

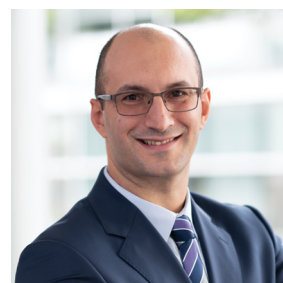
Fundamentally weighted index strategies:

A primer on asset allocation in three core asset classes



Key takeaways

- Fundamentally weighted index strategies can serve as a complement to traditional cap-weighted index strategies.
- Combining fundamentally weighted index strategies with cap-weighted strategies may improve a portfolio's risk-return characteristics.
- Fundamentally weighted index strategies have historically provided the strongest returns and the greatest diversification benefits immediately after a stock market bubble bursts.



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Research overview

This primer summarizes select findings from our white paper titled, *Enhancing Equity Portfolio Diversification With Fundamentally Weighted Strategies*. In this primer, we discuss combinations of traditional market cap-weighted index and fundamentally weighted index strategies to determine whether including both may improve a portfolio's risk/return characteristics and provide diversification, and, if so, the optimal allocations. We provide research across three of the five core asset classes discussed in greater detail in the full white paper: U.S. large-cap equities, international developed large-cap equities, and emerging markets equities.¹

Analysis by asset class

For each asset class, we created 11 sample portfolios starting with a 100% cap-weighted index and increasing the fundamentally weighted index allocation by 10% increments up to 100%. Columns in the tables showing the results of these evaluated allocations represent discrete intervals rather than continuous data and include shading that approximates the allocations that our research suggests as the optimal range of fundamentally weighted index strategies to include for the specified type of investor. Our analysis considered two distinct types of investors:

- **Absolute-return investors** who are not restricted by a specific benchmark
- **Benchmark-conscious investors** who evaluate performance against a cap-weighted index benchmark and are more concerned about excess returns and tracking error relative to that benchmark

The evaluated timeframe was from August 1996 to September 2017, which represents the period for which backdated and historical data were available.



Investment
Management

Key findings: U.S. large-cap equities*

Risk: Overall volatility and maximum drawdowns were similar for both strategies, though this was not consistent for shorter sub-periods.

Total and excess returns: The fundamentally weighted strategy had an annualized excess return of 2.3% over the cap-weighted strategy across the full period and outperformed in 14 of the 22 years. The cap-weighted strategy outperformed during “bubble years”: 1996-1999 (tech bubble), 2007 (housing bubble), 2014-2015 (low-interest-rate asset bubble), and the first nine months of 2017, which potentially could be a sign of another bubble (see calendar year returns in Tables 2 and 4 in the full white paper). This is expected, because the performance of cap-weighted strategies is primarily driven by momentum.²

Sharpe and information ratios: The fundamentally weighted strategy had a higher Sharpe ratio—an indicator of risk-adjusted performance—and a high and positive information ratio—a measure of outperformance relative to tracking error.

Total return analysis for absolute-return investors

Given the two strategies’ similar volatilities, the data suggests a minimum 50% allocation to a fundamentally weighted strategy and a maximum 70% allocation so as not to eliminate the diversification benefit of having exposure to both.

| | Cap-weighted index | Fundamentally weighted index | | | | | | | | | |
|--------------------------------------|--------------------|------------------------------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| | | 10% | 20% | 30% | 40% | 50% | 60% | 70% | 80% | 90% | 100% |
| Annualized return | 8.6% | 8.9% | 9.2% | 9.4% | 9.7% | 9.9% | 10.1% | 10.4% | 10.6% | 10.8% | 11.0% |
| Annualized standard deviation | 15.0% | 14.9% | 14.8% | 14.8% | 14.7% | 14.7% | 14.6% | 14.6% | 14.6% | 14.6% | 14.6% |
| Sharpe ratio | 0.57 | 0.60 | 0.62 | 0.64 | 0.66 | 0.68 | 0.69 | 0.71 | 0.73 | 0.74 | 0.75 |
| Maximum drawdown | -50.9% | -50.9% | -50.8% | -50.7% | -50.6% | -50.6% | -50.5% | -50.4% | -50.4% | -50.4% | -50.5% |
| 1-year return | 18.6% | 18.2% | 17.9% | 17.6% | 17.3% | 17.0% | 16.8% | 16.6% | 16.4% | 16.2% | 16.0% |
| 3-year return | 10.8% | 10.6% | 10.4% | 10.2% | 10.0% | 9.8% | 9.7% | 9.5% | 9.4% | 9.3% | 9.2% |
| 5-year return | 14.2% | 14.2% | 14.1% | 14.1% | 14.1% | 14.0% | 14.0% | 14.0% | 14.0% | 13.9% | 13.9% |

Excess return/tracking error analysis for benchmark-conscious investors

We set 1.7% as an acceptable tracking error (half the 3.3% median realized tracking error for the active funds in Morningstar’s U.S. Large Blend Category as of September 2017). Our analysis implies this level resulted from an approximate fundamentally weighted strategy allocation of 32%, suggesting a maximum 35% allocation.

| | Cap-weighted index | Fundamentally weighted index | | | | | | | | | |
|---------------------------------|--------------------|------------------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| | | 10% | 20% | 30% | 40% | 50% | 60% | 70% | 80% | 90% | 100% |
| Annualized excess return | 0.0% | 0.3% | 0.5% | 0.8% | 1.0% | 1.3% | 1.5% | 1.7% | 1.9% | 2.1% | 2.3% |
| Tracking error | 0.0% | 0.5% | 1.0% | 1.6% | 2.1% | 2.6% | 3.0% | 3.5% | 4.0% | 4.5% | 5.1% |
| Information ratio | – | 0.53 | 0.52 | 0.52 | 0.51 | 0.50 | 0.49 | 0.48 | 0.48 | 0.47 | 0.46 |
| 1-year excess return | 0.0% | -0.4% | -0.7% | -1.0% | -1.3% | -1.6% | -1.8% | -2.0% | -2.2% | -2.4% | -2.6% |
| 3-year excess return | 0.0% | -0.2% | -0.5% | -0.7% | -0.8% | -1.0% | -1.1% | -1.3% | -1.4% | -1.5% | -1.6% |
| 5-year excess return | 0.0% | 0.0% | -0.1% | -0.1% | -0.2% | -0.2% | -0.2% | -0.2% | -0.3% | -0.3% | -0.3% |

Key findings: International developed large-cap equities*

Risk: Overall volatility was similar for both strategies, but the cap-weighted strategy's maximum drawdowns were larger, especially prior to 2005.

Total and excess returns: The fundamentally weighted strategy had an annualized excess return of 3.2% over the cap-weighted strategy across the full period and outperformed in 17 of the 22 years, only lagging in 1998, 2011, 2012, 2015, and the first nine months of 2017.³

Sharpe and information ratios: The fundamentally weighted strategy had a higher Sharpe ratio, and combining both strategies resulted in an information ratio of around 0.84, which we consider a respectable risk-adjusted excess return.

Total return analysis for absolute-return investors

Given the two strategies' similar volatilities and the fundamentally weighted strategy's maximum drawdown advantage, the data suggests a minimum fundamentally weighted strategy allocation of 50% and a maximum of 75% so as not to eliminate the diversification benefit of having exposure to both.

| | Cap-weighted index | Fundamentally weighted index | | | | | | | | | |
|--------------------------------------|--------------------|------------------------------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| | | 10% | 20% | 30% | 40% | 50% | 60% | 70% | 80% | 90% | 100% |
| Annualized return | 5.5% | 5.9% | 6.3% | 6.7% | 7.0% | 7.3% | 7.6% | 7.9% | 8.2% | 8.4% | 8.7% |
| Annualized standard deviation | 16.6% | 16.5% | 16.5% | 16.5% | 16.5% | 16.5% | 16.5% | 16.5% | 16.5% | 16.6% | 16.6% |
| Sharpe ratio | 0.33 | 0.36 | 0.38 | 0.40 | 0.42 | 0.44 | 0.46 | 0.48 | 0.49 | 0.51 | 0.52 |
| Maximum drawdown | -56.4% | -55.8% | -55.2% | -54.7% | -54.3% | -53.9% | -53.5% | -53.2% | -52.9% | -52.6% | -52.4% |
| 1-year return | 19.7% | 20.1% | 20.5% | 20.8% | 21.1% | 21.3% | 21.5% | 21.7% | 21.9% | 22.1% | 22.2% |
| 3-year return | 5.5% | 5.5% | 5.5% | 5.5% | 5.5% | 5.5% | 5.5% | 5.5% | 5.5% | 5.5% | 5.5% |
| 5-year return | 8.9% | 9.1% | 9.2% | 9.3% | 9.5% | 9.6% | 9.7% | 9.7% | 9.8% | 9.9% | 10.0% |

Excess return/tracking error analysis for benchmark-conscious investors

We set 1.9% as an acceptable tracking error (half the 3.8% median realized tracking error for the active funds in Morningstar's Foreign Large Blend Category as of September 2017). Our analysis implies this level resulted from an approximate fundamentally weighted strategy allocation of 42%, and taking into account the relatively lower overall tracking error between the two strategies, this suggests a maximum 50% allocation.

| | Cap-weighted index | Fundamentally weighted index | | | | | | | | | |
|---------------------------------|--------------------|------------------------------|------|------|------|------|------|------|------|------|------|
| | | 10% | 20% | 30% | 40% | 50% | 60% | 70% | 80% | 90% | 100% |
| Annualized excess return | 0.0% | 0.4% | 0.8% | 1.2% | 1.5% | 1.8% | 2.1% | 2.4% | 2.7% | 2.9% | 3.2% |
| Tracking error | 0.0% | 0.5% | 1.0% | 1.4% | 1.8% | 2.2% | 2.5% | 2.9% | 3.2% | 3.5% | 3.8% |
| Information ratio | - | 0.83 | 0.84 | 0.84 | 0.84 | 0.84 | 0.84 | 0.84 | 0.84 | 0.84 | 0.84 |
| 1-year excess return | 0.0% | 0.4% | 0.8% | 1.1% | 1.4% | 1.7% | 1.9% | 2.1% | 2.3% | 2.4% | 2.6% |
| 3-year excess return | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| 5-year excess return | 0.0% | 0.2% | 0.3% | 0.5% | 0.6% | 0.7% | 0.8% | 0.9% | 1.0% | 1.0% | 1.1% |

Key findings: Emerging markets equities*

Risk: Overall volatility was a bit higher for the fundamentally weighted strategy, but its maximum drawdowns were slightly better than the cap-weighted strategy.

Total and excess returns: The fundamentally weighted strategy had an annualized excess return of 5.0% over the cap-weighted strategy across the full period—though most of this added return occurred in the earlier years—and outperformed in 16 of the 22 years, lagging in 1996 (partial year), 2009, 2012, 2014, 2015, and the first nine months of 2017.⁴

Sharpe and information ratios: The fundamentally weighted strategy had a higher Sharpe ratio, particularly in the earlier years, and a favorable information ratio of around 0.7—difficult even for actively managed funds to achieve.

Total return analysis for absolute-return investors

Given the two strategies' similar total risk profiles, along with the fundamentally weighted strategy's outperformance and slightly better maximum drawdowns, the data suggests a fundamentally weighted strategy allocation between 50% and 80%.

| | Cap-weighted index | Fundamentally weighted index | | | | | | | | | |
|--------------------------------------|--------------------|------------------------------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| | | 10% | 20% | 30% | 40% | 50% | 60% | 70% | 80% | 90% | 100% |
| Annualized return | 6.7% | 7.4% | 8.1% | 8.7% | 9.2% | 9.7% | 10.2% | 10.6% | 11.0% | 11.3% | 11.7% |
| Annualized standard deviation | 23.3% | 23.4% | 23.5% | 23.6% | 23.7% | 23.8% | 24.0% | 24.1% | 24.2% | 24.4% | 24.5% |
| Sharpe ratio | 0.29 | 0.32 | 0.35 | 0.37 | 0.39 | 0.41 | 0.42 | 0.44 | 0.45 | 0.46 | 0.48 |
| Maximum drawdown | -61.4% | -60.9% | -60.4% | -60.0% | -59.7% | -59.5% | -59.2% | -59.1% | -58.9% | -58.7% | -58.6% |
| 1-year return | 22.9% | 23.3% | 23.6% | 23.8% | 24.0% | 24.2% | 24.3% | 24.4% | 24.5% | 24.6% | 24.6% |
| 3-year return | 5.3% | 5.4% | 5.5% | 5.5% | 5.6% | 5.6% | 5.6% | 5.7% | 5.7% | 5.7% | 5.7% |
| 5-year return | 4.4% | 4.3% | 4.2% | 4.2% | 4.2% | 4.1% | 4.1% | 4.1% | 4.1% | 4.1% | 4.1% |

Excess return/tracking error analysis for benchmark-conscious investors

We set 2.3% as an acceptable tracking error (half the 4.5% median realized tracking error for the active funds in Morningstar's Emerging Markets Blend Category as of September 2017). Our analysis implies this level resulted from an approximate fundamentally weighted strategy allocation of 23%, but since the strategy's large tracking error was primarily due to significant outperformance in a few years and taking into account its information ratio benefits, the data suggests a maximum 40% allocation.

| | Cap-weighted index | Fundamentally weighted index | | | | | | | | | |
|---------------------------------|--------------------|------------------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| | | 10% | 20% | 30% | 40% | 50% | 60% | 70% | 80% | 90% | 100% |
| Annualized excess return | 0.0% | 0.8% | 1.4% | 2.0% | 2.6% | 3.0% | 3.5% | 3.9% | 4.3% | 4.6% | 5.0% |
| Tracking error | 0.0% | 1.1% | 2.0% | 2.9% | 3.6% | 4.3% | 4.9% | 5.5% | 6.1% | 6.6% | 7.2% |
| Information ratio | – | 0.69 | 0.70 | 0.71 | 0.71 | 0.71 | 0.71 | 0.71 | 0.70 | 0.70 | 0.70 |
| 1-year excess return | 0.0% | 0.4% | 0.7% | 0.9% | 1.1% | 1.3% | 1.4% | 1.5% | 1.6% | 1.7% | 1.7% |
| 3-year excess return | 0.0% | 0.1% | 0.2% | 0.2% | 0.3% | 0.3% | 0.4% | 0.4% | 0.4% | 0.4% | 0.4% |
| 5-year excess return | 0.0% | -0.1% | -0.1% | -0.2% | -0.2% | -0.2% | -0.2% | -0.2% | -0.3% | -0.3% | -0.3% |

Conclusion

This primer presents an asset allocation framework designed to help diversify an equity allocation using fundamentally weighted strategies in conjunction with cap-weighted strategies, while focusing on three core asset classes: U.S. large-cap equities, international developed large-cap equities, and emerging markets equities. Our research suggests that fundamentally weighted index strategies can complement cap-weighted strategies, while potentially improving a portfolio's risk-return characteristics. Our results suggest the following guidelines:

Summary of fundamentally weighted strategy allocation ranges

| Asset class | For absolute-return investors | For benchmark-conscious investors |
|---|-------------------------------|-----------------------------------|
| U.S. large-cap equities | 50% to 70% | 0% to 35% |
| International large-cap equities | 50% to 75% | 0% to 50% |
| Emerging markets equities | 50% to 80% | 0% to 40% |

These allocation ranges are based on our interpretations of the metrics provided in the body of our larger research study, which covers various market conditions, as well as the potential advantages and considerations of the two types of strategies. Although past performance does not guarantee future performance, the disciplined and well-defined portfolio construction methodologies for both cap-weighted and fundamentally weighted strategies give us greater confidence that the diversification benefits of adding exposure to both may be particularly valuable immediately prior to and after the bursting of stock market bubbles.

Please see the full white paper under the Asset Allocation Insights section on schwabfunds.com for further information, including an analysis of additional asset classes and a glossary that defines the statistics and other relevant terms used in this paper.

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*The 22-year period is represented by the timeframe of August 1, 1996, through September 30, 2017, the period for which backdated and historical data are available. Two partial-year periods are therefore included: August 1, 1996, to December 31, 1996, and January 1, 2017, to September 30, 2017.

1. While there are many potential cap-weighted and fundamentally weighted indexes, in this research, we analyzed return data relating to the following:

| Asset class | Cap-weighted index | | Fundamentally weighted index |
|--|-----------------------------|-----|--|
| U.S. large-cap equities | S&P 500® Index | vs. | Russell RAFI™ US Large Company Index |
| International developed large-cap equities | MSCI EAFE Index | vs. | Russell RAFI™ Dev. ex US Large Company Index |
| Emerging markets equities | MSCI Emerging Markets Index | vs. | Russell RAFI™ Emerging Markets Large Company Index |

2. Overall tracking error between the two strategies was 5.1%, implying that the two differ notably in characteristics and exposures to different market styles (betas). Combining the two strategies, therefore, may help investors increase their style diversification, though it is important to note that tracking error between the two strategies tended to change across market cycles.
3. Overall tracking error between the two strategies was 3.8%, implying that the two had different styles (betas) and/or industry exposures. Therefore, we believe that having allocations to both may help investors improve their style diversification.
4. Overall tracking error between the two strategies was 7.2%, larger than the other asset classes evaluated. However, most of this occurred primarily in four years—1998, 1999, 2003, and 2016—when the fundamentally weighted strategy significantly outperformed.

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Diversification and asset allocation strategies do not ensure a profit and do not protect against losses in declining markets.

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