

WHEN FACTORS AND BEHAVIORAL BIASES MEET

How human behavior creates investment opportunities

INTRODUCTION

Behavioral finance shines a spotlight on how psychology influences investor behavior which in turn has an impact on financial markets. This plays an important role in explaining factor premiums and assessing the extent to which they will be sustainable in the long run.

This school of thought proposes that investors are not fully rational in their actions, but instead allow their decisions to be influenced by emotions that can be the source of behavioral biases. It is therefore important to gain an understanding of these cognitive tendencies as they help to explain why markets are inefficient, and why factor premiums such as low volatility, momentum, quality and value exist.

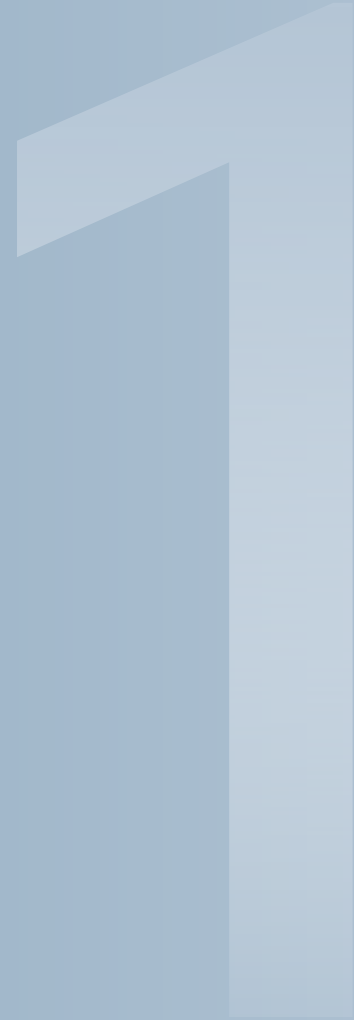
Human psychology and our propensity to make these behavioral errors should not be underestimated. Much of the work in behavioral finance shows that people consistently make mistakes, even when they have been alerted to their tendency to do so. At Robeco, our quantitative solutions seek to exploit these deeply entrenched biases through a disciplined, transparent and systematic approach that keeps emotions at bay and takes advantage of market inefficiencies driven by human behavior.

In this publication, we first look into how behavioral biases can affect investors and how quant investing can benefit from the resulting market inefficiencies by featuring the insights of our in-house experts: Chief Quant Strategist, Pim van Vliet; Chief Researcher, David Blitz; and Head of Factor Investing and Professor in Behavioral Finance at Erasmus University Rotterdam, Guido Baltussen.

We then explore why risk-based theories fail to adequately explain the existence of the low volatility, momentum, quality and value factors, and why behavioral biases actually give rise to them. Moreover, we reveal why we believe these factor premiums have not been arbitrated away and will continue to persist going forward. Then, in closing, Remco Zwinkels, Professor of International Finance at Vrije Universiteit Amsterdam, touches on his work in the field of behavioral finance and shares some interesting anecdotes.

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Roundtable interview with in-house experts



A photograph of three men in business suits standing in a modern office. The man on the left has a beard and is wearing a grey suit with a purple tie. The man in the middle is wearing a grey suit with a light blue tie. The man on the right is wearing a dark blue suit with a patterned tie. They are standing in front of a large wooden table. In the background, there are glass partitions, a modern light fixture with three copper-colored spheres, and a staircase. A large blue circle is overlaid on the left side of the image, containing the text.

Quant investing can keep animal spirits in check

In our roundtable interview, we delved into how behavioral biases affect investors and their decision making. We also touched on why quant investing can benefit from the resulting market inefficiencies, given that its systematic approach keeps emotions at bay. We discussed these topics with our in-house experts: Chief Quant Strategist, Pim van Vliet; Chief Researcher, David Blitz; and Head of Factor Investing and Professor in Behavioral Finance at Erasmus University Rotterdam, Guido Baltussen.

As long-standing proponents of factor investing, which behavioral biases do you perceive to be the primary drivers of markets nowadays?

Guido Baltussen: “I believe overconfidence is a key behavioral bias that influences investor behavior. Daniel Kahneman – who is one of the founding fathers of behavioral finance – calls it the mother of all biases. It speaks to investors having too much confidence in their views. Another example of overconfidence is when people are asked if they are above-average drivers compared to everyone else behind a steering wheel, more than three-quarters typically answer affirmatively.”

“Overconfidence tends to be stronger if people have collected a lot of information on a particular topic, which is what many investors do as part of their process. This can cause them to



take on too much risk, for example, or to trade too aggressively. As quant investors, this is a bias that we are well aware of.”

Pim van Vliet: “I also agree that overconfidence is a key bias because it is quite rational. Biases are often linked with irrational behavior, but this is not always the case. For instance, it can be advantageous to be overconfident in our day-to-day lives, when pursuing job opportunities, in finding a partner, in achieving satisfaction across multiple spheres in our lives, or in generally making you happier.”

“But when it comes to investing, being overconfident does not make you a better investor. Indeed, overconfidence and good results are often at odds with each other. By this I mean that while tempering your overconfidence can actually make you unhappy, it can help you achieve better long-term investment returns.”

Based on your responses, it seems as if overconfidence is quite an entrenched human behavior. How easily can it be overcome in the context of investing?

Guido Baltussen: “While it can be mitigated to a large extent, it is not easy to do so. From an investing perspective, it is a bit difficult because overconfidence tends to strengthen as a result of confirmation bias. Investors typically look for evidence to support their views and they can incorrectly interpret informati-

on or attribute the wrong results to a particular market environment. For the calls they get right, they tend to chalk it up to their investment skills, further strengthening their overconfidence, whereas they tend to blame bad decisions on unforeseen market circumstances.”

“Looking at it from a different perspective, the knowledge we acquire in hindsight also strengthens overconfidence. It is easy to pinpoint the correct decisions after an event has taken place given that there is a lot more information available after the fact. So the more information investors have on hand, the more confident they become. Overconfidence is perhaps an even stronger bias for professional investors. This is due to their own perception that they are skillful at doing their jobs and also because they constantly analyze markets. By contrast, this is possibly less so for retail investors purchasing assets for the first time.”

“That said, creating awareness, critically evaluating bad outcomes and also following a quantitative investment process are important steps to mitigate the impact of overconfidence. However, I believe that as quant investors we also need to be cognizant of this behavioral bias as it can also influence our investment decisions.”

Generally speaking, what are some of the complexities involved in assessing behavioral biases?

David Blitz: “Risk-based explanations for factors fail to hold up when tested. This suggests that behavioral biases give rise to factor premiums. Many cognitive errors, including overreaction, underreaction and extrapolation, are seen as the drivers of market inefficiencies in the academic literature.”

“But given that there are several market anomalies present at the same time, with some even moving in opposite directions, we still have a lot to learn about these biases, especially how they interact with each other.”

Alongside this issue of interaction, could it be that certain behavioral biases are more dominant in specific market environments?

David Blitz: "Investors can alternate between greed and fear and you have instances of risk-on and risk-off moments. So you could say that investors are in risk-on mode when we witness significant rallies such as in tech stocks in recent years, and this typically coincides with strong momentum returns. And then when there is a shift to a risk-off setting again, low volatility returns tend to be strong."

"This seems to describe investor behavior and it is not necessarily irrational. It could be that investors are incorporating new information. For instance, if they get bad news, they might not be sure if this signals more negative newsflow going forward. So it could be a case of investors updating their beliefs and maybe they keep getting surprised along the way. So even in an environment of rational investors you could get these short-term patterns."



On that note, we have just experienced a prolonged period of weak quant equity performance. What lessons can we take from it?

David Blitz: "Our research¹ on the quant cycle basically contextualizes the recent poor performance from a long-term perspective. It is remarkable to see that the same patterns

keep repeating themselves in financial markets almost once every 10 years. Based on recent performance data, it appears as if the quant equity drawdown is behind us and we are now experiencing a reversal."

"So if we use history as a guide, then a 'normal' stage for quant equity factors is the likely scenario for the next five years. This would be particularly good news for quant investors given that all factors tend to perform well during this stage. But the longer we find ourselves in the normal regime, then the bigger the probability that we will face another drawdown. But we are probably several years away from that at this point."

Guido Baltussen: "Behavioral biases are very strong and persistent. We have seen that many investors struggle to stay the course when faced with underperformance and take the decision to disinvest. But when a rebound in performance takes place, there is probably a sense of regret for not being resilient during the challenging periods."

"It is therefore important to demonstrate strong hands, especially since these cycles tend to repeat themselves. Unfortunately, this is easier said than done as humans typically feel strong emotions when faced with difficulties and are probably more susceptible to behavioral biases."

Pim van Vliet: "This also applies to us as quant investors. For instance we could have doubled down on the value strategy and done so too early, which could have resulted in larger drawdowns. On the other hand, we could have given up on value due to its struggles. In hindsight, we are glad we stayed the course. This is not easy for us as quant investors, as we too are human."

"In this case, the action bias can also be an issue. During a crisis, it can be very tempting to change things to demonstrate that you are assessing the data, absorbing new information

and making smart decisions. There is also perhaps an implicit expectation for a reaction from clients. But actively doing nothing can be the best approach in such instances. But again this is tough as you have to resist the temptation prompted by this action bias."

If we look beyond recent market developments, have you seen any behavioral aspects that have changed or disappeared over time?

Pim van Vliet: "If you purely assess factors, we have seen in our research² that the low volatility, momentum and value premiums have been present since the 19th century. But our study analyzes the long-term outcomes of investor behavior without scrutinizing the actual behavior."

"If we look at it from a biological perspective, it is safe to say that our DNA has remained fairly constant. But from a cultural point of view, there is some cross-sectional variation given that some cultures are more risk averse than others. There are also elements of time variation. For example, people can exhibit more risk-taking behavior after a golden age and less so after economic downturns. So it is quite difficult to pinpoint which behavioral aspects have changed over time and how they have changed."

Guido Baltussen: "I think it is fair to say that there are some structural behavioral biases or patterns that have been around for centuries. One way to view this is to look at how humans make decisions or the way our brains work. If you take the two modes of thinking, for example, 'system 1' is the fast and instinctive part of our brain that is focused on emotions, while 'system 2' is the slow and cognitive part of our brain that solves complicated problems. These systems drive our decisions and behavioral biases, while they also illustrate how we are hardwired as humans. We share the same brain processes as our forefathers."

1. Blitz, D., November 2021, "The quant cycle", Journal of Portfolio Management.

2. Baltussen, G., Van Vliet, B. P., and Van Vliet, P., November 2021, "The cross-section of stock returns before 1926 (and beyond)", SSRN working paper.

David Blitz: “If you look at it from a market perspective, similar behavioral patterns repeatedly show up over extended periods of time. Take for instance the significant downturns following bubbles that have occurred across centuries such as the South Sea Bubble or Tulip Mania. It looks like we are seeing the same pattern again with the current market fallout.”

Pim van Vliet: “Another example of a behavioral bias that illustrates how they persist over centuries is comparison. Nowadays, we see this in the form of benchmarking or peer performance comparisons in our industry. But if we look back to the 1800s, wealthy industrialists were also comparing themselves with others as there was an innate desire to do better than the rest.”

“Quant investing can keep ‘animal spirits’ in check if a good governance system is in place. When you follow a rules-based approach, you systematically analyze the data and do not just focus on anecdotal evidence or information that confirms your existing view. In this way, we can circumnavigate obstacles such as confirmation bias or overconfidence. So as quant investors, we can use behavioral finance insights to give us an edge.”

“But this requires the discipline of sticking to your approach, especially in challenging market environments. This can be



difficult to adhere to as team changes that occur over time can lead to adjustments in the investment process. So even groups of people can fall victim to behavioral biases. That is why we like to say that quant investing is sometimes more a test of character than a test of intelligence. Being humble is a good antidote against overconfidence.”

So if investment processes become more systematic for both fundamental and quant investors as we expect, do you think this will help filter out biases?

Guido Baltussen: “I believe systematic processes are less prone to behavioral biases, but having said that, they are also designed by humans. So quant investors need to be conscious of the behavioral biases that could affect their decisions. A related question is whether the factor premiums that are harvested by quant investors can be arbitrated away.”

“To answer this we can draw a link to the research³ David conducted on thematic indices effectively trading against quant investors. He outlines how investing in the former strategies could be rationalized despite their unfavorable factor exposures. This again speaks to strong behavioral biases or preferences. Also, quant investors only account for a portion of the market. Therefore, the premiums that arise from these biases cannot be completely arbitrated away. Moreover, quant strategies can be perceived as risky: this was the narrative on value investing during the 2018-2020 period.”

Pim van Vliet: “Factor premiums such as value can take a long time to materialize. So even if you program quant models to systematically exploit them, patience and persistence is often required. This is why I believe factor premiums are difficult to arbitrage and will continue to exist. Short-term alphas – such as those presented by intraday opportunities – are easier to arbitrage, especially with increasing computing power, data and insights. Long-term alphas, on the other hand, require careers dedicated to their pursuit.”

Guido Baltussen: “I also believe a significant part of the market will always be owned by fundamental investors who are subject to behavioral biases. It requires discipline and a level of discomfort to overcome these. This is because these individuals have to confront their errors and shortcomings, and not many people can do that easily. Quant investors are also prone to behavioral biases and this can influence how they build their models. So even if the market were fully owned by quant investors, it would not be fully efficient and opportunities would still exist.”

Aside from the more well-known biases, are there any other patterns that have caught your eye?

David Blitz: “What I find interesting is the clear pattern between fund performance and fund inflows. I am fascinated by the obsession with track records. Top-performing funds – at a certain point in time – typically attract significant inflows as this often serves as a prerequisite for asset owners to allocate capital to fund managers. But if these fund managers subsequently endure a bad patch of returns for a couple of years, then they become exposed to the risk of outflows.”

“If you compare this to general asset class returns, for example, investors do not get rid of their entire equity allocation if equities perform poorly over a three-year period. Conversely, they probably do not double their exposure if the asset class delivers strong returns for a few years. In the short run, luck as opposed to skill can materially influence outcomes. It is clear that there is noise in short-term performance data, but decision makers are quite sensitive to it.”

Pim van Vliet: “Behavioral finance is not only a lens through which you can study market behavior, it is also a mirror. It does not only reflect the way other people behave, but also how we act. As quant investors, we too have our own biases. I believe a powerful takeaway from behavioral finance is that we can use it to reflect on our process. It is important to scrutinize how our

investment models behave and to evaluate our business in the context of how we can help our clients to achieve their goals.”

Guido Baltussen: “As Pim has mentioned, quant investors are also subject to behavioral biases such as the IKEA effect. This is when you attach a lot of value to something that you have personally built. For instance, people tend to appreciate their own research while being more critical of the studies conducted by others. The same could be said for quant models. This is why we have an independent governance committee that critically evaluates our investment processes to safeguard against these biases.”

Another interesting theme given its increasing importance for investors is sustainability. How do you see it influencing behavioral finance?

Guido Baltussen: “In my view, sustainability does not influence behavioral finance. Instead, it applies to it. There are always important investment themes and long-term trends. Sustainability is one such example. As there has been an increase in investments in sustainable assets, I believe factors will be a prominent feature of this market segment given the rise in investor activity. This is because investors will exhibit the same behavioral biases when investing in sustainable assets. In turn this should offer quant investors opportunities in this area.”

David Blitz: “We will get more insight if sustainable investing itself is one big behavioral effect. Previously, investors primarily focused on risk and returns. But nowadays, they also care about how they make their returns. If they invest in a tobacco company, for example, they feel responsible for related health issues that smokers face. So if more and more investors are going to take into account such issues when investing, then it will likely affect stock prices. So this will create opportunities.”

“But this behavior can resemble a pendulum as it can also swing back again in the other direction. Sustainable stocks will

not consistently outperform their unsustainable peers forever. This could definitely play out over some periods, but at some point unsustainable companies could become attractive deep value stocks. In this instance, investors in the latter could be rewarded with a premium for taking on the reputational risk of investing in such unloved firms.”

Pim van Vliet: “That speaks to the ‘sin stock’ premium. If we look back, there was a big debate about whether or not there should be a discount for sustainability. Over time, this thinking has changed and now there is a belief that there should be a premium. This is maybe a result of some catalytic events such as the Paris Agreement or the establishment of the Sustainable Development Goals (SDGs). Meanwhile, the recent outperformance of sustainable assets has also reinforced this. This combination of factors has helped to create an attractive story for investors that is very enticing.”

“Perhaps then the thinking around sustainable investing has shifted from ‘system 2’ to ‘system 1’ as it has become an entrenched belief. But as David said, this could follow a behavioral cycle and investors could be disappointed if sustainable assets underperform in the coming years. Humans love narratives. We have been telling stories around the fire for centuries and we see this on a daily basis on television. This could be a risk for sustainable investors as their commitment to the sustainability narrative will be tested if these assets underperform for an extended period.”

“We integrate sustainability in various and very specific ways in our strategies. For example, we use proprietary ESG scores to enhance our quality signal and make use of environmental efficiency variables as proxies for higher future profit margins. We believe the market will move away from crude, publicly available ESG measures to more sophisticated sustainability data which will also likely improve the performance of our quantitative strategies. There are many positive developments

on this front as increasingly more research is being done by both academics and practitioners.”

Lastly, what other developments do you foresee taking place in the field of behavioral finance and how will they affect quant investors?

Guido Baltussen: “I believe one of the key takeaways in 10 years’ time will be the reinforced view that factor investing works in practice. We will see yet again how factor premiums are persistent phenomena in markets. In terms of behavioral biases, I do think we will uncover increasingly more insights into how information is processed into market prices, potentially giving rise to various alpha opportunities. This journey has only just started and we expect more traction going forward.”

“Finally, I do think we will get more insights into how interactions affect markets. With the rise of computing power, we can investigate how the list of 80 or so biases interact and when some dominate others. Machine learning will also play a key role in assessing the data patterns that emanate from these interactions. This will allow us to potentially capture new opportunities.”

A peek into how behavioral biases drive factor premiums





Low Volatility defies
the basic finance principles
of risk and reward

Low volatility investing defies the logic of the efficient market hypothesis. Contrary to popular belief, riskier investments do not necessarily translate into higher returns. Rather paradoxically, more volatile stocks tend to yield lower risk-adjusted returns in the long run, while their less volatile peers typically deliver higher risk-adjusted long-term performance.

The low volatility investment style has generated market-like (or higher) returns with lower downside risk over long-term periods. Despite it being a well-known anomaly, behavioral biases and investment constraints have ensured its persistence over time.

The capital asset pricing model (CAPM) dates back to 1964 and has long been the centerpiece used to explain the relationship between risk and return. According to the theory, higher risk should lead to higher returns. Empirical findings, however, contradict this notion. Figure 1 depicts the risk-return profile of ten portfolios sorted on the volatility of historical returns. This clearly shows that the equity market has generally not rewarded investors for taking on more (volatility) risk.¹

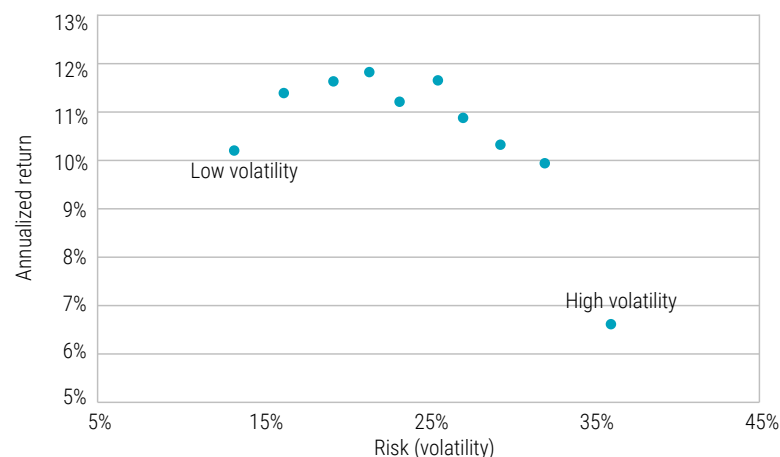
At Robeco, we have done a lot of research on the low volatility factor and contributed to the academic literature over the years. The low volatility effect is pervasive across different regions and asset classes. Most recently, its strong presence has also been documented in the Chinese A-share market.² Its counterintuitive nature underpins its endurance, which we delve into next.

Low Volatility effect confounds risk-based school of thought

The CAPM assumes a linear relationship between the risk (market sensitivity, i.e., beta) and returns of financial securities. However, numerous studies have illustrated that low beta stocks counterintuitively outperform their high beta peers on a risk-adjusted basis. This was pointed out as far back as the 1970s in a seminal paper that demonstrated that less volatile stock portfolios generated higher returns than riskier counterparts.³

The efficient market hypothesis suggests that low-risk stocks must exhibit other risks that are not captured by their market betas, and this explains their high returns. However, attempts to identify these risks have been few and far

Figure 1: Long-term risk-return profile of ten volatility-sorted portfolios



Source: Robeco, CRSP. Figure shows average, annualized returns and volatilities of 10 portfolios sorted on past 36-month return volatility. The investment universe covers all common stocks traded on NYSE, AMEX and NASDAQ exchanges with valid market capitalization and return data from 1926 till 2020. Portfolios are equal weighted and portfolio returns are from January 1929 to December 2020.

between. They also pale in comparison to the behavioral finance explanations of the phenomenon.

Low volatility stocks are typically found in defensive sectors and have more predictable cash flows, leading them to exhibit lower valuation uncertainty. Thus, they portray bond-like characteristics, while investors are also likely to use them as replacements for bonds given that they typically pay out dividends. Despite these features, numerous studies have shown that the low volatility anomaly is not explained by interest rate exposure. Indeed, Robeco research concluded that interest rate risk does not account for the long-term added value from low volatility strategies.⁴

1. A similar picture emerges if the market beta is used as a measure of risk.
2. Blitz, D., Hanauer, M. X., and van Vliet, P., April 2021, "The low volatility effect in China", *Journal of Asset Management*.
3. Haugen, R. A., and Heins, J. A., December 1975, "Risk and the rate of return on financial assets: some old wine in new bottles", *Journal of Financial and Quantitative Analysis*.
4. Blitz, D., Van Der Grient, B., and Van Vliet, P., June 2014, "Interest rate risk in low volatility strategies", Robeco white paper.

Meanwhile, some researchers have suggested that the low volatility effect is explained by the value and profitability factors. This hinges on the assumption that these factors are also driven by risk, which we argue is unlikely to be the case in our series of articles on behavioral finance (including this one). In fact, one academic paper established that the low volatility anomaly cannot be explained by these two factors.⁵

In general, risk-based theories that explain the low volatility effect have largely been disputed within the academic field. On the other hand, research from the behavioral school of thought is far more significant on this front.

Investor behavior drives Low Volatility premium

Behavioral biases and constraints offer more convincing reasons for why low volatility stocks generate higher risk-adjusted returns than their high volatility counterparts. But in contrast to other factor premiums that are driven by irrational investor behavior, the low volatility anomaly is premised on 'rational' investor behavior. Some of the research that explores this premise is outlined below.

Within the investment industry, relative returns often supersede absolute returns as a yardstick for performance or manager aptitude. Low volatility investing can therefore be unpopular due to how markedly different low volatility portfolios can look when compared to benchmarks. This results in higher tracking errors (relative risk) that are not palatable for some investors, especially when short-term underperformance in up markets is a possibility.⁶

Thus, the desire to keep up with the markets against which portfolios are measured incentivizes investments in high volatility stocks. But to effectively harvest the low volatility premium, an investor has to counterintuitively endure a bit of pain (typically lag during bull markets) to benefit from the investment style (market-like long-term returns, with lower downside risk).

The focus on relative performance gives rise to so-called agency issues according to research.⁷ Investment professionals usually have option-like incentive contracts. They typically seek to maximize the value of these by targeting high portfolio returns, which can cause them to be more attracted to higher-risk stocks. This is also closely related to a finding in another academic

paper that focuses on fund performance.⁸ The author states that asset managers are motivated to invest in profit-maximizing, high beta stocks. Consequently, they may be willing to overpay for stocks that outperform in up markets, which tend to be highly volatile in nature, and underpay for those that outperform in down markets, which typically have low volatility characteristics.

One 2014 academic study also highlights how leverage constraints contribute to the low volatility effect.⁹ Based on their risk appetite, investors can enhance their returns by leveraging a low volatility portfolio. This would allow them to increase their return potential without taking on additional risk. But due to leverage (or borrowing) constraints, they tend to overweight riskier investments in search of higher returns, therefore lowering their expected returns.

The lottery ticket effect is another documented reason for the low volatility phenomenon.¹⁰ Many investors participate in the market to gamble and this steers them towards high-risk stocks due to their upside potential, while their downside risk is limited to the investment amount.

In this scenario, the investors are willing to pay a premium for the risk instead of being compensated for it. Investors are often confident of being good stock pickers and market timers. Therefore, rising expectations of upward-trending markets typically trigger high-beta investments, while expectations of downward trends usually prompt lower equity investments in general.

Attention-grabbing stocks also instigate behavioral biases. High-risk stocks with extreme recent returns become more visible during a rally, which induces significant buying pressure on them. Substantial investments in these stocks can then push them to overpriced levels, which can bring about lower future returns. However, a recent study found that the low volatility effect was present for stocks with high media attention, while the media attention effect was not persistent in high volatility stocks.¹¹ Therefore, it was concluded that the media effect does not give rise to the low volatility effect.

Bringing different low-risk factors together

In this article, we have mostly referred to low volatility to explain the low-risk anomaly, while also referencing studies that touch on other risk measures, such as beta. Risk can be measured in different ways and tell us varying information

5. Blitz, D., and Vidojevic, M., September 2017, "The profitability of low volatility", *Journal of Empirical Finance*.
6. Falkenstein, E., June 2009, "Risk and return in general: theory and evidence", working paper.
7. Blitz, D., Falkenstein, E., and Van Vliet, P., April 2014, "Explanations for the volatility effect: an overview based on the CAPM assumptions", *Journal of Portfolio Management*.
8. Falkenstein, E., March 1996, "Preferences for stock characteristics as revealed by mutual fund portfolio holdings", *Journal of Finance*.
9. Frazzini, A., and Pedersen, L. H., January 2014, "Betting against beta", *Journal of Financial Economics*.
10. Blitz, D., Van Vliet, P., and Baltussen, G., January 2020, "The volatility effect revisited", *Journal of Portfolio Management*.
11. Blitz, D., Huisman, R., Swinkels, L., and Van Vliet, P., September 2019, "Media attention and the volatility effect", *Finance Research Letter*.

about stocks, but these measures are often related. For example, beta is a function of stock volatility, correlations and market volatility. We briefly discuss some of these measures below.

A seminal paper in 2006 showed that stocks with high idiosyncratic volatility (variation of returns that cannot be explained by the Fama-French three factor model) have lower returns.¹² As many investors aim to hedge against market volatility, there is high demand for stocks with more systematic volatility. This tends to push their prices up, which in turn lowers their average returns. These stocks typically exhibit negatively skewed returns, while those that perform comparatively well when volatility increases usually display positively skewed returns.

In 2007, Robeco research documented a robust low volatility effect over the period 1986 to 2006, across different global and regional markets.¹³ It was also established that this anomaly is not explained by other factors such as value, momentum or size, but that it is a separate effect that exhibits higher risk-adjusted returns for less volatile stocks.

The previously mentioned 2014 academic research concluded that significant positive risk-adjusted returns are generated by the “betting against beta” factor, which takes long positions in low beta stocks and short positions the high beta ones. When funding liquidity (leverage) constraints tighten, returns generated by the factor usually decrease as most constrained investors overweight riskier assets.

Lastly, researchers observed that idiosyncratic volatility and beta behave differently over the short run and long run.¹⁴ Idiosyncratic volatility has a significantly negative relationship with subsequent stock returns at short horizons of up to six months, while the relationship between beta and returns is flat at any horizon.

However, both idiosyncratic volatility and beta negatively predict stock alphas over horizons from a few months to beyond one year. At short horizons, neither anomaly can fully explain the other, while at long horizons beta emerges as the main driver of alpha.

In conclusion, all these measures are closely related and capture slightly different aspects of the low-risk phenomenon.

Why hasn't Low Volatility been arbitrated away?

The low volatility effect is one of the most persistent market anomalies. In 2008, the style became more widely accepted as its watershed moment arrived with the global financial crisis, when it provided downside protection amid the broad-based sell-off. That said, the anomaly has been observed over a long time period and is closely linked to behavioral biases. Indeed, the low volatility premium has been persistent from as far back as the 1930s. We believe there are a few reasons why it has not been arbitrated away.

Firstly, due to the importance of relative performance measures within the investment industry, investors typically choose not to deviate significantly from the benchmark, while they simultaneously aim for higher returns than those delivered by it. This dilemma incentivizes them to prefer more volatile stocks compared to their low volatility peers.

Secondly, low volatility ETF investments have increased over time. But even though large amounts of capital are currently invested in low-risk strategies, or those targeting specific defensive sectors, these are balanced against significant assets in high risk or high-risk targeting ETFs.¹⁵

Lastly, the lack of leverage constraints and relative performance measures make it attractive for hedge fund managers to exploit the low volatility anomaly. Although they have no leverage constraints and their performance is measured in absolute terms, their option-like incentive structure tilts their preference towards riskier stocks. This helps to keep the low volatility anomaly alive.¹⁶


12. Ang, A., Hodrick, R. J., Xing, Y., and Zhang, X., January 2006, “The cross-section of volatility and expected returns”, *Journal of Finance*.

13. Blitz, D., and Van Vliet, P., October 2007, “The volatility effect: lower risk without lower return”, *Journal of Portfolio Management*.

14. Poon, P., Yao, T., and Zhang, A., June 2021, “The alphas of beta and idiosyncratic volatility”, working paper.

15. Poon, P., Yao, T., and Zhang, A., June 2021, “The alphas of beta and idiosyncratic volatility”, working paper.

16. Blitz, D., June 2018, “Are hedge funds on the other side of the low volatility trade?”, *Journal of Alternative Investments*; and Baker, N. L., Haugen, R. A., May 2012, “Low risk stocks outperform within all observable markets of the world”, working paper.



Momentum is a self-fulfilling
prophecy and therein lies its
strength

As a concept, Momentum investing is simple: buy (overweight) assets that have recently outperformed their peers and sell (underweight) those that have underperformed. Yet, investors have failed to arbitrage it away, and it remains a strong factor across equities, bonds, credits, commodities, exchange rates, private equity, sports betting and even virtual gaming markets.

1. Blitz, D.C., May 2021, "The quant crisis of 2018/2020: cornered by big growth", Journal of Portfolio Management.

In this article, we outline how human behavior can explain the existence of this factor, explore some of the different forms of momentum, and touch on why this phenomenon has been enduring over decades.

Some market participants view momentum investing as counterintuitive, particularly those in the value camp who favor cheap assets or those with downward-trending prices relative to their fundamentals. By contrast, momentum investors seek assets that are becoming more expensive without considering their intrinsic worth. While this style of investing may be uncomfortable for some, the wealth of evidence supporting the momentum premium has put to bed questions around its efficacy and legitimacy.

Despite the relative simplicity of this investment approach, the momentum factor has been able to generate strong long-term performance in equity markets. This is illustrated in Figure 1, which shows the 10-year returns of various factors since the 1930s. We have seen that momentum has delivered the highest gross returns in five out of nine decades and beat the market in all nine. Moreover, recent evidence indicates that it continues to be one of the strongest factors and that it has not been arbitrated away.¹

To understand why momentum investing has performed so well and not been arbitrated away, one needs to understand why this phenomenon exists in the first place. As for most market anomalies, there are two main schools of thought that attempt to explain its existence.

The first one is the risk-based camp, that argues that the high returns achieved by the momentum factor are driven by its high exposure to market-wide risk. The other camp is the behavioral group. It contends that behavioral biases lead to the incorrect pricing of financial assets, which then creates the potential for arbitrage opportunities in the market.

Figure 1: Historical performance of equity factor premiums

1930s	1940s	1950s	1960s	1970s	1980s	1990s	2000s	2010s
Momentum 6.5%	Value 18.9%	Momentum 24.3%	Momentum 17.1%	Value 13.8%	Low-Volatility 22.4%	Momentum 23.6%	Value 7.3%	Momentum 14.3%
Low-Volatility 5.0%	Momentum 17.1%	Value 21.4%	Quality 14.3%	Momentum 12.9%	Value 21.1%	Market 18.0%	Low-Volatility 6.5%	Low-Volatility 14.2%
Small-Caps 4.5%	Small-Caps 15.7%	Small-Caps 18.9%	Small-Caps 13.3%	Small-Caps 10.4%	Value 20.9%	Quality 17.8%	Quality 6.5%	Market 13.6%
Market -0.2%	Low-Volatility 11.5%	Low-Volatility 18.5%	Value 13.3%	Quality 10.0%	Quality 18.9%	Value 16.3%	Small-Caps 6.4%	Quality 13.0%
Value -1.0%	Market 9.5%	Market 18.3%	Low-Volatility 10.3%	Low-Volatility 9.5%	Small-Caps 17.2%	Low-Volatility 14.6%	Momentum 4.1%	Small-Caps 12.1%
			Market 8.3%	Market 6.1%	Market 16.8%	Small-Caps 14.5%	Market -0.4%	Value 11.0%

Source: Data library of Professor Kenneth French, Robeco. All factors are long-only portfolios of US stocks that are invested 50% in big and 50% in small top factor portfolio based on 2x3 size-factor sorts from Professor Kenneth French. The low volatility factor is constructed in the same way, but is obtained from Robeco.com/data. Quality is an equal-weight combination of operating profitability and investment portfolios of Professor Kenneth French. Sample runs from January 1930 till December of 2019 for all factors but quality, which starts in July of 1963.

Risk-based theories fall short in their explanations

According to the neoclassical school of thought, the momentum premium is compensation for bearing some systematic (market-wide) risk. This is the standard 'no pain, no gain' explanation. In practice, momentum is a fast-changing factor and the stocks it favors can change substantially from one month to the next. This typically necessitates regular portfolio rebalancing.

Therefore, from a risk-based perspective, the premium could stem either from the constant change in financial market risks or investors' risk appetites (i.e., shifts in how much risk investors are willing to bear). However, real-world evidence suggests these components actually change quite slowly.

Another risk-based explanation is that the momentum premium could arise from investors expecting to be compensated for potential crash risk. Indeed, it is known that momentum strategies can suffer from sudden and devastating crashes, such as the one that occurred in 2009. However, research shows that risk-managed momentum strategies which do not exhibit crashes also have the potential to generate high returns for investors, clearly contradicting this theory.²

As a result, risk-based theories have largely been dismissed. Furthermore, attempts to link momentum to macroeconomic fundamentals have also mostly been rejected for the exact same reasons. In acknowledgement of the lack of adequate risk-based explanations, even the father of the efficient market hypothesis, Eugene Fama, referred to momentum as the biggest challenge to his theory.

Behavioral biases give rise to Momentum premium

Where risk-based theories have failed, behavioral finance has been more successful at explaining the existence of the momentum factor. Unlike in mainstream, neoclassical finance, where investors are considered to be 'rational' agents that understand risks and opportunities in financial markets, behavioral finance builds on the assumption that investors are not fully rational and they make decisions based on heuristics, which can lead to mistakes and therefore 'anomalies'.

The overconfidence investors have in their ability to analyze securities, and tendency to attribute success to skill and failure to bad luck, can help explain the existence of momentum.³ For instance, if positive newsflow emerges that affirms the views of private investors, they will tend to push the stock price of the related company above its fundamental value i.e., over-extrapolate. But this is eventually rectified when fresh newsflow highlights the overreaction of the investors, typically leading to a long-term correction in the stock price.

Overreaction can also occur due to the representativeness heuristic.⁴ This infers that investors incorrectly observe patterns in data that are random. In this setting, investors tend to extrapolate a series of good news about a company into the future (overreact) and push its stock price too high. But once subsequent newsflow that is below expectations surfaces, it typically results in a long-term reversal.

Underreaction can also contribute to a momentum premium. This is based on the conservatism bias that implies investors tend to change their beliefs slowly. In this scenario, the bias would restrain a firm's stock price from initially adjusting adequately in response to newsflow. But this underreaction can instigate momentum as the price moves slowly towards its correct (fundamental) value, due to the good news being taken into account progressively.

The psychology of overreaction and underreaction was conceptualized in a unified manner in a 1999 academic paper.⁵ The researchers developed a model with two types of investors with different information: news watchers who determine the value of a firm based on fundamental news, and momentum traders who extrapolate patterns from historical price changes.

If positive newsflow is disseminated about a firm's fundamental value, the news watchers would trade on it first. They found this would lead to an insufficient increase in its stock price as the news would spread slowly in the market i.e., underreaction. The momentum traders would then extrapolate this trend only after observing the initial uptick in the price, resulting in an overreaction. As in the other cases of overreaction, a long-term correction would then follow.

Behavioral finance proponents have enjoyed some success in developing theoretical models to explain why the momentum premium exists. Empirical evidence supporting these theories is also on the rise, and increasingly compelling. Recent research using real-world data illustrates that a behavioral finance model – that features two types of agents similar to those in the previously mentioned academic paper – is better suited to explain momentum and other factor premiums, than a model that solely focuses on rational investors.⁶

2. Barroso P., and Santa-Clara P., April 2015, "Momentum has its moments", *Journal of Financial Economics*.
3. Daniel, K., Hirshleifer, D., and Subrahmanyam, A., December 1998, "Investor psychology and security market under- and overreactions", *Journal of Finance*.
4. Barberis, N., Schleifer, A., and Vishny, R., February 1998, "A model of investor sentiment", *Journal of Financial Economics*.
5. Hong, H., and Stein, J. C., December 1999, "A unified theory of underreaction, momentum trading, and overreaction in asset markets", *Journal of Finance*.
6. Stork, P. A., Vidojevic, M., and Zwinkels, R. C. J., June 2020, "Behavioral heterogeneity in return expectations across equity style portfolios", *International Review of Finance*.

The same paper also shows that if investors are allowed to learn and change their investment strategies over time based on what has worked well in the past, then a more robust explanation for the factor could be witnessed. These patterns are consistent with the evidence seen in mutual fund literature, that outlines how investors tend to put too much emphasis on recent returns when selecting fund managers, despite the evidence showing that this strategy is not particularly fruitful.

Exotic Momentum factors

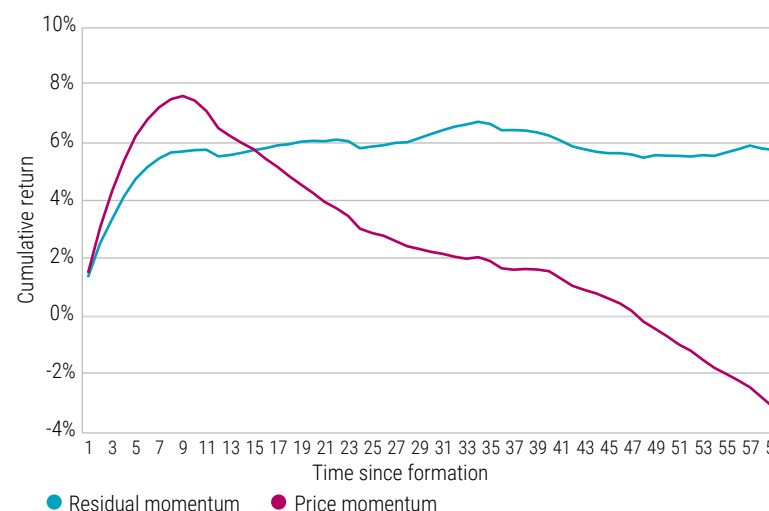
While the price momentum factor is the most well-studied and applied anomaly in its cohort, researchers have identified a host of related factors, that require their own explanations. For example, residual (also known as idiosyncratic) momentum is a close cousin of traditional (total return or price) momentum.

Whereas the latter is based on historical returns over the previous year, the former focuses only on the portion of the returns that cannot be explained by a stock's exposure to other well-known factors. To illustrate this, if a small-cap stock delivers strong returns in line with its small-cap peers, it would have a high price momentum score but not necessarily a high residual momentum score.

In a recent journal article, the residual momentum signal has been shown to be consistent with the underreaction hypothesis, given that the long-term reversal component that exists in traditional price momentum is largely absent.⁷ This is depicted in Figure 2 which shows that price momentum returns start to revert roughly nine months after the portfolio is formed. By contrast, residual momentum returns do not revert even 60 months into the future. Additionally, residual momentum has generated strong returns even in markets such as China and Japan, where price momentum has struggled.

Despite their dated existence, momentum signals remain an area of interest in terms of academic research. In a paper published last year, strong momentum spillover effects between firms that are economically connected or have similar fundamentals were discovered.⁸ These connected firms were identified based on shared analyst coverage, whereby networks of firms covered by the same analysts were created.

Figure 2: Cumulative returns of residual and price momentum up to 60 months after portfolio formation



Source: CRSP, Robeco. Figure shows cumulative returns of residual and price momentum strategies 60 months following portfolio formation, using overlapping portfolio approach of Jegadeesh and Titman (1993). Data comes from CRSP and covers all US common stocks that trade of NYSE, AMEX, and NASDAQ exchanges from 1963/07 till 2015/12. Portfolios are constructed as equal-weighted deciles.

Although similar research using industry classification to identify connected firms – also known as the industry momentum effect – had been conducted more than a decade earlier,⁹ the shared analyst coverage methodology leads to stronger results.

For example, Amazon (consumer discretionary) would be linked to companies such as McDonald's or Nike if the industry classification approach is used; however, it is probably more closely related to firms in the communication services and information technology sectors, which would likely fall under the coverage of the same analysts.

8. Ali, U., and Hirshleifer, D., June 2020, "Shared analyst coverage: unifying momentum spillover effects", *Journal of Financial Economics*.
9. Moskowitz, T. J., and Grinblatt, M., December 2002, "Do industries explain momentum?", *Journal of Finance*.

Because analysts are faced with time constraints and have to split their attention across their universe of stocks, they could be slow to incorporate information across the firms they cover and this could trigger a momentum spillover effect.

Researchers have also found a host of factors derived from analyst earnings forecasts and earnings revisions. There is an abundance of evidence that the signals extracted from these data predict future stock returns for reasons completely unrelated to risk. In particular, the stocks analysts become increasingly more optimistic about tend to do well in the future. This is because investors typically underreact to analyst earnings revisions.

Why hasn't Momentum been arbitrated away?

If all these momentum-linked anomalies have delivered such robust returns on the back of mistakes in human reasoning, the natural question is why have they not been arbitrated away. We believe there are several reasons.

Firstly, momentum is not an easy factor to harvest. Unlike value, for instance, which can be implemented with a modest turnover of 10-20% per year, the traditional momentum factor typically has a turnover of a several hundred percentage points a year. Clearly, in order to effectively harvest this factor after costs, one needs to apply smart trading strategies. As popular as this factor is, there simply are not many momentum-focused strategies available to investors in the market.

Secondly, while the momentum premium has been linked to behavioral biases as opposed to risk, exploiting it may not be completely painless. Momentum strategies have been shown to be prone to rare but severe crashes. Therefore, momentum investors also need to be able to commit their capital over a longer-term period and be ready to face challenging times.

Thirdly, there is no one correct way to define momentum. Even simple price momentum is often defined using different lookback periods, ranging from three to twelve months. Also, an investor can choose to implement one version of momentum or to combine multiple factors such as residual momentum or connected analyst momentum. All these choices have a big impact on which stocks are bought and sold by the strategy.

A high-angle, aerial photograph of a person riding a bicycle on a narrow, winding asphalt road that curves through a dense, lush green forest. The road is bordered by a low stone wall on the right and a metal guardrail on the left. The cyclist is wearing a bright yellow-green jacket and dark pants. The scene is captured from a high vantage point, looking down at the road as it disappears into the trees. A semi-transparent blue circle is overlaid on the left side of the image, containing the text.

Quality: the underappreciation of well-managed businesses

Compared to its more established peers (Low Volatility, Momentum and Value), Quality is the newer kid on the factor block. It has risen in prominence over the last two decades as a growing number of academics and practitioners have validated the style through research and practical application.

While numerous market anomalies have been reported during this period, Quality has emerged as a genuine factor due to the robust evidence in its support, sound reasoning for its existence and resilience post publication. Nowadays, it is well-recognized and held in similar regard to its established peers. In this article, we outline why behavioral finance theories trump traditional finance theses in explaining the driving factors behind the Quality premium, and we review some recent innovations around the style.

The quality factor encompasses several firm characteristics related to profitability, earnings quality, investment policy and corporate governance. Various academic papers demonstrate that high quality companies tend to generate significant outperformance relative to the market that cannot be explained by other common factors.

This result may seem counterintuitive at first. If the high quality of fundamentals is deemed as a desirable feature when selecting stocks, then they would command a higher price and, therefore, result in lower expected returns. However, numerous studies reveal why high quality firms deliver strong returns in the absence of elevated (materialized) risks.

Quality has become an established factor in recent decades

For instance, a seminal paper¹ published in 1996 illustrated that stock prices failed to fully reflect the information contained in accruals and cash flows until it had an impact on future earnings. It therefore deduced that companies with conservative accruals management policies (low accruals) tended to outperform the market.

In another study² in 2008, the authors found evidence that share issuance data – public offerings, share buybacks, stock mergers – exhibited an ability to predict stock returns. Meanwhile, asset growth – related to a firm's investment and financing activities – was also shown to have an effect on predicting future stock returns, according to a research paper³ published in 2008.

In 2013, an academic paper⁴ outlined the association between high gross profitability and strong future returns, notwithstanding the generally poor valuation characteristics (for example, elevated price-to-book ratios) exhibited by highly profitable companies. In fact, the researcher argued that profitability and value are two sides of the same coin. But it was not until 2015 that the quality factor arguably saw the biggest increase in interest. This coincided with the inclusion of quality characteristics (investment and profitability) into the Fama-French five-factor model.⁵

This 'stamp of approval' from the renowned academics spurred a series of research papers that either challenged the robustness of the quality factor, or tried to define what it entailed and how best to implement it in live portfolios. In a publication⁶ released in 2018, for example, the authors demonstrated how a quality factor – based on a composite of measures designed to capture the growth, profitability and safety characteristics of firms – generated significant risk-adjusted returns in the US and globally across 24 countries.

Risk-based theories fall short in their explanations of the Quality premium

In our view, the academic research that argues in favor of the quality premium being driven by risk is unconvincing. Most notably, the seminal Fama and French paper failed to strongly link the investment and profitability factors to risk. The paper represented a clear departure from the findings in their preceding three-factor model,⁷ where they argued that the factors stemmed from exposure to distress risk. Not only is it difficult to associate quality with distress risk, but multiple studies⁸ have also shown that the relationship between distress risk and returns is actually negative.

In a Robeco research paper,⁹ the authors outlined the shortcomings of the Fama-French five-factor model. One of the issues pertained to a number of robustness concerns regarding the two new factors. In particular, it was surprising that the investment factor was defined as asset growth, which Fama

1. Sloan, R. G., July 1996, "Do stock prices fully reflect information in accruals and cash flows about future earnings?", *The Accounting Review*.
2. Pontiff, J., and Woodgate, A., 2008, "Share issuance and cross-sectional returns", *Journal of Finance*.
3. Cooper, M. J., Gulen, H., and Schill, M. J., July 2008, "Asset growth and the cross-section of stock returns", *Journal of Finance*.
4. Novy-Marx, R., April 2013, "The other side of value: the gross profitability premium", *Journal of Financial Economics*.
5. Fama, E. F., and French, K. R., April 2015, "A five-factor asset pricing model", *Journal of Economics*.
6. Asness, C. S., Frazzini, A., and Pedersen, L. H., November 2018, "Quality minus junk", *Review of Accounting Studies*.
7. Fama, E. F., and French, K. R., June 1992, "The cross-section of expected stock returns", *Journal of Finance*.
8. Dichev, I. D., June 1998, "Is the risk of bankruptcy a systematic risk", *Journal of Finance*; Griffin, J. M., and Lemon, M. L., October 2002, "Book-to-market equity, distress risk, and stock returns", *Journal of Finance*; and Campbell, J. Y., Hilscher, J., and Szilagyi, J., December 2008, "In search of distress risk", *Journal of Finance*.
9. Blitz, D., Hanauer, M. X., Vidojevic, M., and Van Vliet, P., March 2018, "Five concerns with the five-factor model", *Journal of Portfolio Management*.

and French had considered to be a ‘less robust’ phenomenon in their earlier work.¹⁰

The five-factor model also failed to explain a number of variables that are closely related to investment and profitability. Moreover, it was unclear whether the two new factors were effective before 1963, which has since been demonstrated in another publication¹¹ that shows evidence of the quality factor dating back to the 1940s.

Another concern revolved around the economic rationale for the model. Fama and French did not even attempt to explain that investment and profitability are plausible risk factors. Instead, the two factors were included as they proxy expected returns based on a rewritten dividend discount model.

In the previously mentioned 2018 publication, the authors showed that high quality stocks appeared to be safer and not riskier than their low quality peers during distressed market conditions. But due to their defensive characteristics, concerns were raised that the quality premium could actually be the low-risk premium in disguise.

However, a Robeco paper¹² highlighted that quality and low-risk factors are distinct. Furthermore, another Robeco study¹³ illustrated that the similarity between the low-risk and quality factors is mainly found in their short positions as poor quality stocks also tend to be very volatile. But when observed from a long-only perspective, the two factors are quite distinct.

Quality anomaly is driven by behavioral biases

In 2012, Robeco launched a project that was aimed at evaluating why quality investing works and how it could be implemented efficiently in portfolios. The key insights were subsequently published in an academic paper.¹⁴ The researchers showed that the quality factor worked across global equity and credit markets.

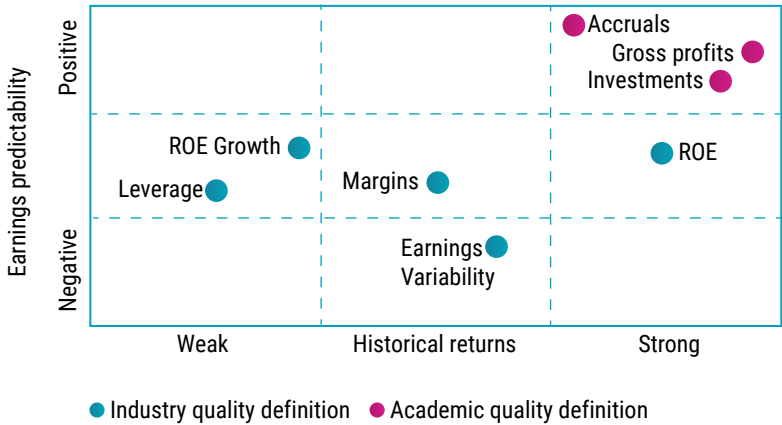
However, they noted that not all quality definitions were created equal. In terms of their findings, they observed that the quality measures documented in the academic literature – gross profitability, operating accruals and investments – were more robust measures than more commonly used metrics in the industry

such as earnings variability, leverage, margins or return on equity growth.

The study dived deeper into the reasons why this was the case. In particular, the researchers noted that the quality measures that were associated with high future returns worked well as they could forecast high future earnings. They found that this information was not properly discounted in current market prices.

In other words, market participants, on average, underreacted to information embedded in past profitability, operating accruals and investments. Figure 1 depicts the relationship between returns and earnings forecasting power of the various quality metrics. As indicated in the top-right corner, the accruals, gross profits and investments measures do well in predicting future earnings and returns. Meanwhile, the results for the other metrics are mixed.

Figure 1: How different quality measures stack up in predicting future earnings and returns



Source: Robeco and Kyosev, Hanauer, Huij and Lansdorp (2020). “Does Earnings Growth Drive the Quality Premium?” Journal of Banking & Finance. The graphs show returns vs earnings predictability of long/short portfolios sorted on different Quality measures. The sample period is from January 1986 to December 2015 for global equity markets.

In another research paper,¹⁵ the authors provided further proof that behavioral biases drive the quality factor. They used analyst forecast data to show that financial analysts are, on average, too pessimistic regarding the future profits of

10.Fama, E. F., and French, K. R., August 2008, “Dissecting anomalies”, *Journal of Finance*.
 11.Wahal, S., February 2019, “The profitability and investment premium; pre-1963 evidence”, *Journal of Financial Economics*.
 12.Blitz, D., and Vidojevic, M., September 2017, “The profitability of low volatility”, *Journal of Empirical Finance*.
 13.Blitz, D. C., Baltussen, G. and Van Vliet, P., 2020, “When equity factors drop their shorts”, *Financial Analysts Journal*.
 14.Kyosev, G., Hanauer, M. X., Huij, J., and Lansdorp, S., May 2020, “Does earnings growth drive the quality premium?”, *Journal of Banking and Finance*.
 15.Bouchaud, J., Kruiger, P., Landier, A., and Thesmar, D., October 2018, “Sticky expectations and the profitability anomaly”, *Journal of Finance*.

highly profitable companies. In their view, this gives rise to the profitability anomaly, which they also find to be particularly strong for firms with persistent profits.

Another recent study¹⁶ also presented evidence in support of a behavioral explanation for the profitability factor. It outlined that investors tend to assign similar price-to-earnings multiples to stocks with similar expected growth. This simplistic approach leads profitable companies to outperform in the future when less profitable firms are forced to issue additional equity to fund their growth. In turn, this dilutes the claims of existing investors to future cash flows.

Quality, ESG and recent advancements

Investor interest in strategies that integrate sustainability has grown significantly over the last few years. Intuitively, one can expect certain features of the quality factor to be related to the corporate governance elements in ESG criteria. For example, well-governed companies tend to have strong earnings quality and conservative investment management approaches.

The link between quality and environmental and social aspects, however, appears to be weaker when analyzing historical data, potentially because the high level of investments aimed at improving the sustainability profile of a company can temporarily result in lower profitability and, therefore, poorer quality scores.

Although still limited, early research indicates that quality and ESG factors are different concepts that have the potential to act as complements as opposed to substitutes. At Robeco, we have incorporated certain ESG signals within the quality basket of our quantitative strategies since 2010 as these can enhance stock selection when combined with the quality factor.¹⁷

We believe that certain sustainability trends can potentially impact a company's ability to create shareholder value in the future. This could include elements such as the quality of management, branding power, human capital development and intellectual capital, to mention a few.

In our view, companies that can effectively manage risks and seize opportunities related to such trends exhibit a superior capacity to prosper over the long run. We therefore use select top-level ESG variables in our enhanced quality factor that we believe act as a suitable proxy for quantifying some of these intangible characteristics.

Our research shows that certain indicators that are more directly correlated with the value of intangible assets can also be used to enhance the quality factor. One such measure is the amount invested in research and development. While accountants treat such outlays as expenses that lower current earnings, we treat them as assets that can enhance a firm's earnings power in the future.

Our research shows that investments in intangible assets are positively related to future stock returns, unlike high investments in physical assets which can be detrimental. At Robeco, we consistently aim to enhance our quality metrics to best capture the quality premium and avoid noisy proxies (for example, return on equity) or measures that are closely related to entirely different factors (for instance, earnings variability and leverage have a closer link to low-risk than quality).

Conclusion

All in all, we believe that behavioral biases linked to persistent human errors when forming future earnings expectations for companies give rise to the quality factor. This premium is consistent over time and across markets, while it is also distinguishable from other factor premiums.

16. Erhard, R., Sloan, R. G., August 2019, "Explaining the profitability anomaly", working paper.

17. De Groot, W., and Churet, C., "Alpha from sustainability", RobecoSAM whitepaper

An aerial photograph of a crowded beach. The foreground is filled with hundreds of colorful beach umbrellas in various colors like red, blue, yellow, and purple. People are scattered across the sand, some sitting under the umbrellas and others walking. The beach curves along the edge of the ocean, where waves are breaking. The water is a deep blue-green color. The overall scene depicts a popular vacation spot.

Human instincts drive the Value premium

In recent times, Value has been one of the most contested styles in the investing fraternity. Its present-day validity is the subject matter of many debates, often leading to polarized viewpoints and colorful metaphors such as death, winter and resurrection. This is in stark contrast to the popularity it enjoyed for most of the 20th century, when many investors followed in the footsteps of Benjamin Graham and Warren Buffett.

While Value has experienced performance headwinds in the last decade or so, the factor has delivered market-beating returns over the long run and in most decades since the 1930s. In this article, we delve into the driving factors behind the Value premium from both a risk and behavioral perspective, review the evolution of the style, and outline the reasons why we believe the Value factor will continue to persist over the long term.

Value investing is predicated on selecting stocks that appear to be trading at a discount to their intrinsic value and avoiding those that seem to be trading at a premium. Investors can therefore harvest the value premium by investing in undervalued companies and ignoring their overvalued counterparts, based on the belief that the market will recognize their true value in the long run.

The general idea behind this is that markets overreact to good and bad news in the short run, leading to stock price moves that do not reflect the long-term fundamentals of companies. This overreaction provides attractive entry points that market participants can exploit by purchasing stocks at discounted prices. In simple terms, value investors ferret out firms that are underestimated by the market from their perspective.

But pinpointing what actually drives the value premium is a contentious issue among academics and practitioners. One argument is that it is compensation for some type of risk, such as distress or macroeconomic risk. Or it could be a reward for stomaching long periods of underperformance.

Value investing can be afflicted by protracted phases of subdued relative returns, like those witnessed during the tech bubble of the late 1990s, the global financial crisis, or the most recent 'quant winter' of 2018-2020.¹ This possibility of prolonged underperformance could be supportive of a risk-based explanation.²

Another view is that the value premium is attributed to rational decisions or behavioral biases that cause 'irrational' reactions. This could vary from a rational buy-side analyst who recommends glamorous growth stocks to further their career (and improve their compensation) in the short run, to 'animal spirits' – as described by John Maynard Keynes – which can influence the decision-making of investors. On the back of our extensive research at Robeco, we believe behavior in particular explains the value premium.

Risk does not account for the Value premium

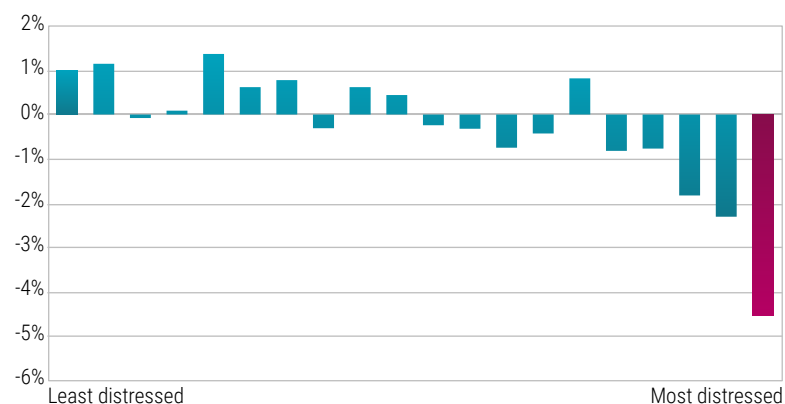
Risk-based explanations of the value premium are largely linked to the efficient market hypothesis (EMH), which states that higher risk should lead to higher returns. In the early 1990s, a number of Fama and French publications³ posited that the value premium is not explained by the capital asset pricing model (CAPM) or standard risk measures such as beta and volatility.

Instead, they argued that the return differences between value and growth stocks are driven by common risk factors such as financial distress. The economic rationale behind this notion is that investors are rewarded for taking on the risk of investing in companies that are facing financial difficulty; i.e., those that have typically low market values compared to their book values and are therefore classified as value stocks.

However, there is a lack of consensus in the academic literature on whether this is indeed the case. For example, a Robeco study conducted in 2018 investigated whether the value premium is attributable to financial distress.⁴ The researchers found no evidence of a causal relationship between value and distress risk and no evidence to support the pricing of this risk. Figure 1 reflects the latter outcome as it shows that a distress risk premium is not concentrated in distressed stocks.

1. Blitz, D., May 2021, "The quant crisis of 2018-2020: Cornered by 'big growth'", *Journal of Portfolio Management*.
2. Asness, C. S., Frazzini, A., Israel, R., and Moskowitz, T., October 2015, "Fact, fiction, and value investing", *Journal of Portfolio Management*.
3. Fama, E. F., and French, K. R., June 1992, "The cross-section of expected stock returns", *Journal of Finance*; Fama, E. F., and French, K. R., February 1993, "Common risk factors in the returns on stocks and bonds", *Journal of Financial Economics*; Fama, E. F., and French, K. R., March 1995, "Size and book-to-market factors in earnings and returns", *Journal of Finance*; and Fama, E. F., and French, K. R., December 1998, "Value versus growth: The international evidence", *Journal of Finance*.
4. De Groot, W., and Huij, J., March 2018, "Are the Fama-French factors really compensation for distress risk?", *Journal of International Money and Finance*.

Figure 1: Relationship between excess return and distress risk



Source: The chart uses monthly EUR returns from Jan 1986 to Dec 2014 for developed markets of the largest 3,000 stocks of all Broad Market Index constituents, ranked by Robeco's distance-to-default factor, assuming a one-month holding period and ignoring transaction costs.

Financial distress is not the only risk flagged as a potential driver of the value anomaly. In one academic paper, the authors argue that the value premium reflects the compensation investors receive for taking on macroeconomic risk.⁵

In their study, they observed that value stocks have a high exposure to bond market variables that predict future economic activity, attributing this to the underlying cash flow dynamics of these companies. More specifically, they found that value stocks experienced negative cash flow shocks in economic downturns, and this coincided with periods of low returns for them versus their growth counterparts.

While numerous risk-based explanations do feature in the asset pricing literature, it is not widely accepted that the value premium is driven solely by risk factors. Indeed, numerous academics and practitioners have provided compelling evidence that suggests behavior, rather than risk, is the reason the value anomaly persists.

Instead, the Value anomaly is rooted in innate human behaviors

According to the behavioral school of thought, human tendencies are behind the existence of the value premium. Many investors are lured by the appeal of

companies with exciting growth stories and prospect of strong short-term returns, while being deterred by those that receive little fanfare or are unloved by the masses.

As explained by Andrew Lo in his book *Adaptive Markets*, "Intelligence is the ability to generate accurate cause-and-effect descriptions of reality" (or, simply put, narratives).⁶ This innate skill has been passed down through generations and contributed to the survival of humans throughout time. Therefore, people are hardwired to be favorably disposed to good narratives and they might struggle to overrule or ignore such a strong instinct.

In one paper, researchers discussed how value strategies outperform the market as they exploit the behavioral errors made by typical investors, and not because they are fundamentally riskier.⁷ They noted how private investors can extrapolate past growth rates of glamour stocks well into the future even though they are unlikely to persist. They could also equate well-run companies with good investments irrespective of price. Moreover, their short-term horizons may lead them to shun value strategies which typically require longer-time periods to pay off. Thus, their resulting optimism about glamour stocks and pessimism about their value counterparts give rise to the value premium.

In another 2005 study, the authors concurred with these findings as they looked into how irrational behavior impacted the long-term returns of growth and value stocks.⁸ They illustrated how investors overreacted to past operating results by naively extrapolating historical growth rates. This caused them to erroneously invest in growth stocks based on the belief (narrative) that their operating performance would continue unabated, and to avoid value stocks due to their low growth profiles. But over time, they found that once the errors stemming from the naive extrapolations were realized, investors would then adjust their positions accordingly, causing value firms to outperform their growth peers.

Similarly, recent research examined the factor exposures of passive thematic indices.⁹ Thematic strategies typically catch the eye of investors by being exposed to stocks, sectors or themes with good narratives (such as emerging macroeconomic, geopolitical or technological trends) or strong historical returns. The study, however, showed that most of these passive thematic indices had negative exposures to factors, including value. From an asset-pri-

5. Koijen, R. S. J., Lustig, H., and Van Nieuwerburgh, S., June 2017, "The cross-section and time series of stock and bond returns", *Journal of Monetary Economics*.
6. Lo, A. W., April 2017, "Adaptive markets: financial evolution at the speed of thought", Princeton University Press.
7. Lakonishok, J., Shleifer, A., and Vishny, R.W., December 1994, "Contrarian investment, extrapolation, and risk", the *Journal of Finance*.
8. Broussard, J.P., Michayluk, D., and Neely, W.P., December 2005, "The role of growth in long term investment returns", *Journal of Applied Business Research*.
9. Blitz, D., August 2021, "Betting against quant: examining the factor exposures of thematic indices", working paper.

cing perspective, the author concluded that this implies that investors in these indices potentially face lower long-term expected returns.

By contrast, some investors take a conscious and rational decision to go against value.¹⁰ This perspective is also explored in detail in the previously mentioned 2005 academic paper. For example, the researchers state that professional investors have career concerns to consider over and above generating good long-term performance. Demanding bosses and clients also evaluate them on their short-term returns and their ability to beat benchmarks.

From a commercial perspective, they are also judged on their capacity to market their investment strategies and create appealing stories around them. Given these concerns, they could opt for more growth style-related approaches which are easier to sell, have more catchier narratives, and potentially offer strong short-term returns relative to ‘unloved’ value stocks.

In recent years, growth stocks with enticing storylines have become very popular investments. This is not surprising, especially with the current ease of investing, proliferation of indicators focused largely on attention-grabbing information (such as recent returns or stock popularity lists) and more visible marketing aimed at luring private investors. With these factors in mind, even the most seasoned investors can become susceptible to the ‘fear of missing out’. But such behavioral biases are likely to strengthen the value factor.

The evolution of the Value factor

Value investing has come a long way from when it was introduced by Benjamin Graham and popularized by Warren Buffet. Well-renowned academics and practitioners have since made significant contributions to the academic literature, including Sanjoy Basu in the 1970s as well as Eugene Fama and Kenneth French in the 1990s. More recently, numerous researchers have continued to evolve the investment style so that it incorporates relevant present-day considerations that can enhance its efficacy.

For example, intangibles are now included in book-to-market metrics by some practitioners. Recent Robeco analysis outlines how research and development (R&D) expenses have increased over time relative to capital expenditure.¹¹ Since R&D outlays are treated as an expense under most accounting standards, they

are immediately recognized as costs on the income statement instead of being capitalized as assets.

As a result, the book values that are reported on the balance sheets of affected companies might not be representative of their true assets, while their earnings might be distorted by the deduction of their long-term R&D investments. Therefore, the adjustment of their book values and income statements, by treating R&D spending as an investment instead of an expense, increases the performance of the value factor.

Another example of present-day considerations is accounting for climate risk. The value factor is typically tilted towards asset-heavy sectors such as energy, materials and utilities. Unsurprisingly, the environmental footprints of these industries are high relative to other sectors. And although climate change has only taken center stage in recent years, climate-related risks are expected to become increasingly important for investors going forward.

In light of this, Robeco researchers have designed an innovative methodology to derive a decarbonized value signal that adjusts the valuations of high-polluting firms by making them less attractive, based on their environmental footprints. This results in a ‘greener’ value signal that removes a large tilt to ‘brown’ companies, without significantly impacting the value premium.¹²

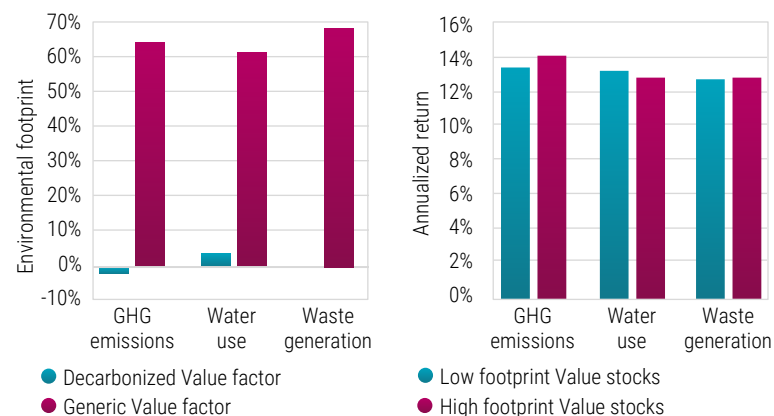
This is illustrated in Figure 2 which shows materially lower footprints for the decarbonized value factor on the left-hand side chart, but broadly similar returns compared to a generic value signal on the right-hand side chart. This enhancement ensures that investors are less vulnerable to climate-related risks, thus making the value signal more future-proof in terms of the ongoing transition to a low-carbon economy.

10. Blitz, D., November 2020, “Why I am more bullish than ever on quant”, Robeco article.

11. Hanauer, M.X., and Swinkels, L., May 2020, “The tangible value of intangibles”, Robeco article.

12. Swinkels, L., Üsaitė K., Zhou, W., and Zwanenburg, M., October 2019, “Decarbonizing the Value factor”, Robeco article.

Figure 2: Environmental footprint of generic and decarbonized value factor and their returns, January 1986 to December 2018



Source: Robeco Quantitative Research. The left-hand side chart shows the average environmental footprint of the highest value quintile portfolio minus the lowest value quintile portfolio as a percentage of the footprint of the equally-weighted universe for the conventional and "decarbonized" book-to-price value variable. A positive number means that the value stocks have a larger footprint than non-value stocks. The right-hand side chart shows the average USD returns of the highest and lowest environmental footprint quintile portfolios within the highest quintile value portfolio. The stock universe consists of MSCI All Country World Index constituents supplemented with large off-benchmark stocks.

A value strategy can also avoid unrewarded risks that are associated with negative exposures to other established factors, such as momentum and quality. Indeed, a couple of studies reveal how the return of generic value strategies can be significantly enhanced by following this approach.^{13, 14}

In addition, a value portfolio that is diversified across different value variables can potentially result in improved and more stable performance. This is outlined in recent analyses that depict the returns of a composite value signal versus a generic value factor, with the former delivering superior results.^{15, 16}

Why hasn't Value been arbitrated away?

As the value premium is rooted in rational and irrational behavior, the likelihood of it being eroded is fairly low. Indeed, it has been around for decades, giving arbitrageurs enough time to profit from it, yet it remains a fixture of global stock markets. In fact, recent developments, such as the rise of the retail investor, are likely to fuel behavioral biases that could result in the strengthening of the premium over the long run.

Furthermore, the constantly evolving mold of the value factor also works in its favor, as its adaptive nature makes it less prone to the prospect of arbitrage. To truly capture the value premium, investors will likely have to enhance their approaches as market environments change, which should help keep the factor alive.

Lastly, harvesting the value anomaly can be a painful exercise. The experience of protracted underperformance is likely to shake out any investors with 'weak hands', which limits the risk of arbitrage. In fact, investors (humans) have the natural tendency to avoid pain and seek short-term rewards. Therefore, it is our hardwired human instincts that give rise to value premium.

13. Blitz, D., Roscovan, V., and Vidojevic, M., December 2017, "Mixed versus integrated multi-factor portfolios", Robeco article.
14. Asness, C. S., Frazzini, A., Israel, R., and Moskowitz, T., October 2015, "Fact, fiction, and value investing", Journal of Portfolio Management.
15. Blitz, D., Hanauer, M. X., January 2021, "Resurrecting the Value Premium", Journal of Portfolio Management.
16. Baltussen, G., Hanauer, M.X., Schneider, S., and Swinkels, L., September 2021, "What valuations and interest rates tell us about equity factors", Robeco article.

Interview with external behavioral finance expert



An aerial photograph of a soccer field situated within a dense, dark green forest. The field is brightly lit, showing white boundary lines and a central circle. Several players are visible on the field. The forest surrounding the field is thick and extends to the edges of the frame. A large, semi-transparent blue circle is overlaid on the left side of the image, partially obscuring the forest and the text.

WHERE FIFA AND EQUITY MARKETS MEET

Disentangling human behavior from risk

We interviewed Remco Zwinkels on his work in the field of behavioral finance, touching on topics including virtual asset markets, GameStop, machine learning and sustainability. He is the Professor of International Finance at Vrije Universiteit Amsterdam.

His main research interest lies in the field of behavioral finance, in particular expectation formation. He won the SBE Senior Teaching award in 2020 and is one of the founders and organizers of the Research in Behavioral Finance Conference (RBFC).

In one of your recent papers,¹ you draw parallels between stock markets and a virtual asset market (FIFA Ultimate Team online transfer market). Can you tell us about this and what your main findings were?

"This is an exciting topic for me, because one of the problems in asset pricing research is that you never really know what drives the results. You have two camps: the neoclassical one that says everything is related to risk, then the behavioral one – of which I am a proponent – which says it might be partly related to risk, but it could also be linked to human behavior. These two camps are very difficult to disentangle."

"But I think we found a way to do that through a quasi-natural experiment, where we used the online transfer market in the



FIFA 19 video game. In this virtual setting, the quality or fundamentals of the players are known and fixed, meaning there is no fundamental newsflow. If you compare it to the stock market, prices in the latter move either because of fundamental news or due to whatever craziness of the market, like Elon Musk tweeting for instance."

"In this virtual market, the fundamentals are constant and you know that every price move stems from the behavior of individuals because, by definition, there is no news. So that is one great characteristic of the FIFA market. It is also very similar to an equity market in terms of structure and players."

"First of all, it is huge. Literally billions of transactions take place in it. Also, it is not just teenagers who play the online game and we have some insight on the demographics. Sure, the average gamer is a bit younger than the average equity market participant, but it is not that far off. The majority of the players are male and college-educated, which resembles what we see in equity markets. The trading process is also similar as it has a limit-order book, for example."

"What we find in this setting is that the return dynamics in the FIFA market are similar to what we see in equity markets. In the latter, there are several prominent factors that we also find in the FIFA market. For example, there is a size premium, whereby players with a smaller market value have higher expected returns."

"Then there is the book-to-market factor. We can calculate a book value or a fundamental value for players in the game. And we see over time that there is mean reversion towards this

value. We also find momentum and mean reversion patterns. More specifically, we see reversals in the returns of the players that did well in the previous week, but if we look back further, we can also see patterns of momentum."

"These are all very similar characteristics to equity markets. Moreover, we know that the FIFA market is purely driven by behavior rather than fundamentals. So if we compare it to equity markets, then it could imply that significant portions of equity price movements are mainly driven by behavior rather than risk."

With respect to the equity market, do you see factors or anomalies as more behavioral or do other explanations hold more ground here?

"Well, the fact that we also find these factors to be so important in this artificial market really points towards a more behavioral explanation. But I do not yet know exactly which biases and heuristics are the drivers. However, if this also happens in the FIFA market, then apparently it is something that is really deeply ingrained in human behavior or market participant behavior. If the same patterns emerge, well then apparently it is the same underlying behavior."

"I think this is also important for practitioners, because if you have a better understanding of what is driving these anomalies or factors, then it is also easier to use them. If you are sure that there is no underlying risk factor, then to a certain extent, you could say it is a free lunch."

Inefficiencies do exist in the market and we see examples of these strange cases. In one of your studies,² you also looked at the case of Royal Intech in 2014, where the price was clearly disconnected from the fundamentals. What do you think these anecdotes can teach us about market efficiency?

"I think these cases are important because they are anecdotes for a reason. These are typically very stark examples, or say deviations from efficiency. In our paper we point towards an 800% mispricing. And of course this is an example and it is anecdotal. But if these things can happen, then I think it also says something about everyday market behavior. If there are individual instances with such huge mispricing, then it cannot be the case that there is no mispricing elsewhere."

"Again, it remains very difficult to disentangle mispricing from rational pricing. But these anecdotes are useful because they represent examples where we are sure that it is mispricing. That is why I think they are important, because they are so clean in their identification."

Do you think the trend of increased retail investor participation will generally contribute more towards market efficiency or inefficiency?

"That is a good question and I guess there are several trends. In the past year and a half, we have seen a huge increase in retail investing. This also goes hand-in-hand with the significant growth in tracker funds or exchange-traded funds (ETFs). So in that sense, it does not really matter that much. But if there are an increasing number of individuals who trade single names, then my gut feeling is that it would be detrimental to efficiency."

"Overall, you could probably say that retail investors are less sophisticated than institutional investors, so there is room for more inefficiency. And maybe if these instances are random, well then on average they might cancel each other out."

"But with Reddit's WallStreetBets, you have a platform that can coordinate retail flows. So this could create pressures that could lead to market inefficiencies. But honestly, I wonder if this is really a long-term trend or whether it is related to the Covid situation, because why has it happened now?"

"I think one of the reasons is that many individuals were bored at home and the stock market is very entertaining. Lots of people also had excess cash because of government support. But they also had less opportunities to spend the money. So on average, savings rates increased significantly."

"Therefore, there was both the opportunity and possibility to invest more. Hopefully we are now moving on from this Covid situation. With people now expected to spend more money elsewhere again, and also with interest rates potentially rising, it could mean that retail participation could go down once more."

Can retail investor participation permanently disrupt the market? For instance, GameStop traded at an elevated market cap which was not really reasonable in the eyes of many investors for quite some time.

"Honestly, I believe GameStop is an exception for different reasons. In this case, retail flows were coordinated into one particular company. I do not necessarily see this trend as something that is permanent or could happen continuously. So it is also surprising to me that its share price stayed as high as it did for so long. I guess there are reasons why it did. But I would not go as far as to say that this is disruptive for the market in general. I doubt it."

In terms of recent research in behavioral finance, are we seeing more evidence that asset pricing factors are a result of mispricing? Also, what excites you in terms of recent or future research in this area?

"What I see happening a lot is the introduction of machine

learning into asset pricing, especially with respect to factors. There are hundreds of factors that have been identified, some better than others, I guess. But of course, that does trigger the question. Is this really true? Maybe we are picking up the same things. Is there time variation or country variation in factors?"

"So I think what is an exciting development is that machine learning techniques really allow us to better pinpoint which factors are important, at which point in time, and whether they are picking up the same thing or not. I think it is a great development. Also, behavioral finance proponents were viewed as being negative in the past. Maybe there was some truth in that, because the school of thought only pointed out things that went wrong without really explaining them."

"On the other hand, researchers that looked into individual behavior, typically experiments showing individual choice behavior, also came up with alternative explanations, like prospect theory for example. Another point of criticism on behavioral finance was that there are lots of biases. And whenever you find something that goes wrong in equity markets, you can just pick a bias and connect it to the issue. So there is always a bias that fits your anomaly."

"What I think is great is that this is really improving of late. The profession is making progress and really finding the driving mechanisms of the anomalies. To give you an example, more and more papers are coming out that show that prospect theory has an effect on asset pricing on the preferences side. Even more recently, we see that expectation formation is being included into asset pricing, like trend extrapolation."

"These experimental studies show that when people form expectations about future returns, they just look at the recent past. That is a very strong human reaction. You are also seeing that researchers are now really incorporating trend extrapolation-

on into asset pricing in mainstream finance literature.”

“So you are really seeing the development of a proper alternative to the efficient market hypothesis. This progress is really filtering out this big bag of biases to pinpoint the few that are really important to asset pricing in general.”

Do you think there are any interesting links between sustainable investing and behavioral finance?

“It is a very broad area and lots of exciting things are indeed happening. Earlier we talked about the neoclassical approach to investing, where you purely look at risk-return considerations, as well as the alternative approach, where you invest for other reasons. I guess in terms of sustainable investing, you could probably also place it in the category of other reasons.”

“Well at least in my reading of the literature, there does not seem to be a strong real effect on performance, at least not in the short run. But maybe in the long run there will be if you look purely at sustainability. That would imply that if you increase the sustainability profile of your portfolio, then you do it for other reasons.”

“But the big question that remains, which is very important, is how do you measure sustainability? I am currently working with a PhD student, who is employed at Robeco, to find a market-based measure of CO2 emissions. This seems to be growing into a very promising new line of research.”

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Investors should consult your professional adviser if you are in doubt about the stringent restrictions applicable to the use of this document, regulatory status of the Fund, applicable regulatory protection, associated risks and suitability of the Fund to your objectives. Investors should note that only the Sub-Funds listed in the appendix to the section entitled "Important Information for Singapore Investors" of the prospectus ("Sub-Funds") are available to Singapore investors. The Sub-Funds are notified as restricted

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Additional Information for investors with residence or seat in South Africa

Robeco Institutional Asset Management B.V. is registered and regulated by the Financial Sector Conduct Authority in South Africa.

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Additional Information relating to RobecoSAM-branded funds/services

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Some Funds referred to in this marketing material have been registered with the UAE Securities and Commodities Authority (the Authority). Details of all Registered Funds can be found on the Authority's website. The Authority assumes no liability for the accuracy of the information set out in this material/document, nor for the failure of any persons engaged in the investment Fund in performing their duties and responsibilities.

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