

Designing Smart Beta Portfolios: The Role of Factor Models and Technology Considerations

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Charles River recently discussed how Smart Beta products can improve portfolio diversification, minimise undesirable correlation risk, and deliver better risk-adjusted performance. These products are increasingly popular with both asset owners and investment managers because they

provide conveniently packaged exposure to a number of risk factors at low cost.

This article continues the discussion, focusing on the pivotal role of factor models in designing these innovative products, and technology considerations for firms managing Smart Beta portfolios.

Three types of factor models

Factor models are central to helping portfolio managers analyze exposures, stress test portfolios, forecast future (ex-ante) risk, and attribute performance. Three complementary approaches to factor modeling are currently used:

Fundamental models decompose risk using a few easily understood factors such as momentum and value for equities and key rate durations and spreads for fixed income. Intuitively appealing and solidly grounded in decades of academic research, fundamental models are used for performance attribution, portfolio optimization and risk decomposition. However, since fundamental models are defined in terms of known factors, they can become less accurate when new, unknown factors emerge.

Statistical models use a numerical technique called principal components analysis (PCA) to calculate risk exposures, without requiring any assumptions about what those factors represent. Unlike fundamental models, PCA-based models adapt readily to changing trends and correlations in the underlying markets. This makes statistical models especially useful during times of market stress when historical asset correlations break down. However, the factors derived from statistical models lack the easy interpretability of fundamental models.

Macroeconomic models calculate risk exposures using economic time series such as inflation, industrial production, and the U.S. Dollar exchange rate as factors. This approach augments fundamental and statistical factor models by gauging the impact of economic conditions on a portfolio. These models are used primarily for portfolio stress testing and performance attribution.

Supporting Smart Beta portfolios across the investment process requires a number of additional capabilities. These all leverage factor models to varying degrees:

Portfolio optimisation

Optimisation provides additional value by enabling managers to construct portfolios that maximise returns for a given level of risk, subject to a number of user-specified constraints. This involves the use of mathematical methods that determine the optimal weight of each security in a portfolio. Optimisation can add value in several ways for both single- and multi-factor Smart Beta products: by minimising volatility, reducing turnover and transaction costs, and making efficient use of leverage.

Several types of constraints are typically specified:

Trading costs are central to the success or failure of a Smart Beta strategy. For example, a strategy that targets a value factor buys inexpensive stocks and shorts expensive stocks (based on some valuation metric). Over time, if the strategy is sound, inexpensive stocks will increase in value and will need to be sold, while expensive stocks that were shorted will need to be covered, forcing turnover in the portfolio. Optimisation attempts to minimise these costs.

The ability to **transact short sales** of securities based on some factor-based metric is a key component of many Smart Beta strategies. Optimisers must handle short sale constraints appropriately, either by avoiding “hard to borrow” securities, or by substituting derivatives or inverse ETFs in place of equities in order to create short exposure. To support compliance and regulatory obligations, additional constraints on short sales by security, sector or asset class must also be supported.

Liquidity constraints prevent stocks below a certain price threshold or market capitalization from being included in the portfolio. Optimizers also reduce concentration risk by capping the weight of any individual security or issuer, or by ensuring that a minimum number of securities are included in the portfolio.

Tax-efficient optimisation seeks to offset realised capital gains with realized losses. This requires portfolio evaluation at the

tax-lot level and may actually increase portfolio turnover. Optimisation balances tax benefits against transaction costs, which introduces additional computational complexity.

Scenario analysis and stress testing

Charles River recently discussed how factor-based scenario analysis enables more informed asset allocation and portfolio construction decisions. Stress testing is another application of scenario analysis, where a portfolio manager uses a macroeconomic factor model to understand how a sudden spike in oil prices or widening credit spreads would impact their portfolio. Being able to quickly construct and visualize an adverse hypothetical scenario helps managers design appropriate hedging strategies or liquidate securities whose valuations would be most impacted by the scenario.

Performance measurement and attribution

Historical analysis of a Smart Beta portfolio is key to quantifying risk-adjusted performance, and for back testing new investment strategies. Performance attribution explains the sources of active portfolio returns. A return-based attribution framework is a standard industry approach that measures the sources of active return due to allocation decisions when investing in any single category, such as sector, industry or country. It also helps managers understand the impact of their security selection decisions within each of the allocated categories.

Factor-based attribution extends the analysis, by further assessing the impact of securities' fundamental characteristics/factors such as momentum and style on overall active return of the portfolio. It provides insight into how each asset characteristic contributed towards their security selection decision. Firms managing funds-of-funds use factor-based attribution to determine whether their sub-managers are truly generating alpha above and beyond their intended factor exposures, or merely providing factor tilts. The factors used for performance attribution can also be used for attributing risk, allowing managers to analyse portfolio returns on a risk-adjusted basis.

Technology considerations

The ability to construct and manage Smart Beta products requires more sophisticated technology than traditional order and portfolio management systems can provide. Minimum required capabilities include factor-based ex-ante and ex-post risk, scenario analysis, performance attribution, and portfolio optimisation.

Differentiated technology solutions combine these capabilities into a single platform that leverages a unified source of data and analytics. An integrated platform enables greater automation, scalability and flexibility.

By **automating manual processes** and supporting exception-based workflows, technology helps portfolio managers focus on value-added activities and minimise potential errors. A centralised portfolio management workspace incorporating risk and attribution provides further efficiencies by eliminating the need for multiple systems.

Firms with in-house factor models or existing vendor relationships expect to incorporate those models in their technology stack with minimal effort or integration costs. A **flexible and open architecture** is key to supporting this requirement. As more assets flow to Smart Beta, **scalability** is critical. Cloud based solutions provide software updates and hardware upgrades, high availability, and cybersecurity, removing significant operational burdens for asset managers.

Redefining investment management

Smart Beta is shifting the balance of power between asset owners and investment managers. Where asset owners traditionally diversified across multiple managers offering different strategies, they can now diversify across factors at far lower cost. Rather than allocating to managers based on consultant recommendations and relationships, factor-based attribution enables manager selection based on true alpha generation skills. Viewing exposures through a factor lens also provides far timelier and realistic risk assessments than backward-looking manager performance reports.

The trend toward lower management fees and evidence-based manager selection will likely continue. Buy-side firms that invest in the technology and human resources required to deliver Smart Beta products at lower cost than competitors will be well positioned in this new environment.

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