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Far from the madding crowd

Factor investing through the cycle

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IN BRIEF

- As factor-based strategies have become more popular, investor enthusiasm has been coupled with concern about how the dynamics of factor investing might change over time. In this paper, we address three central topics: factor crowding, factor timing and the impact of liquidity and accessibility.

- It is important to understand the economic rationale that explains why exposure to factors is expected to compensate investors and why this should persist over time. Compensated factors fall into three overlapping categories: risk-based, behaviour-based and structural-based.

- We take a cautious stance on systematically timing factors; however, we see potential for approaches that integrate quantitative and qualitative inputs.

- In the coming years, factors will become even more accessible. As a result, factor cycles may increase in frequency, leading to more volatility. On a short-term basis, correlation between factors may increase and factors may trade more in line with risk assets. However, we expect the benefits of diversification over a longer time horizon to persist.

THE RISE OF SO-CALLED FACTOR INVESTING HAS SPARKED EXCITEMENT AS WELL AS ANGST ACROSS THE INVESTMENT COMMUNITY. While factors have been studied by academics for decades, today many are available in investible form, often as components of strategic and alternative beta strategies. As these strategies have become increasingly popular, investor enthusiasm has been coupled with questioning as market participants look to understand how the dynamics of factor investing might change over time.

Among the questions investors are asking:

- As investors crowd into factors, can returns to those factors be arbitraged out? Will returns persist, or will they decrease over time?

- Can we time factors?

- Are factors tied to the business cycle?

- As factors become more widely understood, what are the potential investment implications?

In this paper, we address these investor concerns, focusing on three central topics: factor crowding, factor timing and the impact of liquidity and accessibility.

J.P.Morgan
Asset Management

CROWDING EFFECTS AND THE SOURCES OF RETURN OF FACTORS

We define a factor as any characteristic that describes the risk of a group of securities or financial instruments. To assess the effects of factor crowding and the potential that returns to factors can be compressed or arbitraged out, it is crucial to understand the economic rationale that underpins why exposures to certain factors reward investors. Take the equity risk premium,[1] perhaps the most well-known compensated factor, which rewards a willingness to put capital at risk in equity markets. While exposure to equity risk has paid off over time, equity investors must be willing and able to suffer long periods of negative performance[2] and/or substantial crashes or drawdowns. Historically, these drawdowns have often occurred in or around recessionary periods, in which investors are highly averse to portfolio losses. As a result, equities must offer high potential rewards to entice investors to put their capital at risk.

Along with the equity risk premium, other factors serve to compensate those investors who assume risks that other investors cannot, should not or choose not to take on. As we consider the various economic sources of factor returns, we identify three non-mutually exclusive categories: risk-based, behaviour-based and structural-based. Many factors fall into more than one category.

Risk-based

Along with the equity risk premium, another risk-based factor relates to size—specifically the tendency for small cap stocks to outperform large cap stocks. Because small cap stocks carry more risk than large cap stocks (distress risk as a result of higher operating leverage, for example, or greater liquidity risk), small caps must offer greater returns than their large cap counterparts to attract investors. And because investors must be able to accept these risks in order to capture the small cap premium, that premium should persist over the long term, much as stocks are expected to benefit from a persistent equity risk premium. If there was no such premium associated with small cap stocks, investors would prefer the relative safety of large cap stocks and push up their price over time. This, of course, would open up the premium. In other words, and by definition, risk-based factors cannot be arbitraged out.

At any given point in time, however, a risk-based factor may be cheap or expensive. When more and more investors seek to capture the size factor, for example, the excess return to small cap stocks diminishes to the point that it may no longer justify the risk being taken by investors. When this occurs, investors will de-allocate from small cap stocks until the premium re-asserts itself, which eventually draws in a new wave of investors, thus continuing the cycle.[3] **EXHIBIT 1** illustrates the richness vs. cheapness of small cap stocks relative to large cap stocks over time. Historically, the premium has reached extreme levels of richness/cheapness as investors have reacted and subsequently overreacted to changing market

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[1] Factors that are compensated are often referred to as premia to signify the reward that investors earn for bearing exposure to these factors. Not all factor exposures reward investors, with sectors and regions as two examples of pure descriptors of risk.

[2] The equity market premium has been negative in 15% of the decade-long windows dating back to 1926.

[3] There is a general tendency in the space (as is common in others) for those who lose the ability to accept risk to cede profit to those who can—in other words, for the folder to pay the holder.

At any given point in time, a risk-based factor may be cheap or expensive

EXHIBIT 1: SIZE FACTOR VALUATION SPREAD (GLOBAL)
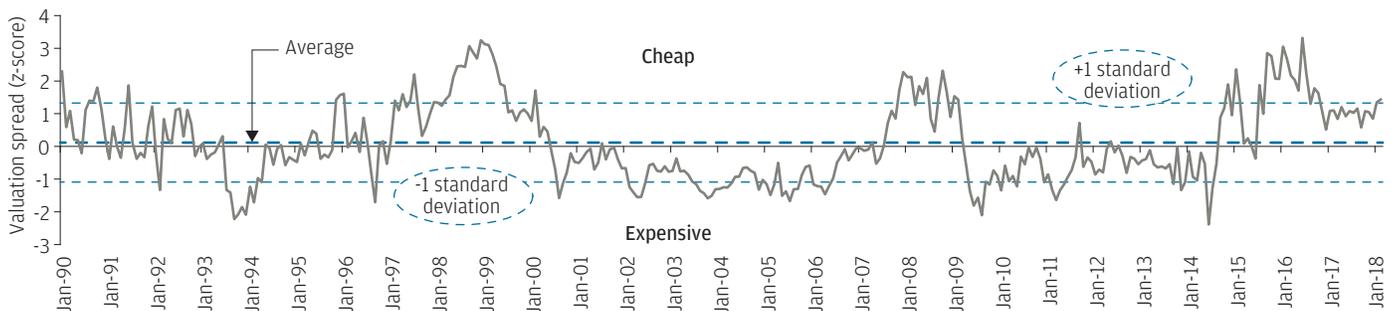
Source: J.P. Morgan Asset Management; data as of 28 February, 2018.

Note: Valuation spread is a z-score between the median P/E ratio of top-quartile stocks and bottom-quartile stocks as ranked by the size factor.

environments. For example, during the dot-com bubble small cap stocks were more than 3 standard deviations cheap relative to large cap stocks, while in the ensuing bust they became almost 2 standard deviations rich.

Among other risk-based factors, some are associated with asset classes beyond equities (e.g., FX carry, where investors favour high yielding currencies over low yielding currencies and take on the risk of devaluation), and some are common to hedge fund strategies (such as merger arbitrage). Whatever the nuances particular to each factor, investors capturing risk factors take on greater risks to capture enhanced returns.[4]

Investor crowding can make the factor expensive, but it cannot arbitrage out returns over the long term. Investors who question whether returns to risk factors can be arbitraged out typically do not ask if equities can be arbitraged out, even though that is essentially the same question. In other words, investors understand that putting their capital at risk in equity markets involves exposure to the equity risk premium, and they understand that the premium goes through cycles of being cheap and expensive. The same principle applies to other risk-based premia.

Behaviour-based

Another class of factors address behavioural or cognitive biases inherent in human nature. These factors, too, display a high degree of persistence. Study of these biases, which have been extensively documented, earned Nobel Prizes in economics for psychologist Daniel Kahneman in 2002 and economist Richard Thaler in 2017. Today principles of behavioural economics—a mix of psychology and economics—inform a range of investment strategies. One strategy backed by a behavioural rationale focuses on the momentum factor, which seeks to profit by going long assets that have been rising in price and short those that have been falling in price. The strategy reflects the insight that humans—including investors—tend to initially underreact to new information and

subsequently overreact once this information becomes more widely recognized and assimilated into a broader story. This tendency, confirmed by studies across a range of geographies, markets and time periods, is particularly strong when the information at hand includes pricing data.

Exposure to another behaviour-based factor, the quality factor, enables investors to profit from the outperformance of high quality stocks over their low quality ("junk") peers—even as high quality stocks have better fundamentals and for that reason should provide lower returns. This anomaly can be explained by the so-called lottery-ticket effect, in which people overestimate and overpay for remote chances of high reward. Investors over-value low quality stocks despite their worse fundamentals; with greater uncertainty surrounding the stocks' future price trajectory, investors presume higher odds of outsize gains. As a result, high quality stocks become undervalued and thus offer greater return prospects over the long term.[5]

In considering the effects of crowding on behaviour based factors, it is once again important to understand the reasoning behind the returns. For example, the effects of crowding in momentum strategies have a very different impact from crowding in quality stocks. Momentum investing by definition results in positive feedback, whereby increases in price lead to increased allocations and better performance. Investor behaviour can thereby increase the momentum effect. Eventually, however, too many investors have allocated solely on the basis of past returns, and a change in sentiment or unexpected loss can lead to large drawdowns.[6] Overall, the impact of crowding in the momentum factor may thus result in higher returns in the short term as well as higher volatility in the long term and, importantly, an increased negative skew.

Crowding in high quality stocks, on the other hand, can result in the factor getting squeezed to the point that the valuation of high quality stocks may be similar to that of low quality stocks, reducing the potential for high quality stocks to outperform

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[4] In merger arbitrage, investors seek to collect the premium implied by announced merger deals (i.e., difference between target company stock price and the announced acquisition price), however in the case of deal break may face asymmetric losses. In FX carry, investors seek to capture return by investing long in high yielding currencies and short in low yielding currencies, however they face the risk of currency crashes that could overwhelm any gains earned from the aforementioned yield differentials.

[5] Romahi, Yazann, Piera Elisa Grassi, and Beltran Lastra, "Low Volatility Investing". April 2012.

[6] In essence, the investor base becomes unbalanced and there are not enough buyers in the market to allow momentum investors to de-allocate without furthering drawdowns.

Crowding in high quality stocks can result in the factor getting squeezed to the point that the valuation of high quality stocks may be similar to that of low quality stocks

EXHIBIT 2: QUALITY FACTOR VALUATION SPREAD (GLOBAL)
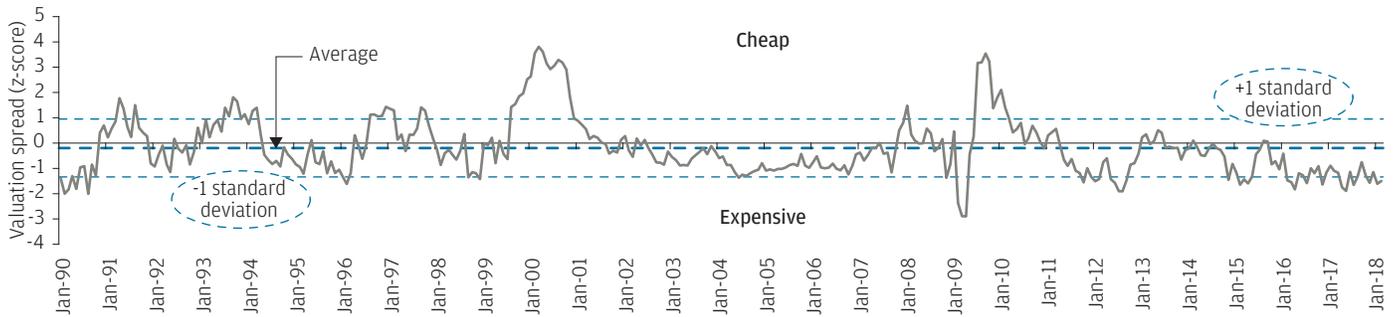
Source: J.P. Morgan Asset Management; data as of 28 February 2018.

Note: Valuation spread is a z-score between the median P/E ratio of top-quartile stocks and bottom-quartile stocks as ranked by the quality factor.

going forward. This concept is illustrated in **EXHIBIT 2**, which shows periods when quality appears either cheap or expensive (as it does in the current environment). When the premium attached to the quality factor becomes expensive, it dissipates and the factor goes through a period of underperformance, leading investors to de-allocate. Eventually, the premium reasserts itself and the factor outperforms.

In sum, the quality factor, like other behavioural factors, exhibits the same cyclicality that is expected of risk-based strategies.

With exposure to behaviour-based factors, investors can profit from effects that have persisted over many decades and are unlikely to disappear without dramatic changes in financial decision-making or a fundamental shift in human psychology– neither of which seems likely in the foreseeable future.

Structural-based

Finally, there are structural-based factors that address cases where investors may be constrained from exploiting return opportunities. These constraints can take the form of regulation, market segmentation or mandate limitations. While these constraints may serve a useful purpose (e.g., meeting client needs, promoting stable markets), they can also create a group of anomalies or structural factors that factor-based strategies can take advantage of. Because they rely on market constraints, however, structural-based factors have the weakest form of persistence and thus require close monitoring to ensure that they represent a productive opportunity for capital.

The outperformance of low beta/volatility stocks over high beta/volatility stocks is one anomaly addressed by structural-based factors. Indeed, this anomaly presents one of the biggest

challenges to the capital asset pricing model (CAPM), which argues that the opposite pattern should hold. The anomaly, first identified in 1972–73[7,8] has continued to persist. One explanation of this effect[9,10] reflects the structure of investors in the market. Most active managers are measured relative to a market index with limited, if any, ability to take on leverage. As a result, in order to outperform the market, investors may prefer securities that are thought to be higher risk/higher reward investments. The lower level of demand for low beta/ volatility stocks, by extension, depresses their price, increasing the return potential for investors.

Another example relates to index reconstitution arbitrage, a factor that takes advantage of the means by which equity indices add and remove constituent names. In order to reduce market dislocation, indices typically pre-announce additions/deletions by one to two weeks so that investors have time to prepare for these index adjustments. While certain investors may trade on these announcements, many others face tracking error constraints and are forced to wait until the effective date of the index change, at which point they demand liquidity irrespective of price and create profit opportunities for flexible investors.

[7] Blitz, David C. and Pim van Viet, "The Volatility Effect", *Journal of Portfolio Management,* F34(1), 2007.

[8] Baker, Malcolm, Brendan Bradley and Jeffrey Wurgler, "Benchmarks as Limits to Arbitrage: Understanding the Low Volatility Anomaly", *Financial Analysts Journal,* 67(1), 2011.

[9] Frazzini, Andrea and Lasse Heje Pedersen, "Betting Against Beta", NBER Working Paper No. w16601, 2010.

[10] Barber, Brad M. and Terrance Odean, "All That Glitters: The Effect of Attention and News on the Buying Behavior of Individual and Institutional Investors", *Review of Financial Studies,* 21(2), 2008.

The index reconstitution arbitrage factor relies on the imbalance in demand for liquidity at the effective date vs. the announcement date of a change to the index composition

EXHIBIT 3: ADDITION OF CHARTER COMMUNICATIONS TO THE S&P 500
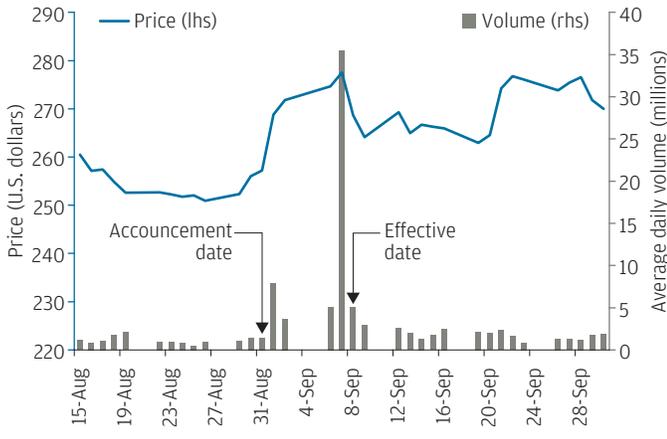
Source: J.P. Morgan Asset Management; data as of October 2016.

The index reconstitution arbitrage factor relies on the imbalance in demand for liquidity at the effective date vs. the announcement date. By monitoring the difference in traded volume over these periods, one can assess whether the dislocation still exists and whether the factor is likely to persist. **EXHIBIT 3** presents an example of index reconstitution, the addition of Charter Communications to the S&P 500 in September 2016; trading volumes on the effective date far exceeded those on the announcement date.

In sum, we believe that the crowding dynamics of a factor depend on the source of return behind the factor itself. Factors that are backed by solid economic rationale (especially those backed by multiple economic rationales) and have been

Factors that are backed by solid economic rationale should persist over time

EXHIBIT 4: COMPENSATED FACTORS
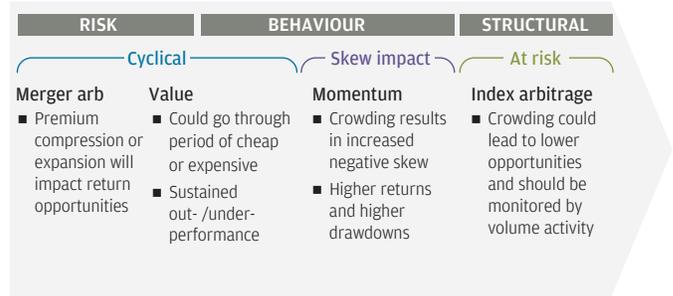
Source: J.P. Morgan Asset Management. For illustrative purposes only.

empirically proven to compensate investors across a range of out-of-sample testing (e.g., time period, geography, asset class) should persist over time (**EXHIBIT 4**).

FACTOR TIMING AND IMPACT OF THE BUSINESS CYCLE

As discussed, individual factor performance can be highly cyclical. While the pain of drawdowns and periods of underperformance partly explain why factor investing is rewarding in the first place, many investors naturally look for ways to minimise their discomfort. Diversifying across a broad range of factors can help reduce drawdown risk. (We have written extensively on the concept of diversification, across both traditional asset classes and factors,[11] and highlight the low correlation across factors in **EXHIBIT 5**.)

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[11] Romahi, Yazann and Katherine Santiago. "Diversification—still the only free lunch?" August 2012; Staines, Joe, Wei (Victor) Li and Yazann Romahi. "Dimensions of Diversification." *Journal of Index Investing, 7(2), 2016:* 119-127.

Individual factor performance can be highly cyclical, but historical data shows low correlation across factors

EXHIBIT 5: AVERAGE PAIRWISE CORRELATION ACROSS EQUITY, FIXED INCOME, CURRENCY AND COMMODITY FACTORS
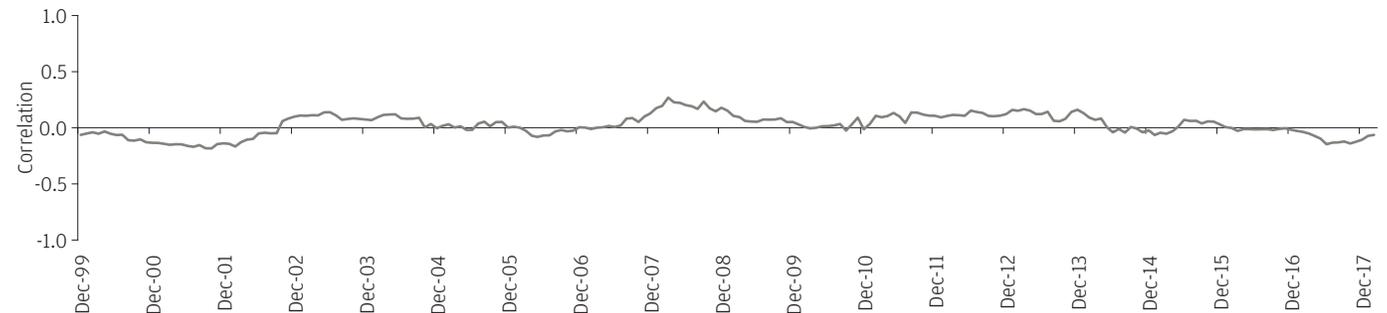
Source: J.P. Morgan Asset Management; data as of 28 February 2018.

Some investors move beyond diversification, attempting to time factor investments with the objectives of sidestepping losses and potentially earning alpha by dynamically trading across factors. We identify two main challenges to systematic factor timing: 1) defining inputs, and 2) implementation/portfolio impact.

Defining inputs

In systematic factor timing, an investor must first determine which inputs should be considered. We have studied a wide variety, ranging from those that are related to the factors themselves (e.g., factor valuation, factor dispersion, factor momentum) to those that are based on the market environment or business cycle. Broadly speaking, we have found that the factor-related inputs do appear predictive of performance on a gross of transaction cost basis. But other considerations must be taken into account.

EXHIBIT 6 illustrates how factor valuation spreads are used as an input. There is a linkage between factor valuation spreads and subsequent factor performance, but the relationship is weak and ignores transaction costs (as we discuss below).

Regarding business cycle inputs, a limited sample of distinctive cycles/market environments makes it difficult to find significant empirical relationships. Some researchers have attempted to draw conclusions by looking at average returns of certain factors in different phases of the business cycle (as illustrated in **EXHIBIT 7**). Certain factors do appear to perform better during certain phases (e.g., value outperforms quality and growth during recessionary periods). However, taking the range of outcomes into account (as illustrated by the error bars), it is difficult to prove a statistically significant relationship between the business cycle and factor performance. In addition, it is very difficult to quantitatively determine where we are in the business cycle, adding layers of complication to this type of factor timing signal.

There is only a weak linkage between factor valuation spreads and subsequent factor performance

EXHIBIT 6: FACTOR PERFORMANCE BY VALUATION SPREAD

6A: VALUATION SPREADS OF MOMENTUM
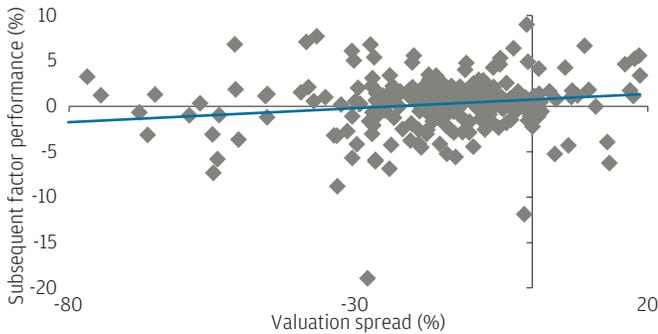
6B: VALUATION SPREADS OF VALUE
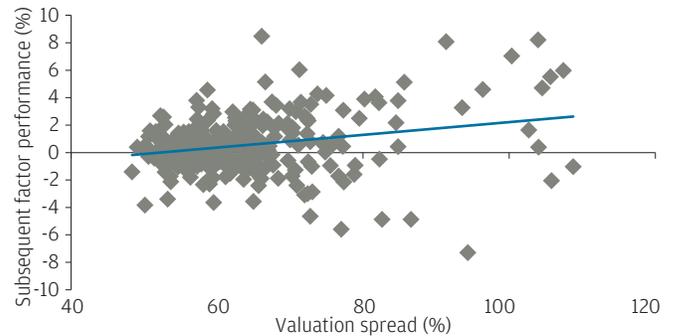
6C: VALUATION SPREADS OF QUALITY
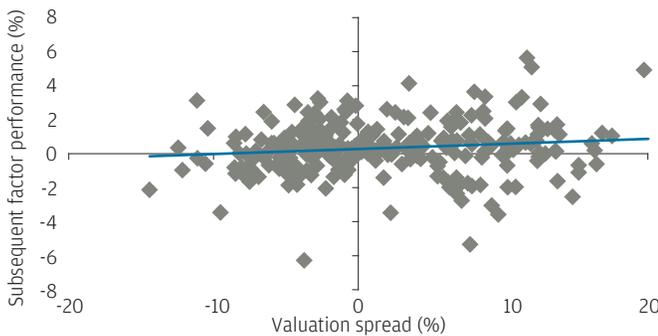
6D: VALUATION SPREADS OF SIZE
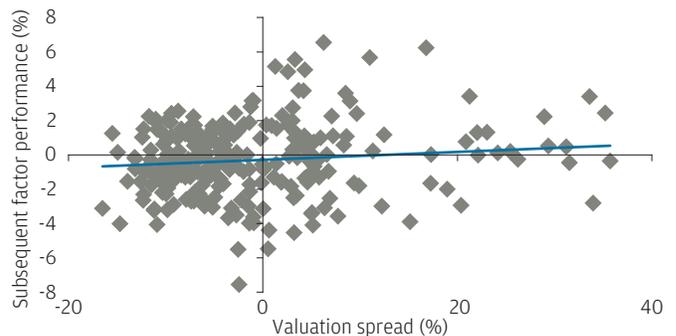
Source: J.P. Morgan Asset Management; data as of December 2014.

Note: The graphs above represent the best linear fit between valuation spreads and subsequent one-month performance.

It is difficult to prove a statistically significant relationship between the business cycle and factor performance

EXHIBIT 7: U.S. FACTOR PERFORMANCE BY PHASE OF BUSINESS CYCLE
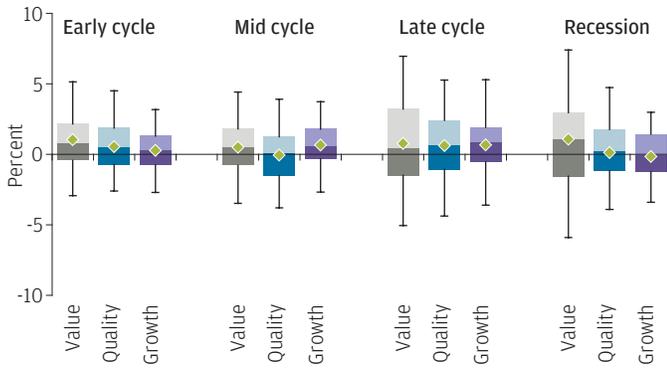
Source: J.P. Morgan Asset Management; data as of December 2014.

Note: Phases are defined using NBER recessionary periods and the CBO output gap. Factor performance is calculated on a beta neutral basis.

Implementation/portfolio impact

The second challenge to factor timing relates to implementation and portfolio impact. Systematic factor timing tends to significantly increase turnover relative to steadier, more diversified approaches. While factor-based investment strategies typically focus on the most liquid segments of the market, the requisite increase in transaction costs can be quite meaningful when considering the size of potential gains associated with factor timing. Moreover, a fundamental drawback of factor timing is that it reduces diversification, whose benefits are especially powerful when return sources are uncorrelated.

Overall, we see value in considering factor valuation, dispersion and the point in the business cycle in determining the forward-looking prospects for specific factors. But we take a cautious stance on timing factors systematically. Instead, we believe qualitative insights must be integrated into factor timing processes, and otherwise we default to diversified approaches that invest across a broad range of factors that are backed by a robust economic rationale.

THE FUTURE OF FACTOR INVESTING

We believe that factors will provide persistent sources of return over time. However, we acknowledge that as factors become more accessible and factor strategies are used by an expanded range of investor types, the dynamics of factor investing may change in three important ways, which we explain below:

Factor cycles may increase in frequency, leading to higher volatility

Historically, exposure to factors was primarily accessed through hedge fund investments, which were subject to monthly or quarterly liquidity terms. Because investors can now access a wide range of factors, in vehicles that offer daily or even intra-day liquidity, the cycles between factor richness and cheapness may compress as capital chases after performance, causing extremes (and ensuing reversals) to be reached more quickly. This effect could be amplified when a broader set of investors has access to strategies that trade factors, particularly if some act without a thorough understanding of the drivers of factor returns and the potential for substantial losses.[12] The increased frequency of factor cycles could thus increase volatility and introduce more negative skew to factor returns.

We have not seen these dynamics play out yet, but believe it is important for allocators to be closely aware of potential changes in the factor environment. One means of measuring factor cycles is to study the number of months between factor valuation highs and lows. **EXHIBIT 8** compares the average number of months between richness and cheapness for four well-established equity factors. As can be seen, factor cycles have actually expanded in length recently (from 36.8 months, on average, to 59.5 months), signalling that this side effect from the popularity of factor investing is not yet cause for concern.[13]

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[12] Such behaviour may actually increase the opportunity for disciplined investors to time factors or benefit by providing liquidity to weaker hands.

[13] We have seen a number of mini-cycles or rotations across factors recently (particularly for value, size and momentum); however, valuation extremes have not been hit.

In recent years, factor cycles have gotten longer

EXHIBIT 8: LENGTH OF GLOBAL EQUITY FACTOR CYCLES (JANUARY 1990–FEBRUARY 2018
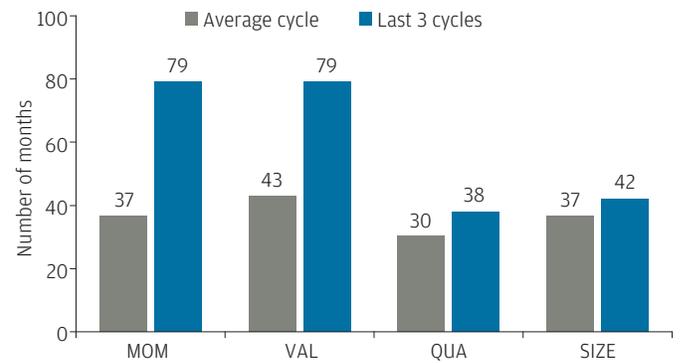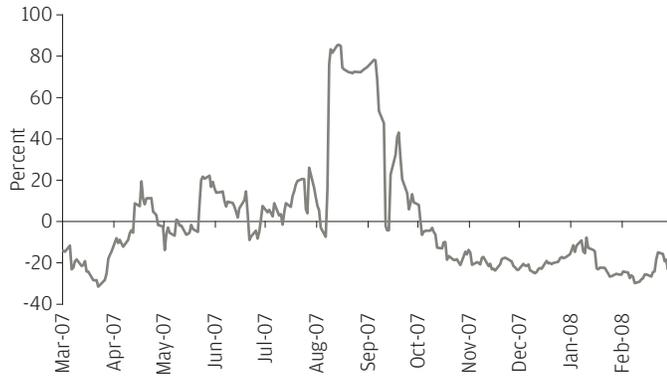

Source: J.P. Morgan Asset Management; data as of February 2018.

Note: Factor cycles are defined as the number of months it takes for factor valuations to move from +1 standard deviation to -1 standard deviation and vice versa.

Factors behaved independently in early February 2018, while in the 2007 quant crisis average pairwise correlation peaked at 0.85

EXHIBIT 9: AVERAGE PAIRWISE CORRELATION (ONE-MONTH ROLLING)

9A: QUANT CRISIS—AUGUST 2007

9B: FEBRUARY 2018

Source: J.P. Morgan Asset Management; data as of 28 February, 2018.

Correlation between factors may increase

In addition to speeding up factor cycles, increases in factor accessibility/liquidity may impact correlation dynamics in a pattern that has played out across other markets. This may appear to degrade diversification benefits, but here it is important to consider the difference between short-term correlation measures and long-term drivers of value. For example, the creation of equity indices and the rise of index investing have altered the relationships across corporate stocks over time. Academic research has shown that when a stock is added to the S&P 500, its correlation with other stocks in the index increases in a manner that cannot be explained by economic fundamentals alone.[14] (This impact would be even more notable in comparing the correlation between privately held and publicly traded companies.)

As factors become more frequently used in multi-factor strategies, they may be impacted by investor inflows/outflows in a more uniform fashion. We might have expected that correlation between factors would thus have already increased as a result of this impact. However, this dynamic has not yet played out, perhaps because of the still relatively modest amount of assets following factor-based strategies.

An examination of factor returns in February 2018, when a technical sell-off impacted a broad range of markets and factors, is instructive. While value, momentum, and quality factors did all decline from February 1 to February 8, short-term correlation metrics highlight that factors behaved independently, with the one-month average pairwise correlation never rising above 0.04. This behaviour is markedly different from earlier periods of factor crowding; in the quant crisis of 2007, for example, the average pairwise correlation across factors peaked at 0.85 (**EXHIBIT 9**).

Correlation with risk assets may increase

In an effect that can be deemed a curse of liquidity, as factors become more popular, on a short-term basis they may begin to trade more in line with traditional risk assets.

We have seen this effect occur with the FX carry factor, which became more popular in the late 2000s. As the factor became more well known across investors (particularly amongst unsophisticated investors), it began to trade in a more risk-on/risk-off fashion, with the correlation between the S&P 500 and a proxy for FX carry rising as high as 0.96 shortly after the financial crisis (**EXHIBIT 10**).

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[14] Barberis, Nicholas, Andrei Shleifer and Jeffrey Wurgler, "Comovement", *Journal of Financial Economics,* 2005.

As factors become more popular, on a short-term basis they may begin to trade more in line with traditional risk assets

EXHIBIT 10: ROLLING 12-MONTH CORRELATION BETWEEN FX G10 CARRY STRATEGY AND S&P 500
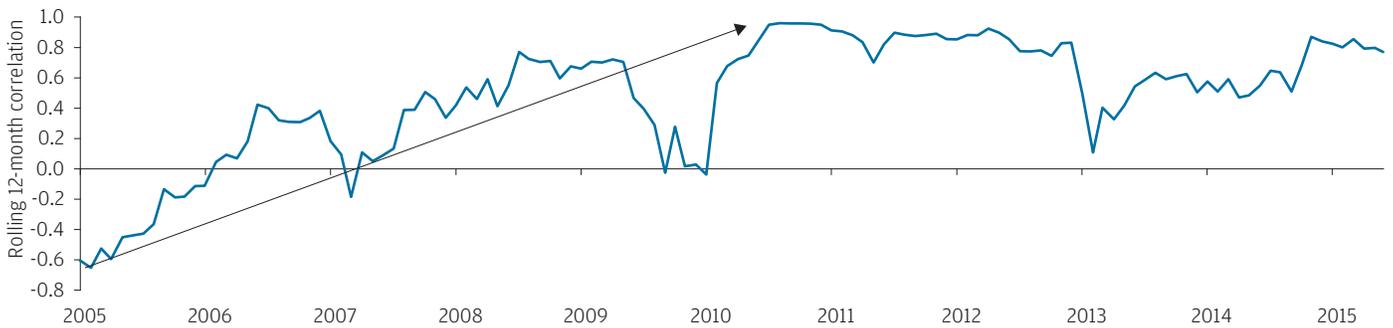
Source: J.P. Morgan Asset Management; data as of February 2018.

The curse of liquidity can play out in different ways. In times of broad market stress, investors may decide to sell all their risky investments and they may include their factor holdings in that category. On the other hand, if factors hold up well in times of broad market stress, investors may source capital from factor strategies to meet liquidity needs or pursue opportunities elsewhere in the market. In this way, factors would in effect become victims of their own success.

On the whole, and over time, factors are uncorrelated with equity markets.[15] As we have discussed, there are periods of correlation, but they are relatively short-term. The correlation effect can be felt on a mark-to-market basis, but it is not economically meaningful over the long term. The long-term value of the stocks that make up a factor will still reflect the underlying dynamics of the securities. Therefore, over the long term, the factor's diversification benefit will endure—even as it may appear to decrease over time when using short-term metrics.

CONCLUSION

While the benefit of diversification will persist over the long term, the dynamics of investing in factors can change over time. These changes need not dampen investor enthusiasm for factor strategies, but they do highlight the need for further education and attention. As the concept of factor investing becomes more understood and accepted, and the set of factors that have been "discovered" continues to increase, it will be crucial for investors to understand the return drivers behind factors used in factor-based investment strategies.

Many investor questions about factor crowding, persistence and timing are appropriate. As we consider the issues they present, we believe factors backed by an economic rationale will be robust enough to handle investor crowding, offering returns that will persist over the long term. While the idea of factor timing may be tempting, we do not believe the approach is reliable on a systematic basis. We do believe in the proven value of diversification. Finally, as we have discussed, the increased frequency of factor cycles could increase volatility and thus introduce more negative skew to factor returns, even for diversified factor strategies. But as yet we see no evidence that this dynamic is playing out in the current market environment.

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[15] The rolling two-year correlation with equities across 17 of the factors we track was 0.02, on average, as of February 2018.

Appendix

EXHIBIT A: COMPENSATED FACTORS ACROSS ASSET CLASSES

Asset class	Factor	Risk	Behavioural	Structural
Equity	Global equities	✓		
	Value	✓	✓	
	Momentum	✓	✓	
	Size	✓	✓	
	Quality		✓	✓
Fixed income	Carry	✓	✓	
	Momentum	✓	✓	
Currency	Carry	✓	✓	
	Momentum	✓	✓	
Commodities	Carry	✓	✓	
	Momentum	✓	✓	
Event-driven arbitrage strategies	Merger arbitrage	✓	✓	
	Activism tracking		✓	
	Conglomerate discount arbitrage		✓	
	Index arbitrage			✓
	Share buybacks		✓	
	Post-reorganization equity	✓	✓	
	Convertible bond arbitrage	✓	✓	✓

Source: J.P. Morgan Asset Management; data as of February 2018.

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Harnessing our firm's deep intellectual capital and broad investment capabilities, we provide our clients with a diverse suite of beta strategies to help build stronger portfolios.

- Empower better investment decisions through **unique insights** and **proprietary research** on strategic and alternative beta.

- Deploy the talents of an investment team dedicated to quantitative research and portfolio construction.

- Invest across a broad spectrum of strategic and alternative beta strategies, created specifically to address client needs.

- Partner with one of the world's leading asset managers and tap into two decades of **industry innovation**.

J.P. MORGAN ASSET MANAGEMENT

J.P.Morgan
Asset Management