-10.45%	-6.49%	-5.08%
	SERS	-	-	-	-
	Peer Group Average	-0.22%	-4.03%	-1.31%	-1.63%
Value Added	PSERS	2.93%	2.43%	1.87%	1.66%
	SERS	-	-	-	-
	Peer Group Average	2.30%	-0.54%	2.74%	-0.05%

Source: Individual Peer Fund 2017 Comprehensive Annual Financial Reports (CAFR)

Real Estate

With the exception of Georgia Teachers and Iowa PERS, all other funds in the peer group invested in Real Estate. For this asset class, return, benchmark return, and value added figures were generally positive across time. Although no peers recorded loss, all funds experienced significant declines in returns in the long-term, particularly between 5-year and 10-year figures. This was likely influenced by the effects of the Great Recession in 2008-2009 that covers the 10-year time frame.

The performance of SERS and PSERS in this asset class is consistent but disparate. When looking at returns, PSERS figures are very close to the peer group average, with the exception of the 10-year figures, where it significantly underperformed against the peer group (0.6% vs. 3.9%). SERS underperformed across all years, with the exception of long-term 10-year returns, where its performance was mostly in line with the peer group (2.1% vs. 3.9%).

In terms of benchmarks, PSERS' benchmark performance was lower than the peer group average across all years. In contrast, SERS' benchmark performance was higher than the peer group average for all years except the 10-year figures. When looking at PSERS' value added, we can see positive results except for the 10-year figures, which is in line with the peer group average. For SERS, value-added figures are low due to overall low returns, given that its benchmarks are only slightly higher than the peer group average.

Table 2.20 Real Estate Returns, Benchmarks, and Value Added

Real Estate					
		1Y	3Y	5Y	10Y
Returns	PSERS	8.38%	10.36%	11.18%	0.66%
	SERS	1.20%	6.50%	8.40%	2.10%
	Peer Group Average	8.64%	10.74%	11.64%	3.96%
Benchmarks	PSERS	2.92%	7.38%	8.59%	5.20%
	SERS	6.40%	10.20%	10.90%	4.50%
	Peer Group Average	5.69%	9.81%	10.38%	5.90%
Value Added	PSERS	5.46%	2.98%	2.59%	-4.54%
	SERS	-5.20%	-3.70%	-2.50%	-2.40%
	Peer Group Average	2.95%	0.93%	1.26%	-1.94%

Source: Individual Peer Fund 2017 Comprehensive Annual Financial Reports (CAFR)

Insight Validation

Our assessment was performed against a specific group of funds that were selected because of their similar characteristics and due to data availability. To ensure consistency in our findings and validate that the funds selected were not predisposed towards producing a specific outcome, the research team looked at a wider data set from the PPD database and explored findings from other reports. Our findings were confirmed in that

the performance ranking of PSERS and SERS is quite similar against broader peer groups.

A broader assessment was performed leveraging PPD data. The research team began by downloading the 2017 PPD database and filtering funds that are over $10B, report net figures, and have June 30th as their fiscal year end date (with the exception of SERS, as has already been previously described). The research team then removed funds with gaps across the spreadsheet to ensure a consistent comparison across the group and arrived at a list of 52 peer funds.

- With this new data set, when looking at 1-year, 3-year, 5-year, and 10-year investment returns of funds, we find similar results to our previous assessment. As illustrated in Table 2.21 and Table 2.22 below, SERS and PSERS rank towards the bottom of the list in terms of their ability to generate investment returns in the 1-year, 3-year, 5-year, and 10-year time frame.

Table 2.21 SERS and PSERS Absolute Investment Return Performance vs. 52 Peer Fund List

	Overall Rank (Absolute Investment Returns)			
	1 Year	3 Year	5 Year	10 Year
SERS	40/52	45/52	45/52	49/52
PSERS	48/52	43/52	49/52	50/52

Source: Authors' analysis and Public Plans Database (2018)

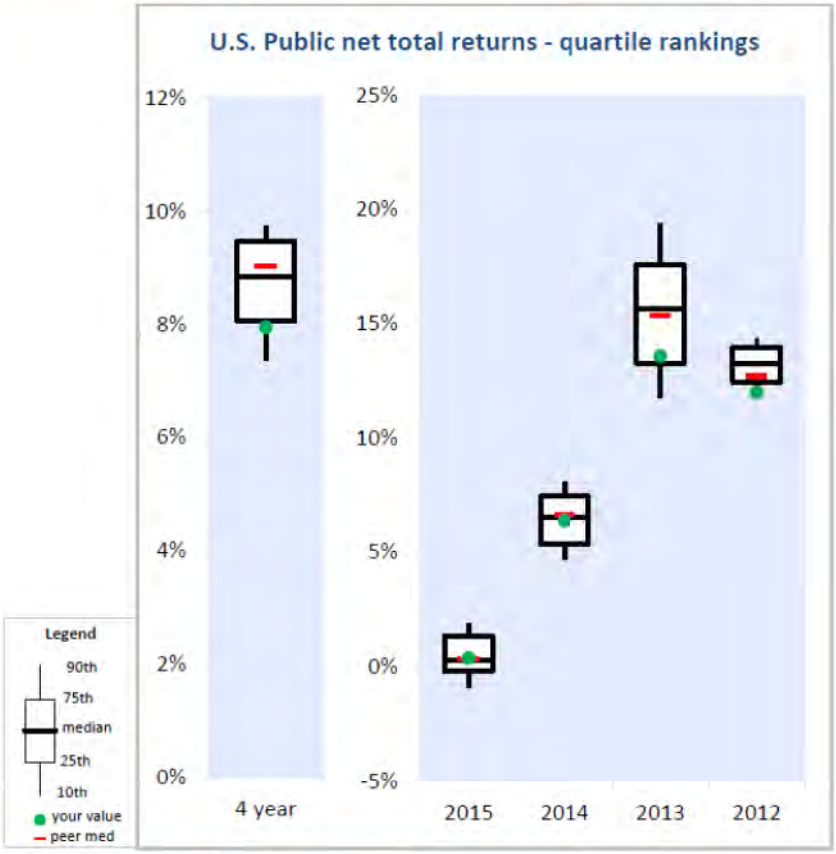
Table 2.22 Fund List (52) Filtered by 10-Year Investment Return Performance (High to Low)

PlanName	fy	fye	MktAssets_net	InvestmentReturn_1yr	InvestmentReturn_3yr	InvestmentReturn_5yr	InvestmentReturn_10yr
Oklahoma Teachers	2017	6/30/2017	$15,637,797.29	15.28%	5.35%	11.01%	6.87%
Ohio Teachers	2017	6/30/2017	$71,118,707.00	14.29%	6.74%	10.06%	6.80%
Kentucky Teachers	2017	6/30/2017	$18,707,699.03	15.37%	6.27%	10.09%	6.29%
Minnesota GERF	2017	6/30/2017	$20,100,579.00	15.10%	6.30%	10.20%	6.20%
Minnesota State Employees	2017	6/30/2017	$11,223,065.00	15.10%	6.30%	10.20%	6.20%
Minnesota Teachers	2017	6/30/2017	$21,258,090.43	15.10%	6.30%	10.20%	6.20%
Georgia ERS	2017	6/30/2017	$13,098,299.00	12.40%	5.80%	9.50%	6.20%
South Dakota RS	2017	6/30/2017	$11,644,038.60	13.81%	5.95%	10.97%	6.14%
Georgia Teachers	2017	6/30/2017	$71,340,972.00	12.50%	5.80%	9.40%	6.10%
Arkansas Teachers	2017	6/30/2017	$16,284,808.24	16.10%	6.70%	10.50%	6.03%
Nevada Regular Employees	2017	6/30/2017	$30,034,611.00	11.90%	6.10%	9.60%	6.00%
Iowa PERS	2017	6/30/2017	$30,779,116.33	11.70%	5.86%	8.65%	5.89%
TN State and Teachers	2017	6/30/2017	$23,019,615.00	11.42%	5.78%	8.70%	5.87%
Louisiana Teachers	2017	6/30/2017	$19,513,345.68	16.50%	6.90%	10.90%	5.80%
New York City ERS	2017	6/30/2017	$61,316,782.00	12.99%	6.01%	9.37%	5.65%
Louisiana SERS	2017	6/30/2017	$11,753,275.85	15.80%	4.70%	9.00%	5.60%
Arizona SRS	2017	6/30/2017	$36,202,756.00	13.90%	5.70%	9.60%	5.60%
New York State Teachers	2017	6/30/2017	$115,468,360.00	12.50%	6.60%	10.20%	5.60%
Mississippi PERS	2017	6/30/2017	$26,543,097.00	14.96%	6.34%	10.08%	5.59%
New York City Fire	2017	6/30/2017	$12,089,896.00	12.82%	5.73%	9.36%	5.58%
New York City Teachers	2017	6/30/2017	$50,095,723.00	12.89%	5.80%	9.29%	5.57%
Missouri Teachers	2017	6/30/2017	$37,280,246.06	12.50%	6.20%	9.50%	5.50%
Washington LEOFF Plan 2	2017	6/30/2017	$11,776,198.00	13.44%	6.91%	9.95%	5.47%
Washington PERS 2/3	2017	6/30/2017	$35,001,233.00	13.44%	6.91%	9.95%	5.47%
Washington Teachers Plan	2017	6/30/2017	$12,524,207.00	13.44%	6.91%	9.95%	5.47%
Florida RS	2017	6/30/2017	$154,053,262.97	13.77%	5.85%	9.51%	5.46%
San Francisco City & County	2017	6/30/2017	$22,410,350.00	13.81%	6.19%	9.98%	5.40%
Illinois Universities	2017	6/30/2017	$18,484,819.58	12.20%	5.00%	9.00%	5.40%
Oregon PERS	2017	6/30/2017	$66,371,703.25	11.92%	5.72%	9.19%	5.37%
Idaho PERS	2017	6/30/2017	$15,335,945.86	12.70%	5.80%	8.60%	5.30%
LA County ERS	2017	6/30/2017	$52,743,651.00	12.70%	5.80%	9.00%	5.20%
New Mexico Educational	2017	6/30/2017	$12,509,355.91	12.00%	6.10%	8.70%	5.20%
Massachusetts SRS	2017	6/30/2017	$26,282,232.00	13.24%	6.36%	9.79%	5.10%
Massachusetts Teachers	2017	6/30/2017	$27,138,609.00	13.24%	6.36%	9.79%	5.10%
Connecticut Teachers	2017	6/30/2017	$17,134,326.00	14.38%	5.63%	8.80%	4.97%
California Teachers	2017	6/30/2017	$210,289,900.00	13.44%	6.32%	10.05%	4.95%
Maine State and Teacher	2017	6/30/2017	$10,893,305.47	12.50%	4.90%	8.40%	4.90%
Virginia RS	2017	6/30/2017	$70,159,680.00	12.10%	6.20%	9.10%	4.90%
Connecticut SERS	2017	6/30/2017	$11,929,236.42	14.32%	5.63%	8.80%	4.87%
Illinois Teachers	2017	6/30/2017	$49,375,664.52	12.60%	5.40%	9.20%	4.80%
Illinois SERS	2017	6/30/2017	$16,530,179.79	12.30%	5.30%	9.40%	4.60%
Ohio School Employees	2017	6/30/2017	$13,438,843.28	13.20%	6.00%	9.50%	4.50%
South Carolina RS	2017	6/30/2017	$25,732,829.00	11.88%	4.23%	7.50%	4.48%
San Diego County	2017	6/30/2017	$11,397,064.76	12.00%	4.90%	7.10%	4.40%
California PERF	2017	6/30/2017	$326,498,998.00	11.20%	4.60%	8.80%	4.40%
Maryland PERS	2017	6/30/2017	$16,540,665.00	10.00%	4.60%	7.60%	4.20%
Maryland Teachers	2017	6/30/2017	$29,731,192.00	10.00%	4.60%	7.60%	4.20%
New Mexico PERA	2017	6/30/2017	$14,798,917.91	11.10%	4.39%	8.53%	4.08%
Pennsylvania SERS	**2017**	**6/30/2017**	**$29,405,042.00**	**12.00%**	**4.70%**	**7.90%**	**3.90%**
Pennsylvania PSERS	**2017**	**6/30/2017**	**$53,155,336.00**	**10.14%**	**4.76%**	**7.35%**	**3.80%**
Indiana PERF	2017	6/30/2017	$14,644,671.00	8.00%	3.00%	5.70%	2.90%
Indiana Teachers	2017	6/30/2017	$11,069,670.00	8.00%	3.00%	5.70%	2.90%

Source: Authors' analysis and Public Plans Database (2018)

Our findings are also confirmed by the plan's consultant reports for peer performance, which show consistently below-median performance for SERS and PSERS. For example, a 2016 CEM Benchmarking report for SERS illustrates that the fund's 4-year net total return of 7.9% is below a U.S. Public median of 8.8% and a peer median of 9.0%.[lvii] It also states that the fund's 4-year policy return of 8% is below the U.S. Public median of 8.6% and peer median of 8.7%.[lviii]

Figure 2.19 SERS 4 Year Net Total Return Comparison



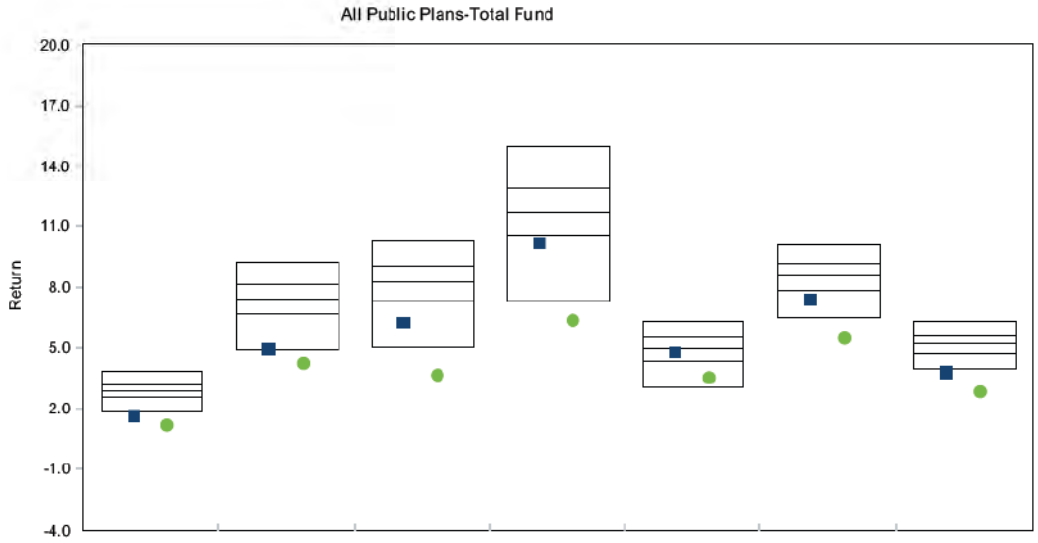
Source: CEM Report – SERS Investment Cost Effectiveness Analysis 2015

Similar results can be observed in a quarterly investment review of PSERS performed by Aon Hewitt Retirement and Investing for second quarter 2017 results. In a peer group assessment of total fund performance in 2017, PSERS' total fund results consistently perform towards the lower end of the spectrum for 1-year, 3-year, 5-year, and 10-year return results.[lix]

Figure 2.20 PSERS Total Fund Analysis vs. peer group (Aon)

PSERS Total Fund — As of June 30, 2017

Peer Group Analysis



	1 Quarter	2 Quarters Ending Jun-2017	3 Quarters Ending Jun-2017	1 Year	3 Years	5 Years	10 Years
PSERS Total Fund	1.60 (98)	4.90 (96)	6.21 (92)	10.14 (82)	4.76 (62)	7.35 (87)	3.80 (97)
Blended Policy (Total Plan)	1.20 (99)	4.22 (98)	3.62 (98)	6.39 (97)	3.49 (93)	5.47 (97)	2.80 (99)
5th Percentile	3.85	9.27	10.32	14.99	6.34	10.16	6.34
1st Quartile	3.21	8.10	9.06	12.90	5.56	9.18	5.61
Median	2.88	7.42	8.25	11.73	5.04	8.58	5.20
3rd Quartile	2.54	6.70	7.36	10.59	4.35	7.84	4.80
95th Percentile	1.88	4.94	5.07	7.33	3.08	6.54	3.96
Population	398	398	389	386	366	356	283

Source: Aon PSERS Total Fund Assessment Second Quarter 2017 Review

This would suggest that PSERS and SERS have consistently performed lower than most U.S. pension plans, irrespective of peer groupings or time periods, in the last 20 years.

2.7.2 Investment Performance Synthesis

From an absolute returns perspective, the peer group experienced a decline in long-term performance for the period of 2008-2017. While funds experienced strong short-term total portfolio 1-year returns in 2017, none of the funds exceeded their discount rate based on 10-year annualized figures. However, when isolating for the financial crisis embedded within the 10-year period, and focusing on 5-year returns, the data illustrates that all funds exceeded their discount rate in the medium term.

The relative performance of SERS and PSERS against the peer group changes depending on the measure being assessed, which is why this set of chapters looks at returns, value added, and benchmarks holistically.

From a total portfolio returns perspective, the data shows that both SERS and PSERS underperformed the peer group in the 2008-2017 period. On one hand, PSERS had the

lowest total portfolio returns among the peer group for 1-year, 5-year, and 10-year return figures. On the other hand, while SERS outperformed the peer group average at the 1-year mark, it was the second lowest performer (after PSERS) for 5-year and 10-year returns.

A look at value-added figures reveals opposite results. Based on value-added data, PSERS appears to be a strong performer, beating the peer group average across all time horizons. Meanwhile, SERS appears to be a low-performing fund against the peer group for all years. These value-added results, however, can only be assessed considering the relative performance of the funds' benchmarks. After all, as discussed above, investors can use benchmarks to disguise underperformance by selecting benchmarks that generally produce lower returns, and investors who pick more rigorous benchmarks should not be punished for doing so.

By incorporating benchmark performance into the analysis, one can observe another reversal of performance for SERS and PSERS. From a peer group lens, and similar to absolute returns, the total portfolio benchmark returns generally outperformed the funds' discount rates in the short term (1 year) but underperformed in the long term based on 10-year benchmark returns. Isolating for the financial crisis, from a 5-year total portfolio benchmark return lens, all peer group benchmarks exceeded their discount rate, with the exception of Georgia Teachers and PSERS. For Georgia Teachers, this is inherent to the fact that the fund selected CPI as their benchmark to follow inflation. For PSERS, however, this is an illustration of the systemic underperformance of its benchmarks relative to those of the peer group.

When assessed against peer group benchmark returns, PSERS' benchmark underperformance holds true. In fact, PSERS' total portfolio benchmark returns experienced the lowest performance amongst the peer group. In contrast, SERS' total portfolio benchmark returns exceed the peer group average across all time horizons.

In summary, from a holistic perspective that considers returns, value added, and benchmarks, the data reveals that both SERS and PSERS underperform when assessed against the peer group. While PSERS had positive value-added figures, a look at its benchmark performance reveals that these value-added figures are relatively high because the benchmarks they are measured against are relatively low compared to the peer group. In terms of absolute returns, PSERS is the lowest-performing fund in the peer group across all time periods. Data on SERS' performance reveals that overall, the fund has performed relatively better in the short term than it has in the long term. This is true not only for its absolute returns, where SERS underperformed the peer group average in the 5-year and 10-year marks and was the second-lowest performer after PSERS, but also for its total portfolio benchmark returns, which underperformed the fund's discount rate in the 10-year time horizon. SERS' relatively low performance in value added should be assessed against the fact that it has higher benchmark returns than most funds in the peer group.

To better understand the causes behind the performance of SERS and PSERS, one must once again look at their asset allocation strategy and their effectiveness of executing against it. SERS' and PSERS' low funded status and their cash flow requirements must be considered when assessing their relative performance. Their requirements for cash and liquidity, due to significant underfunding, have been crucial in shaping their asset allocation. Yet, both funds have responded differently to these constraints. SERS made a strategic choice to focus on equity and fixed income. Meanwhile, PSERS has decreased its dependency on equity markets while increasing its exposure to alternative asset classes. The difference in these asset allocation strategies, as well as their execution against them, reveals much about the funds' performance over the 2008-2017 period.

Beginning with SERS, one can observe that the fund has opted to focus on equity and fixed income as major pillars of their asset allocation strategy. By 2017, these two asset classes made up a cumulative 66% of their portfolio, compared to 47% in 2008. After an initial divestment from equities through 2010, their focus on equities has allowed them to capture the value derived from the "longest bull run in history," where the S&P 500 has quadrupled from its 2009 low of 666.[lx] However, SERS' ability to generate returns in this asset class is relatively lower when compared to the peer group.

As the data presented illustrates, SERS' equity returns were above the peer group average in the short-term (1-year), but it underperformed in the medium- and long-term (3-year, 5-year, and 10-year). The same is true for fixed income, where SERS outperformed the peer group average for 1-year returns but underperformed across other time horizons.

The analysis shows that SERS faces an execution challenge. The fund has followed an asset allocation strategy that has allowed them to capture market value as equity values have risen across time, but when compared to the peer group, equity and fixed income, their "big bets" have produced lower returns than other funds in the peer group.

PSERS' strategy of diversifying their portfolio and investing in "all asset classes available to it . . . [including] risk parity and absolute return"[lxi] may be contributing to their relative underperformance over long time periods. To begin with, it should be noted that PSERS is a relatively strong performer in fixed income – its largest asset class – as it beat the peer group average across all time periods covered. However, a challenge faced by PSERS' asset allocation strategy can be observed in their sustained divestment out of equities. The fund's initial allocation for equity at the beginning of the period was 52% and it began to decrease at the onset of the global financial crisis, like most other funds. However, PSERS did not rebalance its equity allocation. In fact, other than a minor increase between 2014 (21%) and 2015 (24%), equity allocations continued to decline across the time period. In 2017, PSERS was the only fund that did not have equity as its largest asset class. The fund was not able to fully extract value from the recovery in equities post-2010 by not rebalancing to its previous policy target, as SERS and other funds did. Moreover, the fund has chosen to focus on alternative asset classes, where it has not produced relatively higher returns than a balanced mix of listed market indices. For example, PSERS is the fund with the largest allocation towards commodities across the peer group (10% in 2017) and it doubled its allocation from 5% in 2008; yet, it has

experienced losses across all time periods covered (-3.48% 1Y; -8.02% 3Y; -4.62% 5Y; -3.42% 10Y). Although positive on an absolute basis, a similar relative underperformance can be observed for private equity, where PSERS has increased its allocation from 14% in 2008 to 20% in 2017. In this case, PSERS' returns were below the peer group average across all time periods. Despite the positive returns, the fact that PSERS underperforms other funds in asset classes where it has chosen to focus on and allocate high percentages of its portfolio, points to both strategy and execution challenges for that fund.

As the data shows, PSERS outperforms in fixed income, the asset class that represents its largest portfolio allocation. However, it is not a relatively strong performer in other illiquid asset classes that it has chosen to focus on as part of its diversification strategy away from equity. Lower return expectations for investment grade bonds in a rising interest rate environment could further limit their portfolio's return in excess of inflation with higher duration fixed income allocation. Moreover, its large and sustained divestment from equity has meant that it has not captured the benefits of the longest bull market in history, and could limit future potential portfolio return in excess of inflation. Adopted strategic asset allocation using reasonable return expectations can have consistency implications for the pension plan's discount rate.

2.7.3 Risk Adjusted Performance

As discussed earlier, it is critical to analyze the returns achieved on a risk-adjusted basis – that is, to measure the investment return relative to the amount of risk the investment has been exposed to. We aligned our analysis with each plan's respective fiscal year given availability of annual returns, thus analysis periods below overlap, but don't begin and end on the same date. We have calculated both Sharpe Ratios and Information Ratios on return data obtained from publicly available sources of the respective websites of SERS and PSERS beginning in 1988 – about 30 years. This includes various measures required to calculate the performance ratios including risk, returns, and value added relative to various multi-asset class benchmarks we developed using public market indices to construct appropriate balanced asset allocations. Unfortunately, data was not available for the peer group for longer timeframes as was available for absolute performance. The risk-adjusted performance analysis focuses solely on the two plans themselves.

As highlighted above, data for performance analysis or security prices can be difficult because of limitations caused by small sample size due to less than desirable data frequency or shorter time periods. Generally, performance statistics such as Sharpe and Information Ratios should be evaluated over at least an investment or business cycle, including the most recent trough in Q1-2009. Furthermore, if there is a lot of variation in the strategic policy mix, statistical results may not be as significant.

Private market investments also introduce uncertainties, including infrequent and limited mark-to-market pricing, which should not be mistaken for greater diversification effects or lower risk than is reasonable to assume for smaller company or illiquid securities. Actual fund risk may be understated given long lags between updating fair value prices, the uncertainty of pricing non-marketable securities in private equity, private debt, real

estate, infrastructure, and even hedge funds. Limited frequency of fair value pricing of private market funds creates a lower risk illusion for the total fund return simply by observing only quarterly returns, let alone annual returns. The greater the exposure to private market funds, the more likely that observed total fund return risk is understated.

Benchmarks Used for Information Ratios

In order to calculate risk-adjusted performance, we constructed various multi-asset benchmark portfolios using simple public total return indices. These benchmarks compounded monthly data to provide annual returns compatible with annual plan returns. We used 30 years of data to develop a comparable history with large enough sample size to provide significant calculations.

There are three main multi-asset benchmarks that we used to compare the plans against. These benchmarks were intended to provide simple public market index representations of the funds' policy asset allocation. By using a simple representative public market index we can get a better understanding of behavior of risk over the period to check, assuming there is an alignment to the objective of the fund. This allows us to understand whether changes in the risk-adjusted ratio are due to market volatility or whether they are specific to fund selection or investment decision-making.

The first benchmark was made up of a simple U.S.-based balanced portfolio – 60% equity, 30% bonds, 5% real estate, and 5% cash.

The second is a global balanced portfolio with 60% equity and 40% fixed income that includes typical sub-allocations to different indices, relatively consistent with an optimal mean-variance allocation.
The third benchmark is a global mix of public indices that is similar to the most recent policy allocation of the respective exposures in the case of PSERS. For SERS, we included a simple 60% Global Equity (MSCI World) and 37% JPM Global Bonds (3% Cash),as the global balanced portfolio is relatively similar to their current allocation.

The final benchmark is a quasi-LDI benchmark. This allocation has a slightly longer duration bond-heavy mix with an allocation to commodities versus PSERS given their allocation to commodities.

The asset allocation weights are provided below for each of the benchmarks used for comparison. Global Balanced and US 60/30/5/5 are slightly different due to different beginning and ending periods (Dec. 2017 vs. June 2018 for PSERS) from differences in their respective fiscal year-end.

Table 2.23: Asset class weights for Benchmarks used in analysis

SERS	S&P500	R2000	MSWorld	EAFE+Can	EmgMkt	NAREIT	CRB	T30Y	T10Y	HIYLD	AggBND	SHTBND	JPM-GBND	JPM-GBxUS	T-Bill
Global Bal	36.00	9.00		9.00	6.00	5.00				7.00	15.75	5.25		3.50	3.50
60/40 Global			60.00										37.00		3.00
Quasi-LDI	12.00	9.00		6.00	3.00	10.00		6.00	12.00	18.00	24.00	0.00		12.00	-12.00
PSERS	S&P500	R2000		EAFE+Can	EmgMkt	NAREIT	CRB	T30Y	T10Y	HIYLD	AggBND	SHTBND		JPM-GBxUS	T-Bill
Global Bal	36.00	9.00		9.00	6.00	5.00				7.00	15.75	7.00		3.50	1.75
PSERS Global	21.00	5.25		5.25	3.50	15.00				12.50	30.00	0.00		5.00	2.50
Quasi-LDI	12.00	9.00		6.00	3.00	10.00	15.00	9.00	9.00	11.25	18.00	0.00		9.00	-11.25

Source: Author

Because the reporting periods for both plans are different, we carried out separate calculations of the respective multi-asset index benchmarks created for comparison. Both plans have asset allocations that have varied tremendously over the last 30 years, with a significant decline in equity exposure for PSERS following the Financial Crisis in 2008.

The index benchmarks are representative of passive investments that have been challenging strategies for the average investor or multi-asset fund to beat, but it is noteworthy that index tracking funds necessarily underperform their indices by at least the related fees and transaction costs over longer horizons, even if management fees are less than 5-10 basis points.

Performance – PSERS

The following table summarizes the calculated risk-adjusted performance measures for PSERS:

Table 2.24: PSERS Risk Adjusted Performance Results

			Balanced Benchmarks			
	PSERS	Retn%	US 60/30/5/5	Global Bal	PSERS Global	Quasi-LDI	T-Bill
30yr	Return	8.43%	8.50%	8.14%	7.95%	7.43%	2.92%
	Risk	10.21	9.48	9.01	7.34	7.14	2.59
	Sharpe Ratio	0.54	0.59	0.58	0.69	0.63	
	Information Ratio vs.		-0.01	0.07	0.09	0.16	
10yr	Return	5.03%	7.76%	6.79%	6.70%	5.85%	0.31%
	Risk	12.86	10.20	11.27	9.92	10.40	0.42
	Sharpe Ratio	0.37	0.73	0.57	0.64	0.53	
	Information Ratio vs.		-0.81	-0.50	-0.35	-0.15	
5yr	Return	7.62%	9.29%	7.73%	6.97%	5.62%	0.42%
	Risk	5.55	4.72	6.28	4.20	5.32	0.56
	Sharpe Ratio	1.30	1.88	1.17	1.56	0.98	
	Information Ratio vs.		-0.97	-0.07	0.21	0.46	

Source: Author

As mentioned, the fiscal year end for PSERS is June 30th and so the beginning and end-points for PSERS results in different asset class and benchmark returns, although significantly overlapping. The returns data was obtained from the plan's website through June 30, 2018. For PSERS, only gross returns were recorded prior to 2002, and so an assumed expense ratio of 0.25%, consistent with historical average difference between

net and gross returns, was applied to make the data consistent with net returns over the full period.

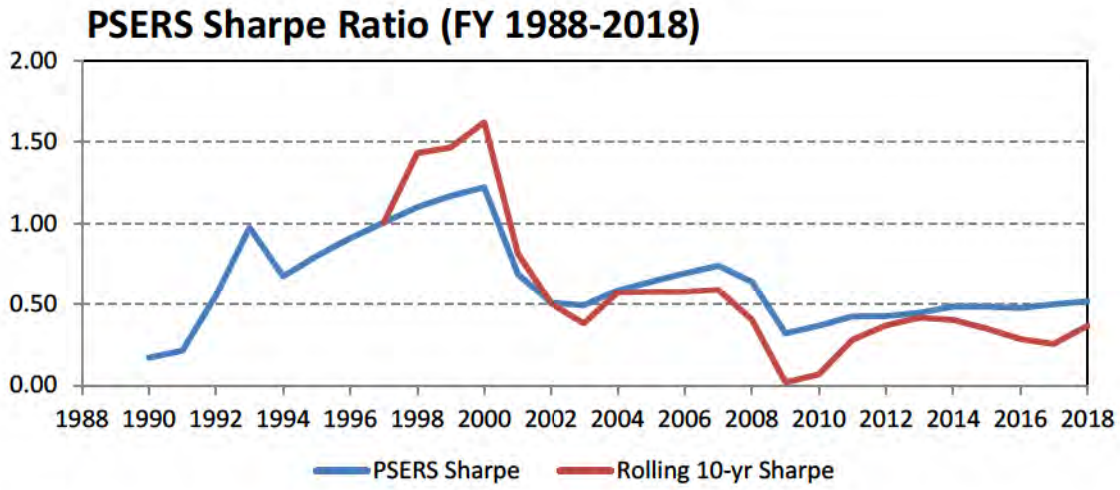
The asset allocation of the global balanced strategies of SERS and PSERS are different to reflect the unique characteristics of each plan's unique investment strategy. PSERS' equity allocation is closer to 40% with longer duration fixed income, and includes commodities. SERS has an equity policy allocation of 60%, but the fund recently maintained exposure closer to 65%.

The 30-year PSERS Sharpe ratio is slightly lower than all the alternative balanced benchmarks, but the 10-year Sharpe ratio is 2/3rds of the global balanced portfolio, reflecting more than a 2:1 ratio of risk to return in excess of the risk-free rate despite a higher-than-average exposure to bonds, including leverage.

10-year negative information ratio vs. US 60/30/5/5 and Global Balanced portfolios, for example, reflects that PSERS has significantly and consistently underperformed various simple multi-asset index portfolios. This is particularly troubling given the last decade through June 2018 provided the best possible capital market return regime of falling interest rates and quantitative easing (exceptional demand for Treasuries), resulting in a flattening yield curve that benefited long duration or leveraged fixed income strategies. Given the Treasury yield curve shuld eventually normalize as interest rates risk further, coinciding with reducing the Fed's balance sheet, the coming years may be particularly challenging for LDI and risk parity strategies favoring long duration bonds, just as we have observed during periods of rising bond yields historically. Leveraging bond exposure can be particularly treacherous in a rising interest rate environment as short-term refinancing costs can rise faster than long duration coupon yields. This negative cash flow scenario contributed to driving Orange County into bankruptcy with just 150% leverage on a $7.5 billion portfolio.

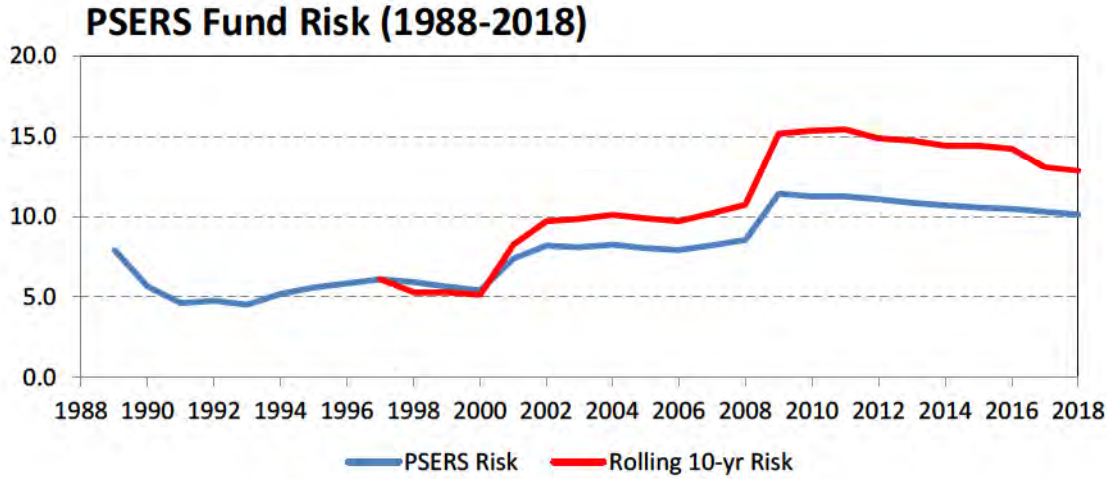
The chart below shows the historical Sharpe Ratio for PSERS as well as the rolling 10-year Sharpe ratio value. Similar measures for the overall Fund risk of the plan are shown also below.

Figure 2.21: PSERS Historical Sharpe Ratio



Source: Author

Figure 2.22: PSERS Fund Risk



Source: Author

The charts show that the Sharpe Ratio of the PSERS portfolio over the first half of the period was much higher than the second half of the period as total fund risk has nearly doubled. Information ratios relative to these benchmarks are not statistically different from 0, which are not surprising given the Sharpe Ratios are similar.

Performance – SERS

The following table illustrates the calculated risk-adjusted performance of SERS:

Table 2.25: SERS Risk Adjusted Performance Results

			Balanced Benchmarks				
	SERS	Retn %	US 60/30/5/5	Global Bal	60/40 Global	Quasi-LDI	T-Bill
30yr	Return	8.98%	9.38%	9.33%	7.53%	7.89%	3.09%
	Risk	11.44	11.12	11.83	10.53	9.01	2.56
	Sharpe Ratio	0.51	0.49	0.47	0.30	0.33	
	Information Ratio vs.		-0.08	-0.07	0.27	0.16	
10yr	Return	4.06%	7.08%	6.56%	5.24%	6.01%	0.33%
	Risk	12.72	12.19	14.23	11.31	11.11	0.49
	Sharpe Ratio	0.29	0.55	0.44	0.43	0.51	
	Information Ratio vs.		-0.85	-0.45	-0.25	-0.29	
5yr	Return	8.27%	10.75%	9.46%	7.60%	6.48%	0.26%
	Risk	5.99	6.72	7.34	7.52	4.96	0.36
	Sharpe Ratio	1.34	1.56	1.25	0.98	1.25	
	Information Ratio vs.		-0.96	-0.58	0.37	0.63	

Source: Author

The fiscal year for SERS ends on December 31st with the data here being included until December 31, 2017.

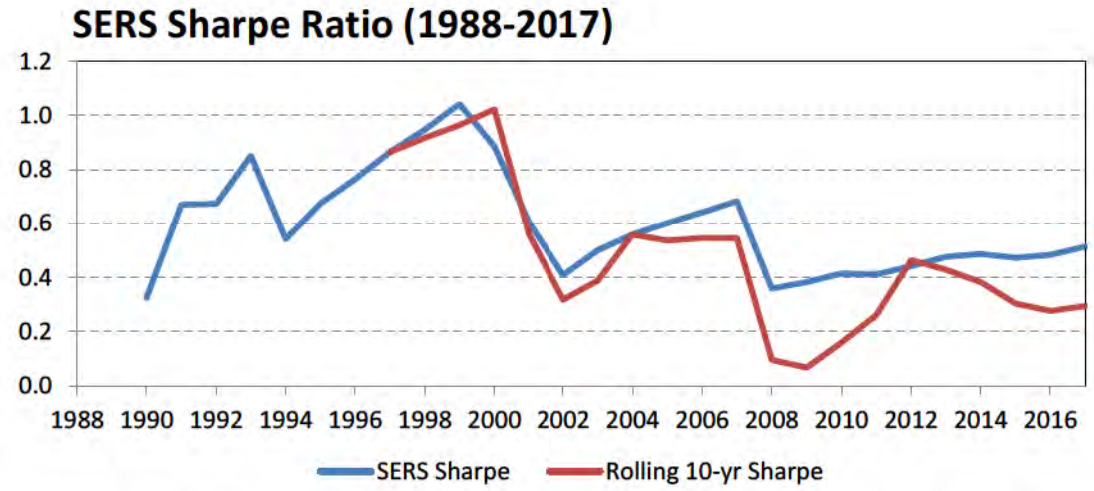
The 30-year SERS Sharpe ratio is similar to the alternative U.S. and global balanced benchmarks constructed, but the 10-year Sharpe ratio is materially less than the global balanced portfolio. A meaningfully lower Sharpe ratio for 10 years intuitively coincides with a meaningfully negative information ratio versus various passive alternative strategies, although not incorporating management fees or transaction costs.

Calculations for simple comparative U.S. and global 60/40 balanced benchmarks suggest there are liquid global balanced benchmarks that would have provided meaningfully better performance with greater consistency, particularly over the last 10- or even 5-year periods than the SERS' net return.

The negative 10-year information ratio versus both US 60/30/5/5 and Global Balanced benchmark portfolios further reflects that SERS valued added underperformed other alternative policy mixes on a risk adjusted basis.

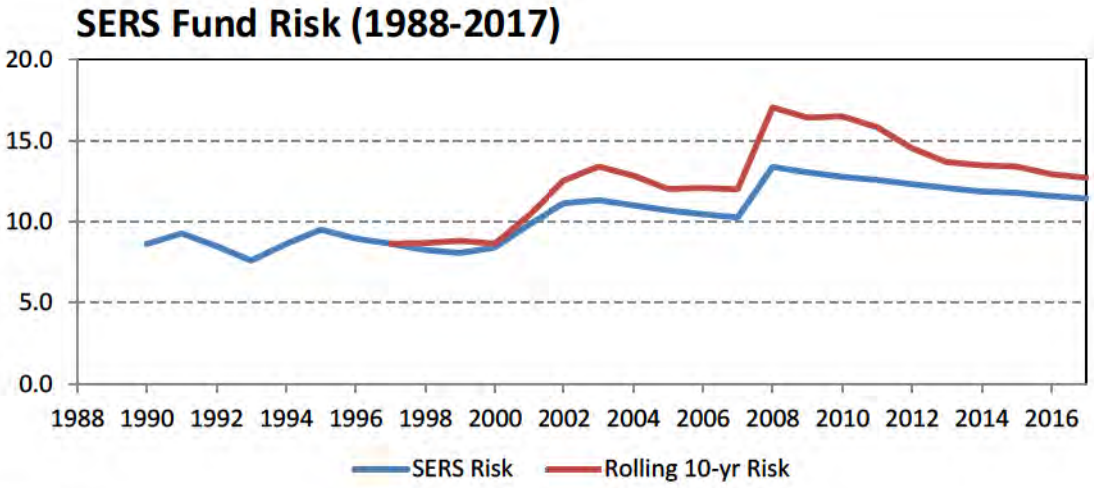
The following charts indicate the Sharpe Ratio and Fund Risk for SERS over the time period examined. Values are provided for the fund over the entire period as well as a rolling ten-year value.

Figure 2.23: SERS Historical Sharpe Ratio



Source: Author

Figure 2.24: SERS Historical Fund Risk



Source: Author

Similar to PSERS, the charts show that the Sharpe Ratio over the first half of the period was much higher than the second half of the period while total fund risk increased.

2.8 Summary of Asset Allocation and Performance Analysis

In summary, the analysis documented in this section reveals some key insights and findings about the two PA pension plans.

Firstly, the absolute performance analysis would suggest that both the PA plans have underperformed when compared against the peer group used in this set of chapters. This underperformance was confirmed when assessing the funds against a wider universe of funds in the Center for Retirement Research Public Pension Database. Furthermore, the risk-adjusted performance analysis of the two funds indicates very low Sharpe ratios over the 10- and 30-year time periods. The information ratio calculations show that both funds have underperformed against simple balanced public index portfolios over the 10- and 30-year periods. We note that using longer time horizons for risk-adjusted returns is important in order to provide a more accurate value of risk that takes into account a full cycle. Smaller time horizons can provide misleading values for risk that don't take into account market corrections.

The overall fund risk of the two plans increased over longer horizons and remains at high levels, despite recent market volatility decreasing across equities, bonds, and currencies.

The performance results of the two funds provide evidence that the current asset allocation strategies employed by the funds might need to be addressed. Specifically for PSERS, the significant use of leverage to extend duration in fixed income is a cause for concern, particularly if short-term refinancing costs rise faster than long duration yield. The high allocation to fixed income may restrict the fund's ability to earn returns closer to its expected discount rate return (if real bond returns decrease as the Fed normalizes monetary policy). The high return expectations for commodities might also be cause for concern in attempting to achieve returns close to the discount rate of the fund.

For both funds the allocations to illiquid asset classes should be addressed. The risk-adjusted performance against simple balanced public indices highlights the current approach to illiquid asset classes may not be very effective and has increased risk. Illiquid investments should offer a risk premium or identifiable inefficiency, but purchase price matters and stretched valuation plus high fund fees appear to exceed available risk premiums. The combination of illiquidity, lack of transparency, and fund lock-ups preclude efficient rebalancing of a drifting asset allocation mix from cash flows and relative asset class returns.

Many asset owners assume the risk of private markets is unreasonably low and correlation is near zero or even negative. If alternative investments are too costly to manage for certain pension funds or risk premiums diminish with capacity constraints, then no amount of diversification can overcome the headwinds versus public market exposures. Moreover, if fair values are derived from observing public market changes in valuation, then correlations and volatility are much higher than assumed, particularly if mark-to-market prices are infrequent and uncertain. Any benefit to portfolio diversification can be overwhelmed by an asset class that is riskier or more correlated with stocks and bonds than assumed.

Our assessments here based on publicly available information (most notably from the negative information ratios calculated against simple balanced public indices) would

suggest that both plans would have been better off with less complex strategies than have been used.

Our findings from Section 2 are summarized as follows:

- PSERS' asset allocation strategies significantly deviated from the peer group over the ten-year time period (2007-2017), specifically with regards to its low public equity allocation in favor of fixed income, hedge funds, private equity, commodities, and its use of leverage in the portfolio.
- SERS' asset allocation strategies tended to be in line with that of the peer group.
- The absolute performance of the PA plans has been poor.
- PSERS and SERS were the worst and second worst performers, respectively, on an absolute returns basis when compared against our peer group over the 5- and 10- year period.
- Both funds have consistently performed below the median in the wider U.S. public pension plan universe and consultant peer groupings over the last 10 years.
- The risk-adjusted performance analysis shows that PSERS and SERS have Sharpe ratios 2/3rds of a simple global balanced index portfolio over a ten-year period, reflecting more than a 2:1 ratio of risk to return in excess of the risk-free rate.
- The information ratio calculations show that both funds have underperformed against simple balanced public index portfolios on a risk-adjusted basis over the 10- and 30-year periods.
- The preliminary analysis here indicates that the use of leverage by PSERS should be addressed and that both funds' allocations to illiquid asset classes such as private equity should be revisited and reevaluated.

Section 3: Cost-Saving Options and Recommendations

In this chapter, we present non-exhaustive possible cost-saving pathways for the two plans. We specifically present a framework to highlight the drivers of cost-saving that institutional investors have utilized. There are a number of factors that need to be considered before some of these strategies can be adopted, which means that not all of the below will be appropriate for the PA plans. In particular, we highlight the importance of governance for pension funds and how the quality of governance structures can impact the cost-saving strategies a plan adopts. The final part of this section outlines cost-saving recommendations put forward for the plans.

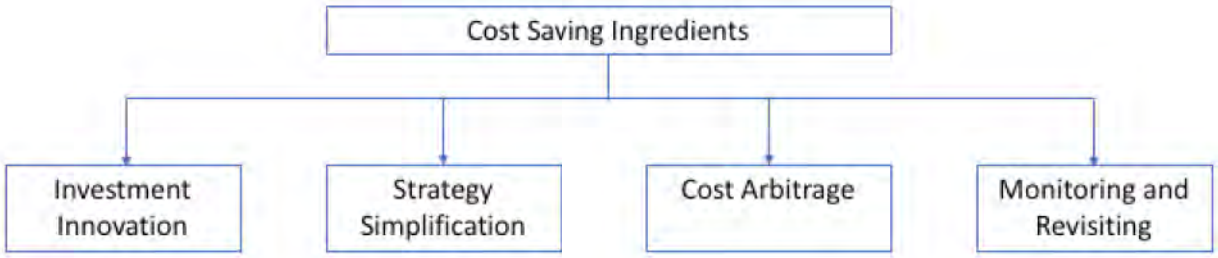
3.1 Cost-Saving Pathways

A growing number of institutional investors are becoming aware of the high costs associated with their investment products and, as a result, they are developing new methods to access certain strategies. It is important to note that we do not recommend any cost-saving pathways that compromise long-term investment returns. Instead, the motivation to explore these options comes from the recognition that direct, indirect, and often hidden costs and charges can limit the upside of an investment strategy, while reinforcing negative returns on the downside of market returns. Cost-saving strategies

should also consider any changes in risk or volatility that might be associated with a change in strategy.

We believe that there are some key ingredients that help to build a menu of cost-saving options for institutional investors. These ingredients provide the conceptual framework for how investors can approach cost-saving opportunities. As highlighted throughout this set of chapters, the local context and unique characteristics of funds may prohibit certain initiatives from being adopted. In this section we highlight the framework for saving costs and the wider tool kit available to investors before examining what is most appropriate in the PA context. The following figure represents the different ingredients of the key cost-saving pathways available to institutional investors:

Figure: 3.1 Cost-Saving Ingredients



Source: Author

These cost-saving ingredients can be explained as follows:

1) Investment Innovation: Changing the supply and demand of capital by doing things that others are not (*e.g.*, seeding new managers).
2) Strategy Simplification: Complexity generally comes with cost, which means you can remove complexity and cut fees (*e.g.*, indexing). Note that this can imply a change in exposures in some, but not all cases.
3) Cost Arbitrage: Looking for similar risk factors in different markets at lower cost (*e.g.*, hedge funds to smart beta).
4) Monitoring and Revisiting: Taking what you have in the portfolio and getting a better deal (*e.g.*, renegotiation).

From the principles above, there are a number of initiatives that investors have started to employ to help them run more cost-effective portfolios without compromising returns. When considering which path to take for achieving cost-savings, it is important to understand the comparative advantages and weaknesses of a fund and design the strategy accordingly.

We note that this is a simplified framework to help understand the potential paths that could be taken, and their costs and benefits. It is not intended to be a rigid set of categories for cost-saving strategies to fall under, and we acknowledge that there are certain options that could fall under more than one of these headings.

Investment Innovation

Innovation is rare in asset owner organizations for a number of reasons related to the structural setup of many of the funds. The prudent person rule can lead to herding behavior by funds with many reluctant to do anything different than what their peers are doing. For many investors, having a monopoly of assets can lead to the mindset of "guaranteed survival." This is backed up by the fact that funds with greater funding ratios usually run lower-risk portfolios. Many professionals working at institutional investors are poorly compensated relative to private sector investment professionals, leading them to focus on career risk rather than investment risk. There is thus a lack of incentives and capabilities for innovation to occur. Poor governance within plans and overly bureaucratic systems can stifle organizations' ability to innovate and act opportunistically. The over-reliance on consultants and financial services firms can bring misaligned advice that stifles innovation. While there are structural challenges for certain organizations, we have observed amongst the best performing funds that innovation is a key ingredient for the adoption and implementation of certain cost-saving investment strategies. Some of these strategies include:

- Seeding new managers
- Entering into new forms of collaboration with peers and partners
- Using different corporate structures, such as platform companies (e.g., REOCs)
- Utilizing new technologies

Seeding new managers, entering new forms of collaboration with peers and partners, and using different corporate structures, such as platform companies, represent some of the new ways that investors are accessing attractive investment opportunities. A core driver behind this innovation has been a dissatisfaction with the performance and service provided by their intermediaries, which has fueled the desire to form new more aligned partnerships. As will be discussed in an example below, seeding new investment managers or teams can lead to significant cost-savings in management fees and carried interest. Investors in these examples are in a better position to set the terms and conditions of the de novo funds setup. These managers can be more motivated for success than existing managers, because doing well is a matter of survival. Data has shown that new funds in certain asset classes outperform existing funds.[lxii]

Collaboration is about consciously and strategically forming new partnerships with peer organizations to help build organizational capacity and subsequently gain more alignment on investments. By developing trusted relationships with other pension funds and asset owners, investors are able to learn from the respective idiosyncrasies and comparative advantages and through these relationships build their own capabilities, which reduce their reliance on intermediaries and subsequently reduce costs. Collaboration can lead to co-investment opportunities with these aligned partners where management fees are significantly reduced or eliminated altogether.[lxiii]

Platform companies are a further extension of seeding, where new corporate structures, such as LLC's or joint ventures, are used to access opportunities in a more aligned

fashion with proven trusted partners. Investors have formed platform companies and joint ventures for investments in real estate, infrastructure and agriculture, where the partner may have domain experience in construction, development, or management of assets.

Technology is the medium through which organizations transfer and communicate decision-critical information to decision-makers, such as the board and/or investment committee. These systems can serve to empower professionals and streamline investment processes, including risk management. Whereas data and information systems are typically counted as costs to any organization and, at times, discounted accordingly, effective and timely information systems can reinforce an organization's comparative advantages, build or reinforce the legitimacy of an investment team and its board, and thereby distinguish an asset owner investor from other competing organizations. New technologies have been developed, for example, for better monitoring the performance of investment managers using data science and machine learning techniques.[lxiv]

Case Study: Seeding new private equity managers

Innovation for cost-saving opportunities has been particularly important in the private market asset classes specifically in private equity, where costs are usually a lot higher than in other asset classes. The Limited Partnership Agreement (LPA) used as the most common vehicle for accessing private market investments has come under scrutiny because of overly complicated waterfalls, hidden costs through transaction fees and board monitoring fees, and general opacity of underlying investments. The Private Equity model has arguably become more focused on fees and asset gathering rather than investing – General Partners (GPs) of funds have been employing the cyclical strategy of raising a fund then deploying it quickly, raising an even larger fund and so on, leading to an increase in assets under management. Returns from private equity have become more dependent on financial engineering and leverage rather than operational and top line improvements in portfolio companies. The use of leverage could be used to pay distributions and artificially boost fund IRRs but leave underlying portfolio companies with a lot of debt. GPs could easily move on to raising successive funds without actually creating value. GPs often would sell their best companies early to return capital and boost returns in order to raise successive funds. In recent years, GPs have underwritten deals with lower returns in order to get Funds invested.

The alignment of interest within private equity between limited partners and GPs has been greatly reduced and investors have started to realize that PE returns, often driven by extensive leverage, are not likely to generate sufficient return to justify the risk. Despite the possibility underlying private equity being attractive, accessing the asset class via typical PE fund terms is increasingly unattractive. This has led to innovation occurring amongst certain funds to invest in private equity more on the terms of asset owners. Investors, either alone or with other LPs, have 'seeded' or launched de novo PE firms to achieve improved alignment and better returns. Seeding essentially is the process of forming new PE funds with an exclusive relationship that enables better cost economics for the investor.

When seeding new PE firms, a key objective has been to create a structure that ensures wins and losses are shared proportionally and commensurately with the risks being assumed by the various parties. In a seeding arrangement, LPs are able to ensure that GPs invest their own money into the opportunities and make sizable commitments to the initiative. This enables LPs to achieve lower fees and more governance oversight.

The following illustrative example from a pension fund outside of the USA shows that considerable cost-savings can be achieved from seeding:

Table 4.1 Seeded Fund Fee Reduction Example

	Fees	**Carry**
Seeded Funds (70% of portfolio)	0.875%	11.81%
Traditional Funds (30% of funds portfolio)	1.74%	20%
Weighted average funds portfolio	1.13%	14.22%
Co-investments and Direct Investments (44% of portfolio)	0%	0%
Weighted average total PE Portfolio	0.63%	7.93%

Source: Author

The above figures were for a private equity portfolio of $14 billion. The total portfolio 5-year return (IRR) net-of-all-fees was 19.43% (as of March 31, 2014). The funds' 5-year net IRR was 15.6%, while the co-investments and direct investments achieved a 5-year net IRR of 28.8%. Co-investments and direct investments incur no fees at all and are most likely to generate better net performance than the traditional fund route. This may not always be the case, as illustrated by Fang et al. 2014, who showed that while direct investments outperformed fund investments, co-investments alongside fund managers underperformed fund investments due to adverse selection by fund managers. This is partly due to the fact that managers do not earn management fees and performance fees on co-investment deals, and so are not motivated to bring the best deals to co-investments. Despite this, other studies have shown that the highest-cost implementation styles for private equity have the worst net returns, and that the full costs are materially underreported in the financial statements of many funds.[lxv]

Despite the advantages of direct and co-investments as well as seeding de novo funds, these strategies can be resource intensive and do require a certain skill set, experience, and network to implement successfully. As will be discussed at length in latter sections, there are certain prerequisites before any fund should consider these strategies. The purpose of providing these examples, however, is to illustrate how cost-savings can be achieved through innovation within asset owner organizations. Seeding private equity managers as an interim step towards direct and co-investing can be seen as an example of this innovation, not only for saving costs in asset classes that utilize limited partnership agreements such as private equity, infrastructure, real estate, and hedge funds, but to help build organizational capacity.

Strategy Simplification

The complexity of finance was most notably exposed in the financial crisis of 2008-2009 following the subprime mortgage meltdown. A key contributing factor to the crisis was arguably the complexity of the derivative products that were developed from relatively simple, albeit subprime, mortgages.

Investment management and finance were not always this complex. Traditionally, finance was a highly personal industry based on mutual and local understanding. Bankers often put themselves at the center of local communities, providing a service that was well understood and important. Investors focused on their knowledge of specific assets and opportunities. They understood exactly what they were investing in and had a deep appreciation of the actual function of the businesses in their portfolio and what was driving returns. While effective, this model of finance was difficult to scale to the masses. And in an era marked by a lack of capital, policymakers and financiers agreed that the productization of finance was needed in order to transform the financial services industry into something that could be more easily accessed by all.

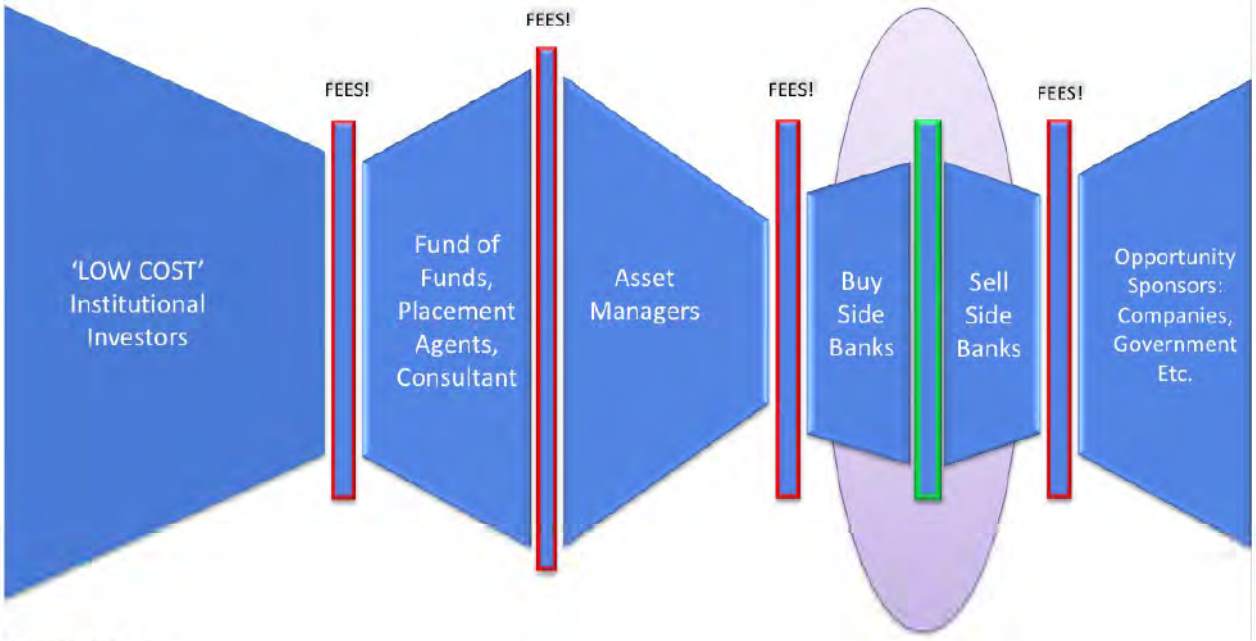
Finance thus transitioned from an inherently local product rooted in communities of banks and investors to a global product overseen by global firms in financial centers.[lxvi] The very notion of selling financial "products" (as opposed to investing in companies or assets) underscores the de-localization that began to take place. Financial products became abstractions of "real" assets and companies. The products often tranched and stripped the underlying assets of local or idiosyncratic characteristics in order that they could be sold to investors on exchanges with the help of rating agencies and a plethora of intermediaries. Today, financial products are "packaged" and sold to investors looking to satisfy a specific return need, often with very little understanding of the ingredients that are meant to deliver those returns.

Given the operating and governance constraints asset owners such as pension funds exhibit, it can be challenging to break down the amount of complexity associated with the expanding array of financial products and services on offer. Many investors do not understand the fees, costs, risks and thus incentives being accepted either explicitly or implicitly in financial products. Furthermore, it is very hard to get ahead of the innovations in terms of knowledge. In fact, perversely, financial education and literacy has been linked to increasing levels of obfuscation and intended disorientation by financial service providers intent on maintaining their knowledge gap.[lxvii]

On the back of poor performance in more expensive, complex strategies, there has been a recent shift by investors towards cheaper, simpler strategies. The financial crisis highlighted that complexity does not necessarily bring better returns and that there may be risks that are not apparent or easy to understand. With simple index equity funds, it is relatively straightforward: if the market goes up, then the index is likely to go up, notwithstanding the interim volatility of index movements. With complicated hedge fund strategies or other private market investments, it can be very difficult to understand clearly how investors make their money. There are a variety of other risks, such as

illiquidity, that need to be accounted for. The more complicated the product, the less transparent the risks. Measures of performance and risk profiles associated with any product can be and have been found to be manipulated in order to lure investors. The following figure highlights how complexity through intermediation has led to multiple layers of abstraction between investors and the opportunities they invest in (particularly in private markets):

Figure 3.2: The Costs of Financial Intermediation in Private Markets

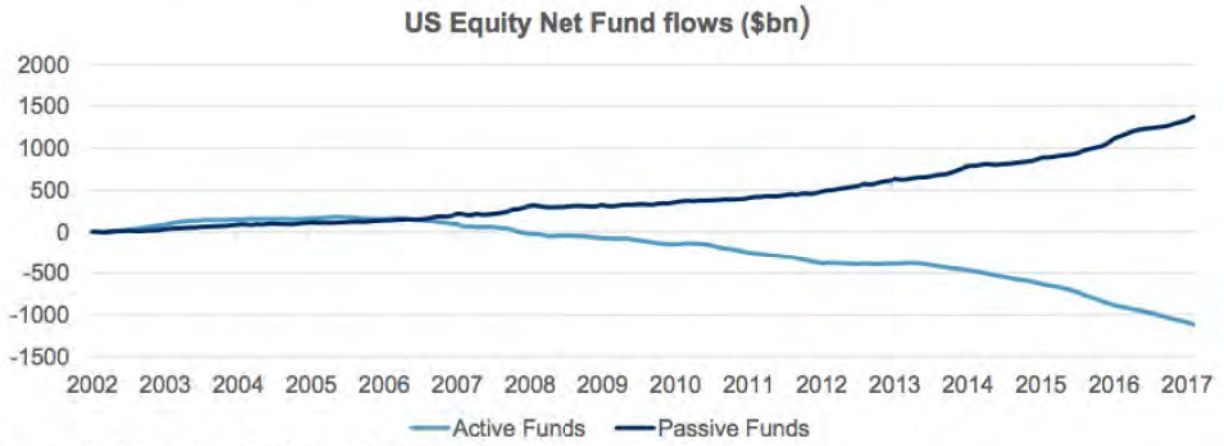


Source: Author

Investing in simpler products tends to be significantly less expensive than investing in more complex strategies. Financial product providers understand their complex strategies far better than the investors investing in them. This asymmetric information between investors and sellers of products creates a situation where investors may pay more for products than they are really worth. The more complex the information about a product, the more an unsophisticated investor may be willing to pay for it. Research shows that unsophisticated consumers can be strategically exploited by financial product producers.[lxviii]

The shift towards cheaper, simpler strategies has been most noticeable over the last decade in the public equity markets through a movement by investors away from active management towards indexing. Standard & Poor's Dow Jones Indices have conducted extensive research on the topic of active vs. passive through the SPIVA® scorecard, which compares actively managed funds against their appropriate benchmarks on a semi-annual basis. The following figure shows the divergence in asset flows of U.S. Equity funds between active and index funds:

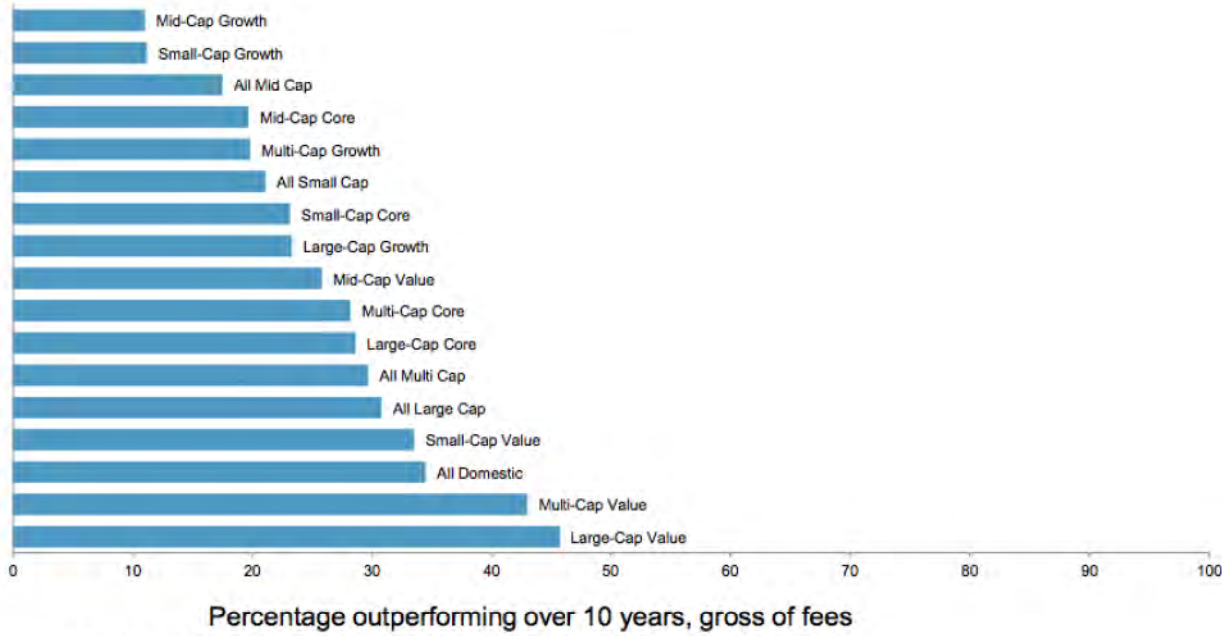
Figure 3.3: Divergence in Asset Flows Between Active and Index



Source: S&P Dow Jones Indices LLC, Morningstar.

Furthermore, the S&P Dow Jones research has found that most institutional equity managers, across all categories, underperform their benchmarks gross of fees:

Figure 3.4: Performance of Institutional Equity Managers



Source: S&P Dow Jones Indices LLC, eVestment Alliance.

From the SPIVA® scorecards that have been produced since 2001, there are some broad conclusions that can be drawn from the data collected. The first is that actively managed funds have historically tended to underperform their benchmarks over short- and long-term periods regardless of country or region. Secondly, of the actively managed funds in a category that have outperformed the benchmark over a time period, the majority have usually failed to outperform over multiple periods.

Despite the poor performance of actively managed funds, the costs are significantly higher. When looking at the specific strategies offered to investors, (according to investment consultant Willis Towers Watson), the range of fees for active long-only strategies is usually 0.2-1%. Smart beta costs may be as little as 0.15-0.2% with the more basic end at 0.1%. A smart beta strategy may have 1000 stocks, while more sophisticated quantitatively managed strategies may have 200 stocks and charge 0.25-0.3%. Active managers would charge 0.4-0.6% for a developed global equity strategy, while 0.05-0.1% would be added on top for emerging market exposure.

The rise of indexing has already saved and will continue to save asset owners billions of dollars in management fees, without requiring that they accept a concomitant reduction in investment performance. What investors do have to realize, however, is that there may be a change in risk exposure as a result of shifting strategies, such as from active to indexing. By moving to indices, there may be an increase in short-term volatility. Investors would thus need to withstand temptation to act in the short term and ensure decision-making is commensurate with long-term performance. Complex active products can have benefits to address the volatility of general market indices. Investors would need to fully understand the implications of giving up these benefits.

In summary, investors are becoming increasingly aware that they have been paying "active" prices for products that are only partly active in nature and would likely achieve greater value for money by switching to a cheaper index fund. Because information is now more readily available, technology has improved, and markets are more efficient, the active managers who exploited their "knowledge gap" without innovating their methodologies have started to come under a lot of fire. Institutional investors are more easily able to understand exactly what they are investing in, and as a result, more accurately pay for the sources of their return.

Cost Arbitrage

Cost arbitrage, as the name suggests, involves investing in opportunities with similar risk and return characteristics, but at a lower cost. There are two main areas of cost arbitrage that we highlight here. The first aspect is related to the risk factor or total fund approach to asset allocation, where having a risk approach can lead to more efficiently accessing investment opportunities. Cost arbitrage can also come in the form of disintermediation by investing in assets through internal management, which can be a lot cheaper than using external service providers.

Total Portfolio/Risk Factor Approach

The risk factor approach to selecting investments, in comparison to the traditional strategic asset allocation approach, has risen in prominence since the financial crisis. The traditional asset allocation approach is based on an optimal allocation to each broad asset class using a mean-variance optimization process. The simple balanced asset allocation

model consisting of stocks and bonds has evolved to also include broader investment types such as real estate, commodities, natural resources, and other private investments.

However, during the financial crisis of 2008-2009, supposedly uncorrelated investments in a portfolio moved in sync, raising fundamental questions about whether diversified portfolios based on asset class categories actually were diversified. The key insight behind risk factor investing is that investors should seek to understand which risk factors they are prepared to take to achieve a given return objective. The financial crisis demonstrated that financial product and asset class labels are often misleading. We now know that asset class diversification did not matter nearly as much as factor risk diversification. Assets are bundles of factor risks and investors need to understand the factor risks behind the assets. These risk factors can then be exposed to the portfolio via the sophisticated implementation of assets or products. Some risk factors themselves are asset classes, while other dynamic factors cut across asset class boundaries.[lxix]

When taking a risk factor approach, and having a "risk budget" to work from, this enables investors to choose products that provide a risk exposure that might be cheaper to alternatives. This is in contrast to the traditional asset allocation model where investors need to fill allocations to each asset class "bucket" that have been set by the portfolio construction or strategic asset allocation calculation. When filling asset class "buckets," investors do not place as much of an emphasis on the costs of filling the allocation. By taking a total portfolio or risk approach, investors can focus on the efficient allocation to risks and avoid the pressure, for example, to buy or dispose of illiquid investments at non-preferable times.

The total portfolio view has been adopted by a number of leading pension funds and sovereign funds around the world instead of the typical strategic asset allocation model. The Canadian Pension Plan Investment Board and New Zealand Superannuation Fund are examples that use the total portfolio approach. These funds have a reference portfolio set by their respective Boards, usually made up of a simple, low-cost and index portfolio that contains traditional asset classes. An overall active "risk budget" approved by the Board is then provided to the investment staff. A risk allocation process is then used to allocate active risk consistently over different investment opportunities. The approach essentially diversifies the portfolio at the level of risk and return streams, rather than at the level of specific asset classes. Investment staff must continuously assess the level of risk exposures and expected returns on a net basis. Such an approach makes investment staff a lot more conscious about the true substance of the portfolio and the costs associated with those exposures.

The cost arbitrage from taking a risk factor approach is related to the discussion of active vs. indexing above. A number of active management strategies have historically used these risk factors to inform their approach. However, investors are now able to access these factors through lower-cost index strategies, such as Smart Beta indices. Many of the historically active management strategies are being redeveloped with technological advances so that they can be offered in a lower-cost product that still achieves the same level of active risk (Smart Beta). Smart Beta combines the benefits of active management

with the reduced expenses of indexing. Factor-based investing has emerged as a third method of managing money, alongside passive management based on cap-weighted indices and more fundamental active management approaches.

Internal Management

The second form of cost arbitrage refers to replacing external service providers for a certain investment opportunity with an internal team that has the ability to invest in similar assets at a much lower cost. The costs of using external service providers can be substantial and as highlighted above, include the management fees paid to investment consultants and external asset managers, performance fees, carried interest, and rebates which are directly subtracted from the returns and are not incorporated into cost figures. There are also other agency costs with external management because the asset owner and the fund manager may have different utilities or risk aversions, incentives, horizons, skills, information sets, or interests.

As a result, there is a growing trend among large institutional investors to reduce the agency problems present in the investment management industry, by insourcing more of their investment operations. The cost-savings from internal management will vary depending on the type of asset that is being internally managed. Scale and governance of the institutional investor organization are crucial considerations for the internal management decision. Internal investment management has generally been restricted to investors larger than $25 billion, but this is also subject to the governance structure of the fund in question. Generally speaking, private market investments are more resource intensive and thus more challenging to internally manage than public assets. Understanding an organization's unique characteristics and comparative advantages is central to the decision to internally manage investments.

Notwithstanding the above considerations, the cost-savings potential from internal management can be significant. This can be seen in a simplified example of an institutional investor with a $10 billion portfolio for infrastructure:

Table 3.2: Internal vs. External Management for $10bn Infrastructure Portfolio

External Manager	Internal Management
1% management fee	40 member team
10% carried interest	Average $1m/team member
10% return	10% return
$200m /annum	$40m /annum

Source: Author

From the above table, and using conservative assumptions for the fee terms and conditions for an external manager vs. expensive assumptions for building a 40-member

internal team at a cost of $1 million per team member, there are still significant cost-savings to the fund on an annual basis.

As discussed above and as will be elaborated in detail further below, there are significant resource requirements that need to be considered before deciding to do internal management. These include being able to attract the right talent, having the right systems and processes in place, and crucially, having the right governance structures in place.

Monitoring and Renegotiation

At times, the easiest and most practical method of reducing costs is to better monitor existing asset managers and then renegotiate the contracts with managers already in the portfolio. The principal agency issues between asset owners and managers have been well documented in this set of chapters and elsewhere. We use the term re-intermediation, as opposed to dis-intermediation, to define how asset owners should be renegotiating and managing their external manager relationships for more alignment.

Re-intermediation is concerned with asset owners reengaging with their managers to achieve more alignment in the governance and contractual relationships created.[lxx] For too long we have seen asset managers set the terms for pension funds and other investors to participate in their products. The power asymmetry in this principal-agent relationship has been skewed too far in favor of asset managers. We note that asset managers deploy significant resources to assist them in their negotiations with asset owners to ensure that they get the best deal for themselves. Asset owners need to be aware of the various tactics that certain asset managers may use and ensure that they are well informed when entering into (re)negotiations.

When looking across a portfolio, there are areas that might be easier than others to achieve immediate cost-savings for investors. In public markets, where there is more liquidity and capital is not locked up for multiple years, cost-savings through negotiations can be immediately effective. In private market asset classes, because of the longer time horizon, it may be more difficult to extract cost-savings in the short term. Private market investments, however, are typically the most expensive asset classes and therefore can be a source of significant savings once the impact of renegotiations and/or terminations are implemented.

With private market asset classes, the amount of fees paid through management fees and carried interest can be substantial. Research has shown that pension funds with the highest-cost implementation styles in private equity have the worst net returns.[lxxi] Furthermore, private equity costs in particular are underreported in a number of funds. Carried interest is often not reported as a fee, nor are various other expenses and offsets such as consulting fees and monitoring fees. The amount of costs unreported in private equity has been estimated to be on average 2.33% annually.[lxxii] A key component of monitoring asset managers is thus to fully understand the costs associated with investments. Only that which is measured can be monitored and managed.

Effective monitoring must ensure that misappropriations in expenses and valuations are examined and corrected for. Through the SEC's "Spreading Sunshine in Private Equity" operation, violations of law or material weaknesses for expenses were found in over 50% of cases. A list of the SEC fines for private investment firms for their wrongdoing is included in the appendix.

We highlight below some key cost and transparency guidelines that investors should adhere to in order to effectively monitor and renegotiate current asset managers:

- First, it is important for investors to ensure that they have regular access to all information to adequately compute and compare costs, and to establish procedures to do so.

- Investors should compensate their managers through management and incentive fees only. Any other direct or indirect compensation or benefits, received by a manager or its affiliates resulting from the investment, must be credited back to the investor. Research, market data, and travel costs need to be borne by the manager, and brokerage must be "unbundled" from these costs. All expenses, including operating expenses, must be transparently reported.

- Investors need to establish appropriate benchmarks to evaluate managers' performance. Incentive fees should only be accrued for true long-term performance over those benchmarks (consistent alpha) and where positive. managers should be incentivized to take appropriate risks by limiting fees through use of tools such as hurdles, caps, and high watermarks, and avoiding use of catch-up clauses.

- Investors should invest through the vehicles, structures, and share classes that minimize total costs over the lifetime of the investment and should receive benefits from both the economies of scale and the status that its investment brings. Investors should demand discounts when allocations are of a significant size.

- Investors should establish that transactions are executed efficiently, taking into account state of the market and order timing, while minimizing the costs and, as discussed above, they should identify the next-best alternative to the current investment (*e.g.*, indexed, internally managed, alternative manager, etc.). Investors should prohibit undue special treatment of individual Managers, which inhibits the objective of full transparency.

The following table summarizes the different cost-saving drivers and associated strategies that can be implemented by institutional investors:

Table 3.3: Summary of Cost-Saving Drivers, Strategies and Considerations

Cost Saving Driver	Example Strategy	Key Considerations
Investment Innovation	Seeding New Managers, Platform Companies, New Collaborations, New Technologies	Governance
Strategy Simplification	Active to Passive, Private to Public	Risk Exposure, Volatility
Cost Arbitrage	Risk Factor Approach – cheaper products for same risk exposures (Smart Beta), Internalize Investment Management	Governance, Strategy
Monitoring and Renegotiation	Better monitoring of current managers and renegotiation of better terms with current external managers	Private markets will take longer than public markets

Source: Author

As can be seen from the above table, there are a number of factors that need to be considered with the different cost-saving strategies that are available. There are certain strategies that will not be appropriate for a particular fund, because of the associated considerations and the specific characteristics of the fund. A crucial consideration that is particularly apparent for investment innovation and cost arbitrage is *governance*. In the following sections, we provide a discussion of the importance of governance and indicate why some of the cost strategies might not be appropriate for the PA pension plans because of the governance requirement.

3.2 Governance Considerations for Cost-Saving Opportunities

A number of the strategies for cutting costs are contingent on having the right governance and organizational capabilities in place. Specifically, seeding new managers in private markets, insourcing across various asset classes, and re-intermediating external managers through co-investments, funds-of-one and separate IMAs, all require sophistication in governance in order to achieve the desired outcomes.

Governance is a key ingredient for the long-term success of any institutional investor, as it is the mechanism that can mobilize the resources of the institution to realize its objectives. Research suggests the impact of good governance may be as much as 100–300 basis points per year.[lxxiii] The independence of the organization, its resources and systems, and the ability to identify areas of opportunity as well as challenges are all crucial elements of governance that can dramatically impact the success of any of the above cost-saving strategies, whether internalizing investment management, seeding new managers, or re-intermediating external managers for more alignment.

"Governance Budget"

Before embarking on any of these cost-saving pathways, institutional investors should first assess their governance capabilities to determine whether a given investment strategy is commensurate with its organizational capabilities and oversight. Similar to using a "risk budget" to guide portfolio construction and investment decision-making,

institutional investors should use a "governance budget"[1] to guide the process of investing, the development of the organization, and the guidance of management[lxxiv].

Developing a "governance budget" first requires cataloging the resources and assets that drive sustainable returns, such as the talent and skills of portfolio managers; the processes and protocols of decision-making; and the information processing tools that support judgments. It is the board that has the ultimate control over resourcing decisions and that controls the strategic levers of success. A fund's "governance budget", which ultimately refers to the resources available to build and economize the investment operations, is thus a crucial determinant of an investor's capacity to innovate and has clear relevance to certain cost-saving pathways.

Governance budgets are comprised of three ingredients: 1) The amount of time that a fund's board can apply to a given investment problem; 2) The level of expertise that can be called upon at the level of the board; and 3) The commitment of the board, which refers to its effectiveness at getting things done; this is the dynamic capabilities of the board (e.g., real time meetings versus calendar time meetings). We can look at each of these as being scarce resources that can be drawn down as a fund engages in more innovative or risky behavior. Thinking about "governance budgets," then, should become just as important as thinking about asset allocation or manager selection, especially for those funds interested in innovating and internally managing assets.

Pension Investment Boards vs. Administrative Boards

In order to achieve the level of governance required, based on our examination of institutional investors around the country and world, we think it prudent to first examine the nomination procedures of boards. We have found that one of the most important factors driving the success or failure of an institutional investor over the long run are the procedures used to nominate board members to oversee the investment staff. In the ideal, these procedures should prioritize commercial, financial, and entrepreneurial expertise over political or stakeholder affiliations. Political and stakeholder affiliations are important for an administrative board, but are not appropriate as the only requirements for an investment board. The origins of these funds may be political, but their theater of operations is quite clearly commercial. It is important to find board members who can align with the operating environment and not just represent the plan's origin.

On top of a proven track record within the investment, business, or related space, three desired qualities should guide board member selection: demonstrable numeric skills, a capacity for logical thinking, and an ability to think about risk in the probability domain. Collegiality is important, but from our research, it was often noted that shared competencies combined with peer recognition for experience and ability tended to enhance collective decision-making, whereas disparate and unmatched abilities tend to be a drag on board decision-making.[lxxv] This issue is under-recognized, with many institutions assuming that commitment, training, and experience can overcome

[1] Please note that the Governance Budget does not refer to the amount of compensation given to the Board Members.

deficiencies. Our research on best practice investors has shown that these competencies are not easy to instill, and so, as highlighted, the selection of board and staff becomes a critical function.

As a result, some of the most effective institutional investors we have looked at are those that have formed a standing sub-committee of the board with responsibility for monitoring board performance and its relationships with senior staff and the myriad of consultants and service providers who populate the industry. That is, leading organizations have sought to identify best-practice forms of governance and mechanisms of accountability. For example, leading funds we have studied are conscious of the costs for decision-making of a large board, recognizing that many members (normally more than nine) tend to fracture collegiality[lxxvi] and add a degree of heterogeneity in board member competence that undercuts competent decision-making.[lxxvii]

Good Governance and the Pyramid of Success

Any fund considering a policy to move assets in-house or adopt the more resource-intensive cost-saving pathways outlined above, should first check to ensure that their governance budget aligns with the new strategy and "risk budget." If the levels of governance required exist, then the fund can equip the organization to successfully implement the given strategy. Lower "governance budget" arrangements are consistent with less complicated or sophisticated arrangements. If this is not the case, we expect some difficulties with such funds' implementation of complex arrangements. The importance of governance is best highlighted in the following figure, which shows that good governance is the crucial foundation for the long-term success of institutional investor organization, particularly for the consideration of adding complexity and innovation such as in-sourcing, seeding, or re-intermediating.

Figure 3.5: Foundation for Institutional Investor Innovation for Cost-Saving Pathways

Source: Clark and Monk (2012)

As indicated, good governance forms the base of the pyramid for innovating successfully in institutional investor organizations.[lxxviii] Without this crucial foundation, the effectiveness of certain cost saving pathways will be compromised. It is interesting to note that delegation and segregation of authority is the 8th characteristic on the pyramid and should only be instituted once the seven other criteria beneath it in the pyramid have been fulfilled. For a detailed explanation of each layer, please refer to Clark and Monk (2012). It is inappropriate to suggest that the board has delegated all investment expertise to staff. Delegations should occur once the appropriate processes and protocols are in place, as depicted by the above pyramid.

3.3 The Governance of PA Pension Plans

Although we attempted to conduct a governance analysis of the two Pennsylvania pension plans, we were not given full access to do so. Despite this, based on publicly available information and the information obtained through our limited access, there are certain key fundamental governance characteristics of each fund that do not align with our best practice framework outlined above. Our governance assessment and subsequent recommendations would need to be confirmed through a full assessment.

PA PSERS

In terms of composition, the 15-member Board of PSERS includes three ex-officio members, two members appointed by the Governor, six elected members, one from among the system's non-certified members, one from among the system's annuitants, and one from among school board members in PA, two members from the Senate, and two members from the House of Representatives. The PA PSERS Board appears to be a representative board, which is common practice for an administrative unit. Such a board

size and composition, however, is at the larger end of the spectrum among U.S. public pension funds and would not be considered a best-practice *investment* board.

The challenge here lies with the responsibilities given to the Board for the investment operations of the fund. A key component of the mission of the PSERS Board is to "prudently invest in the assets of the System." It appears very difficult for the Board, which is constituted primarily on a member or politically representative basis, to adequately carry out the investment oversight for which the Board has responsibility.

While education programs and policies are in place for Board members at PSERS, in our research, it is unclear how many members utilize the optional provisions for specific investment and financial education, questioning the effectiveness of these programs to upskill members. Crucially, however, there also does not appear to be any Board member evaluation programs, which should look to appraise performance of Board members on an annual basis.

The PSERS Investment Policy statement, which outlines the guidelines for the management of the assets by or on behalf of the Board, states that:

> *The Board, through the Investment Committee with the assistance of Staff, contracts with External Portfolio Managers and Investment Consultants, monitors the performance of investments; ensures funds are invested in accordance with Board policies; studies, recommends, and implements policy and operational procedures that will enhance the investment program of the System; and ensures that proper internal controls are developed to safeguard the assets of the System.*

Such an undertaking requires significant experience and understanding of financial markets and the field of institutional investment. If there is an over-reliance on staff and investment consultants to provide guidance, then the board may not be carrying out its fiduciary responsibility to provide adequate oversight correctly.

Furthermore, in our experience of working with funds locally and internationally, the PSERS' investment strategies employed would be considered at the more complex or innovative end of the spectrum. While the Investment Policy Statement does an adequate job of explaining the guidelines around some of the more complex strategies adopted, such as internal management, and the use of derivatives, it is unclear that the appropriate oversight is in place to be able to monitor, assess, and scrutinize actions in these areas. The more complex the strategies employed, the greater the requirement on the governance of the organization. It would appear that there is a mismatch between the inherent complexity associated with the PSERS Investment Policy Statement and the governance structure in place to oversee the strategies contained in the Policies. In other words, the "governance budget" does not align with the "risk budget" of the pension fund's investment function.

On top of this, no compensation is provided for Board members, which, while this is not irregular amongst U.S.-based pension funds, is inconsistent with best performing

government funds internationally. In our research, it has been found that a modest level of compensation combined with commitment to the goals and objectives of government-sponsored pension funds is sufficient to attract appropriately qualified individuals.

Upon initial examination (subject to further full analysis), it would appear that, specifically, the requisite financial expertise for monitoring PSERS' innovative strategies might be lacking. Delegation for (complex) investment strategies to investment staff should only happen when they can be accompanied with adequate oversight. As stated above, lower "governance budgets" should be associated with low-risk and unsophisticated arrangements.

PA SERS

The Board of SERS comprises 11 members, which while still being large, is closer to the median size pension board size of nine in the United States (NASRA). Five members are appointed by the Governor, one of whom must be a SERS retiree. Two members are appointed by the President Pro Tempore of the Pennsylvania Senate, and two members are appointed by the Speaker of the Pennsylvania House of Representatives. The independently elected Pennsylvania Treasurer and the Governor-appointed Secretary of Banking and Securities serve as ex-officio members. Five Board members must be active members of SERS, two of whom must have at least 10 years of service, and one must be an annuitant. As is the case with PSERS, the Board composition is primarily motivated by member and political representation, which is common for an administrative unit, but does not represent best practices for overseeing complex investment operations.

The large number of stakeholder representatives provides good member representation, but this could be at the detriment of adequate financial expertise. A deeper analysis of the Board composition would be required to determine whether members have the requisite skill sets and, in particular, the ability to think about risk in the probability domain.

It appears that SERS has undergone a governance upheaval in the last few years due in part to certain events that had taken place. These events included the departure of a long-time chairman of the board after more than 20 years of service, enactment of Retirement Code changes, extensive staffing turnover in key positions, and inquiries into allegations of misconduct by a former CIO. It would appear that steps have been taken to improve the governance and operations of SERS in the last few years.

As part of Section 5901 (f) of the retirement code, each member of the SERS Board is required to obtain eight hours of training in investment strategies, actuarial cost analysis and retirement portfolio management on an annual basis. This indicates a step in the right direction towards having the necessary expertise on the Board. We note that eight hours of training is not comparable to the multiple years (in some cases greater than 10) of specific investment experience requested by other pension investment boards.

As is the case with PSERS, there does appear to be a large reliance on the investment staff and consultants for carrying out the investment function of the organization. As

stated in the SERS Statement of Investment Policy: *"In order to administer the System and carry out its investment obligations, the Board relies heavily on both staff and external contractors."*

We agree that some delegation of authority is important for effective investment organizations; however, if the gap in expertise is too large between the board and the investment staff, this would suggest that the "governance budget" is not equipped to take on too much risk in the investment operations. Furthermore, academic research has shown that while investment consultants can provide expertise in certain areas, the value add they bring, in particular to the selection of fund managers, is questionable.[lxxix]

The general investment consultant works for both the investment staff and the board. In certain cases, we have found that it is important for the board to be able to draw upon expertise that is independent of the general investment consultant to adequately provide oversight. Provisions are included in the SERS Statement of Investment Policy for the Board to utilize its own specialty consultants on emerging trends, which we believe is important for enabling oversight. While the provision is there, we are unsure whether this is utilized.

With regards to the monitoring of investment managers, within the investment policy for private equity, it is stated that: "Each partnership agreement shall be negotiated such that SERS receives competitive terms and conditions. SERS' leverage to negotiate terms may be reduced when it commits relatively modest capital or if the Firm's offering is heavily oversubscribed."

While the statement indicates that competitive terms will be negotiated, it does not provide any insight into what competitive terms or alignment might be. Furthermore, there is no policy on how expenses and costs (over and above management fees and carried interest) should be treated in private equity arrangements. It appears in the second half of the statement that SERS is happy to invest in funds even if they cannot achieve "competitive" terms. While the rationale might be accurate for not getting "competitive" returns, it is debatable if it would be prudent to invest in these funds if that was the case. The poor performance of private equity for SERS against their benchmarks would indicate that there might be certain funds underperforming, while still drawing excessive fees.

As of December 31, 2017, SERS had commitments in over 350 private equity funds and over 50 real estate funds. The SERS Private Equity Investment Policy document states that: "Each Manager will provide SERS' Investment Office with quarterly unaudited reports (or semi-annual reports if customarily produced by the Manager) and annual audited reports in sufficient detail to allow SERS' Investment Office staff to assess the performance of each Private Equity investment." Furthermore, it is stated that "Semi-annually, the Private Equity consultant will submit to the Board a Private Equity performance report."

Given the volume of private equity funds in the portfolio, the burden placed on the investment staff and Board to accurately monitor the performance of the managers and asset class seems extremely stretched and overly demanding. Private asset classes are typically more risky because of the unique capital market and illiquidity factors attached to them and inherently require greater oversight and governance. In this case it would appear that further complexity is added through the volume of funds invested in. For an asset class that is typically the most expensive, it does not appear that the governance of SERS matches the riskiness or demands required to adequately monitor the assets in this portfolio.

Generally, it would appear that SERS' governance is moving towards better practice. The size of the Board and size of the Investment Committee, the processes for evaluating board performance/contributions, along with the specific expertise of members to carry out their function, are areas that could be looked into further. Crucially, it is unclear whether the Board is equipped to accurately monitor the fund's statement of investment policies.

Summary

There are certain governance challenges within both PA plans that prevent our recommending some of the cost-saving pathways described above. At the heart of the issue is the fact that the respective boards of the two plans are constituted primarily of member and political representation, which is common in administrative units, but is not appropriate for the governance of investment organizations. As indicated, the "governance budget" of an investment organization (which stems from the expertise and nomination procedures of the Board), should align with the "risk budget" of the fund's investment operations.

In the case of both funds, it would appear that the investment staff has implemented complex strategies, as indicated by the Investment Policy Statement, which the respective boards are ill-equipped to monitor. This is with specific regard to the internal management, the use of derivatives, and private market asset classes by PSERS, and the monitoring of managers in private market asset classes by SERS.

It is interesting to note that the U.S. public sector plans that have been able to carry out innovative strategies like internal management with success, have a separate investment board compared with their administrative (representative) board or have explicit requirements of investment or financial expertise. Some of these funds include South Dakota, Wisconsin and Florida. The emphasis on investment and finance expertise is evidenced in the respective pieces of legislation that the pension funds are enacted upon:

For South Dakota: "The members of the State Investment Council shall be qualified by training and experience in the field of investment or finance."

For the State of Wisconsin Investment Board: "four members shall have had at least 10 years' experience in making investments."

Florida has a separate investment advisory council appointed by the Board of Trustees consisting of 9 members.

The above investment boards are appointed based on specific investment experience and are tasked with facilitating a business environment. Crucially, investment boards help to maintain a nonpolitical environment and to focus the fund on long-term performance.

We observe that the governance structures of the PA pension boards are far from the structure and expertise of other U.S. public pension fund boards that have carried out innovative strategies such as internal management. As mentioned earlier, these assertions are based on a preliminary analysis of the governance functions of each of the funds using primarily publicly available information. A full governance analysis was not permitted by the plans and would be required to confirm the above insights.

3.4 Cost-Saving Recommendations

Based on our abbreviated analysis, we believe that there are certain cost-saving strategies that are not appropriate for the PA plans because they do not appear to have the governance required to adequately monitor them. There are elements of the current portfolios that suggest there is already a level of complexity present that is not commensurate with the level of governance for the two funds. For PSERS, this refers to their internal management, use of derivatives, and allocations to illiquid asset classes. For SERS, this refers to their very large number of commitments in the private equity and real estate asset classes.

Based on the brief and incomplete analysis conducted here, we believe that it is not appropriate for both funds to currently go down the route of internal management and innovation through seeding to save costs. While both of these strategies have significant potential to save costs for the plans, there would need to be major overhauls in the governance structures of the funds and the culture between staff, consultants, and the board in order for the strategies to be successful and not compromise performance in any way. The governance overhaul required would likely mean getting legislative changes to the nomination procedures of both Boards, or alternatively, forming a separate investment board that works complementarily to the current Boards. Such changes would take time to implement and are outside the scope of this project. This would require further analysis to confirm and suggest specific recommendations for potential amendments. Our cost-saving recommendations are thus based on the public information and limited access that was granted to us to do our analysis.

Given the menu of options available to investors for cost-saving strategies, and based on our analysis through this set of chapters, we believe the most appropriate cost-saving strategies to the plans currently include:

1. Renegotiation and Monitoring of Current Mandates

Without changing the asset allocation and risk levels of the current portfolio, renegotiations should take place along best practice guidelines. Quite often a deeper analysis of the current mandates can highlight inefficiencies, such as economies of scale, suboptimal investment vehicles, and mismatches between pricing and best practice. As a result, by identifying and reducing investment expenses paid to external parties, the funds have the potential to capture risk-free returns. The idea is to transform the funds from being price takers to price makers as much as possible and reinstate their position as the principal disciplining their agents. Renegotiation of current mandates is subject to obtaining the necessary data to do a thorough analysis. Unfortunately, we have not been given access to do a full analysis of all external mandates for the two plans. We have been able to access a certain amount of information on the public equity mandates of the two plans. Details of this analysis are presented in the next section along with the calculations of potential cost-savings for the plans.

2. Strategy Simplification

A move to simpler strategies such as from active to indexing and from private to public could be considered and investigated further. This may not only reduce costs but help bring the "governance budget" of the plans in line with the level of complexity contained within it.

Our rationale for recommending strategy simplification as a cost-saving option is based not only upon our preliminary governance analysis but also upon the asset allocation and performance analysis carried out in the previous section.

In particular, we noticed that the exposure of both plans to alternative, illiquid asset classes like private equity does not appear to have served them well. Investing in these asset classes can be difficult. As discussed in Section 2, alternative investments gained in popularity rapidly in the 2000s promising to improve portfolio risk diversification and exploit the unique risk premiums and inefficiencies of private markets. These investments should offer a risk premium or identifiable inefficiency, but purchase price and manager selection matters significantly.

If alternative investments are too costly and complex to manage or risk premiums diminish with capacity constraints, then no amount of diversification can overcome the headwinds versus public market exposures. Moreover, if fair values are derived from observing public market changes in valuation, then correlations and volatility are much higher than assumed, particularly if mark-to-market prices are infrequent and uncertain. Any benefit to portfolio diversification can be overwhelmed by an asset class that is riskier or more correlated with stocks and bonds than assumed. Disappointing performance, high costs, and lack of transparency have provided an indication that reducing private equity and hedge fund holdings should be considered.

As mentioned, our assertions for a simplification of strategy and reduction of illiquid alternative asset class exposure to reduce costs are based upon an incomplete analysis of predominantly publicly available information on the plans. Deeper consideration would

need to be given to the active risk associated with these changes as well as the extra short-term volatility that might come with moving to indices in place of certain private strategies. These recommendations are thus subject to doing a full analysis of the entire portfolio of the pension plans, including analyzing the contracts and performance of illiquid asset classes such as private equity (where success is highly dependent on security selection and manager selection).

Our findings from Section 3 are summarized as follows:

- There are a number of cost-saving strategies that could potentially help save the PA plans large amounts of capital, including internal management, seeding, strategy simplification, renegotiations.
- Certain strategies (i.e., internal management, seeding) are not appropriate for the PA plans because the plans currently do not appear to have the requisite governance structures and culture in place for the strategies to be successful.
- The PA plans would need to address (through possible legislative changes) the board expertise available for oversight and the culture between the board and investment staff before considering the full suite of cost-saving strategies.
- Our immediate cost-saving recommendations for the PA plans focus on strategy simplification and current mandate renegotiations. Strategy simplification would need to consider, however, potential changes in risk exposures and volatility increases.
- Our recommendations are not exhaustive and are based on limited data access. These recommendations do not preclude the PPMAIRC putting forward additional or alternative actions.

Section 4: Cost-Saving Analysis on Current PA Pension Mandates

As discussed in the previous section, we believe that one of the more appropriate areas of cost-savings is to analyze the plans' existing mandates and where applicable seek to renegotiate better terms with managers where cost-savings can be accrued. This section thus provides detailed analysis on aspects of the current portfolios of the two PA plans, including specific calculations for how $1.5 billion of cost-savings can be achieved by the plans.

As mentioned earlier, we were not granted full access to the information needed to perform an in-depth analysis across the entire portfolios of SERS and PSERS. The analysis here has thus focused on public equity mandates, where we have been given more, albeit still not sufficient, information. We were able to obtain the contracts of PSERS with their public equity managers; however, SERS provided the contracts redacted, and so crucial information on costs from these arrangements could not be observed.

4.1 Methodology and Approach

The fee and cost analysis aims to provide a snapshot of the cost structure of each of the mandates into which the funds have invested. In order to create this snapshot, we assembled detailed information on various cost components of the holdings. In normal circumstances, this information would be taken from monthly statements, invoices, custodial reports to legal documentation, manager-completed questionnaires, and trading histories. This granular information is then consolidated and reviewed against the best practices that we have observed in the industry and our in own experience.

For the analysis carried out here, we evaluated the fee terms and conditions in the contracts for public equity managers for PSERS. This included data from investment management agreements, consultant reports, performance reports, self-assessment, and publicly available data. For SERS, the terms and conditions were redacted in the contracts supplied to us, and so only consultant reports, performance reports, self-assessment and publicly available data were used, providing an incomplete picture of the total costs of SERS' mandates. Wherever we had to assume incentive fees or carry, such running costs were calculated on the basis of 3-year rolling returns, or since inception if the investment was younger than 3 years.

We first provide an overview of the cost stack for the plans, which shows the composition of different costs that make up the total cost of ownership (base fees, performance fees, transaction costs, and other operating expenses). This is then shown together with the dollar return relative to the benchmark and hurdle. We also show in the overview the gross returns of each mandate of the plans, which can then be compared against the total cost of ownership for each mandate to understand the cost per alpha of each manager.

Following the overview, we provide detailed analysis on each of the mandates for the plans, examining the specific terms and comparing them against best practice for possible renegotiations and where cost-savings can be identified.

While we do not have detailed information on the private equity mandates for the plans, we provide an estimation of where and how the cost-savings for the plans could be achieved from this asset class.

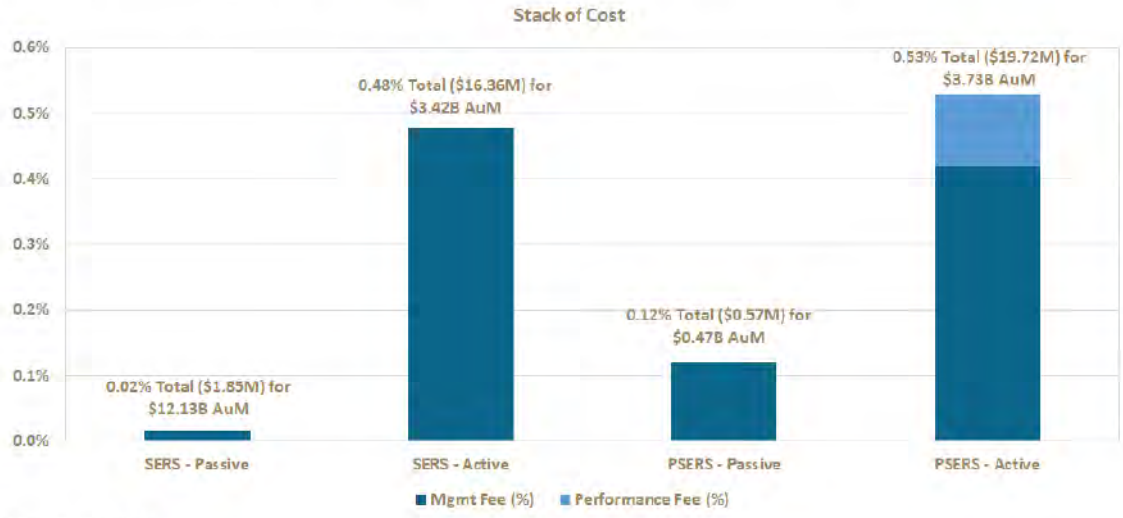
The data on performance used at the time of producing this report is as per the end of June 2018.

4.2 Overview of Analysis

Overview - Cost Stack

The cost stack shows the total cost of ownership for public equity mandates split between passive and active stacks respectively for SERS and PSERS. Only external public equity mandates are included here. Each stack represents aggregate base/fixed fees along with any performance related fees, where applicable. These are understated, as we do not have actual contracted fee schedules from SERS, or details about operating expenses from any of the managers for either SERS or PSERS. Consequently, this review does not include other components that usually make up the Total Cost of Ownership (viz., Holding Costs, Transaction Costs, Other Operating Expenses and 2nd Tier Fund Costs).

Figure 4.1 Cost Stack for PSERS and SERS Public Equity Mandates



Source: Author

Overview - Cost of Ownership

The following table shows a breakdown of the aggregate cost of ownership in dollars. As stated earlier, the total cost of ownership comprises the base/fixed fees, any performance fees, and known transaction costs, custody and other operating expenses, and costs associated with investing in other funds. We also show the dollar return relative to the benchmark and the hurdle (if the performance fee is contracted; otherwise, it is the same as the benchmark). Annualized returns over the previous 3-years have been used for this analysis.

Table 4.1 Aggregate Cost of Ownership

* Data in $	Manager	AUM	Mgmt Fee	Operating Expenses incl. Custody	Transaction Costs	Performance Fees	2nd Tier Costs	Total Cost of Ownership	Total Return	Outperformance Over Hurdle	Outperformance Over Benchmark
SERS	SERS Active Mandate 1	476,000,000	2,332,400	-	-	-	-	**2,332,400**	26,180,000	-17,075,348	-17,075,348
	SERS Passive Mandate 1	5,570,000,000	557,000	-	-	-	-	**557,000**	651,690,000	3,704,579	3,704,579
	SERS Active Mandate 2	680,000,000	3,128,000	-	-	-	-	**3,128,000**	148,920,000	6,899,828	6,899,828
	SERS Passive Mandate 2	336,000,000	67,200	-	-	-	-	**67,200**	54,432,000	-39,856	-39,856
	SERS Passive Mandate 3	615,000,000	123,000	-	-	-	-	**123,000**	68,880,000	-244,741	-244,741
	SERS Passive Mandate 4	4,926,000,000	492,600	-	-	-	-	**492,600**	354,672,000	25,436,815	25,436,815
	SERS Active Mandate 3	604,000,000	4,107,200	-	-	-	-	**4,107,200**	36,240,000	-16,743,704	-16,743,704
	SERS Active Mandate 4	913,000,000	3,560,700	-	-	-	-	**3,560,700**	109,560,000	38,381,356	38,381,356
	SERS Passive Mandate 5	681,000,000	612,900	-	-	-	-	**612,900**	53,799,000	-1,442,292	-1,442,292
	SERS Active Mandate 5	320,000,000	1,280,000	-	-	-	-	**1,280,000**	24,000,000	7,364,470	7,364,470
	SERS Active Mandate 6	99,000,000	643,500	-	-	-	-	**643,500**	4,752,000	2,871,289	2,871,289
	SERS Active Mandate 7	326,000,000	1,304,000	-	-	-	-	**1,304,000**	35,208,000	18,260,554	18,260,554
	Aggregate	15,546,000,000	18,208,500	-	-	-	-	18,208,500	1,568,333,000	67,372,949	67,372,949
	As % of AUM		0.12%	0.00%	0.00%	0.00%	0.00%	0.12%	10.1%	0.4%	0.4%
PSERS	PSERS Active Mandate 1	322,730,000	1,452,285	-	-	330,730	-	**1,783,015**	10,295,087	2,775,206	2,775,206
	PSERS Passive Mandate 1	466,888,000	566,888	-	-	-	-	**566,888**	38,191,438	12,560,796	12,560,796
	PSERS Active Mandate 2	1,167,411,300	2,648,673	-	-	3,324,488	-	**5,973,161**	102,265,230	44,204,777	49,107,905
	PSERS Active Mandate 3	1,116,851,500	3,650,555	-	-	-	-	**3,650,555**	68,127,942	15,208,911	15,208,911
	PSERS Active Mandate 4	231,242,400	1,549,324	-	-	413,291	-	**1,962,615**	13,365,811	3,615,780	3,615,780
	PSERS Active Mandate 5	270,150,600	1,135,452	-	-	-	-	**1,135,452**	33,714,795	13,397,943	13,397,943
	PSERS Active Mandate 6	305,593,900	2,584,751	-	-	-	-	**2,584,751**	30,712,187	9,030,128	9,030,128
	PSERS Active Mandate 7	219,274,500	1,904,196	-	-	-	-	**1,904,196**	25,984,028	10,475,925	10,475,925
	PSERS Active Mandate 8	98,247,300	725,231	-	-	-	-	**725,231**	7,309,599	233,141	233,141
	PSERS Active Mandate 9	158,500	1,268	-	-	-	-	**1,268**	9,558	-1,761	-1,761
	Aggregate	4,198,548,000	16,218,622	-	-	4,068,510	-	20,287,132	329,975,674	111,500,846	116,403,974
	As % of AUM		0.39%	0.00%	0.00%	0.10%	0.00%	0.48%	7.9%	2.7%	2.8%

Source: Author

Overview - Share of Costs

The following table shows a breakdown of the aggregate cost of ownership as a percentage of AuM. As stated earlier, the total cost of ownership comprises the base/fixed fees, any performance fees, and known transaction costs, custody and other operating expenses, and costs associated with investing in other funds. We have also shown for each of SERS' and PSERS' mandates, their share in total costs and performance.

Table 4.2: Aggregate Cost of Ownership as a Percentage of AuM

	Manager	Share of AUM	Mgmt Fee	Operating Expenses incl. Custody	Transaction Cost	Performance Fees	2nd Tier Costs	Total Cost of Ownership	Share of Cost	Share of Performance
SERS	SERS Active Mandate 1	3.06%	0.49%	0.00%	0.00%	0.00%	0.00%	0.49%	**12.8%**	1.7%
	SERS Passive Mandate 1	35.83%	0.01%	0.00%	0.00%	0.00%	0.00%	0.01%	**3.1%**	41.6%
	SERS Active Mandate 2	4.37%	0.46%	0.00%	0.00%	0.00%	0.00%	0.46%	**17.2%**	9.5%
	SERS Passive Mandate 2	2.16%	0.02%	0.00%	0.00%	0.00%	0.00%	0.02%	**0.4%**	3.5%
	SERS Passive Mandate 3	3.96%	0.02%	0.00%	0.00%	0.00%	0.00%	0.02%	**0.7%**	4.4%
	SERS Passive Mandate 4	31.69%	0.01%	0.00%	0.00%	0.00%	0.00%	0.01%	**2.7%**	22.6%
	SERS Active Mandate 3	3.89%	0.68%	0.00%	0.00%	0.00%	0.00%	0.68%	**22.6%**	2.3%
	SERS Active Mandate 4	5.87%	0.39%	0.00%	0.00%	0.00%	0.00%	0.39%	**19.6%**	7.0%
	SERS Passive Mandate 5	4.38%	0.09%	0.00%	0.00%	0.00%	0.00%	0.09%	**3.4%**	3.4%
	SERS Active Mandate 5	2.06%	0.40%	0.00%	0.00%	0.00%	0.00%	0.40%	**7.0%**	1.5%
	SERS Active Mandate 6	0.64%	0.65%	0.00%	0.00%	0.00%	0.00%	0.65%	**3.5%**	0.3%
	SERS Active Mandate 7	2.10%	0.40%	0.00%	0.00%	0.00%	0.00%	0.40%	**7.2%**	2.2%
	Aggregate	**100.00%**	**0.12%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.12%**	**100.00%**	**100.00%**
PSERS	PSERS Active Mandate 1	7.69%	0.45%	0.00%	0.00%	0.10%	0.00%	0.55%	**8.8%**	3.1%
	PSERS Passive Mandate 1	11.12%	0.12%	0.00%	0.00%	0.00%	0.00%	0.12%	**2.8%**	11.6%
	PSERS Active Mandate 2	27.81%	0.23%	0.00%	0.00%	0.28%	0.00%	0.51%	**29.4%**	31.0%
	PSERS Active Mandate 3	26.60%	0.33%	0.00%	0.00%	0.00%	0.00%	0.33%	**18.0%**	20.6%
	PSERS Active Mandate 4	5.51%	0.67%	0.00%	0.00%	0.18%	0.00%	0.85%	**9.7%**	4.1%
	PSERS Active Mandate 5	6.43%	0.42%	0.00%	0.00%	0.00%	0.00%	0.42%	**5.6%**	10.2%
	PSERS Active Mandate 6	7.28%	0.85%	0.00%	0.00%	0.00%	0.00%	0.85%	**12.7%**	9.3%
	PSERS Active Mandate 7	5.22%	0.87%	0.00%	0.00%	0.00%	0.00%	0.87%	**9.4%**	7.9%
	PSERS Active Mandate 8	2.34%	0.74%	0.00%	0.00%	0.00%	0.00%	0.74%	**3.6%**	2.2%
	PSERS Active Mandate 9	0.00%	0.80%	0.00%	0.00%	0.00%	0.00%	0.80%	**0.0%**	0.0%
	Aggregate	**100.00%**	**0.39%**	**0.00%**	**0.00%**	**0.10%**	**0.00%**	**0.48%**	**100.00%**	**100.00%**

Source: Author

Overview - Benchmarks for Active Mandates

The following table compares the gross returns (net returns + fees) of each mandate to their benchmark's return. Alpha refers to the outperformance above benchmark return. We have noted that the benchmarks for SERS' active mandates are more varied than PSERS' active mandates. If PSERS is actively seeking to switch to performance fee based schedules, then a more granular choice of benchmarks would be appropriate. PSERS' generally lower benchmarks are consistent with the findings in Section 2 of this report (set of chapters).

Table 4.3: Cost of Ownership and Alpha

	Manager	Share of AuM	Total Cost of Ownership	Gross Return	Benchmark	Benchmark Return	Alpha	As Of Date
SERS	SERS Active Mandate 1	13.93%	0.49%	5.99%	Russell Mid Cap Index	9.58%	-3.59%	30-Jun-18
	SERS Active Mandate 2	19.89%	0.46%	22.36%	Russell 2000 Grth Index	21.35%	1.01%	30-Jun-18
	SERS Active Mandate 3	17.67%	0.68%	6.68%	MSCI Wrld Ex US Sm Cap Index (Net)	9.45%	-2.77%	30-Jun-18
	SERS Active Mandate 4	26.71%	0.39%	12.39%	MSCI World Index (Net)	8.19%	4.20%	30-Jun-18
	SERS Active Mandate 5	9.36%	0.40%	7.90%	MSCI Emg Mkts Index (Net)	5.60%	2.30%	30-Jun-18
	SERS Active Mandate 6	2.90%	0.65%	5.45%	MSCI Emg Mkts Sm Cap index (Net)	2.55%	2.90%	30-Jun-18
	SERS Active Mandate 7	9.54%	0.40%	11.20%	MSCI Emg Mkts Index (Net)	5.60%	5.60%	30-Jun-18
	Aggregate (Active only)	100.00%	0.48%	11.74%		10.57%	1.17%	

	Manager	Share of AuM	Total Cost of Ownership	Gross Return	Benchmark	Benchmark Return	Alpha	As Of Date
PSERS	PSERS Active Mandate 1	8.65%	0.55%	3.74%	70% M1EFSC/15% M1EF/15% M1FEM	2.88%	0.86%	30-Jun-18
	PSERS Active Mandate 2	31.28%	0.51%	9.27%	MSCI AC World ex USA (Net)	5.07%	4.21%	30-Jun-18
	PSERS Active Mandate 3	29.93%	0.33%	6.43%	MSCI AC World ex USA (Net)	5.07%	1.36%	30-Jun-18
	PSERS Active Mandate 4	6.20%	0.85%	6.63%	MSCI AC World ex USA (Net)	5.07%	1.56%	30-Jun-18
	PSERS Active Mandate 5	7.24%	0.42%	12.90%	MSCI AC World ex USA Small Cap (Net)	7.94%	4.96%	30-Jun-18
	PSERS Active Mandate 6	8.19%	0.85%	10.90%	MSCI AC World ex USA Small Cap (Net)	7.94%	2.95%	30-Jun-18
	PSERS Active Mandate 7	5.88%	0.87%	12.72%	MSCI AC World ex USA Small Cap (Net)	7.94%	4.78%	30-Jun-18
	PSERS Active Mandate 8	2.63%	0.74%	8.18%	MSCI AC World ex USA Small Cap (Net)	7.94%	0.24%	30-Jun-18
	PSERS Active Mandate 9	0.00%	0.80%	6.83%	MSCI AC World ex USA Small Cap (Net)	7.94%	-1.11%	30-Jun-18
	Aggregate (Active only)	100.00%	0.53%	8.35%		5.56%	2.79%	

4.3 SERS Mandates

SERS - Fee Terms

Below is a summary of the terms, the type of mandate and the chosen benchmark for each of SERS' externally-managed public equity mandates.

Table 4.4: Summary of Terms – SERS

	Manager	AUM ($M)	Management Fee Terms	Performance Fee Terms	Date Terms last agreed	Structure	Active/ Passive	Benchmark
US Mid/Large Cap	SERS Active Mandate 1	476	49 bps†	n/a	Dec 01, 2009*	SMA	Active	Russell Mid Cap Index
US Mid/Large Cap	SERS Passive Mandate 1	5,570	<1 bp†	n/a		SMA	Passive	Russell 1000 Index
US Small Cap	SERS Active Mandate 2	680	46 bps†	n/a	Sept 01, 2009*	SMA	Active	Russell 2000 Grth Index
US Small Cap	SERS Passive Mandate 2	336	2 bps†	n/a	Nov 09, 2016*	SMA	Passive	Russell 2000 Index
US Small Cap	SERS Passive Mandate 3	615	2 bps†	n/a	Nov 09, 2016*	SMA	Passive	Russell 2000 Val Index
Non-US Developed	SERS Passive Mandate 4	4,926	<1 bp†	n/a		Fund	Passive	MSCI Wrld Ex US Index (USD) (Net)
Non-US Developed	SERS Active Mandate 3	604	68 bps†	n/a		SMA	Active	MSCI Wrld Ex US Sm Cap Index (Net)
Global Developed	SERS Active Mandate 4	913	39 bps†	n/a	Oct 07, 2010*	SMA	Active	MSCI World Index (Net)
EM Equity	SERS Passive Mandate 5	681	9 bps†	n/a		Fund	Passive	MSCI Emg Mkts Index (USD) (Net)
EM Equity	SERS Active Mandate 5	320	40 bps†	n/a		SMA	Active	MSCI Emg Mkts Index (Net)
EM Equity	SERS Active Mandate 6	99	65 bps†	n/a	Jun 17, 2013*	SMA	Active	MSCI Emg Mkts Sm Cap Index (Net)
EM Equity	SERS Active Mandate 7	326	40 bps†	n/a	Dec 09, 2013*	SMA	Active	MSCI Emg Mkts Index (Net)
	Aggregate	15,546						

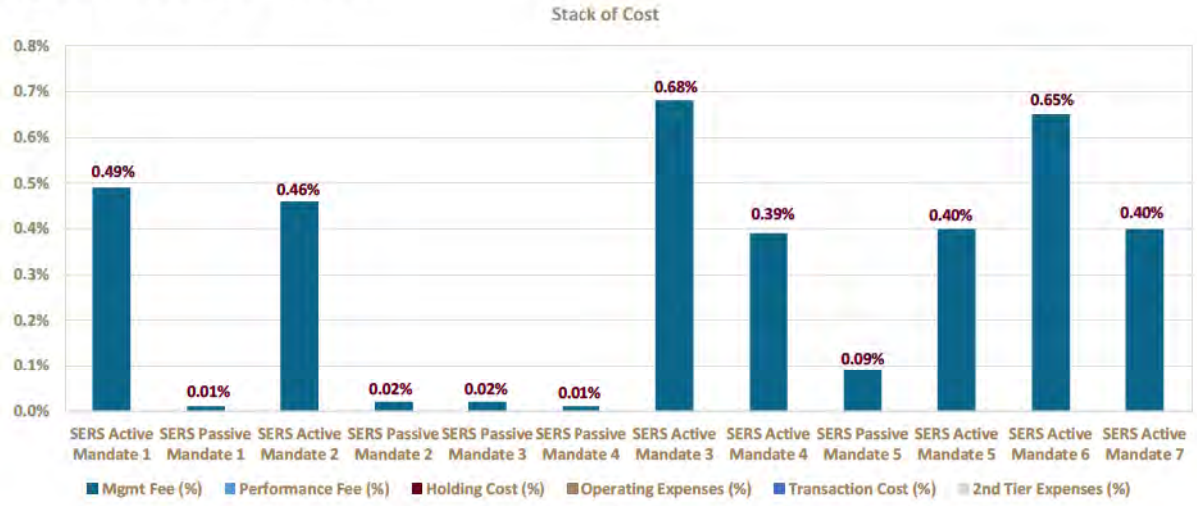
†: Exact contract details unavailable

*: Contract Terms Redacted

SERS - Cost Stack by Mandate

The following graph shows the division of costs between individual mandates. Since we have received only one fee number from the consultant report, it has been reported under the Management Fee heading as we do not have access to unredacted contracts to be able to state the performance fee. The limited information available during this review has not allowed us to go deeper into other cost components that make up SERS' Total Cost of Ownership (viz., holding costs, transaction costs, other operating expenses and 2nd tier fund costs).

Figure 4.2: Costs per Mandate



The data for the above graph is detailed in the below table.

Table 4.5: Costs per Mandate

Asset Class	AuM ($M)	Total Costs ($M)	Total Costs (bps)
SERS Active Mandate 1	476.0	2.33	49.0
SERS Passive Mandate 1	5,570.0	0.56	1.0
SERS Active Mandate 2	680.0	3.13	46.0
SERS Passive Mandate 2	336.0	0.07	2.0
SERS Passive Mandate 3	615.0	0.12	2.0
SERS Passive Mandate 4	4,926.0	0.49	1.0
SERS Active Mandate 3	604.0	4.11	68.0
SERS Active Mandate 4	913.0	3.56	39.0
SERS Passive Mandate 5	681.0	0.61	9.0
SERS Active Mandate 5	320.0	1.28	40.0
SERS Active Mandate 6	99.0	0.64	65.0
SERS Active Mandate 7	326.0	1.30	40.0
Total	15,546.0	18.21	11.7

Summary Stack of Costs	$M	bps
Fixed Fee	18.21	11.7
Performance Fee	n/a	n/a
Management Fee Total	18.21	11.7
Transaction Costs	n/a	n/a
Holding Costs	n/a	n/a
Other OpEX	n/a	n/a
Running Costs Total	n/a	n/a
FoF / 2nd Tier Costs	n/a	n/a
Total Cost of Ownership	18.21	11.7

SERS - Ranking by Costs and Returns Retained by Managers

The following table is a comparison between the external public equity mandates of SERS. The quartiles are used to highlight the difference between the mandates based on historical returns and the costs that were incurred in achieving those returns.

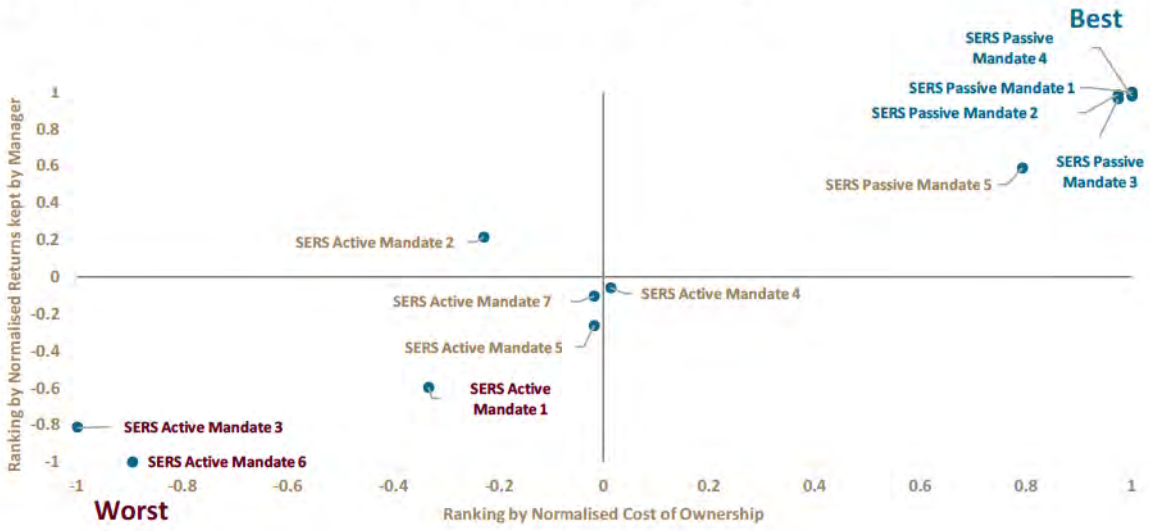
Table 4.6: Performance of Mandates by Quartile

	Manager	Total Cost of Ownership	Cost Quartile	Net Return	Gross Return	% Gross Return Retained by Manager	Retained Returns Quartile	Avg Rank Top Quartile	Avg Rank Bottom Quartile
SERS	SERS Active Mandate 1	0.49%	4	5.50%	5.99%	8.18%	4		☒
	SERS Passive Mandate 1	0.01%	1	11.70%	11.71%	0.09%	1	☑	
	SERS Active Mandate 2	0.46%	3	21.90%	22.36%	2.06%	2		
	SERS Passive Mandate 2	0.02%	1	16.20%	16.22%	0.12%	1	☑	
	SERS Passive Mandate 3	0.02%	1	11.20%	11.22%	0.18%	2	☑	
	SERS Passive Mandate 4	0.01%	1	7.20%	7.21%	0.14%	1	☑	
	SERS Active Mandate 3	0.68%	4	6.00%	6.68%	10.18%	4		☒
	SERS Active Mandate 4	0.39%	2	12.00%	12.39%	3.15%	3		
	SERS Passive Mandate 5	0.09%	2	7.90%	7.99%	1.13%	2		
	SERS Active Mandate 5	0.40%	3	7.50%	7.90%	5.06%	3		
	SERS Active Mandate 6	0.65%	4	4.80%	5.45%	11.93%	4		☒
	SERS Active Mandate 7	0.40%	3	10.80%	11.20%	3.57%	3		
	Aggregate	0.19%		9.61%	9.81%	1.99%			

☑ Top Value-Accruing Mandates
☒ Candidates for re-negotiation

In the following chart, we present a comparison of various SERS' mandates by total costs and gross returns. The data from the above table is normalized by dividing by the range (highest - lowest). As the chart shows, active mandates that cost more do not necessarily represent better value-for-money.

Figure 4.3: Cost of Ownership and Returns Retained by Manager



SERS - Findings

US Equity

Mandate, AuM, Benchmark	Findings
SERS Active Mandate 1 **$476M** Russell Mid Cap Index	•0.49% (terms unclear) •**Active Mandate** •No visibility on contract details. •This is a candidate for review, contract 9 years old, recent returns (3Y ending June 2018) are poor. •This is expensive! SERS has a Small Cap mandate that is cheaper than this Mid Cap mandate. We think that this nearly-$500M mandate should be about 25-30 bps, potentially saving $1M in aggregate.
SERS Index Mandate 1 **$5,570M**	•<1bp (terms unclear) •**Index Mandate**

Russell 1000 Index	•No visibility on contract details. •This mandate appears to be priced fairly.
SERS Active Mandate 2 **$680M** Russell 2000 Growth Index	•0.46% (terms unclear) •**Active Mandate** •No visibility on contract details. •This mandate has return 1.01% above benchmark over previous 3 years. This implies that almost half of the gross alpha is being paid to the manager. •PSERS has a contract for similar mandate with this manager at a base fee of only 0.05% with 20% Perf Fee above hurdle of MSCI US Small Cap Growth Index. This is an attractive fee structure to compare to. •Although this mandate is priced better than the Mid Cap Value portfolio above (SERS Active Mandate 1), we think an active US Small Cap mandate of $600-750M should be priced at about 25-30 bps.
SERS Index Mandate 2 **$336M** Russell 2000 Core Index	•0.02% (terms unclear) •**Index Mandate** •No visibility on contract details. •This mandate appears to be priced fairly.
SERS Index Mandate 3 **$615M** Russell 2000 Value Index	•0.02% (terms unclear) •**Index Mandate** •No visibility on contract details. •This mandate appears to be priced fairly.

International Equity - Developed World

Mandate, AuM, Benchmark	Findings
SERS Index Mandate 4 **$4,926M** MSCI World ex-US Index	•<1bp fee (terms unclear) •**Index Mandate** •No visibility on contract details. •This mandate appears to be priced fairly.
SERS Active Mandate 3 **$604M** MSCI World ex-US (Small Cap) Index	•0.68% (terms unclear) •**Active Mandate** •No visibility on contract details. •This mandate is very expensive for Developed World Small Cap. We think the fee should be 40-45 bps for AuM between $300M-$600M.
SERS Active Mandate 4	•0.39% fee (terms unclear)

$913M MSCI World Index	•**Active Mandate** •No visibility on contract details. •We think 25-30 bps tiered fee rate is the fair price for Developed World mandates for $1B AuM.

International Equity - Emerging Markets

Mandate, AuM, Benchmark	Findings
SERS Index Mandate 5 **$681M** MSCI Emerging Markets (All Cap) Index	•0.09% (terms unclear) •**Index Mandate** •No visibility on contract details. •Additional allocation appears to have been made to this mandate as the AuM was $331M at the end of Dec. '17. •Similar products from competing managers are priced equivalently for allocations >$100M. In light of recent additional allocation, we believe SERS has room to negotiate an improvement and will particularly benefit from switching to a tiered fee structure if and when they allocate more.
SERS Active Mandate 5 **$320M** MSCI Emerging Markets (All Cap) Index	•0.40% fee (terms unclear) •**Active Mandate** •No visibility on contract details. •This appears to be priced fairly.
SERS Active Mandate 6 **$99M** MSCI Emerging Markets (Small Cap) Index	•0.65% fee (terms unclear) •**Active Mandate** •No visibility on contract details.
SERS Active Mandate 7 **$326M** MSCI Emerging Markets (All Cap) Index	•0.40% fee (terms unclear) •**Active Mandate** •No visibility on contract details. •This appears to be priced fairly.

Based on the findings above, our estimates for SERS' public equity cost-savings are shown in the following table:

Table 4.7: SERS Public Equity Cost-savings

Manager	AUM ($M)	Total Fees	Potential Fees	Savings	Savings ($M)
SERS Active Mandate 1	476	0.49%	0.28%	-0.22%	-1.02
SERS Passive Mandate 1	5,570	0.01%	0.01%	0.00%	0.00
SERS Active Mandate 2	680	0.46%	0.28%	-0.19%	-1.26
SERS Passive Mandate 2	336	0.02%	0.02%	0.00%	0.00
SERS Passive Mandate 3	615	0.02%	0.02%	0.00%	0.00
SERS Passive Mandate 4	4,926	0.01%	0.01%	0.00%	0.00
SERS Active Mandate 3	604	0.68%	0.43%	-0.26%	-1.54
SERS Active Mandate 4	913	0.39%	0.28%	-0.12%	-1.05
SERS Passive Mandate 5	681	0.09%	0.09%	0.00%	0.00
SERS Active Mandate 5	320	0.40%	0.40%	0.00%	0.00
SERS Active Mandate 6	99	0.65%	0.65%	0.00%	0.00
SERS Active Mandate 7	326	0.40%	0.40%	0.00%	0.00
Aggregate	15,546	0.12%	0.09%	-0.03%	-4.87

4.4 SERS Mandates Synthesis

Public Equity

- We have not been given unredacted contracts. Only one party's interests are served by not being transparent on asset managers' contractual details: that of the asset managers.
- From our experience, whenever clients are told that contractual terms are a trade secret of the manager, it's an indication that these should be reviewed.
- Due to the lack of transparency on contractual language, it is difficult to make meaningful statements on full optimization potential.

From an RVK report we have taken the average per manager fees paid on public equity and have used them for our analysis:

- Index mandates seem generally fairly priced.
- One of the two active mandates in International Developed Equity, SERS active mandate 3, seems very expensive. We strongly advise the contractual language be reviewed in greater detail.

Private Equity

This chapter is not focused on private equity, as we were not allowed access to the necessary data, but we have learned that there are a large number of individual private equity investments in SERS' portfolio. Such a large volume of small private equity investments is rather unusual from our experience and, by definition, difficult to manage / monitor.

Although the private equity allocation may be smaller than public market allocation, because the fees are higher on average, the smaller allocation to private equity may in fact cost more in total than the larger allocation to public equity.

Any decision, however, to sell private equity stakes in the secondary market should be considered very carefully. We note from experience, that this can be a very expensive exercise due to lower secondary market value.

4.5 PSERS Mandates

PSERS - Fee Terms

Below is a summary of the terms, the type of mandate and the chosen benchmark for each of PSERS' externally-managed public equity mandates.

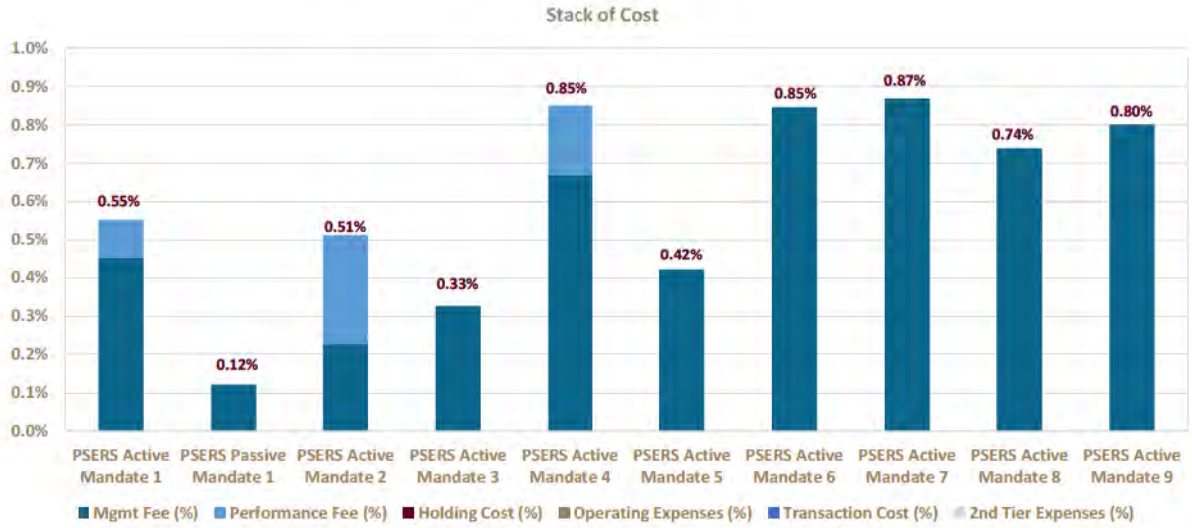
Table 4.8 Mandate Terms – PSERS

	Manager	AUM ($M)	Management Fee Terms	Performance Fee Terms	Date Terms last agreed	Structure	Active/ Passive	Benchmark
EM Small Cap	PSERS Active Mandate 1	323	45bps	25% of Perf over hurdle of 70% MSCI EM Small Cap 15% MSCI EM 15% MSCI Frontier EM	Jun 30, 2018	SMA	Active	Same as hurdle
EM - passive	PSERS Passive Mandate 1	467	14bps: If Total AuM < $350M,0.14% else: 14bps for first $100M 12bps for $100M < Assets < $400M 10bps for Assets > $400M		Oct 06, 2014	Fund	Passive	MSCI Emerging Markets Index (Net)
Intl (ex-US) Equity	PSERS Active Mandate 2	1,167	45bps for first $100M 36bps for $100M < Assets < $350M 18bps for $350M < Assets < $1B 15.75bps for Assets > $1B	8% of Perf over hurdle of MSCI ACWI ex-US + 0.42%	Apr 11, 2011 Hurdle was increased by a spread of 42bps on Apr 04, 2017	SMA	Active	MSCI AC World ex USA (Net)
Intl (ex-US) Equity	PSERS Active Mandate 3	1,117	55bps for first $100M 35bps for $100M < Assets < $200M 30bps for Assets > $200M		Mar 04, 2015 Fee was increased with same Tiers II	SMA	Active	MSCI AC World ex USA (Net)
Intl (ex-US) Equity	PSERS Active Mandate 4	231	67bps	20% of Perf above Benchmark (unstated in contract)	Nov 01, 2014	SMA	Active	MSCI AC World ex USA (Net)
Non-US Small Cap	PSERS Active Mandate 5	270	60bps for first $50M 50bps for $50M < Assets < $100M 40bps for $100M < Assets < $150M 35bps for $150M < Assets < $200M 30bps for Assets > $200M		May 10, 2010	SMA	Active	MSCI AC World ex USA Small Cap (Net)
Non-US Small Cap	PSERS Active Mandate 6	306	1% for first $40M 90bps for $40M < Assets < $100M 80bps for Assets > $100M		Jun 04, 2015	SMA	Active	MSCI AC World ex USA Small Cap (Net)
Non-US Small Cap	PSERS Active Mandate 7	219	1% for first $50M 90bps for $50M < Assets < $100M 80bps for Assets > $100M		Jun 19, 2013	SMA	Active	MSCI AC World ex USA Small Cap (Net)
Non-US Small Cap	PSERS Active Mandate 8	98	85bps for first $25M 70bps for $25M < Assets < $100M 60bps for $100M < Assets < $200M 50bps for Assets > $200M		Jun 30, 2018	SMA	Active	MSCI AC World ex USA Small Cap (Net)
Non-US Small Cap	PSERS Active Mandate 9	0	0.80%		Oct 02, 2013	SMA	Active	MSCI AC World ex USA Small Cap (Net)
	Aggregate	4,199						

PSERS - Cost Stack by Mandate

The following graph shows the division of costs between individual mandates. The data only includes fixed management fee and performance fee (calculated on the basis of the past 3-years' returns). The limited information available during this review has not allowed us to go deeper into other cost components that make up PSERS' Total Cost of Ownership (viz., Holding Costs, Transaction Costs, Other Operating Expenses and 2nd Tier Fund Costs).

Figure 4.4: Cost Makeup per Mandate



The data for the previous graph is detailed in below table.

Table 4.9: Mandate Terms

Asset Class	AuM ($M)	Total Costs ($M)	Total Costs (bps)
PSERS Active Mandate 1	322.7	1.78	55.2
PSERS Passive Mandate 1	466.9	0.57	12.1
PSERS Active Mandate 2	1,167.4	5.97	51.2
PSERS Active Mandate 3	1,116.9	3.65	32.7
PSERS Active Mandate 4	231.2	1.96	84.9
PSERS Active Mandate 5	270.2	1.14	42.0
PSERS Active Mandate 6	305.6	2.58	84.6
PSERS Active Mandate 7	219.3	1.90	86.8
PSERS Active Mandate 8	98.2	0.73	73.8
PSERS Active Mandate 9	0.2	0.00	80.0
Total	4,198.5	20.29	48.3

Summary Stack of Costs	$M	bps
Fixed Fee	16.22	38.6
Performance Fee	4.07	9.7
Management Fee Total	20.29	48.3
Transaction Costs	n/a	n/a
Holding Costs	n/a	n/a
Other OpEX	n/a	n/a
Running Costs Total	n/a	n/a
FoF / 2nd Tier Costs	n/a	n/a
Total Cost of Ownership	20.29	48.3

PSERS - Ranking by Costs and Returns Retained by Managers

The following table is a comparison between the external Public Equity mandates of PSERS. The quartiles are used to highlight the difference between the mandates based on historical returns and the costs that were incurred in achieving those returns.

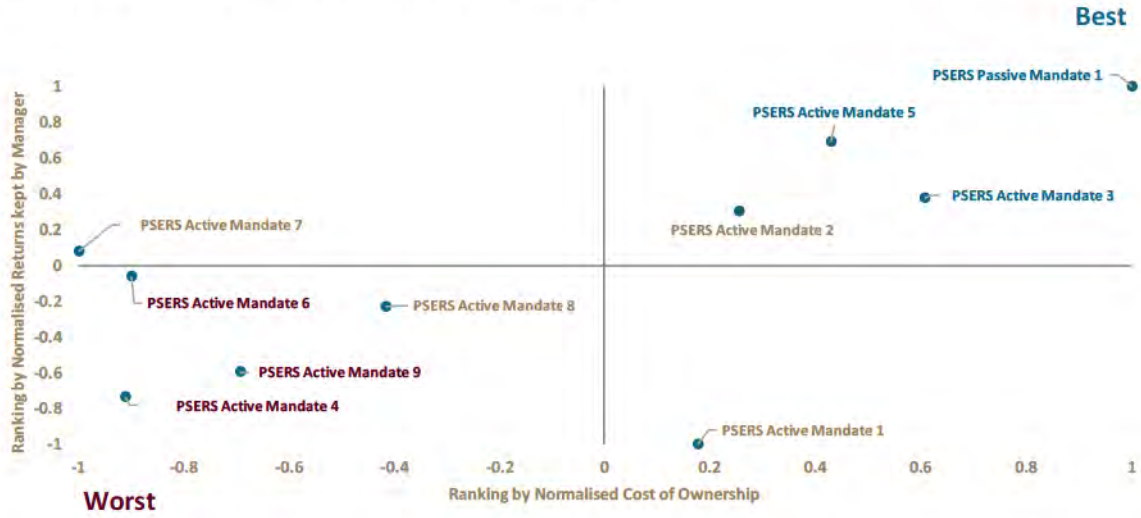
Table 4.10: Performance of Mandates by quartile

	Manager	Total Cost of Ownership	Cost Quartile	Net Return	Gross Return	% Gross Return Retained by Manager	Retained Returns Quartile	Avg Rank Top Quartile	Avg Rank Bottom Quartile
PSERS	PSERS Active Mandate 1	0.55%	2	3.19%	3.74%	14.76%	4		
	PSERS Passive Mandate 1	0.12%	1	8.18%	8.30%	1.46%	1	☑	
	PSERS Active Mandate 2	0.51%	2	8.76%	9.27%	5.52%	2		
	PSERS Active Mandate 3	0.33%	1	6.10%	6.43%	5.09%	1	☑	
	PSERS Active Mandate 4	0.85%	4	5.78%	6.63%	12.80%	4		☒
	PSERS Active Mandate 5	0.42%	1	12.48%	12.90%	3.26%	1	☑	
	PSERS Active Mandate 6	0.85%	4	10.05%	10.90%	7.76%	3		☒
	PSERS Active Mandate 7	0.87%	4	11.85%	12.72%	6.83%	2		
	PSERS Active Mandate 8	0.74%	3	7.44%	8.18%	9.03%	3		
	PSERS Active Mandate 9	0.80%	3	6.03%	6.83%	11.71%	4		☒
	Aggregate	0.19%		9.61%	9.81%	1.99%			

☑ Top Value-Accruing Mandates
☒ Candidates for Renegotiation

In the following chart, we present a comparison of various PSERS' mandates by total costs and gross returns. The data from the previous table is normalized by dividing by the range (highest - lowest). As the chart shows, and as was the case for SERS, active mandates that cost more do not necessarily represent better value-for-money.

Figure 4.5: Returns Retained vs Cost of Ownership



PSERS – Findings

International Equity - Emerging Markets

Mandate, AuM, Benchmark	Findings
PSERS Active Mandate 1 **$323M** MSCI EM (Small Cap) Index 70%, MSCI EM (All Cap) Index 15%, MSCI Frontier EM Index 15%	•0.55% running costs (fee: 0.45% fixed + 25% Perf Fee above composite hurdle; projection 3y ending June 18) •**Active Mandate** •Recently switched from 0.90% flat fee to this performance fee schedule. As shown below, the new fee schedule would be expensive by a large margin in 5 out of the previous 9 years. Of particular interest would be 2011, where a -12.98% return under the old schedule would become -16.14% return under the new schedule. Please use "Reference Table" below.*
PSERS Passive Mandate 1 **$467M** MSCI Emerging Markets (All Cap) Index	•0.124% tiered-rate •**Passive Mandate** •Small part of the internally managed $3.2B ACWI ex-US portfolio that has been allocated to an external manager. •SERS are paying manager 9bps for the same product, which until Dec '17, had a smaller allocation than PSERS. •As an example, Vanguard (VEMIX) Institutional Plus share class is available for 9bps for investments > $100M. Consequently, we think PSERS will benefit from using an improved tiered fee structure to benefit from scale for any allocation above $100M.

*Reference Table:

PSERS Active Mandate 1			Old Fee Schedule		New Fee Schedule					
			Flat fee @		Fixed Fee @	Perf Fee @				
			0.90%		0.45%	25%				
Calandar Year	Net Ret (NR)	Bnchmrk Ret (BR)	Net Value Added (NR - BR)	Gross Return (GR)	Fixed Fee (FF)	Perf Fee (PF)	Total fee Payable TF = FF + PF	Net Ret w/ Perf Fee NNR = (GR - TF)	Net Value Added (NNR - BR)	Diff in Value Add
2017	35.73%	33.33%	**2.40%**	36.63%	0.45%	0.71%	1.16%	35.47%	**2.14%**	-0.26%
2016	-3.95%	4.03%	**-7.98%**	-3.05%	0.45%	0.00%	0.45%	-3.50%	**-7.53%**	**0.45%**
2015	-10.36%	-9.81%	**-0.55%**	-9.46%	0.45%	0.00%	0.45%	-9.91%	**-0.10%**	**0.45%**
2014	2.13%	1.49%	**0.64%**	3.03%	0.45%	0.27%	0.72%	2.31%	**0.82%**	**0.18%**
2013	1.87%	1.01%	**0.86%**	2.77%	0.45%	0.33%	0.78%	1.99%	**0.98%**	**0.12%**
2012	28.06%	22.60%	**5.46%**	28.96%	0.45%	1.48%	1.93%	27.03%	**4.43%**	-1.03%
2011	-12.98%	-26.96%	**13.98%**	-12.08%	0.45%	3.61%	4.06%	-16.14%	**10.82%**	-3.16%
2010	42.87%	27.47%	**15.40%**	43.77%	0.45%	3.96%	4.41%	39.36%	**11.89%**	-3.51%
2009	119.09%	114.32%	**4.77%**	119.99%	0.45%	1.31%	1.76%	118.24%	**3.92%**	-0.86%

International Equity - All-Country World, All Cap

Mandate, AuM, Benchmark	Findings
PSERS Active Mandate 2 **$1,167M** MSCI ACWI ex-US (All Cap) Index	•0.51% running costs (fee: 23.4bps fixed + 8% Perf Fee over hurdle of MSCI ACWI ex-US +0.42%; projection 3y ending June '18) •**Active Mandate** •Although we think that Base Fee alone is a fair price to pay for this mandate, it has performed well over the last few years, especially as compared to PSERS Active Mandate 3, and it is fine to reward the manager for such out-performance. But we think that to discourage excessive risk-taking, the Performance Fee component should be capped.
PSERS Active Mandate 3 **$1,117M** MSCI ACWI ex-US (All Cap) Index	•0.327% tiered-rate •**Active Mandate** •Top tier ends at $200M at 30bps. We think additional tiers should be added at $500M (~25bps), $750M (~20bps) and $1B (~15bps).
PSERS Active Mandate New **$107M** MSCI ACWI ex-US (All Cap) Index	•New allocation of $400 million at unknown fees, as only redacted contract is available. •**Active Mandate** •We have reviewed the investment recommendation by PSERS and Aksia, and noticed that the recommendation does not show any evidence of alternatives being considered as part of the process while negotiating fees with this manager. As noted separately in this report, this is despite PSERS answering "Yes" to our self-assessment question whether this sort of comparison was an intrinsic part of their investment process.
PSERS Active Mandate 4 **$231M** MSCI ACWI ex-US (All Cap) Index	•0.85% running costs (fee: 0.67% fixed + 20% Perf Fee over Hurdle; projection 3y ending June '18) •**Active Mandate** •Worst performing in the last 3 years and most expensive out of the 3 MSCI ACWI (ex-US) All-Cap mandates by PSERS. High Performance fee despite having highest fixed fee out of the 3. We think this mandate **should be negotiated to the fee level of PSERS Active Mandate 3.**

International Equity - All Country, Small Cap

Mandate, AuM, Benchmark	Findings
PSERS Active Mandate 5 **$270M** MSCI ACWI ex-US (Small Cap) Index	•0.42% tiered-rate •**Active Mandate** •Cheapest and best performing mandate out of the 5 in this asset-class.
PSERS Active Mandate 6 **$306M** MSCI ACWI ex-US (Small Cap) Index	•0.85% tiered-rate •**Active Mandate** •This manager's MSCI All Country mandate is more expensive than its MSCI Emerging Markets mandate, which is hard to explain. •There is no reason this mandate should be paid twice that of PSERS Active Mandate 5, especially with lower returns. We think that a tiered fee structure with an aggregate of 0.40% will be fair.
PSERS Active Mandate 7 **$219M** MSCI ACWI ex-US (Small Cap) Index	•0.87% tiered-rate •**Active Mandate** •There is no reason this mandate should be paid twice that of PSERS Active Mandate 5, especially with lower returns. We think that a tiered fee structure with an aggregate of 0.40% will be fair.
PSERS Active Mandate 8 **$98M** MSCI ACWI ex-US (Small Cap) Index	•0.74% tiered-rate •**Active Mandate** •Smallest of the mandates, which explains the higher price on tiered schedule. We think that a mandate of this size should be priced at 0.50%-0.60%.
PSERS Active Mandate 9 **$159K** MSCI ACWI ex-US (Small Cap) Index	•0.80% fixed fee •**Active Mandate** •Absence of tiered structure means that any economies of scale are to the full benefit of the manager. But since this mandate appears to have been cut (AuM has dropped from $156M in June '17), we will not make a recommendation.

Based on the findings above, our estimates for PSERS' public equity cost-savings are summarized below:

Table 4.11: PSERS' public equity cost-savings

Manager	AUM ($M)	Total Fees	Potential Fees	Savings	Savings ($M)
PSERS Active Mandate 1	323	0.55%	0.55%	0.00%	0.00
PSERS Passive Mandate 1	467	0.12%	0.09%	-0.03%	-0.15
PSERS Active Mandate 2	1,167	0.51%	0.45%	-0.06%	-0.68
PSERS Active Mandate 3	1,117	0.33%	0.28%	-0.05%	-0.55
PSERS Active Mandate 4	231	0.85%	0.43%	-0.42%	-0.97
PSERS Active Mandate 5	270	0.42%	0.42%	0.00%	0.00
PSERS Active Mandate 6	306	0.85%	0.40%	-0.45%	-1.36
PSERS Active Mandate 7	219	0.87%	0.40%	-0.47%	-1.03
PSERS Active Mandate 8	98	0.74%	0.55%	-0.19%	-0.18
PSERS Active Mandate 9	0	0.80%	0.80%	0.00%	0.00
Aggregate	**4,199**	**0.48%**	**0.37%**	**-0.12%**	**-4.92**

4.6 PSERS - Synthesis

Public Equity

- Two managers capture too large a portion of the alpha generated.
    - PSERS Active Mandate 4 (38% in 2017, 3y rolling), and
    - PSERS Active Mandate 1 (45% in 2017, 3y rolling).
- International Small Cap mandates show large price differences, ranging from 44bps to 88bps (on similar sizes). Interesting side note: the cheapest is the best performer in recent years.
- 30% of mandates' fee schedules have not been revised in 5 years or longer.
- SERS is paying lower fees on the same PSERS Passive Mandate 1 product, despite SERS allocating smaller amount until recently.
- PSERS does not seem to have a sufficiently granular choice of benchmarks for their active managers. Although this helps in overall comparison, it could be problematic where performance fees are or have been introduced, as one needs to make sure the benchmark properly reflects the risk of the investment.

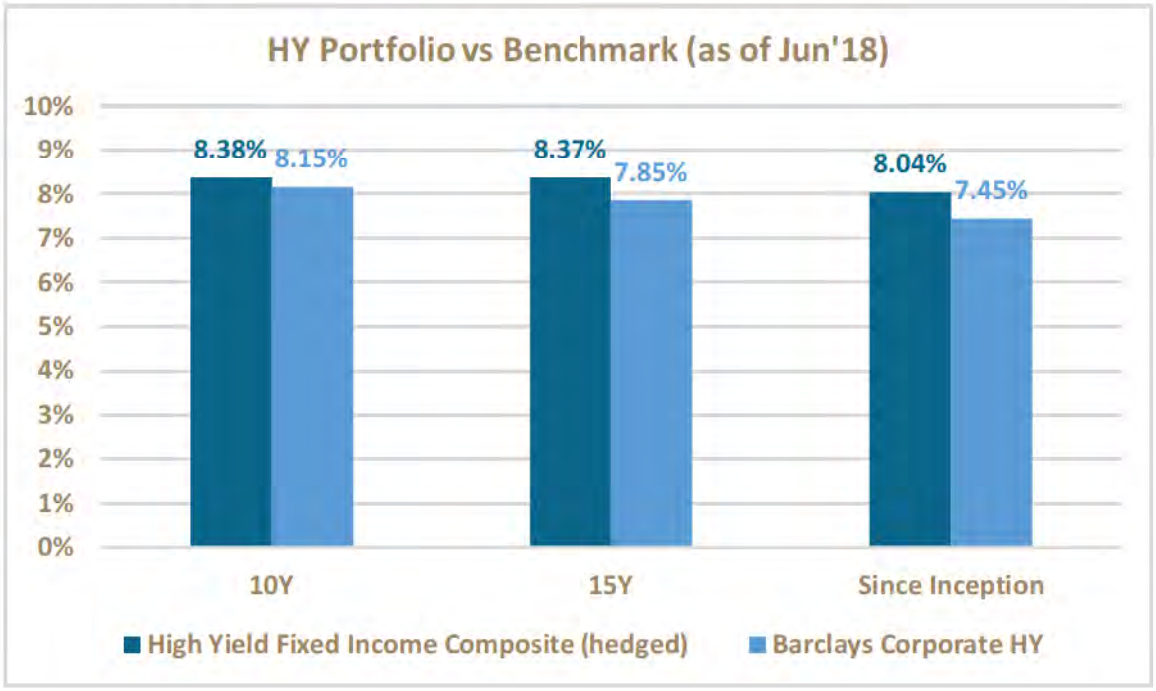
High Yield / Opportunistic

PSERS' investments of $5.02B (as of June 2018) in this asset class are in, essentially, Private Debt Limited Partnerships. There are 41 external mandates classified under four subclasses of Mezzanine HY, Opportunistic HY, Real Asset HY and Senior Loans HY. All these investments are benchmarked against Barclays US Corp High Yield Index. The performance of each allocation within is wildly different, though. Over the previous 3 years, the performance of various LPs have ranged from -25.57% p.a. to +22.13% p.a. compared to benchmark performance of +5.53% p.a.

Long term performance has been similar to the benchmark. The 10-year net value add was +0.23% p.a. (= Portfolio net return of 8.38% p.a. - Benchmark return of 8.15% p.a.).

- Please note that in the previous reporting period, ending June 2017, over 10 years this number was actually negative -0.22% p.a.

Figure 4.6: High Yield Portfolio Performance vs Benchmark



Base Management Fee:

- As per the report published by PSERS: "*Response to PSERB Resolution 2017-41 Re: Management Fees – July 2018*," the aggregate fees paid by PSERS is 1.14%.
- As per the presentation by PSERS: "*General Partner Ownership Interest (a.k.a. Carried Interest),*" dated Oct. 12, 2018; Net Management Fee for Private Credit in CY 2016 (AuM $4.16B) and CY 2017 (AuM $4.82B) were both 1.20% based on end-of-year AuM.

Carried Interest:

- As per the presentation "*General Partner Ownership Interest (a.k.a. Carried Interest)*," dated Oct. 12, 2018; Carried Interest for Private Credit in CY 2016 (AuM $4.16B) was 1.76% and in CY 2017 (AuM $4.82B) was 1.85% based of end-of-year AuM.

Assuming only the base management fee was paid, and it was a stable 1.14% historically, the following table shows that 83% of the entire alpha is being paid as base management fee to the asset managers.

Table 4.10: Cost per Alpha Calculation

10Y		
High Yield Composite Net Return (NR)		8.38%
Benchmark Return (BR)	(-)	8.15%
Net Alpha (NA)=NR+BR		0.23%
Base Management Fee (BF)	(+)	1.14%
Gross Alpha (GA)=NA+BF		1.37%
Share of Gross Alpha retained by Manager BF/GA		83%

Now, if we assume an additional carried interest of 1.20% (average of 2016 and 2017) was paid historically, then the following table shows that 93% of gross alpha was paid as fee (base management Fee + carried interest) to the asset managers (100% in previous 10-year period).

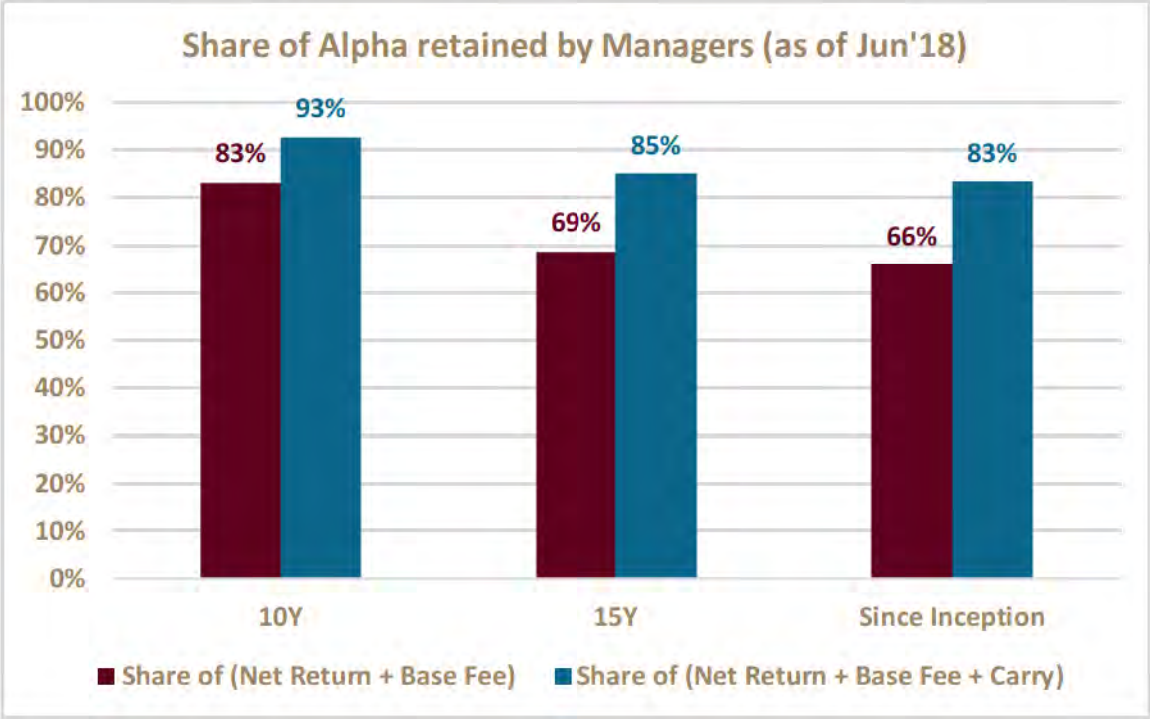
Table 4.11: Cost per Alpha Calculation

10Y		
High Yield Composite Net Return (NR)		8.38%
Benchmark Return (BR)	(-)	8.15%
Net Alpha (NA)=NR+BR		0.23%
Base Management Fee (BF)	(+)	1.14%
Carried Interest (CI)	(+)	1.80%
Gross Alpha (GA)=NA+BF+CI		3.17%
Share of Gross Alpha retained by Manager (BF+CI)/GA		93%

Both above estimates do not include the cost of an internal team that selects and manages these (currently, 41) allocations, and fund-level operating expenses.

The following graph shows this share of alpha that is paid out to the manager for various periods.

Figure 4.7: Share of Alpha retained by Managers



We have experience in successfully renegotiating multiple HY active mandates with fees of 25-30 bps (compared to the 114 bps paid here), contracted without any carried interest, for total assets that were less than a fifth of what PSERS has in its portfolio in this asset class. That represents savings of >84 bps (or $42M) annually on base fees alone, or >264 bps (or $132M) annually on total fees including carried interest.

While the performance record of PSERS' investments in this asset class over 15 years was similar to long-term returns of the asset-class benchmark, it generated a significant multiple of the costs of an index replication of this benchmark. These index mandates would be more liquid, more transparent, have lower operating expenses, and incur negligible internal costs compared to private debt LPs.

4.7 Private Equity Cost-savings for SERS and PSERS

Without full access to the private equity investment details, it is difficult to make a very thorough statement. We can, however, share some observations and estimates based on our experience of renegotiating private equity mandates. Meaningful savings in private equity are best achieved upon time of reinvesting. The average life of private equity investments (not specific to PSERS/SERS) is around 10 years. We therefore assume that within the next five years, the average of the mandates will come to the end of their life cycle or reinvestment phase. Although the total private equity costs easily reach 700 bps and more, the fee components then have some room for negotiation (see below table as an excerpt) and account for roughly 300 bps p.a. From our experience, achieving savings

of 10% or more on the 300 bps is feasible upon reinvesting. Therefore, we would encourage the plans to set a fee savings target of 10% upon the next reinvesting phase.

Please note that the plans indicate base management fees of 163 (SERS) and 138 (PSERS) bps in their annual and consultant reports. We base our estimates on this incomplete information, given we were not granted access to more detailed Private Equity information.

Here are a few examples of areas in which these savings can be achieved:

- Don't pay on committed capital, only on invested (not applicable for VC)
    - Private equity managers often charge their fees based on the committed capital, which is often subject to negotiation and makes an enormous difference in absolute fees at the beginning of the investment.
- Ensure fee reductions during the investment phases
    - Do so by trying to understand GP's budget for running the fund and negotiate lowest per-investment phase management fees upon it.
- Cap monitoring, oversight and legal fees
    - These, like other fees, are often subject to negotiation.
- Negotiate carry terms carefully
    - The mechanics of how carry is calculated must not leave any room for interpretation and one needs to simulate potential carry fees carefully, based on different return scenarios.
- Distribution Waterfalls
    - Ensure full transparency is given on whether different waterfall calculations are being offered to other investors, such as American versus European.
- Re-calculate GP reported carry calculations
    - This could either by done by internal resources or using third party services, including software-based solutions.
- Make pitch materials part of the IMA
    - Marketing materials often suggest terms that later on disappear in the IMA's.
- Credit portfolio company income towards management fees
    - Also get clarity as to how "banking / advisory" fees with the portfolio get apportioned.
- Add language to prevent Zombie funds
    - Negotiate most favorable terms for the ability to remove the GP for non-performance.
- Invest the smallest amount possible and negotiate Sidecar / Co-investment access (as was already suggested by PSERS)
    - This has already been suggested by PSERS in their savings suggestions but is subject to internal capabilities and governance constraints.

4.8 Self-Assessment of the Plans

As part of our review, we asked the plans to participate in a self-assessment of their monitoring of external investment costs. Here is an excerpt of the answers provided. We would like to highlight those answers that indicate potential room for improvement and inherent cost-savings opportunities.

1. On a scale from 1-10, where do you think your management fees are placed in the market (1 being least competitive, 10 being most competitive)?	
PSERS	**SERS**
10	10
Both plans justify this (self-assessed) ranking by the fact they have Most Favored Nation (MFN) clauses in place.	

Full reply by PSERS:

We require all our investment management agreements to contain a most-favored nation clause ensuring that we get the best fee arrangement for the amount of assets committed or invested. We have worked with SERS' investment office professionals to combine our commitment levels where we can to get better economics for each of our funds which has provided some fees savings. We believe another area where some improvements could be made is driving a better alignment of interest, with lower base fees (which are guaranteed) and higher profit sharing fees which are only earned if the manager has good performance.

Full reply by SERS:

SERS' management agreements contain an MFN (Most Favored Nation) clause that ensures SERS receives the best fee arrangement for the amount of funds committed and/or invested as well as the timing of the investment. SERS has worked closely with PSERS in an effort to combine the commitment amounts of the two agencies and thereby obtain more favorable pricing of the fees paid.

Our Comment

We do not believe the plans merit a 10. Although there are many things that the Plans are doing very well, there are gaps that can and should be closed. Most Favored Nation (MFN) clauses are not a guarantee of best terms.

2. What is the average age of the fee schedules in your portfolio?	
PSERS	**SERS**

Not tracked.	Not tracked.

Full reply by PSERS:

We don't track the average age of investment mandates by asset class. All limited partnership fee arrangements are negotiated at the beginning of the partnership and will continue for the life of the partnership (10-12 years for private equity and private real estate; 5-8 years for private credit). In hedge funds and separate accounts, we have recently re-negotiated numerous agreements.

Full reply by SERS:

SERS does not track the average age of its fee schedules by asset class. Private equity and private real estate closed-end commingled vehicle investments will generally last between 10-12 years. SERS renegotiates fees with these general partners with every new investment opportunity. Public market managers are revisited periodically and can usually be terminated at any time.

Our Comment

It is essential to review contractual terms on a regular basis; at the very least every 2-3 years. We therefore believe the plans should actively track the age of the agreements.

3. What is the average age of investment mandates in your portfolio?

PSERS	SERS
"*PSERS does not maintain this information.*" (Full Reply)	"*SERS does not track this information.*" (Full Reply)

Our Comment

Asset managers value long-term relationships; therefore, the longevity of a mandate should be taken into account upon recurring fee reviews. We believe the plans should actively track the age of their investments.

4. What percentage of your asset managers have confirmed in writing that they don't receive commissions, rebates, retrocessions and the like; associated with your investment?	
PSERS	**SERS**
"*PSERS does not maintain this information.*" (Full Reply)	See Comment.*

*SERS has not directly answered the question; however, SERS indicates that this is addressed as part of their Due Diligence process.

Full reply by SERS:

As part of SERS due diligence process, SERS requires the investment manager to disclose if a placement agent or third-party marketer was used by the investment manager as part of the search process. SERS does not directly work with placement agents. If and when a general partner discloses its use of a placement agent, SERS requires that it contractually agrees that SERS' negotiated fee structure will not be altered in any way as a result of its participation. SERS requires fund sponsors to attest that no placement agent fees have been paid to attract or obtain approval for SERS' investment. For any investment under consideration, SERS discloses to the board the identity of any placement agent.

Our Comment
This is an area of potentially big conflicts of interest and should be monitored with great discipline. Most pension funds we work with have all asset managers confirm in writing whether or not they have received such benefits.

5. What percentage of your asset managers have confirmed in writing that they don't pay and have not paid any commissions, introduction fees or the likes associated with your investments?	
PSERS	**SERS**
"*PSERS does not maintain this information.*" (Full Reply)	See comment.‡

‡SERS has not directly answered the question; however, SERS indicates that this is addressed as part of their Due Diligence process. SERS also mentions that they do not directly work with placement agents and requires the fund sponsors to attest that no placement agent fees have been paid to attract SERS' investment.

Full reply by SERS:

As part of SERS due diligence process, SERS Due Diligence Questionnaire includes comprehensive conflict of interest and related party questions which address compensation associated with referring, retaining, or increasing the level of business.

Our Comment

We believe it is crucial to have full transparency on where your fees are ending up. There have been many situations in the past where parties were inappropriately compensated for capital introduction; not being fully aware of such potential payments carries enormous reputational risk for the plan and the state.

6. Does your plan operate under a fee budget for investment managers?

PSERS	SERS
"*No.*" (Full Reply)	"*No.*" (Full Reply)

Our Comment

Those of our clients who operate under such a budget would still allow the budget to be exceeded by board approval, but signing checks to asset managers turns out to be a more conscious decision.

7. In negotiating investment costs, does the Plan have a process for determining the best alternative to the investment under consideration?

PSERS	SERS
"*Yes.*" (Full Reply)	*"Yes, through SERS' Strategic Investment Plan and asset allocation process."* (Full Reply)

Our Comment

We have not seen any evidence of how this is done (nor did we ask for it) but we do believe that in some cases, such as the HY allocation of PSERS, the process needs improvement.

8. Do your brokers, or those of your managers, make use of bundled brokerage?	
PSERS	**SERS**
"*Yes, in some cases.*" (Full Reply)	Yes, several of them.

Full reply by SERS:

Yes, several investment managers have soft dollar arrangements in place to use a part of trading commissions to pay for permitted research services.

Our Comment

Bundled brokerage incentivizes the managers to churn the portfolio more than necessary, in order to generate soft dollars, such as, with Research. It is also never clear if such soft dollars are then used for the benefit of the client who created such budgets or not. For example, in Europe, with MiFID II regulation coming into force, bundled brokerage has been banned and has been considered illegal since the beginning of 2018.

9. Are you conducting regular transaction cost analyses on equities, fixed income and FX?	
PSERS	**SERS**
No.	"*Yes, on a quarterly basis.*" (Full Reply)

Full reply by PSERS:

No; PSERS has used providers in the past and found they did not add valuable insights. As net of fee returns take into account trading costs, we are monitoring through the performance of the manager vs. their benchmark.

Our Comment

It is important to regularly perform transaction cost analysis, as it would highlight potential shortcomings in the implementation of a mandate, such as closet indexing, churning, market impact, etc.

10. What do you think is the single biggest hurdle (per asset class, if different) as to why asset management terms cannot be further improved?	
PSERS	**SERS**
Overhead; capacity.	Capacity.

Full reply by PSERS:

Traditional asset classes: the two greatest impediments are the need for the active asset manager to have a minimum amount of fees to cover overhead of the business, especially during years where performance may be more challenged. Secondly, the generation of excess returns is not unlimited and the asset managers have to limit capacity to their product to protect this alpha generating ability. Products with limited capacity will generally command higher fees. Non-traditional asset classes: the single biggest hurdle in this area, which includes private equity and hedge funds, is supply/demand imbalances. There is a limited supply of institutional quality managers and significant demand for their 7 services. For example, we've seen private equity fund raises where demand outstripped the fund size by 3x. Investors possess little if any negotiating power in these cases. Theoretically, a manager could increase its fund size by 3x and reduce its fee by 2/3 to accommodate all investor demand and not charge more in fees, but there are two reasons why managers do not do this. One, managers are incentivized to maximize performance and taking on too much money may make that impossible; and, two, managers generally commit significant sums of their own money into the funds and don't want performance to be watered down.

Full reply by SERS:

The top performing managers are in demand and do not need to lower their respective fees because, in many instances, they are already over-subscribed. By contrast, the lower performing managers are more inclined to lower their fees in order to attract capital.

Our Comment

Although we respect both arguments, we believe that the mentioned overhead is not applicable in the case of PSERS since all mandates are significant by size and create meaningful management fees for the managers. And even if it were not the case, a pension plan's duty is to its beneficiaries and it should not be providing support for inefficiencies of their service providers.

We understand that some strategies/managers indeed have capacity constraints. We would, however, also like to warn that this is the single most-used negotiating tactic by asset managers to avoid fee conversations, whether it is applicable or not.

11. What does the Plan estimate as its total annual investment costs of the portfolio and per asset class and when was this calculation last made?	
PSERS	**SERS**
"*We don't make such estimates.*"	$130.4 million or 47.1 basis points (0.471%) in 2017.

Full reply by PSERS:

We don't make such estimates. In 2017, 18% of our total external management fees were profit sharing fees which will vary significantly based on the success of the asset manager. However, we are in the process of reviewing all of our base management fees to look for potential savings.

Full reply by SERS:

Annually, SERS reports its fees by asset class in its supplemental budget books. SERS' Manager Investment Expenses for calendar year 2017 was $130.4 million or 47.1 basis points (0.471%) of the total fund assets. The Investment Office searches for those opportunities that provide the highest risk-adjusted return.

Our Comment

We must assume that PSERS misunderstood the question. If true, this is deeply concerning.

12. Do you have procurement guidelines for asset management services in place?	
PSERS	**SERS**
"*No.*" (Full Reply)	Yes, to some degree.

Full reply by SERS:

The State Employees' Retirement Code establishes the Board's investment authority. The procurement of SERS' asset management services are governed by SERS Statement of Investment Policies and Strategic Investment Plan.

Our Comment

We believe it is important to have procurement guidelines in place, as they ensure a structured and replicable process whenever investment management agreements are signed. These guidelines also help the management in negotiations with asset managers, as certain "rules for investing" need to be adhered to by asset managers when the latter are trying to get into business with a plan and typically show more flexibility to meet the client's requirements.

4.9 Summary of Potential Cost-savings

Based on our analysis above, we provide details of a set of cost-savings that can be achieved for the two plans. We were asked to find savings opportunities to achieve actuarial savings of $1.5 billion for each System compounded over 30 years under the assumption of a 7.25% annual return.

Our analysis is purely limited to best-practice procurement in order to achieve cost reductions while keeping the existing risk/return exposure. None of our recommendations should be interpreted as investment advice, as our analyses and recommendations are done under the assumption that asset allocation and manager selection remain unchanged, and do not preclude other or broader savings approaches.

We believe that both plans are able to meet the target, although due to the different size of the plans, achieving the target proves to be more difficult for the smaller of the two plans, SERS.

We outline below the actuarial savings for the two plans over a 30-year time horizon on their current investment strategies, taking into account 7.25% interest for both SERS and PSERS.

SERS Cost-Savings

Table 4.12: Summary of Cost-Savings – SERS

SERS		
Asset Class	**Savings Potential, p.a.**	**Implementation**
Public Equity	$4.87 M	Assumed, immediate
Private Equity	$12.18 M	Assumed, upon reinvestment
Other Asset Classes	*No view to date*	
Total (p.a.)	$17.05 M	
Total 30 years (compounded) (@7.25% assumed return)	**$1.51 B**	
	Assuming 30 years for public equity = $584 M *Assuming 25 years for private equity = $926 M*	

For SERS, we are confident that savings can be achieved but because we don't have unredacted contracts to base our view upon, there remains a level of uncertainty.

SERS appears to have many index mandates, which seem generally to be priced fairly.

There are four primary candidates for in-depth review and potential renegotiation:

- SERS Active Mandate 1: Agreement almost 9 years old; returns (3y ending June 2017) are poor.
- SERS Active Mandate 3: Very expensive for Developed World Small Cap.
- SERS Active Mandate 4: Agreement 8 years old.
- SERS Active Mandate 6: Agreement 5 years old.

We note that Most Favored Nation (MFN) clauses don't guarantee best terms and in fact, over time, they tend to serve the asset manager more than the asset owner.

Due to a lack of data on private equity for both plans, we are working under the following conservative assumptions, based on our experience:

- Negotiable fee components of 3.00% p.a. (whereas, total private equity costs are higher)
- Average life of private equity investment of 10 years, resulting in an average 5 years before reinvesting
- Achievable savings of 10% upon reinvesting of each private equity allocation

PSERS Cost-Savings

Table 4.13: Summary of Cost-Savings – PSERS

PSERS		
Asset Class	**Savings Potential, p.a.**	**Implementation**
Public Equity	$4.91 M	firm, immediate
Private Equity	$15.48 M	assumed, upon reinvestment
High Yield	$42.50 M	firm, upon reinvestment
Other Asset Classes	*No view to date*	
Total (p.a.)	$62.89 M	
Total 30 years (compounded) (@7.25% assumed return)	**$4.96 B**	
	Assuming 30 years for public equity = $560 M *Assuming 25 years for private equity = $1.17 B* *Assuming 25 years for high yield = $3.23 B*	

For PSERS, we have a high-conviction view of how savings can be achieved in public equity and high yield, as detailed in the set of chapters. For HY we have assumed an average life before reinvesting of 5 years, identical to private equity, although it is likely to be shorter.

Our analysis has shown, contrary to PSERS' assertions, that more expensive mandates don't guarantee better returns. The cheapest out of five mandates in "International All Cap Equities," has enjoyed the best returns. This cheapest mandate is priced at 44 bps; the average of the other four is 81.75 bps.

There are several primary candidates for potential renegotiation:

- All of the five International Equities Small Cap mandates.
- PSERS Index Mandate 1: SERS pays lower fees for the same.
- PSERS Active Mandate 3: Absence of tiers above $200M is not in line with best practice.
- PSERS Active Mandate 4: Worst performer in its category, despite highest fixed fee.

Due to a lack of data on private equity for both plans, we are working under the following conservative assumptions, based on our experience:

- Negotiable fee components of 3.00% p.a. (whereas total private equity costs are higher)
- Average life of private equity investment of 10 years, resulting in average 5 years before reinvesting
- Achievable savings of 10% upon reinvesting of each private equity allocation

4.10 Additional Savings

The above savings are based on an analysis carried out on limited data. We believe that if we had access to more data, including of all other asset classes and more granular information on certain mandates, further potential savings could be uncovered.

One area that should involve further exploration is the joining of certain mandates. We do believe the plans have room to cooperate more extensively when it comes to sharing investment mandates and negotiating packages where both plans' assets are added into one scale of fees.

Fee savings could occur from combining capital together which would enable the plans to slide into higher scale brackets, reducing combined fees. Because both plans are large, the additional benefits might not be too significant in the public equity space but should enable large benefits in private mandates, where co-investments might be offered on a more regular basis.

On top of achieving cost-savings from shared mandates, collaboration and consolidation of the two plans could lead to cost-savings through combining various operational processes such as sharing facilities, sharing HR services, IT services, consultants, and sharing due diligence. We understand that there may be certain legal and statutory challenges associated with combining some of these services. We also understand that there have been efforts made by the plans using external assistance to look at areas where collaboration and consolidation could occur between the two plans. Our general recommendation to the Commission would be to further investigate the possibilities of consolidation between the two plans. Where statutory and legal considerations allow, we would encourage initial efforts to collaborate on investment mandates to continue. Further analysis would be required (including learning from existing examples of consolidation) to understand the true benefits of such an effort.

Our findings from Section 4 are summarized as follows:

- On the current public equity mandates of SERS, we believe the plan can achieve $4.87m savings per year while our cost-saving estimates on SERS' private equity portfolio are $12.18m per year. This equates to $1.51 billion over 30 years, assuming a 7.25% discount rate.

- On the current public equity mandates of PSERS, we believe the plan can achieve $4.91m savings per year while our cost-saving estimates on PSERS' private equity portfolio are $15.48m per year. Furthermore we believe there are $42.5m of potential savings on PSERS' current high yield allocation. This equates to $4.96 billion over 30 years assuming a 7.25% discount rate.
- We have a high conviction of these savings for PSERS on the public equity and high yield mandates. We are confident of the savings for SERS, although because the contracts provided by SERS were unredacted, there remains a level of uncertainty. The private equity savings are based on conservative assumptions and estimates as no private equity contracts were provided for this analysis.

Section 5: Conclusions

5.1 Conclusions and Recommendations

This set of chapters has been prepared to assist the work of the PPMAIRC, which has been tasked through Act 5 of the Pennsylvania General Assembly to study the investment management performance of the two largest plans in the Commonwealth of Pennsylvania, PSERS and SERS, and put forward recommendations for cost-savings. In this section, we summarize the findings from our analysis.

From our first key area of analysis on asset allocation and performance, we summarize our findings as follows:

- The 2017 asset allocation of SERS was relatively consistent with the peer group of our analysis, which consisted of 11 funds of similar size and funding ratios to the PA plans. The asset allocation of PSERS contained a number of irregularities compared with the peer group: namely, it had the lowest allocation to public equity, the highest allocation to fixed income and commodities, and one of the highest allocations to private equity and hedge funds. PSERS was the only fund to use leverage in their asset allocation.
- Over the ten-year time period examined, SERS has progressively increased its allocation to public equities, while PSERS has decreased its public equities allocation. PSERS has increased its hedge fund, commodities and fixed income allocations and maintained a relatively high private equity allocation.
- Excluding one fund that used the CPI, the total portfolio benchmark performance for PSERS was the lowest in the peer group across the 1-year, 3-year, 5-year and 10-year time horizons. The total portfolio benchmark performance of SERS, in contrast, was consistently above the average for the peer group across all time periods.
- The absolute performance of PSERS and SERS were the lowest in the peer group over ten years at 3.8 and 3.9%, respectively. In the wider universe of the Public Pension Database, PSERS and SERS ranked 50th and 49th respectively out of 52 U.S. public pension plans. Notwithstanding the difficulties in doing peer comparisons, the absolute performance data would show that the PA plans have underperformed their peer universe over the last 5 and 10 years.
- Our risk-adjusted performance figures confirm the absolute performance assertions. The Sharpe Ratios for PSERS and SERS were calculated to be slightly lower than alternative simple balanced indices at the 30-year level and significantly less at the 10-year level. Negative information ratios for both plans at the 10-year level and 30-year level for SERS indicate that both plans have significantly and consistently underperformed simple multi-asset index portfolios on a risk-adjusted basis.

The analysis in this project indicates that the asset allocation strategy of the funds might need to be addressed. For PSERS, it would appear that the use of leverage to extend duration in fixed income, the allocation to illiquid asset classes such as private equity,

and the allocation to commodities and hedge funds should all be looked at and reconsidered. For SERS, the allocation to private equity should be addressed, although we note that SERS' allocation to public equities is more in line with what is likely to contribute most to the total portfolio returns.

The second area of analysis for this project highlighted the various cost-saving pathways available to institutional investors. We summarized the drivers and related strategies to be:

- Investment innovation – seeding new managers, new collaborative vehicles, platform companies.
- Strategy simplification – active to index, illiquid to public.
- Cost Arbitrage – risk factor approach for more efficient access points, internal management.
- Monitoring and Revisiting – renegotiating current mandates.

We provided illustrative examples of how the above strategies can save money for pension funds, with the savings achieved by certain investors being quite significant. There are, however, certain factors that need to be considered for the adoption of some of the strategies. The most important consideration, in particular for investment innovation and internal management (cost arbitrage), is governance. We indicate (from research) that strong governance (having an investment board as opposed to purely an administrative board), and specifically the nomination procedures of pension board members, is a prerequisite for adopting innovation and internal management as a cost-saving strategy.

When looking at the PSERS and SERS boards (based on an incomplete and preliminary analysis due to denied access by the plans), we note that both funds have best practice administrative boards with political and member representation. However, they have far from best practice investment boards. This is evident by the large number of board members, the composition, the training, and expertise requirements for nomination. A board without the sufficient expertise to adequately oversee and hold the investment staff accountable can be problematic and a recipe for disaster if complex or innovative strategies are adopted. These findings are further emphasized when comparing the nomination procedures of PA board members with other U.S. public pension plans that have adopted innovative strategies and internal management successfully, namely the South Dakota Investment Council, the State of Wisconsin Investment Board and the Florida State Investment Board. All of these plans have separate investment boards to their administrative boards or they have specific investment expertise requirements (up to 10 years) for their board members.

Based on the initial governance analysis carried out, we do not believe that investment innovation and internal management are appropriate cost-saving strategies that should be recommended to the plans, despite the large cost-savings that could be achieved by the plans from these strategies. Our formal recommendations for cost-saving strategies are thus limited to strategy simplification and renegotiating current mandates.

The recommendation of strategy simplification is also in line with our asset allocation and performance analysis, where particularly in the case of PSERS, we observed complexity in the portfolio with regards to the use of leverage, private equity, seeding hedge funds and internal management. Our risk-adjusted performance analysis indicates that a shift to a simple balanced public index would have performed significantly better on a risk-adjusted basis than the current complex strategies. There are a number of aspects that would need to be addressed when considering a simplification of strategy, such as how the change in active risk exposure would impact the plans as well as the increased volatility that would be associated with moving private market allocations to public indices. Our preliminary analysis in this project would suggest that strategy simplification should be explored as a cost-saving strategy for the two plans. Further analysis would be needed to confirm this.

The second, most feasible cost-saving strategy for the plans based on our preliminary analysis is to renegotiate the current mandates of the two plans. Assuming no change whatsoever in asset allocation or risk tolerance, the easiest and quickest way to generate cost-savings can be to renegotiate the terms and conditions of mandates with existing managers. While we were not provided with data on the plans' entire portfolio, we were able to access data pertaining to the public equity mandates of the two plans. Our recommendations for the specified minimum of $1.5 billion of cost-savings over 30 years for each plan come from detailed calculations of savings from the existing public equity mandates of the two plans. We also provide estimates of savings that could be achieved from the private equity mandates of the two plans. While more potential savings could come from analyzing the private equity mandates, we note that it is hard to alter these arrangements (which usually last for 10 years) once Limited Partnership Agreements have been signed. Our estimates for private equity savings thus need to factor in this time lag, whereas public equity mandates, being more liquid, could be achieved much more quickly.

We believe that both plans are able to meet the target, although due to the different size of the plans, achieving the target proves to be more difficult, although attainable, for the smaller of the two plans, SERS.

Over a 30-year time horizon, taking into account 7.25% interest for both SERS and PSERS, the plans' current investment strategy carries the potential to achieve the following actuarial savings:

SERS		
Asset Class	**Savings Potential, p.a.**	**Implementation**
Public equity	$4.87 M	Assumed, immediate
Private equity	$12.18 M	Assumed, upon reinvestment

Other Asset Classes	*No view to date*	
Total (p.a.)	$17.05 M	
Total 30 years (compounded) (@7.25% assumed return)	**$1.51 B**	
	Assuming 30 years for Public Equity = $584 M *Assuming 25 years for private equity = $926 M*	

PSERS		
Asset Class	**Savings Potential, p.a.**	**Implementation**
Public equity	$4.91 M	firm, immediate
Private equity	$15.48 M	assumed, upon reinvestment
High yield	$42.50 M	firm, upon reinvestment
Other asset classes	*No view to date*	
Total (p.a.)	$62.89 M	
Total 30 years (compounded) (@7.25% assumed return)	**$4.96 B**	
	Assuming 30 years for public equity = $560 M *Assuming 25 years for private equity = $1.17 B* *Assuming 25 years for high yield = $3.23 B*	

For SERS, we are confident that savings can be achieved, but because SERS did not provide unredacted contracts to base our view upon, there remains a level of uncertainty.

For PSERS, we have a high-conviction view of how savings can be achieved in public equity and high yield, as detailed in this set of chapters. For HY we have assumed an average life before reinvesting of 5 years, identical to private equity, although it is likely to be shorter.

Due to lack of data on private equity for both plans, we are working under the following conservative assumptions, based on our experience:

- Negotiable fee components of 3.00% p.a. (whereas total private equity costs are higher).
- Average life of private equity investment of 10 years, resulting in average 5 years before reinvesting.
- Achievable savings of 10% upon reinvesting of each private equity allocation.

Our analysis and recommendations above are premised on not having the full amount of data to do a comprehensive analysis on the plans. We thus caveat the recommendations put forward as being subject to doing a fuller analysis in certain areas, such as governance and cost-savings on the plans' current mandates in all asset classes.

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Appendix

APPENDIX 1: Section 2 Methodology and Supplementary Information

Phase 1 – Scope Definition & Peer Selection

- Defined project scope, approach, timelines, and high-level data requirements
- Performed research to identify similar assessments across the industry
- Defined peer selection criteria
- Developed preliminary peer candidate list
- Finalized peer list through client feedback

Phase 2 – Analytical Framework & Data Gathering

- Developed an analytical framework to identify potential assessment categories
- Created a master dataset to refine data requirements
- Identified data source alternatives and selected a main data source
- Gathered and audited data to reinforce consistency across the peer group

Phase 3 – Data Analysis & Insights Generation

- Performed asset allocation, benchmarking, and investment performance assessment
- Developed insights summary and gathered client feedback
- Prepared preliminary insights for Committee Hearing
- Developed final report

Peer Group Selection Process

The process for selecting funds for the Peer Group consisted of five major steps:

- **Step 1:** The first step consisted of developing "fund snapshots" with key information on SERS and PSERS to develop a deeper understanding of the funds' characteristics today and over time
- **Step 2:** The second step consisted of defining the criteria indicated above
- **Step 3:** With the Peer Group criteria established, the team expanded research for potential peers by tapping into common data sources in the investment management industry (*e.g.*, Pensions & Investments Online, Sovereign Wealth Funds Institute, Chief Investment Officer Publications, Public Pensions Database)
- **Step 4**: Having identified common data sources, the team amalgamated data points from across these sources into a master list of potential candidates and began applying the defined criteria to narrow down the potential list of options
- **Step 5:** Through discussions with project staff, a preliminary group of 11 funds were selected for analysis

Peer Asset Class Benchmarks

The following represent a summary of the asset class benchmarks of every fund in the peer group for 2017. For more information, refer to the Comprehensive Annual Financial Report (CAFR) of each fund.

Table A.1: Equity Benchmarks (2017)

Plan (2017)	Equity Benchmarks 2017
Arizona SRS	Total Equity Index
Georgia Teachers	S&P1500
Illinois Teachers	TRS Equity Composite Benchmark
Iowa PERS	Wilshire 5000 & Fund's Custom Benchmark
LA County ERS	Russell 3000 Index, Non-U.S. Equity Custom, Hedged Index
Oregon PERS	Combination of: Russell 3000 Index for Domestic and MSCI All Country
PSERS	MSCI USA Investable Market Index, MSCI ACWI ex USA IMI
SERS	MSCI ACWIM Index (Net)
South Dakota RS	Global Equity composite—MSCI All Country World Index (ACWI) weighted
Virgina RS	Custom Benchmark
New Mexico Educationa	Custom Benchmark

Source: Individual Peer Fund 2017 Comprehensive Annual Financial Reports (CAFR)

Table A.2: Fixed Income Benchmarks (2017)

Plan (2017)	Fixed Income Benchmarks 2017
Arizona SRS	Custom Benchmark
Georgia Teachers	Barclays Government Credit
Illinois Teachers	Bloomberg Barclays Capital Aggregate Index
Iowa PERS	Custom Benchmark
LA County ERS	BBG Barclays US Universal Index
Oregon PERS	Custom Benchmark
PSERS	Custom Benchmark
SERS	Bloomberg Barclays US Aggregate Bond Index
South Dakota RS	USBIG Opportunistic
Virgina RS	Custom Benchmark
New Mexico Educationa	BBG Barclays US TR

Source: Individual Peer Fund 2017 Comprehensive Annual Financial Reports (CAFR)