

The original research was  
conducted by

Reporting Year 2016

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## Retirement Plan Performance Measures

The data consisted of four categories of retirement plans of various sizes based on their market values, \$1 million to \$10 million, \$10-100 million, \$100-500 million, and over \$500 million. Of the 6,130 plans included in the original data sample, 306 plans were excluded from the analysis due to missing values in returns of the funds and/or their associated benchmarks. The final sample size for the analysis was 5,824.

- Table 1 reports the number of the total population and the sample of each fund size category in 2016.
- Table 2 reports the mean ratio of funds in plans that outperformed their benchmark.
- Table 3 reports the percentage of plans in each size category that outperformed their benchmark.

This report employs a fund-level approach and a plan-level approach to evaluate the plan's performance. The performance measures used in the analysis at both the fund level and the plan level included expected return, standard deviation, Sharpe ratio, downside risk, and Sortino ratio.

## Summary of Results

### Plan Performance at the Fund Level

Table 2 reports the mean (average) ratio of funds in plans that outperformed their benchmark.

The average of funds in plans that outperformed their benchmark was calculated by dividing the number of outperforming funds by the total number of funds in the lineup for each plan and taking an average of these ratios for all plans and for plans in each size category.

Evaluated by the expected return, the overall average percent of funds in a plan that outperformed its benchmark was 29.68%. In general, the average of plans with outperforming funds in a plan was higher in larger market value plans. In plans with a market value of \$500 million or more, 39.01% outperformed their corresponding benchmark, the highest of all four size categories. Meanwhile, only 28.42% of funds in the \$1-10 million category outperformed their benchmark, the lowest among all four categories.

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Disclaimer: This report is not affiliated with the University of Missouri (MU) or Dr. Rui Yao's role at MU.

*Reporting Year 2016*
**Plan Performance at the Plan Level**

Table 3 reports the percentage of plans that outperformed their corresponding benchmark plan in 2016 at the plan level.

To calculate at the plan level, an equal weight is assigned to each fund offered in its retirement plan. The benchmark for each retirement plan consists of the benchmark of each fund in that plan. Funds in each benchmark plan received their weight in the same manner. Performance measures are then calculated for both the retirement plan portfolio and its benchmark plan portfolio.

On average, the percentage of plans that achieved a higher expected return than their benchmark was 10.59%. Generally, the percentage of plans that outperformed their benchmark plan as measured by expected return was higher for plans with a larger market value. This is clearly displayed in the \$1-10 million category, where only 8.29% of plans outperformed their benchmark. Meanwhile, the average percentage of plans that outperformed with a market value of \$500 million or more was 27.61%.

## Table 1

*Number of Defined Contribution Plans and Sample Weights in 2016*

Plan Size	2016
<b>\$1m-\$10m</b>	
Population	38,939
Sample weights	1,232 0.52499613
<b>\$10m-\$100m</b>	
Population	33,021
Sample weights	1,623 0.33788486
<b>\$100m-\$500m</b>	
Population	8,120
Sample weights	1,849 0.07292617
<b>\$500m+</b>	
Population	4,328
Sample weights	1,120 0.06419283
<b>Total</b>	
Population	84,408
Sample	5,824

## Table 2

*Mean Ratio of Funds in Plans that Outperformed Their Benchmark*

Plan Size	2016
	<b>Panel A: Higher Expected Returns</b>
<b>Overall</b>	29.68
\$1-10m	28.42
\$10-100m	29.48
\$100-500m	31.59
\$500m+	39.01
	<b>Panel B: Lower Risk (Standard Deviation)</b>
<b>Overall</b>	47.94
\$1-10m	48.81
\$10-100m	47.30
\$100-500m	47.04
\$500m+	46.63
	<b>Panel C: Higher Sharpe Ratio</b>
<b>Overall</b>	30.75
\$1-10m	30.58
\$10-100m	30.45
\$100-500m	30.09
\$500m+	35.89
	<b>Panel D: Lower Downside Risk</b>
<b>Overall</b>	38.74
\$1-10m	39.63
\$10-100m	38.11
\$100-500m	37.18
\$500m+	38.49
	<b>Panel E: Higher Sortino Ratio</b>
<b>Overall</b>	31.94
\$1-10m	31.47
\$10-100m	31.81
\$100-500m	31.95
\$500m+	37.85

Note. n=5,824, numbers in percentages.

## Table 3

### Percentages of Plans that Outperformed Their Benchmark

Plan Size	2016
	<b>Panel A: Higher Expected Returns</b>
<b>Overall</b>	10.59
\$1-10m	8.29
\$10-100m	10.54
\$100-500m	12.72
\$500m+	27.61
	<b>Panel B: Lower Risk (Standard Deviation)</b>
<b>Overall</b>	49.47
\$1-10m	50.04
\$10-100m	49.51
\$100-500m	48.76
\$500m+	45.49
	<b>Panel C: Higher Sharpe Ratio</b>
<b>Overall</b>	11.52
\$1-10m	9.42
\$10-100m	11.34
\$100-500m	13.31
\$500m+	28.33
	<b>Panel D: Lower Downside Risk</b>
<b>Overall</b>	40.75
\$1-10m	41.19
\$10-100m	40.51
\$100-500m	39.07
\$500m+	41.91
	<b>Panel E: Higher Sortino Ratio</b>
<b>Overall</b>	12.79
\$1-10m	10.72
\$10-100m	12.45
\$100-500m	14.72
\$500m+	30.29

Note. n=5,824, numbers in percentages.

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## Retirement Plan Performance Measures

The data consisted of four categories of retirement plans of various sizes based on their market values, \$1 million to \$10 million, \$10-100 million, \$100-500 million, and over \$500 million. Of the 6,125 plans included in the original data sample, 295 plans were excluded from the analysis due to missing values in returns of the funds and/or their associated benchmarks. The final sample size for the analysis was 5,830.

- Table 1 reports the number of the total population and the sample of each fund size category in 2017.
- Table 2 reports the mean ratio of funds in plans that outperformed their benchmark.
- Table 3 reports the percentage of plans in each size category that outperformed their benchmark.

This report employs a fund-level approach and a plan-level approach to evaluate the plan's performance. The performance measures used in the analysis at both the fund level and the plan level included expected return, standard deviation, Sharpe ratio, downside risk, and Sortino ratio.

## Summary of Results

### Plan Performance at the Fund Level

Table 2 reports the mean (average) ratio of funds in plans that outperformed their benchmark.

The average of funds in plans that outperformed their benchmark was calculated by dividing the number of outperforming funds by the total number of funds in the lineup for each plan and taking an average of these ratios for all plans and for plans in each size category.

Evaluated by the expected return, the overall average percent of funds in a plan that outperformed its benchmark was 63.78%. In general, the average of plans with outperforming funds in a plan was higher in larger market value plans. The only exception was plans with market value of \$500 million or more, where only 60.75% of the funds in a plan outperformed their corresponding benchmark, the lowest of all four size categories. Meanwhile, 66.56% of funds in the \$100-500 million category outperformed their benchmark, the highest among all four categories.

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### Plan Performance at the Plan Level

Table 3 reports the percentage of plans that outperformed their corresponding benchmark plan in 2017 at the plan level.

To calculate at the plan level, an equal weight is assigned to each fund offered in its retirement plan. The benchmark for each retirement plan consists of the benchmark of each fund in that plan. Funds in each benchmark plan received their weight in the same manner. Performance measures are then calculated for both the retirement plan portfolio and its benchmark plan portfolio.

On average, the percentage of plans that achieved a higher expected return than their benchmark was 82.66%. Generally, the percentage of plans that outperformed their benchmark plan as measured by expected return was higher for plans with a larger market value. The only exception was the largest plans with a market value of \$500 million or more. An average of 82.50% of these plans outperformed their benchmark, lower than the 90.53% of the \$100-500 million size category and the 85.71% of the \$10-100 million size category.

## Table 1

*Number of Defined Contribution Plans and Sample Weights in 2017*

Plan Size	2017
<b>\$1m-\$10m</b>	
Population	38,290
Sample weights	1,241 0.51295458
<b>\$10m-\$100m</b>	
Population	34,010
Sample weights	1,658 0.34102595
<b>\$100m-\$500m</b>	
Population	8,407
Sample weights	1,817 0.07692216
<b>\$500m+</b>	
Population	4,630
Sample weights	1,114 0.06909731
<b>Total</b>	
Population	85,337
Sample	5,830

## Table 2

*Mean Ratio of Funds in Plans that Outperformed Their Benchmark*

Plan Size	2017
	<b>Panel A: Higher Expected Returns</b>
<b>Overall</b>	63.78
\$1-10m	62.36
\$10-100m	65.10
\$100-500m	66.56
\$500m+	60.75
	<b>Panel B: Lower Risk (Standard Deviation)</b>
<b>Overall</b>	44.53
\$1-10m	43.67
\$10-100m	44.29
\$100-500m	47.83
\$500m+	47.46
	<b>Panel C: Higher Sharpe Ratio</b>
<b>Overall</b>	58.15
\$1-10m	56.64
\$10-100m	59.73
\$100-500m	61.12
\$500m+	53.63
	<b>Panel D: Lower Downside Risk</b>
<b>Overall</b>	58.74
\$1-10m	57.38
\$10-100m	60.32
\$100-500m	61.11
\$500m+	53.99
	<b>Panel E: Higher Sortino Ratio</b>
<b>Overall</b>	59.63
\$1-10m	58.51
\$10-100m	61.03
\$100-500m	61.84
\$500m+	54.77

Note. n=5,830, numbers in percentages.

## Table 3

### Percentages of Plans that Outperformed Their Benchmark

Plan Size	2017
	<b>Panel A: Higher Expected Returns</b>
<b>Overall</b>	82.66
\$1-10m	78.24
\$10-100m	85.71
\$100-500m	90.53
\$500m+	82.50
	<b>Panel B: Lower Risk (Standard Deviation)</b>
<b>Overall</b>	59.94
\$1-10m	58.26
\$10-100m	60.31
\$100-500m	67.20
\$500m+	57.99
	<b>Panel C: Higher Sharpe Ratio</b>
<b>Overall</b>	82.22
\$1-10m	78.08
\$10-100m	84.92
\$100-500m	90.37
\$500m+	81.87
	<b>Panel D: Lower Downside Risk</b>
<b>Overall</b>	68.63
\$1-10m	61.72
\$10-100m	73.46
\$100-500m	80.85
\$500m+	68.04
	<b>Panel E: Higher Sortino Ratio</b>
<b>Overall</b>	78.55
\$1-10m	72.20
\$10-100m	82.69
\$100-500m	89.32
\$500m+	81.15

Note. n=5,830, numbers in percentages.