APPENDIX B
THE TRUTH ABOUT SMART BETA

When Nobel Prize winner William F. Sharpe was asked what he thought about the term "smart beta," he responded that hearing it makes him sick. While our reaction is not as extreme, we do urge caution. The reason is that many of the strategies often referred to as smart beta are mostly marketing gimmicks. They are simply re-packaged, re-branded quantitative management strategies that deliver exposure to the various factors we have discussed. However, the fact that they are marketing gimmicks does not mean they do not work; indeed, we advocate exposure to many of the same factors they target. Thus, we want to be sure that we do not make the mistake of throwing the proverbial baby out with the bathwater.

The argument that there cannot be such a thing as "smart" beta is that beta is just beta, or loading on a factor. William Sharpe coined the term "beta" when he developed the capital asset pricing model (CAPM) of modern portfolio theory. As Sharpe explains, beta (in this case, market beta) is simply a portfolio's sensitivity to movements in the overall market. Which raises the

question: So how, then, do you get smart out of that? It is neither smart, nor alternative, nor better. It just is.

As we have discussed, as asset pricing theory advanced and additional factors were added, we learned that what had looked like outperformance (alpha) by active managers relative to the CAPM was actually the result of exposure to other factors — or betas of the size, value, momentum, and profitability/quality factors.

While multifactor models do a much better job of explaining returns than the original CAPM, anomalies (remember, size, value, and momentum were once considered anomalies) that the models cannot explain still remain. Among this group of anomalies is that any asset with a lottery-like distribution has been shown to have poor risk–return characteristics. Exposure to these assets results in negative alphas (below-benchmark returns). This brings us back to the question of whether or not there is such a thing as smart beta. In our view, while it might just be a matter of semantics, the answer is yes. Let us see why this is the case.

FUND CONSTRUCTION RULES

There can be many different portfolios that have the same loading or exposure to the various factors. In other words, their betas are the same. Let us assume that we start with a mutual fund (Fund A) that owns the total U.S. market. By definition, it will have a market beta of 1. The manager of Fund B believes that

she can create smarter beta by screening out all the stocks with lottery-like distributions (such as IPOs, "penny stocks," stocks in bankruptcy, and extremely small growth stocks). Fund B will also likely have a market beta of 1, but it can be expected to produce a higher return in the long term. Because the market betas are the same, it seems perfectly appropriate to say that Fund B has smarter beta, or better beta. Or you could say that if Fund B indeed earned a higher return, it has alpha. The difference is just semantics, not a real one.

Creating intelligent construction rules is just one way a fund can create smarter beta. Management of trading costs presents another.

TRADING COSTS

If a fund's sole goal is to replicate an index — which is typically the case for index funds — it must trade when stocks enter or exit that index. This causes the fund to be a demander (buyer) of liquidity. It also forces the fund to demand that liquidity at the same time other index funds are doing so. In addition, the fund must hold the exact weighting of each security in the index. A fund whose goal is instead to earn the return of the asset class (or factor) in which it invests, and is willing to live with some random tracking error, can be more patient in its trading strategy and avoid demanding liquidity. For example, it can use algorithmic trading systems to place market orders, reducing trading costs. It can also use block trading strategies to take

advantage of discounts (premiums) offered by active managers that desire to quickly sell (buy) large amounts of stock. Patient trading reduces transaction costs, and block trading can even create negative trading costs in some cases.

There is yet another way in which beta can be made smarter.

MULTI-STYLE VERSUS SINGLE-STYLE FUNDS

We have made the case that investors should at least consider diversifying their portfolios across a broad range of factors. If you decide to do so, your next decision involves whether to invest in a number of single-style funds or in a single fund that provides exposures to multiple factors. Both approaches could provide the same exposure to each factor. However, a well-designed multi-style fund is smarter beta. One reason is that a multi-style approach can net different style signals before trading. Consider an investor who desires exposure to both value and momentum. To gain exposure to both factors, he buys both a value fund and a momentum fund. Stock XYZ has fallen in price and enters the buy range of the value fund. At the same, the recent poor performance of the stock causes the momentum fund to sell it. Multi-style funds avoid needless turnover and its associated costs — and for taxable investors, potentially lower their tax burden. While single-style funds are simpler, there are advantages to multi-style funds.

CHOICE OF INDEX AND FUND CONSTRUCTION RULES

Yet another example of smarter beta is the choice of benchmark index and the rules used to construct portfolios, including how closely a fund adheres to its underlying benchmark. This can be important because returns can be affected by how often an index reconstitutes. Most indices (such as the Russell and RAFI Fundamental indices) reconstitute annually. The lack of a more frequent reconstitution schedule can create significant style drift. For example, from 1990 through 2006, the percentage of stocks in the Russell 2000 Index in June that would then leave the index when it reconstituted at the end of the month was 20 percent. For the Russell 2000 Value Index, the figure was 28 percent. The result is that a small-cap index fund based on the Russell 2000 would have seen its exposure to the small-cap risk factor drift lower over the course of the year. For small value funds based on the Russell 2000 Value Index, their exposure to both the small and value premiums would have drifted lower. The drift toward lower exposure to these risk factors results in lower expected returns. To avoid this problem, a fund could choose to reconstitute monthly, or quarterly, depending on how it affects turnover and transaction costs.

We hope that the following provides a good example of why smart beta is not entirely a marketing gimmick. Recall that a fund can demonstrate smarter beta in its choice of fund

construction rules. This point is best made by performing a regression analysis on the four leading small-cap indices: the Russell 2000, the CRSP 6–10, the S&P 600, and the MSCI US Small Cap 1750. Table B.1 shows the results of a four-factor (market beta, size, value, and momentum) regression using the Fama-French factors, covering the period from 1994 (the inception date of the S&P 600) through December 2015. The *t*-statistics are in parentheses.

TABLE B.1: SMALL-CAP INDICES AND FACTOR EXPOSURES (1994–2015)

INDEX	ANNUAL ALPHA (%)	MARKET BETA	SIZE	VALUE	MOM.	R2 (%)	ANNUALIZED RETURN
CRSP 6–10	0.98 (1.8)	1.01 (90.3)	0.86 (60.3)	0.16 (10.1)	–0.14 (–15.1)	99	10.3
MSCI 1750	–0.01 (0.0)	1.04 (68.1)	0.61 (31.1)	0.26 (12.4)	–0.03 (–2.2)	97	10.3
RUSSELL 2000	–1.96 (–2.9)	1.01 (72.8)	0.79 (44.4)	0.26 (13.3)	0.01 (0.7)	97	8.4
S&P 600	–0.31 (–0.3)	0.98 (47.4)	0.70 (26.5)	0.35 (12.1)	0.01 (0.7)	94	10.2

To begin our analysis, we note that all the R-squared figures are very high, meaning the model is doing a good job of explaining returns. And almost all the loading statistics are highly significant. During the period, using Fama-French data, the market beta premium was 6.3 percent, the size premium was 1.2 percent, the value premium was 1.3 percent, and the momentum premium was 4.4 percent.

As you can see, all four indices had very similar exposure to market beta, ranging from 0.98 to 1.04. However, we see much greater differences in the exposure to the other factors. Exposure to the size factor ranged from 0.86 for the CRSP 6–10 Index to as low as 0.61 for the MSCI US Small Cap 1750 Index. Exposure to the value factor ranged from 0.35 for the S&P 600 Index to 0.16 for the CRSP 6–10 Index. Exposure to the momentum factor ranged from 0.01 for both the Russell 2000 Index and the S&P 600, to –0.14 for the CRSP 6–10 Index.

The CRSP 6–10 Index had the highest exposure to the size factor (providing a relative boost to its return) but the lowest exposure to the value and momentum factors (creating a drag on returns). The negative impact of the lower exposure to value and momentum offset the benefit of its higher exposure to the size premium. And the index did manage to produce an annual alpha of 0.98 percent. What is more, it was close to being statistically significant at the 5 percent level (*t*-stat = 1.8).

Relative to the CRSP 6–10 Index, the MSCI US Small Cap 1750 Index's lower loading on size was offset by its higher loadings on the other three factors. The result was that it produced the same annualized return of 10.3 percent. The alpha of the index was effectively zero.

A similar story reveals itself when we compare the results of the CRSP 6–10 Index relative to the S&P 600 Index. The latter's higher value and momentum loadings were almost sufficient to offset its lower size loading and slightly lower market beta loading. The result was that the S&P 600 Index underperformed the CRSP 6–10 Index by just 0.1 percent. The S&P 600 did

produce a negative annual alpha of –0.31 percent. However, the negative alpha was not close to being statistically significant.

The Russell 2000 Index data tell a very different story. Compared to the CRSP 6–10 Index, it had the same loading on market beta. Its lower loading on the size factor was more than offset by its higher loadings on the value and momentum factors. This should have resulted in a higher return for the Russell 2000 Index. However, the Russell 2000 produced a negative annual alpha of –1.96 percent. And that resulted in it returning just 8.4 percent, 1.9 percent less than the returns of the CRSP 6–10 and the MSCI US Small Cap 1750 indices.[10] As you can see, the index a fund chooses to use to establish its fund construction rules can make a dramatic difference in the return received.

This example demonstrates that it is not only important for investors to make their choice of funds based on the amount of exposure they desire to each of the factors that explain returns, but also to consider how the fund's construction and implementation rules can impact returns — an effect that can be significant.

10 To be fair, the Russell 2000 Index follows a very transparent constitution process, which can be a very useful characteristic for a benchmark, although not necessarily for an index in which to invest. In fact, the Russell 2000 has been by far the most popular small-cap index in terms of assets either indexed or benchmarked to it. This has made it a prime target for front-running, lowering the index's returns. If other small-cap indices become more popular, they too may suffer a similar fate. This is another reason why we consider that a smarter way of obtaining exposure to any type of beta is not strictly adhering to a benchmark.

We are certainly in favor of strategies that provide exposure to the factors we advocate in this book, whether they are dubbed "smart beta" or not. For funds using proprietary, newly minted factors that do not meet our criteria, we do urge caution. Tread carefully and remember that the details of implementation matter quite a bit as well. The bottom line is that the use of intelligent, patient trading strategies and incorporating the findings from academic research can result in the design of portfolios that produce results superior to total market portfolios and pure index funds. In other words, sometimes smart beta is really smarter beta.