

White Paper

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Behavioral Finance Solutions GmbH
a spin-off firm
of the University of Zurich

Behavioral finance: The psychology of investing

White Paper
The psychology of investing

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We are delighted to present to you Behavioral Finance: The Psychology of Investing, a White Paper that was developed in collaboration with The University of Zurich. This report aims to provide you with insight on the emotional and psychological influence that can impact our financial decisions, and how it can result in irrational behavior. It further explores ways to avoid the pitfalls that investors commonly face.

Behavioral finance is a fairly novel topic which has gained prominence since the early 1990s. This can be credited to Amos Tversky and Daniel Kahneman, who were notable for their development of Prospect Theory in behavioral finance. Kahneman won the 2002 Nobel Memorial Prize in Economic Sciences for the work he did in this area with Tversky, who died in 1996. A big part of investment is psychology and if investors can understand the psychological aspects, it could potentially prevent any financial drawbacks.

Behavioral finance has managed to bridge the gap between theory and practice by scientifically recording human behavior. To date, research has focused on the ideal scenario of thoroughly rational investors in efficient markets, while reality is dealing with day-to-day irrational investor behaviors and inefficient markets. Combining theory and practice allows us to use the findings from behavioral finance as fundamental elements of advisory services, asset management, and financial product development.

At Credit Suisse, our holistic approach to providing clients with wealth management advice transcends the traditional financial advisory relationship. Our five-step advisory process enables us to thoroughly understand our clients' needs and their rationale in making any financial decisions, in addition to assessing their risk appetite and behavioral bias. Credit Suisse has had the privilege of serving many of the world's wealthiest individuals and families since 1856, which shows our commitment to the needs of our clients and the needs of society.

We hope you find this White Paper a source of insight and relevance.

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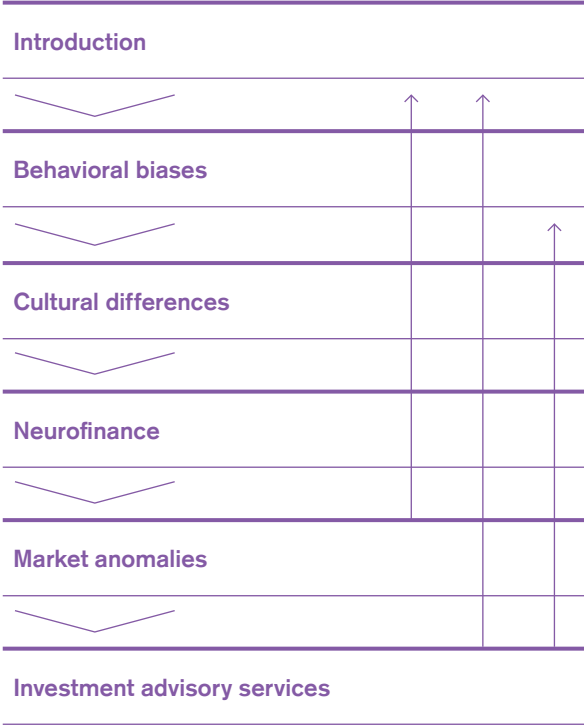
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Orientation

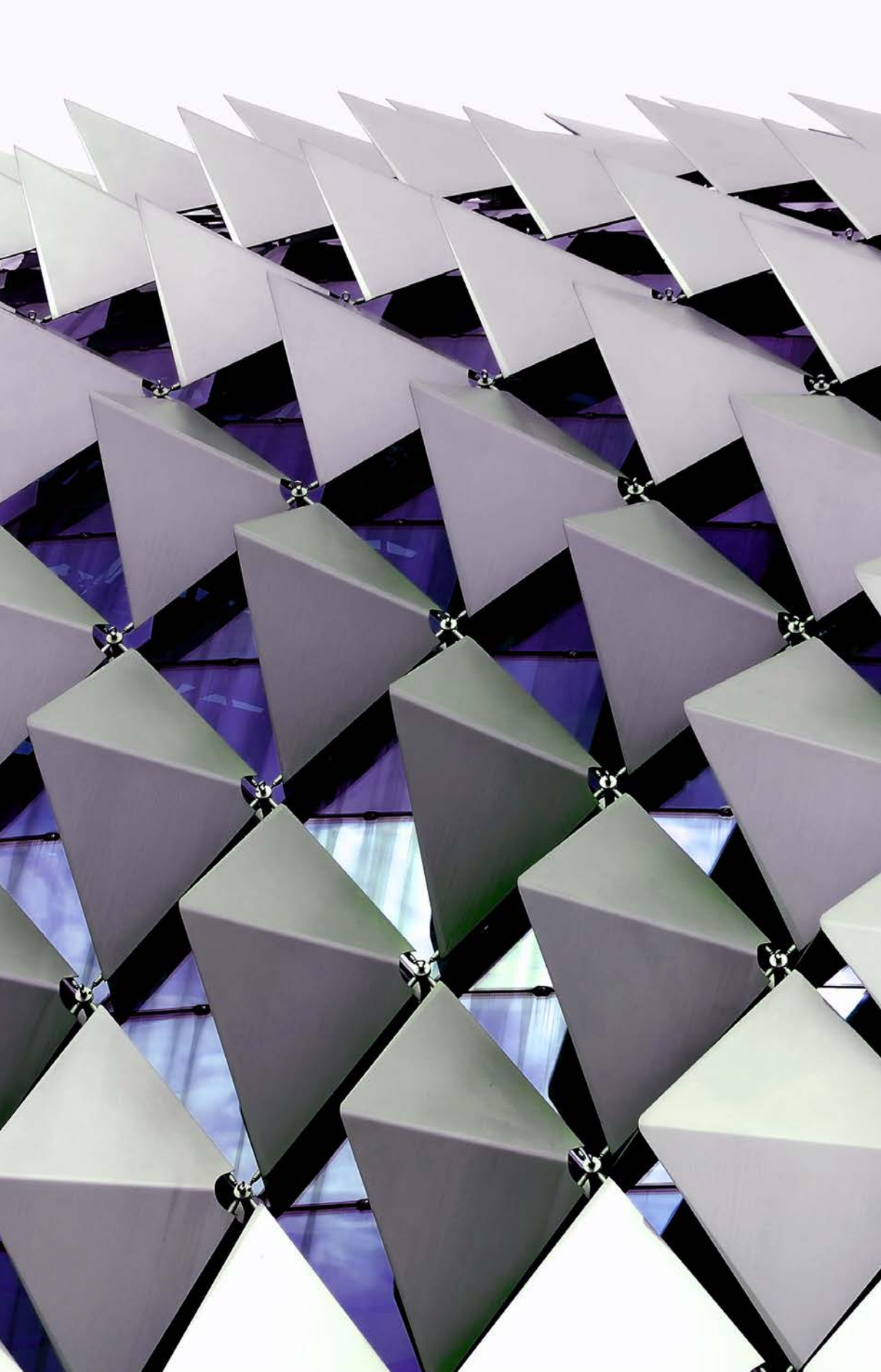
This White Paper is divided into six sections. Ideally, these should be read in sequential order.

The figure below shows which sections are required reading for other sections. Naturally, the introduction to each section is important. However, should readers choose to skip the remainder of the sections, only the section on market anomalies will be difficult to understand unless they have solid background knowledge. Behavioral Biases is the basis for Cultural Differences, which in turn is the basis for Neurofinance. Finally, Behavioral Biases is also particularly fundamental to Investment Advisory Services.

Figure 1. Orientation



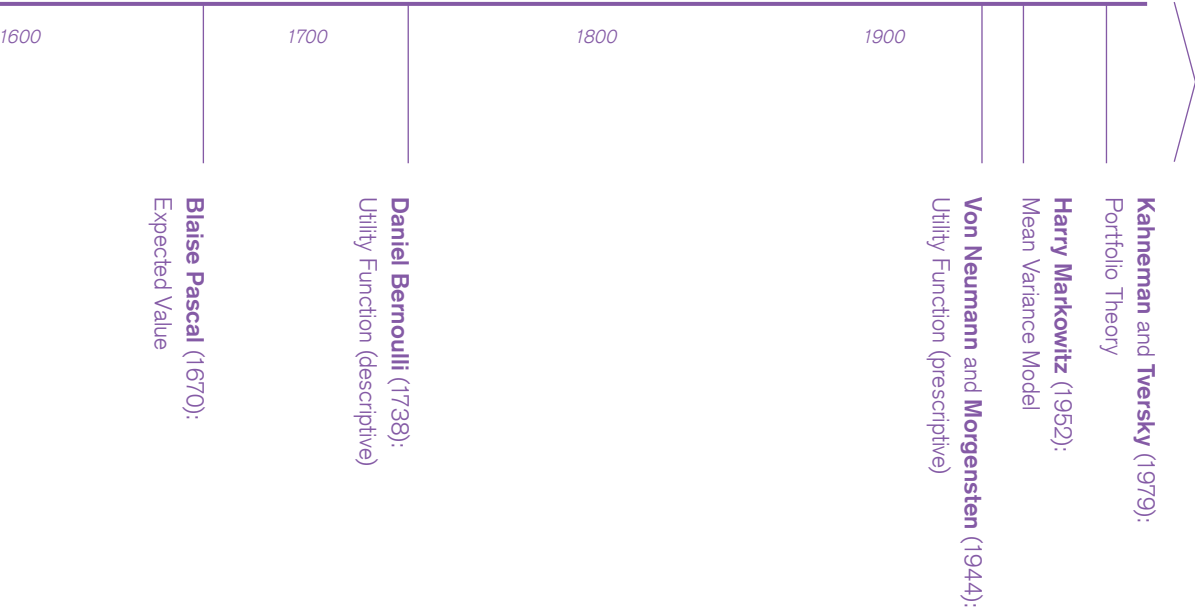
The small arrows show the normal reading pattern. The large arrows show the prerequisites, i.e. at these points, the reader should refer back to the indicated sections.



Milestones of portfolio theory

While the present functions without the past, we can understand it better if we look at its historical developments step by step. The same is true for financial market research. This currently comprises fairly complicated mathematical and psychological models that, at first glance, can seem quite confusing. The figure below shows the milestones of portfolio theory, one of the primary areas of financial market research, over time.

Figure 2. Milestones of portfolio theory

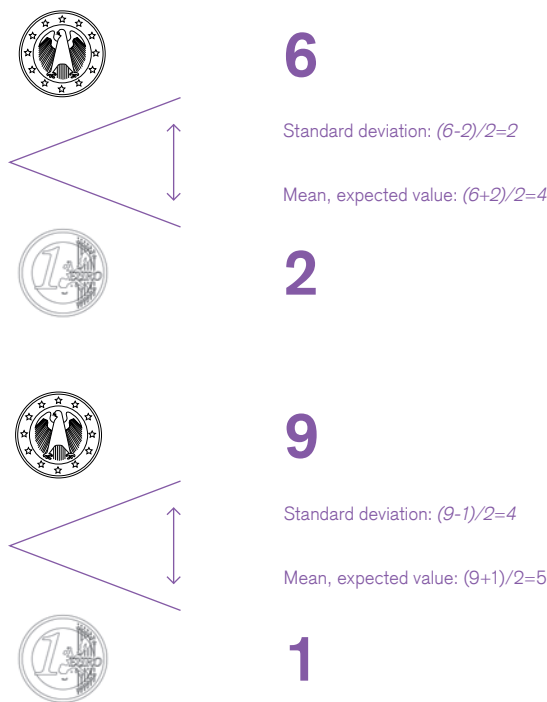


The first person to focus on how we make decisions in uncertain situations was French mathematician Blaise Pascal in 1670. He looked at fairly simple situations and wondered, for instance, what would be preferable:

- a) a coin toss in which one could win 6 francs for heads — and only 2 francs for tails —
- b) or another coin toss in which one could win 9 francs or 1 franc

His suggestion was to make the decision based on the expected value, i.e. the average payout.

Figure 3. Sample coin toss



For the first coin toss, the expected value is 4, for the second coin toss, it is 5. Therefore, in Pascal's view, one should choose the second coin toss. Daniel Bernoulli, a mathematician from Basel, had the same idea when his brother Nikolaus told him about the St. Petersburg game more than one hundred years later. Under Blaise Pascal's theory, the citizens of St. Petersburg should wager every cent they had to play the St. Petersburg game, because it had an infinite expected value. This contradicted the observations of Nikolaus Bernoulli, which revealed an average payout of 2 ducats. The average payout of 2 ducats may seem like a paradox at first, but is explained by Daniel Bernoulli's generalization of the theory on calculating the expected payout. Bernoulli's function, as applied to Pascal's theory, is now known as the utility function. The utility function refers to a fundamental psychological law, the diminishing marginal utility of money.

Or, as Daniel Bernoulli said: "There is no doubt that a gain of one thousand ducats is more significant to the pauper than to a rich man though both gain the same amount." It is important to notice that the diminishing marginal utility of money embodies the risk aversion of the person making the decision. A decision-maker is averse to risk if, instead of a random payout, he prefers the certainty of the expected fixed payout from a game. The St. Petersburg game shows that the people of St. Petersburg were averse to risk. Let us imagine someone made a decision and received the expected payout. If he chose to gamble instead, in some cases he would win more, and in other cases he would win less. Due to the money's diminishing marginal utility, the utility of the higher payout would be lower than for a reduced payout. This is why it is more rational to take the average payout with certainty.

Figure 4. Utility function for various level of risk aversion

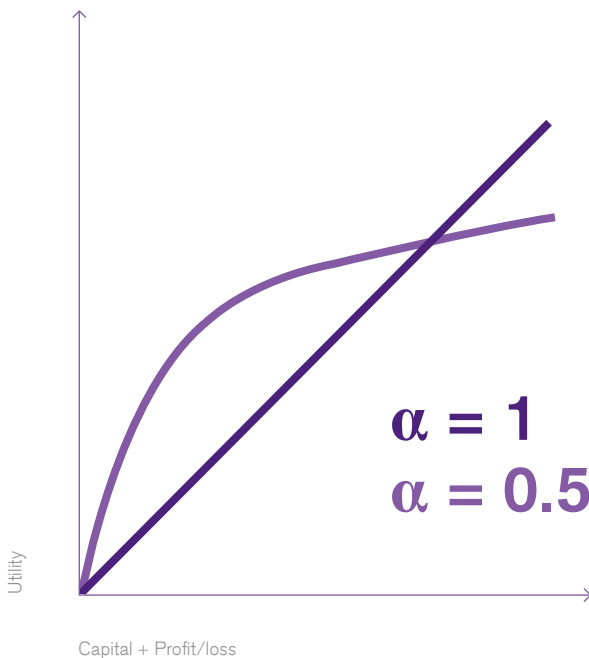


Figure 4 shows the utility function $u(x) = \frac{x^\alpha}{\alpha}$ for various levels of risk aversion, α^1 . The larger parameter α , the less risk averse the decision-maker.

With the expected utility hypothesis a method of calculation had been found to explain a variety of observed behaviors². In 1944, mathematicians John von Neumann and Oskar Morgenstern determined that the expected utility hypothesis is also the only criterion that allows people to make rational decisions in uncertain situations. Every other criterion contradicted plausible fundamental conditions for behavior, known as axioms. One example for these axioms of rational behavior is the axiom of independence, which states that when choosing between two lotteries, only the differing aspects of the lotteries should be considered.

For instance, two lotteries could each be based on throwing one die. Neither lottery has a payout for an odd number. The first lottery (A) has a payout for each even number, in the amount of the number cast.

The second lottery (B) has the following payouts: a payout of zero for a two, a payout of four for a four, and a payout of ten for a six.

The axiom of independence now states that when selecting a lottery, we can limit ourselves to those cases in which the two or the six is cast, because the payouts of both lotteries are identical in all other cases. Thus, the selection is reduced to whether the player wants two and six, or zero and ten, with the same probability.

¹ A risk aversion of $\alpha = 1$ denotes a risk-neutral investor.

² In the example shown in Figure 3, for all levels of risk aversion $\alpha > 0.326$ the right coin toss is chosen. While for $\alpha < 0.326$ the left one is chosen. For a risk aversion of 0.326, both games are equal. This is calculated based on the $u(x) = \frac{x^\alpha}{\alpha}$. The result is $6^{0.326} + 2^{0.326} = 9^{0.326} + 1^{0.326}$.

Figure 5. Axiom of independence

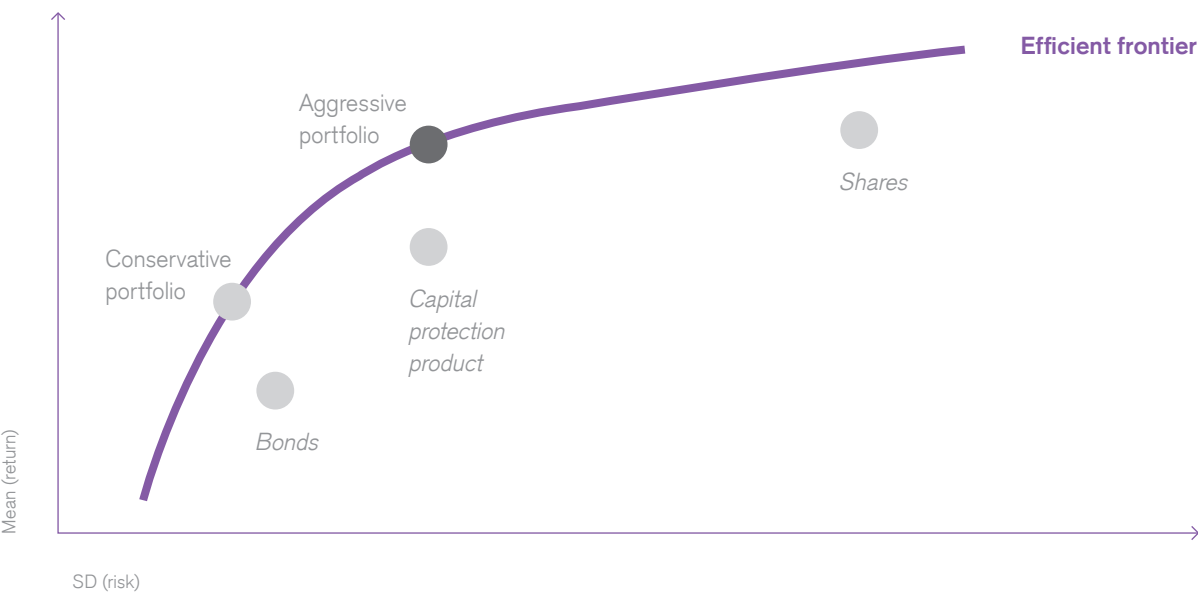
Outcome	1	2	3	4	5	6
Lottery A	0	2	0	4	0	6
Lottery B	0	0	0	4	0	10

So had everything been figured out by the middle of the last century? The expected utility hypothesis was flexible enough to illustrate different behaviors in uncertain situations and was also the only sensible manner of proceeding in such situations. Unfortunately, there was a significant weak spot in this hypothesis: Where to find realistic probabilities for calculating the expected utility if it was not a coin toss? For instance, how can we define the probabilities of returns on asset classes such as bonds, equities, or alternative investments, or even single securities within a class? These returns depend, among other things, on economic factors such as the economy itself, monetary policy, innovation, and growth, alongside the behavior of other stakeholders. The sum of these aspects results in an almost impossibly tangled mass of interactions. To unravel this Gordian Knot, Eugene Fama developed his efficient market hypothesis, which had its predecessors in the 1950s. If all market participants thought constantly about the factors behind the returns on securities, and then developed trading strategies to make money based on these factors, the buying and selling decisions of these trading strategies would ensure that all profitable information about the decisive

factors would be priced into the securities at all times. The market anticipates every predictability in the prices. The remaining price developments result from previously unanticipated changes to the factors, surprise information. Because surprises are inherently impossible to predict, the prices of securities develop by pure chance, i.e. statistically independent of one another. We know from statistics that the sum of random variables can be defined by normal distribution (bell curve). The distribution is well-defined by its mean and its standard deviation.

The efficient market hypothesis is a brilliant simplification of decision-making in uncertain situations, because these then would depend only on the mean and the standard deviation of the distributions. In 1952, Harry Markowitz built on this idea to develop his mean variance model, which was also based on only two aspects, namely returns, measured by mean, and risk, measured by its standard deviation. It was clear to Markowitz that investors preferred a high average return with a low risk. As we saw from the two coin tosses in Figure 3: For the first toss, the average payout is 4, the standard deviation is 2; for the second,

Figure 6. Risk-return diagram



the average payout is 5 and the standard deviation is 4. Depending on risk tolerance (here, the aversion to fluctuating returns) the decision-makers will choose the first or the second coin toss. Therefore, Markowitz presented the various investment options in a return/risk diagram such as the one in Figure 6.

As we can see in Figure 6, when the average return (mean) increases, the expected risk (standard deviation) of an investment also increases. For each return level indicated, an investor can minimize his risk by diversification. This sequence of minimization problems results in the efficient frontier, which denotes the minimum risk for a given return level. Depending on the individual risk tolerance of an investor, the best portfolio can be selected on the efficient frontier (see Figure 6).

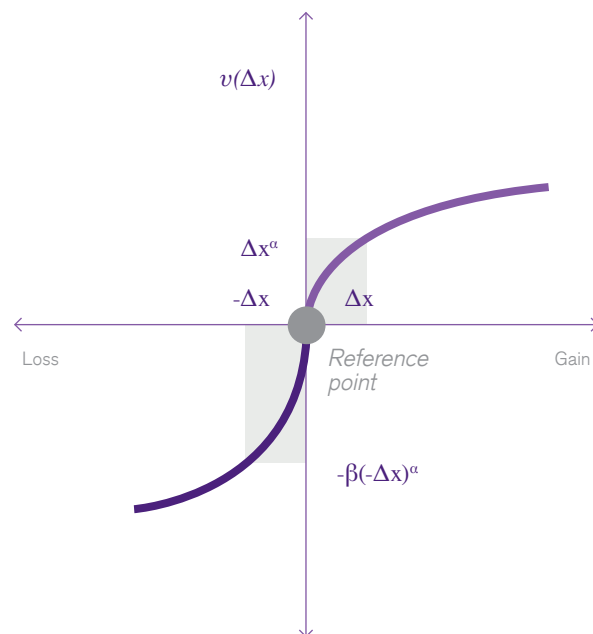
Behavioral finance is the newest chapter in the history of portfolio theory. Why do we yet need another theory? Behavioral finance explains the typical mistakes (behavioral biases) made by investors. Secondly, it provides a detailed picture of investors' risk preferences. This second aspect is

covered by Daniel Kahneman and Amos Tversky's prospect theory (1979). Unlike the Markowitz analysis, prospect theory focuses on the significance of investment losses. Kahneman and Tversky found in their studies that most investors are averse to loss. This means that investment losses have to be compensated through the opportunity for higher returns. For most investors, these must be at least twice as³ high as the potential loss.

The utility function of the prospect theory is shown in Figure 7. Maximizers of prospect utility evaluate the results of their investments using a reference point. This can be the purchase price of a security, for example. Loss aversion is reflected in the fact that the utility function initially has a much steeper curve than the profit area. The prospect utility theory takes from the expected utility theory the characteristic of declining marginal utility of the gains. The loss area reflects the declining marginal damage of the losses. This is demonstrated by the fact that prospect utility maximizers would risk something for a break-even opportunity rather than face a definite loss. Thus, they prefer a random payout to the expected utility

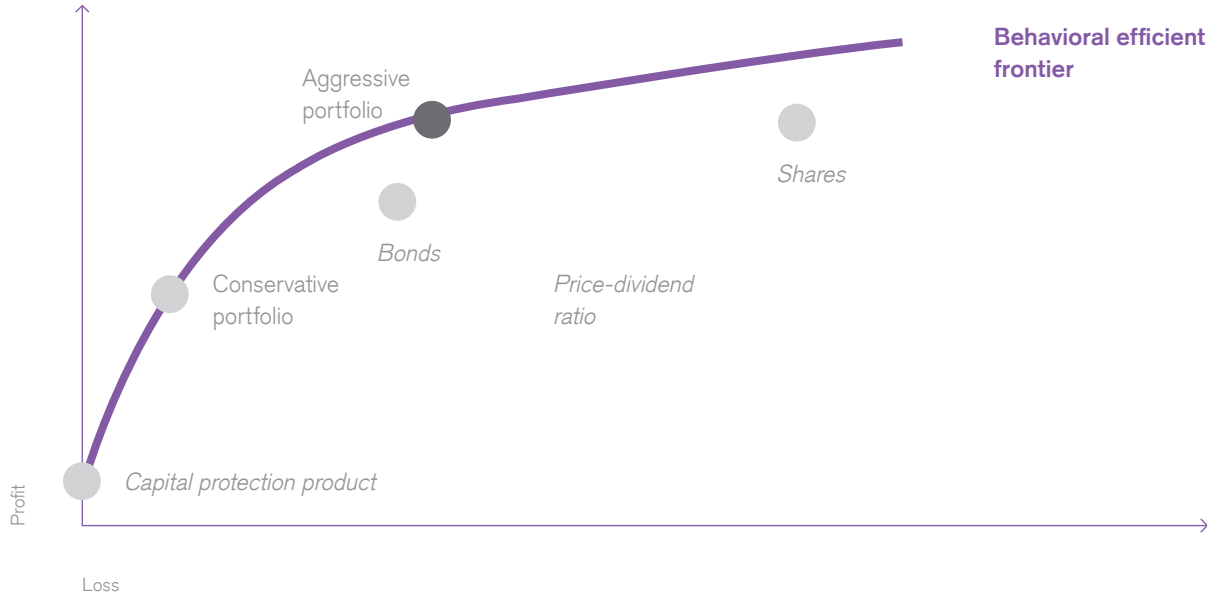
³ To be precise, it is 2.25 times higher.

Figure 7. Utility function of the prospect theory



if it is negative. If markets were efficient as per Fama's theory, all investment returns would have a normal distribution and the application of the mean standard deviation criterion would still be justified for prospect theory investors. In reality, the efficient market hypothesis is not valid, so very few investments have returns with normal distribution. For this reason, the loss aversion under the prospect theory is key to an optimal portfolio. We must replace the efficient market line in the mean-standard deviation model with a behavioral efficient frontier based on the prospect theory. The behavioral efficient frontier was first developed in a paper by De Giorgi, Hens, and Mayer (2011). It depicts prospect theory using a risk-return diagram. The results of an investment are broken down into those cases where investments make a profit and those where the investments make a loss. The degree of loss aversion determines the selection of an optimal portfolio on the behavioral efficient frontier, as shown in Figure 8. If we compare portfolios based on the prospect theory with the Markowitz portfolios, we see that these have a lower portion of equities and hedge funds while weighting capital protection products more heavily. Equities and hedge funds are not heavily represented in the prospect portfolios, because of their potential high losses. On the other hand, capital protection products are not very common in the Markowitz portfolios. Although they do not

Figure 8. The behavioral efficient frontier based on the prospect theory



show a loss as long as the counterparty does not default, they have varying levels of returns and thus a standard deviation. Practice has often shown that clients whose portfolios were based on the Markowitz theory did not adhere to their investment strategy when the markets declined. As a result, they usually missed the rebound and performance was lower than if they had maintained their strategy. Thus, it is worth choosing a prospect theory, so that investors can stick to the strategy both in financial and emotional terms.

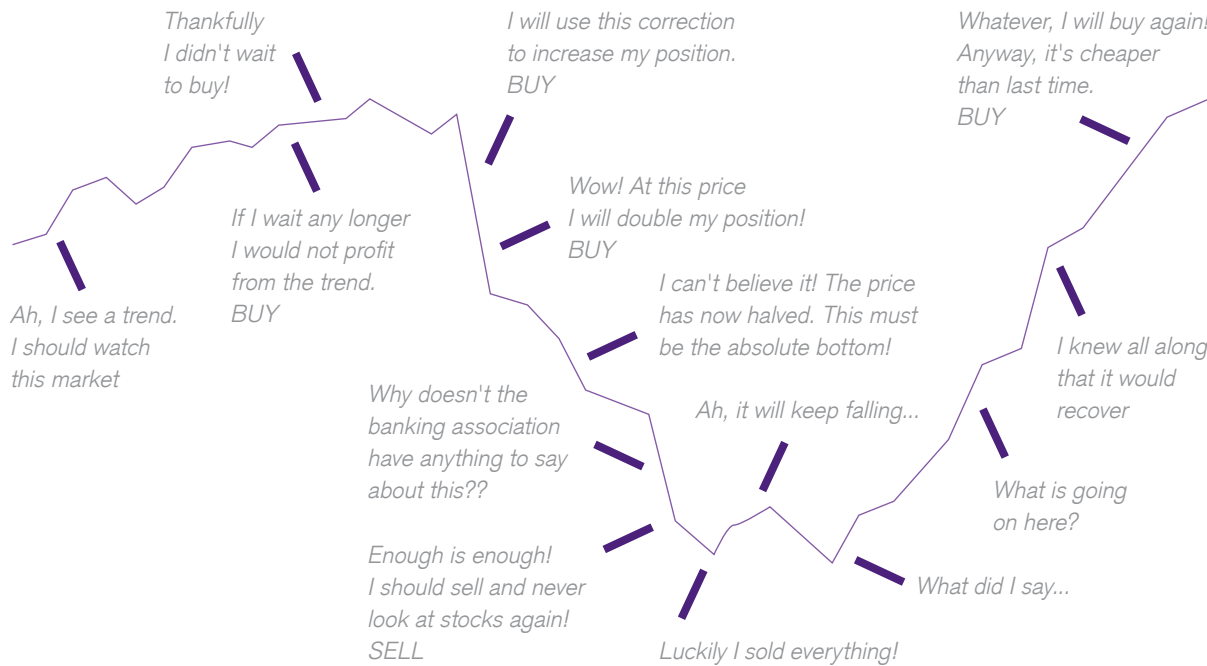
As a result, investment advice based on current research findings must optimally position prospect theory investors for inefficient markets.

Behavioral biases

The cyclical investment process – including information procurement, stock picking, and investing, holding, and selling investments, followed by a new selection – is full of pitfalls. These can come at a high price to investors in the literal sense of the word. As Benjamin Graham liked to say, “The worst enemy of the investor is most likely himself.” Investment purchases are a rapid-fire process, and the value of these investments can decline just as rapidly – even to zero, of course, making them a waste of money.

In this section, we will illustrate each step of the process and explain the potential pitfalls. In the next section, we will show how you can avoid these pitfalls with the help of Credit Suisse's investment advisors and investment processes. Let us start from the beginning – the investment roller coaster.

Figure 9. Investment process – Roller coaster of emotions



The markets are on the rise, the stock exchanges are registering record highs, and the media reports this to readers in diluted form. Business journalists report on innovative, creative companies that are all making a profit in these markets. However, they fail to see that not all companies are successful using those same criteria. Thus, they do not falsify the theory, a mistake known as the confirmation bias. We cannot avoid reading the headlines about price gains and booming markets, or the multitude of success stories. These stories attract the interest of many (amateur) investors. Readers follow developments in the bull market with bated breath; with some hesitation and a little safety distance, they make note of certain stock markets and shares. If the media spotlights a particular stock, it is more likely to attract investor attention. After a certain amount of watching from the wings, some investors feel a need to actively invest in order to participate in the uptrend before it is too late. With the wind of so many success stories beneath their sails, there is (almost) no chance of our investors failing. So the survival error has taken hold. The media and its readers love to write and talk about success stories: looking at the gossip magazines while at the hairdresser, for instance, we see it is all glitz and glam. However, these are not the only publications featuring the rich and famous – wealthy entrepreneurs, writers, celebrities, singers, and other people who have made it. Of course, there is never any mention of the hundreds of thousands, even millions, of people who haven't succeeded. As a result, we grossly overestimate the stellar achievements, which are as unlikely as a winning lottery ticket. Investors also fall victim to induction. They see a security rise and rise, until they are certain that it can only get better. Often they invest a large portion of their assets in this security – resulting in a serious cluster risk – and are likely to lose it all. It is a bit like a Christmas goose believing in the good of humanity and still getting the ax in the end.

Because investors don't know they have fallen into the trap, they try to find a good investment and look for familiar company names. In situations like these, it is very hard to avoid the availability/attention bias. Events that come up more frequently (often with additional media coverage) remain in our minds more than events that come up less frequently. We forget that there are other scenarios. On the other hand, rare events that attract heavy media attention (dramatic events) are overestimated, as can be seen in the following example. If we ask a random person what the most common cause of death is, he or she might say getting eaten by a shark, or killed in a plane crash or during a hold-up. This is because the media pounce on these sensational causes of death, which stay in our minds whether we want them to or not. What is more, illustrated, easy-to-digest information is

easier to remember than statistical figures, for instance. This distorts our perception between the frequency distribution and statistical reality. As a result, investors never choose information from the other side of the fence but always based on their experiences and preferences. This means that we are more likely to recall the front page of a newspaper showing a CEO racing down the Côte d'Azur in his convertible; maybe you have to change the domicile depending on the target group (customers). We are less likely to remember that his company's net profit margin dropped by 30% and its earnings by 18%. Investors make positive associations with the company, because they liked the car, or the CEO had a nice smile in the photo. They may also remember the CEO's attractive companion with her bright red lipstick. The image in their head is a good one, and so is their impression of the company. Typical investors evaluate information according to how quickly it can be recalled. This means that in most cases, we do not continue to think of alternatives, because we are satisfied with our initial thought. Investors who remember the CEO in his convertible associate the company with success, and think it would be a good investment. They may also remember a company advertisement or the make of car driven by the villain in an action movie they just saw. As soon as we remember a promising company, we begin to support our opinions with other publicly accessible information. This is not very rational, as the process does not permit a differentiated view. Once an investment has won the investor over, he often makes the mistake of looking for only positive information. We made reference to this at the beginning of this section with the business journalists' reports. The Confirmation bias is the phenomenon of supporting our own opinions with selective information. Investors seek confirmation for their assumptions. They avoid critical opinions and reports, reading only those articles that put the product in a positive light.

Our investor's boss is also interested in market developments and likes to talk about the bull market during his coffee breaks. He recommends investing in the pharmaceuticals industry. Because the investor is afraid to contradict him, or would not even think about it, he begins to do some research. The coffee break scenario is a good example of the authority pitfall that our investor falls prey to. He considers his boss an authority and would never dare to disagree with him. However, the boss is no more or less correct than his employee. Because our investor does not know about this bias (or that he has succumbed to it), he now wants to research the earnings of three Swiss pharmaceutical companies over the last few years. As he looks for information, he also reviews the returns on the company's stock over the last few years. Too bad that he looks only at the last three years.



He does not have the profits handy for one company, but sees that revenues have grown steadily over the last three years. He concludes that profits will continue to grow in the future and that the company must be successful. Investors do not tend to use representative data. This means that the time period shown by the data is too short to determine the statistical population and thus it is not possible to draw conclusions about the statistical population. In the above case, it would be wrong to draw conclusions about the entire industry based on an analysis of three companies.

Moreover, one to three years is too short a time period to draw a valid conclusion.

We refer to these cases as the law of small numbers. You may remember learning about the law of large numbers in school. If we toss a coin enough times, the number of heads will be essentially equal to the number of tails. Unfortunately, we often believe that this equality is very likely to apply to smaller random samples. As a result, based on just a little information, we look forward to high returns and presume that the world in general is looking up.

...back to the roller coaster

While looking for the profits of the pharmaceutical company, our investor finds an interesting article in a reputable business journal. It reports on a Swiss company with a 40% chance of generating a 5% excess return over the SMI. He is so excited that he decides to invest in this company. He probably would not have done so if he had read in the paper that there was a 60% chance of the company generating a less than 5% excess return over the SMI. He has just fallen for the framing effect.

This means that how something is presented will influence our decisions. For instance, there is a huge difference in whether a sum is presented as a loss or a missed profit, even if these mean the same thing. Therefore, our decisions are based largely on how they are depicted. The choice of scale on a chart is seldom random. It is chosen intentionally to influence the desired result as much as possible.

These types of framing effects apply to everything in life. Imagine our investor is having dinner at a friend's house and she tells him that she made the sauce with 80% fat-free cream. Do you think she would have bought this cream if the package said cream with 20% fat? This would also work if it said 98% fat-free as compared to 2% fat. Most people would choose the 98% fat-free product even though factually,

it has more fat than the product with 2% fat. Since he saved so many calories with the meal, our investor should treat himself to another beer. Imagine the beer bottle says 3.9% alcohol – how do you think consumers would feel about a label that said 96.1% water? This means that a company's presentation of a product is never random. It is usually intended to serve the seller's purpose, which does not always conform to the buyer's purpose.

Because our investor doesn't really care about cream sauce, he changes the subject and boasts about the investments he made in the stock market. He tells his friend that he invested in high-growth, successful companies, so he purchased equities from Roche, Novartis, Geberit, Holcim, Nestlé, Synthese, Google, Facebook, and Credit Suisse. As he moves down the list, he does not realize most of these shares are country specific or target customer specific. The [home bias](#) is to blame. According to this bias, most investors choose the majority of their equities from their home country. These stocks seem more trustworthy, and we grew up with these company names. They are also mentioned more frequently in the local media. This is one reason investors do not diversify enough, but it's far from being the only reason.

Once we invest in a stock, we hope the price will go up but are afraid it will go down. Of course, price developments depend on chance. In psychological terms, what counts is how we handle them. First the price goes up and the optimists feel their decision was the right one – they think, "Thank goodness I didn't wait any longer." However, our investor is not the only one, and everyone wants to be part of the boom (herd instinct). This includes the pessimists, who feel lucky each time the price increases. This herd instinct is rooted within us and, once upon a time, was necessary for our survival.

After an uptrend phase – a phase of hoping for big profits, for instance, the price begins to drop. The optimists would say that these price losses are bad luck, or a necessary correction. The pessimists would be furious if they suffered a loss. We can imagine that pessimists do not remain invested for long – unless they are masochists. This is why the stock market tends to have more optimists, who frequently invest on the principle of hope. This means they invest in stocks such as innovative technologies that have a low probability of generating enormous returns. Because this is typical behavior in sports bets, we call it the [favorite long shot bias](#). People who fall into this psychological trap always bet on the long shot, because it promises very high returns. Unfortunately, they forget that the likelihood of the long



shot winning cancels out the profit in the middle. Of particular interest is the typical investor behavior in cases of long-term loss, when the downward spiral persists and the prices plummet – a bear market. On the one hand, investors will initially ignore all the information about a downward trend, because it does not support their preconceived notion that the investment is good and that there is an uptrend. Another common, irrational response is to buy more stock because: “I’m taking advantage of the correction and reinforcing my position” or even: “Great, I’ll double my position at this price.” This behavior is caused by contrast and [anchoring](#). When making these decisions, investors do not rely on fundamental factors. Rather, they tend to base their decision on the price at which the original or last position in a stock was purchased. This price – also known as the acquisition cost – is the unfortunate anchor and causes the irrational decisions. Unlike the acquisition cost, the new price seems cheap to the investor.

Anchoring influences individual decisions based on the fact that investors do not realize how the information is presented. When it comes to making decisions, people seem to be influenced by random data, even if they know that the data has no informational value or is outrageously high or low.

For instance, we can ask whether Mr. Miller died before or after the age of 90, and ask the same question using 40 years as an example. The participants are influenced by the anchors of 90 years and 40 years because on average, those asked about 90 years would list a higher age than those subjects asked about 40 years. If we left out the age entirely, most people would guess that Mr. Miller died at about the age of 80.

People want an anchor to cling to.

Not even the experts are immune, as various experiments reveal. The price at which we last bought something is the psychological anchor. Financial institutions tend to provide investors with the acquisition price in standard form or, on request, in the safekeeping account statements (which is less sensible from a behavioral finance standpoint, given the bias stated above).

If the price drops below the psychological anchor (such as the purchase price), then investors are more likely to buy, because the stock seems cheap, as if it were on sale at the supermarket. It is also frequently seen that private investors will keep buying as the losses continue. This is because they want to make up for their initial losses. “I can’t believe it! The price is 50% lower! That has to be a record low.” No, it doesn’t. This behavior can result in investors taking

more and more risks, because they have to make up for greater and greater losses. It is like a bottomless pit.

People tend to be short sighted, meaning that they overthink matters fairly often. As a result, they make decisions that they would not over longer periods of time. Bernartzi and Thaler (1995) showed that investors would invest more in stocks, and thus with more risk appetite, if they made the decisions at longer intervals. This phenomenon is known as [myopic loss aversion](#). Rational investors are unfamiliar with this type of behavior. They consider the consequences of their decision over a lifetime and not only for a limited time period. A discretionary mandate can keep investors from falling into the myopic loss aversion trap.

It is foreseeable that prices will rise again at some point. Although it usually takes a longer time for prices to rise again, the time period is not necessarily the critical factor behind what are usually large investor losses. How sharply the prices drop is far more important. Most investors cannot handle large price losses from an emotional standpoint. In other words, their psychological risk ability is too low. They suffer from insomnia, existential anxiety, or panic attacks.

They look for external help – “Why isn’t the Bankers’ Association commenting on this?” Financial risk ability is usually higher than psychological risk ability. Because psychological risk ability is initially triggered, this should be assigned equal or even higher priority than financial risk ability. The investment advisory services of today pay a great deal of attention to financial risk ability, while psychological risk ability is cast aside. While it is sometimes evaluated, it rarely occurs systematically or with a process that is proven to deliver reliable, informative results.

You may be wondering why the investor in our story does not sell off his investments. Many private investors engage in [mental accounting](#), i.e., they make distinctions in their head that don’t exist financially. Often, losses incurred are viewed separately from paper losses. This means that people sell stocks from their portfolio too soon when they make a profit and too late when they make a loss.

Turning a paper profit into real profits makes us happy, while we shy away from turning a paper loss into a real loss. Literature refers to this bias as the [disposition effect](#).

A second form of mental accounting is the distinction between money in the bank and money we made on the financial market. The latter, known as house money, is often placed at a greater risk than bank balances, which usually come from savings. So mental accounting makes us think that a franc is not worth a franc – a dangerous attitude.



It is also hard to admit our mistakes and confess that the investment might not have been the cash cow we once thought. At the very least, we want to earn back the acquisition cost from our investment.

All of these considerations, whether from expenses already incurred (in our case, the purchase price), whether we do not want to **regret** the decision, or whether we are engaging in mental accounting, lead to irrational decisions and can cost a lot of very real money. Just before the price bottoms out, investors can't take it anymore. Their nerves are shot and they decide to sell everything. "Enough is enough! I'm never buying or even thinking about equities again!" The prices drop a bit more and investors feel their decision was validated. "Good thing I sold it all," they think.

Looking back for a moment at the investment decision, we can see that at the time of the investment, the buyer underestimated market developments and overestimated his psychological risk appetite. This is a very common mistake. If the markets are up, investors become too confident – known as the **overconfidence bias**. This means they overestimate their own abilities and think they know more than they actually do. They are certain they possess above-average skills. Notably, most experts also overestimate themselves – frequently to a greater degree than laypersons do. Many investors are too confident. This is often seen when the markets are on the rise. The sweet smell of success quickly clouds our own judgment. It is also known that men overestimate themselves more often than women do. The opposite (underestimation) does not exist. There are merely varying degrees of overestimating oneself.

Back to our roller coaster. Stocks are getting cheaper and cheaper, the return on dividends is much higher than the interest on bonds, and eventually the market is oversold. Anyone still standing is very lucky indeed. However, the average private investor is surprised just as much by the rebound as by the crash.

With the shock of the sales rally fresh in his mind, he is initially very cautious and doesn't trust the rebound. Despite small price gains, the investor is convinced that "It's still going to crash." The share price does in fact drop again and the investor feels happy and vindicated. "It's just as I said..." He becomes more confident again. Then the rapid switch from a downward spiral to a sharp increase nearly takes his breath away – "Now what's going on?" The investor needs a little time to get back on board and gain an overview of the fast-paced market. Usually, he gets himself together pretty quickly and that old familiar self-confidence is back.

He thinks he saw the rebound coming and invests again once the price is high (or higher than the record low). The statement "I knew the whole time this would happen" shows that hindsight is 20/20 and that we have an explanation for everything on hand after the fact. This is known as the hindsight bias, which is a problem because it keeps us from learning from our mistakes. Even if prices rise, we keep buying. "What the heck, I'll buy it again because it's cheaper than last time." This statement is also interesting because we have the last acquisition cost in our head as the anchor, and not the last selling price. In other words, the typical private investor buys high and sells low – wasting a lot of money over the long term. The main reason for this is that human behavior adapted to our natural environment over millions of years of evolution. However, the way we behave on the financial markets is anything but natural. We cannot use our adaptations to the natural environment in a profitable manner. We find ourselves in a complex system that we do not fully understand. If we apply human behavior in natural settings to the financial market, we usually buy when it is too late and do not sell early enough. By nature, people are adaptive learners, meaning that we keep doing what's gone well and avoid what's gone badly. This is a bad idea on the stock market, as it causes pro-cyclical behavior. Investors tend to buy more of a share once the price has gone up, but maybe it is so high that they should consider selling instead. We must remember that we cannot make money on a stock unless someone is willing to pay more for it than we did. So it is better on the financial market to swim upstream rather than follow the herd of investors. One consequence of the roller coaster ride and of irrational decisions is that private investors can only rarely beat the returns on a highly diversified index, such as on the MSCI World. On average, investor performance is 4.3% worse than the index, as shown by US financial analyst Dalbar. This is true not only for private investors but also for fund managers – the pros. Many studies show that private investors don't realize they're investing more poorly than the market is. They succumb to various psychological pitfalls but do not realize it because they are not measuring their investment result in a systematic manner.

Confirmation bias

The confirmation bias refers to the phenomenon of seeking selective information to support one's own opinions or to interpret the facts in a way that suits our own world view. Investors seek confirmation for their assumptions. They avoid critical opinions and reports, reading only those articles that put the point of view in a positive light.

Availability/Attention bias

The attention bias states that things such as products, companies, and issuers that are more frequently present in the media will be remembered more quickly by investors when they look for a suitable investment instrument. Bad or scarcely accessible information is (unconsciously) not considered.

Home bias

Statistics show that most investors tend to buy stocks from companies in their home country. These stocks seem more trustworthy, and investors grew up with these company names. They are also mentioned more frequently in the local media.

Favorite long-short bias

People who fall into this psychological trap always bet on the long shot, because it promises very high returns. Unfortunately, they forget that the likelihood of the long shot winning cancels out the profit in the middle.

Anchoring

When making decisions, investors do not rely on fundamental factors. Rather, they tend to base their decision on the price at which the original or last position in a stock was purchased. This purchase price is the anchor and causes irrational decisions. Unlike the acquisition cost, the new price seems cheap to the investor. Anchoring influences individual decisions based on the fact that investors do not realize how the information is presented. When it comes to making decisions, people seem to be influenced by random data, even if they know that the data has no informational value or is outrageously high or low.

Myopic loss aversion

Most investors fear losses more than they enjoy profits. If these investors look at their stock performance too often, they usually see they have lost money and sell everything off again. A long-term view would be better. They should check their stock performance less often. The more they can keep their curiosity at bay, the more likely they are to turn a profit with their investments, provided that the portfolio is broadly diversified.

Mental accounting

Many private investors engage in mental accounting, i.e., they make distinctions in their head that do not exist financially. Often, losses incurred are viewed separately from paper losses. This means that people sell stocks from their portfolio too soon when they make a profit and too late when they make a loss. So mental accounting makes us think that a franc is not worth a franc – a dangerous attitude.

Disposition effect

Gains are realized too early and losses too late as a result. Turning a paper profit into real profits makes us happy, while we shy away from turning a paper loss into a real loss. One possible explanation is mental accounting (see above).

Overconfidence

In most cases, we overestimate our own abilities and think we are above average. Notably, most experts also overestimate themselves – frequently to a greater degree than laypersons do. Overconfidence is often seen when the markets are on the rise.

Hindsight bias

The statement “I knew the whole time this would happen” shows that hindsight is 20/20 and that we have an explanation for everything after the fact. This is known as the hindsight bias, which is a problem because it keeps us from learning from our mistakes.

Get-even-itis

Once we have lost money we take a greater risk to make up for it. Get-even-itis can cause us to place everything in one basket and probably lose even more money.

Representativeness bias

After even a brief period of positive returns on the financial markets, we may think the world has changed for the better. People tend to think in schemes and stereotypes learned in the past. They arrive at a result too quickly and based on imprecise information.

Gambler's fallacy

Here, the effective probabilities are greatly underestimated or overestimated. This can mean that, based on the (false) assumption that prices are about to drop, we sell too soon and vice versa (assumption that the prices will recover soon, even though they are not (yet) doing so).

Framing bias

Decisions are based largely on how facts are depicted in statistical terms. For instance, we do not think that “Four out of ten are winners” and “Six out of ten are losers” mean the same thing. The statement is identical, but most people don't realize it.

Regret avoidance

If we invest in a blue chip stock and it does not perform as hoped, we call this bad luck. However, if we invest in a niche product that fails to perform well, we tend to regret this more than we do the failure of the blue chip stock. This is because many other people have made the same mistake and thus our decision to buy it does not seem so wrong.

Cultural differences in investor behavior

One branch of behavioral finance has developed in the realm of cultural research. It shows how behavior patterns differ in the cultures familiar to us. Cultural finance provides an essential foundation for globally active banks, and for good reason. Despite advancing globalization, we can still identify some significant cultural differences around the world. Thousands of languages are spoken worldwide, eating habits vary from region to region, and there are some differences in our social conventions that we should know before crossing the globe. However, traditional finance barely acknowledges international cultural diversity. It is based on the premise that money is the great equalizer.

These days, investors can trade (nearly) any security they want just by pressing a few computer keys. Traditional finance also dictates that in the end, we all want the same thing: to achieve high returns without taking on too much risk.

For some 20 years, researchers in behavioral finance have been trying to determine whether finance is indeed subject to cultural differences. Even if we assume that investors around the globe are focused on the return/risk trade-off, researchers believe that culture can influence investors differently in terms of the type of investments, investment time horizons, and risk aversion. Ultimately, behavioral finance shows that while there is only one way to act rationally, there are many ways of acting irrationally. Thus it would not be far-fetched to say that our culture helps determine which psychological pitfalls we are more likely to succumb to. In this section we will show the fascinating cultural differences in investment behavior and how this can even influence returns on the equity markets.

What is culture?

In the broadest sense, culture is everything that people create. Looking at the world's artistic treasures is an excellent way to identify the cultural differences that existed, and may continue to exist, in various regions of the globe. The question is how to measure culture and make a numeric correlation to something as mundane as investment behavior and market returns. Because investment behavior is also part of our social behavior, we can take a cue from the cultural dimensions identified by Dutch sociologist Geert Hofstede.

Figure 10. Hofstede's cultural differences¹

Professor Geert Hofstede found that our social behavior can best be described using the following five dimensions. The diagram shows which countries have the most extreme forms of the five Hofstede dimensions.

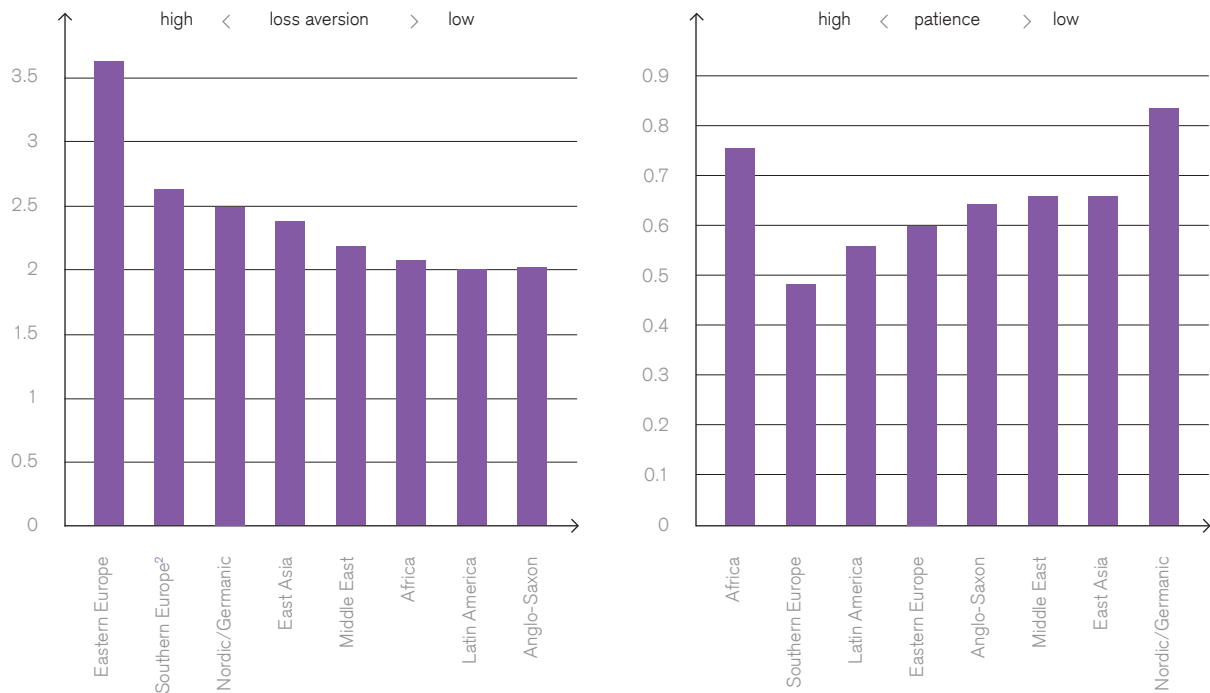
Hofstede (2001)		Lower extreme	Higher extreme
Power distance index	Imbalance between power and wealth	Austria	Malaysia
Individualism	Reward for individual or collective performance	Colombia	USA
Masculinity	Gender differences in society	Norway	Japan
Uncertainty avoidance index	Intolerance for uncertainty	Denmark	Greece
Long-term orientation	Respect for traditions	Czech Republic	China

¹ Hofstede's web page www.geert-hofstede.com shows an interactive map of cultural differences

How our culture shapes our investment behavior

In the world’s largest study of cultural differences in investment behavior to date in 2010, Professor Mei Wang⁴, Professor Marc Oliver Rieger⁵ and Professor Thorsten Hens looked at the time preferences, risk behavior, and behavioral biases of nearly 7,000 investors in 50 countries. If we group the results by cultural region, there are some astonishing differences. First, investors in Nordic and German-speaking countries are the most patient, while African investors are the least patient. Second, investors in Anglo-Saxon countries are the most tolerant of loss, while investors in eastern Europe have the greatest loss aversion (see Figure 11).

Figure 11. Loss aversion and time preference

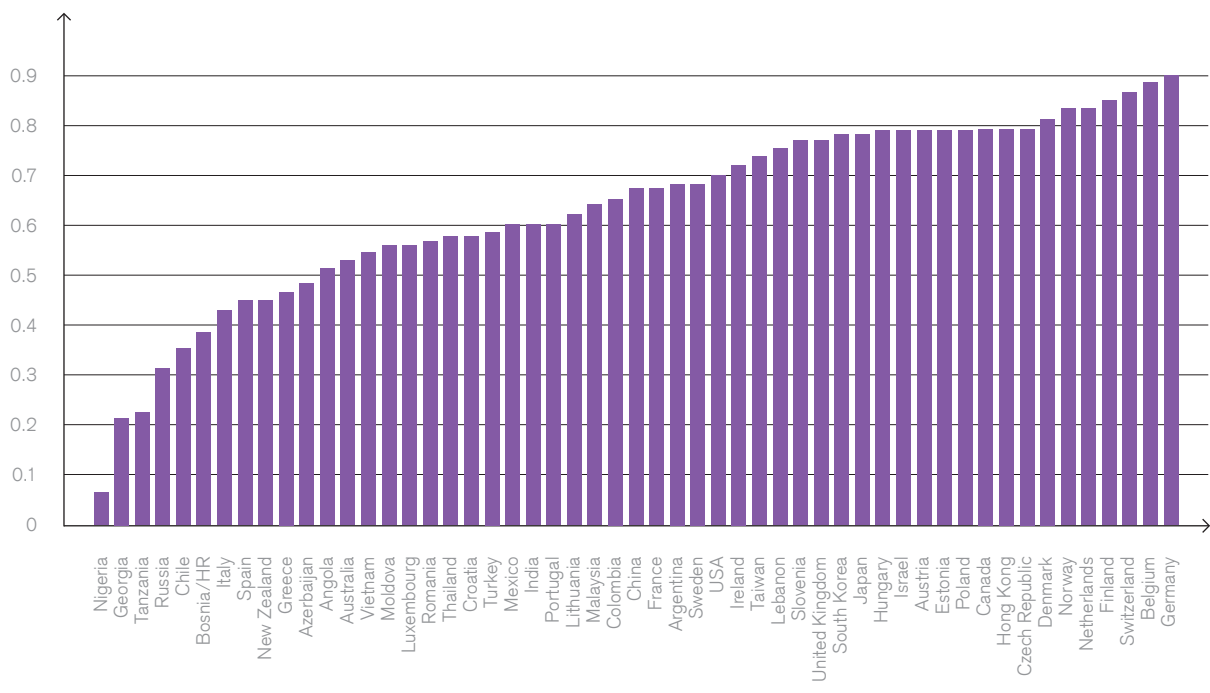


⁴ Chairholder at WHU – Otto Beisheim School of Management
⁵ University of Trier, Germany

² Italy, Spain, Greece, and Portugal

The following figures show the international differences per country.

Figure 12. International differences in investor patience



As far as behavioral biases are concerned, we see that in all cultural regions there is a high inclination to increase the risk after losing money (get-even-itis).

Figure 13. International differences in investor loss aversion

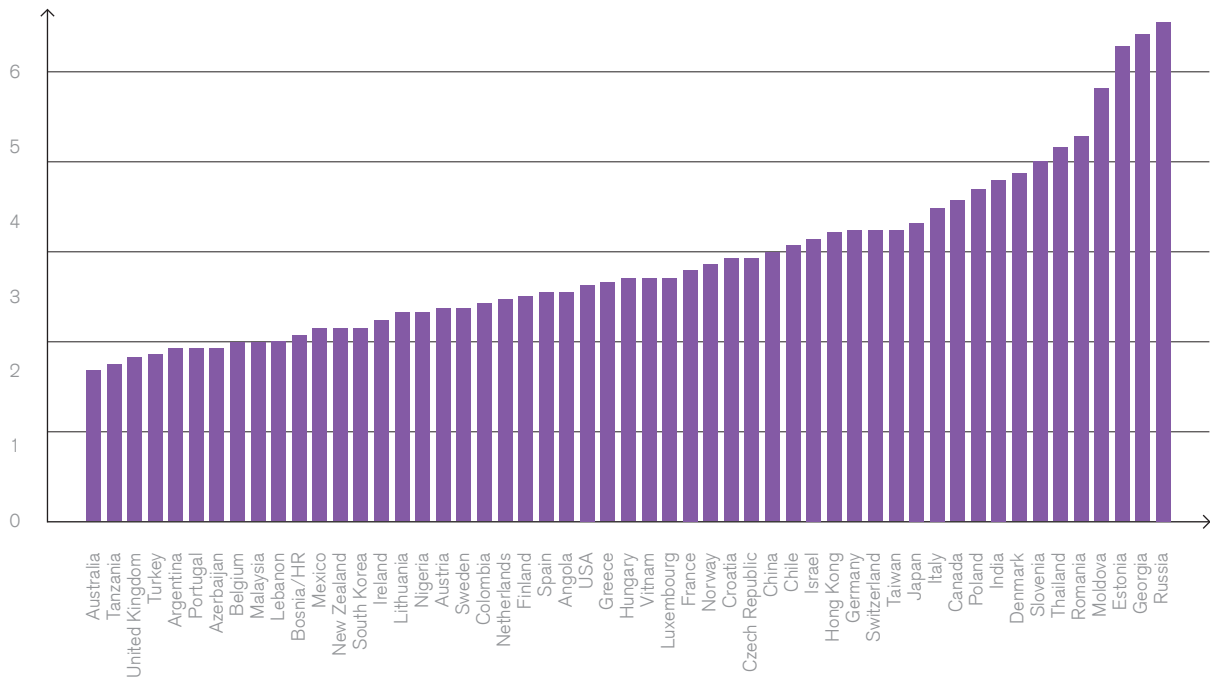
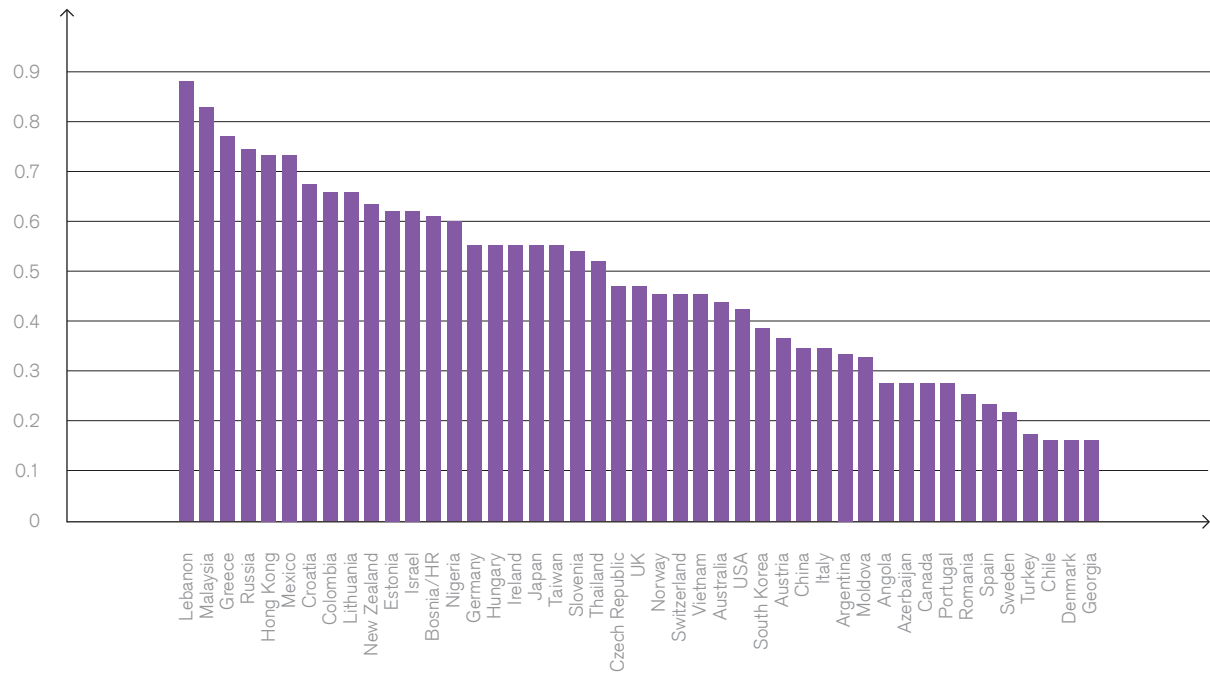
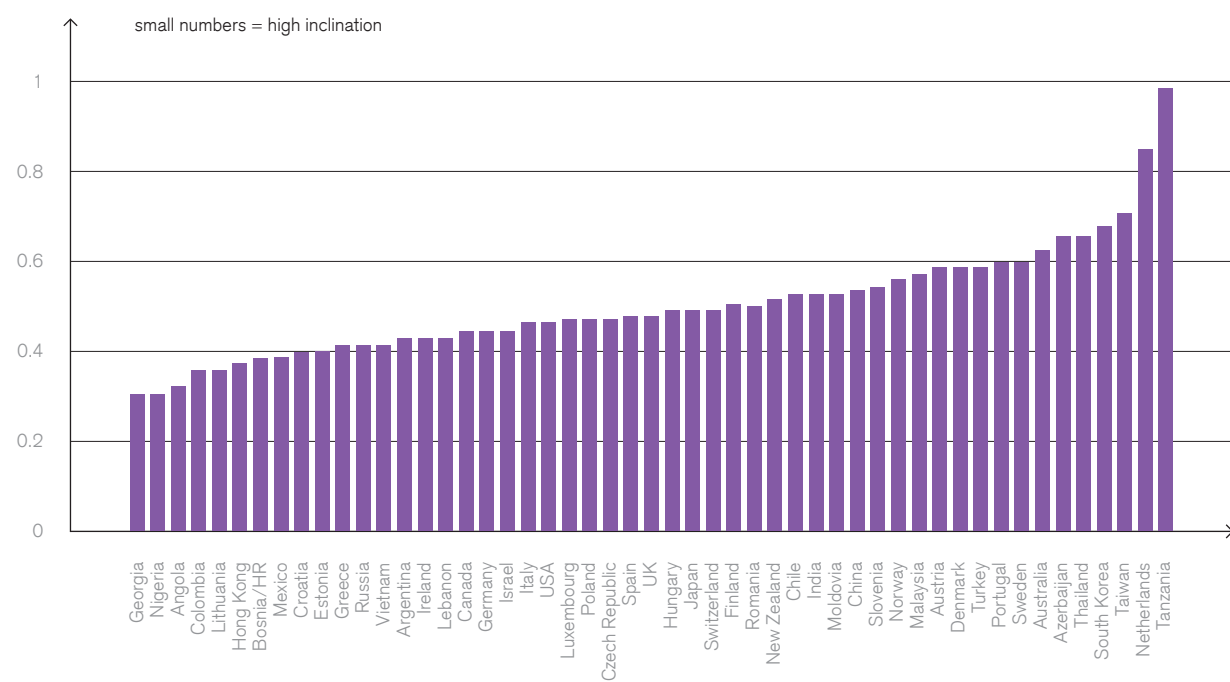


Figure 14. Get-Even-itis: The inclination to risk more money to avoid a definite loss, even if this may result in a greater loss



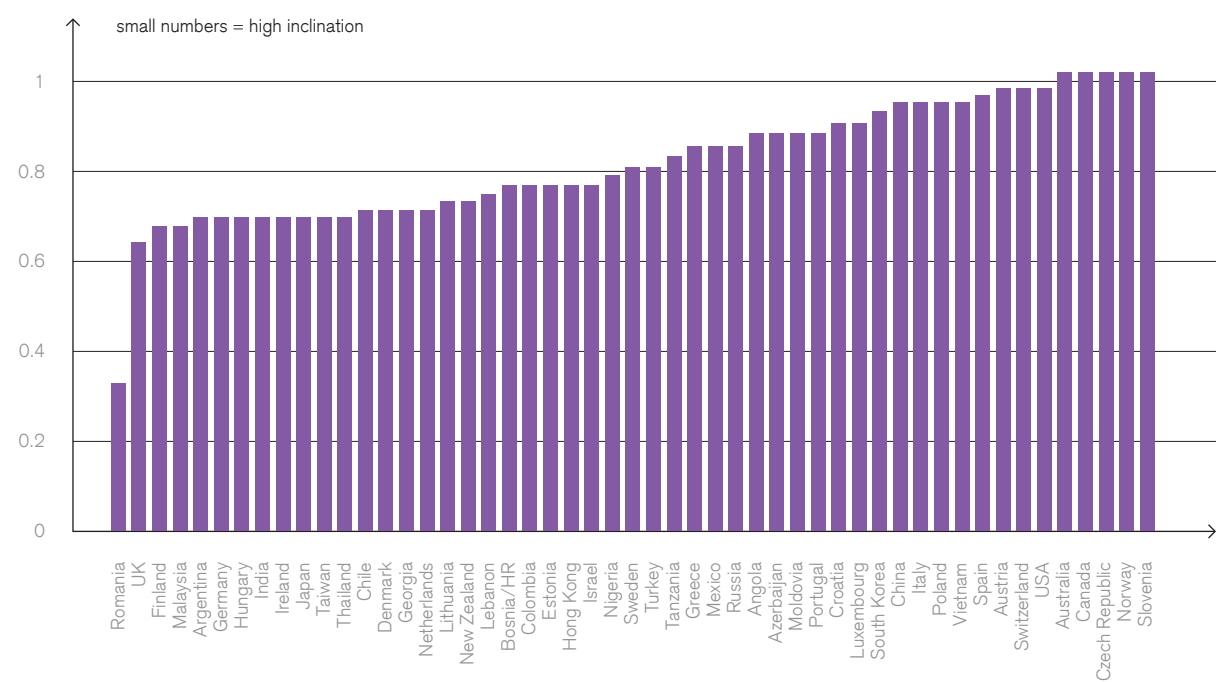
In most countries there is a tendency to take unlikely events too seriously – whether they are largely positive or largely negative. In the first case, fantasies about what people could do with an extremely positive outcome are so tempting that these people fail to realize how unlikely they are to win. In the second case, anxiety about an event with a very negative outcome is so worrisome that people fail to realize how unlikely this is as well.

Figure 15. Inclination to bet on extremely unlikely events with a very positive outcome



These interesting findings indicate that there are also cultural differences in investor behavior. It must be researched whether, as globalization continues, these differences are declining in the way that our differences in language, eating habits, and social customs have declined.

Figure 16. Inclination to avoid extremely unlikely events with a very negative outcome



Neurofinance: a new branch of behavioral finance

So far we have looked at the behavioral biases that investors often fall prey to. Behavioral finance has not only drawn up a long list of these pitfalls, but also developed reliable diagnostic methods and suitable remedies for avoiding them. It also incorporates findings from neurofinance in the realm of brain research.

In recent years, this knowledge has been applied to economics, thanks to major technological advances, and is now also being applied to financial sciences. Neurofinance allows us to determine which pitfalls have a biological origin and are therefore more difficult to avoid.

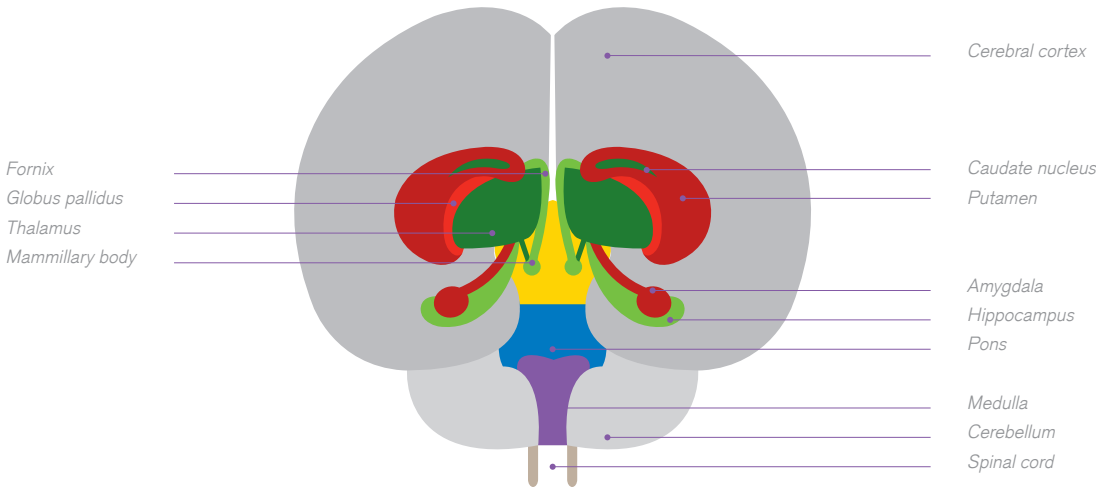
Evolution: the cause of bad financial decisions

There are many aspects of life in which we make mistakes. Even if we know better from experience, we make these mistakes over and over. Particularly in the financial world, we continually make decisions that economists consider to be irrational. We play the lottery even though we usually lose. We go to Las Vegas, play roulette, and when we lose we say, “I knew I should have bet on red.” We buy that beautiful coat we saw in the shop window, even if it is out of our budget. Truthfully, our brain is not designed for financial decisions or complex financial markets. When the human brain began its complex development, simple neural networks were created. From there, our brain continued to develop over millions of years. Our ancestors spent most of their time fighting for survival — foraging for food, reproducing, and avoiding natural enemies. It was not until the last few millenia of this development that we began using our brain for financial decisions as well. No wonder, then, that investors (professionals and amateur investors alike) systematically deviate from rational decision-making behavior.

The human brain

To understand neurofinance and its reasoning, we must first take a brief look at the neurosciences. The human brain consists of different parts, shown in the following figure:

Figure 17. The functional structure of the human brain



The oldest part, the inner core of the brain, is the stem (truncus cerebri). The brain stem controls key bodily functions such as circulation, respiration, and digestion. The limbic system is responsible for our senses (in the thalamus) and also includes such instincts as survival and reproduction (in the hypothalamus), as well as positive emotions (in the nucleus accumbens) and fears (in the amygdala). Not surprisingly, this part of our brain plays a large part in intuition. Three-quarters of the human brain comprises the cerebral cortex (telencephalon). What distinguishes humans from other species in particular is the prefrontal cortex, its role in short-term and long-term memory, as well as learning, planning, and self-control. The telencephalon also helps us reflect on feelings such as love, hate, and happiness. Of critical importance is that the older parts of the brain have not changed much over the course of evolution. Instead, new parts have developed, such as the telencephalon, which is in charge of additional functions including planning and social conduct. When we have to make decisions, our limbic system and telencephalon are activated. Intuition and emotions meet cognition. These systems do not always act in unison and emotions often get the upper hand, as best seen by

measuring psychological and neuronal activity. To understand investment behavior, it is important to ask: How does our brain respond to gains and losses? How about risks? What about instant versus long-term gains, losses, and risks? Can our brain assess gains, losses, and risks correctly? Our neurons send signals to reveal an emotionally charged assessment of returns and risks. For instance, gains and losses sometimes affect different parts of the brain. Some of these parts, such as the striatum and the amygdala, clearly come from the limbic system and not our rational prefrontal cortex. Thus, a clear separation of gains and losses, as the Nobel Prize-winning prospect theory of Kahneman and Tversky showed, is more natural than traditional finance intended. The main hypothesis of the prospect theory is loss aversion, meaning the observation that losses hurt us twice as much as gains make us happy. When we talk about a painful financial loss, we are not exaggerating. Financial losses are processed by parts of the brain responsible for the pain network. One of these areas is the amygdala. Patients with damaged amygdalas are not afraid of loss and often take high financial risks that they should not.

Market anomalies

Is individual error relevant to the market?

Behavioral finance shows that when it comes to risk and uncertainty, investor behavior deviates greatly from the ideal scenario of the rational investor. Typical investors fall victim to an array of psychological pitfalls as described in the previous sections. Are these behavioral biases also pertinent to market developments? Isn't it possible that individual errors ultimately balance each other out? If some investors are too optimistic and others are too pessimistic, the market may find its happy medium. Isn't it true that investors who make errors lose money to rational arbitrageurs, such as hedge funds, which means they keep losing relevance to the market? In spite of these plausible questions, behavioral finance research on market activity has found a wide range of market inefficiencies, known as market anomalies. So it seems that individual investment errors are moving in the same direction and also occur more or less simultaneously. Ultimately, it is unclear whether irrational investors are losing money to rational arbitrageurs. The reverse may be true. If the stock market is too cheap from a fundamental standpoint, so that rational investors will buy, panic among irrational investors may still lead to further price losses. John Maynard Keynes⁶ a famous British economist summed up this problem nearly a hundred years ago: "The markets can remain irrational longer than you can stay solvent." The great hope that rational investors can quickly make an impact on the market can be very dangerous. Thus, good asset management should consider fundamental factors alongside behavioral finance, as Credit Suisse has been doing for years.

Empirical evidence and behavioral explanations

Whether financial markets are efficient is not a matter of faith. It can be measured empirically. The starting point for an efficiency market hypothesis is that any profitable information has been priced into shares at all times. Thus, share prices should be statistically independent of one another, just like the repeated coin toss. However, this statistical independence does not even apply to major share indexes such as the S&P 500. If the S&P 500 increases in a month, the probability that it will grow again the next month is 63%; the average return of the next month is then 0.11%. If the S&P declines in a month, the probability that it will decline again the next month is

48%; the average return of the next month is then 0.06% (Gerber, Hens & Vogt, 2010). This monthly momentum is also reflected by the positive correlation of the monthly returns from the S&P of 28%. This means that 28% of the returns from the next month have been defined by the previous month. In an efficient market, this figure would be 0%. Due to adaptive investor behavior, as described in the section about the roller coaster, even in highly liquid equity markets, there are escalation processes that ultimately collapse. If we look at the S&P not just from one month to another, but over its 140+ year history, we see in Figure 18 that there are long phases of deviation from the efficient market hypothesis. The largest deviations occur in times of speculative bubbles and crashes, such as in the roaring twenties and the subsequent global depression, the dot-com bubble and the crash of 2000–2003, and the subprime bubble and major financial crisis of 2007/2008. The result of the escalation processes and subsequent collapses is that equity returns do not have normal distribution. Statistically speaking, there are too many months with very poor returns, as shown in the Figure 19 below. It is also true that not all profitable factors are always priced into share prices. Even very basic factors, such as the price/dividend ratio, can only predict developments to some extent, as seen in Figure 18. After a year with a high price/dividend ratio, the return of the S&P (in excess of the risk-free rate) tends to be lower than after years of a low price/dividend ratio.

Figure 18. Inflation-adjusted performance of the S&P 500 compared with the analysis under the efficient market hypothesis³

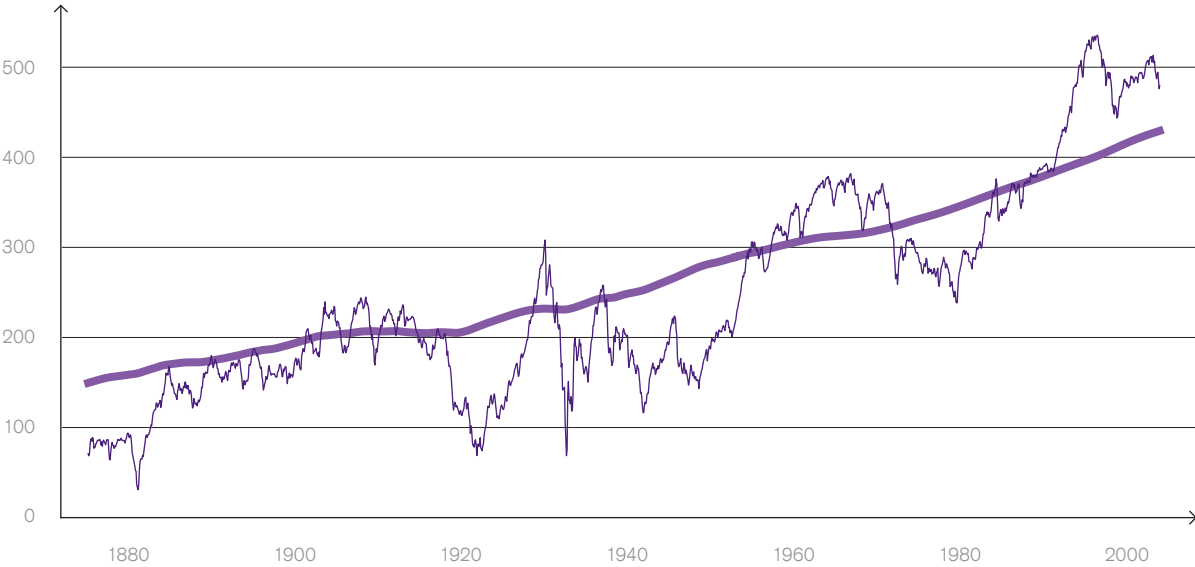
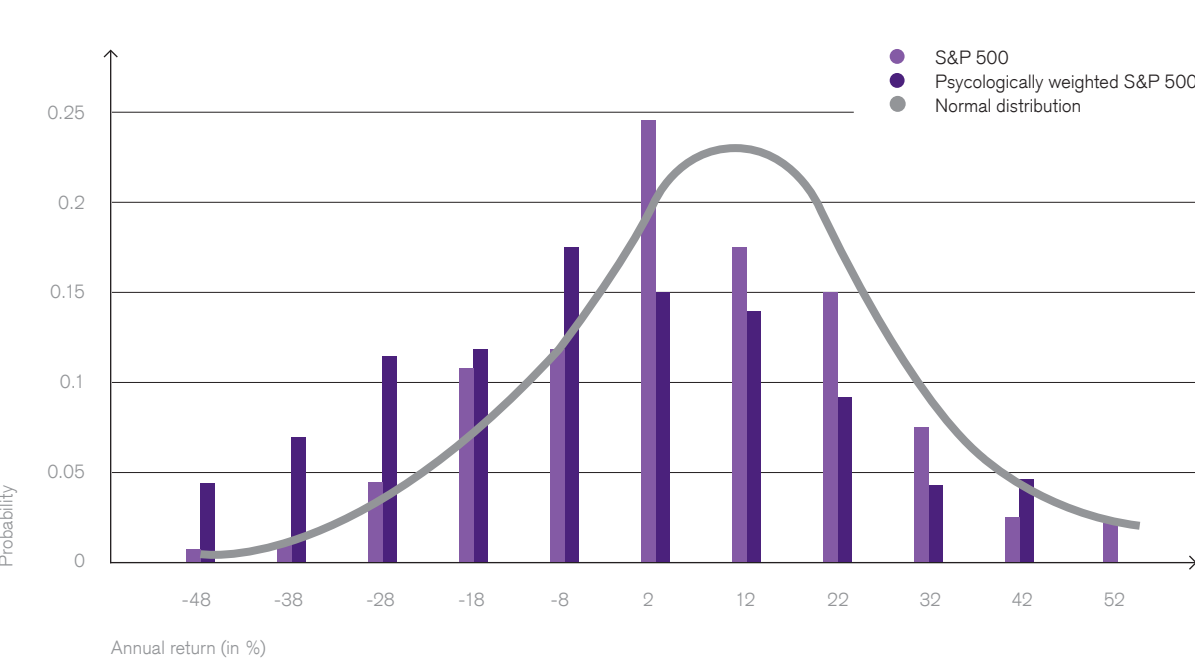


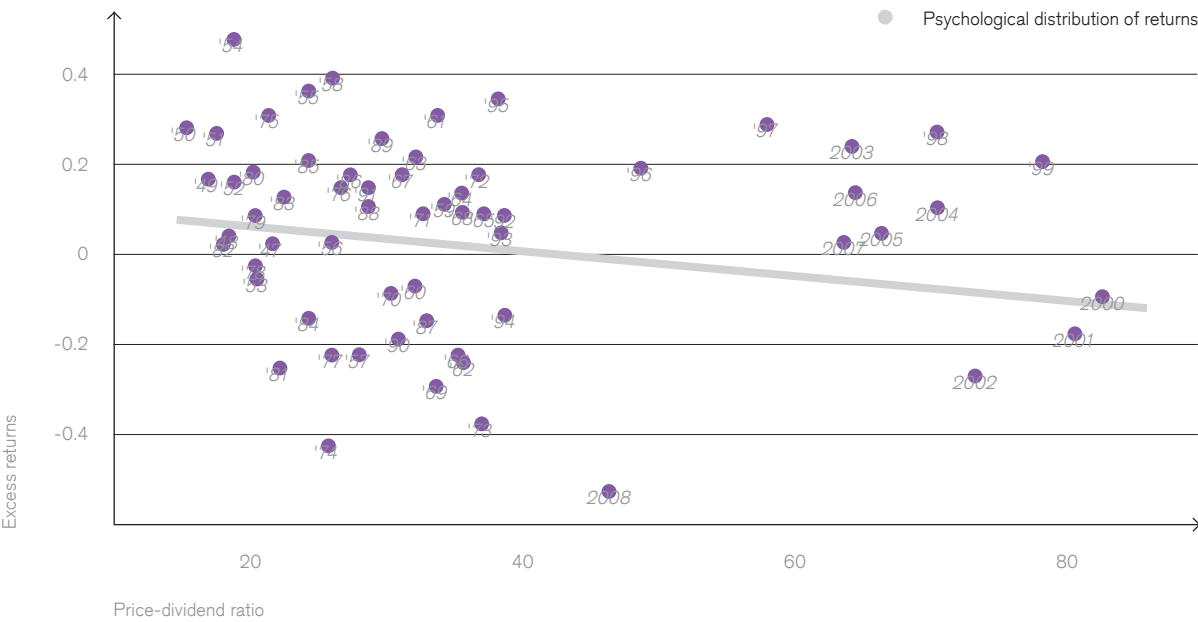
Figure 19. Abnormal distribution of returns on the S&P 500



⁶ Keynes' ideas form the basis of Keynesian economics

³ Gerber, Hens, Vogt (2010)

Figure 20. Returns of the S&P 500 (in excess of the risk-free rate) and the price-dividend ratio at the end of the previous year⁴



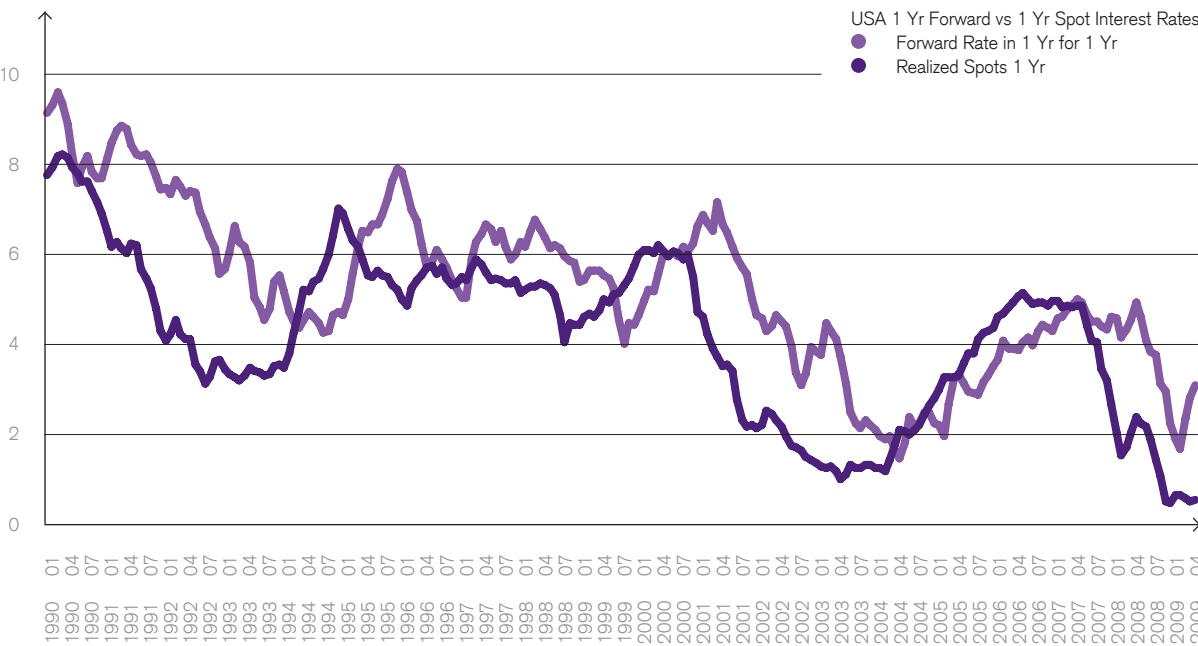
There are other market anomalies in other asset classes, such as bonds. When we compare short-term and long-term interest rates, the efficient market hypothesis says that if long-term rates are higher today than short-term ones, short-term rates will soon rise. If we compare the expected short-term rates with the rates that occur later, we see the following. During a phase of interest rate growth, the expected rates from the comparison underestimate the actual rates that occur. During a phase of interest rate declines, the reverse is true. Behavioral finance uses the [anchoring bias](#) to explain this phenomenon. Future interest rates that are implicitly expected based on current rates are too close to the current rates, which are used as the starting point (the anchor) as the basis for expectations. Even on the options markets, there are surprising deviations from the efficient market hypothesis.

For example, out-of-the-money options⁷ are more expensive than they should be from a rational standpoint. Such options as tickets for the national lottery have a small probability of delivering high returns. As psychologists Kahneman and Tversky found in numerous studies, investors place too much value on low probabilities so they pay too much for lottery tickets like out-of-the-money options. If the probability of an alternative rises by 1%, the psychological appeal of the resulting situation depends on how high the probability was to begin with. If the original option had a 0% probability, the same 1% increase has a much greater psychological impact than if the original probability was 49%. While in the latter case, the increase was from fairly possible to a little more possible, the former case is impossible to possible. See Figure 15 and 16 – section on Cultural Differences. If we apply this psychological weighting of probabilities

⁴ Gerber, Hens, Vogt (2010)

⁷ Options that would have a zero value if the current date was the maturity date.

Figure 21. The forward rate bias⁵



to the returns on the S&P 500, then we obtain the brown bars in figure 19. Thus, equities not only have too many months of excess loss from a statistical standpoint, but investors also exaggerate the probability of these months occurring.

Rather than continue down the list of market anomalies, it is worth considering what would happen if everyone invested using the prospect theory portfolio model, identified their biases with a diagnostic test, and then abandoned these biases. The markets would ultimately be efficient under these ideal conditions. Then the Markowitz model would suffice as well: because the prospect theory portfolio model includes the Markowitz model as a special model, this also still works in efficient markets. After all, you can drive a cross-country car with four-wheel drive in the summer.

⁵ Burkhardt (2008)

Investment advisory services

The goal of any investment advisory service is to explore the best personal strategy for the client and to review it on a regular basis. An investment strategy cannot be optimal unless it integrates the client's **risk ability**, **risk tolerance**, and **risk awareness**. Risk ability refers to the client's financial situation. What are the client's assets and income, spending and earning sources? The client's risk ability limits the optimal portfolio if the investors cannot financially bear losses above a certain amount. This circumstance must be accounted for. Risk tolerance indicates how much risk an investor is emotionally willing to bear. The subjective assessment of the objectively (measurable) risk of an investment is determined by risk awareness.

The client's risk awareness is often distorted and can change quickly. Due to the biases mentioned above, among other factors, they are unable to identify the real risk and evaluate it properly. One example is hedge funds, or collateralized debt obligations (CDOs), which became notorious during the financial crisis. Many investors considered these investments evil, due in part to media coverage.

Despite its importance, subjective risk awareness is generally not given the attention it deserves. The goal of investment advisory services should be to review the investor's risk awareness and then provide sufficient risk disclosure. Because we can assume that the client's risk awareness is distorted by many biases and influenced by the media, it should not be a part of optimal portfolios. Reputable banks have a research department that uses the best methods to adequately assess the current risks of the asset classes. The advisor must provide the client with this market view along with an explanation.

A structured advisory process can help investors explore their actual risk ability and risk appetite.

At Credit Suisse, the advisory process has five steps⁸: The first step aims to obtain a complete picture of the client. In this needs analysis, the client's financial situation, requirements, and goals are determined systematically.

It is also advisable to conduct a diagnostic test for behavioral biases and identify the client's existing financial knowledge.

In the simplest case, the test results in four types that categorize investors in terms of investment approach and financial knowledge.

At a later point – the third step at Credit Suisse, the service profile– the client's needs are compared with Credit Suisse's service range to determine which products are best suited. Does the client want to make his or her own investment decisions based on investment advice, or is a discretionary mandate preferable? The investor type determined by the diagnostic test can help answer this question.

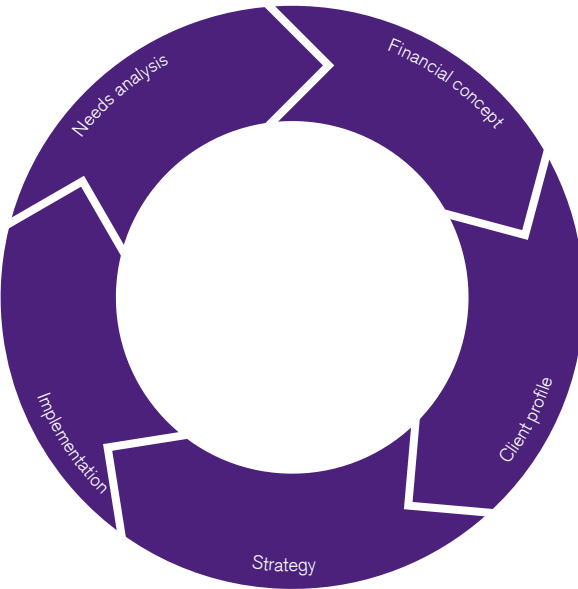
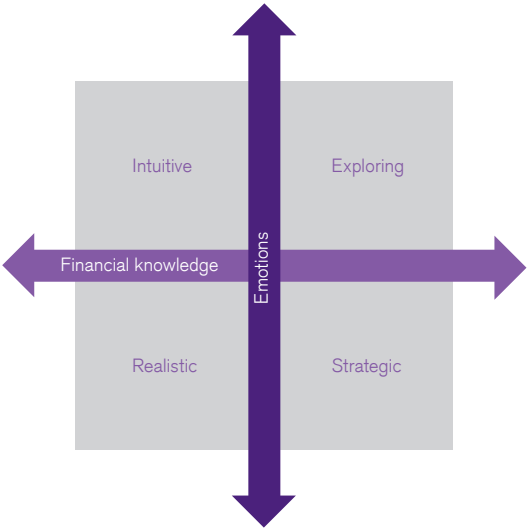


Figure 22. Determining investor type



Intuitive investors - Intuitive investors make emotional decisions. Without the right investment strategy, there is the risk that they will be influenced too heavily by current market developments and lose sight of their investment goals. A discretionary mandate is recommended to give emotional investors the chance to maintain a defined investment strategy. Research studies show that the investment strategy is responsible for⁹ about 80% of investment gains. Otherwise, clients may make hasty purchases when the markets are up in a rush of euphoria (too expensive) and sell off in a panic when the markets are down, which is mostly likely to chip away at their assets over time.

Exploring investors - Exploring investors are very familiar with the financial market, but make emotional decisions. They have a good overview of the opportunities and risks on the market. While they are sometimes dazzled by new, innovative financial products, they always bear the risks in mind. Despite their extensive financial knowledge, exploring investors sometimes abandon their predefined investment strategy for emotional reasons. This is why their investments must be reviewed periodically to be sure they comply with the investment strategy.

Realistic investors - These investors are not swayed by emotions. However, they lack the financial knowledge to assess risks and opportunities properly. Professional investment advice is recommended for realistic investors. It can help them make investment decisions and improve their financial knowledge.

Strategic investors - Strategic investors have good knowledge of the financial markets, so they can assess the risks and opportunities they are facing. They are also not swayed by emotions and can make objective decisions. Their strategic approach does not allow them to lose sight of their investment goals. They are qualified to implement their investment strategy in conjunction with a non-discretionary mandate. Based on the investors' background, in the second step a holistic investment concept is developed, taking account of assets, wealth building, obligations, and asset depletion. In particular, this proposal focuses on personal liquidity management, i.e., coordinating income with financial obligations. This plan helps investors ensure that they can meet all of their account payable when due, and do not run into any liquidity bottlenecks.

⁸ See diagram at the beginning of this chapter.

⁹ Brinson, Hood, and Beebower (1986) and Ibbotson and Kaplan (2000).

Specifically, the investment goals should first be determined. The focus is also on clients' wishes and plans, which are to be accounted for in the investment plan as expenses (income). Investors should rank these goals in order of importance. Goals can include obligations (paying off a mortgage, children's education, etc.) and plans and wishes for themselves and other people (vacation home, trip around the world, etc.). The defined goals are also used to determine the minimum investment horizon.

Once the obligations (including wishes/needs) have been prioritized over time, it can be determined which part of the investments are freely available, i.e., not subject to an obligation. In this step, it is important to consider tax, legal, and personal restrictions.

Credit Suisse recommends an asset split to its clients in order to not jeopardize the principal – see Figure 23. The fixed obligations are covered by secure investments. The remaining assets can then be used to invest freely in a wide range of wishes. One interesting aspect of this is the way risk ability is covered. Risk ability means that the value of the assets should cover obligations to the greatest extent at all times. Traditional finance uses the concept of value at risk (VaR) here. Value at risk is the amount of a loss that will not be exceeded for a certain amount of time (with a few

exceptions). Aside from the argument that VaR is not necessarily the right measurement tool, this viewpoint is somewhat unsettling in psychological terms, because there are cases in which investors can lose so much money that they are unable to meet their obligations. This can mean that investors become nervous when prices are down and abandon their investment strategy. A better method is to cover the fixed obligations with secure investments. So instead of a value-at-risk view, an asset split is preferable. From a behavioral finance viewpoint, asset splits are a very good idea, because clients (even in phases where they are losing money from their free assets) still know that their obligations are not at risk and they can better maintain their investment strategy. This means they will not have to make emergency sell-offs, and can act if there are attractive investment opportunities in turbulent times.

One of the most important steps in the advisory process is the third one – the client profile and risk analysis. The advisor and the investor try to determine the investor's actual psychological risk profile together. Specifically, they need to know which fluctuations the client can bear without losing sleep. Of course, the client must be able to bear these fluctuations both emotionally and financially. The all-important decision is then how to define the investor's risk appetite. Under the traditional view, risk lies only in the

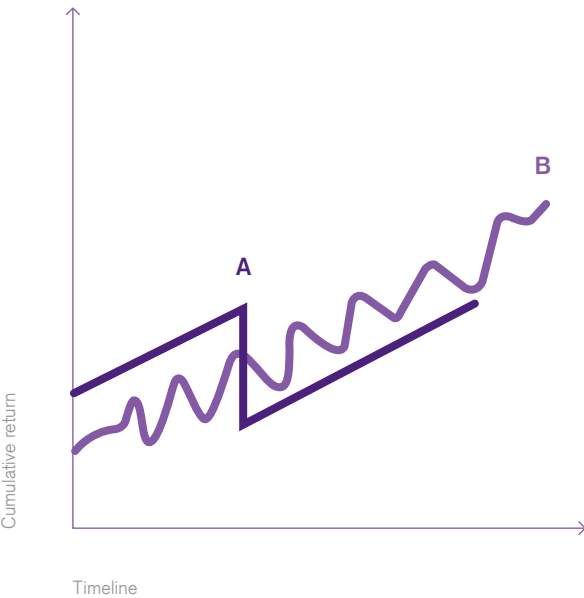
fact that for some investments (such as equities), it is not very easy to determine with certainty how high the returns will be at the end of the investment horizon. Actually, in empirical terms, the average returns and standard deviation in returns will rise along the investment class chain (money market, bonds, hedge funds, equities). From a traditional finance standpoint, determining risk appetite consists only of choosing from this trade-off. Some banks also use risk profilers that inquire directly about this trade-off by offering the client a few combinations of average returns and standard deviations.

Lab experiments and experience from many banks show that investors are overwhelmed by this process. They don't understand the question properly, so their answer results in an asset allocation that has drawdowns (cumulated loss in a specific periode) for them. They cannot maintain the strategy during times of crisis. Behavioral finance takes a different view of risk tolerance. While uncertainty about the amount of the yield upon maturity is a key aspect of risk tolerance, loss tolerance is far more important. Because most asset yields do not have the same amount of opportunities for losses and gains, this distinction is very important for asset allocation. Equities, for instance, have many more losses than they normally should, given their standard deviations. Capital-protected products have a high standard deviation in their yields, although their losses are limited. Therefore, the inclusion of losses in risk tolerance means that the asset allocation has fewer stocks – but capital-protected investment products can play a key role.

Behavioral finance also integrates the fluctuation into the portfolio (volatility). The response to asset volatility, called investment temperament, is a key indicator of whether investors can maintain their strategy. Figure 24 shows the differences among the three components of risk tolerance.

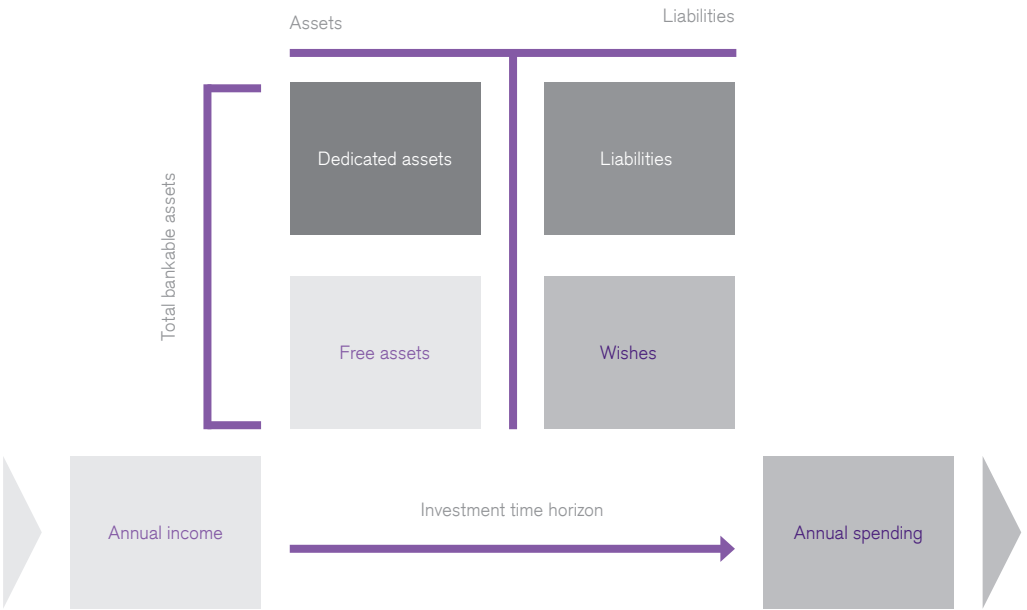
Figure 24 illustrates nicely that volatility (standard deviation of returns) is not easy to understand, especially for non-professionals. It shows that Investment A is subject to a higher (one-time) fluctuation in returns than Investment B. For Investment A, the difference between the minimum return achieved and the maximum return is higher than for Investment B. However, B has a higher volatility than A, because the volatility is defined as the average standard deviation in the returns. However, because A fluctuates enormously only once, this has a lower influence on the average of the standard deviation, because the weight of a one-time deviation is smaller than if it were to fluctuate frequently, even if these fluctuations are smaller.

Figure 24. Various risk aspect



This lies in the definition of average. Investors who would have chosen Investment A due to the lower volatility and would not have withstood the drop due to an excessively low psychological or financial risk tolerance, will suffer a greater loss than if they had invested in the higher risk Investment B (measured with the risk criteria of volatility). This example illustrates clearly that volatility as a (sole) risk measurement tool must be treated carefully. It is also important to know how willing the client is to take risks. Once the financial situation and risk analysis are known, the foundation has been set for creating the investment strategy. The investment strategy can be implemented in an active or passive manner. This too is a decision that clients must make and where the advisor can assist. The investment strategy is based on the individual investment goals and personal risk profile. It is used to present potential strategic investment plans in step 4. If the client has found the right investment strategy based on his or her risk profile, this will be implemented in the fifth step.

Figure 23. Asset split



Implementation into the Credit Suisse advisory process – step 5 – consists of three parts: implementation, monitoring, and adaptation. This process repeats itself continually. By implementing the strategy, the research team (e.g. at Credit Suisse) protects clients from the availability/attention bias. The research team uses fundamental data and does not blindly apply the past to the future. This is why every disclaimer includes “past performance does not guarantee future earnings” or something along those lines. Today’s talents are not necessarily tomorrow’s stars.

Typical investors evaluate information according to how quickly it can be recalled. Advisors also present sufficient timelines for returns and not just from the last year.

If the client wishes to make the investment decisions (execution only)

People should not stop at the first best result that comes to mind. The attention bias states that things such as products, companies, and issuers that are more frequently present in the media will be remembered more quickly by investors when they look for a suitable investment instrument. Therefore, the investors should be sure to look for arguments that refute their opinions. They must weigh the pros and cons.

Moreover, an objective analysis protects an investment idea from the confirmation bias. It refers to the phenomenon of supporting our own opinions with selective information. We want confirmations of our views. We avoid critical opinions and reports, reading only those articles that put the product in a positive light.

Of particular importance in the above process is the correct assessment of individual risk ability, but this is very difficult. Determining risk preference is part of the risk profiler's job. The goal is to give an investment recommendation that reflects the risk preferences as accurately as possible. Credit Suisse uses a risk profiler in its advisory process. This is part of the client profile and is divided into risk ability and risk tolerance. Both aspects are measured using two detailed questionnaires.

That's why a good risk profiler is needed.

Finding the right risk profile for the client is probably the most important aspect of investment advice. The risk profile defines the strategic asset allocation (SAA). Many studies show that investment success depends largely on SAA. Studies by Brinson et al. show that SAA accounts for 80% of investment gains. However, to reach this goal, the investor must be able to maintain the strategy, as Dalbar's study (2011) found.

This makes it one of the keys to success – the main component. While just a few years ago, most banks defined SAA solely on the qualitative opinion of the advisors, today nearly all banks use a formal questionnaire, known as the risk profiler or risk profile. In most industrialized nations, the regulatory agencies prescribe this profile by law.

The same is true for risk profilers as for everything else: Some are good, some are bad. Unfortunately for the banks and clients however, it is not easy to determine how the good differ from the bad. Controlled lab experiments are useful for designing risk profilers. Lab experiments on decision-making are one of the most important research methods in behavioral finance.

They originated with Vernon Smith, an American professor who won the Nobel Prize in 2002 for economic sciences. The key advantage of lab experiments is that the lab manager retains control over the exogenous influences and can thus make direct comparisons, for instance between the gains of investors with or without risk profilers before investing. This comparison can be applied to all market phases (rising, falling, sideways, etc.), as the lab manager can set these in the experiments. This is a huge advantage over the real world, where it is not possible to experiment with the client advisory process.

For about five years, a group of researchers led by Thorsten Hens at the Institute for Banking and Finance, University of Zurich, has been developing risk profilers based on lab experiments.

The goal of a risk profiler is to determine asset allocation by asset class, which investors tailor optimally to the return/risk trade-off, so that they can tolerate fluctuations in the investment strategy financially and most of all emotionally over the long term.

The bar is set very high, as it requires a balance between the investor's rational and irrational aspects. It is bad for investors if their behavioral biases have too much influence on their asset allocation, because they will lose money. At the same time, the psychology of the clients must be considered, so that they are not overwhelmed by the ups and downs of the investment strategy and do not abandon it at the wrong time.

To diffuse the conflict between irrational behavior and mental overload, it is advisable not to use the risk profiler in an isolated manner, but rather in context (for instance, with a diagnostic module and a training module before and good reporting after). A diagnostic module reveals investors' behavioral biases, while the training module teaches the pros and cons of asset classes and investment strategies.

What questions should a risk profiler include?

First it is clear that the questions in a risk profiler must impart a logical thought pattern so that investors can see why they have to answer these questions.

A logical template would be to start with the investors' goals, then the tools with which they want to reach these goals, to define the potential restrictions that must be kept in mind when using the tools, and finally to analyze the solution. In order to understand how the solution is defined by the goals, tools, and restrictions, it is important to return to the aforementioned aspects time and again so that a dialogue can be held based on the risk profiler.

Portfolio Design

Once the investment goals, obligations, investment tools, and risk tolerance have been determined, the question is how to link this information to asset allocation.

Unfortunately, this step is not well covered in practice.

Scoring methods are very popular.

They assign a score to each answer in the risk profiler and add these numbers together based on specific rules.

The problem with this method is that all of the hard-won, carefully extracted pieces of information are lost, because they are presented only on a scale (e.g. between 0 and 10). However, this is a simple procedure, because the points in the scale can simply be allocated to certain sample portfolios in the risk/trade-off.

A more detailed method is to evaluate the answers using a decision model. Based on the investor's answers, parameters of a target function and their restrictions are defined. The decision model is then optimized in line with a data set of returns. The central decision-making model of behavioral finance is the prospect theory of Kahneman and Tversky mentioned earlier (page 3).

Documentation and Reporting

Individuals usually want to ponder the suggested asset allocation and may wish to discuss it with others. For this reason, they should be given thorough documentation about the entire decision-making process to support the direct impressions made.

The documentation also helps manage certain biases, such as the hindsight bias and regret avoidance. Thus, each decision and the basis for the decision should be documented. This facilitates learning from mistakes. So making their own investment decisions, they should keep a trading diary, listing the reasons for and goals of buying a stock.

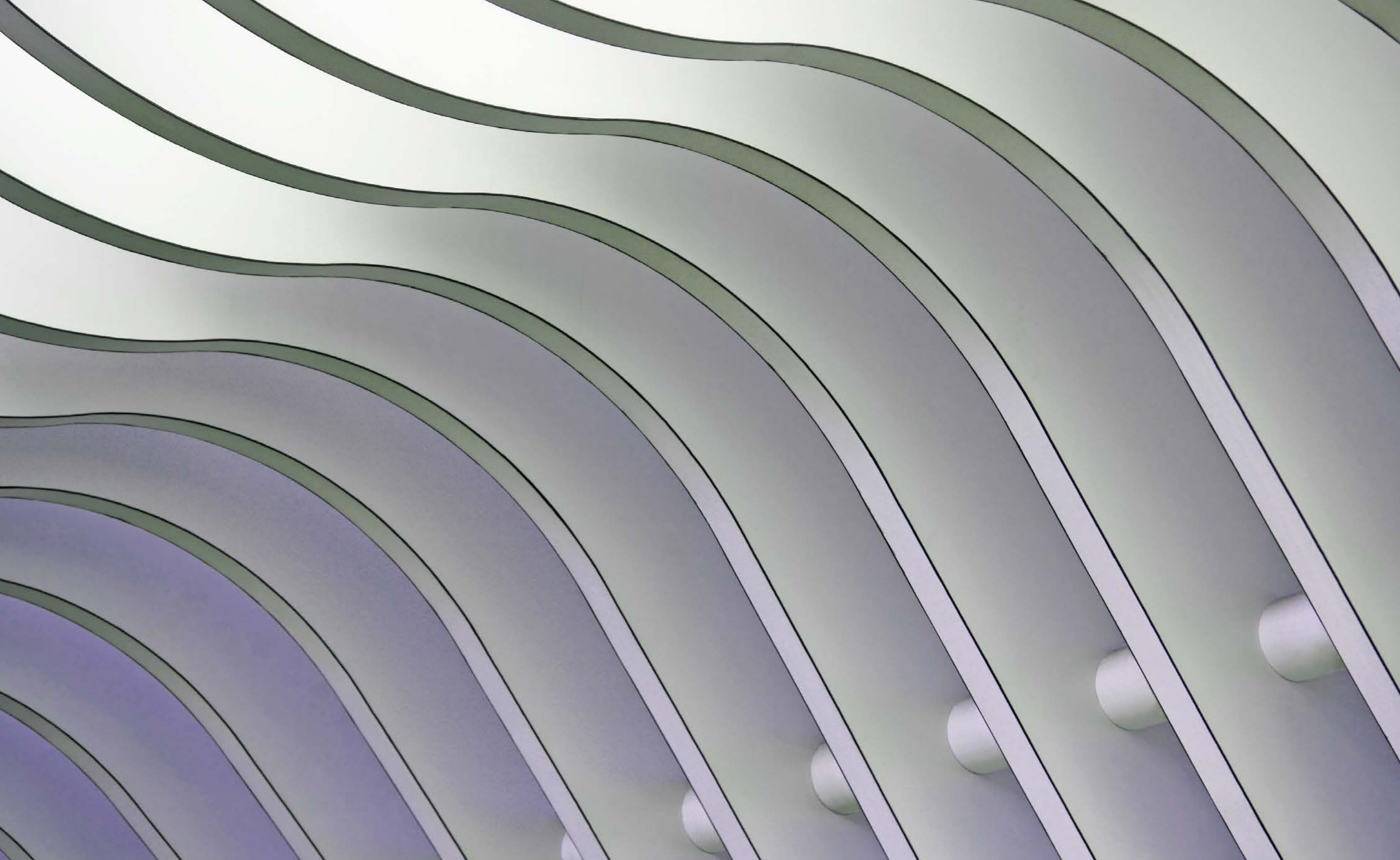
Before selling, clients should review the purchase entry and review whether the original facts behind the purchase are true.

Risk monitor

The optimal investment strategy for the client must be reviewed continually and revised if needed.

Over time, clients' risk ability can change significantly for two reasons. Gains and losses on the financial market change their assets, and personal events such as marriage, birth, divorce, and retirement change their obligations.

A risk monitor provides an ongoing review of the suitability of the investment strategy chosen. It shows which of the client's obligations and wishes can be met with current assets and which can likely be met in future. Thus, the risk monitor provides valuable signals to review the investment strategy. It should be based on long-term expected returns and plan for a certain amount of tolerance to the market fluctuations, so that it does not lead to knee-jerk reactions in the portfolio.



Countermeasure	Client advisor	Research
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Confirmation bias

Look for counterarguments. Be honest with yourself. Also, an objective analysis of an investment idea will protect you from a confirmation bias.	Helps the client get an objective viewpoint.	Fundamentals and long time periods help the client with an objective analysis.
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Availability/attention bias

<p>Ask yourself why you have just thought of this particular instrument.</p> <p>Do not stop at the first best idea.</p> <p>Do not be taken in by glossy brochures.</p> <p>Ask a neutral party for advice.</p>	<p>Should be able to access a database with research reviews. The database should not contain any biases and should be objective in content.</p>	<p>Reviews companies regardless of the level of media coverage.</p>
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Home bias

Structure your portfolio top-down and start by defining the strategic asset allocation. It is best to let your client advisor assist.	A structured investment process helps. Diversification principles are standard.	Evaluates global stocks and markets based on fundamentals.
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Favorite long-short bias

Be satisfied with smaller gains, which offer greater opportunities.	Your relationship manager can explain the risks and opportunities to you and prevent you from taking excessive risks.	Research analyzes each opportunity and risk in a neutral manner.
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Anchoring

Ask yourself how the investment will pay off in future. Whether you made or lost money with an investment is not relevant to future performance.	Decisions to buy or sell are made based on fundamentals. IT-based systems help the client advisors act without emotions getting in the way.	Research contributes to rational decision-making.
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Mental accounting

Try to avoid this distinction and be aware of when you entered this pitfall.	Your client advisor will not even mention these distinctions, so you can avoid the pitfall to begin with.	
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Countermeasure	Client advisor	Research
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Disposition effect

Stick to your predefined strategy. Keep a diary of your investment ideas. Why are you buying an investment, what do you want to achieve, and under what circumstances (based on what facts) is the investment to be re-sold? Consult your diary before you actually sell. Has the reason for selling occurred? If not, review your decision.	With the help of a relationship manager and a systematic investment process, it is easier to maintain the previously defined strategy.	With the help of a client advisor and a systematic investment process, it is easier to maintain the previously defined strategy.
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Myopic loss aversion

Stick to a long-term strategy; do not let your emotions lead you in financial matters.	Your advisor will guide you along the way. He or she will provide you with information as required for your portfolio or the markets.	Research will review on a regular basis whether your strategy still meets the market conditions.
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House money effect

Realize that a franc is a franc, no matter where it came from.	It is easier for an outsider to realize this than it is for us. Your client advisor will inform you if your risk ability has increased so much from financial returns that you can risk more.	Research will review on a regular basis whether your strategy still meets the market conditions.
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Overconfidence bias

Look at the abilities of the average person and realize that everyone wants to be a winner.	Your client advisor will make it easier to realize your actual abilities, as long as he/she is honest.	Research provides you with peer group comparisons that you can use to see how much better or worse you are doing compared with others.
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Hindsight bias

Realize that this won't help you. Try to learn from your mistakes. Look at your investment diary from time to time. You will then see what the situation was when you chose an investment.	Together you can accelerate the learning process and find the cause sooner.	Research will review on a regular basis whether your strategy is still appropriate to market conditions.
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Countermeasure	Client advisor	Research

Get-even-itis

Realize that losing money is just as much as part of investments as is making money. Maintain your long-term strategy and don't try to turn things around by taking extreme steps.	If you are suffering too greatly from financial loss and want to make up for it as soon as possible, your client advisor will counsel you to be patient and reasonable.	Research will review on a regular basis whether your strategy is still appropriate to market conditions.
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Representativeness bias

Look at longer time periods.	Your client advisor will be glad to show you the long-term performance of your investments in the past.	Statistical models try to track trends and aren't led by emotions.
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Gambler's fallacy

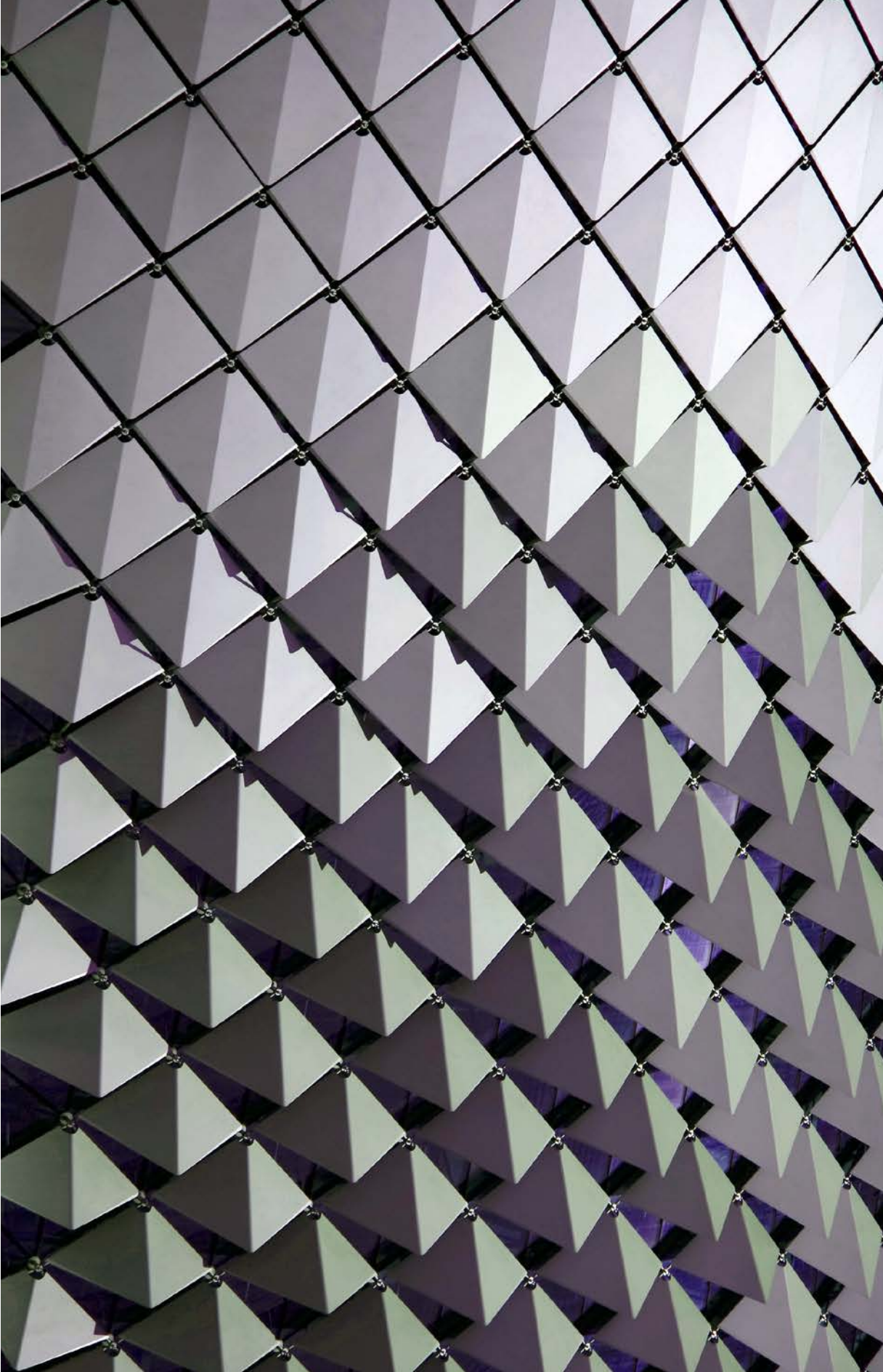
Consider the actual probability that the trend will reverse.	Your client advisor will be glad to show you the long-term performance of your investments in the past.	Statistical models try to track trend turnarounds and aren't led by emotions.
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Framing bias

Look at everything in the reverse, e.g., if there is a 60% of X happening, there is a 40% that it won't (4 out of 10 cases).	Ask your advisor for further information. Consider the source's possible motivation for providing you with information.	Research Institutes can give you additional, public background information.
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Regret avoidance

Learn from these situations and don't make excuses.	Your client advisor will help you look at the situation in a factual manner.	Research will provide you with the pros and cons of investments with a neutral tone.
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Conclusion

Traditional finance, based on the hypothesis of efficient markets and the optimization of statistical figures such as means and variances, suggests that investing has a lot to do with mathematics. However, behavioral finance has put the spotlight back on people. People make mistakes – even in investment decisions, which results in inefficiencies at market level. Based on behavioral finance, investment is 80% psychology.

In the meantime, behavioral finance has created methods that help investors identify their typical mistakes, while finding the right portfolio for them. The hope is that as many investors as possible will make use of this and the markets will become as efficient as traditional finance assumes. However, the saying “There's no such thing as a free lunch” will always apply.

**Be aware of
the risks before
you make a decision
and choose the right
combination of risk
and return.
The findings of
behavioral finance
can help you.**

Please note: this paper does not claim to be original research. To the best of our knowledge we have cited all original work on which it is based.

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Resources

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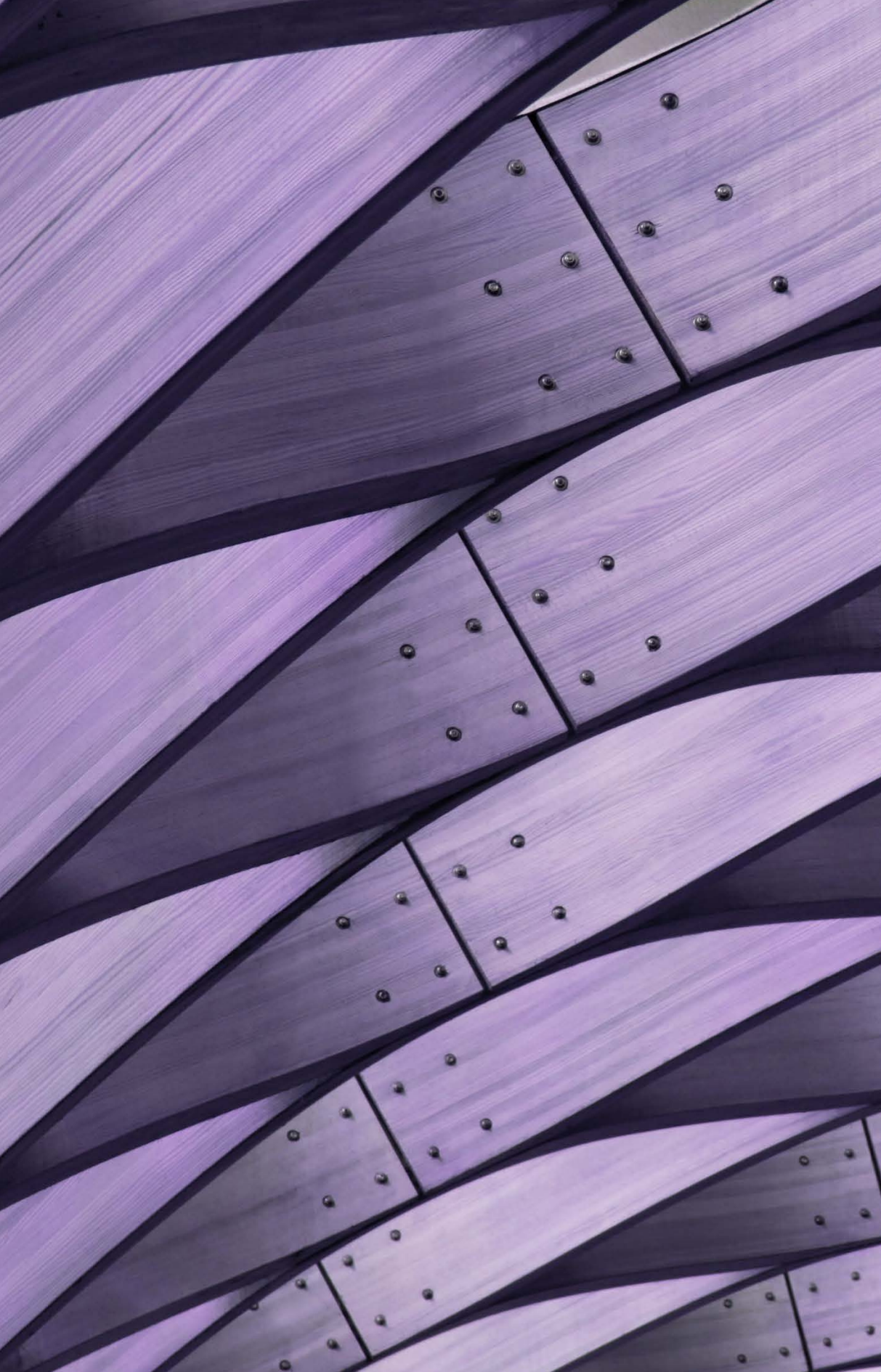
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Important informations

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