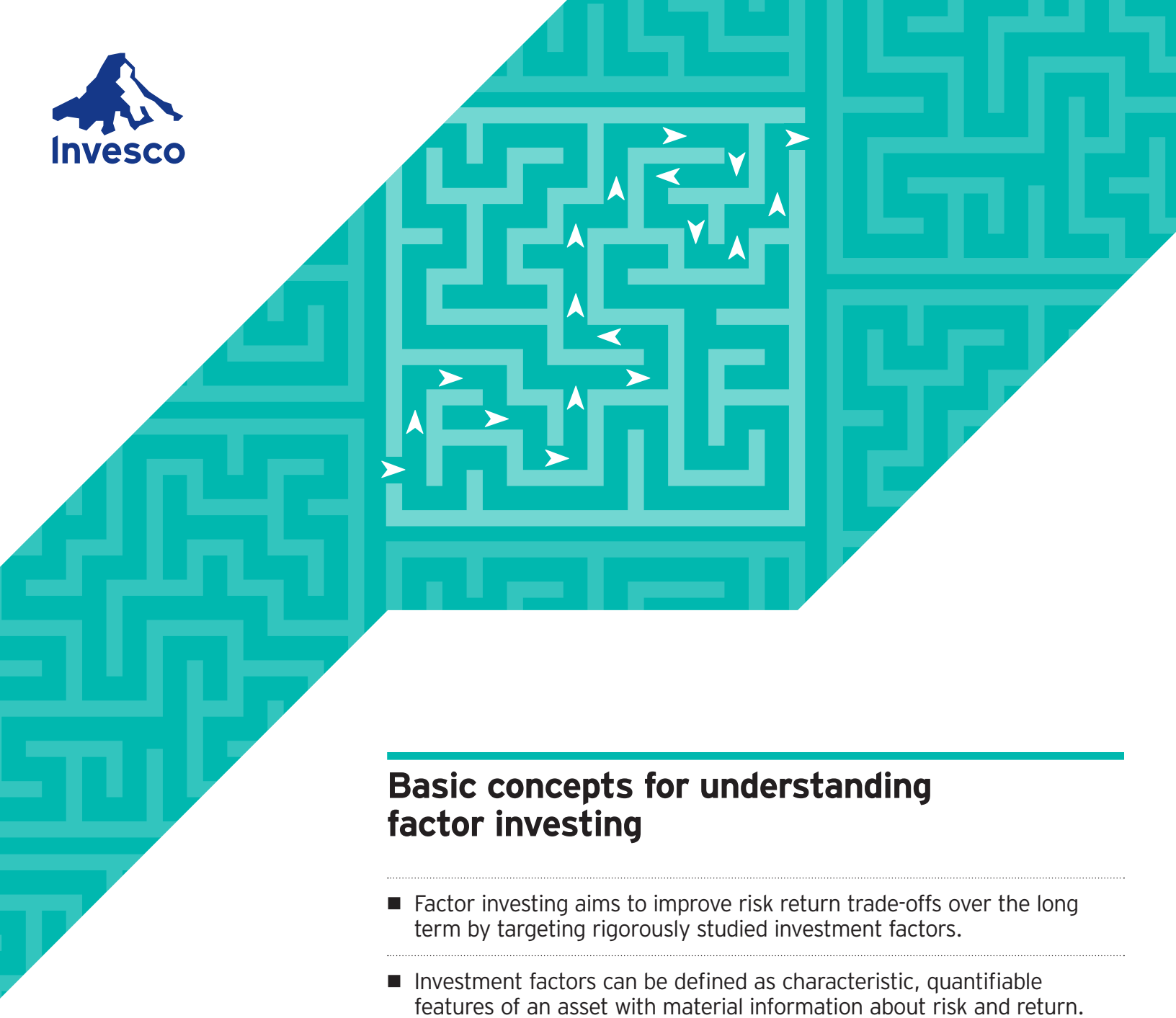


# Basic concepts for understanding factor investing

- Factor investing aims to improve risk return trade-offs over the long term by targeting rigorously studied investment factors.
- Investment factors can be defined as characteristic, quantifiable features of an asset with material information about risk and return.
- In the equity area, the most well-known and best documented factors include value, size, momentum, low volatility and quality.
- In bonds and other asset classes, factor investing isn't yet as established. Promising developments have been made to apply factors to fixed income investing or to exploit macroeconomic factors.

Factor investing approaches were long the domain of professional and institutional investors. In 2016, as many as 70% of institutional investors surveyed were using factor strategies and more than 70% were planning to increase their use of them in the following years, according to the Invesco Global Factor Investing Study, which was carried out by NMG Consulting. Increasingly, however, factor-based investing has also become important for private investors and their advisers. A growing number of investors are seeking a better understanding of the elements that drive returns and reduce risk. Factors can help investors gain this understanding and thus offer better control and transparency. Today, factor investing has established itself as a pillar of investing, offering investors a complementary approach to traditional active and pure passive investing. In this paper, you will learn what factors are and what role they can play in a portfolio.

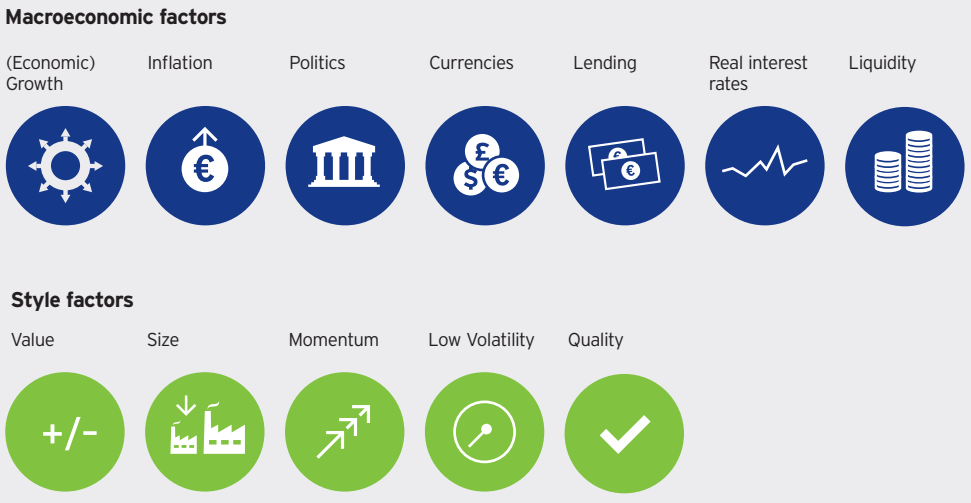
## Factors as important indicators of risk and return

There are several reasons why factor investing has gained so much importance recently. First, the correlations between traditional asset classes – the usual basis for building a diversified portfolio – have proven to be disappointing in the past, particularly during crises. In these types of situations, sell-offs sometimes led to large drawdowns, with traditional diversification failing to buffer the impact as expected. Secondly, exciting advancements in the study of asset pricing, largely from academia, have shown the huge potential for factor-based strategies to play a major role in diversified portfolios. For this reason, factors are likely here to stay.

But what are factors actually? Factors can be defined as characteristic, quantifiable features of an asset with material information about its risk and return. A distinction is made between style factors and macroeconomic factors.

The macroeconomic factors are well-known and intuitive. They relate to the influence that factors such as economic growth and inflation rates have on security prices. Consider inflation for example. Inflation broadly impacts financial and economic environments. Changes in expected inflation impact prices across stocks, bonds, commodities; just about any asset class. Many markets have options to invest directly in inflation factor strategies such as TIPS or linkers. Recent focus in research and development has increasingly shifted toward style factors. Therefore, when someone talks about factor investing today, they are often referring to style factors, rather than macroeconomic factors. For this reason, the bulk of the following discussion is focused on style factors.

**Figure 1: Examples for macroeconomic and style factors**




Source: Invesco. Simplified schematic representation for illustrative purposes only.

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## What is factor investing?

Factor investing is identifying factor characteristics of securities that can be targeted with investable securities and structuring portfolios to either capture or avoid specific factors in a systematic way. A common objective of factor investing within the framework of a rules-based investment is to position the portfolio based on factors in an attempt to outperform the market. In addition, factor-based investing can contribute to portfolio diversification or as a risk control mechanism. Due to the explanatory power of investment factors, factor investing is becoming a strategic, long-term element of many asset allocations. However, it can also be used in a tactical way. Factor investing is currently receiving much attention, but the approach as such isn't new – its roots can be traced as far back as the 1930s. In the equity area, the most well-known style factors include value, size, momentum, low volatility, and quality. They are considered to be the best documented in research and practice.

Academic literature and practitioners use a whole range of terms to describe style factors, with value and size the most well-known. However, momentum, low volatility, and quality are also terms that will be familiar to many people. Growth and liquidity are sometimes cited as additional factors as well.

## Value, size and low volatility

With value strategies, the emphasis is placed on securities that are priced at a discount to other similar securities. The underlying assumption is that, over the long term, purchasing securities at lower prices will lead to higher returns. But how do you determine value? As it turns out, there are many different approaches that yield similar results. The index provider MSCI, for example, uses dividend yield, price-earnings ratio (P/E ratio) and price-to-book ratio (P/B ratio) as criteria. Cash flows and net profit are sometimes used as criteria as well. Price to book – as well as size – was used in 1993 by the scholars Eugene Fama and Kenneth French to expand the capital asset pricing model to produce the Fama-French three-factor model. However, there are also points of criticism. Quite apart from the fact that value strategies aren't successful in all market phases, there is the considerable concern that innovative companies that don't pay dividends and have a high price to book value are excluded.

With size (i. e. small cap) strategies, the focus is on the shares of small companies in the expectation that they will outperform those of large companies in the universe being considered. This relationship was first demonstrated in a study by Rolf W. Banz in 1981.[1] Subsequent studies confirmed these results. There are several explanations for the size factor. On the one hand, it is claimed that small companies have better growth prospects than large established companies. On the other hand, analysts focus less on these companies, which therefore tend to be "overlooked". It is also said that the shares of small companies are not as liquid as those of their larger counterparts, with investors preferring the shares of large companies.

The low volatility factor (also known as minimum volatility or minimum variance) implies that shares associated with lower volatility perform better on a risk-adjusted basis than those with higher volatility. The observation was first described in 1972 by Robert Haugen and A. James Heins.[2] Later studies also found that low-volatility shares outperformed those with a high degree of volatility over the long term on a risk adjusted basis. What might be the rationale to explain this unexpected phenomenon? One possibility is a difference between reality and the realm of academic research. Given a set of assumptions, theory says investors should be indifferent between low and high volatility stocks because of access to leverage. In reality, investors may not be able to access leverage, or the costs of leverage might be higher than assumed in the research. This practical reality could cause investors to be willing to accept less incremental return as volatility increases. On the other hand, the approach is criticised for its poor sector coverage, with low volatility healthcare stocks overrepresented, for example. One note about the low volatility factor: The most rigorous studies of this phenomenon find results are largely driven by poor returns of highly volatile securities. This result has important implications when considering a low-volatility investment, but details of this finding are beyond the scope of this introduction.

[1]Rolf W. Banz, Journal of Financial Economics, 1981
[2]Robert A. Haugen, A. James Heins, Wisconsin working Paper, 1972

# Momentum and quality

Within the framework of momentum strategies, the most known factor is price momentum. Equities are purchased if they have performed well recently, and sold if they have performed badly. The outperformers of the recent past might therefore be seen as the outperformers of the future.[3] This factor was "discovered" by Jegadeesh and Titman in 1993.[4] Momentum strategies are usually justified by the findings of behavioral finance, which focuses on known modes of behavior, such as the herd mentality, or anchoring bias for example. More recent studies find that earnings momentum largely subsumes price momentum. Earnings momentum is commonly defined as the trend in earnings surprises or changes in earnings expectations. The rationale for earnings momentum is similar to price momentum, although the finding impacts how the factor is captured in portfolios.

The quality factor entails a focus on the shares of high-quality companies because they tended to outperform those of lesser quality. Robert Noxy-Marx demonstrated in 2012[5] that the shares of highly profitable companies achieve better risk-adjusted performance than less profitable companies. Other criteria that are used to define "quality" include cash flows and debt ratios, as well as the quality of the management and business model, along with the market environment. However, it is problematic that some elements of quality often can't be measured, such as the value of a brand or good reputation. Not least, there is the danger that young high-growth companies – which don't yet have steady earnings – are excluded, as are companies that are highly sensitive to economic trends.

**Figure 2: Key style factors in the equity area**

| Systematic factors | Seeks to capture | Commonly captured by |
|---|---|---|
| **Value** | Excess returns to stocks that have low prices relative to peers with higher prices in the long run | Price/book ratio, price/earnings ratio, cash earnings, net profit, dividend yields, cash flow |
| **Size** | Excess return of smaller firms (by market capitalization) relative to their larger counterparts | Market capitalization (full or free float) |
| **Momentum** | Excess returns to stocks with stronger past performance | Relative returns (3-mth, 6-mth, 12-mth, sometimes with last 1-mth excluded) historical alpha, earnings expectation |
| **Low volatility** | Excess returns to stocks with lower than average volatility, beta, and/or idiosyncratic risk | Standard deviation (1-yr, 2-yrs, 3-yrs), downside standard deviation, standard deviation of idiosyncratic returns, beta |
| **Quality** | Excess returns to stocks that are characterised by low debt, stable earnings growth, profitability, and other "quality" metrics | Return on equity, earnings stability, dividend growth stability, strength of balance sheet, financial leverage, accounting policies, strength of management, accruals, cash flows |

Source: Invesco. Simplified schematic representation for illustrative purposes only.

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## Style factors in the equity area

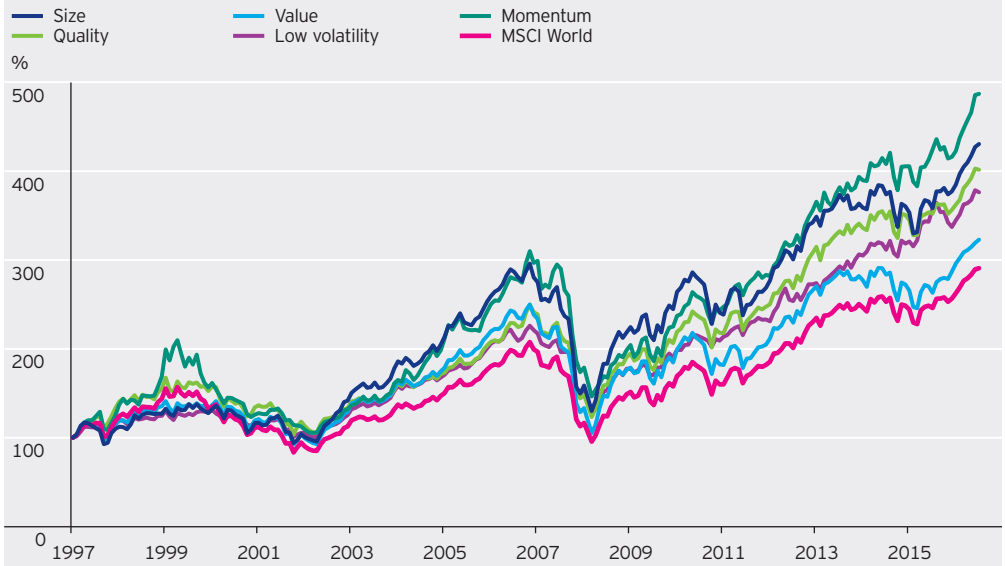
Value, size, low volatility, quality, and momentum are among the most established factor strategies in equity investing. The objective of the value strategy is to identify securities that are priced at a discount by some measure. Size strategies focus on the shares of small companies within a larger universe being considered, while low-volatility strategies emphasise securities whose prices fluctuate less than those of other securities. Momentum strategies involve the purchase of equities that have recently recorded an above-average performance, while quality strategies search for companies of superior quality. The distinction is made on the basis of quantifiable metrics such as P/E ratio, price-to-book ratio, dividend yield or volatility. While some criteria are generally recognised, the approaches can vary in other aspects.

[3] Actual events are difficult to predict and may substantially differ from those assumed. There can be no guarantee that the assumptions discussed will come to pass.
[4] Narasimhan Jegadeesh and Sheridan Titman, Journal of Finance, 1993
[5] Robert Novy-Marx, Quality Investing; Working Paper, December 2012, revised May 2014.

## Factor investments: At times performed better than the market

Professional investors' special interest in investment factors becomes understandable if the returns on factor-based equity portfolios are considered and compared with general market developments. Indeed, factor investing has at times outperformed the market in the long term.

**Figure 3: Factor strategies: Historical index data shows outperformance potential**




Source: Invesco, MSCI from Dec. 31, 1997 to June 30, 2017 (total return, in USD). For illustrative purposes only. Indexes: Size = MSCI World Equal Weighted, incepted on Jan. 2, 2008; Momentum = MSCI World Momentum, incepted on Dec. 11, 2013; Value = MSCI World Value Weighted incepted on Dec. 7, 2010; Low Volatility = MSCI World Min. Volatility, incepted April 14, 2008; Quality = MSCI World Quality, incepted on Dec. 18, 2012. All of the factor indices shown have been created comparatively recently, and therefore, contain elements of hindsight and selection bias. All information presented prior to the inception dates is back-tested. Back-tested performance is not actual performance, but is hypothetical. Although back-tested data may be prepared with the benefit of hindsight, these calculations are based on the same methodology that was in effect when the index was officially launched. Index returns do not reflect payment of any sales charges or fees. Performance, actual or hypothetical, is not a guarantee future results. An investment cannot be made in an index. Please note the x axis labelling denotes the end of each full year.

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### The crucial issue of weighting according to market capitalization

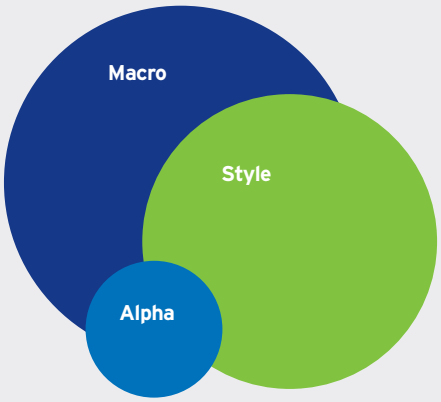
For global equity investments, the data above shows that factor investments based on the style factors of value, size, low volatility, quality and momentum have outperformed the MSCI Index. This is also explained by the fact that factor investing avoids the disadvantages associated with conventional indices that are based on market capitalization. In traditional indices, individual equities are allocated to the index portfolio proportional to their market capitalization. This means that – in the MSCI World Index, for example – equities that tend to have high valuations receive a higher weighting than equities with a low valuation. Cap-weighted indices therefore tended to overweight securities whose prices are high, and to underweight those whose prices have fallen. Cap-weighted indices also have an inherent bias towards large companies, which are more likely to have freely available shares and therefore a high market capitalization.

## Factor investments vs. stock picking

What is the difference between factor investing and traditional stock picking, as it has long been practiced? After all, many traditional fund products have "value" or "size" in their name.

The essential difference is in the security selection process. Stock picking involves leveraging a unique skill or information source to determine which securities are undervalued. Factor investing involves a rules-based approach, picking securities that exhibit particular characteristics based on solid and objective rationale.

**Figure 4: Macro and style factors as guiding principles for active and passive fund managers**




**Macro risk factors**
Macro factors – with an impact on stock market performance

- (Economic) Growth
- Inflation
- Politics
- Currencies
- Liquidity

**Style risk factors**
Style factors that have generated excess returns over the market over long periods of time

- Value
- Momentum
- Quality
- Low volatility
- Size

**Alpha**
Positive alpha requires manager skill

- Security selection
- Country and industry selection
- Market and factor timing

Source: Invesco. Simplified schematic representation for illustrative purposes only.

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### How to differentiate factor investing

Although traditional stock picking and factor investing often apply similar criteria, there are tangible differences between the two. Traditional fund managers select individual securities that seem attractive due to a multitude of fundamental features. These could be specific features, meaning those that apply only to the individual company – such as changes in management or new patent registrations. However, they could also be features that are assigned to factors such as value and size or to general market factors. It requires rigorous stock specific research, subjective decision making and, to pursue alpha, high stock specific conviction. In contrast to the usual stock-picking strategies, factor strategies following a rules based approach consistently view individual securities just as a means of implementation of the factor strategy. Factor investing relies on the rationale for the factor itself to continue to explain returns in the future. If the rationale holds, the factor should continue its usefulness. For these strategies, the crucial issue is how best to define the factors and implement them in live portfolios to achieve the desired outcome net of fees over time. The skill set and process is different even if the desired outcome, outperforming an index for example, is the same.

## How the effectiveness of factors can be explained

Empirically speaking, the data of global style factor indices show that factors have generated a better return than the market over the long term. However, investors who make their investment decisions for the future also want to understand the reasons for this phenomenon. This is why the rationale is so important.

**Figure 5: Why can factor premiums be expected?**

**Risk premiums**
Compensation for additional risks versus the broad market, that is, for an undesirable return pattern.

**Behavioral psychology**
Markets are inefficient due to the behavioral characteristics of investors.
- Anchoring
- Action bias
- Loss aversion

**Market structure**
Markets can be inefficient due to restrictions and limitations.

Source: Invesco. Simplified schematic representation for illustrative purposes only.

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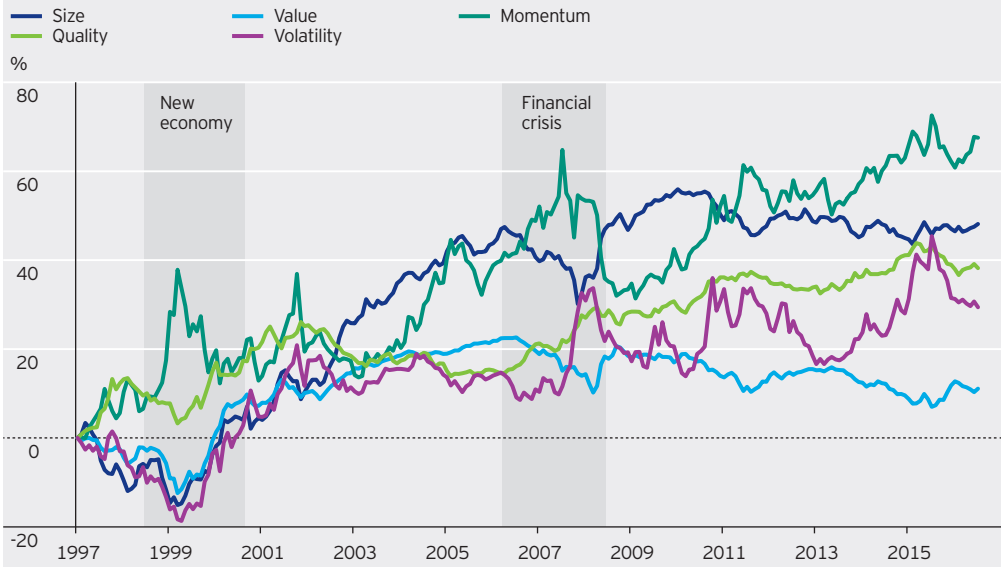
## How factors can be explained

There are various approaches to explain the effectiveness of factors. One of them is to attribute factors to risk premiums. According to this approach, investors take on special risks for which they should be rewarded through higher returns (risk premiums). Therefore, the effectiveness of the size factor, for example, can be explained by the fact that the shares of smaller companies with low market capitalization can be harder to sell in falling markets (illiquidity premium). Other factors can be explained by the findings of behavioral finance. The momentum effect, for example, can be attributed to herd behavior or to the tendency to only take note of information that conforms with one's own assessment (confirmation bias). Complex game theory (population games) can explain the drivers of temporary stable trends supporting the momentum factor as well.

While it can be demonstrated relatively easily that factor investments have produced above-average returns over the very long term, large fluctuations and differences in returns are possible in the short and medium term. Different factors display strengths and weaknesses in different economic and market environments, with one factor outperforming in one environment and the other doing better in another environment. Successful predictions (timing) are exceedingly difficult.

**Figure 6: Factor strategies: Success in various market phases**




Source: Invesco, MSCI from Dec. 31, 1997 to June 30, 2017 (total return, in USD). Indexes: Size = MSCI World Equal Weighted, Momentum = MSCI World Momentum, Value = MSCI World Value Weighted, Volatility = MSCI World Min. Volatility, Quality = MSCI World Quality. All of the factor indices shown have been created comparatively recently, and therefore, contain elements of hindsight and selection bias. Please see MSCI disclosures at the end of this document for further information on MSCI factor indices, indices inception dates and back tested past performance. Backtested performance is not a guide or an indicator of future returns. Please note the x axis labelling denotes the end of each full year.

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## When different factors are successful

Factor strategies perform quite differently in the various phases of the economic cycle. During economic recovery phases characterised by weak or accelerating growth, smaller and more flexible companies (size) tended to perform better, as do value stocks that are already trading at a discount. If growth is strong, but decelerating, quality stocks – i.e. companies with solid balance sheets – score more points. In the second half of the 1990s, for example, value strategies performed badly when technology stocks rallied. Momentum strategies showed their strength in strong trending markets, such as the years 1999/2000 and 2007/2008. Quality and low-volatility factor strategies, on the other hand, have worked particularly well during times of crisis. However, active timing of factor investments is very difficult in practice. It is very easy to understand the behavior of factors looking back in time when the economic cycle is known. Looking forward, it is much more difficult to predict phases in the economic cyle consistently; particularly at or near inflection points. This challenge may be best left to traditional active managers who possess this skill and seek to exploit it through high conviction security selection.

The different return patterns of factors during different market phases also offer opportunities. As mentioned before, enhanced diversification is one potential benefit of factor investing. Over the long term, investment factors have captured a premium over market cap weighted indexes. Since factors often perform differently at different points in the economic cycle, factor investing can enhance diversification. Multi factor strategies seek to exploit this benefit within the portfolio while single factor strategies can complement the broader client portfolio.

## Factor strategies: active or passive?

Factor strategies that are implemented with rules-based ETFs have recently attracted a lot of attention and have managed to pool significant amounts of investor capital. This can create the impression that factor strategies are always best suited to passive investment products. But a closer look reveals that factor strategies – even as rules-based ETFs – can entail a high level of activity in terms of the steady turnover of securities. For example, the momentum strategy naturally involves changing large portions of the investment portfolio, such as when a steady trend shifts after being effective for a long period of time. With a momentum strategy, technology stocks would have been selected on a massive scale in the buildup phase of the dot-com bubble, but probably barely played a role anymore in the momentum portfolio after 2000.

In any case, factor investments aren't only reserved for passive investment products and ETFs. Quite the opposite, in fact: Active management teams have been using factors for decades to assemble and structure their portfolios – even though these often don't carry the "factor investing" label. A look at the history of factor research also shows that factors in asset management are much older than ETFs.

**Figure 7: Factor investing: The origins**


**1964**
**The separation of beta and alpha**
Using Markowitz's mean variance analysis, Sharpe, Lintner and Mossin develop the Capital Asset Pricing Model (CAPM).

**1972**
**Low Volatility**
Haugen and Heins show that low-volatility equities offered higher risk-adjusted returns.

**1976**
Launch of the first index-based mutual fund

**1981**
**Size**
Banz discovers that small caps outperformed large caps.

**1981**
**Value**
Basu discovers that equities with a low P/E ratio achieved higher returns than equities with a high P/E ratio.

**1993**
**Size and Value**
Fama and French develop a three-factor model by adding size and value to the market factor.

**1993**
**Momentum**
Jagadeesh and Titman discover that it is very profitable to buy past outperformers and sell past underperformers.

**1993**
First exchange-traded fund (ETF)

**1997**
Carhart develops the four-factor model.

**2003**
First smart beta ETF

Source: Invesco. Simplified schematic representation for illustrative purposes only.

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### The roots of factor investing

The foundations for factor investing were laid in the 1960s with the Capital Asset Pricing Model (CAPM) developed by William F. Sharpe, John Lintner and Jan Mossin. It made a distinction between alpha as a measure of excess return compared with a benchmark, and beta as market risk. In the Fama-French three-factor model (1993), developed by Eugene Fama and Kenneth French, the size and value premia were combined with market risk for equities. In 1997, Mark Carhart expanded the model to produce the four-factor model by adding the momentum factor. However, studies on the size and value factors were first conducted in the early 1980s, and the first studies on the low volatility factor date back as far as 1972. Security Analysis, the famous book by Graham and Dodd, first published in 1934, touches on many of the same concepts at the heart of factors such as value and quality. Therefore, factor strategies have long been used in active fund management as well – just not under the "factor" label or in the systematic way used today.

## The core differences between active and passive factor investing

Active quantitative managers typically use self-developed factors or multi-factor models that are constantly monitored and enhanced. The active manager's work is at the core of the optimization process. As a result, these strategies often lack transparency for investors – except when it comes to the main features and objectives. Passive products, on the other hand, generally use single-factor strategies based on publicly available and fully transparent factor indices.

**Figure 8: Differences between active and passive factor investing**

| | Active | Index-based |
|---|---|---|
| **Model updates** | Regular monitoring and enhancement of factors and their weightings to suit the market environment | Adjustment of the portfolio according to fixed rules |
| **Factors** | Individual/self-developed, often defined to complement other factors or improve diversification across factors. | Often not self-developed, but generally proven |
| **Transparency** | Transparent in the factors pursued but more complex and less transparent in implementation process. | Transparency of method and implementation. |
| **Costs** | Typically at a discount to traditional alpha seeking strategies and connected to complexity of the strategy. | Generally cheaper reflecting the lower complexity. |

Source: Invesco. Simplified schematic representation for illustrative purposes only.

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### Active vs. passive factor investing

Factor investing can be implemented through actively managed vehicles and passive vehicles, such as ETFs. Continued research has lead to a number of advancements over time and ongoing study and modification is a valuable element of maintaining best practices in the field. In addition, they can pursue a multi-factor approach to assign different weightings to factors, depending on the market environment. The objective here is to make even better use of the advantages offered by individual factors under particular market conditions and evolve as new breakthroughs occur. Private investors might struggle to implement such a strategy with passive ETFs, especially those based on single strategies with fixed definitions.

## Factor investing in the fixed income area

In the bond area, factor investing is still in the early stages of adoption by most investors. There are only a small number of theoretical analyses and reliable empirical studies, many of which relate only to individual sectors of the bond market, such as US government bonds or corporate bonds.

When it comes to government and corporate bond indices, the usual weighting of securities based on market capitalization causes special problems – because it means that high weightings are assigned to the most highly indebted countries and companies, respectively. Investors will therefore disproportionately be invested in issuers with the highest debt burden. Weighting a portfolio based on deliberate factor exposures may be a better way to control overall risk and return.

Furthermore, the indices are often even less balanced than equity indices. For example, many global government bond indices have a strong US and Japan bias, while many corporate bond indices primarily contain bonds from the financial sector.

## Application of factors to fixed income strategies

However, there are also some promising approaches to apply well-known style factors to fixed income strategies. In very general terms, value can be interpreted as meaning that a financial asset is cheap relative to other bonds by some measure. The momentum strategy appears to be the easiest to apply to the fixed income area. Accordingly, the focus is on bonds that have performed well most recently.

**Figure 9: The most important style factors in fixed income investing**

| Systematic factors | Seeks to capture | Commonly captured by |
|---|---|---|
| **Value** | Excess returns to bonds that have low prices relative to peers with higher prices in the long run | Relative value measures: Yield-to-maturity, yield-to-worst, option-adjusted spread (OAS) |
| **Size** | Excess return of smaller firms relative to their larger counterparts within the universe considered | Total issuer debt outstanding, individual bond size |
| **Momentum** | Excess returns to bonds with stronger past performance | Price change (i.e. 3-month, 6-month) |
| **Low volatility** | Excess returns to bonds with lower than average volatility | OAS volatility, yield volatility, duration times spread |
| **Quality** | Excess returns to bonds that are characterised by low debt, stable earnings growth, profitability, and other "quality" metrics | Financial leverage, debt servicing capacity, free cash flow, earnings capacity, capitalization, credit ratings |

Source: Invesco. Simplified schematic representation for illustrative purposes only.

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### Factor investing in the fixed income area

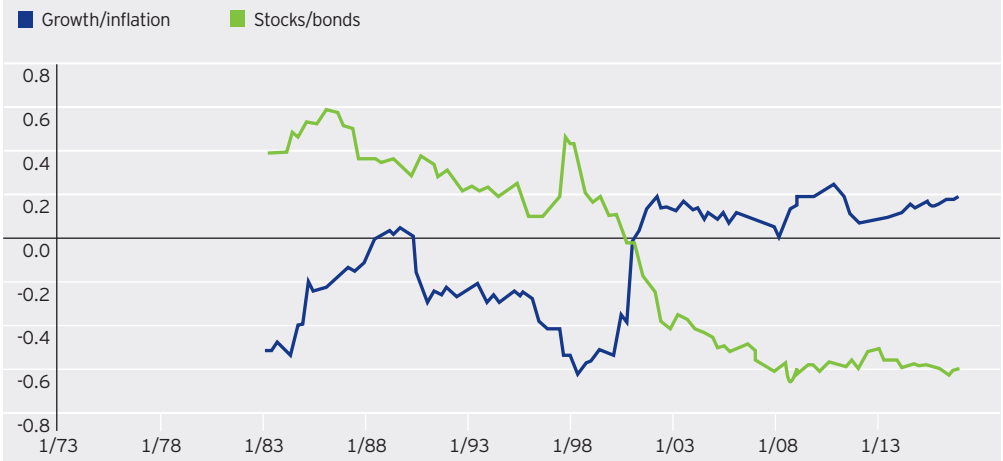
Factor investing is less established in the fixed income area, in contrast to the equity area. There are few reliable empirical studies, largely due to the fact that data is not as readily availble. Since bonds trade over the counter without central exchanges, and many bond issues do not trade every day like stocks, its not surprising gleening valuable insights from bond markets is harder. Nevertheless, there are promising approaches that indicate factor investing will become increasingly important in the fixed income area as well. Much of the same rationale that forms the basis of equity factors applies in bonds and much research in this area is ongoing.

## Multi-asset portfolios: Macroeconomic factors that span asset classes

Macroeconomic factors that include fixed income can also be interesting, particularly in multi-asset portfolios. The objective here is to more efficiently manage allocations at the portfolio level. The rationale is that diversification across various standard asset classes (equities and bonds) no longer guarantees the risk diversification that investors seek because correlations between these asset classes have increased significantly since the financial crisis. Further, to the extent factor exposures cross traditional asset classes, explicitly managing the factors across asset classes makes a lot of sense.

In the fixed income area, as in the equity area, it is more difficult to gain exposure to macroeconomic factors than would appear to be the case on first examination. One example is the common assumption that growth and inflation rates have a direct effect on returns. As a result, consideration is increasingly given to scenario analysis, which observes how changes in the macroeconomic environment affect bonds.

**Figure 10: Correlations between macroeconomic factors and correlations between equities/bonds**




Sources: Bloomberg L.P., Invesco. Correlations beginning in 1983 are based on 10-year quarterly rolling periods from Jan. 1, 1973 to March 31, 2017. Growth and inflation are measured using the Federal Reserve Bank of Philadelphia's Survey of Professional Forecasters; the correlation is between the quarterly change in one-year-ahead real GDP growth and the growth in the GDP deflator (measure of the level of prices of all new, domestically produced, final goods and services). The correlation between stocks and bonds is measured by the correlation between excess price returns in the S&P 500 Index and the Bloomberg Barclays US Treasury Index.

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### Macroeconomic factors may help to optimize portfolios

A scenario analysis shows, for example, that the correlation between bonds and equities from 1973 to 1998 was slightly positive, but subsequently slipped into negative territory and was then distinctly negative since. By contrast, the macroeconomic factors of growth and inflation rates were negatively correlated from 1973 to 1998, but then became positive. This suggests a link between the correlation of equities and bonds and the correlation of the macroeconomic factors of growth and inflation rates. A portfolio can be constructed based on these considerations. As a first step, estimates are developed for growth and inflation rates. On this basis, one can then forecast how the different asset classes will behave in various environments. In this way, an optimized portfolio consisting of equities and bonds can be designed for different scenarios which seeks a maximum risk-adjusted return through different market phases.

However, the use of macroeconomic factors also has its limits here. For example, periods of monetary policy reversals – such as the recent past since 2008 – can't be so easily reflected in this model. Nevertheless, these types of models enable bond strategies to assume a new role with respect to macro factors.

Given the success of factor investing in the equity area and investors' ongoing search for alternatives to conventional bond products, it can be expected that factor-based investing will increasingly gain in importance in the fixed income area as well. Even today, the structure of multi-asset portfolios can be improved significantly by using scenario analyses based on market factors.

## Factors in an investor's portfolio are used for different reasons

Now that we have gained a general understanding of factors, the key question is how factor investing is used in investor portfolios and what its objectives are. In general, a strategic portfolio that is diversified according to factors can reduce the risk and enhance the return in the long term compared with the broad market. Depending on their individual starting point and investment portfolio, investors may use factor strategies for different reasons.

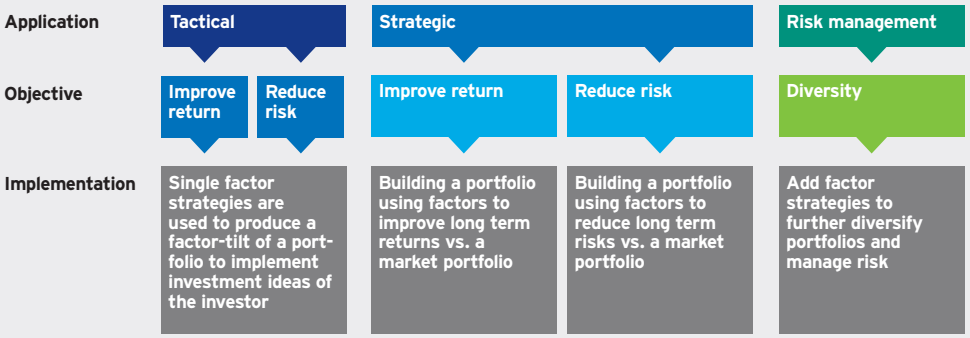
Some of the key considerations are:

- In a **portfolio with traditional passive strategies, passive factor strategies** (frequently referred to as "smart beta" strategies) can offer a cost-efficient means of increasing return potential of the portfolio or used as a tool to balance overall factor exposures.
- Investors with a **portfolio consisting of passive strategies may use active quantitative factor strategies** to pursue excess return or achieve a more effective risk diversification.
- Investors who have traditionally invested in **fundamental active strategies** may decide to add **factor strategies** to increase diversification, smooth allocations, directly target factor premiums or lower total investment costs.

- Investors who already use **passive factor strategies (smart beta)** might want to consider **active factor strategies** to achieve more efficient implementation, allow for advancements in techniques or increase effective risk diversification.

In the process, the decision to use factor strategies in a portfolio does not have to be strategically motivated. As the following chart shows, factor strategies can also be used tactically.

**Figure 11: Objectives of factor investing**




Source: Invesco. Simplified schematic representation for illustrative purposes only.

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## Tactical use is also possible

The objective of factor investing is normally strategic due to the long term nature of investment factors. However, a tactical use of factors is also possible, for example, in order to express a market view. In this way, investors who expect a positive equity market trend to continue can focus on momentum strategies. Other investors, who may expect heavy volatility in equity markets in the future, can hedge their bets with low-volatility strategies instead. Last but not least, factor investing can also be used in a targeted way to reduce portfolio risk – with the objective of giving the investment additional diversification. A note of caution, however; applying factors that have historically delivered a premium in the long term creates an additional hurdle that must be overcome when used tactically. Market trends and economic cycles can change quickly and, sometimes unexpectedly. In order to benefit from tactical applications, investors must know when to get in and when to get out.

# Multi-factor investing: Relevant solutions for different investor needs

Given the fact that different factor strategies can be used both strategically and tactically to achieve specific investment objectives, multi-factor investing is especially suited to providing relevant solutions for a wide range of investor needs.

**Figure 12: Where multi-factor investing could be relevant**

| Core equity investors | Passive-minded investors | Factor-based investors |
|---|---|---|
| - Stable, consistent process<br>- Historical outperformance and compounding effect over time<br>- No capacity constraints | - Seeks to be close to the passive comfort zone (tracking error 1%, beta 1, market volatility)<br>- Targets index+ performance after costs<br>- Cost-efficient active management | - Built on proven drivers of equity returns<br>- Diversified, integrated multi-factor solution |
| **Multi manager investors** | **Quant-driven investors** | **Multi asset investors** |
| - Historically low correlation to other equity strategies<br>- Low cost active approach<br>- Core equity solution with potential to outperform index vs. passive | - Unbiased quantitative process<br>- Solid performance, esp. during Quant Meltdown | - Equity sleeve<br>- High Information Ratio<br>- Easy to hedge |

Source: Invesco. For illustrative purposes only.

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### Typical applications of multi-factor investing

The benefits of multi-factor investing are as manifold as the options to combine factor strategies to meet investor needs. For example, investors seeking to build a core portfolio offering exposure to equities can use a multi-factor approach to obtain a highly robust and consistent investment process while seeking to avoid the capacity limits inherent to some equity strategies. Another example: Many investors use strategies managed by different managers in their portfolios (for example, by investing in different funds). Adding a multi-factor strategy to such a portfolio can offer particular benefits because of the frequently low correlations between such a strategy and other equity strategies.

## Multi-factor investing: relevant solutions for different investor needs

In summary, we can see that investors who already have an existing equity or equity fund portfolio can try to compensate for one factor's recognized deficiency by adding single-factor products, such as smart beta ETFs. For example, if an investor believes that the existing portfolio is too speculative in orientation and doesn't include enough securities that are more resistant to volatility, an investment product with a low-volatility factor strategy can be added.

However, the situation isn't always clear because it is very difficult to analyze exactly how good the factor diversification of an existing portfolio really is and what would have to be done to improve it. In this case, a new equity portfolio based entirely on factors may be more appropriate. This can be based on single-factor strategies. However, this might force investors and their advisers to make ad-hoc interventions to adapt the portfolio to changed market conditions.

A fundamentally different approach is to assign an active manager to construct a multi-factor portfolio with the relevant products. This requires skill and proficiency on the part of the professional manager to weight and adapt the individual factors in the portfolio in such a way that the investment objectives that were agreed upon – or defined in the fund prospectus – are achieved for the investor in an optimal way.

Different objectives also require a different approach. If the objective is to achieve as much return as possible – even with higher volatility risks – the fund manager can assign a lower value to risk aversion as part of the portfolio optimization process and thereby assign greater importance to higher returns. On the other hand, a long-term strategic diversification based on factors is paramount to achieve the steadiest returns possible with manageable equity risk.

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