

Understanding the Performance Drivers Behind Fundamentally Weighted Strategies



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In this paper we explore some of the drivers behind the performance of fundamentally weighted and market-cap weighted strategies. Focusing on U.S. large-cap and small-cap equity asset classes, we examined the impact of those drivers as well as identified the market environments in which one strategy historically outperformed the other. As a by-product of our research, we also address the common misconception that a fundamentally weighted index is simply a value strategy.

Our high-level findings include the following:

- **Value**, while still an important factor, is not the only driver of excess return of fundamentally weighted strategies relative to their cap-weighted counterparts.
- **Size** (market capitalization) and **negative momentum** are also among the key drivers of the excess return.

Because the two weighting strategies have different factor exposures, combining the two in a portfolio may offer diversification benefits.

The performance information for the Russell RAFI Index Series is back-tested performance based on simulated data (July 2, 1996–February 23, 2011), unless otherwise noted, and actual stock results (February 24, 2011–August 27, 2015) using the strategy of quarterly rebalancing. For the indexes discussed, dividends and capital gains are reinvested. Commissions and other fees were not taken into consideration and, if they had been, performance would have been lower. Back-tested performance is hypothetical and done with the benefit of hindsight. Past performance of a back-tested model is not a guarantee that the model will produce similar results in the future.

All calculations were produced by Charles Schwab Investment Management, Inc. based on daily total return data from Bloomberg L.P.

Introduction

With their roots in efficient market theory, capitalization-weighted strategies weight their components by the market capitalization of their constituents—share price multiplied by the number of shares outstanding.¹ As a security's share price rises, therefore, so does its weighting in the strategy. As a result, overpriced stocks are systematically overweighted, while underpriced stocks are underweighted, and an investor in such a strategy is essentially buying (overweighting) expensive stocks and selling (underweighting) cheap stocks. But price may not always reflect a company's fair value—and indeed can be driven by speculation, emotion or any of myriad explanations.² Recent empirical research has shown that cap-weighted strategies are prone to stock market bubbles, potentially exposing investors to significant losses when such bubbles burst.³

The Fundamental Index® methodology⁴, pioneered by Rob Arnott of Research Affiliates along with Jason Hsu and Phillip Moore, offers a different approach to passive investing to potentially create more-robust portfolios that may be less sensitive to the effects of market bubbles. In a fundamentally weighted index, security weights are chosen based on fundamental criteria—such as revenue, sales, dividends, earnings and/or book value—as opposed to market capitalization, severing the link between price and weighting.

By their nature, however, most strategies that are not cap-weighted will tilt toward different style factors relative to their cap-weighted counterparts. In this paper, we focused on three of these style factors—value, momentum, and size—that we determined have notable impact on the performance of fundamentally weighted strategies relative to their cap-weighted counterparts. We examined each of them individually as well as their effects when combined.

This research combined with the results in an earlier Charles Schwab Investment Management white paper, *Enhancing Equity Portfolio Diversification with Fundamentally Weighted Strategies*⁵, suggests that there might be a dynamic relationship between fundamentally weighted and cap-weighted strategies. That could

lead to dynamic factor exposures for both approaches, which we believe can potentially be exploited to identify signals that may be useful in determining when to shift a portfolio's allocation between fundamentally weighted and cap-weighted strategies.

We begin by summarizing the impact of each of the factors on the two weighting strategies.

Value

Cap-weighted strategies, because they are driven by stock prices, tend to overweight expensive stocks and underweight cheap stocks relative to fundamentally weighted strategies. Fundamentally weighted strategies, by removing pricing information in determining portfolio allocation, tend to do the reverse—underweighting expensive stocks and overweighting cheap stocks relative to a cap-weighted strategy. This, of course, can be characterized as a “value tilt”

But just because a fundamentally weighted strategy by its nature emphasizes value stocks, that's not to say it's an intentional value strategy—or, by extension, that it can be replicated by an index with a value emphasis. That's where the misconception lies. In fact, most deviations from a strictly cap-weighted strategy result in a value tilt—even an

¹ For more on the development and rationale of market capitalization-weighted strategies, see: Portfolio Selection. **Markowitz, Harry**. 1, March 1952, *Journal of Finance*, Vol. 7, pp. 77-91; **Markowitz, Harry**. Portfolio Selection: Diversification of Investments. New York: John Wiley & Sons, 1959; Risk-Aversion in the Stock Market: Some Empirical Evidence. **Sharpe, William**. 3, September 1965, *Journal of Finance*, Vol. 30, pp. 416-422.

² **Schiller, Robert J**. Irrational Exuberance. Princeton, New Jersey: Princeton University Press, 2015. 0691166269.

³ **Arnott, Robert D., Hsu, Jason C. and West, John M**. The Fundamental Index: A Better Way to Invest. Hoboken, New Jersey: John Wiley & Sons, 2008.

⁴ Fundamental Indexation. **Arnott, Robert D., Hsu, Jason C. and Moore, Philip**. 2, March/April 2005, *Financial Analyst Journal*, Vol. 61, pp. 83-99.

⁵ **Erdogan, Emre**. Enhancing Equity Portfolio Diversification with Fundamentally Weighted Strategies. [Online] Charles Schwab Investment Management, Insights. 2015. <https://www.csimfunds.com/public/csim/home/insights>.

equal-weighted strategy in which each holding has the same weighting. But there is a key difference between a portfolio that consciously tilts toward a value strategy and one that inherently does so; that difference is that value is not driving performance; it is merely a by-product of it.

Momentum

Cap-weighted strategies have significantly greater exposure to momentum than do their fundamentally weighted counterparts, generally overweighting stocks that have recently been outperforming their peers (or the market) and underweighting those that have been underperforming. With that understanding, it's easy to see the similarities between a cap-weighted strategy and a momentum strategy: As a stock starts to outperform its peers, its price and market-cap grow (assuming that the number of outstanding shares remains constant), as does its allocation in the cap-weighted strategy; the opposite occurs as a stock underperforms. As a result, cap-weighted and momentum-driven strategies tend to overweight and underweight similar stocks.

Following the same logic, a fundamentally weighted strategy will have less exposure to momentum than a cap-weighted one and, in some cases, will even have a negative momentum exposure (an “anti-trend”).

One caveat, however: The momentum exposure of an index will vary depending on its rebalancing frequency. As an example, the Russell RAFI indexes undergo an annual reconstitution, which is then implemented with quarterly rebalances. Between rebalancing dates, therefore, the momentum exposure to these indices will rise or fall as their stocks outperform or underperform, taking a larger or smaller allocation than was established at the latest rebalance. What that means is that fundamentally weighted strategies will at times have elevated momentum exposure.

Size

In the same way that fundamentally weighted strategies will have lower exposure to momentum, they will also generally result in portfolios with more small-cap exposure than cap-weighted strategies—except when their stock universes differ (which we discuss later in this paper). That's because as a stock's momentum falls (“negative

momentum”), it moves toward the smaller-cap end of the market-capitalization spectrum. The impact of size is more evident under scenarios in which momentum is positive. In addition, when the stock universe of the comparative indices is different, as it was for U.S. small cap equities presented in this paper, small-cap bias may be less evident.

Combining factors: Momentum plus Value

Combining multiple factor exposures can have significant performance impact, as in the case of adding value exposure to a momentum-driven strategy. This is particularly true in a fundamentally weighted strategy with positive value exposure and negative momentum exposure—that's when fundamentally weighted strategies tend to outperform cap-weighted indices, as they did immediately following the bursting of the 2000 tech bubble and the 2008 financial crisis.^{3,5}

The performance differential between the two weighting strategies is less evident, however, when momentum is positive but value is negative. In such cases, stock prices are generally driven by speculative investor behavior, which can lead to prices well beyond their sustainable values. During such times, small and medium-size companies often have an edge, due to their ability to grow into the large-cap space—particularly as a discreet sector or industry is thriving. However, the evolution of those former small or medium-caps into large-cap companies, carrying unsupportable optimism and euphoria into asset prices, could be a sign of the impending bursting of a bubble.

Positive momentum, however, is not always a sign of a market bubble. Often it is evident during an economic recovery immediately following a crisis, such as after the tech bubble burst of 2000, as referenced in Chart 1. The yellow bands represent periods when rising stock prices were supported by attractive valuations (both momentum and value were positive); during these periods, as shown in Chart 2, the fundamentally weighted strategy outperformed the cap-weighted one. The blue bands, on the other hand, highlight periods when momentum was positive but value was negative—periods in which fundamentally weighted strategies underperformed.

Chart 1. Cumulative Factor Performance: Mar 2001–Sep 2002

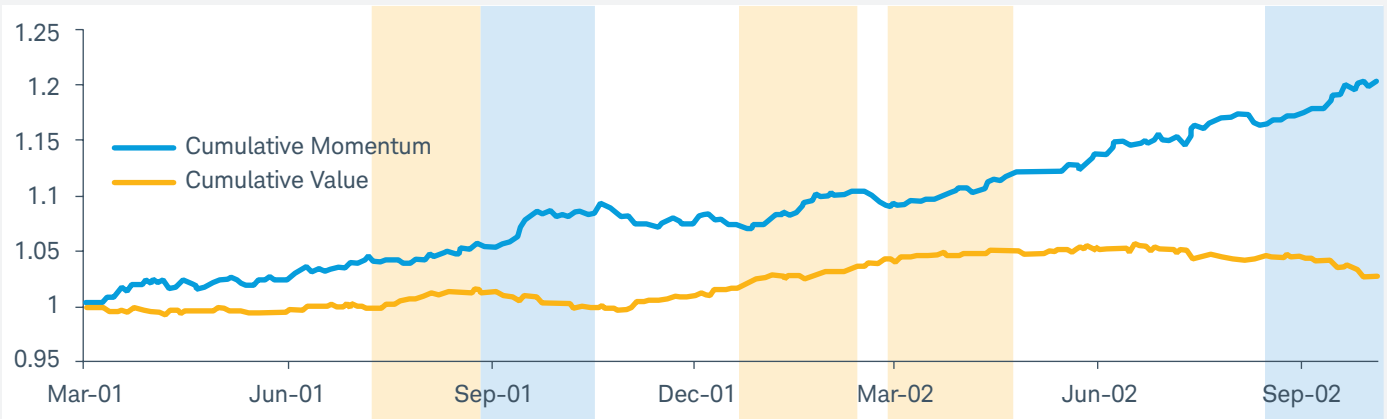
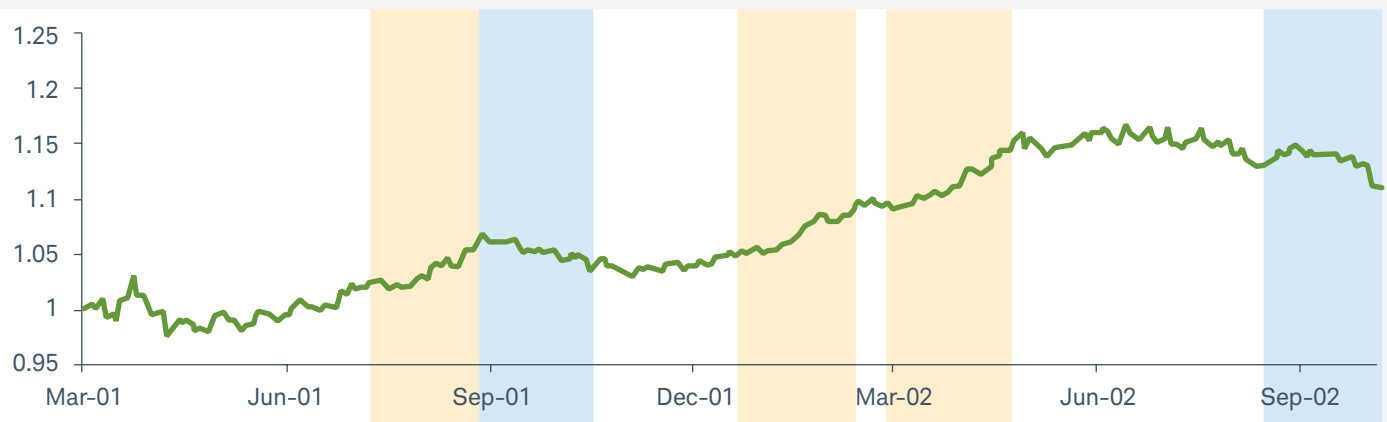


Chart 2. Cumulative Excess Return of Fundamentally Weighted vs. Cap-Weighted Strategies (U.S. Large Cap)



Analysis and methodology

For the purposes of this paper we address domestic asset classes only; we intend to extend our analysis to international asset classes in a subsequent study. We analyzed the outperformance of a fundamentally weighted index over its cap-weighted counterpart across U.S. large-cap and small-cap stocks, using the following indices:

Asset class	Cap-weighted index	Fundamentally weighted index
U.S. large-cap stocks	S&P 500 Index	Russell RAFI U.S. Large Company Index
U.S. small-cap stocks	Russell 2000 Index	Russell RAFI U.S. Small Company Index

For each asset class, we looked at the comparative index outperformance or underperformance in terms of the three factors to determine the impact and effect of each, both alone and in combination with the other two. Calculated using total local returns and performance data provide by Axioma[®],⁶ we evaluated asset-level exposure to each factor, computed as follows:

- **The value factor** is calculated using book-to-price and earnings-to-price ratios: Stocks with a positive value score are viewed as relatively inexpensive compared to their book value and earnings.
- **The momentum factor** is defined as an asset's cumulative return over the past 250 trading days (essentially, a full year) excluding the most recent 20 trading days to eliminate recent, short-term anomalies. Stocks with a positive medium-term momentum score outperformed over the period.
- **The size factor** is defined using the market capitalization (share price multiplied by the number of shares outstanding) averaged over the last 20 trading days. Stocks with a positive size score are larger-cap stocks; stocks with a negative size score are smaller-cap stocks.

We began our analysis by computing the daily excess returns of the fundamentally weighted index over the cap-weighted index. Then we separated the days of outperformance or underperformance according to the performance of the three factors—both positive and negative. Finally, we computed average daily excess returns of the fundamentally weighted index over the cap-weighted index and their statistical parameters for those days. This helped us identify those conditions that were statistically significant⁷ and where one strategy may be more or less likely to outperform the other. Based on data availability, our research covered daily return analysis for each asset class from July 2, 1996, to August 27, 2015—a period that includes numerous market extremes, such as the tech bubble of 2000 and the financial crisis/credit bubble of 2008, as well as reverse-market cycles.

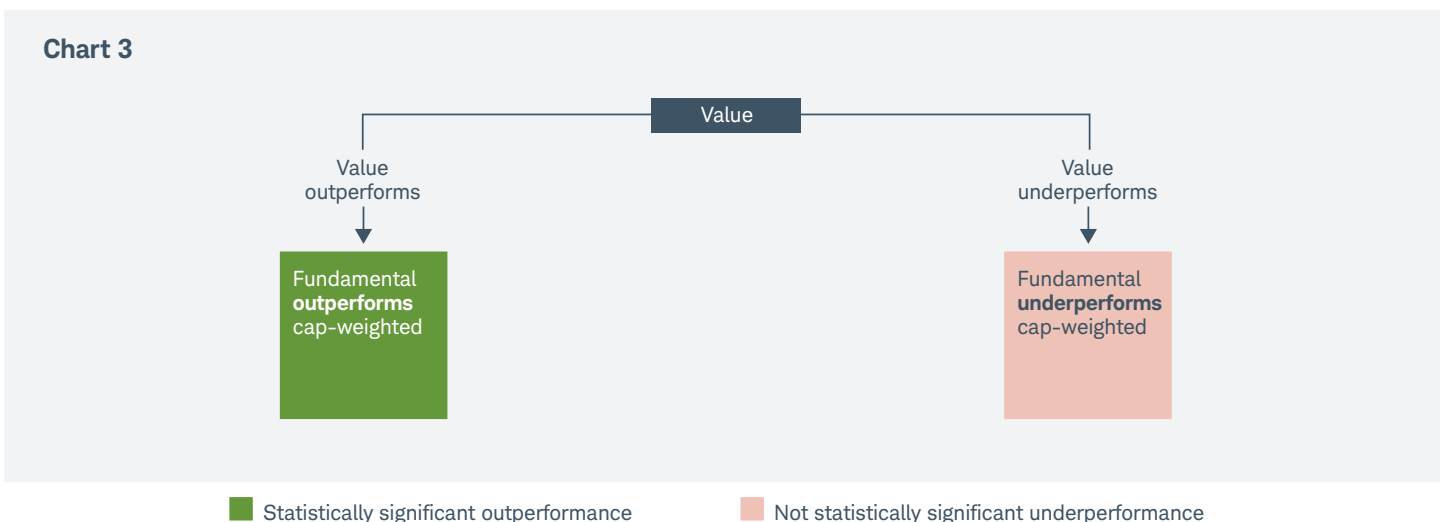
What we found is that all three of these factors, and their interactions, impact the performance of the fundamentally weighted versus the market-cap weighted strategies. In some cases, all three contribute to excess performance of one strategy over the other; in others, they appear to negate each other, resulting in little performance differentiation between the two strategies. As the findings are somewhat complicated, we present them, by asset class, in two ways to help ensure clarity and understanding.

⁶ Axioma's tools allow portfolios to be modeled based on specific objectives and a combination of constraint parameters over various time periods. Please note that Axioma's definition of factors may differ from traditional Fama-French factors, which are widely used in research. For more information about Fama-French approach please refer to: Common Risk Factors in the Returns on Stocks and Bonds. **Fama, Eugene** and **French, Kenneth**. 1, February 1993, Journal of Financial Economics, Vol. 33, pp. 3-56.

⁷ Because daily returns have serial correlation and heteroscedasticity, and therefore violate the standard assumptions of regression analysis, we applied Newey-West methodology to calculate statistical significance (t-stats). Details about Newey-West methodology can be found in **Green, William H.** Econometric Analysis. New Jersey: Prentice Hall, 2003. 0-13-110849-2.

U.S. large-cap stocks

We began our analysis on U.S. large-cap stocks with a single factor: value exposure (Chart 3). When the value factor was in favor—in other words, when relatively inexpensive stocks outperformed relatively expensive ones—the fundamentally weighted index outperformed the cap-weighted one. Conversely, when the value factor was out of favor, the fundamentally weighted index underperformed, although not to any statically significant degree. This, however, is where much analysis ends, and is a source of the misconception that value is the sole driver of fundamentally weighted strategies. We took our analysis two steps further.



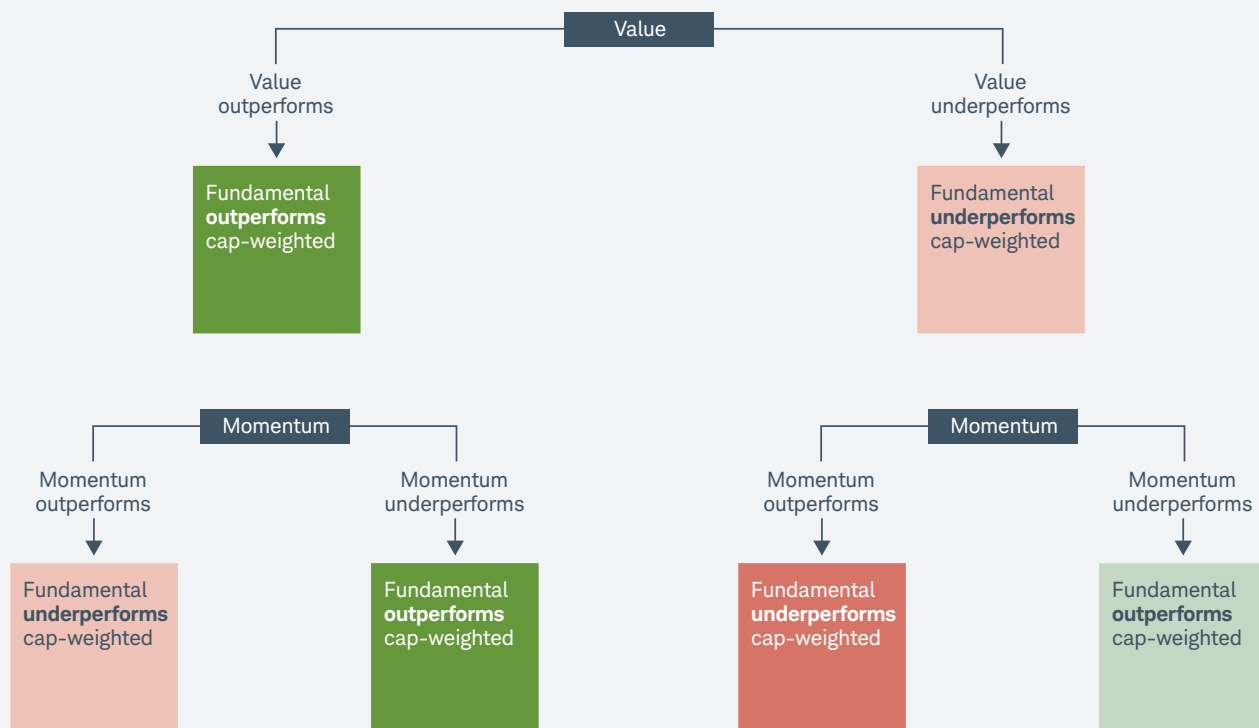
First, we added the momentum factor, examining the impact of positive and negative momentum on the two value-driven scenarios. As illustrated in Chart 4, in the case where value outperformed, when the momentum factor was in favor (stocks exhibiting positive momentum outperformed those with negative momentum), the fundamentally weighted index underperformed the cap-weighted one, but not to a statistically significant degree. When the momentum factor was out of favor (stocks exhibiting positive momentum underperformed), however, the fundamentally weighted index outperformed the cap-weighted one to a statistically significant degree.

In the case where both value and momentum underperformed, the fundamentally weighted index outperformed the cap-weighted one, but not to a

statistically significant degree. But when value underperformed and momentum outperformed, the cap-weighted index was the outperformer.

Another way to look at these scenarios that combined both value and momentum factors is that when momentum outperformed, the fundamentally weighted index underperformed the cap-weighted index, irrespective of whether the value factor was positive or negative; and when momentum underperformed, the fundamentally weighted index outperformed—again, regardless of the direction of the value factor. This tells us that momentum—specifically, negative momentum—is a key factor in the performance of the fundamentally weighted index and, interestingly, that the impact of value out- or underperformance is less relevant to the impact of momentum.

Chart 4



■ Statistically significant outperformance
■ Not statistically significant outperformance

■ Statistically significant underperformance
■ Not statistically significant underperformance

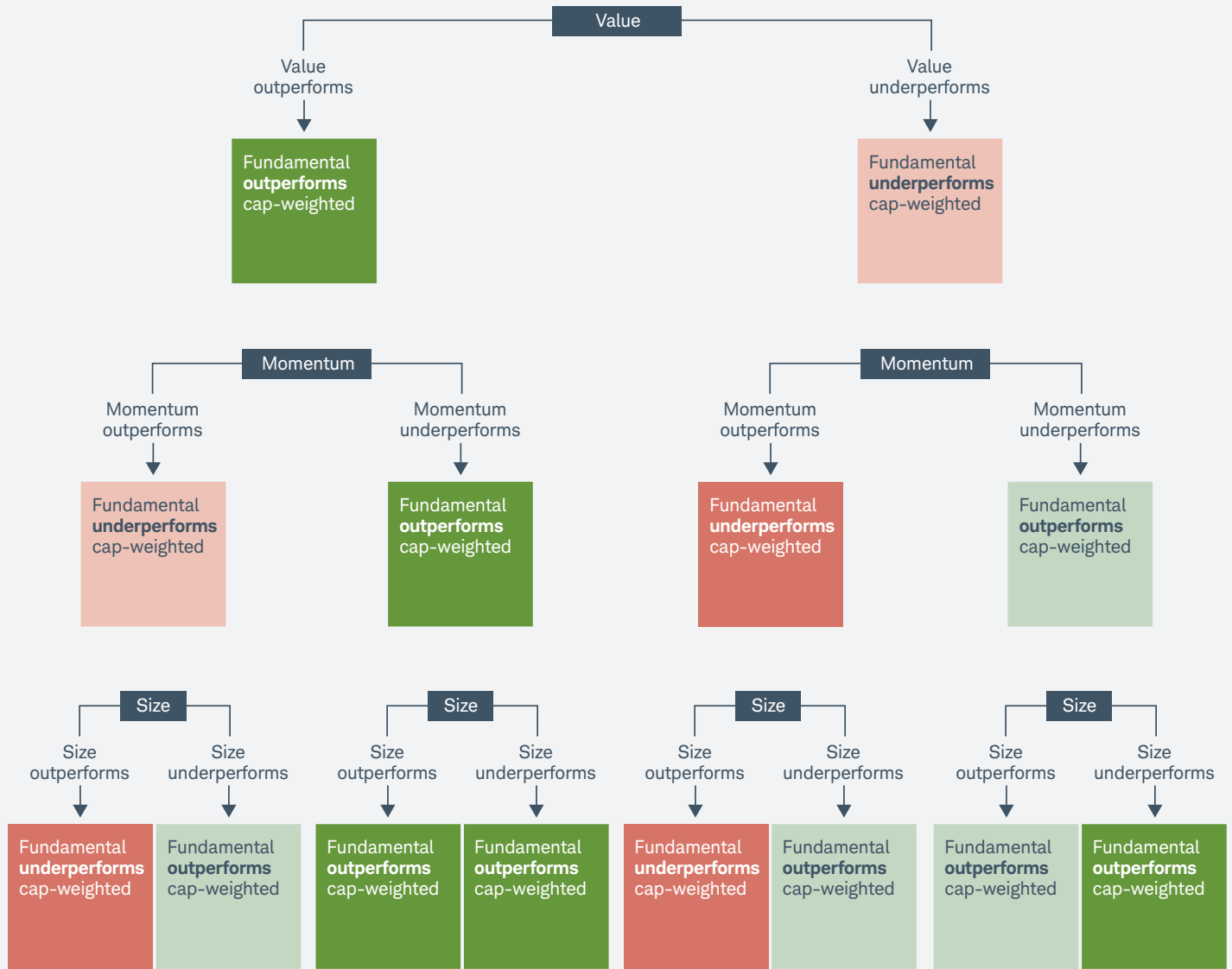
Finally, we add the size factor (Chart 5). When we say that “size outperformed,” we mean that large-cap stocks outperformed small-cap stocks; when we say that “size underperformed,” we mean that small-caps were in favor. In the case where value, momentum and size all outperformed, the cap-weighted index outperformed. In the case where both value and momentum outperformed but size underperformed, the fundamentally weighted index outperformed, but not to a statistically significant degree.

When value outperformed and momentum underperformed, and the size factor was added, the fundamentally weighted index outperformed, whether or not size was positive or negative. What this tells us is that size is irrelevant in terms of performance impact in an environment in which value is in favor and momentum out of favor.

On the right-hand side of the chart, when both value and momentum underperformed and the size factor was positive (large-caps were in favor), the fundamentally weighted index outperformed the cap-weighted index, but not to a statistically significant degree. Given the same value and momentum scenario but negative size (small-caps were in favor), however, the fundamentally weighted index outperformed to a statistically significant degree.

In the cases when value underperformed and both momentum and size outperformed, the cap-weighted index outperformed the fundamentally weighted one. But given the same value and momentum scenario but size underperformance, the fundamentally weighted index outperformed, but not to a statistically significant degree. This tells us that the size factor was an important determinant in these scenarios.

Chart 5



■ Statistically significant outperformance ■ Statistically significant underperformance
■ Not statistically significant outperformance ■ Not statistically significant underperformance

Our findings can be shown in another way while putting a finer point to them with the supporting data, per Table 1, which shows the eight scenarios we considered (presented in the order of the bottom row in Chart 5, from left to right).

- The **green arrows** indicate when the various factors were positive (outperformed); **red arrows** reflect when they were negative (underperformed).
- **Excess return** indicates daily average outperformance (positive numbers) or underperformance (negative numbers) of the fundamentally weighted index to the cap-weighted index for the various scenarios.

- **T-values**, which measure the significance of the estimate, are calculated using Newey-West robust standard errors. A t-value of above ~1.7 in absolute value is significant at the 10% level; a t-value above ~1.9 is significant at the 5% level.
- **Frequency** represents the proportion of time that a particular scenario has been observed to occur.

Table 1. Performance Impact of Different Factors for Fundamental vs. Cap-Weighted Strategies

Scenario	Value	Momentum	Size	Excess return	t-value	Frequency
1	↑	↑	↑	-0.076%	(3.69)	14.6%
2	↑	↑	↓	0.023%	1.21	14.2%
3	↑	↓	↑	0.049%	2.18	13.3%
4	↑	↓	↓	0.090%	6.46	12.0%
5	↓	↑	↑	-0.080%	(5.74)	12.5%
6	↓	↑	↓	0.010%	0.71	16.8%
7	↓	↓	↑	0.003%	0.08	7.2%
8	↓	↓	↓	0.075%	3.37	9.5%

Reordering this table to sort by performance impact (Table 2), we can readily see the scenarios in which the fundamentally weighted index outperformed the cap-weighted index by the greatest degree: when the momentum factor was out of favor. Although the impact of the added factors of value and size led to inconsistent conclusions, note that for the two scenarios with the largest magnitude of outperformance of the fundamentally weighted index, size was negative (small-caps outperformed).

Conversely, the environments in which the cap-weighted index is most likely to outperform to a statistically significant degree are those in which momentum and size are positive, regardless of the impact of value.

Table 2. Performance Impact of Different Factors for Fundamental vs. Cap-Weighted Strategies

Scenario	Value	Momentum	Size	Excess return	t-value	Frequency
4	↑	↓	↓	0.090%	6.46	12.0%
8	↓	↓	↓	0.075%	3.37	9.5%
3	↑	↓	↑	0.049%	2.18	13.3%
2	↑	↑	↓	0.023%	1.21	14.2%
6	↓	↑	↓	0.010%	0.71	16.8%
7	↓	↓	↑	0.003%	0.08	7.2%
1	↑	↑	↑	-0.076%	(3.69)	14.6%
5	↓	↑	↑	-0.080%	(5.74)	12.5%

■ Statistically significant outperformance
 ■ Not statistically significant outperformance
 ■ Statistically significant underperformance

U.S. small-cap stocks

Moving on to U.S. small-cap stocks, we applied the same methodology and undertook the same analysis; our findings are presented here, in both graphic (Chart 6) and table (Table 3) formats.

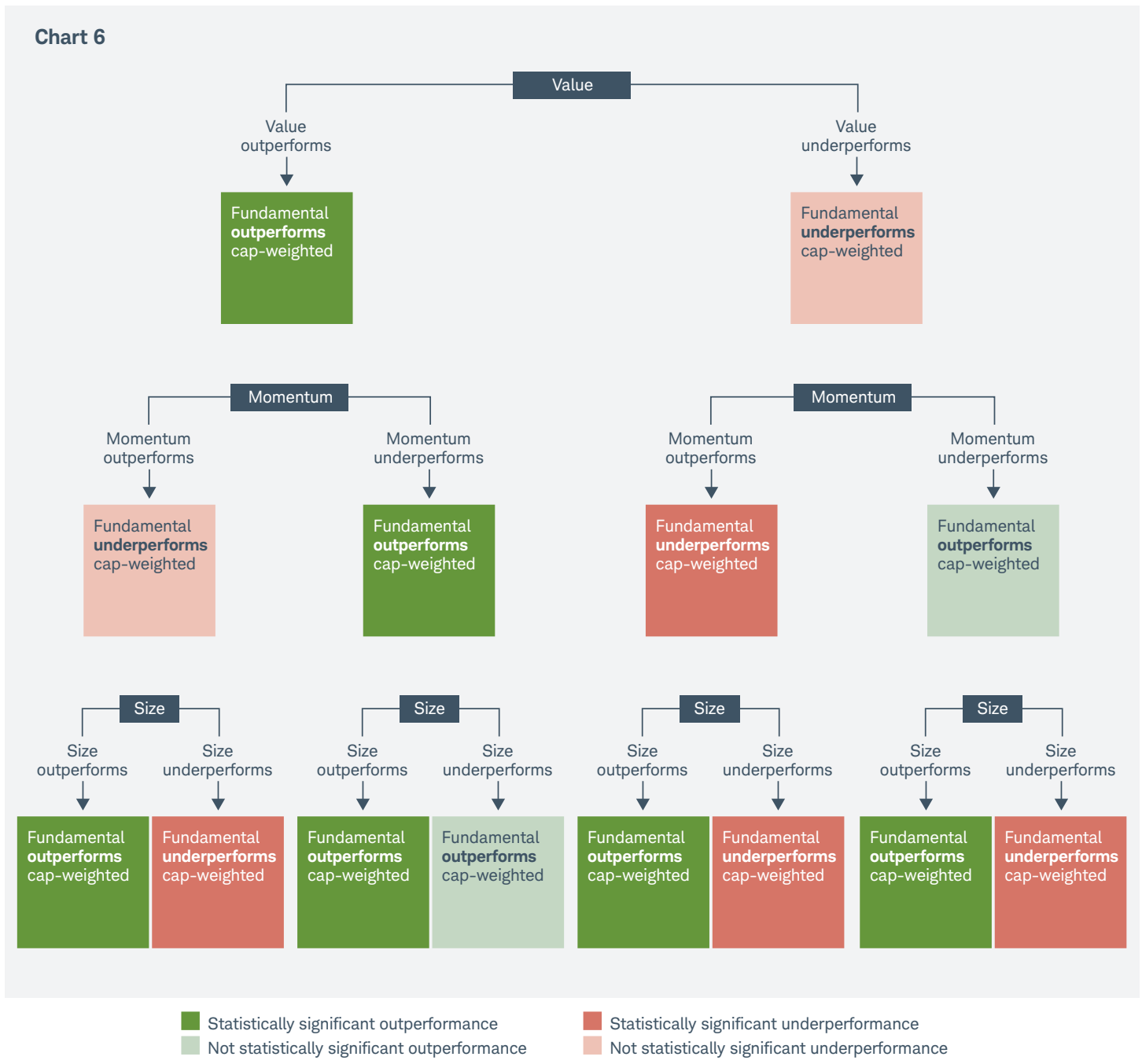


Table 3. Performance Impact of Different Factors for Fundamental vs. Cap-Weighted Strategies

Scenario	Value	Momentum	Size	Excess return	t-value	Frequency
3	↑	↓	↑	0.181%	6.19	13.3%
7	↓	↓	↑	0.164%	3.52	7.2%
1	↑	↑	↑	0.069%	5.70	14.6%
5	↓	↑	↑	0.033%	2.91	12.5%
4	↑	↓	↓	0.005%	0.35	12.0%
8	↓	↓	↓	-0.044%	(2.82)	9.5%
2	↑	↑	↓	-0.090%	(3.57)	14.2%
6	↓	↑	↓	-0.101%	(5.03)	16.8%

■ Statistically significant outperformance
 ■ Not statistically significant outperformance
 ■ Statistically significant underperformance

The impact of the three factors on U.S. small-cap fundamentally weighted versus cap-weighted indexes can be summarized as follows:

- **Size:** Size is the most significant factor in the relative performance of the two small-cap indices. When size was positive (large-caps outperformed small-caps), the fundamentally weighted index outperformed the cap-weighted one in all scenarios, regardless of the impact of value and momentum. However, note the differences in the magnitude of the outperformance in the top two scenarios: Negative momentum clearly has a positive impact on degree of the fundamentally weighted index's outperformance. When size was negative (small-caps outperformed), the cap-weighted index outperformed in three of the four scenarios (in the fourth, the fundamentally weighted index outperformed, but not to a statistically significant degree).
- **Momentum:** The impact of momentum is less visible until one looks at the magnitude of the performance impact. When momentum was negative, it resulted in a larger magnitude of fundamental outperformance (Scenarios 3 and 7) or less underperformance (Scenario 8) compared to cap-weighted strategy.
- **Value:** The impact of value is less visible, as the fundamentally weighted index outperformed in some cases when value was in favor and underperformed in others.

Why, however, is the size factor more influential in the small-cap analysis compared to the large-cap one? In large part, the anomaly can be attributed to design differences between the two small-cap indices. The Russell RAFI U.S. Small Company Index selects stocks from the entire Russell 3000 universe using a fundamental approach, whereas the cap-weighted Russell 2000 Index is restricted to a universe of the 2,000 smallest companies of the Russell 3000 Index.⁸ Therefore, unlike the Russell 2000 Index, the fundamental index tends to include medium-cap companies, which would imply that the cap-weighted index would have greater small-cap exposure than the fundamentally weighted index. In an environment in which small-caps dominate, this could explain the cap-weighted index's outperformance over the fundamental one. In addition to a different universe, we should also highlight the differences between large-cap (small-cap) and large companies (small companies). Company size can be measured in various ways: market capitalization is one way of doing it while economic footprint—such as revenue, sales, dividends, earnings and/or book value—is the other. The result is that the same company could be considered large-cap by market-cap index, but be a small company by fundamental index.

This distinction in index construction highlights the potentially complementary relationship of the two indices, which may offer diversification benefits for investors across various market cycles.

⁸ For more information on Russell's index construction, see <http://www.russell.com/documents/indexes/construction-methodology-fundamental-indexes.pdf>

Conclusion

In this paper, we identified key factor characteristics of fundamentally weighted and market cap-weighted strategies. We found that, in addition to value, size and negative momentum are also among the key drivers of excess return of fundamentally weighted strategies relative to cap-weighted ones. We also identified which factor characteristics were likely to lead to outperformance of one strategy over the other. Our findings are summarized below in Table 4.

We also note that despite the fact that fundamentally weighted strategies inherently have a value tilt, they are not designed intentionally to do so; it is simply a by-product of the strategy. The same goes for the fact that fundamentally weighted strategies generally exhibit negative momentum—this, too, is not an intentional characteristic but a by-product of the strategy, which severs the link between stock prices and portfolio weighting. The majority of smart beta strategies exhibit these same characteristics, including equal-weight strategies.

In addition, even though a fundamentally weighted index and a traditional cap-weighted value index may be correlated, they are not one in the same, and one cannot

be replicated by the other—they may very well behave differently at different parts of an investment cycle. We believe that such differences can present diversification opportunities for investors; specifically, that fundamentally weighted strategies can add a level of diversification that cannot be obtained through a cap-weighted strategy alone—even a value-oriented one.

Investors interested in learning more about how to combine these investment strategies in a portfolio can find more information in an earlier Charles Schwab Investment Management white paper, *Enhancing Equity Portfolio Diversification with Fundamentally Weighted Strategies*.⁹

Table 4. Summary of Findings for Fundamental and Cap-Weighted Strategies

Asset class	Best environment for fundamental indices	Best environment for cap-weighted indices
U.S. large-cap stocks	Negative momentum Positive value Negative size	Positive momentum Negative value Positive size
U.S. small-cap stocks	Negative momentum Positive value Positive size	Positive momentum Negative value Negative size

⁹ Op cit. Erdogan, Emre. "Enhancing Equity Portfolio Diversification with Fundamentally Weighted Strategies."

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Past performance does not guarantee future results.

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