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# Change Is a Great Thing

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## Morningstar Research

Working Draft as of April 15, 2019

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## Abstract

There is little evidence to suggest that monitoring defined-contribution menus adds value, despite the time, effort, and resources spent by plan sponsors on such activities. We use a unique longitudinal data set of plan menus from January 2010 to November 2018 that includes 3,478 fund replacements, and we find significant evidence that the replacement fund outperforms the replaced fund over both future one-year and three-year periods. The outperformance remains even after controlling for various fund attributes and risk factors. This analysis suggests that monitoring fund menus can improve performance, although more research on why this effect occurs is warranted.

## Change Is a Great Thing

American workers hold \$5.6 trillion in assets within employer-sponsored 401(k) defined-contribution plans (ICI, 2018). Plan sponsors are responsible for selecting and monitoring the menu of funds available to participants. Selecting more-efficient investment options for participants can play an important role in retirement outcomes for workers, and in allocating capital to what are typically more-effective fund managers.

A plan sponsor evaluates the quality of mutual fund investments offered to plan participants, and occasionally decides to replace one fund with another. The removal and replacement of a fund indicates a preference for one investment (the replacement) over another (the fund being replaced). Despite the importance of this monitoring activity, we know little about whether adding and deleting mutual funds from a plan menu is valuable for participants (or for investors in general).

Prior studies of plan sponsor replacement decisions suggest that replacements may be motivated by historical performance data relative to a benchmark that does not predict future performance. Goyal and Wahal (2008) find that institutional investment managers hired to replace terminated underperforming managers perform much better before they are hired, but this outperformance disappears after they are selected. Stewart, Neumann, Knittel, and Heisler (2009) find that plan sponsors often favor investments that have recently outperformed, and subsequently underperform, resulting in a loss of value for participants.

A lack of available data on plan menus has limited research into the value of monitoring investments offered to individual participants in DC plans. Using a sample of 215 fund additions and 45 fund deletions, Elton, Gruber, and Blake (2007) find that funds that are added had significant excess performance before the addition, but no statistically significant excess performance relative to the sample of deleted funds after the change. The relative-performance comparison does not account for differences in investment style between the additions and deletions.

We use a large data set of plan holdings from three different recordkeepers between January 2010 and November 2018, to investigate the monitoring value provided by plan sponsors. For each plan, a list of available funds is available at some interval, typically quarterly. We employ a matching criterion to determine when a fund is replaced within the same investment factor style based on its Morningstar Category over time. The analysis results in a sample of 3,478 replacements across 678 DC plans.

Not surprisingly, we find that on average replacement funds had better historical performance and lower expense ratios, along with more-favorable comprehensive metrics such as the Morningstar Rating for funds (the “star rating”) and the Morningstar Quantitative Rating for funds, than the funds

they replaced. The largest performance difference in the replacement and replaced funds is the five-year historical returns, suggesting this historical reference period is the one that carries the most weight among plan sponsors.

We also find that the future performance of the replacement fund is better than the fund being replaced at both the future one-year and three-year time periods, and that these differences are statistically significant. The outperformance persists even after controlling for expense ratios, momentum, style exposures, and other metrics commonly used by plan sponsors to evaluate funds such as the star rating and quantitative rating. Our findings suggest that monitoring plan menus can have a positive impact on performance.

### Literature Review

The 401(k) DC plan sponsor bears a fiduciary responsibility to prudently select and monitor investments offered to participants. While the plan sponsor can delegate this responsibility to a third party, commonly referred to as 3(38) investment management, or share fiduciary responsibility with a third-party, commonly referred to as a 3(21) arrangement—some entity is responsible for monitoring the fund menu with an incentive to provide higher-quality investment options.

While taxes are not a concern in the DC space, there are implicit and potentially explicit costs associated with a change. Implicit costs would be the time spent reviewing the menu, coordinating the replacement, and communicating to participants, while explicit costs could include things such as costs associated with mailings.

The process of monitoring mutual fund performance within a DC plan often involves selecting alternatives within various domestic and international factor styles (size and value orientation). An investment manager may look for funds that underperform relative to a benchmark within that style category, or may employ more-sophisticated techniques to identify underperforming funds that can be replaced with funds that they believe are more likely to outperform in the future.

Can plan sponsors identify funds that will perform well and poorly in the future? Fama and French (2010) find evidence that only the best and worst funds can be identified through the use of past performance characteristics independent of beta and risk factors, and this excess performance often disappears after accounting for fund expenses. Investment consultants often rely on factors that are unrelated to past performance, but Jenkinson, Jones, and Martinez (2016) find no evidence that recommendations made by these consultants add value to plan sponsors.

Studies of investment selection by the managers of assets held by institutional investment funds overseen by a plan sponsor, such as pensions or endowments, provide little evidence of investment

selection ability and significant evidence of return-chasing. Stewart, Neumann, Knittel, and Heisler (2009) find that institutional investors appear to favor products with high recent returns that subsequently underperform products experiencing withdrawals over one-, three-, and five-year time periods. There is also no evidence that the ex-post performance of investment managers who are fired by plan sponsors for underperformance differs from the performance of the investment managers who are hired to replace them (Goyal and Wahal, 2008). The replacement investment managers appear to have been hired because of their successful recent investment performance.

The need to justify ex-ante the decision to make investment changes appears to influence the recommendations that investment advisors make to institutional plans. Del Guercio and Tkac (2002) find that investment managers consider historical risk-adjusted performance when selecting new investments, and are particularly attracted to funds that have had the highest recent alpha and performance relative to a benchmark. This finding implies that investment managers favor funds that have demonstrated significant superior historical investment ability when compared with a performance criterion. Selecting replacement funds based on performance relative to a benchmark may encourage fund managers to select higher-beta securities within the fund category to generate excess performance. Christoffersen and Simutin (2017) find that pension fund managers appear to substitute high-beta for low-beta stocks to beat benchmarks. To the extent that risk factors vary within fund style categories on plan menus, this bias may result in the selection of additions that do not provide superior risk-adjusted return.

While basing investment selection on recent returns appears to provide little value, there is evidence to suggest that skilled fund managers can be identified through the use of more sophisticated screening techniques. A review of empirical research on active strategies (Jones and Wermers, 2011) identifies ex-ante empirically verified strategies that may be used by an informed investment advisor to select fund managers who will outperform, including fund and manager characteristics. Identifying more skilled fund managers requires information that can help plan sponsors better evaluate funds based on more advanced criteria than past returns.

In a DC plan menu, plan participants select from a group of curated investment choices selected by the plan sponsor. The plan sponsor's primary incentive is to provide participants with funds that are superior to those that are either not included in or are deleted from the fund menu. Few studies investigate the investment-selection abilities of DC plan sponsors.

Brown and Harlow (2012) find that funds selected by plan sponsors outperform funds that were not included in the plan, and that much of this excess performance can be attributed to the selective inclusion and exclusion of actively managed funds. Elton, Gruber, and Blake (2007), however, find evidence that recent performance guides fund additions and that this performance advantage of added funds disappears relative to deleted funds. Return comparisons are unadjusted for risk and drawn from a small sample of 215 added funds and 45 deleted funds.

This study adds to the literature on fund performance within DC plans by estimating the benefit to plan participants from monitoring existing fund quality and selecting fund replacements. The decision to replace a fund represents a clear decision to favor one fund over another, and the availability of subsequent performance data allows us to estimate whether these replacement funds outperformed the replaced funds independent of style factors.

### **Data Set**

The analysis relies on historical fund menus provided by three recordkeepers who use Morningstar's managed accounts services. The managed accounts provider, Morningstar Investment Management LLC, is an investment manager and the fiduciary responsible for determining the appropriate portfolio for participants who use the service. Managed accounts is available because the plan sponsor selected it as part of the overall plan features.

For these plans Morningstar Investment Management is not responsible for the creation or selection of the menu of investments. The creation and selection (and monitoring) of the investment menu is the responsibility of the plan sponsor, although they may work with an investment advisor who helps select the plan menu in a "co-fiduciary" capacity (typically referred to as a 3(21) arrangement) or delegates the process to another professional fiduciary (a 3(38) arrangement). The extent to which each plan sponsor uses an investment advisor, and the scope of the potential relationship, is not available.

In order for Morningstar Investment Management to build portfolios as part of its managed accounts service, the recordkeeper for the DC plan provides the list of available funds at some interval, approximately quarterly. Data on plan menus is available from January 2010 to November 2018.

For the analysis, the menus for two different periods are compared. A fund is deemed to have been replaced if it does not exist in the later menu, and a new fund is added in that later menu, of the same investment style as the replacement fund, which is defined as Morningstar Category.

A number of filters are imposed to ensure the funds considered are the replacement funds. These include comparing menu names across periods, ensuring there is only one fund within a given style that changes over the period, and ensuring no more than 50% of funds change from period to period. These filters help ensure that only replacements are compared, since we do not have a positive affirmation from the recordkeeper that these are actually replacements (and therefore the replacement decision must be inferred).

The key identifier used for funds is the Morningstar Security Identifier (also called SeclD), a security-specific metric proprietary to Morningstar, although tickers and CUSIPs are also available for funds

and used if the SecId is incorrect. Potential replacements were also compared at the Fund Identifier (also called FundId) to ensure that the replacement was not simply a change to a lower-cost share class of the same underlying investment strategy.

These filters resulted in a total of 3,478 replacements that were reviewed. For each menu batch, for each plan, we have the date that the lineup was provided to Morningstar. We assume the replacement occurred during the month of the average date of the two menus. For example, if the first menu is dated (or provided on) January 5, 2015, and the next (comparison) menu is as of March 25, 2015, the assumed replacement month would be February 2015.

We focus on changes of the same investment style for a variety of reasons. First, since we have limited data on the underlying decision-making process related to the change, we can feel confident that if one fund disappears and one appears with the same investment style, the plan sponsor intended to make a replacement. Second, it helps control for issues surrounding style exposures. Plan sponsors obviously change fund menus over time, providing (and removing) various investment styles. Granting participants access to a new type of investment or style (e.g., adding a long bond or international small-cap fund) is a fundamentally different decision than a replacement. While changes in the style exposures of core menus is also potentially a topic of interest, it is beyond the scope of the analysis. There were significantly more changes in menus over time than those considered in this analysis; however, our objective is to control for investment style and to isolate, to the best of our ability, situations where one investment is replaced with another with a similar style mandate. As a reminder, we do not have any kind of specific affirmative information that one fund replaced another—rather, we have “snapshots” of the entire menu of funds available to participants (available to be used in the managed accounts portfolios).

We have relatively limited data on the plan menus, fundamentally just the FundId. We do not know things such as the total plan assets, the assets (or portion of total assets) invested in each fund, whether the plan sponsor uses a consultant or financial advisor to assist with fund selection, when the fund was added to the plan, and so on. Having this data would provide additional insight into the efficacy of the replacement decision, and we hope this piece encourages future research that explores this topic in greater depth.

In Exhibit 1, we include information about the number of funds replaced, by both style and broad style group, for each year of the analysis. The Investment style, i.e., Morningstar Category, is based on the month of the replacement, which may change over time.

**Exhibit 1** Number and Distribution of Funds Replaced by Style and Year of Replacement

	Number of Funds (Year of Replacement)										% of Total Funds (Year of Replacement)									
	2010	2011	2012	2013	2014	2015	2016	2017	2018	Avg	2010	2011	2012	2013	2014	2015	2016	2017	2018	Avg
<b>Investment Style</b>																				
Large Growth	16	41	48	50	62	23	36	35	47	<b>39.8</b>	8.6	11.4	13.3	12.4	12.0	7.1	9.8	8.3	8.8	<b>10.2</b>
Large Blend	8	24	28	47	81	71	42	45	38	<b>42.7</b>	4.3	6.6	7.8	11.6	15.7	21.8	11.4	10.6	7.1	<b>10.8</b>
Large Value	21	24	35	33	41	22	38	32	31	<b>30.8</b>	11.3	6.6	9.7	8.2	8.0	6.7	10.4	7.5	5.8	<b>8.2</b>
Mid-Cap Growth	12	31	30	31	28	22	19	23	45	<b>26.8</b>	6.5	8.6	8.3	7.7	5.4	6.7	5.2	5.4	8.4	<b>6.9</b>
Mid-Cap Blend	4	6	19	6	13	6	10	11	9	<b>9.3</b>	2.2	1.7	5.3	1.5	2.5	1.8	2.7	2.6	1.7	<b>2.4</b>
Mid-Cap Value	18	19	17	19	40	16	27	27	34	<b>24.1</b>	9.7	5.3	4.7	4.7	7.8	4.9	7.4	6.4	6.4	<b>6.3</b>
Small Growth	17	27	14	22	30	21	27	22	38	<b>24.2</b>	9.1	7.5	3.9	5.4	5.8	6.4	7.4	5.2	7.1	<b>6.4</b>
Small Blend	6	5	11	9	23	11	7	10	7	<b>9.9</b>	3.2	1.4	3.1	2.2	4.5	3.4	1.9	2.4	1.3	<b>2.6</b>
Small Value	6	13	12	18	19	21	18	23	30	<b>17.8</b>	3.2	3.6	3.3	4.5	3.7	6.4	4.9	5.4	5.6	<b>4.5</b>
Foreign Large Growth	3	8	3	13	13	10	7	9	21	<b>9.7</b>	1.6	2.2	0.8	3.2	2.5	3.1	1.9	2.1	3.9	<b>2.4</b>
Foreign Large Blend	4	5	5	6	6	4	1	7	11	<b>5.4</b>	2.2	1.4	1.4	1.5	1.2	1.2	0.3	1.7	2.1	<b>1.4</b>
Foreign Large Value	5	3	5	4	7	2	3	6	8	<b>4.8</b>	2.7	0.8	1.4	1.0	1.4	0.6	0.8	1.4	1.5	<b>1.3</b>
Diversified Emerging Markets	1	8	7	5	7	5	3	5	13	<b>6.0</b>	0.5	2.2	1.9	1.2	1.4	1.5	0.8	1.2	2.4	<b>1.5</b>
Real Estate	2	4	5	12	11	6	6	6	13	<b>7.2</b>	1.1	1.1	1.4	3.0	2.1	1.8	1.6	1.4	2.4	<b>1.8</b>
Money Market	5	11	16	6	16	8	12	14	13	<b>11.2</b>	2.7	3.0	4.4	1.5	3.1	2.5	3.3	3.3	2.4	<b>2.9</b>
Intermediate-Term Bond	20	34	21	20	18	23	42	68	65	<b>34.6</b>	10.8	9.4	5.8	5.0	3.5	7.1	11.4	16.0	12.1	<b>9.0</b>
Inflation-Protected Bond	4	8	3	3	6	4	4	6	11	<b>5.4</b>	2.2	2.2	0.8	0.7	1.2	1.2	1.1	1.4	2.1	<b>1.4</b>
Intermediate Government	4	9	3	6	6	1	5	1	10	<b>5.0</b>	2.2	2.5	0.8	1.5	1.2	0.3	1.4	0.2	1.9	<b>1.3</b>
High Yield Bond	2	12	13	8	13	8	3	9	15	<b>9.2</b>	1.1	3.3	3.6	2.0	2.5	2.5	0.8	2.1	2.8	<b>2.3</b>
Other	28	69	65	86	75	42	57	65	76	<b>62.6</b>	15.1	19.1	18.1	21.3	14.6	12.9	15.5	15.3	14.2	<b>16.2</b>
<b>Total</b>	<b>186</b>	<b>361</b>	<b>360</b>	<b>404</b>	<b>515</b>	<b>326</b>	<b>367</b>	<b>424</b>	<b>535</b>	<b>386.4</b>	<b>100</b>	<b>100</b>	<b>100</b>	<b>100</b>	<b>100</b>	<b>100</b>	<b>100</b>	<b>100</b>	<b>100</b>	<b>—</b>
<b>Broad Style Group</b>																				
Equity	126	226	240	270	383	244	247	273	344	<b>261.4</b>	67.7	62.6	66.7	66.8	74.4	74.8	67.3	64.4	64.3	<b>67.7</b>
Bond	43	84	62	52	71	50	71	110	128	<b>74.6</b>	23.1	23.3	17.2	12.9	13.8	15.3	19.3	25.9	23.9	<b>19.4</b>
Allocation	7	43	47	62	42	21	38	32	39	<b>36.8</b>	3.8	11.9	13.1	15.3	8.2	6.4	10.4	7.5	7.3	<b>9.3</b>
Alternative	6	6	7	14	15	9	11	9	23	<b>11.1</b>	3.2	1.7	1.9	3.5	2.9	2.8	3.0	2.1	4.3	<b>2.8</b>
Other	4	2	4	6	4	2	0	0	1	<b>2.6</b>	2.2	0.6	1.1	1.5	0.8	0.6	0.0	0.0	0.2	<b>0.8</b>
<b>Total</b>	<b>186</b>	<b>361</b>	<b>360</b>	<b>404</b>	<b>515</b>	<b>326</b>	<b>367</b>	<b>424</b>	<b>535</b>	<b>386.4</b>	<b>100</b>	<b>100</b>	<b>100</b>	<b>100</b>	<b>100</b>	<b>100</b>	<b>100</b>	<b>100</b>	<b>100</b>	<b>—</b>

The number of funds replaced is relatively consistent across years, except for the first year of the analysis (2010), which has the lowest number of replacements (186). Large-blend was the investment style with the most replacements, averaging 42.7 funds per year, which was 10.8% of the total funds replaced. Equity was the most common broad style group, averaging 67.7% of replacements. Equity replacements in our data set are more prominent than Equity funds in all 401(k) plans, where they average 47.1% of funds (BrightScope/ICI, 2018). We assume that replacements occur at the same frequency across all styles, which may or may not be the case, which is why we compare the frequency of replacements by style to overall fund options in DC plans.

A likely reason the equity replacements are higher than general availability in DC plans is the relatively low number of replacements noted in the allocation style, which would include target-date funds and balanced funds. Allocation funds average only 9.3% of all replacements, yet represent 32.2% of fund options on DC menus according to BrightScope/ICI (2018). If we exclude allocation funds from DC plan availability, the percentage of total funds that is Equity funds increases to 69.4%, which is much closer to our estimate.

In Exhibit 2, we provide some information on the attributes of the replaced fund and its replacement. We include metrics such as expense ratio; historical style (that is, Morningstar Category) percentile performance for the one-year, three-year, five-year, and 10-year periods before replacement; and future one-year and three-year style percentile performance. Style percentile ranks are estimated by Morningstar, based on the respective universe. For style percentile ranks, 100 is best and 1 is worst. This is the reverse of how style ranks are normally portrayed, where 1 is best and 100 is worst. The values are reversed (where 100 is best) so that higher future relative performance is a positive value, similar to a performance comparison (i.e., a positive value is a good thing).

Our analysis focuses primarily on style percentile ranks because percentiles normalize differences across styles. While the analysis already controls for style, since both the replaced fund and the replacement must have the same Morningstar Category, there are variations in distribution of historical and forward-looking performance across styles. Percentile ranks provide a better context of how the fund has fared against its peers, both ex-post and ex-ante replacement. We do provide some context, though, about the raw performance impact of the values in the Results section.

Exhibit 2 also provides information on more comprehensive fund metrics, namely star ratings and quantitative ratings. These additional metrics are included because they have been noted to play an important role in fund selection, in particular the star rating (Del Guercio and Tkac 2008). They also give us a numerical context to evaluate funds beyond performance and expense ratio metrics (i.e., are more holistic in nature since they typically combine multiple attributes). Additional background on these metrics is included in Appendix 1.

We assign numerical values for both the overall ratings as well as the respective pillars, which are aggregated to determine the fund's quantitative rating. For the star ratings we use the number of stars as the value. For the quantitative ratings, we use values of 5 for Gold-rated funds, 4 for Silver-rated funds, 3 for Bronze-rated funds, 2 for Neutral-rated funds, and 1 for Negative-rated. Therefore, both aggregate ratings metrics are on a 1-to-5 scale, where 1 is worst and 5 is best.



For the pillars, which are aggregated to determine the overall quantitative rating, we assign values of 1 for Positive, 0.5 for Neutral, and 0 for Negative. The correlations between the quantitative rating, and the respective pillars, for all available funds over the entire period of analysis is included in Appendix 2 for informational purposes. The quantitative rating is obviously endogenous to the underlying pillars, since it is just a sum of the pillars, it is nevertheless included for reference purposes.

## Exhibit 2 Fund Attributes

		Replaced Fund				Replacement Fund			
		10th	50th	Avg	90th	10th	50th	Avg	90th
	Expense Ratio	0.30	0.92	0.88	1.34	0.14	0.88	0.82	1.34
		<b>Performance</b>							
<b>Historical Rank</b>	10 Year	93.00	64.00	61.58	26.00	97.00	79.00	74.23	44.00
	5 Year	86.00	46.00	47.75	12.00	96.00	77.00	71.01	36.00
	3 Year	87.00	51.00	50.03	11.00	94.00	71.00	66.02	29.00
	1 Year	88.00	55.00	53.24	15.10	90.00	62.00	58.34	20.00
<b>Future Rank</b>	1 Year	88.00	54.00	52.69	15.00	90.00	63.00	58.99	20.00
	3 Year	87.00	55.00	52.31	15.00	94.00	71.00	66.00	29.00
		<b>Ratings</b>							
	Star Rating	2.00	3.00	3.16	4.00	3.00	4.00	3.77	5.00
	Analyst Rating	2.00	2.00	2.83	5.00	2.00	4.00	3.44	5.00
	Parent	0.50	0.50	0.61	1.00	0.50	0.50	0.64	1.00
	People	0.00	0.50	0.61	1.00	0.50	1.00	0.76	1.00
	Price	0.00	0.50	0.60	1.00	0.00	1.00	0.69	1.00
	Performance	0.00	0.50	0.62	1.00	0.50	1.00	0.81	1.00
	Process	0.00	0.50	0.61	1.00	0.50	1.00	0.78	1.00

In Exhibit 2, we see that the replacement fund typically has attributes that would be deemed more “attractive” by investment professionals when compared with the fund being replaced. For example, replacement funds tend to have lower expense ratios, higher historical relative performance, higher star ratings, and higher quantitative ratings (and respective pillars). This is consistent with our expectations and these differences are explored in greater detail in the following (Results) section.

It is worth noting the replacements are not substantively different from the replaced funds in terms of investment factor styles (i.e., it is not market-based factors that are driving the differences in performance). For example, in Appendix 3 we include the percentile differences in the Carhart (1997) four-factor coefficients between the replacement and replaced fund for domestic equity mutual funds for the previous 60 months before replacements. The medians for all factors are effectively zero. This not unexpected, since we control for style in our analysis, yet it is an important consideration when trying to understand the potential drivers in the different ex-post and ex-ante performance.

The vast majority of funds included in the analysis are classified as actively managed funds by Morningstar, 89.3% of funds replaced and 87.3% of replacement funds. This is higher than the average percentage of plan funds that are noted as being actively managed, where 88.0% of funds were active in 2006 and 76.7% of funds were active in 2015 according to Brightscope/ICI (2018). In terms of the replacement types, the vast majority were the same type: 81.7% are Active to Active, 6.2% are Index to Index, 7.2% are Active to Index, and 5.0% are Index to Active.

## Results

In this section, we explore the impact of the replacement decision, primarily by reviewing the differences in the replacement fund versus the fund being replaced. As a reminder, all replacements included in this analysis have the same investment style (i.e., Morningstar Category) at the time of replacement, which makes comparisons easier since the fundamental risk factors of the replaced and replacement fund should be similar.

**Exhibit 3** Differences in Attributes by Broad Fund Type

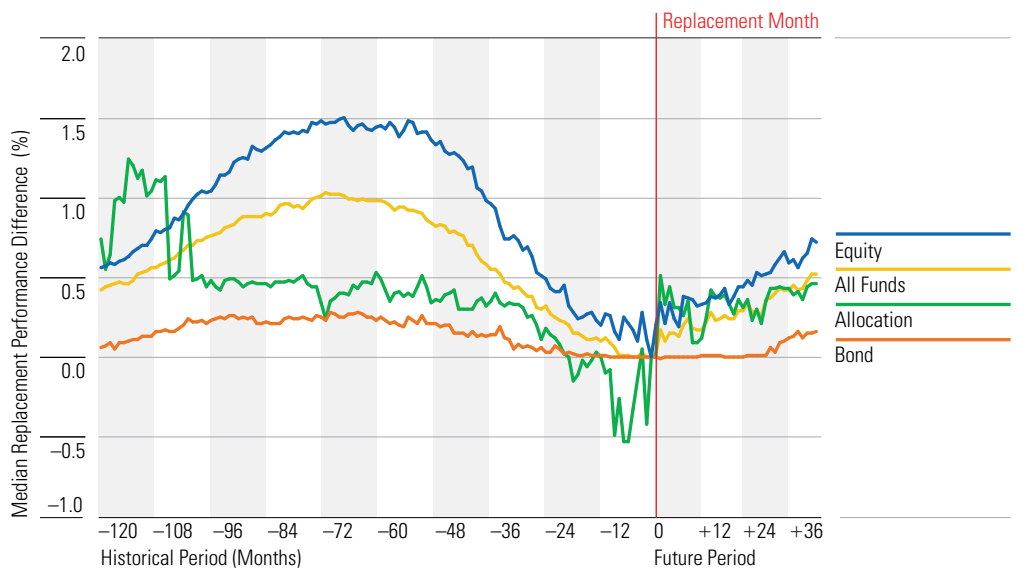
	Equity Funds				Bonds Funds				Allocation Funds				
	10th	50th	Avg	90th	10th	50th	Avg	90th	10th	50th	Avg	90th	
Expense Ratio	-0.51	-0.02	-0.05	0.39	-0.35	-0.04	-0.06	0.23	-0.45	-0.15	-0.14	0.20	
<b>Performance</b>													
<b>Historical</b>	10 Year	-1.48	0.56	0.62	3.10	-0.90	0.07	0.17	1.37	-1.00	0.74	0.73	2.59
	5 Year	-1.70	1.44	1.64	5.22	-0.99	0.23	0.41	1.96	-0.41	0.53	0.70	2.29
	3 Year	-2.35	0.98	1.43	5.84	-0.99	0.13	0.34	1.92	-0.66	0.32	0.54	2.21
	1 Year	-6.10	0.23	0.62	7.44	-1.47	0.01	0.45	2.60	-1.55	0.03	0.30	2.41
<b>Future</b>	1 Year	-5.65	0.31	0.68	7.02	-1.60	0.01	0.27	2.33	-0.91	0.12	0.59	2.94
	3 Year	-2.32	0.72	1.06	4.98	-0.86	0.16	0.35	1.73	-0.20	0.46	0.78	2.20
<b>Style Rank</b>													
<b>Historical</b>	10 Year	57.2	11.0	13.5	-25.0	49.0	4.0	8.7	-22.0	45.0	14.0	15.1	-18.0
	5 Year	73.0	27.0	24.8	-23.0	62.7	23.0	19.7	-20.0	57.0	13.0	18.0	-13.5
	3 Year	67.1	14.0	16.8	-31.0	58.6	13.0	14.3	-29.6	50.3	10.5	14.4	-14.1
	1 Year	57.4	3.0	5.0	-44.0	52.0	5.0	5.6	-41.0	47.2	1.0	4.0	-41.0
<b>Future</b>	1 Year	56.0	4.0	5.3	-46.0	52.6	3.0	6.4	-39.2	46.0	3.0	7.5	-20.0
	3 Year	63.0	10.0	12.8	-34.0	55.0	14.0	12.6	-31.5	51.7	14.5	17.6	-5.0
<b>Ratings</b>													
	Star Rating	-1.00	1.00	0.65	2.00	-1.00	0.00	0.45	2.00	-0.20	1.00	0.60	2.00
	Analyst Rating	-2.00	1.00	0.67	3.00	-1.00	1.00	0.59	2.00	-2.00	0.00	0.40	2.00
	Parent	-0.50	0.00	0.05	0.50	-0.50	0.00	-0.07	0.50	0.00	0.00	0.14	0.50
	People	-0.50	0.00	0.16	1.00	-0.50	0.00	0.13	0.50	-0.50	0.00	0.17	0.50
	Price	-0.50	0.00	0.04	0.50	-0.50	0.00	0.13	0.50	-0.50	0.00	0.03	0.50
	Performance	-0.50	0.00	0.21	1.00	-0.50	0.00	0.16	1.00	-0.50	0.00	0.19	1.00
	Process	-0.50	0.00	0.18	1.00	-0.50	0.00	0.16	0.50	-0.50	0.00	0.17	0.75

The differences in attributes are relatively consistent across broad style groups. Replacement funds tended to have lower expense ratios, averaging 5, 4, and 14 basis points for equity, bond, and allocation funds, respectively. Replacement funds tended to have higher historical returns, most notably at the five-year period, averaging 164, 41, and 70 basis points for equity, bond, and allocation funds, respectively. Replaced funds also tended to have higher star ratings and quantitative ratings. The Performance Pillar is the metric with the highest average improvement across the five pillars, suggesting return differences are perhaps the largest driver (or difference) among replaced and replacement funds. These results strongly suggest that when selecting replacement funds, plan sponsors tend to favor lower expense ratios, higher historical performance, and better holistic metrics, consistent with our expectations.

What is perhaps most surprising about these results is the positive relative outperformance of the replacement funds versus the replaced funds, at both the one-year and three-year forward-looking periods. This is unexpected in the context of past research, which has generally noted that replacement funds do no better (or worse) than the funds being replaced.

To better understand how future performance differs between the replaced fund and the replacement fund, an event study is performed, where the two funds' performance is compared over different periods. We use raw return differential since it can be estimated at different intervals (e.g., a 10-month period). Periods greater than a year are annualized for comparison purposes. As a reminder, the historical return difference would be known to the plan sponsor at the time of the replacement (i.e., is ex-post), while the future is unknown (ex-ante).

**Exhibit 4** Median Annualized Performance Differences in Performance: Replacement Fund Versus Replaced Fund



The performance differences in Exhibit 4 are consistent with those in Exhibit 3, which is expected, but provide some interesting context as to how the differences vary over different periods. For example, the historical return differences are greatest at approximately the 66-month period, possibly because of the typical time lag associated with identifying and eventually replacing a fund. For example, if an investment oversight committee meets quarterly, there will likely be a lag between identifying and determining the replacement. Even when the replacement is determined, communications still must be created and communicated to participants.

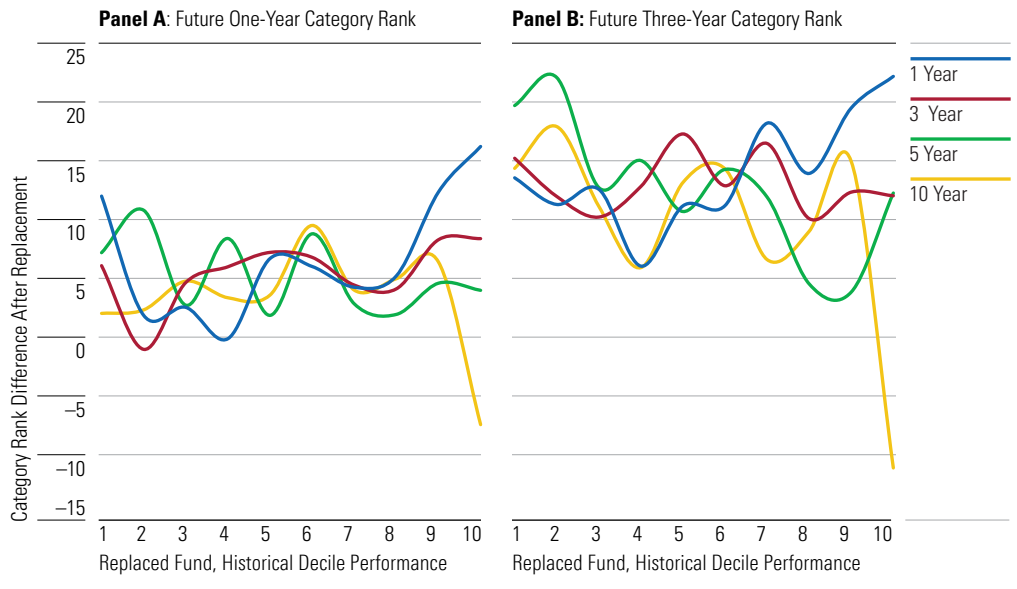
Equity funds tend to have the highest relative outperformance, followed by allocation and bond funds. Interestingly, for each broad style group the relative performance of the replacement fund to the replaced fund improves over longer out-of-sample periods. For example, for all funds, the median performance difference is 22 basis points after one year, 26 basis points after two years, and 52 basis points after three years.

In Appendix 4, we provide some context as to how the t-statistics for the average outperformance vary over the various periods. These are based on averages, while Exhibit 4 is based on the median, which is why some of the results look slightly different. In Appendix 2, we note that the t-statistic for the replacement outperformance is always greater than 2, which implies at virtually all periods the plan (and its participants) are better off because of the replacement. For bond funds the t-statistic is greater than 2 after seven months; for allocation funds it's by month two. In other words, for almost all future periods the replacement fund outperforms the replaced fund at a statistically significant level.

Separately, we explore when the fund is replaced in relation to the available data, and find a meaningful relationship to date of replacement and future relative performance (i.e., no monotonically increasing or decreasing relation).

Our analysis demonstrates that the historical performance of replacement funds is significantly higher than that of replaced funds. This suggests historical performance is an important component of the replacement decision. It's worth exploring, therefore, the relation between historical performance and future performance for these replaced funds.

For this analysis, we group funds into deciles, based on the historical performance of the replaced fund at the time of the replacement. For example, a fund with a historical percentile of 95, suggesting it outperformed 95% of its peers, would be in the 10th decile. For each decile, we then determine the difference in the future percentile for the replacement and replaced fund for both future one-year and future three-year periods (following the replacement). The higher the value, the more the replacement fund outperformed the replaced fund. We do this for historical one-year, three-year, five-year, and 10-year periods. The results are included in Exhibit 5.

**Exhibit 5** Historical Category Decile Rank and Future Rank of Replacement (All Funds)

There is no consistent relation between past performance at the future one-year rank (Exhibit 5, Panel A). For the future three-year rank, replaced funds with the lowest relative performance tended to exhibit the largest improvement in performance, although the results were relatively noisy. This suggests replacing funds that are significantly underperforming may result in some benefit, but even for replaced funds that were in the top decile before the replacement, the replacement still tended to outperform. Overall, this suggests other factors could be related to these performance differences.

To better understand which factors could be related to the future benefit of the replacement decision, two ordinary least squared (or, OLS) regressions are performed. For the first, the dependent variable is the future one-year style rank performance difference (between the replacement and the replaced fund); for the second, the dependent variable is the future three-year style rank performance difference. A number of independent variables are included, such as number of funds in the DC plan menu at the time of replacement, difference in the expense ratios of the respective funds, and historical five-year and one-year style rank difference. Note, historical performance periods are endogenous (e.g., the five-year rank includes the one-year rank), which is why not all historical performance periods were included. We also include the difference in the star rating, the difference in the Morningstar Quantitative Analyst Rating, and dummy variable whether or not the fund has a broad style of equity, bond, or allocation (where the omitted variable would be if the fund were some other broad style group, such as alternative).

In order to be included in the regressions, data for all fields must be available, which reduced the available sample of funds to consider. The results of the regressions are included in Exhibit 6.

**Exhibit 6** OLS Regression Results

Variable	Future 1 Year Category Rank Differential			Future 3 Year Category Rank Differential		
	Coefficient	t stat	p value	Coefficient	t stat	p value
Intercept	19.932	4.223	< 0.0001	33.017	5.940	< 0.0001
# of Funds in DC Plan	-0.042	-0.290	0.772	0.011	0.064	0.949
Expense Ratio Difference	-8.171	-2.802	0.005	-16.913	-4.906	< 0.0001
5 Year Category Rank Difference	0.008	0.225	0.822	0.077	1.782	0.075
1 Year Category Rank Difference	-0.069	-2.715	0.007	-0.109	-3.674	0.000
Star Rating Difference	-0.544	-0.465	0.642	-2.114	-1.533	0.126
Analyst Rating Difference	-0.105	-0.154	0.877	1.543	1.960	0.050
Equity Fund	-15.166	-3.144	0.002	-20.810	-3.649	0.000
Allocation Fund	-6.355	-0.908	0.364	-12.030	-1.574	0.116
Bond Fund	-13.416	-2.600	0.009	-18.326	-2.968	0.003
	R <sup>2</sup>	1.74%		R <sup>2</sup>	6.14%	
	Adj R <sup>2</sup>	1.20%		Adj R <sup>2</sup>	5.35%	
	n	1,645		n	1,086	

The overall explanatory power of the models is relatively weak, with an R<sup>2</sup> of 1.74% for one-year future rank difference and 6.14% for three-year future rank difference; however, a few of the coefficients are statistically significant (and consistent across the two regressions). In particular, replacement equity and funds with lower expense ratios and higher recent (one-year) performance tended to outperform the funds being replaced. The negative relation with expense ratio is consistent with our expectations.

Although the analysis already controls for style, since only funds of the same Morningstar Category are considered, the results for the OLS regressions (Exhibit 6) suggest that past (recent performance) and expense ratios are factors related to outperformance. Additionally, differences in style exposures could also be a driver of performance differences. Therefore, in an attempt to better understand, and control for, the drivers in the performance differences for the respective funds, an additional set of regressions is performed.

For this analysis, we perform four-factor regressions (Mkt-Rf, HML, SMB, MOM), similar to Carhart (1997) for all domestic equity mutual fund replacements on the future 36-month returns following the replacement. We conduct regressions on both net and gross returns. There are a total of 2,028 domestic equity funds in the analysis, but only 462 funds have available net returns and 424 have gross returns.<sup>1</sup> The number of funds by underlying style is included in Appendix 5.

<sup>1</sup> The number of gross returns is lower because both the net return and the expense ratio are required to estimate the gross return. For some funds, expense ratio is not available.

The dependent variable for the regressions is the fund return minus the risk-free rate, and the independent variables are respective factor data obtained from Kenneth French's data library.<sup>2</sup> The average future return difference and four factor is alpha is estimated for each fund, on both a net and gross return basis. The results are included in Exhibit 7.

**Exhibit 7** Average Four-Factor Alphas and Return Differences by Category

Category	Net Return		Gross Return	
	Avg 4F	Avg Ret Diff	Avg 4F	Avg Ret Diff
Large Growth	0.470	0.706*	0.454	0.779*
Large Blend	0.714*	1.186**	0.569	1.048**
Large Value	0.841*	0.658	0.732*	0.650
Mid-Cap Growth	1.247**	0.812*	1.175*	0.678
Mid-Cap Blend	1.941**	2.035**	1.998**	2.099**
Mid-Cap Value	1.537**	1.478**	1.498**	1.426**
Small Growth	0.783*	0.876**	0.673*	0.752*
Small Blend	1.316	1.528*	1.299	1.511*
Small Value	0.453	0.635	0.328	0.537

Source: Author's calculations. \* significant at 5% level, \*\* significant at 1% level.

The future performance of the replacement was always higher than the replaced fund for all styles (i.e., the alphas are all positive), although the difference was not always statistically significant. On a capitalization basis, differences were the greatest for mid-cap funds, followed by small-cap and then large-cap funds. When looking across valuation, Blend funds tended to have the greatest difference, followed by value and growth funds.

Next, we try to understand to what extent other, more qualitative factors, could be related to the future performance differences in replacement and replaced funds. In particular, we focus on underlying pillar ratings, which are components of the Morningstar Quantitative Analyst Ratings. Note, some of these pillars are similar to other metrics included in past regressions; for example, the Price Pillar is related to expense ratio and the Performance Pillar is related to historical performance. Therefore, these variables are not entirely exogenous to previous factors, but pillars such as Parent, People, and Process quantify different aspects of funds that could be important.

For these regressions, we focus on the difference in the future one-year and three-year percentile ranks for the replacement and the replaced fund, whereby a positive number would be associated with a performance improvement. The higher the pillar rating, the better the fund, so a positive difference would be associated with a higher (i.e., "better") pillar rating. In addition to the pillar ratings, dummy variables for whether the fund is an equity, bond, or allocation fund are included (where the omitted variable would be if the fund is a different type, such as alternative). The regression results are included in Exhibit 8.

<sup>2</sup> [http://mba.tuck.dartmouth.edu/pages/faculty/ken.french/data\\_library.html](http://mba.tuck.dartmouth.edu/pages/faculty/ken.french/data_library.html)

**Exhibit 8** OLS Regression Results: Morningstar Pillars

Variable	Future 1 Year Category Rank Differential			Future 3 Year Category Rank Differential		
	Coefficient	t stat	p value	Coefficient	t stat	p value
Intercept	20.714	4.387	< 0.0001	33.352	5.987	< 0.0001
Parent Pillar Difference	7.656	3.370	0.001	11.499	4.508	< 0.0001
People Pillar Difference	-5.511	-1.702	0.089	-14.833	-3.851	0.000
Price Pillar Difference	2.832	1.415	0.157	8.086	3.331	0.001
Performance Pillar Difference	0.374	0.140	0.889	-2.123	-0.663	0.507
Process Pillar Difference	2.045	0.603	0.546	9.661	2.390	0.017
Equity Fund	-15.763	-3.266	0.001	-21.259	-3.729	0.000
Allocation Fund	-7.289	-1.035	0.301	-11.349	-1.472	0.141
Bond Fund	-13.091	-2.541	0.011	-16.923	-2.738	0.006
	R <sup>2</sup>	1.84%		R <sup>2</sup>	6.15%	
	Adj R <sup>2</sup>	1.36%		Adj R <sup>2</sup>	5.45%	
	n	1,645		n	1,086	

The explanatory power of the regressions that focus on pillars are slightly better than the regressions that include more traditional attributes. The coefficients for the equity and bond dummy variables are also similar. Interestingly, the Performance Pillar is not significant for either regression in Exhibit 8. This is likely because the historical performance considered for the Performance Pillar is longer-term in nature. Only the Parent Pillar has a statistically significant coefficient across both regressions. As noted in Appendix 1, the Parent Pillar seeks to answer the question: “What priorities prevail at the firm? Stewardship or salesmanship?,” and the resulting positive coefficient (suggesting a positive relation between better Parent ratings and future percentile performance) suggests funds with higher Parent ratings are more likely to result in higher future performance.

When looking at the three-year future performance, four of the five pillars have statistically significant coefficients. The results suggest equity and bond funds with better Parent, Price, and Process ratings, and worse People ratings, outperformed. The negative coefficient for People is interesting and is potentially related to the fact that many manager changes are related to changes in portfolio managers (e.g., if there is a manager change a replacement is selected). These results suggest this perspective, i.e., in particular selecting a fund with a better Parent rating.



## Implications

This analysis demonstrates that among the plans and replacements considered, replacement funds historically outperformed the funds they replace over future periods. A more elusive question is, Why this is occurring? While we can analyze certain factors related to the outperformance, such as the type of fund (equity or bond), lower expense ratios, higher recent historical performance, and various Pillar ratings, the primary drivers of the outperformance remain elusive.

One issue with this data set is we have no information as to the decision-making process plan sponsors use to determine whether a fund should be replaced. While we can make generalized statements (e.g., replaced funds tend to have lower performance), there are clearly exceptions to the rule. Additionally, we lack information on the relative importance of the fund being replaced (proxied by plan assets), how long the fund has been in the plan, and so on. Therefore, we hope future research will explore this relation more, using a more-complete data set.

One important note about the overall findings is that they are robust across the recordkeeping platforms considered. This is important since different recordkeepers will have different funds available and different processes (and potentially restrictions) associated with replacing funds. We provide information about the average future percentile rank differences by future period (one-year or three-year), and broad style type (equity, bond, and allocation) for each of the three recordkeepers considered in Appendix 6. The more recordkeepers considered, the more robust the findings are likely to be.

## Conclusions

Monitoring fund menus is an important function of investment fiduciaries, especially DC plan sponsors, given the significant assets in the plans and the importance of these monies for participants with respect to saving for retirement. Existing research on the efficacy of monitoring pension fund lineups has been mixed. Using a large sample of fund additions and deletions, we find evidence that fund replacements provide significantly higher risk-adjusted returns than the funds that were replaced. Our results provide evidence that monitoring plan menus to identify underperforming funds and replace them with more attractive funds provides value to plan participants.

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## Appendixes

### Appendix 1: Background on Morningstar Metrics

The Morningstar Rating for funds (or star rating) was introduced in 1985. It uses utility theory to provide a risk-adjusted assessment of a fund's historical performance. The star rating is purely quantitative and is not intended to convey the likelihood of future performance.

In contrast to the star rating, which is entirely quantitative and backward-looking, the Morningstar Analyst Ratings are a forward-looking assessment of a fund's expected ability to outperform its peer group (or a relevant benchmark) over a market cycle, after accounting for risk and expenses. The actual Morningstar Analyst Rating is assigned by a Morningstar analyst and is therefore both qualitative and quantitative in nature. Morningstar launched its analyst ratings in 2011 and the score is based on five "pillars," which are: Process, Performance, People, Parent, and Price. These pillars each seek to answer the following questions.

- ▶ **Process:** What is the fund's strategy, and does management have a competitive advantage enabling it to execute the process well and consistently over time?
- ▶ **Performance:** Is the fund's performance pattern logical given its process? Has the fund earned its keep with strong risk-adjusted returns over relevant time periods?
- ▶ **People:** What is Morningstar's assessment of the manager's talent, tenure, and resources?
- ▶ **Parent:** What priorities prevail at the firm? Stewardship or salesmanship?
- ▶ **Price:** Is the fund a good value proposition compared with similar funds sold through similar channels?

For each pillar, an analyst assigns a rating of Positive, Neutral, or Negative. These pillar ratings are aggregated to an overall rating of Gold, Silver, Bronze, Neutral, or Negative.<sup>3</sup> The higher the rating (e.g., Gold versus Silver versus Neutral), the higher the analyst's conviction in a fund's ability to outperform.

While the number of funds that receive analyst ratings has increased over time, analyst ratings are not available for the entire period of analysis (which begins in 2010), or for many funds considered as part of this study (i.e., the coverage has increased over time). Therefore, quantitative ratings are used as the proxy for fund quality for the analysis.

Quantitative ratings were developed using a machine-learning model designed to replicate the decision-making processes of its analysts. Davidson et al. (2018) provide a comprehensive overview of the methodology for quantitative ratings. For consistency purposes we always use the Morningstar Quantitative Ratings even if an actual Morningstar Analyst Rating is available.

<sup>3</sup> "Not Rated" is also possibility if not enough information is available on the fund to assign it a rating.

**Appendix 2** Correlations Between Analyst Ratings and Underlying Pillars

	Rating	Parent	People	Price	Perfor.	Process
Rating	1.00					
Parent	0.50	1.00				
People	0.74	0.31	1.00			
Price	0.29	0.18	0.10	1.00		
Performance	0.68	0.15	0.62	0.11	1.00	
Process	0.77	0.28	0.77	0.08	0.67	1.00

**Appendix 3** Percentile Differences in Carhart Four-Factor Coefficients Based on 60-Month Regressions (Alphas Have Been Annualized)**Percentile Differences Across All Domestic Equity Funds**

Percentile	Alpha	Mkt	SMB	HML	MOM
5th	-2.480	-0.190	-0.240	-0.220	-0.120
25th	-0.090	-0.060	-0.060	-0.050	-0.030
50th	0.890	0.000	0.000	0.000	0.000
75th	2.580	0.050	0.060	0.060	0.050
95th	5.720	0.160	0.230	0.260	0.160

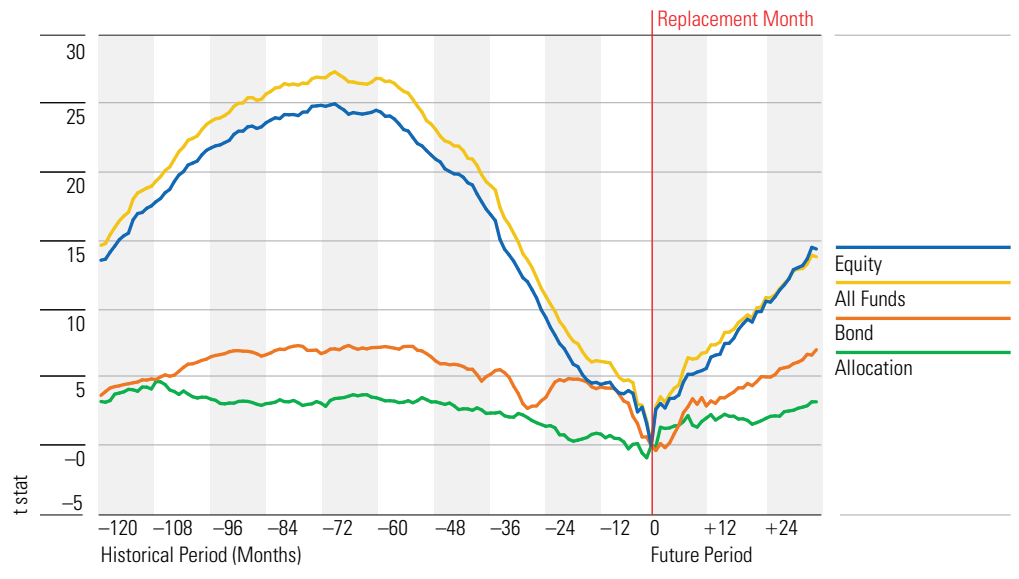
**Average Difference by Morningstar Category**

Category	Alpha	Mkt	SMB	HML	MOM
Large Growth	0.894	0.006	0.006	-0.021	0.004
Large Blend	0.555	0.000	-0.010	-0.008	0.008
Large Value	1.431	-0.039	-0.016	-0.018	0.007
Mid-Cap Growth	2.301	-0.049	0.003	0.065	0.011
Mid-Cap Blend	1.557	-0.017	-0.039	-0.001	0.006
Mid-Cap Value	1.826	0.000	0.016	0.018	0.021
Small Growth	2.292	-0.036	-0.045	0.024	-0.012
Small Blend	0.580	0.024	0.023	0.022	0.037
Small Value	1.298	0.032	0.061	0.047	0.027

**Median Difference by Morningstar Category**

Category	Alpha	Mkt	SMB	HML	MOM
Large Growth	0.982	0.010	0.014	-0.029	0.006
Large Blend	0.181	0.000	0.000	0.000	0.000
Large Value	1.519	-0.033	-0.026	-0.031	0.000
Mid-Cap Growth	2.160	-0.044	0.010	0.043	0.008
Mid-Cap Blend	0.630	-0.004	-0.047	-0.004	0.000
Mid-Cap Value	2.024	-0.002	0.020	0.028	0.027
Small Growth	2.463	-0.035	-0.045	-0.001	-0.021
Small Blend	0.194	0.028	0.000	0.000	0.014
Small Value	1.070	0.044	0.034	0.067	0.010

**Appendix 4** T-Statistic of Performance Differences



**Appendix 5** Number of Funds Considered in Four-Factor Factor Regressions

Category	Number of Funds		
	All Funds	w/ Net Returns	w/ Gross Returns
Large Growth	358	82	69
Large Blend	384	68	65
Large Value	277	77	68
Mid-Cap Growth	241	49	43
Mid-Cap Blend	84	15	14
Mid-Cap Value	217	50	49
Small Growth	218	57	56
Small Blend	89	22	22
Small Value	160	42	38
<b>Total</b>	<b>2,028</b>	<b>462</b>	<b>424</b>

**Appendix 5** Future Replacement Differences by Broad Asset Group and Recordkeeper

		Category Rank Differences					Raw Return Differences				
		Avg	Std Dev	Count	t stat	p value	Avg	Std Dev	Count	t stat	p value
<b>Equity Funds</b>											
RK1	1 Year	6.13	35.19	329	3.16	0.00	0.69	4.91	381	2.73	0.01
	3 Year	11.08	33.52	242	5.14	0.00	0.88	2.71	288	5.52	0.00
RK2	1 Year	8.88	35.02	445	5.35	0.00	1.29	5.07	461	5.46	0.00
	3 Year	15.11	34.44	336	8.04	0.00	1.32	2.95	351	8.37	0.00
RK3	1 Year	3.57	39.14	843	2.65	0.01	0.42	5.88	892	2.15	0.03
	3 Year	11.87	38.57	550	7.22	0.00	1.02	3.47	594	7.17	0.00
<b>Bond Funds</b>											
RK1	1 Year	1.01	32.61	77	0.27	0.79	0.13	1.97	93	0.65	0.52
	3 Year	4.94	35.66	49	0.97	0.34	0.03	1.36	63	0.16	0.87
RK2	1 Year	12.19	35.93	106	3.49	0.00	0.35	1.50	180	3.09	0.00
	3 Year	22.33	35.34	72	5.36	0.00	0.48	0.95	126	5.65	0.00
RK3	1 Year	5.73	34.72	196	2.31	0.02	0.27	1.95	231	2.11	0.04
	3 Year	9.81	31.20	114	3.36	0.00	0.38	1.26	141	3.57	0.00
<b>Allocation Funds</b>											
RK1	1 Year	2.81	21.37	124	1.47	0.14	0.24	1.13	124	2.33	0.02
	3 Year	13.00	15.47	94	8.15	0.00	0.49	0.58	94	8.10	0.00
RK2	1 Year	15.35	26.67	55	4.27	0.00	1.21	2.61	55	3.42	0.00
	3 Year	25.88	33.82	33	4.40	0.00	1.26	2.15	33	3.39	0.00
RK3	1 Year	13.86	36.11	21	1.76	0.09	1.00	4.51	23	1.06	0.30
	3 Year	26.18	41.15	17	2.62	0.02	1.41	3.19	19	1.92	0.07

### **About Morningstar's Investment Management group**

Morningstar's Investment Management group is a leading provider of discretionary investment management and advisory services. Guided by seven investment principles, the group is committed to focusing on its mission to design portfolios that help investors reach their financial goals. The group's global investment management team works as one to apply its disciplined investment process to all strategies and portfolios, bringing together core capabilities in asset allocation, investment selection, and portfolio construction. This robust process integrates proprietary research and leading investment techniques. As of Sept. 30, 2018, Morningstar's Investment Management group was responsible for more than \$207 billion\* in assets under advisement and management across North America, EMEA, and Asia-Pacific.

In addition to advisory services, the group's investment professionals build and manage model portfolios for financial advisors in the United States, United Kingdom, Australia and South Africa to create strategies that incorporate a wide variety of investment objectives.

\*Includes assets under management and advisement for Morningstar Investment Management LLC, Morningstar Investment Services LLC, Morningstar Investment Management Europe Ltd., Morningstar Investment Management Australia Ltd., Ibbotson Associates Japan, Inc., Morningstar Investment Management South Africa (PTY) LTD, and Morningstar Associates, Inc. all of which are subsidiaries of Morningstar, Inc. Advisory services listed are provided by one or more of these entities, which are authorized in the appropriate jurisdiction to provide such services.

### **Disclosures**

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This paper contains certain forward-looking statements. We use words such as "expects", "anticipates", "believes", "estimates", "forecasts", and similar expressions to identify forward looking statements. Such forward-looking statements involve known and unknown risks, uncertainties and other factors which may cause the actual results to differ materially and/or substantially from any future results, performance or achievements expressed or implied by those projected in the forward-looking statements for any reason. Past performance does not guarantee future results.

### **Morningstar Quantitative Rating™**

The Morningstar Quantitative Rating is intended to be comparable to Morningstar's Analyst Ratings for open-end funds and ETFs, which is the summary expression of Morningstar's forward-looking analysis of a fund. The Morningstar Analyst Rating is based on the analyst's conviction in the fund's ability to outperform its peer group and/or relevant benchmark on a risk adjusted basis over a full market cycle of at least 5 years. Ratings are assigned on a five-tier scale with three positive ratings of Gold, Silver, and Bronze, a Neutral rating, and a Negative rating. Morningstar calculates the Morningstar Quantitative Rating using a statistical model derived from the Morningstar Analyst Rating our fund analysts assign to open-end funds.

### **Risk Warning**

The quantitative fund ratings are not statements of fact. Morningstar does not guarantee the completeness or accuracy of the assumptions or models used in determining the quantitative fund ratings. In addition, there is the risk that the return target will not be met due to such things as unforeseen changes in changes in management, technology, economic development, interest rate development, operating and/or material costs, competitive pressure, supervisory law, exchange rate, and tax rate. For investments in foreign markets there are further risks, generally based on exchange rate changes or changes in political and social conditions. A change in the fundamental factors underlying the quantitative fund ratings can mean that the recommendation is subsequently no longer accurate.

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