

Factor-Based Investing



Executive summary

Factor-based investing (FBI) strategies have grown considerably in popularity over the past few years, as many investors have looked for other ways to achieve their investment objectives. By identifying and harnessing the underlying drivers of performance, these strategies have attracted investors looking to achieve specific portfolio outcomes, such as risk reduction and diversification, and to access non-traditional sources of return.

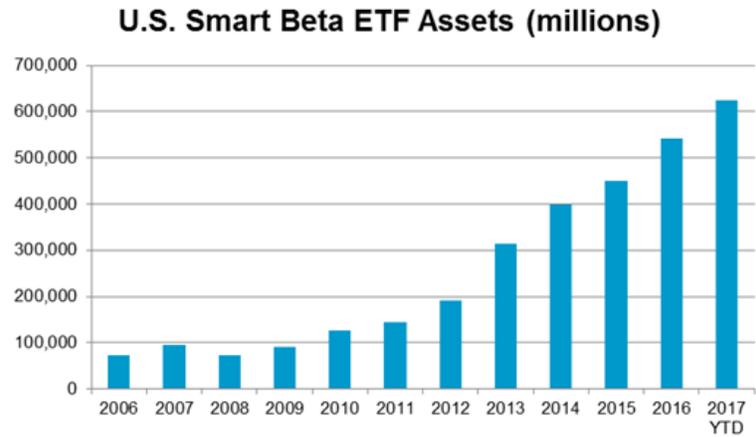
Despite the recent rise in popularity, these strategies have existed for decades and have been proven to be successful. The most recent development resulted in repackaging these strategies in a liquid, systematic, transparent and cost-efficient form. In addition to identifying which factors to use, it is imperative for investors to decide how to combine these factors within the overall portfolio to achieve superior outcomes over time.

At LGIMA, we have been helping design customized solutions for our clients since 2010 and we believe that our expertise and investment outcome orientation is a key differentiator in helping clients achieve their objectives.

The move to FBI is happening now

Assets under management within factor-based funds and ETFs have grown steadily, reaching \$600 billion in 2016, according to Morningstar. This figure likely underestimates the total figure invested in factor strategies as significantly more is contained within segregated and institutional account mandates that are not reported (see figure 1).

Fig. 1: Growth of assets in Smart beta ETFs¹

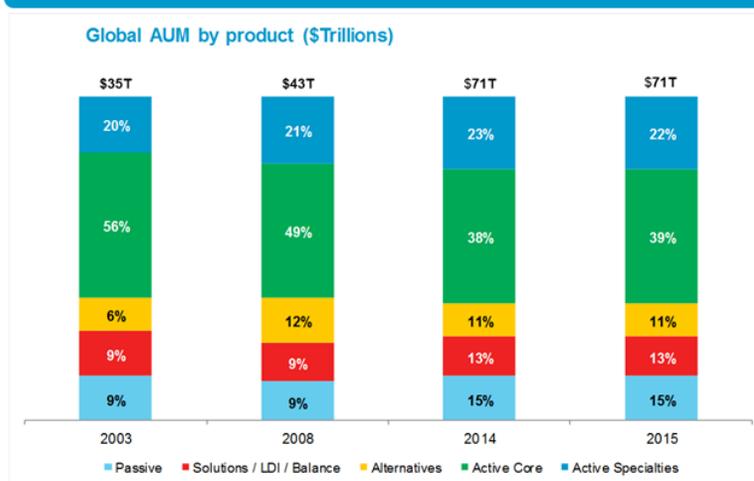


¹Source: Bloomberg Intelligence, as of July 31, 2017

This growth is in line with the overall direction of the global asset management industry, where we saw over the past decade the traditional fundamental active equity business (active core) losing ground in favor of passive funds, high conviction strategies (active specialties), alternatives and outcome-oriented solutions (see figure 2).

FBI has been a major beneficiary of this trend, but it is hard to pigeon-hole it into any of the above categories. It shares certain characteristics with each of them and so, depending on investors' specific objectives and perceptions, FBI could well be considered as a high-conviction, outcome-oriented or alternative strategy.

Fig. 2: Global assets under management (AUM) by product²



Totals are in trillions and were rounded so numbers add up

Why are investors turning to FBI?

The short answer is a combination of disappointment with traditional investment strategies and more targeted investment objectives.

Disappointment with the value provided by traditional active managers

Many investors have been disappointed with active performance net of fees, particularly against market-capitalization benchmarks. When active equity managers have delivered outperformance, research has shown it has often been linked to risk factors rather than security selection, adding to disappointment³.

As an example, based on the SPIVA U.S. Scorecard report produced by Standard & Poor's for 2016, over the last 15 years less than ten percent of US large cap mutual funds were able to outperform the S&P 500 Index net of fees. The statistics for small and mid-cap benchmarks look even worse. Part of FBI's recent growth is linked to its ability to offer exposure to historically compensated risk factors that are observed in those mutual funds' performance in a liquid, transparent and cost-efficient fashion.

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More targeted investment objectives

Investors can use FBI to better target certain investment styles and portfolio constructions according to suitability and objectives. This is all the more important as some investors have been looking to complement existing portfolios with more diversified or targeted factor exposures. For example, market-capitalization indices tend to be highly concentrated in larger cap growth stocks.

FBI offers the opportunity for investors to counter some of the market-capitalization index challenges by focusing on either risk reduction or return-enhancement, or a combination of both. Additionally, since FBI can be accessed via a top down or bottom-up approach, it could be used to access non-traditional

²BCG, 2015, Sparking growth with go-to-market excellence

³Carhart, Mark M. (1997, March). On persistence in mutual fund performance, The Journal of Finance

sources of return which are less tied to economic growth, and more to market microstructure, human behavior, or structural biases. Overall, from an investment perspective, investors can use these strategies to help reduce concentration risk, enhance portfolio diversification, and achieve a better portfolio risk balance.

On the governance side, we anticipate broadly similar investment governance burden as is the case with traditional active managers. Some governance processes associated with staff turnover would be eased – for example a star portfolio manager leaving the management of the mandate is not such a concern anymore because of a rules-based implementation. The trade-off is however, that the in-house investment staff is expected to take more ownership of the selection of the portfolio construction methodology.

For many investors with an outcome-oriented focus, FBI represents the best of both active and passive based investing.

How does factor-based investing work?

In many ways, FBI is both brand new and decades old. These have existed as active long-only strategies in the asset management industry for many years on the understanding that factors can offer different opportunities and outcomes.

FBI, however, uses well-established investment styles and portfolio construction approaches to offer the opportunity to implement those styles through indices in a systematic, transparent, liquid, and cost-efficient fashion.

Nevertheless, it is important to note that there is no standardized definition of FBI. Many different investment managers use different methodologies and definitions to build their own factor-based strategies.

What is classified as a ‘factor’?

Certain characteristics drive the performance of one security relative to another, and they are distinct from wider market dynamics. These characteristics can be categorized into different sub-sets, or ‘factors’, to help decompose security returns.

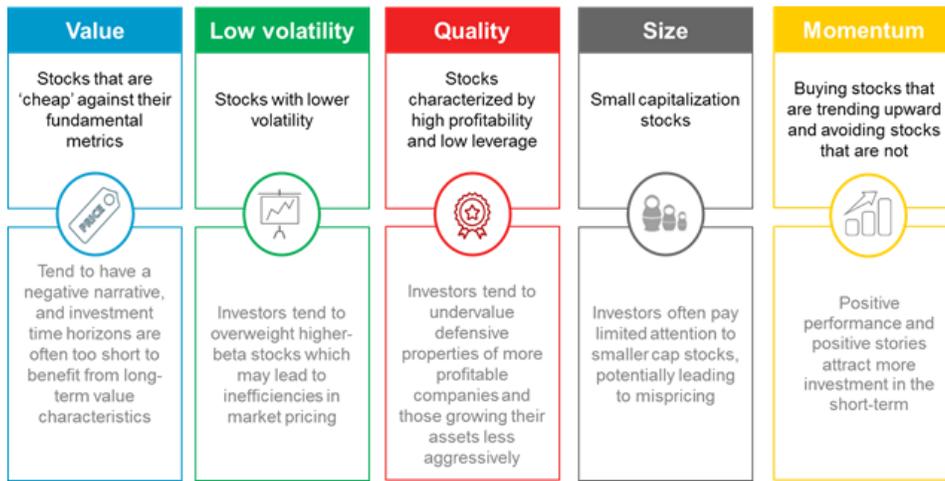
Although the universe of possible factors to choose from is increasingly large, the investment world has come to a general agreement about equity style factors with only a handful dominating the landscape: Value, Low Volatility, Quality, Size, and Momentum.

Implementing FBI strategies

While it is entirely possible that many investors have already been implicitly engaging in FBI, at LGIMA we believe a robust FBI implementation requires the following steps.

The choice of a factor or combination of factors: filtering the market universe to focus on stocks which display a specific investment style bias (e.g. value, size etc.). LGIMA’s view is that the selected factors need to have been validated by rigorous academic research and to have exhibited superior risk-adjusted returns historically. We believe that every factor should have a risk and behavioral rationale to justify the associated long-term risk premium. By deviating from market capitalization weighting, one takes a risk which is expected to be compensated over time. This might result in temporary drawdowns but these are expected to be rewarded significantly per unit of additional tracking error.

Fig. 3: Typical factors⁴



The choice of a portfolio construction: e.g. weighting the different securities within the restricted universe to build the portfolio. Investors could rely on market-capitalization weighting, equal weightings, or risk-based weightings. Non market-cap weightings do not explicitly target higher returns but rather aim to reduce risk and/or enhance diversification. We introduce a couple of examples below.

- A minimum variance weighting weights securities with the intention of minimizing the drawdown risk of the portfolio based on historical volatility
- A risk parity weighting focuses on the risk contribution of each asset to the portfolio. In such portfolios, the manager weights securities by equal risk contribution in order to enhance diversification and seek a better risk balance

Combining these to create multi-factor solutions

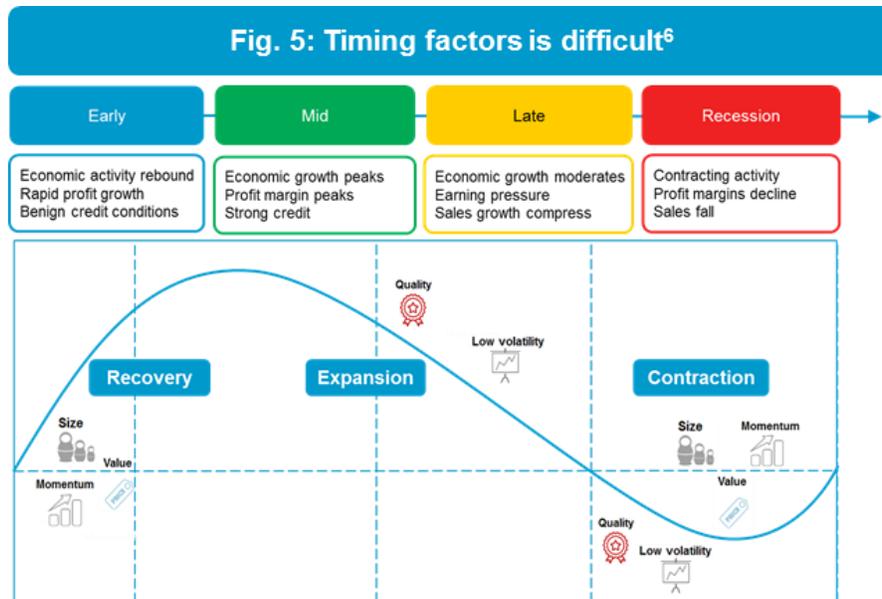
The performance and behavior of each individual factor can vary over the course of the economic cycle, as evidenced in figure 4.

Fig. 4: Factor performance varies through⁵

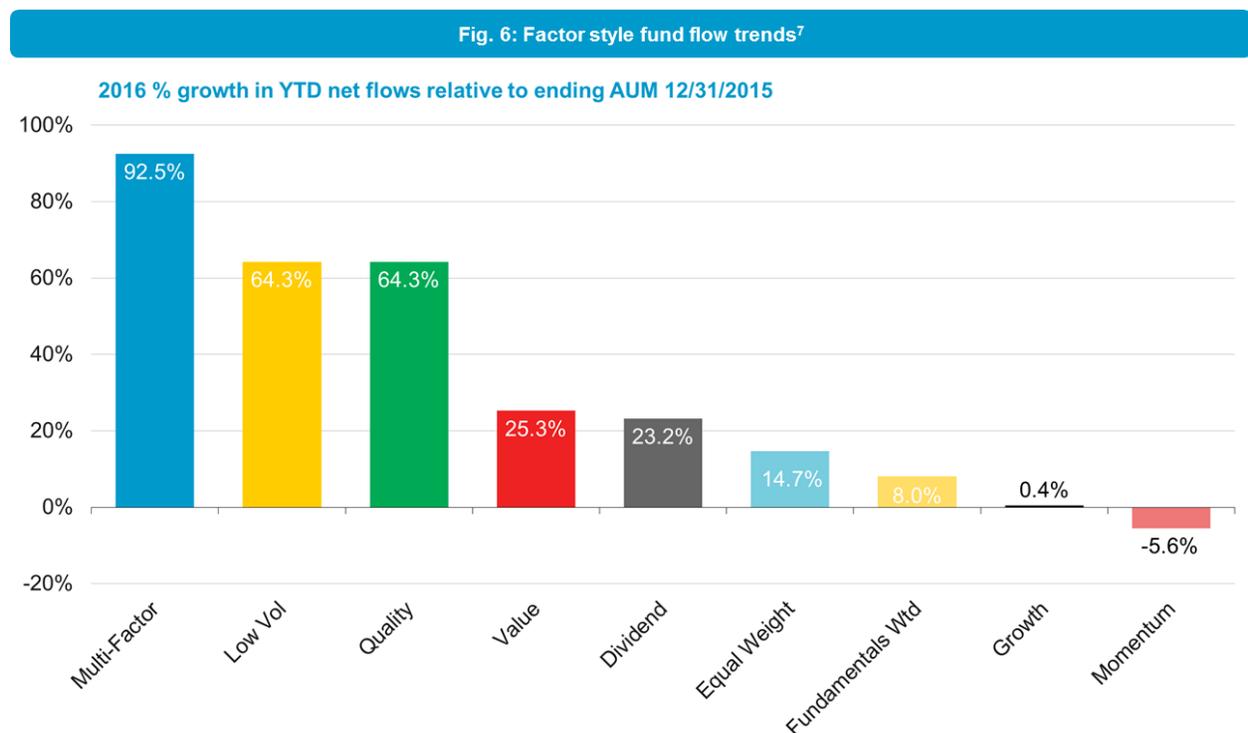


⁴LGIMA
⁵LGIMA, MSCI

Each factor may only add value some of the time and, while choosing which factor to use at any point in time would be the ideal scenario (see figure 5), it is difficult for investors to anticipate when outperformance will occur. Figure 5 illustrates why factors are compensated, as they each play a role during the economic cycle.



Because timing factors is a difficult exercise, FBI investors are increasingly combining factors in order to enhance returns over time while aiming for better diversification and better risk-balance with respect to the economic cycle. The multi-factor growth (see figure 6) illustrates this point.



⁶LGIMA
⁷EPRF Global

A multi-factor strategy can be achieved through a 'top-down' approach which allocates to different factor-based portfolios as individual building blocks.

Alternatively, the 'bottom-up approach' to multi-factor investing gives each stock within the investment universe a score on each of the desired factors. These individual scores are then combined into an overall multi-factor score, which is then used to determine the weight it should have in the portfolio.

There are trade-offs for using either a top-down or bottom-up approach that should be considered when evaluating multi-factor solutions. Typically, bottom-up approaches will consider how stocks score across a variety of factors. This can provide stronger factor exposures; however, it can lead to concentration in a single factor or individual stocks contributing the majority of a particular factor. For example, an equal-weighted approach to scoring stocks' factor exposures will view a stock favorably even if it scores particularly high on just one factor (see figure 7).

Fig. 7: Maximizing multi-factor scores⁸

$$\text{Factor Score} = .25 \times \text{Value} + .25 \times \text{Size} + .25 \times \text{Momentum} + .25 \times \text{Low Volatility}$$

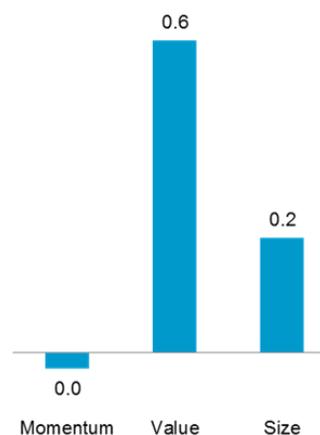
In this example, a stock with very high value exposure and limited exposure to other factors will still have a high overall score, making it attractive to a bottom-up multi-factor strategy.

If a particular factor is prevalent across enough stocks, the multi-factor strategy ultimately becomes concentrated in that factor (see figure 8). In this example, the maximum multi-factor score leads to a concentration in Value. Additionally, the positive exposure to Momentum was largely driven by a single stock (Facebook: FB) and offset by other securities.

On the other hand, top-down approaches may have weaker overall factor exposures but better diversification across factors. Weaker factor exposures are the result of combining the stocks that may score very well for one factor, such as Value, with other stocks that score very well on another factor but also have some amount of offsetting exposure to Value.

We see two primary advantages to top-down approaches for investors considering a multi-factor strategy as part of an outcome-oriented solution. First, it is typically easier to provide attribution showing how performance was influenced by the expected factor exposures. Better understanding of factor performance can lead to improved decision making about including and mixing certain factors, which can in turn lead to better outcomes. Second, top-down approaches better support customization of exposures meant to support investors' objectives.

Fig. 8: Example maximum multi-factor portfolio for the S&P 500 universe⁹



FBI model strategies

Depending on the type of investor, specific investment needs, and level of comfort with FBI, there are three broad models of implementing an FBI strategy: straightforward indexing, outcome-oriented, and advanced quantitative. It is important to note that there can also be overlaps between these models from time to time.

Straightforward indexing: Single factors

Asset allocators may choose to purchase single-factor funds in order to create their own in-house

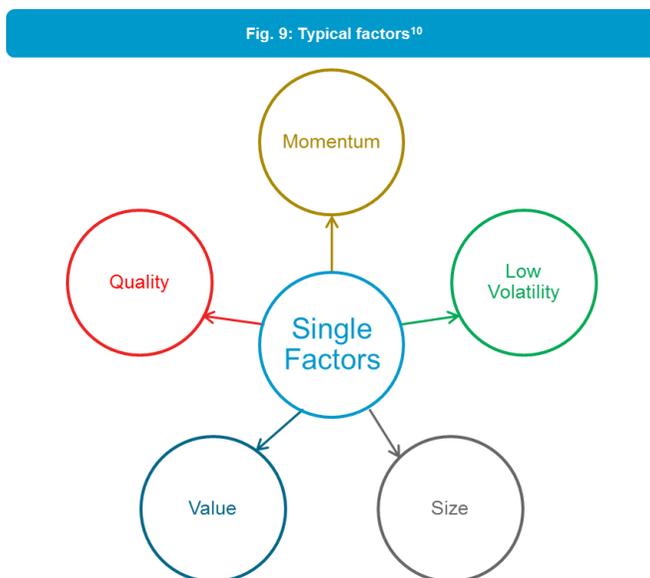
⁸LGIMA

⁹LGIMA, Bloomberg, Kenneth R. French Research Library, MSCI BarraOne. Data as of July 31, 2017

model portfolios. This method requires only the management of the single factor fund on the part of the manager and leaves the role of monitoring, allocation adjustment, and governance function in the hands of the investor.

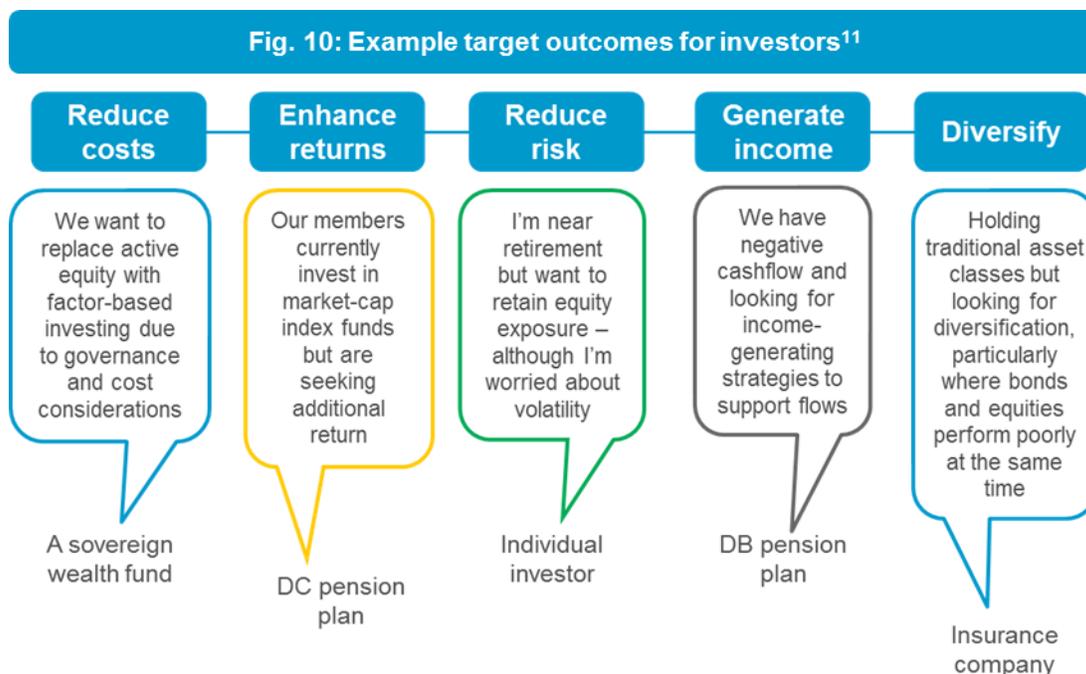
There is the risk, however, that many investors may exit an active strategy and re-allocate proceeds to a single factor. Such investors should be aware that this strategy could lead to concentration risk as the behavior of factors is time-varying (see figures 4 and 5) which could lead to underperformance in specific macro-economic cycles and market circumstances.

For investors choosing to exit actively managed style funds, this implementation of FBI is perhaps best used as a direct replacement strategy; for example, replacing an actively managed value fund with a value factor index.



Outcome-oriented

Investors may choose to work with a manager to design a customized factor-based solution with a particular outcome in mind. This could be a desire to reduce risk, reduce costs, achieve a certain return objective, or generate further income (see figure 10).



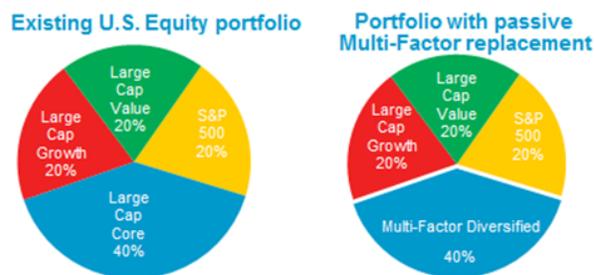
Using a real case study, let's illustrate how FBI has the potential to help improve outcomes for clients. An investor inquired about an approach to help increase risk-adjusted net returns while maintaining factor exposures in their fund of funds structure.

¹⁰LGIMA

¹¹LGIMA

As a starting point we thought a multi-factor approach would be a good replacement for core US equities, while maintaining the other portfolio allocations. We introduced four equally-weighted factors (size, value, momentum, and low volatility), referred to as Multi-Factor Diversified in figure 11. Using our risk systems and multiple approaches to ensure robustness, we produced an analysis demonstrating the interaction of multi-factor with the rest of the portfolio. The approaches used included historical risk and return, holdings-based analysis, principal component analysis, and Fama French Carhart (FFC) return decomposition.

Fig. 11: Case study – combining multi-factor with traditional active equities¹²



In isolation, the Multi-Factor Diversified strategy provided better risk-adjusted returns than the existing manager, so it was already a step in the right direction. However, we think it is more important to consider the total portfolio context, and our analysis focused on results for the entire equity portfolio.

The outcome (see figure 12) was better risk-adjusted returns, as replacing the core manager improved the overall rewarded factor tilts when combined with the other managers.

Fig. 12: Case study – results¹³

Investment	Return	Std Dev	Sharpe Ratio	Alpha	Beta	Effective Stocks	Batting Average	Tracking Error
Existing Blend	8.82	14.71	0.56	0.71	1.02	165	55.17	2.22
Blended w/ SciBeta Diversified	9.53	14.31	0.62	1.53	0.99	287	59.20	2.42

The results illustrate how combining traditional active equities with a multi-factor allocation can help improve risk-return characteristics, as well as improve diversification. Additionally, we would be able to implement this multi-factor approach at a lower cost compared to the fees charged by the large cap core manager.

While this demonstrates very desirable generic features, it is important to note that such strategies could also be used to help achieve specific targeted outcomes. For example, if the client had a strong preference for lower tracking error, we could consider allocating less to the multi-factor portfolio. Similarly, if the client had a higher volatility objective in mind than that of the strategy, we could allocate more to the multi-factor portfolio.

In a nutshell, we believe that using multi-factor in an outcome driven context increases its relevance even further.

Advanced quantitative strategies

It is worth noting that one of the application methods gaining traction in the market is the use of **advanced quantitative strategies**, which require a large degree of risk modeling, intellectual capital and technology in order to generate an additional stream of idiosyncratic returns through advanced portfolio construction, risk weighting, and factor timing. Some managers will use a proprietary definition of factor, active rebalancing, and/or timing of factors to add value. We believe that those

¹²LGIMA

¹³Source: LGIMA, Morningstar Direct, Scientific Beta. Data from May 31, 2006 through June 30, 2017. Hypothetical performance results have many inherent limitations with the benefit of hindsight and no representation is being made that any account will or is likely to achieve profits or losses similar to those shown. In fact, there are frequently sharp differences between hypothetical performance results and the actual results subsequently achieved by any particular trading program. All trading strategies applied to the analysis were available throughout the performance period. However, the analysis includes certain assumptions where actual performance could be different from the hypothetical performance presented. Please see Appendix for further disclosures.

strategies are certainly not without merit but should be evaluated in a way similar to how traditional active managers are evaluated, but in the context of factor exposure – for example, a traditional cap-weighted benchmark is not likely to be appropriate.

Partnering with LGIMA

We believe that LGIMA is uniquely positioned to deliver factor-based solutions to clients. With an exceptional track record in providing custom client-focused solutions, LGIMA and our affiliate, Legal & General Investment Management (LGIM), have established strong credentials in managing factor-based strategies over time.

- As of June 30, 2017, LGIM manages more than \$52 billion across over 20 different alternative-weighted strategies, of which LGIMA manages \$3 billion.
- LGIMA has the resources, the platform, and the intellectual capital to implement a variety of FBI solutions ranging from standard multi-factor strategies to more customized outcome-oriented portfolios.
- LGIMA is a leader in innovation, offering advanced research and analysis in FBI and client-focused FBI portfolio solutions.

Our FBI initiative is driven by a core senior team of five people who work on delivering FBI, with the support of multiple investment professionals including fund managers, strategists and investment specialists.

Contributors



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One of the limitations of hypothetical performance results is that they are generally prepared with the benefit of hindsight. In addition, hypothetical trading does not involve financial risk, and no hypothetical trading record can completely account for the impact of financial risk in actual trading. For example, the ability to withstand losses or to adhere to a particular trading program in spite of trading losses are material points which can also adversely affect actual trading results. There are numerous other factors related to the markets in general or to the implementation of any specific trading program which cannot be fully accounted for in the preparation of hypothetical performance results and all of which can adversely affect actual trading results.

The use of hypothetical performance is subject to inherent limitations derived from the reliance on historical data and the benefit of hindsight. All trading strategies applied to the analysis were available throughout the performance period. However, the analysis includes certain assumptions where actual performance could be different from the hypothetical performance presented.

In order to match the index returns a fund would need to track the security weightings in a way that would exactly match the Index and that the economic and market conditions were sufficient to have allowed effective execution of replicate the risk and return characteristics of the index. There are a number of factors that could reduce our ability to track index positions perfectly, including small position sizes and/or available liquidity in some securities. We estimate the net effects of index- and trading-related factors on the passive components of the strategy would affect performance either favorably or unfavorably depending on the size of the portfolio.

Not all strategies offered by LGIMA are appropriate for all investors.

Past performance, including hypothetical returns, does not guarantee future results, and the strategy bears the risk of potential loss.