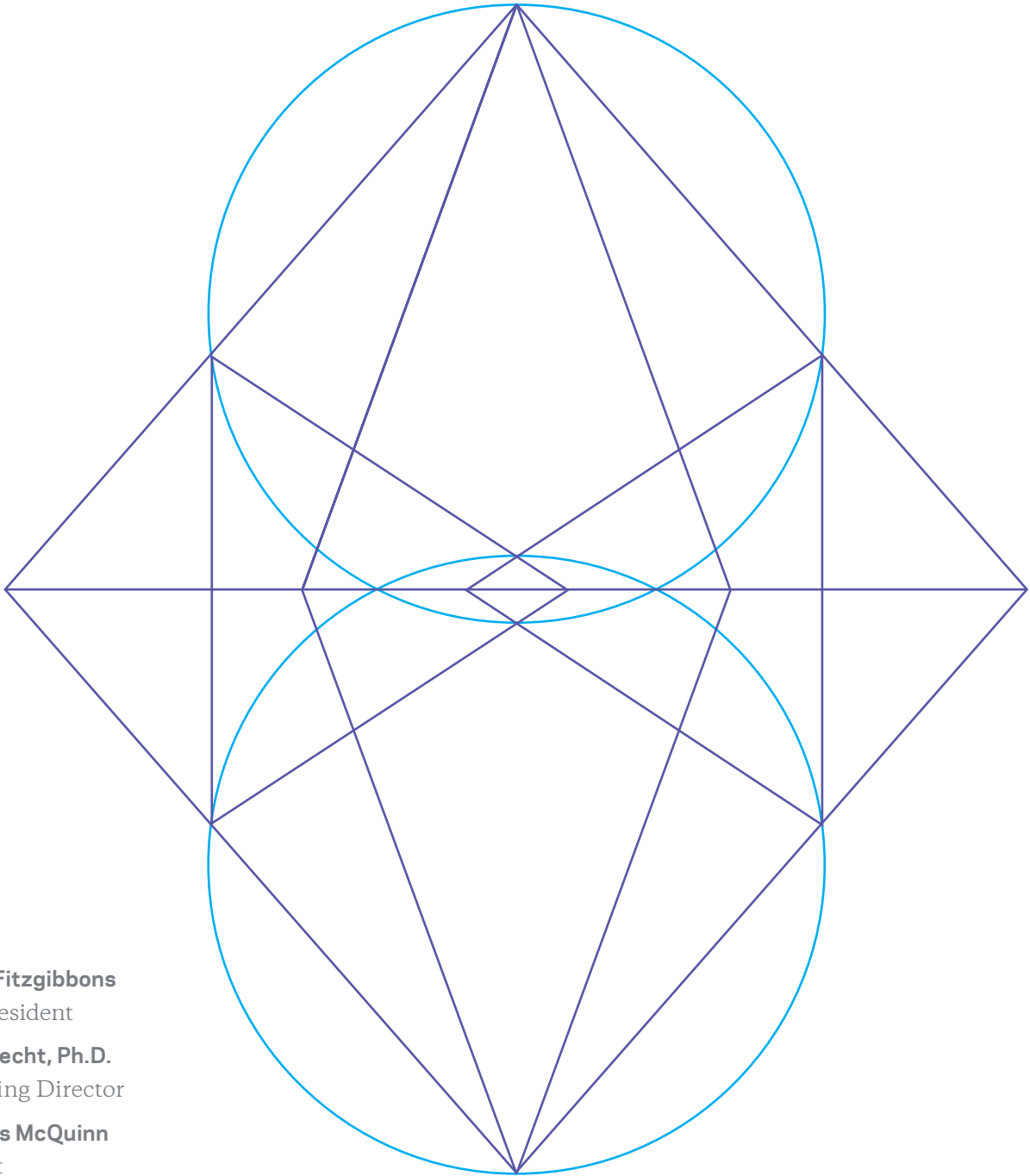# Portfolio Construction Matters

A Simple Example Using Value and Momentum Themes

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Abstract

Portfolio implementation is critical for investment success. Seemingly minor differences in portfolio construction can lead to major differences in performance outcomes. In this paper, we summarize the differences between two popular portfolio construction approaches, "mix" and "integrate," and examine a handful of value and momentum-themed examples to demonstrate how these differences play out in practice. Theory, intuition, and empirical evidence suggest these decisions are of first order importance and that the "integrate" approach has a material edge. In sum, when underwriting new investment strategies, it is important to fully understand the various portfolio construction approaches and their implications for future performance.

A more detailed and in-depth coverage of this topic can be found in *Long Only Style Investing: Don't Just Mix, Integrate* (Fitzgibbons et al, 2016).

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Introduction

Discretionary and systematic equity managers have been incorporating value (e.g. buying low PE stocks) and momentum (e.g. buying recently outperforming stocks) themes into their investment process for decades. In fact, these types of themes have become so prevalent that an entire "smart beta" industry now exists.

While the general efficacy of value and momentum is now widely accepted, there are disagreements on how best to "combine" these themes within the context of a portfolio. In other words, portfolio construction techniques tend to differ across managers. One popular approach, which we'll call "mix," first identifies the top value stocks, then separately identifies the top momentum stocks, and lastly "mixes" the top value stocks with the top momentum stocks to form the portfolio. In contrast, a competing approach, which we'll call "integrate," first blends each stock's value and momentum score into one average composite (or "integrated") measure and then builds a portfolio based on the stocks with the highest "integrated" score. **Exhibit 1** summarizes these differences.

Exhibit 1

Comparing the "Mix" and "Integrate" Approaches

Portfolio Construction Technique 1 "Mix"

1. Identify top value stocks

2. Identify top momentum stocks

3. "Mix" the top value stocks with the top momentum stocks to form the portfolio

Portfolio Construction Technique 2 "Integrate"

1. Blend each stock's value and momentum score into one average composite (or "integrated") measure

2. Choose the stocks with the highest "integrated" score

Source: AQR.

"Mix" And "Integrate" Portfolio Examples

In order to better understand the two different portfolio construction techniques and appreciate how the end portfolios are materially different, let's go through a few examples. We'll start with an easy example and then move to a more thorough, complex example. A more detailed and in-depth coverage of this topic can be found in *Long Only Style Investing: Don't Just Mix, Integrate*.

Exhibit 2 reports the earnings-to-price ratio ("value" characteristic) and last 12 month return ("momentum" characteristic) for 10 consumer discretionary stocks as of 10/31/2016. If we were tasked with identifying the 4 stocks with the most attractive prospective returns, which 4 stocks would we choose? As a "mix" manager, we would first separately rank each stock based on the earnings-to-price ratio ("value" characteristic) and last 12 month return ("momentum" characteristic). Then, we would choose the top 2 ranked value stocks (shaded in light purple in Exhibit 2) and top 2 ranked momentum stocks (shaded in dark purple in Exhibit 2). As an "integrate" manager, we would first take an average of each stock's value and momentum rank (i.e. create an "integrated" rank). Then, we would choose the 4 stocks with the highest integrated rank (shaded in light blue in Exhibit 2).

Exhibit 2

Simple Portfolio Construction Example: 10 Consumer Discretionary Stocks

Evaluation of Value and Momentum Characteristics

Company Name	Value: Earnings-to-Price	Value Rank	Momentum: Last 12 Month Return	Momentum Rank	Average of Value and Momentum Rank	Comment
Culp Inc.	5.7%	7	-8.7%	6	6.5	
Deckers Outdoor	7.2%	4	4.2%	4	4.0	Unique to "Integrate"
Dr. Horton Inc.	8.2%	3	-4.8%	5	4.0	Unique to "Integrate"
Fossil Group Inc.	12.2%	1	-50.6%	10	5.5	Unique to "Mix"
Hasbro Inc.	5.0%	8	9.8%	3	5.5	
Helen of Troy	6.9%	5	-21.5%	8	6.5	
Hovnanian Enterprises A	4.0%	9	-30.7%	9	9.0	
Johnson Outdoors A	6.0%	6	69.4%	1	3.5	Common to Both
Perry Ellis International	9.1%	2	-14.6%	7	4.5	Common to Both
Vince Holding Co.	2.2%	10	24.9%	2	6.0	Unique to "Mix"

Source: AQR, Bloomberg. The above stocks were selected from all Consumer Discretionary stocks within a universe roughly similar to the Russell 3000 using the following method. In order to ensure reasonable dispersion between the Value and Momentum characteristics to make the example both more illustrative and more representative of the overall sector, stocks were first ranked by their Momentum characteristic, and then every 10th stock was selected. This process was used to generate a random sampling that still had a meaningful distribution of Momentum and Value characteristics. In the rankings above, a lower rank means a stock is better along the given metric, with 1 being the best. The securities presented herein are for illustrative purposes only and not a representation that they will or are likely to achieve profits or losses. Not to be construed as investment advice or a recommendation. Past performance is not a guarantee of future performance. Please read important disclosures at the end of this document.

The "mix" and "integrate" approaches clearly lead to different end portfolios. In the previous example, there is only overlap in 50% of the positions — out of the 4 stocks in the end portfolios, only 2 stocks (Johnson Outdoors and Perry Ellis) are included in both the "mix" and "integrate" portfolios. Why the low overlap? High (low) earnings-to-price stocks tend to have poor (great) recent performance, i.e. the stock's value and momentum characteristics are negatively correlated. The one-dimensional "mix" approach processes information in a sequential, piecemeal manner. It identifies the top value (momentum) stocks in a silo. In contrast, by blending each stock's value and momentum score, the "integrate" approach explicitly takes into consideration all relevant information at the same time and, thus, correctly incorporates the offsetting nature of value and momentum. A top value stock with a horrible momentum rank will have a mediocre "integrated" rank and, thus, will not make it into the "integrate" portfolio. However, this same stock will make it into the "mix" portfolio as a "top value stock."

Let's build on our basic understanding of the "mix" and "integrate" portfolio construction techniques by considering a much larger sample of stocks. In particular, we'll assume 1) there are 500 stocks in our investment universe, 2) the stock-level value and momentum exposure correlation is -0.6, and 3) the end portfolios contain 125 stocks each. The plots in **Exhibit 3** graph each stock's momentum exposure (Y axis) versus its value exposure (X axis). The purple dots in figure 3a represent the stocks chosen for the "mix" portfolio. The purple dots at the top (right) represent the stocks with the highest momentum (value) exposure. Figure 3b represents the "integrate" portfolio with light blue dots. The stocks represented by the light blue dots might not have the highest value exposure or the highest momentum exposure in isolation, but they do have the highest blended (or "integrated") value and momentum exposure. Figure 3c compares the "mix" and "integrate" portfolios. Clearly, there are many stocks in the "mix" portfolio not present in the "integrate" portfolio (purple dots) and vice versa (light blue dots). The purple dot stocks from figure 3c have offsetting extreme value and momentum exposures, making them good candidates for the "mix" portfolio and poor candidates for the "integrate" portfolio. The light blue dot stocks from figure 3c have slightly above average value and momentum, making them good candidates for the "integrate" portfolio. However, the slightly above average exposures are not extreme enough to make it into the "mix" portfolio. The green dot stocks make it into both portfolios.

Exhibit 3

Complex Portfolio Construction Example: 500 Simulated Stocks

Figure 3a: The Mix Portfolio
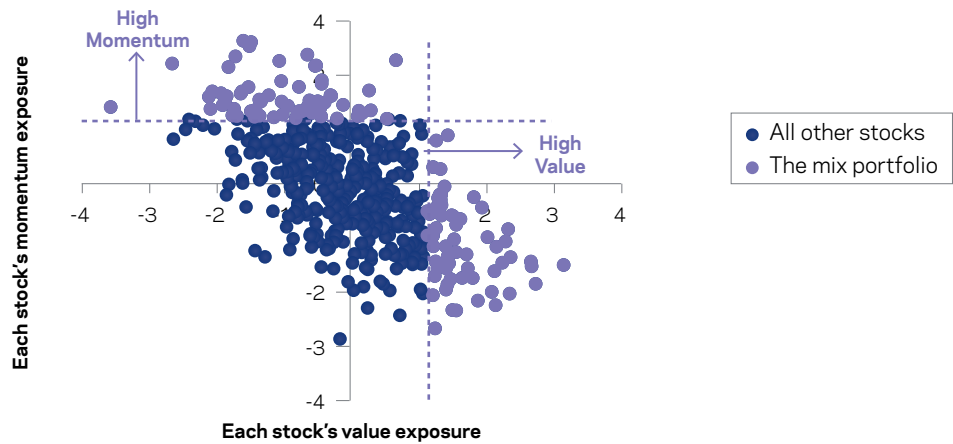
Figure 3b: The Integrated Portfolio
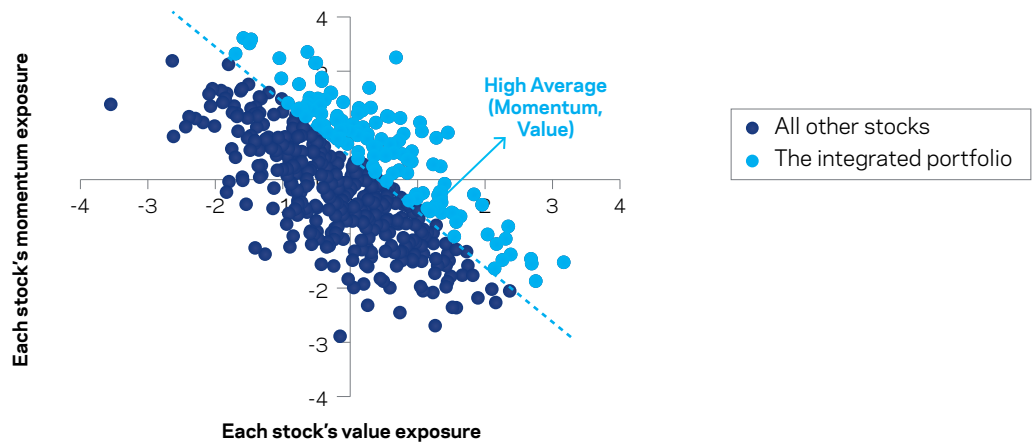
Figure 3c: Comparing the Mix and Integrated Portfolios
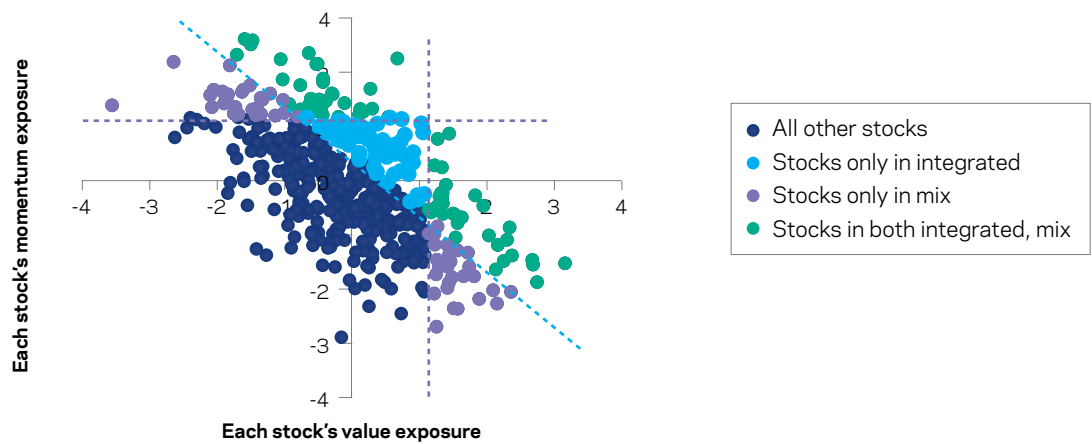
Source: AQR. Hypothetical performance results have certain inherent limitations, some of which are disclosed at the end of this document.

"Mix" Versus "Integrate": Which Is Better?

Now that we've illustrated the differences between the "mix" and "integrate" portfolio construction techniques, it is natural to ask, "which is better?" If both value and momentum are important for prospective returns, then both need to be considered before identifying the highest expected return stocks. The "integrate" approach does just this by first blending each stock's value and momentum scores. Stocks with great value scores but poor momentum scores have mediocre expected returns, and the "integrated" portfolio correctly avoids these stocks. In contrast, the "mix" approach chooses stocks with partial information — focusing on value while ignoring the potential offsetting nature of momentum and vice versa. As a result, the silo-based "mix" approach incorrectly allows some mediocre stocks (e.g. great value offset by poor momentum) into the end portfolio.

Additionally, the "integrate" approach is more intuitive. It focuses on buying cheap (value) AND improving (momentum) stocks. This helps protect the investor from buying 1) a cheap stock that is susceptible to getting cheaper or 2) an improving stock that is extremely expensive.

Beyond the theoretical and intuitive arguments, the actual data suggests that the "integrate" edge in practice is material. During the 1993-2015 period, forming "integrate" value and momentum portfolios within the liquid developed country stock universe outperformed the "mix" portfolio by approximately 1% per year (at an assumed tracking error of 4%). Additionally, the "integrate" portfolio delivered a 40% higher information ratio (as shown in **Exhibit 4**).

Exhibit 4

Hypothetical Portfolio Risk-Adjusted Returns, February 1993 — December 2015
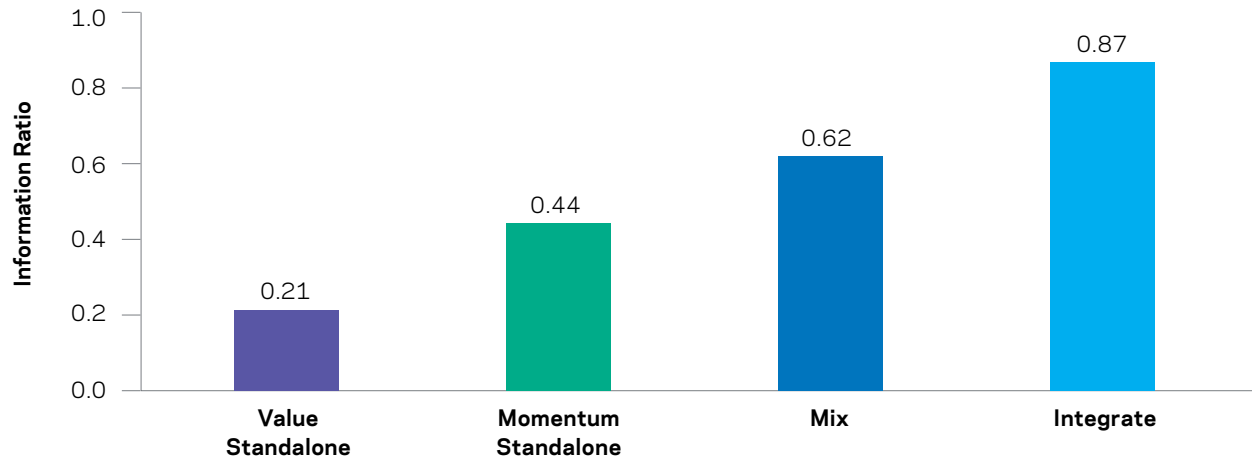
Source: AQR. *Long-Only Style Investing: Don't Just Mix, Integrate.* All data from 2/1993 – 12/2015. Risk-adjusted return is the Information ratio. Information ratio is defined as the excess return of a portfolio versus its benchmark divided by the standard deviation of those excess returns (tracking error). Excess returns here are against the MSCI World Index. Please see the disclosure section for the methodology and universe used to create the hypothetical portfolios. Hypothetical performance results have certain inherent limitations, some of which are disclosed at the end of this document.

Clearly, as demonstrated above, portfolio implementation is critical for investment success. Seemingly minor differences in portfolio construction, e.g. "mix" versus "integrate," can lead to major differences in performance outcomes. This point is underappreciated by many investors.

In sum, when underwriting investment strategies, such as value and momentum, make sure to take the time to fully understand the various portfolio construction approaches and their implications for future performance.

Disclosures

Our hypothetical portfolios are based on liquid, large stocks in developed countries (roughly the MSCI World benchmark universe) over the period from February, 1993 to December, 2015. To minimize any unintended differences between the two implementations, we use identical style signals, the same weighting scheme across styles, and similar optimization methodologies. Both implementations weight the value and momentum styles at 50% each, a weighting scheme designed to provide a balanced contribution to risk from each style. All portfolios are rebalanced monthly.

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