NORTHERN TRUST

FACTOR INVESTING: NOT WHICH, BUT WHEN

Investors interested in reaping the benefits of factor-based investing have long searched for the best factor when making a portfolio allocation. Based on our research, however, investors should also ask themselves *when* they should favor each factor.

Factors follow unique cycles, outperforming cap-weighted indices during some periods and underperforming during others. With this in mind, we believe that time diversification – the varying of factor exposures based on investment horizons – can be used to address the issues associated with factor market cycles and to improve portfolio outcomes.

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FACTOR CYCLE LENGTHS

To understand the length of various factor cycles, we used a unique multi-period portfolio optimization algorithm to determine which factors had the most favorable results at different points during a market cycle. For example, we found factors with longer cycles such as size and value would be preferred for portfolios with long investment horizons, while a factor such as low volatility has a shorter cycle and should be matched up with shorter investment horizons. The factors studied and their associated market cycle lengths can be seen in Exhibit 1.

EXHIBIT 1: OPTIMAL FACTOR EXPOSURES ACROSS THE PORTFOLIO TIME HORIZON

Time to Liquidation	Optimal Factor Exposures	Examples
More than 8 years	Long cycle factors	Size, value, momentum
4 to 8 years	Intermediate cycle factors	Dividend yield
Less than 4 years	Short cycle factors	Low volatility

Source: Northern Trust Quantitative Research

UNDERSTANDING FACTOR CYCLES

One drawback of factor-based investing is that factors can underperform for long periods. To illustrate this, we calculated value-factor returns using the MSCI Barra definition of value within the Russell 3000 universe from January 1979 to June 2014. We ranked all stocks in the universe based on the MSCI value definition, put them into equally weighted quintiles each month, and calculated the subsequent return for each quintile. We then defined the resulting value-factor return as the first quintile (highest value) return minus the benchmark return, which provides us the value factor return net of market beta.

Exhibit 2 shows that the cumulative return line slopes upward, suggesting that over time the value factor does indeed have a positive return. However, value underperformed during several protracted periods as shown in the shaded areas. For more accurate results, we used a statistical process known as spectral analysis to produce accurate cycle-length estimates (see Exhibit 3). Clearly, cycle lengths vary substantially across factors.

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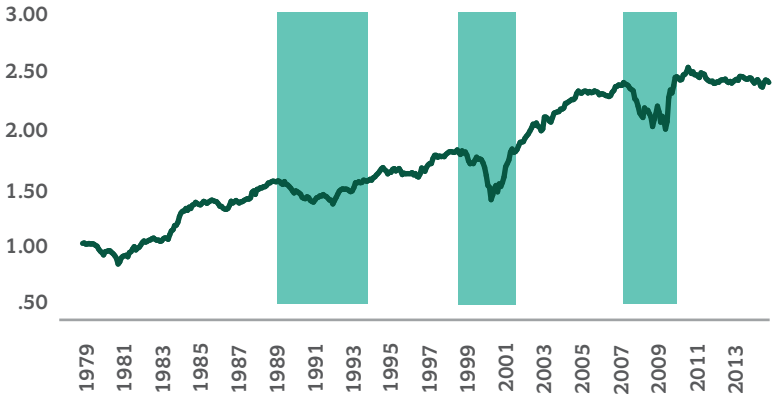
EXHIBIT 2: VALUE FACTOR CUMULATIVE RETURNS
For first-quintile returns of the Russell 3000



Note: Dollar values are calculated as the value of $1 invested in the top quintile of value less the Russell 3000 performance. Shaded bars represent periods of underperformance.
Source: Northern Trust Quantitative Research

EXHIBIT 3: VALUE FACTOR CUMULATIVE RETURNS
Cycle lengths as determined using spectral analysis

Factor	Major Cycle Length
Low volatility	12 months
Dividend yield	22 months
Momentum	39 months
Value	47 months
Size	106 months

Source: Northern Trust Quantitative Research

106

MONTHS - THE LENGTH OF THE LONGEST FACTOR CYCLE (SMALL SIZE FACTOR)

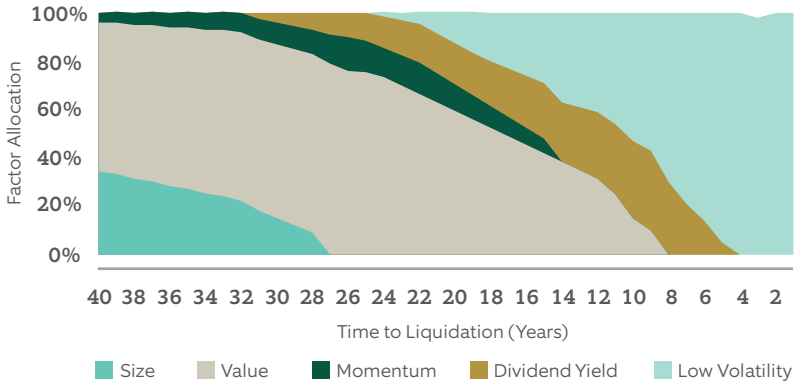
USING FACTOR CYCLE LENGTHS IN PORTFOLIO CONSTRUCTION

It makes sense for investors to focus on factors with cycle lengths less than their investment horizon to avoid forced liquidation before the cycle completes and the factor can fully recover.

To test this concept, we determined the factor allocation glide path that maximizes investor utility across the entire investment horizon (see Exhibit 4). At every year in the investment horizon, the model determines the optimal holdings of the MSCI Size, Value, Momentum, Dividend Yield and Low Volatility equity indices, our proxies for this calculation.

The investor's holding period should be at least double the estimated length of the factor cycle.

EXHIBIT 4: OPTIMAL FACTOR ALLOCATION



Source: Northern Trust Quantitative Research

OPTIMAL ALLOCATION TO VALUE:

44%

WITH 30 YEARS TO LIQUIDATION

13%

WITH 10 YEARS TO LIQUIDATION

This demonstrates a natural ordering of factor exposures over the investment horizon. Long cycle factors such as size, value and momentum appear early in the allocation and are gradually reduced as the portfolio matures.

In addition, factors leave the portfolio at roughly twice their cycle length. For example, we measure the dividend-yield cycle at 22 months and it leaves the portfolio about 48 months prior to liquidation. We therefore propose that the investor's holding period should be at least double the estimated length of the factor cycle.

OPTIMAL FACTOR CHOICE DEPENDS ON INVESTMENT HORIZON

Investors interested in, or currently using, factor-based investments should add another dimension to their investment decision-making process. Rather than focusing solely on the choice of factors, the investment time horizon should be seriously considered as well. Investors with short horizons should avoid long-cycle factors and instead should opt for shorter-cycle factors like dividend yield and low volatility. Conversely, investors with longer investment horizons are better positioned to hold longer-cycle factors like value, size, and momentum. This approach to factor-based allocations allows investors to take advantage of time diversification and mitigate the effects of factor cycles on returns.

IMPLEMENTING THE IDEA

As we have explored in this paper, it is not a question of choosing the right factor for your portfolio, rather matching factors to your investment time horizon and objectives. If you would like to work with us to identify the factors best suited to your portfolio and investment objectives please contact your Northern Trust Relationship Manager or email EngineeredEquity@ntrs.com. We have a range of solutions for implementing factor based strategies, from mutual funds to separately managed accounts.

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