



FOUNDATIONS IN FACTORS

THE QUEST TO CAPTURE EFFICIENT ALPHA MEANS CHALLENGING MODERN PORTFOLIO THEORY

Historically, style factors have been shown to deliver superior risk-adjusted returns to passive capitalization weighted indexes and more persistent performance than traditional active management, making them a compelling alternative for investors. Although the efficacy of style factors conflicts with modern financial theory, they have been successfully employed for more than 40 years to improve upon passive capitalization weighted equity portfolios. Empirical studies have repeatedly shown that style factors outperform capitalization weighted benchmarks across most global markets. However, these results are considered anomalous because they are inconsistent with the concept that expected return is determined solely by beta.

Like all investment strategies, style factors are not without potential drawbacks. They are susceptible to prolonged periods of poor relative performance. This cyclical nature is problematic because investors commonly evaluate strategies on a three- to five-year horizon. Style factors, like any active investment strategy, are prone to underperforming over short holding periods and can ultimately lead to divestment at inopportune times. This is why we believe factor diversification improves the chances of investors benefiting from style factors. However, diversification is not the only way to reduce the potential style factor underperformance; we believe portfolios can be explicitly designed to address this risk.

HISTORY AND EVOLUTION OF STYLE FACTORS

William Sharpe introduced the first factor model in 1964 that only included a single factor (beta) and was quite straightforward. This is known as the Capital Asset Pricing Model (CAPM).

Even though the CAPM encompasses all financial assets, equity markets are commonly used as a proxy for the aggregate market portfolio. In this context, the CAPM tells us a stock's expected excess return is entirely determined by its beta, and that the only reliable manner to outperform the market is by holding stock(s)

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with higher systematic risk than the market (beta greater than one). However, according to the CAPM, investors would be foolish to do so because a superior alternative exists with leverage. By borrowing at the risk-free rate and investing in a market portfolio, investors can increase beta beyond one and achieve a higher expected return than an unlevered portfolio with the same underlying investment volatility. If investors are either unwilling or unable to employ leverage, they must accept lower Sharpe Ratios if they wish to outperform the market.

The importance of the CAPM to passive capitalization weighted investing cannot be overstated, as it provides the theoretical justification for holding the market portfolio. However, despite its wide acceptance, there are two assertions of the CAPM that have been consistently challenged.

CAPM ASSERTION #1: MARKET BETA IS THE ONLY SYSTEMATIC RISK FACTOR

If we accept the CAPM as the true market model, we must reject the possibility that other factors are driving returns. If portfolios reliably generate high (low) excess returns, it must be solely the result of higher (lower) beta. Unfortunately for the CAPM, there is plenty of evidence to suggest otherwise.

Dividend yield is only one of several well-documented CAPM inconsistencies. For example, research shows that the average returns of high dividend yield portfolios are greater than those of low dividend portfolios, and that this difference in returns is not attributable to beta. In fact, the betas of the top dividend yield portfolios are actually lower than those of the bottom dividend yield portfolios, which directly conflicts with the CAPM. Either this finding is incongruent with the CAPM assumption that return is solely a function of beta, or these findings are anomalous.

Even though anomalous findings began piling up almost immediately after the publication of Sharpe's paper, it took almost 30 years for a serious CAPM competitor to emerge. In 1992, Eugene Fama and Kenneth French introduced a three-factor model that had much better success in explaining historic stock returns. Although Fama and French's model included Sharpe's beta factor, it rejected market beta as the only systematic risk factor and addressed CAPM anomalies by including factors for size and value.

In 1997, Carhart extended the Fama and French model to include a fourth factor - momentum. Although the three-factor model could explain over 90% of the variation in diversified portfolio returns, momentum was a statistically robust addition to the model that increased its predictive power. Perhaps more importantly, Carhart's model explained the three most prevalent equity market anomalies in one succinct package – value, size, and momentum.

CAPM ASSERTION #2: THE MARKET PORTFOLIO OFFERS THE HIGHEST AT-TAINABLE SHARPE RATIO

The existence of factors beyond market beta is of great interest to academics, but not necessarily investors. If these insights cannot be applied to achieve superior risk-adjusted returns relative to a passive market index, they have little relevance beyond the classroom. Exhibit 1 shows the Sharpe ratios for various factors alongside their respective indices. As you can see below, individual factors have superior Sharpe ratios relative to passive capitalization weighted indices.

EXHIBIT 3: PERFORMANCE OF CAPM ANOMALIES

	Russell 1000 (1980-2018)		MSCI World ex US (1997 - 2018)		MSCI Emerging Markets (1999 - 2018)	
	Avg CW Return	Sharpe Ratio	Avg CW Return	Sharpe Ratio	Avg CW Return	Sharpe Ratio
Panel A: Capitalization weighted index performance						
Market Index	12.5%	0.53	6.2%	0.25	11.8%	0.45
Panel B: Portfolio performance						
Book to Price (Value)	13.2%	0.52	8.6%	0.32	14.5%	0.49
Earnings to Price (Value)	14.6%	0.65	9.1%	0.39	16.8%	0.60
Dividend Yield (Value)	13.7%	0.69	9.1%	0.42	16.2%	0.68
Low Size	15.4%	0.56	8.0%	0.31	14.6%	0.54
Momentum	14.2%	0.55	6.7%	0.28	14.0%	0.53
Low Volatility	11.9%	0.71	6.6%	0.34	11.5%	0.56
ROE (Quality)	13.6%	0.57	7.0%	0.30	12.2%	0.46
Low ROE Variability (Quality)	13.3%	0.65	7.2%	0.33	11.5%	0.49
ROIC (Quality)	13.7%	0.58	7.1%	0.32	12.7%	0.50
Gross Profitability (Quality)	15.1%	0.67	7.7%	0.39	13.0%	0.53

SOURCE: Northern Trust Quantitative Research, FTSE Russell, MSCI, Worldscope, Compustat

IMPLICATIONS FOR INVESTORS

The implications of this to passive investors are obvious. Style factors offer a simple, systematic alternative to generating higher risk-adjusted returns than capitalization weighted indices. Perhaps a less obvious outcome is the disruptive effect this research has had on traditional active investors.

While the CAPM offers no insight into the source of alpha, conventional wisdom has attributed it to the ability of portfolio managers. Managers who consistently generated positive alpha were thought to have superior stock-picking abilities and were highly coveted by investors, as evidenced by their fees. However, the advent of multi-factor pricing models has changed this perception. The explanatory power of multi-factor models is greater than Sharpe’s single factor model, and reduces the amount of unexplained active manager alpha, implying that manager skill could be explained by other systematic factors.

This topic was thoroughly explored in the landmark paper by Carhart (1997), in which he examined the performance of more than 1800 mutual funds between 1962 and 1992. Initially, he found strong persistence in active returns, supporting the notion that managers with superior insights can consistently generate positive alpha. However, after the returns were subsequently adjusted for style factors, the persistence disappeared and alpha was found to be negative, indicating that manager skill actually decreased returns on average.

The interest in style factor investing should not be surprising, given its appeal to both passive and active investors. Similar to capitalization weighted investing, style factors offer a systematic, diversified, and transparent source of return, but with the added benefit of higher Sharpe ratios. Just like traditional active investing, style factors offer the ability to outperform the market, but in a more reliable and cost-effective manner.

Of course, these potential benefits assume that style factors will continue to behave similarly in the future. However, this assumption lacks consensus and represents a key consideration for investors. Despite their success in explaining historic stock returns, multi-factor models face some theoretical difficulties. In particular, they do not address why a premium should result from investing in high value, small size, high momentum, low volatility, and high quality stocks. Unlike the CAPM, which provides an intuitive justification for returns (high systematic risk = high return), the connection between style factors and returns is not so clear.

The genesis of style factor return premia is still open to interpretation, but explanations generally fall into one of three categories:

- **Risk-based explanations** imply that volatility alone is not enough to describe risk, and measures like the Sharpe ratio do not truly represent risk-adjusted performance. In other words, style factor investors earn a premium because they are actually bearing more risk.
- **Structural explanations** assert there are constraints that prevent the CAPM assumptions from holding. The most common of these explanations is that if investors are unable to use leverage, but have high return requirements, they have no choice but to invest in high beta assets. This creates inefficiencies as high beta assets become mispriced relative to the market.
- **Behavioral explanations** suggest that investors are prone to persistent behavioral biases that ultimately manifest as factor anomalies.

THE PERILS OF FACTOR CYCLICALITY

Although the benefits of style factor investing are enticing to investors, they should not be viewed as a free lunch. There are three deterrents that collectively create a high hurdle for style factor adoption:

1. Style factors are prone to sustained periods of underperformance.
2. Investors commonly evaluate strategies on a three- to five-year horizon.
3. Investors tend to resent losses more than they value gains of an equal amount.

These considerations suggest style factor investors will be inclined to abandon the strategy at some point during the holding period, potentially to their detriment, just as they do with traditional active strategies. On average, investors who evaluate strategy performance on a three-year horizon would be unhappy with various factors even though they may earn a positive active return over longer holding periods. This propensity paints a grim picture for style factor investors because the length and depth of drawdowns threaten to force divestment. If style factors are to be useful for investors, the downturns must become shorter and shallower. So how do we do this?

DIVERSIFY WITHIN AND ACROSS FACTORS

There are a number of techniques to mitigate the risk of cyclical risk. One of the most prominent methods involves a concept that predates style factor investing itself – diversification. Instead of choosing a single style factor with the most desired characteristics, a reasonable alternative is to combine them. For example, a value investor may wish to favor stocks that rank high in book to price, earnings to price, and dividend yield dimensions. Similarly, a quality investor may seek firms that exhibit both high ROE and low ROE variability. This means there are considerations that must be taken into account to deliver the benefits of style factors in an acceptable manner for investors. A few of the most important considerations are:

- **Exogenous systematic risks** often accompany style factor strategies, potentially creating significant tracking error. Examples include fundamental risk factors such as industries and countries, and macroeconomic risks such as growth and inflation. Factors may be designed to minimize these extraneous risks without sacrificing the style factor risk premium.
- **Structural differences** across sectors (industries) and regions (countries) can make cross comparing style factors difficult. Naïve factor definitions that fail to acknowledge the unique economics or accounting standards of a particular industry group or region may become persistently biased.

Considerations for style factor implementation

Style factors are not perfectly independent from one another and the relationships among them vary over time. An effective multi-factor strategy must account for this to prevent the dilution of the style factor premium. For example, high value stocks tend to be high volatility, and high momentum stocks become synonymous with low value during periods of valuation multiple expansion. If investors are not careful, the way they diversify style factors can lead to loss of active return.

Style factor volatilities differ significantly, which can lead to concentrated active risk. A simplistic multi-factor weighting scheme often results in the active return being heavily influenced by one or two strategies. Low volatility strategies are the most common example, as they notoriously generate high levels of tracking error relative to the other style factors and tend to dominate active risk when used in combination.

While factor cyclicalities cannot be completely eliminated, strategies that account for these considerations exhibit downturns that are significantly shorter and shallower than naïve alternatives. Given the importance of factor cyclicalities on the investment outcome, it is imperative that investors are mindful of these issues when evaluating a factor strategy.

CONCLUSION

Historically, style factors have been shown to deliver superior risk-adjusted returns to passive capitalization weighted indexes and have more persistent performance than traditional active management, making them a compelling alternative for investors. However, the benefits of style factors come with the cost of cyclicalities and expose investors to the risk of sustained underperformance.

Style factor cyclicalities can be mitigated by employing multi-dimensional factor definitions and diversifying across factors on top of other methods of reducing risk without sacrificing return. Through intelligent factor design and implementation, drawdowns can be made less severe, which makes it easier for investors to stay the course. Given the potential benefits style factors afford, we recommend investors seek out portfolios designed explicitly to improve the investor experience and avoid divestment.

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