ODDO BHF
ASSET MANAGEMENT

# Factor-based investing – the third pillar

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# Content

## Introduction

Institutional investors have adapted their asset allocation to a changed market environment in recent years. Persistently low interest rates and volatile equity markets have had an impact on the assessment of the risks associated with passive and fundamental investment strategies. While passive strategies inevitably increase market risk in times of rising volatility, it has become increasingly challenging for fundamental-based asset managers to consistently outperform their benchmarks. Both approaches will continue to have their place in the portfolios of professional investors. However, the role of factor-based strategies as a third pillar is likely to grow in order to contribute to generating consistent, predictable outperformance.

Multi-factor strategies, which ODDO BHF Asset Management has been successfully offering for more than 14 years now, contribute to portfolio diversification and thus to risk reduction. Yet for many investors, this raises questions: What factors should we focus on? How stable are the negative correlations between different factors? Can factor strategies sustainably generate alpha?

In our first white paper on factor-based fund management, we would like to give interested investors an insight into the history and current characteristics of this asset management approach. Looking back shows that the basis for factor premiums is scientifically and empirically sound. A practical look helps to better understand how factor-based strategies can work in the portfolio context. These strategies are not a panacea, but when used correctly, they help improve portfolio efficiency significantly.

**Dr. Carsten Große-Knetter**

Global Head of Quantitative Equity
ODDO BHF Asset Management GmbH

**Thierry Misamer**

Portfolio Manager, Quantitative Equity
ODDO BHF Asset Management GmbH

# Chapter 1:
# Capturing Alpha

## The myth of market efficiency

A hallmark of classical capital market theory is the linear correlation between risk and reward. That higher returns can only be achieved through greater risk is so intuitive that it is a part of almost all standard curriculums, in spite of its extremely restrictive basic assumptions. For it to be true, however, a perfect market is required, on which rational investors trade homogeneous goods without spatial, temporal or personal preferences, and without transaction costs, taxes or other market barriers, all against a backdrop of full market transparency. With his Efficient Market Hypothesis (EMH), Eugene Fama subsequently put out the myth that markets worldwide are efficient. Yet, doubts soon emerged on whether markets were truly efficient. Anomalies such as calendar effects and speculative bubbles could not be reconciled with the EMH. As far back as the 1980s, Robert Shiller thought that the EMH did not stand up to empirical evidence:

> *"It should be obvious to the most casual and unsophisticated observer by volatility arguments like those made here that the efficient markets model must be wrong … The failure of the efficient markets model is thus so dramatic that it would seem impossible to attribute the failure to such things as data errors, price index problems, or changes in tax law."*

(Robert J. Shiller, « Do Stock Prices Move Too Much to be Justified by Subsequent Changes in Dividends? » ; The American Economic Review, juin 1981, p.421)

### What is factor investing?

Factor-based investment strategies focus on characteristics of securities, the so-called factors that explain differences in returns. Factors that demonstrably have achieved higher risk-adjusted returns than the market average include the size of the company, the market valuation, recent price trends of a stock (momentum) and high dividends. By selecting securities based on factors, investors aim to outperform markets in the long term. Asset managers using a factor-based approach do not let themselves be guided by their own opinion or speculations about a specific stock. Instead, their investment decisions are always based on quantifiable facts and data.

## Value – a proven recipe for success

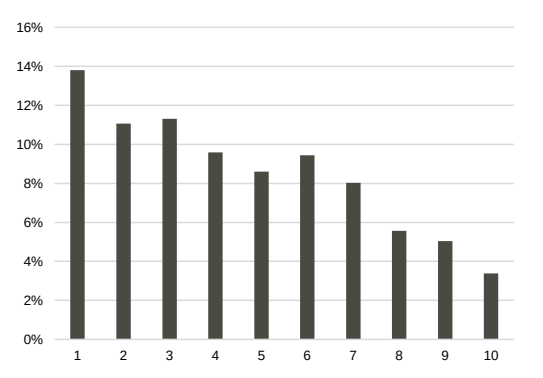
Long before academics did so, market participants doubted the existence of efficient markets. Benjamin Graham's watershed work *The Intelligent Investor* was published as far back as 1949. It was based on the premise of investing in companies that are trading below their real value. The underlying assumption that the market does not always reflect a company's true value stands in direct contradiction with the EMH. Graham thought that markets tend towards overshooting or undershooting and that prices approach fair value only over time. He put a face on the market, whom he called "Mr. Market" and whom he described as manic-depressive. He is not rational but is driven by emotions, offering to buy shares one day and sell them the next. The Intelligent Investor stands ready to exploit Mr. Market's moods. The Intelligent Investor suppresses his own emotions, buying from pessimists (at excessively low prices) and selling to optimists (at excessively high prices).

Graham's investment philosophy was based mainly on his observation of historical P/E ratios, in which companies are often chosen that have performed poorly recently and are therefore cheap. Such shares tend to be more volatile and to have a beta over one. Things often get worse before they get better. Deep-value strategies, which invest in such turnaround stories, may be a good idea but they often result in high drawdowns.

## Example 1:
## "Cyclical Value" – Price/Earnings ratio (see below)

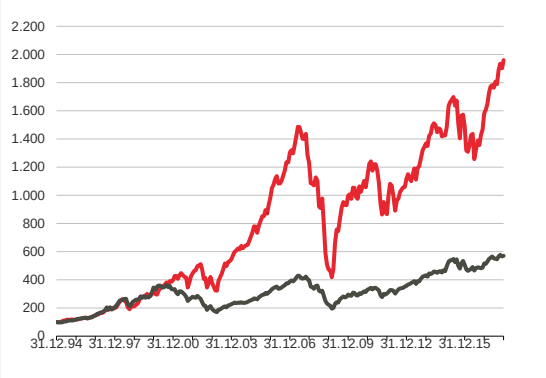
One of Graham's main indicators was the price/earnings (P/E) ratio. Although it dates back to the publication of Graham's work, in 1949, it is still in use. By way of illustration, we have carried out a simple study. Starting from 31 December 1994, DJ Stoxx 600 components were sorted on a quarterly basis on the basis of their P/Es and divided into deciles. Decile 1 includes shares with the lowest P/Es, Decile 10 with the highest P/Es:

**Shares listed in the DJ Stoxx 600 index broken down by their P/E**




Source: Factset / Calculation by ODDO BHF Asset Management GmbH. Period: 31/12/1994 – 31/12/2017.

**Historical performance of decile 1 versus last decile**




Source: Factset / Calculation by ODDO BHF Asset Management GmbH. Period: 31/12/1994 – 31/12/2017.

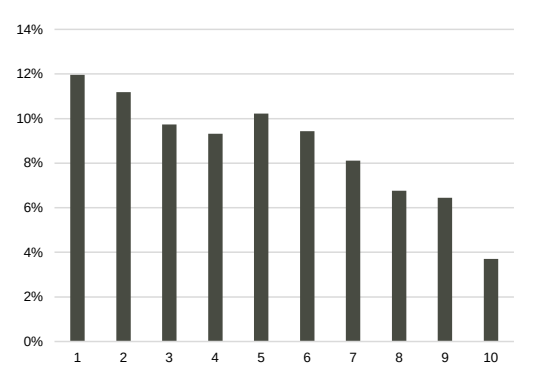
While shares in Decile 1 achieved an average annual return of almost 13.8% till the end of 2017, shares in Decile 10 achieved only 3.3% (left-hand chart). Decile 1 shares inevitably outperformed the entire market (right-hand chart). However, realised volatility over the observation period was 22.3% in the first Decile, far higher than the 15.4% of the market in general. EMH proponents would have us believe that this is proof of their theory that model-immanent outperformance is possible only by taking on greater risk. However, this would neglect the fact that the reverse outcome does not hold. Based on this logic, the poorer-performing Decile 10 would be less volatile than the market. In fact, the opposite is true. With volatility of 24.2%, Decile 10 is more volatile than Decile 1.

Investors such as Warren Buffet later modified Graham's approach in quest of "stable value", i.e., mature companies with good and stable cash flows, high and sustainable dividends. In a word, companies that are considered somewhat "boring" and are thus overlooked precisely during bull markets, when there is little fear of price declines and a strong appetite for performance rules the day. History has shown that this approach also achieves surplus returns.

## Example 2:
## "Stable Value" – Dividend yield (high)

Along the lines of the procedure described in Example 1 (P/E), we classified shares over the same time period based on their dividend yield, with the highest dividend yield in Decile 1 and the lowest in Decile 10.

**Shares listed in the DJ Stoxx 600 index broken down by their dividend yield**

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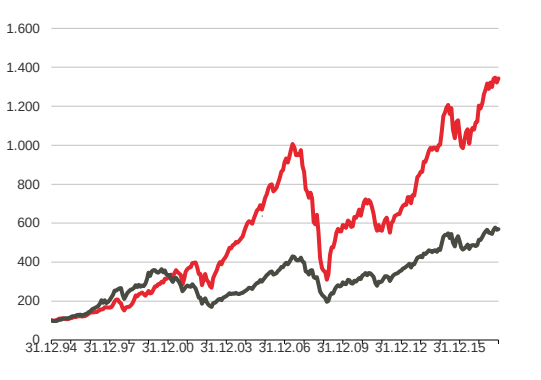
**Historical performance of decile 1 versus last decile**



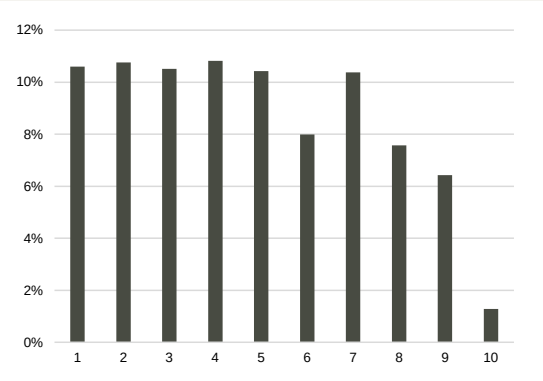

Source: Factset / Calculation by ODDO BHF Asset Management GmbH. Period: 31/12/1994 – 31/12/2017.

Shares with the highest dividend yields (Decile 1) were once again the leaders, at 12.0% p.a. and outperformed the market on a sustained basis. Their realised volatility of 18.5% was still above the market level, but far lower than in the P/E comparison. Shares will low dividend yields, in contrast, achieved price gains of only 3.7%, even with higher volatility of 22.8%.

# Factor Investing – adding value over the long term

Market inefficiency is not limited to “value”: other factors have also been identified to act as systematic drivers of added value.

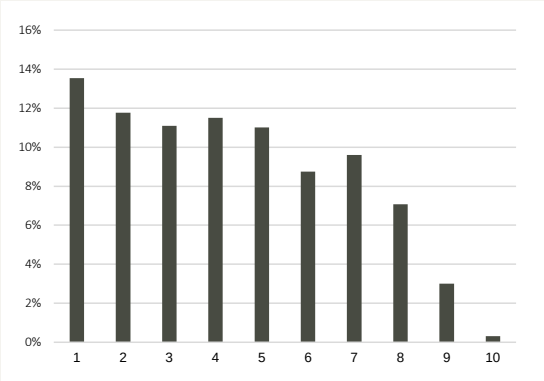
## “Size” factor – Market cap (small)




Source: Factset / Calculation by ODDO BHF Asset Management GmbH. Period: 31/12/1994 – 31/12/2017.

Shares with the largest market caps (Decile 10) averaged price gains of only 1.2% p.a., while smaller companies dominated the market with double-digit returns.

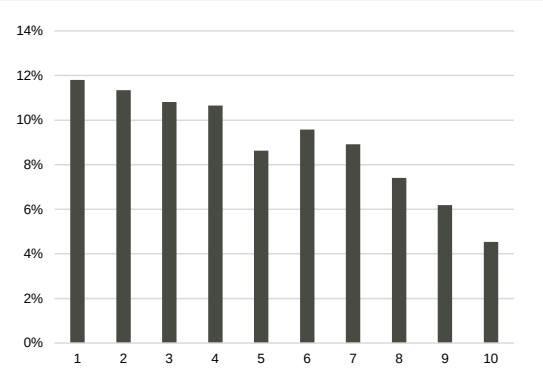
## “Momentum” factor – 1-year price change (high)




Source: Factset / Calculation by ODDO BHF Asset Management GmbH. Period: 31/12/1994 – 31/12/2017.

While Decile 1 shares averaged almost 14% p.a. returns until the end of 2017, Decile 10 shares achieved only about 0.3%. Nor can this difference be explained with the slightly higher risk.

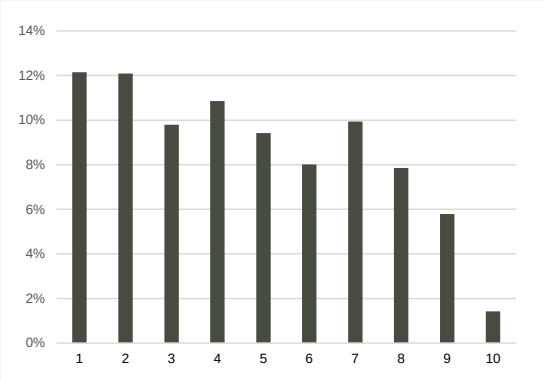
## “Quality” factor – Return on equity (high)




Source: Factset / Calculation by ODDO BHF Asset Management GmbH. Period: 31/12/1994 – 31/12/2017.

Assessing a company’s profitability is also a reliable source of added value. Shares with high returns on equity (Decile 1) clearly outperform the market over time, while shares with low ROEs underperform the market significantly.

## “Risk” factor – Volatility (low)




Source: Factset / Calculation by ODDO BHF Asset Management GmbH. Period: 31/12/1994 – 31/12/2017.

While the least-volatile shares (Decile 1) averaged a return of 12.2%, the highest-volatile shares (Decile 10) gained only 1.4%.

These examples show that investing systematically based on factors adds value over the long term. Granted, the stocks referred to above do have slightly above-average volatility. EMH proponents cite this as a confirmation of their thesis according to which added value can be achieved in efficient markets only by taking on added risk. However, this argumentation ignores the opposite conclusion, that underperformance does not necessarily result from lower risk. Decile 10 shares underperform drastically even when they are more volatile. Furthermore, the example for the “Risk” factor makes clear that higher risk in itself does not lead to greater returns. On the contrary, it costs a lot of money.

## Behavioural Finance: Human, all too human

Empirical evidence thus shows that the efficient market hypothesis can at best be understood in normative terms but its basic grounding in reality is by no means assured. This is where behavioural finance comes in. Behavioural finance focuses on the decisions of individual persons and the aggregated impact of irrational thinking and behaviour on the market level. There are many traps here, and investors are not the only ones to be ensnared by them:

### Case study:

**Test subjects were given the following choice in a study:**

**A.** You have a 50% chance of winning EUR 1000
**B.** You have a 100% chance of winning EUR 500

**Statistically speaking, both answers are equivalent, and yet the overwhelming majority of respondents chose the safe EUR 500 gain.**

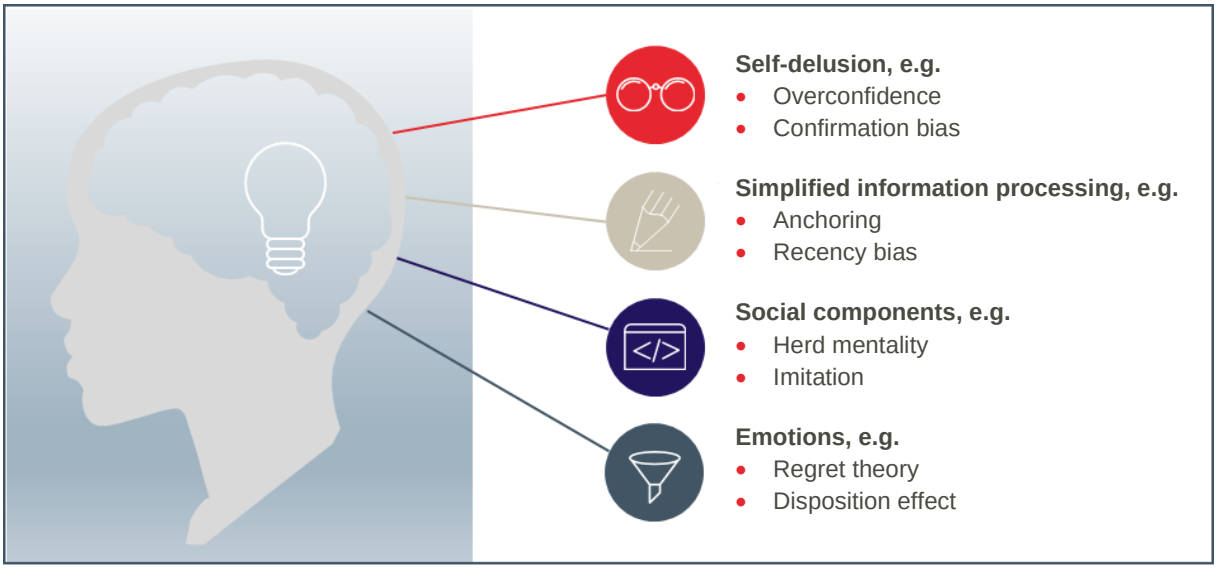
**Another test group was given the following choice:**

**A.** You have a 50% chance of losing EUR 1000
**B.** You have a 100% chance of losing EUR 500

**This time the overwhelming majority opted for the riskier choice, "A".**

This case study is based on the so-called disposition effect, i.e., investors' tendency to realise gains too early and to hold on to losing positions too long. This behaviour affects investment success, as it contradicts the observable tendency of stocks that have recently risen in value to keep doing well. So, fear of losing is enough to make one assume a greater risk, whereas when there is a possibility of a gain, one is more satisfied with a moderate outcome. This study shows that the risk of loss has a higher emotional value in decision-making situations than potential gains.

A related phenomenon is "anchoring". Share prices at any one time often reflect less the firm's current earnings situation. Rather, there are other factors more strongly at play, such as historical highs, cost basis, or, in some cases, round numbers such as 100 or 1000. Chart analysis arose as an investment strategy based on this behavioural pattern. It is not rational to continue to be guided by a five- or 10-year-old high. The company in question may be far more profitable now or it may have realigned its strategy. Chartists compare only the price of a share while ignoring the company's degree of success. This has implications for capital markets, as investors follow herd instincts that drive them to invest in assets that many other investors are investing in. So, the more people keep an eye on the same milestones, the greater the probability that they buy stocks until these milestones have been reached, hence creating a self-fulfilling prophecy.




Other widespread irrational behaviours in the investment world include calculated optimism and the herd mentality. However, there are many more of these, as our illustration shows.

What about market behaviour? Since science has shown that people make poor decisions when relying on their emotions, the question begs itself: "Why indeed do we decide in the heat of the moment?" When shares that we consider cheap are driven down in value by irrational emotions, their undervaluation objectively looks even greater. Markets can be irrational for a long time, but not forever. As Joel Greenblatt said:

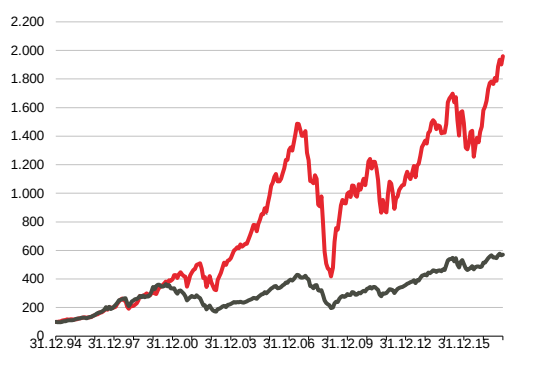
> *"Over the short term, Mr. Market acts like a wildly emotional guy who can buy or sell stocks at depressed or inflated prices. Over the long run, it's a completely different story. Mr. Market gets it right."*

(Joel Greenblatt, « The Little Book that beats the Market », 2010)

## Example 1 :
## "Cyclical Value" – price/earnings ratio (low)

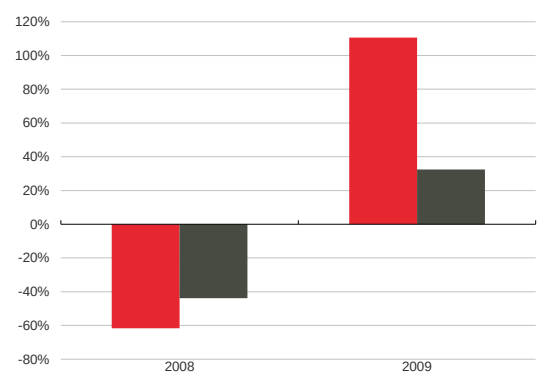
Over the entire, 23-year observation period, shares with the lowest P/Es outperformed the market as a whole considerably (left-hand chart).

**"Value" factor – low P/E ratio (in red)**




Source: Factset / Calculation by ODDO BHF Asset Management GmbH. Period: 31/12/1994 – 31/12/2017.

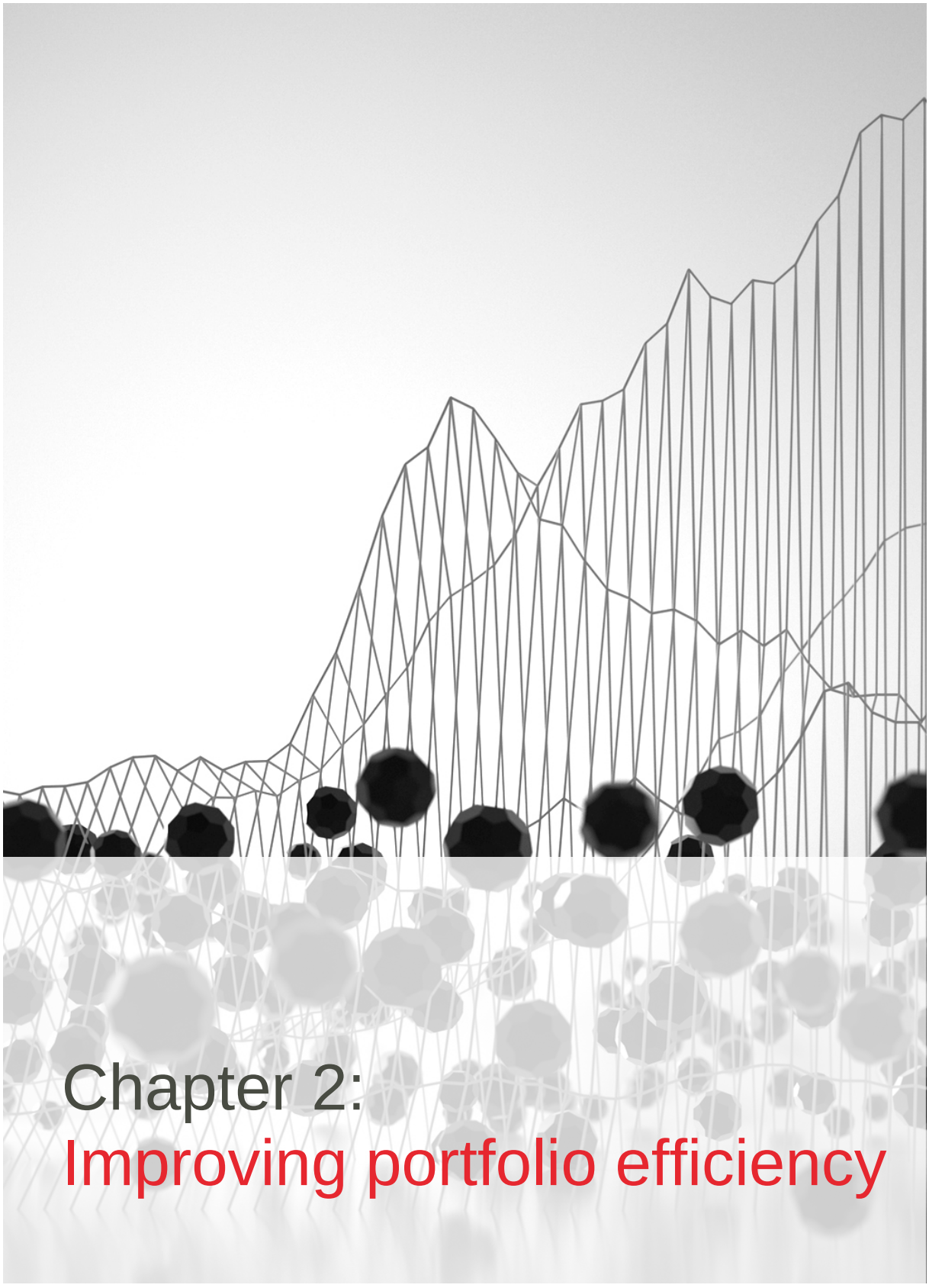
**"Value" factor – 2008 vs. 2009**




Source: Factset / Calculation by ODDO BHF Asset Management GmbH. Period: 31/12/1994 – 31/12/2017.

But things were completely different during sub-periods. At the peak of the subprime crisis in 2008, shares with low P/Es fell completely out of favour. While the market as a whole fell by 43.8%, the highest-P/E stocks were in true panic mode, dropping 60.8%. It was just the opposite in the next year, as the total market gain of 32.8% outperformed the strategy portfolio. Shares in Decile 1 even doubled.

On a long-term view, it is worth investing independently of market mood. Not letting yourself be infected with market panic and, instead, resisting all temptation and sticking to your convictions is easier said than done. Just as Odysseus had himself tied to the mast of his ship to keep himself from giving in to the seductive song of the sirens, investors must protect themselves from their emotions if they are to achieve success.



# Chapter 2:
# Improving portfolio efficiency

## Playing by the rules – the power of quantitative management

Quantitative equity fund management is underlain by a structured and disciplined process based on predefined rules. Hence, irrationality, such as described in Chapter 1 can be not only avoided; the resulting market inefficiency can be exploited for systematic outperformance. To achieve this, quantitative fund managers basically use the same factors as traditional managers. They also call on fundamental and technical indicators, such as dividend yield, earnings growth and revisions, price momentum and volatility. It is therefore a fallacy to affirm that quantitative fund management is not fundamental fund management. It must also stand out from the many, purely passive approaches. Indeed, in quantitative approaches, the computers' only role is to calculate and evaluate large amounts of data, whereas setting the parameters for data analysis and calculations as the interpretation of results is the sole responsibility of quantitative portfolio managers. Their intervention is key to the process. To achieve active performance they therefore need not only mathematical knowledge and a feel for numbers, but also an understanding of economics and familiarity with the equity markets.

### At a glance – Properties of quantitative fund management

The investment process is rigorous, clearly structured and transparent

Quantitative screening can be used to select attractive shares from a broad investment universe

Systematic assessment guarantees high objectivity and discipline in implementation

All markets are covered with consistent quality

The model's predictive capacity may vary depending on the market environment

The main difference between quantitative portfolio management and conventional approaches is far more in its capacity to assess a large set of data on a large number of markets, its rigorous application and the systematic evaluation of available indicators. This makes it possible to identify and select "hidden champions" from the crowd that might go completely unnoticed in a traditional approach based on fundamental analysis given its too narrow focus on a limited investment universe. A home bias or big-cap bias, i.e., the systematic overweighting of domestic or large companies merely because one knows them better, can't happen in a quantitative model, as the stocks are selected consistently on the basis of model indicators and factors. The company's "story" and one's personal opinion on the company are deliberately erased in order to eliminate intuition and irrationality. The investment decision is thus consistent, understandable and repeatable in each individual case.

At the risk of oversimplifying, non-quantitative fund managers go into greater depth as they research precisely the companies in which they invest. Quantitative fund managers go into greater breadth by

using computing power to tap into a far wider investment universe in their search for attractive companies.

## Success factors for achieving outperformance

A systematic stock-picking model must first identify factors representing investment styles whose systematic analysis helps generate a positive active performance vs. the market. Here are some examples:

Value: Fundamentally attractively priced shares

Momentum: Shares with solid medium-term performance track-records

Revision: Shares with positive trends in analyst forecasts

Growth: Shares with good fundamental growth indicators

Risk: Shares will low risk indicators, such as volatility and beta

Value, revision and growth are fundamental factors based on indicators such as corporate earnings or analyst forecasts. Momentum and risk are technical and are based on the share price history, while the value factor takes into account multiples such as the price/earnings ratio and dividend yield.

Each factor is underlain by several indicators that represent this investment style. For example, value uses indicators such as price/earnings ratio, dividend yield etc.. We have found that the higher the number of indicators analysed, the more stable the factor's performance.

## Reducing portfolio risk through a multi-factor approach

Many investors tend to focus on certain factors. For example, value approaches have long been among the favourite investment approaches. But this requires acceptance of phases of steep underperformance. Pure style portfolios such as so-called “smart-beta” products deliver added value only to very long-term-oriented investors, who are willing to stick out long periods of weakness.

However, many investors are not willing to do so. They sell off or sell down their exposure after a phase of weakness, thus missing out on the subsequent rally. This is a good argument for multi-factor approaches, which combine several factors. The “value” factor invests in undervalued stocks and, hence, also in “turnaround stories” that have suffered steep losses. Conversely, the trend-following, “momentum” factor invests in stocks that have an especially strong performance track-record. Accordingly, the “value” and “momentum” factors select more volatile shares, and the “risk” factor deliberately chooses stocks that are less volatile.

The variety of factors manifests itself mathematically in the low or even negative correlation of the relative returns of the factor portfolios. There are always market phases in which a certain investment style does not work. Moreover, a single factor portfolio can focus very closely on certain sectors by choosing an overwhelming proportion of shares from the same sector, thus foregoing optimal diversification.

However, combining various factors can reduce portfolio risk through diversification. When one factor is not working, other factors can pick up the slack. In particular, a combination of fundamental factors (value, revision and growth) and technical ones (momentum and risk) has proven to be advantageous. Here again the rigour of the quantitative process is on display, in that it is possible to stick with investments in individual factors and investment styles during phases of poor performance, in order to take part in the subsequent rally.

## Multi-factor strategies – a turnkey solution

From a diversification point of view, the question arises as to how best to determine factor weightings. It is useful to do this in two steps. First, a strategic weighting is established via Markowitz optimisation (maximising the information ratio) based on long-term historical risk-reward indicators. However, it is apparent that optimisation alone based on long-term risk indicators does not guarantee optimum diversification. The theoretical basic assumption of portfolio optimisation that the risk properties of factor portfolios, particularly their correlation with one another, is constant over time, has been shown in practice to be unrealistic. During tense market phases in particular, long-term lightly correlated investment styles can move in a single direction. In this case, active risk cannot be reduced through diversification between factors.

This is why  in a second step and each time the portfolio is turned over, dynamic factor weightings are determined on the basis of short-term historical risk parameters. Factors that are closely correlated with one another or that are highly volatile are thereby underweighted. This reduces active risk even further.

As a result, factor portfolios are combined that are slightly, or even negatively, correlated. This reduces the active risk of the entire portfolio through diversification, but it also allows to collect the returns that the individual factor portfolios generate. From five portfolios with very high tracking errors, a comprehensive portfolio is formed with moderate tracking error. But this is not a quasi-index or passive portfolio, as seen in a high active share (deviation from the benchmark). This is a typical indicator of a quantitative equity fund: on the one hand highly active positioning with – when examined on an isolated basis – a highly risky (hence with high potential returns) positioning in the individual stocks and investment styles but, on the whole, a diversified portfolio with aggregate risk under control.

## Conclusion

Despite having a long experience in markets and techniques, no professional from the financial industry, not even a quant, has yet found the philosopher's stone or the secret formula for investing in the right shares so as to outperform the market. Even so, quantitative stock-selection models make it possible, though their systematic approach, to identify promising investment opportunities, to actively position oneself, and to make investment decisions in the future as well, based on the exact same rules. This gives investors the opportunity, at negligible risk, to outperform the market routinely in the medium- to long-term, i.e., to beat the indices and ETFs. A stock-picking system, when used consistently, also makes it possible to achieve greater reliability and consistency in future investment outcomes.

## About ODDO BHF AM

ODDO BHF AM is part of the independent Franco-German financial group ODDO BHF that was founded in 1849. ODDO BHF AM is an independent asset management leader in Europe. The asset management of the ODDO BHF Group comprises ODDO BHF AM GmbH in Germany, ODDO BHF AM SAS, ODDO BHF Private Equity in France and ODDO BHF AM Lux AG in Luxembourg, which together manage assets totaling € 61.6 billion.

ODDO BHF AM offers its institutional and wholesale clients a unique range of high-performance investment solutions in all main asset classes, i.e. European equities, quantitative strategies, fixed income, multi-asset solutions and private equity.

The team dedicated to quantitative strategies currently manages a total of € 4.1 bn, applying both multi-factor and single-factor approaches. It comprises 9 investment professionals with an average of 16 years of investment experience and has a track record of up to 14 years in Europe and the US.

On a combined basis, 70% of assets under management are from institutional clients and 30% from distribution partners. The teams operate from investment centers in Dusseldorf, Frankfurt and Paris with additional locations in Luxembourg, Milan, Geneva, Stockholm, Madrid, Hong Kong, Abu Dhabi and Zurich.

ODDO BHF AM puts the long-term support of its clients at the heart of its priorities. Its independence allows its teams to be responsive, flexible and innovative in order to constantly find solutions tailored to the customers' needs.

ODDO BHF
ASSET MANAGEMENT

**ODDO BHF Asset Management GmbH**
Herzogstrasse 15 – 40217 Düsseldorf (registered seat)
Bockenheimer Landstrasse 10 – 60323 Frankfurt am Main
am.oddo-bhf.com