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Behavioural finance

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1 Introduction

Behavioural finance first attracted considerable attention in the early 2000s, not least due to the Nobel Prize of Daniel Kahneman (2002). After that, the 2008 crisis called into question the framework of the applicability of forecasting and risk management models based on the premise of rational economic actors. These events paved the way for a stronger focus on the psychological aspects of economics, and the necessity of painting a more nuanced picture about the *homo economicus*. Behavioural economics provides an empirically supported framework for this. Within behavioural economics, the latest development of capital market theories is behavioural finance, challenging the paradigm that has dominated the field since the 1970s, i.e. the modern portfolio theory. In contrast to the rational expectations assumed by modern portfolio theory, behavioural finance stresses the importance of the psychological aspect of investment decision-making, i.e. emotions.

The capacity for rational thinking or more precisely the belief in rational thought and decision-making is considered one of the most important values in today's humans. Keeping up the appearance of rationality is such a central issue that whole business lines worth billions of dollars have been developed to use data to subsequently support decisions often made based on intuition. It must be noted that the ideal of the rational man is characteristic not only of economics, as it has been a deeply rooted belief in our culture since the Age of Enlightenment.

Our study focuses on human thinking. Today's man (*Homo sapiens sapiens*) appeared around 195,000 years ago, and although evolution and constant adaptation have of course not ceased since then, humans have had a roughly unchanged genetic make-up and thinking optimised for survival. For thousands of years, the environment around humans could be considered more or less stable, and therefore the responses to the challenges of the surroundings could become automatic efficiently. However, the past couple of hundred years, especially the past hundred years brought about drastic changes in our lives to which the previously completely rational heuristics cannot be applied automatically anymore. While 20,000 years ago our brain's

constant and most of the time not conscious pattern-seeking function was the key to survival – as recognising a shadow similar to a lion and immediate flight is rational even if we are wrong – in today's information-laden and often random environment this feature can easily be misleading.

In recent years, several books have been published on behavioural economics. Our present study does not wish to compete with these works and is unable to do so for reasons of brevity. We would instead like to present the essence of this way of thinking and its applicability to the capital markets. While the efficiency of markets follows from modern portfolio theory, i.e. prices contain all the relevant information, in the behavioural approach market prices may persistently diverge from the fundamental value. The two theories offer different practical advice: while modern portfolio theory recommends a passive, index-tracking strategy, in behavioural finance active portfolio management is considered superior.

Owing to the topic, this Handbook draws substantially on the work of Daniel Kahneman and Amos Nathan Tversky, the two greatest authorities in this field, and therefore several scientific categories that were introduced by them and that are considered generally known today are used throughout the Handbook without specific reference to the above-mentioned scientists.

2 Behavioural economics

2.1 Cognitive miser[1] or System 1 and 2[2]

The key to humans' survival and success is the efficient utilisation of the available resources. The same holds true for our thinking, as conscious attention and conscious – or, in other words, rational – thinking can also be regarded as a limited resource.

On one hand, this is partly attributable to humans' limits with respect to our abilities and physical capabilities, i.e. the scope of our attention is extremely limited. Experiments have shown that this scope is in the 7+/-2 range, which is identical to the capacity of short-term memory. Researchers have established that the capacity of short-term memory is 7+/-2 units, i.e. the brain is able to store that many cognitive blocks immediately after perception. In plain terms, this means that we are able to concentrate on 7+/-2 things at the same time on average, and that short-term memory can hold 7+/-2 things on average. This is the limit to the consciously controlled attention requiring effort.

On the other hand, using the brain for conscious thought uses energy, although it has to be pointed out that different researchers have arrived at different values with regard to the brain's energy consumption when at rest and when making an effort.

Moreover, humans are cognitive misers by nature, i.e. we strive to achieve acceptable results with the least possible effort, and to operate intuitively, in "autopilot" mode based on rules of thumb requiring no conscious thinking. In evolution, this led to rapid and mostly optimal decisions in most cases, however, all in all this paints a much more nuanced picture about the ideal of rational man in economics (actors update their knowledge based on Bayes'

[1] The concept is from a book by Pratkanis and Aronson: Age of Propaganda: The Everyday Use and Abuse of Persuasion.

[2] Amos Tversky, Daniel Kahneman

law when new information is received, and their decisions are consistent with the subjective expected utility).

2.1.1 The two systems

Adopting the approach of Daniel Kahneman and Amos Tversky, we can differentiate between two systems of thinking distinguished in a psychological – but not physical – sense:

- System 1: functions completely automatically and rapidly, without effort and voluntary control;
- System 2: allocates the mental resources requiring effort; this is the conscious, self-controlled self.

When we are thinking about ourselves, identify ourselves, we mainly speak about System 2, i.e. our identity and actions are derived from this conscious system of thinking. At least we like to believe this, since we like to think of ourselves as conscious beings. Yet behavioural experiments refute precisely this hypothesis, as the impressions, emotions and often strikingly complex ideas of System 1 generated rapidly and without effort provide the input necessary for decision-making to the slower and more conscious System 2. Moreover, due to the processes described above, System 2 can only be used under limited circumstances requiring effort.

Not only are most of our actions and impressions governed by a thinking process which is hardly controlled by us, we are also often unaware of this. Changing the operation of our brain, i.e. achieving the ideal, rational man, would be thus impossible and futile due to the above-mentioned limits. Therefore, we can merely aim to explore the potential malfunctions of System 1 and identify situations when we have to consciously activate System 2, despite our cognitive miserliness. The crux of the problem is that this consciousness in itself already assumes the use of System 2, and the way out of this catch may be consciously practised conscious thinking that becomes a habit. We need to recognise when we can trust the comfortable

autopilot and when we need to manually intervene, irrespective of how demanding that is at the given moment.

From now on, we will primarily concentrate on the mistakes and solutions often recurring in money and capital market situations.

2.1.2 Pathological dependence on 'cause and effect' or coherence at any cost

Even among clichés, the following is an overused adage, however, it is difficult to argue with its core truth: understanding the processes in the globalised, fast-paced world poses a huge challenge to humans. Globalisation, the expansion of the wealth of information, started a couple of hundred years ago, which is insignificant from an evolutionary perspective, and this process has exhibited a steadily accelerating trend in recent decades. The adaptation to the changed environment is fraught with obstacles, of which we will now examine System 1's pathological dependence on correlations and pattern-seeking function.

System 1 of our brain is responsible for developing our internal, own model of the external world. Its main task is to transform our surroundings into a map, then create an internal model of the events, thoughts and situations and put them on this map. The world is undoubtedly a dangerous place, and therefore exploring the causal links is vital for survival. The main problem is that the risks related to the identification of causal links are asymmetrical. In the past, an unrecognised causal link or pattern could more readily cost a person's life (see the example with the lion's shadow), and in a simpler environment than today's false causal links were probably weeded out more easily due to less complicated testing. In the majority of cases, System 1 produced an internal model that imitated the slowly changing environment well, therefore the autopilot mode functioned appropriately. Just as airplane's autopilot functions well in a well-known, slowly changing environment, conscious human intervention is usually warranted by hectic circumstances.

System 1 shapes our impressions, thoughts and beliefs into a coherent picture or story. The easier it is to understand and place the events of the world in the given, created model, the more relaxed we feel due to the perceived predictability of the world. System 2 often extracts information from this model. System 1 is responsible for memory, and if there is no external pressure, System 2 accepts the input offered by System 1 without much of a filter due to our cognitive miserliness. System 1 constructs the story, and System 2 accepts it in absence of critical thinking requiring effort.

Unfortunately, the reality is that a large portion of our beliefs, theories and experience does not even stand the test of falsifiability, Popper's[3] precondition of scientific tests. Our beliefs are often not exact or logically perfect, and therefore refuting them is very difficult. Events consistent with the model strengthen it, while those that do not fit the model are either disregarded or their significance is played down. Furthermore, we are extremely prone to concentrating on easily recognisable evidence triggering emotions and on recent events that are perceived as being frequent. Furthermore, we tend to ignore the *lack of* evidence that would be necessary for the validity of the given framework. In other words, *the absence of evidence is not evidence of absence.*[4] Elimination of these shortcomings would require the effort of System 2, and therefore we rather choose the easier way and use the information that is more readily available, that is in front of us. For example, those who read lots of magazines about successful and rich hedge fund managers, are prone to overestimate the probability of launching a successful fund. Among other things, they fail to examine the number of all hedge funds or the long-term results of the persons claimed to be successful in the magazines.

[3] Sir Karl Raimund Popper was one of the most well-known philosophers of the 20th century who claimed that the criterion distinguishing science from pseudoscience was falsifiability. This means that the events at the occurrence of which the theory is rejected can be precisely determined.

[4] Nassim Taleb (2014): Antifragile: Things that Gain from Disorder

Attachment to readily available information is such an extreme need for our brain that, when making a decision about a given topic, it tends to use information that is unrelated to the topic but easily accessible. The literature refers to this as anchoring. Several experiments have demonstrated that subjects decide about a given topic relative to the value obtained as reference, using it as relevant information. One concerning feature of the experiments is that the participants used the value obtained as an anchor (reference) in their decision even if they were told beforehand that it was a randomly generated value, unrelated to the topic. In an experiment that demonstrated this, participants had to estimate the share of African countries in the UN after turning a wheel of fortune. The estimate was clearly influenced by the number given by the wheel, as the subjects gave a higher guess after a higher number, even if they were fully aware of the random effect.

Our brain's continuous and automatic causality-seeking dependence is illustrated by the example[5] mentioned by Nassim Taleb that presents Bloomberg headlines linked to the capture of Saddam Hussein:

• US Treasuries rise:[6] Hussein capture may not curb terrorism

Half an hour later:

• US Treasuries fall: Hussein capture boosts risky assets

Another example is the following two news items that were published a couple of hours apart, and that identify two different effects for the same cause.

[5] Nassim Taleb: Fooled by Randomness.

[6] One of the most important safe assets, US Treasuries usually rise in a highly risk-averse climate, while in a positive atmosphere usually the reverse happens. Usually, but not always.

Source: Reuters

At first, the need for coherence overrides the correlations based on real facts tested scientifically on an appropriate sample or the absence of correlations. In short, we are more likely to live with a false world view and find imaginary points of reference in this system than face the random and unpredictable nature of the world. There are few areas where so many conspiracy theories and false causal laws are widely cited as in the world of money and capital markets. And there are few areas that are as complex, random and obscure as that of money and capital markets. This duality, coupled with the pressure for profits, causes a considerable psychological tension in the actors, which leads to continuous rationalisation and the creation of theories in exchange for some predictability and safety, however imaginary the latter may be. Unfortunately, we tend to abandon common sense for some illusion.[7] Moreover, the less information we have about a given field, and as a result the less elements we have to construct a coherent story, the stronger this

[7] One example for irrational beliefs is the following experiment: some subjects in the experiment have to roll a dice, and they receive points corresponding to the number they rolled, which becomes their result. Then the other subjects participating in the experiment need to decide based on these results which of them should receive money for being "managed" through rolling the dice. Despite the fact that participants are fully aware of randomness, in a large majority of the cases, the subjects with the best results receive the money to be "managed".

tendency may become, possibly leading to, in the majority of the cases, false belief. As the saying goes, the more we know, the more we know how much we don't know.

The desire to understand the world around us often makes us blind to recognising random events. Let us assume, for example, that we toss a coin six times, and we get the following series: (heads – H, tails – T):

HHHHHH, TTTHHH, HTHHTT

Which of these series is random? Many people would point to the third series, while detecting some kind of pattern in the first two. However, the reality is that as events independent from each other, all three series are equally likely to occur, i.e. they are random. The human brain has a hard time processing random events in everyday situations as well: a good example of this is the "I was thinking about him, and then he called me" effect. When taking into account how many times we think of the people we know (a lot), and how many times we receive a call from a given person (very rarely), we can see that this folk wisdom is very likely due to chance.

The situation is further complicated by the process called the self-fulfilling prophecy, which may start a vicious circle based on a false model or cognitive framework. This is because traders, portfolio managers, brokers and analysts are not only observers of the market but also its active players and shapers. Therefore, the subject of their thinking (the market) and the process of their thinking (the thinking of market participants is the market itself) are not distinguished, and thus their actions may be positively reinforced even if the decision itself was based on false facts and models. In the longer run, the "bitter" truth always comes to light, and in the majority of the cases this is referred to as the bursting of the bubble. It is interesting to see that due to the fact that we take into account the evidence selectively (model-strengthening bias), these bubbles can last much longer than expected. It is important to note that the word "bubble" here can not only refer to the market developments in a narrow sense, but also to theory bubbles, which are often much harder to dispel.

To go back to the strong desire for coherence, one might ask why the "wisdom of the crowd" effect does not offset these cognitive models? In this case, the problem is the strong correlation between the actors' thinking, which sometimes manifests itself in herd behaviour. While in the case of separate, independent, individual decisions the random unique mistakes (the so-called white noise, or in other words, some people are wrong in one direction, while others are wrong in the other direction) can offset each other, in a market environment functioning as a global echo chamber this is impossible.

Overall, we can say that a story that is coherent for our brains is much more acceptable to us than a fact-based, much more probable story, which seems less coherent to us. The next chapter seeks to find the ways in which, in light of the above-mentioned factors, we can improve the quality of our thinking and avoid the traps resulting from the features of our brains according to behavioural theory.

2.2 Strengthening critical thinking

The first step towards tackling the above-mentioned issues to accept that none of us are free from these cognitive stumbling blocks. It should be noted that it is impossible to make decisions controlled by System 2 in all walks of life, and this would also be inefficient in our day-to-day operation. The majority of our daily decisions can be easily managed along rules of thumb and heuristics, and the rare mistake does not entail significantly negative consequences. This is in stark contrast to the overwhelming majority of our financial and investment decisions, where critical thinking and overcoming our cognitive miserliness are key challenges. We will see that for the whole society, some cognitive errors that result in ignoring statistical probabilities can also be the drivers of economic growth, even if at the individual level they still entail mostly negative consequences.

2.2.1 Overcoming "I told you so, I knew that" and the illusion of validity

Despite the saying that "It is easy to be wise after the event", when it comes to us, we are prone to disregarding and not acknowledging this. However, better decisions call for self-reflection, as excessive self-confidence based on a false forecasting capacity can be truly harmful from a financial perspective (and it can become an extremely annoying basic characteristic in the eyes of the people around us). The underlying cause is again the necessity to constantly interpret our environment, which, of course, can also be observed in the subsequent assessment of past events. The understanding of past events happens in stories that seem to be coherent and consistent to us, and in such situations the main aim is not to systematically compare them to reality, but to smoothly fit them into our internal model. The literature refers to this as the narrative fallacy, and false stories (which are usually simple, familiar and easily constructed) lead to false projections and expectations. How can we tell that we are tricked by the fallacy?

- We assign great significance to individual skills, motivation and will, while underestimating chance and randomness.
- We concentrate only on a few, outstanding events, while ignoring the absence of the events that *did not happen* but that would be necessary to support our world view.
- In hindsight, we see everything as straightforward and inevitable, i.e. past surprises do not seem surprises anymore but naturally occurring events.

Putting individual skills in the forefront (which is the manifestation of the need for completely controlling our fate) is especially problematic on money and capital markets. The majority of investors are unable to assess the true skills of portfolio managers, fund managers and traders, i.e. the large returns of a few years may completely conceal the significant role of (blind) luck. As a result, even the most untalented financial decision-makers can be stars

for a few years, thanks only to luck. The situation is exacerbated by the fact that rewarding luck instead of true abilities can unfortunately make even talented decision-makers reckless and irresponsible on a rational basis, due to the short-term competition with the other decision-makers.

All in all, the quality of a given decision in an unstable environment should not be primarily judged by its result, however controversial this statement may sound at first. In the context of the unpredictability of the unstable environment, the quality of a given decision has to be evaluated much more by the rational consequences that can be measured ex ante: the extent to which the losses caused by the worst-case scenario are limited, the extent to which the profits after the best event are unlimited,[8] whether the decision is in line with the minimum requirement of "doing no harm,"[9] and whether it takes into account the future negative consequences of short-term advantages that appear only rounds later ("side effects"). We should concentrate on these factors and take into account the role of randomness in an unstable environment under all circumstances, even if this is not in line with the above mentioned need for creation of coherent story arising from our human nature.

In an unpredictable situation, another illusion that provides false safety is the so-called illusion of validity, in which we use new information despite the fact that its forecasting power is far from clear. Experience has shown that in the world of capital markets, the majority of the thousands of analyses and data are typically unsuited for making projections, however, the need for safety overrides the true utility of data and analyses. In short, we make decisions based on almost blind luck, while the wealth of data may provide the appearance and peace of mind of a scientifically sound decision.

The illusion of validity can be also be managed by focusing on empirical evidence, investing the additional time and energy in the examination of the situation and overcoming the desire for a readily available but false point of

[8] In other words, whether it fulfils the principle of antifragility devised by Nassim Taleb.

[9] "Primum non nocere" medical principle.

reference that may seem attractive over the short term. This means that it is crucial that we continuously test our thinking and theories empirically, to compare them to reality and reject them, if necessary. Knowing that we do not know something is also knowledge.

2.2.2 Hedgehogs versus foxes or the world cannot be squeezed into one world view

Creating consistent stories based on causal links and condensing them into a simplified model is in some sense inevitable, since with our limited brain capacity the world can only be understood this way. We have already seen the problems posed by assessing a particular situation with a given model; therefore the conscious activation of System 2 is critical. Now let us examine the attitude (or more broadly speaking philosophy of life) can help us make better decisions and forecasts in the labyrinth of life full of a wide range of challenges.

The metaphor of the hedgehog and the fox in the subtitle is from one of the works of Archilochus, a poet in ancient Greece, that we know and that goes: "The fox knows many things, but the hedgehog knows one big thing". (The fox exhibits good abilities in several small, non-unique things – jumping, cunningness, swiftness – while the hedgehog knows one thing – balling up – very well.) The above association appeared again in a highly popular essay by the philosopher Isaiah Berlin in the 20th century. Based on this, Berlin classified authors and thinkers into two groups, obviously hedgehogs and foxes. The hedgehogs have a large, comprehensive, unique world view and interpret the world through that, while foxes can accept a plethora of "patchy", small ideas at the same time.

The table below shows the difference between the two attitudes:

Table 1
Foxes vs hedgehogs[10]

Fox thinking	Hedgehog thinking
Multidisciplinary: Utilises the ideas from several disciplines	Specialised
Adaptable: Able to use a new approach or many models in parallel if it they are not sure that the original model is working	Stalwart: Stick to their views, "all-in" approach
Self-critical: Able to acknowledge their mistakes	Stubborn: Mistakes are merely accidental or the consequences of unique, "external" events, i.e. the model has a bad day
Tolerant of complexity, i.e. they accept that several basic problems are irresolvable and many events are unpredictable	Order-seeking, i.e. they prefer a world with clear-cut causal links where events can be predicted if we find the basic governing principle
Cautious: Think in probabilistic terms	Self-confident: Rarely hedge themselves against potential mistakes, and rarely change their views
Empirical: Believe more in observation than in theories	Ideological: Expect that the solution to all small, day-to-day problems is the basis for a grander theory
Foxes are better forecasters.	Hedgehogs are weaker forecasters.

From a behavioural perspective, foxes do not stick to a given story, in fact, they are able to accept sometimes conflicting principles if experience confirms them in different situations. In contrast, hedgehogs link everything to their existing world view often based on a truly important idea, and they are loath to change this basic idea. (Often this grand principle that determines everything makes up a substantial portion of the given person's sense of identity as well.)[11]

It should be emphasised that the above-mentioned categorisation is not a value choice, but rather focuses on the differences in forecasting and decision-making functions, and the categorisation itself also contains a significant simplification. Several significant and great thinkers and scientists are characterised by the "hedgehog" attitude, and with respect to their personalities, they may even be considered more interesting characters in many cases. Precisely because of the human psyche's focus on consistent

[10] The table was adopted from Nate Silver: The Signal and the Noise: Why So Many Predictions Fail – But Some Don't.

[11] Keynes' famous saying stands in stark contrast to hedgehogs' thinking: "When the facts change, I change my mind. What do you do, sir?"

stories, hedgehog pundits are in the majority in the media, partly due to their more presentable personalities (influencer status).

To go back to the decision-making and forecasting role, we can safely say that the best in these fields constantly shift their opinion and views based on the feedback from reality, i.e. they exhibit continuous innovation. Self-reflection is an important part of their personalities, and they are able to view the world from a very high perspective, or, in other words, the level of philosophy, and also take into consideration the minutest details at the same time. (The problem is that we live 99% of our lives between these two levels.)[12]

Another important feature that is significant from a forecasting ability perspective is highlighted by Philip Tetlock's experiments.[13] According to the results, our predictions mostly affect the future only superficially, they rather tend to represent a personal credo, advertisement or identity. The thoughts about the future are presented as instruments for self-expression rather than true expectations about the future.

2.2.3 When should we believe experts' intuition?

If we would like to learn about future events in a given topic, we turn to an expert in the specific field. In the previous chapter, we examined the features of a good expert, and now we will strive to establish the areas where it is worth turning to a pundit.

Experts' expertise and intuition are respected by society in the overwhelming majority of the cases, and this respect lays the foundation of "rationally" abandoning critical thinking. However, according to the majority of the studies, in certain fields, experts' intuition can rather be regarded as experts' illusion. Kahneman believes that intuition is justified in exclusively those fields that fulfil the following criteria:

• the environment is regular and deterministic enough,

[12] Nate Silver: The Signal and the Noise: Why So Many Predictions Fail – But Some Don't – Chapter 2.

[13] http://www.ft.com/intl/cms/s/2/3950604a-33bc-11e4-ba62-00144feabdc0.html#axzz3CTarlzfz, Good Judgement Project

- the given expert spends enough time in the field to learn these regularities as skills.

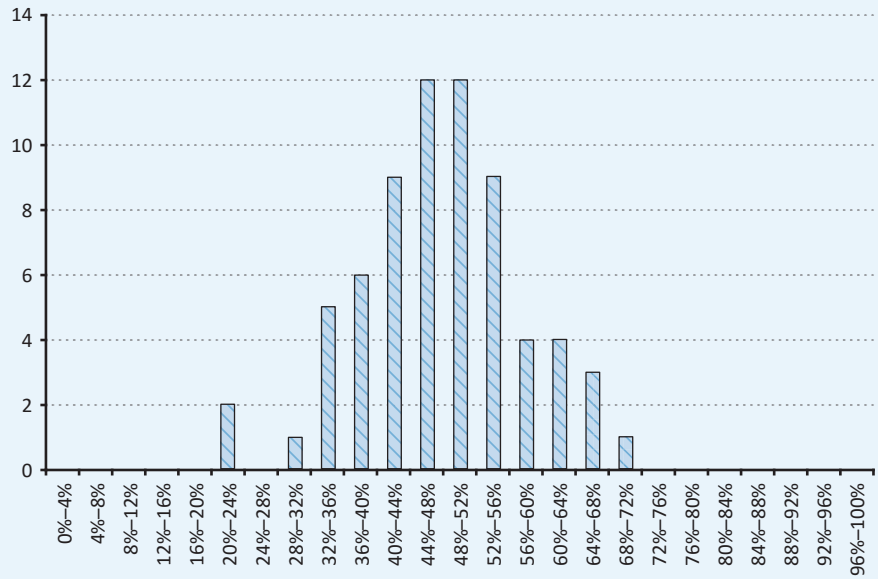
In such fields, experts' knowledge may be embedded enough to be able to make the appropriate decision in certain questions without much deliberation and detailed analysis of the options. It should be noted though that the orderly and systematic collection of objective information cannot be neglected in this case either. Examples for such areas include certain fields of engineering or medicine (e.g. anaesthesiology), chess or accounting in economics.

With respect to the forecasting ability, experts' knowledge and intuition are somewhat questionable in fields that are not characterised by the above features, for example on the money and capital markets that are of special importance in our topic, and more broadly speaking in other segments of the economy. By nature, these processes can mostly be considered unpredictable, although they are characterised by certain regularities, the individual cycles may be drastically different with regard to their duration, intensity and development. (This may apply to a formation identified on a 4-hour exchange rate chart or a large, comprehensive figure spanning decades.) The heart of the problem is not the true characteristic of the field, but mainly the fact that the actors themselves are not aware of this (see also the illusion of validity).

This claim is supported by the following chart,[14] which was produced in a long-term study. Using an almost 15-year-long time series, the study examined the accuracy of certain experts widely respected on the market with regard to their public comments on the S&P 500. It should be noted that the study includes several methodological difficulties – the experts' comments were often not exact enough, the sample was not always big enough, etc. – however, it may be suitable for identifying a certain trend. As we can see, a considerable portion of the pundits had a forecasting accuracy of 50%, which is close to randomness.

[14] http://www.cxoadvisory.com/gurus/, a study based on almost 7,000 projections.

Chart 1
Accuracy of market influencers (x-axis: percentage of when the given expert was right, y-axis: number of experts in the given band)



Source: CXO Advisory

Apart from that, it is important to note that robust decisions can be made in these fields as well, just not in the traditional role of the guru (influencer and "oracle"). Therefore, the goal may be to develop an investment strategy in which forecasts simply do not count,[15] and expertise, i.e. intuition deriving from experts' experience, is especially important in this, just not with respect to forecasts. A new approach is necessary both in terms of experts' thinking and the needs of the recipient audience.

The applicability of algorithms and the substitution of experts raise further questions. Many experiments have shown that in the fields exhibiting enough regularity,[16] algorithms proved to be more efficient than human

[15] For more on this strategy, see Nassim Taleb's works. A similar way of thinking characterises the legendary Warren Buffett as well.

[16] The more complex a given area is, the easier formulas seem to be the most efficient, while in more simple and deterministic fields, complex formulas can be used as well.

decision-makers with respect to forecasting. This is attributable to the limits of thinking, also studied by behavioural science. Due to their large capacities, machines are able to run the whole thinking process and all the formulas for each case, while people often rely on heuristics on account of our much more limited calculation capacity. In addition, as humans we are prone to concentrating on the facts in front of our eyes, make decisions based on our mood (as we know, in a bad mood, people are much more rational, while in a good mood we are rather creative) and unable to eliminate the effect of subconscious stimuli influencing decisions.[17]

2.2.4 Start-up illusion

One of the best examples of overconfidence[18] is provided by start-ups. According to general experience, 7–9 out of ten firms are unable to operate sustainably.[19] This 70–90% failure rate does not always mean bankruptcy, as, for example, several companies generate the capital invested, but weighted with risk and the work invested, the statistical odds are stacked against entrepreneurs. Therefore, at the individual level, it is highly risky and irrational to start a business.

The basis and core element of capitalism is innovation, the abundance of new ideas and investments, which would be impossible without the multitude of start-ups. This is how economic development can be consistent with the principles of evolution, since the many different small enterprises ensure the robustness of the system (many small firms fail, but this is not a systemic risk as long as the successful are selected). The irrational, "heroic" decisions of individuals to start a business can be very much rational socially.

Of the many cognitive fallacies, we would like to focus on overconfidence, which is also related to the subjective probability distortion discussed later. This fallacy has been confirmed by many experiments and studies,

[17] For example such an effect is the so-called priming, when the prior perception or recollection of a stimulus primes the next one.

[18] Overconfidence bias

[19] http://www.businessinsider.com/startup-odds-of-success-2013-5

and it refers to the fact that people tend to overestimate the probability of the correctness of their own decisions and opinions. This attitude can be considered beneficial from an evolutionary perspective, since in the context of overconfidence, perseverance can be observed even under difficult circumstances, which often leads to success, whatever statistics may show beforehand. The effect becomes stronger as the environment becomes more unstable and unfamiliar. In one famous experiment, subjects had to estimate the number of doctors in Boston. On average, participants stated that their estimate contained a margin of error of 2%, while in reality this was 46%.[20] Overconfidence goes hand in hand with the "better-than-average" bias. In the most well-known survey,[21] 93% of American drivers claimed to be better than average, which is of course impossible by definition. In connection with our topic, we should mention an experiment from 2006 (James Montier 2006[22]), in which 300 professional fund managers were asked about their performance. 74% of the participants claimed to be better than average, and only the remaining 26% believed themselves to be average.

All in all, overconfidence makes the decision on starting a business much more rational than warranted by cold facts.

2.3 Prospect theory[23]

"Cut your losses and let your profits run." Why is it so difficult to follow this seemingly simple advice? Why do so many people wait for the desired turnaround of the market, even with increasingly large and catastrophic losses, and why do they find it easier to close a profitable position?

The decision-makers of traditional economics are rational, i.e. they make their decisions based on the probability of occurrence and the expected utility. This hypothetical model of this way of thinking serves as a basis for several

[20] http://en.wikipedia.org/wiki/Overconfidence_effect

[21] Svenson (1981)

[22] Behaving Badly – James Montier, Dresdner Kleinwort Wasserstein, 2 February 2006

[23] The backbone of this chapter is provided by Amos Tversky, David Kahneman: Econometrica, 1979, Vol. 47. 263–291.

theories. The problem is that this claim is not corroborated by dry empirical evidence, and in reality both the probability of occurrence and expected utility are distorted. The following simplified example shows this clearly:

Which do you choose?

A) Toss a coin. If it is heads, you get USD 100,000, if it is tails, you get nothing.

B) You get USD 47,000.

The ideal rational man would choose "A", since the expected value of "A" is USD 50,000, which is more than the guaranteed USD 47,000. However, according to experiments, most people choose "B". Why are people willing to pay for safety? Why do they perceive it as a loss if they win nothing in this situation?

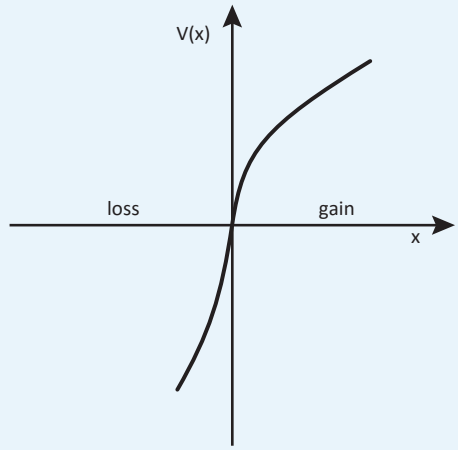
The prospect theory of Kahneman and Tversky seeks to ascertain this.

First, the outcomes of the decision are never assessed from the perspective of absolute zero utility. There is no *tabula rasa* before each decision, decisions are made assuming a certain status quo. In fact, the status quo can mean not only the current situation, but also a strong goal or a future event considered certain. Therefore, the reference point itself also influences the decision, which is not made exclusively in the rational framework pertaining to the given situation. Perhaps one of the most important psychological findings of prospect theory is the following: as compared to the reference point, risk aversion dominates in the profit range, while risk-taking dominates in the loss range. Giving up the status quo feels like a loss.

This means that winning or losing USD 100,000 does not trigger the same emotions – with opposite signs – at all, and therefore it does not provide the same subjective utility. It hurts much more to lose USD 100,000 than it brings pleasure to win the same amount. The avoidance of the sense of pain due to the expected loss urges us to take on greater risk, and it has a stronger psychological impact than the effects triggered by the same expected gain. Most people would not enter a game in which they have equal chance of

winning or losing USD 100,000. According to experiments, the loss aversion ratio fluctuates around 1.5–2x, therefore potential gains of USD 150,000–200,000 are necessary for people to be even willing to participate in such a game.[24] The following chart demonstrates this psychological phenomenon.[25, 26]

Chart 2
Psychological value function



The prevention of loss as compared to the status quo may trigger reckless actions, which may even be heroic in certain situations (e.g. patriotic war, perseverance in a seemingly hopeless situation), while on the markets it can result in the failure to close loss-making positions, i.e. not realising existing losses and thus eventually incurring huge losses in many cases. The fact that in the case of a significant loss the pain triggered by one unit of loss diminished, as it can be seen on the chart above, points towards this. Therefore, we put off realisation precisely in the case of small losses, while in the case of larger losses, we feel the increasing pain less and less, thus

[24] The strong fear of failure is also attributable to a similar psychological phenomenon.

[25] Daniel Kahneman: Thinking, Fast and Slow, p. 283.

[26] http://ias.jak.ppke.hu/hir/ias/20123sz/09.pdf

we let the given position run even longer.[27] By contrast, the urge to realise gains can be considered strong due to rapid psychological satisfaction, and therefore gains are often realised not along the arguments that are rationally acceptable in the given situation but prematurely, by abandoning them. (We can see on the chart that the slope of the value function is the greatest when the values start turning into gains, therefore the urge to realise profits grows the fastest there.)

The intense feeling of loss aversion provides some explanation for our greater sensitivity to negative news. Evolutionarily, our brain assigns greater priority to bad news, since avoiding bad events is crucial from the perspective of survival, while the identification of beneficial events is important in the longer run, but it is not that vital in certain cases. For example, according to experiments, we can spot an angry expression in an otherwise happy crowd much quicker than a happy face among many angry ones. This human characteristic may explain the overwhelming majority of bad news in newscasts and on news sites vying for an audience.[28]

Prospect theory works with a decision-making function weighted with mentally distorted probabilities of occurrence compared to the rational expectations school. According to experiments, people in decision-making roles use a consistently modified weight function instead of the actual probabilities of occurrence. Decision-makers tend to overestimate events with a relatively low probability of occurrence, while they tend to underestimate those with a greater probability of occurrence. In a tabular form, this looks like this:[29]

Probability (%)	0	1	2	10	20	50	80	90	98	99	100
Decision weight	0	5.5	8.1	18.6	26.1	42.1	60.1	71.2	87.1	91.2	100

[27] The feeling of "It doesn't matter anymore".

[28] The linguist Robert Schrauf studied 37 languages and concluded that we have much more negative words than positive ones. Words linked to emotions that can be found in all languages with similar meanings: happiness, fear, anger, sadness, guilt, disgust, shame. As we can see, there is only one positive word in the list.

[29] Daniel Kahneman: Thinking, Fast and Slow, p. 315.

In the case of small probabilities, the "already possible" effect takes hold, and therefore if the probability of occurrence is 1%, we take it into account with a weight of 5.5%. This is especially true if we can associate lively and realistic pictures or strong feelings to the given event under review. In the case of greater probabilities of occurrence, the effect is precisely the reverse, and this is the "complete certainty" factor. On the one hand, this may urge us to accept the less favourable bargain in the case of a gain (e.g. winning USD 100,000 with a probability of 95% or surely getting USD 85,000), or we may become strongly risk-seeking in a loss-making situation (losing USD 100,000 with a probability of 95% or surely losing USD 85,000). In the case of very low probabilities (<1%), the above-mentioned effect does not always take hold, and decision-makers often ignore these events completely, assigning a decision weight of 0% to them. This is especially problematic when it comes to large-scale events with far-reaching consequences, where in many cases non-linearity takes hold as well (e.g. revolutions, whether technological or social, large terror attack).

In the longer run, the cognitive distortions described in the chapter may be quite costly to decision-makers, since in the overwhelming majority of cases, the bargain calculated with not the actual probabilities of occurrence is accepted. It is very important to note that in reality, estimating the probabilities of occurrence entails many problems (it is almost impossible in certain cases), but in this chapter we only wished to highlight those cognitive errors that undoubtedly emerge. Prospect theory is a cognitive framework, which may help us understand events, but it is not an accurate description of reality.

Still, it is worth examining what we can do to eliminate these distortions. For example it may help to reframe the situation, i.e. to assess it from a wider perspective. In the case of capital market decisions, this is represented by the portfolio approach, when we do not analyse one given transaction. This may help in accepting a smaller loss and the resolute preservation of stop-loss levels. Accordingly, studies have shown that a professional fund manager's or trader's loss aversion ratio is around the average 2x. Furthermore, the law of large numbers can take hold in the case of many decisions, and thus

several losses of a limited extent may be offset by a smaller number of gains managed with a strategy eliminating the asymmetric thinking distortion.[30]

The above show the eternal truth that the actors (traders, fund managers, etc.) who wish to survive on the markets mainly have to know and improve their own thinking and the mistakes hardwired into it. Continuous, relentless self-inspection and the identification and acknowledgement of mistakes are vital for development.

[30] As one of the best-known Hungarian fund managers says about his strategy somewhat superficially: "We executed 58 transactions, 52 were quickly stopped, the others lasted longer, but in the end only one remained, and we still have that." http://www.privatvagyonkezeles.hu/alapblog/18-alap/2181-ezert-nem-szeretunk-interjut-adni-interju-vakmajommal-es-vermedvevel

3 Behavioural macro-finance

Similar to other disciplines, the history of thought and development of capital markets can be described as a series of paradigms after one another. If the "rational man" is replaced with the "psychological man", we arrive at different conclusions with regard to the functioning of the markets and the corresponding investments. Before presenting the conclusions of behavioural macro-finance, we provide a brief overview about the preceding two approaches.

3.1 History of financial paradigms

Graham and Dodd's 1934 book, Security Analysis, was seminal in laying the foundations of fundamental analysis, as the first systematic approach to capital market analysis and investment. According to the authors, instead of examining only profitability and its trend, analysing all aspects of a company's fundamentals and employing some simple rules could result in more successful stock portfolios. These rules are based on the mistakes of emotional investors and the price distortions that can be derived from such mistakes, and these distortions can be utilised employing the tools of fundamental analysis. The fact that the book was published during the Great Depression, when stock prices plummeted, contributed to its success.

This theory was replaced by the modern portfolio theory that gained prominence in the 1970s. Modern portfolio theory accepted that many investors make decisions based on their emotions, but argued that there were enough rational market participants who eliminate price distortions through arbitrage transactions. If the market is ruled by rational expectations, then market prices are efficient, in other words, they reflect all available public information. On semi-strong efficient markets, there is no use performing fundamental or any other analysis, instead investors should follow a passive (buy-and-hold) strategy.

The modelling of individual decisions based on expected utility maximisation was first suggested by Daniel Bernoulli in 1783. Since then, the rationalist

model of human behaviour has become a fundamental element in several social disciplines, which is largely attributable to the fact that the model could be mathematised. Modern portfolio theory is based on this premise as well.

Harry Markowitz published an article in 1952 with the first description of mean–variance optimisation, which means that when financial portfolios are built, expected returns are maximised relative to the volatility of the returns. In 1965, Bill Sharpe combined Markowitz's idea with rational expectations and the availability of information to lay the foundations of the capital asset pricing model (CAPM), which describes the relationship between risk and return. The third pillar of modern portfolio theory, the theory of efficient markets, was created by Eugene Fama. According to this theory, market prices reflect all relevant information, and therefore active portfolio management yields no extra returns.

The first empirical findings did not confirm the theory's assumptions. This is because during the examination of the capital market theory, the data did not exhibit a positive relationship between risk and return. The search for statistical errors did not produce any result, but new anomalies emerged. Sanjay Basu (McMaster University) showed that the stocks of the companies with a low price/earnings (PE) ratio outperformed the companies with high values. Rolf Banz (Northwestern University) proved that the stocks of small enterprises yielded returns in excess of those of large corporations. Company size and the PE ratio are publically available information, which should be reflected in the prices, however, in reality this is not the case, and the model did not offer any explanation for that. In order to save CAPM, anomalies were included, which produced the so-called three-factor model, then the four-factor model as the list of market anomalies grew longer.

Proponents of modern portfolio theory did not find any explanation for research results showing that a considerable portion of active equity fund managers have first-class stock-picking skills and are therefore able to generate extra returns. Of course, it is true that average portfolio managers underperform the benchmark, but the best investment ideas and the high-conviction positions, i.e. those that are held by portfolio managers on

purpose, consistent with the strategy, generate extra returns. The holding of low-conviction positions is attributable to the oversized nature of the funds, the serving of clients' emotional needs, the reduction of volatility and compliance with the "style box",[31] i.e. not with return aspects.

In parallel with the rise of modern portfolio theory, the study of human decision-making processes did not corroborate the rational expectation hypothesis and found instead that emotions and heuristics dominate. Behavioural portfolio management is an approach that takes into account these features of the decision-making process. Based on this, it distinguishes between two types of investors, the emotional crowd and behavioural-data investors (BDI), the latter essentially being rationally thinking actors.

The emotional crowd consists of investors who base their decisions on emotions and intuition, that is, on Kahneman's System 1: automatic, quick short-term thinking with no effort or control, social reinforcement and loss aversion hardwired into us by human evolution. By contrast, behavioural data investors conduct thorough and comprehensive analyses of the available data prior to making decisions, representing System 2-type conscious thinking in which effort and complexity dominate.

According to modern portfolio theory, there are many irrational actors (emotional investors) on the markets, but the development of market prices is dominated by rational investors who swiftly eliminate price distortions through arbitrage transactions, i.e. by producing risk-free returns. In this approach, since prices contain all the information, active portfolio management does not yield higher returns in the long run, and a passive, index-tracking strategy should be followed, which is cheaper to implement.

What would happen if the reverse was true, i.e. emotional investors determined the prices and the arbitrage performed by rational investors was not swift and efficient enough to eliminate short-term price distortions? In such a scenario, price distortions can persist. In this case, active portfolio

[31] Style Box is a product of Morningstar, classifying stocks in the dimensions of capitalisation, value and growth. For more information, visit: www.morningstar.com.

management can help build portfolios of better quality and success than simple index tracking.

Behavioural portfolio management is based on the dynamic interaction between the emotional crowd and behavioural-data investors. Emotional investors dominate the market more often than not, and thus only by chance do stock prices reflect the true underlying value. Price distortions may offset each other over the whole market, but significant mispricing can persist. Market prices reflect emotions rather than the assumed intrinsic value of the stocks in the majority of cases.

Events triggering a strong emotional response may be short-lived, but the resulting emotions linger. Accordingly, price distortions are also persistent, which provides an opportunity for building better portfolios. However, building such a portfolio poses a great challenge from an emotional perspective, since it requires the investor to go against the grain of the emotional crowd, which is difficult to reconcile with the desire for social acceptance.

3.2 Basic principles of behavioural portfolio management

The first basic principle of behavioural portfolio management is that the emotional crowd dominates market price developments, while intrinsic value only plays a more minor role.

This claim does not surprise those who monitor equity markets: one need only think of the development of stock prices, which shows no sign of rationality and tends to more reflect investor sentiment and the development of emotions. In addition to our intuition, two strands of research provide evidence worth considering that prices are driven by some factors other than fundamentals.

One strand of research examines the significant variance (high volatility) of equity market prices. According to 2013 Nobel laureate Robert Shiller, market movements are not completely irrational, but they do contain considerable noise. No study was able to confirm the relationship between fundamentals

and market price fluctuations, and instead noise dominated short-term price movements.

The other avenue of research attempts to solve the equity premium puzzle. According to Rajnish Mehra (University of California) and 2004 Nobel laureate Edward Prescott (Arizona State University), stocks' risk premium (i.e. their additional return as compared to risk-free government securities) has been around 7 per cent on average since the 1870s, which is two or three times as high as fundamental risk.

Based on the research by Shlomo Benartzi (University of California) and Richard Thale (University of Chicago), high equity market risk premiums are caused by investors' loss aversion on the one hand, and by overly frequent evaluation of the portfolios on the other hand, i.e. myopic loss aversion. This basically means that price developments are driven by emotions rather than fundamentals.

The fundamental difference between modern portfolio theory and behavioural portfolio management lies in their assessment of the efficiency of arbitrage. Many studies have confirmed that arbitrage did not eliminate several market anomalies that are inconsistent with the theory of efficient markets. Arbitrage may be inefficient for three reasons. First, arbitrage opportunities may be hard to spot. Second, arbitrage is costly or risky for some reason (although per definition it includes no market risk). Third, too few market participants may be willing to enter into an arbitrage transaction.

The empirical research by David McLean (MIT) and Jeffrey Pontiff (Boston College) identified 82 market anomalies. Two-thirds of these persisted even in the fifth year following their discovery. In addition, the researchers found that the efficiency of arbitrage did not improve in recent years, despite the reduced transaction costs and the dominance of institutional investors considered rational, which is a fairly significant statement.

The direction of development in capital market theory was perhaps best summarised by Hersh Shefrin. According to Shefrin, finance is in the midst of a paradigm shift from the neoclassical framework to the psychological

framework. Behavioural finance is the application of psychology's results to investment decision-making, i.e. the substitution of neoclassical assumptions for behavioural assumptions. Shefrin believes that future finance will be a combination of behavioural assumptions and the application of strict analysis methods of neoclassical economics.

The second claim of behavioural portfolio management is that behavioural-data investors achieve higher returns.

The second basic principle of behavioural portfolio theory seems to follow logically from the first, since behavioural-data investors are able to build portfolios that are more successful and produce higher returns by going against the grain of the emotional crowd. However, this is not necessarily true, as the price distortions triggered by market participants' emotional responses may be random. Nevertheless, behavioural finance has found several examples of measurable, persistent price distortions, which points towards deeply rooted, general cognitive flaws. We should also not forget that assuming a position opposed to the emotional crowd is a huge emotional challenge, precisely because of the decision-making mechanism of System 1, the desire for acceptance by others.

The second claim of behavioural portfolio management is supported by empirical research as well. Analyses of actively managed equity market investment funds have shown that these funds were successful in identifying well-performing individual stocks. Randy Cohen, Christopher Polk and Bernhard Silli examined the unique stock-level allocation of actively managed equity funds and found that the stocks which were most strongly overweighted by the funds compared to the benchmark (high-conviction positions) produced substantial extra returns (alpha). The stock overweighted the most yielded extra returns of 6 per cent in the next quarter. Exploring the extent to which higher performance can be attributed to the utilisation of behavioural factors requires further analysis.

According to the better known strand of research analysing the performance of investment funds, the average equity fund produces zero or negative excess returns in the long run as compared to the market stock price index,

which led to the conclusion that the average active manager does not have a special ability when it comes to picking stocks. Although the results of the two studies are in contrast, they are reconcilable. This is because professional investors are very often not behavioural investors, but part of the emotional crowd in order to optimise the strategy aimed at serving client needs. If a fund wishes to retain its investors or grow, it has to serve the clients and their emotions as well. Therefore, many equity funds become part of the emotional crowd. This behaviour is rational on the part of the fund if the revenue of the fund depends on the size of the assets under management. Consistently, the return of funds typically diminishes as they grow in size.

The third basic principle of behavioural portfolio management posits that investment risk is the chance of underperformance.

The most frequently used indicator used for analysing investment risk is volatility, i.e. the standard deviation of investment returns. However, similar to other market-based indicators, this is far more an instrument for quantifying emotions rather than investment risk. As soon as a piece of information appears on the market, it triggers a response in the emotional crowd, which in turn generates a price movement. The extent of this shift, or in other words the volatility, is not necessarily consistent with the development of fundamentals, and in many cases it entails an opportunity for investors rather than risk. Instead, investment risk should be regarded as the risk of persistent underperformance. The measurement of underperformance depends on the time horizon of the investment. If an investment's aim is to make a sum of money available in one year, risk is basically the chance of less money being available than necessary. In this specific case, since this is a short-term investment, actually liquidity management, short-term market volatility plays a pivotal role in capturing risk. In the case of a long-term investment, short-term volatility plays less of a role or none at all, since emotion-driven price movements offset may each other over the long term.

The most widely used technique in portfolio building is the mean–variance optimisation, as suggested by the Nobel laureate Harry Markowitz in 1952. The gist of this is that in their activities investors need to take into account the discounted expected return as a desirable factor, and the standard deviation

of returns as an undesirable factor. However, the investment industry falsely used this as a basis to construct portfolios that minimise short-term volatility as compared to long-term returns. This practically puts emotions at the centre of long-term portfolio building, which justifies the persistent distortions described above. Focusing on short-term price movements aims to serve the emotional need of short-term loss aversion, which is basically a cognitive error well-documented in behavioural science. The typical use of volatility and risk as each other's synonyms can be considered widespread in the investment industry. It is important to note, however, that Warren Buffett – one of the most successful investors to date – fundamentally rejects the notion of identifying volatility as risk. If risk is defined as the chance of persistent underperformance, it becomes clear that focusing on short-term volatility during long-term portfolio building is a strategy that increases risk rather than decreasing it. This is because the excessive emphasis on short-term volatility prompts investments in assets with lower returns without having any effect on long-term volatility. For example over the long term, stocks generate higher returns than bonds. The short-term standard deviation of the returns can be decreased by investing in bonds, but this comes at the price of relinquishing a portion of the long-term returns, which entails an increased chance for long-term underperformance, i.e. heightened investment risk. It is common knowledge that many investors withdraw their investments from the equity market when stock price indices fall. However, research shows that this is precisely the time when investors need to be present on the market, in fact, they have to increase their investments, as on average higher returns can be earned after markets calm down. The typical investor loses if stock price indices fall, but do not win if they rise.

4 Behavioural micro-finance – Behavioural portfolio management

Behavioural micro-finance is basically the application of the psychological factors identified by behavioural science in practical financial advisory services and portfolio management.[32]

4.1 The cult of emotions

4.1.1 Blocking out or serving emotions

Several studies have pointed out that the most harmful factor in wealth accumulation and successful investment is emotional decision-making. Controlling emotions is a great challenge, not only because operating System 2 requires resources, but also because many factors, which may even by highly regarded by science, strengthen the cult of emotions.

One such factor is modern portfolio theory. It places emotions in the focus of portfolio building through the use of the volatility of returns by equating the volatility of the asset's price with investment risk. To investors suffering from myopic loss aversion, volatility seems like a real risk, which partly explains the enduring nature of modern portfolio theory in both investment decisions and risk management. However, the variance in returns cannot be regarded as a real risk factor in the process of building long-horizon portfolios, as has been highlighted by many investors on several occasions. In the case of short-term portfolios, volatility should indeed be taken into account, but this should be considered liquidity management rather than an actual, long-term activity. In other words, volatility is merely one risk out of many, and it is significant only in the case of activities with a certain time horizon.

The extent to which the strategy of successful investors based on intuition coincides with the tenets of behavioural finance is an interesting aspect of the discourse on real investment risks. This bolsters the theory with practical

[32] The chapter is based on the works by Howard (2014) and Pompian (2006).

results and shows the depth of the theory's roots. The words of Charles Munger[33] on modern portfolio theory are worth citing here: "Using a stock's volatility as a measure of risk is nuts". According to Munger, risk is the risk of persistent capital loss on the one hand, and the risk of inadequate returns on the other hand. Munger believes that the spread of volatility is due to the fact that investors like indicators that are easily quantifiable and that are based on statistical methods taught at the university, while the aspects that are difficult to grasp are relegated to the background. Due to the elegance of mathematical models, the use of easily accessible decision-making inputs gains prominence, which is clearly a serious case of confirmation bias. Seth Klarman[34] has similar views on the role of volatility, as he believes that risk is simply the probability and extent of loss. According to him, positive correlation between risk and returns could only be observed in a fully efficient market, and therefore in reality no extra returns are provided automatically for taking on risk, as assumed by modern portfolio theory. According to the capital asset pricing model (CAPM), there is a positive relationship between risk and expected returns, but statistical tests have found a negative correlation between the two indicators. This led to Eugene Fama (University of Chicago) and Ken French (Dartmouth College) discouraging the practical use of the CAPM's risk parameter, beta, in their 2004 study. Another problem with beta is that it is the ratio of the correlation between an individual stock and equity market returns on the one hand, and the standard deviation (volatility) of market returns on the other hand, i.e. in simple terms it is the measure of emotions according to behavioural theory.

Warren Buffett explains risk in even simpler terms: "Risk comes from not knowing what you're doing, therefore the best way to minimise risk is to think". [35] As we can see, thinking about the process of thinking is key in the investment decisions of practising professionals, just like in behavioural finance.

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[33] The vice chairman of Berkshire Hathaway, one of the best-performing investment funds in history.

[34] American billionaire, author of the famous Margin of Safety: Risk-Averse Value Investing Strategies for the Thoughtful Investor.

[35] http://25iq.com/2015/09/05/a-dozen-things-ive-learned-from-charlie-munger-about-risk-2/

Modern portfolio theory relies on volatility not only when making investment decisions, but also when evaluating the result of investment activities. The performance of the equity fund is measured against an arbitrarily chosen benchmark index by calculating the volatility of the yield spread between the portfolio and the benchmark index (tracking error volatility).

In the cult of emotions, there are several rules of thumb for assessing the activities of fund managers. According to one, if a fund is large and it has functioned for a long time, it is likely that it performs well, since that is how it could grow big and survive. However, research has shown that size and age have precisely the opposite effect on financial results. The other rule of thumb is connected to past performance. Despite the proven fact that past performance is not an indicator of future success, several investors place great emphasis on it. Reversion to the mean is much more typical on the investment market, just like in nature. This means that after a couple of years with extreme performance, investment funds are usually characterised by a reversion to average returns.[36] In today's society, legal aspects play a major role, and the same holds true for financial service providers. When people do something differently than others ("swim against the current"), they can easily draw the attention of lawyers and regulatory bodies. One common technique for avoiding this is citing prudence, which in practice only means doing everything like the others, not being the odd one out. However, in a broader sense, this simply serves the emotional need for acceptance.

4.1.2 The investment strategy of the cult of emotions

The investment strategy of emotional investors is based on the use of System 1, typically without the solutions of System 2 requiring effort and thinking. In this case, investment decisions are made based on intuition and anecdotal information instead of a comprehensive analysis of capital markets. Of course, this does not mean that such investors do not monitor economic developments. On the contrary, they spend much time on being well-informed to feel safe by knowing this and to satisfy their insatiable desire

[36] One of the most pragmatic reasons behind this is the significant role of luck in capital market performance, and, as we know, there are ups and downs.

for causal links (this is the previously mentioned cognitive error). However, this is irrelevant from the perspective of equity market investment activities, considering that the daily change of stock prices can hardly be explained by the development of fundamentals. With respect to individual stocks, however, careful analysis is less typical, and brand names are chosen instead. In addition, emotional investors often over-diversify their portfolios and hold a large number of stocks in order to reduce the volatility of the portfolio's returns. These investors carefully record the price they pay for a particular stock, which anchors their future investment decisions. One typical example is holding a loss-making stock until it reaches the original purchase price, thereby avoiding the pain of loss.

During the building of long-term portfolios, emotional investors often concentrate on the short-term volatility of returns and correlations, which are irrelevant from the perspective of long-horizon investments as we saw above, but they fulfil short-term emotional needs. Another typical behaviour is exiting the market when volatility rises, but in this way investors lose the higher returns of the next period.

4.2 Abandoning the cult of emotions

4.2.1 Releasing emotional breaks: a 12-step programme

Howard (2014) recommends a 12-step practical programme for abandoning the emotion-driven world:

• Admitting that we are emotional investors

The starting point is to realise the problem, by admitting and being aware that we are emotional investors.

• It is OK to be wealthy

To many small investors, accumulating large wealth is inconceivable, and therefore it is important to be aware that this is possible. Time, discipline and the application of the behavioural principles are the most important in this.

• Striving to eliminate myopic loss aversion and to reduce the need for social validation

These are the two most important emotional breaks that developed over millions of years of evolution. Kahneman is pessimistic about whether the breaks can be relegated to the background, but the author believes that this is possible.

• Volatility cannot be used for building and assessing portfolios

Volatility and the related indicators described above are measures of emotions that do not reflect the development of fundamentals, therefore they should be excluded from portfolio management and financial decisions as much as possible.

• Volatility and risk cannot be used as synonyms

In everyday speech and sometimes even in professional parlance, volatility is often equated with risk. When developing long-horizon portfolios, the focus on short-term volatility does not mitigate true risk, i.e. the chance of underperformance, but in fact increases it. Therefore, when investors hear about *volatility as risk*, they should mentally cross that out and replace it with the word *emotion*.

• Rising volatility should not be considered risk but an opportunity

The decision suggested by evolution for rising volatility is to liquidate investments. However, research shows that after high volatility, above-average returns can be earned, and therefore the right decision is not to exit the market but to remain and increase investments.

• Financial portfolios should be divided into classes in order to reduce the influence of emotions

The three-class portfolio structure (liquidity portfolio, capital increase portfolio and a portfolio with assets requiring special management) is one of the best ways for to abandon emotional breaks.

- When building long-term portfolios, we should concentrate on expected returns instead of volatility or correlations

The three-class portfolio structure enables the capital growth portfolio to reach its goal, i.e. long-term wealth accumulation.

- We should forget the price we paid for a security in order to abandon this emotional anchor

Investors are prone to selling well-performing securities too early, since the fact of earning gains fulfils the desire for social validation. In contrast, investors tend to hold losers too long due to loss regret. If we do not use the price we paid for a security as an anchor, these emotional breaks can be eliminated.

- We have to be aware that past performance is not a good predictor of future performance

This fact is supported by several academic studies, but due to the representativeness bias investors tend to forget this; therefore, it is important to be aware of this.

- Unwarranted constraints on the portfolio's investment instruments should be avoided, since they reduce performance

The most typical constraint is the classification of the portfolio into some investment category ("style grid"), which reduces the room for manoeuvre for improving financial performance.

- The investment strategy should be implemented consistently

The two key features of a successful investment strategy are narrow focus and the holding of high-conviction positions (instead of diluting the portfolio).

4.2.2 How does the categorisation of equity funds impair performance?

One of the easiest methods of finding our way in the world is to label things. However, if we put the wrong label on something, our decisions lose their justification. The set of labels used in the investment industry ("equity style box" or "style grid") categorises stocks along certain features. This helps investors navigate the world of stocks. In addition to unique stocks, this approach was applied in the case of various investment funds, advisers and portfolios.

For example, the system of categories developed by Morningstar classifies stocks along two dimensions – size and value/growth – into a square of a 3×3 matrix. With respect to size or market capitalisation, we distinguish small, medium-sized and large enterprises. With regard to *value*, the key is the stock's price relative to the expected profitability, its book value or sales, while with regard *growth*, the crucial issue is the expected growth of these variables from one year to the next. One such category is the group of small enterprises with good growth prospects (i.e. growth-oriented enterprises). Although academic studies have confirmed that these factors are historically relevant from the perspective of stock performance, the correlations may change over time. In addition, the validity of this categorisation of equity fund managers has not been proven.

The "style box" categorisation is so widespread in the investment industry that it has become a requirement for investment funds to belong to one of the categories. Divergence from the category into which the equity fund was classified ("style drift") is deemed negative because it makes it harder to assess performance. This may even result in the sacking of the manager.

The "style drift" concept is based on the assumption that the investment strategy and the stocks currently held in the portfolio are equivalent. However, the strategy is based on the analysis and trading of individual stocks. During the consistent implementation of the strategy, the features of the stocks held in the portfolio are not constant: on the contrary, they change. It is somewhat contradictory that an investment fund is classified

into a category, i.e. a stock subindex is assigned to it, then higher performance is expected relative to the subindex's returns without style drift. Research by Russ Wermers (University of Maryland) has shown that style drift is central in achieving greater returns.

4.2.3 Diversification: Bubble wrapping

In modern finance, diversification is highly regarded, and most financial experts deem it desirable. However, according to Howard, there are very few situations when diversification is truly warranted. Warren Buffett believes the same: "Diversification is protection against ignorance. It makes little sense for those who know what they're doing."

The greatest advantage of diversification is that it reduces the short-term volatility of the portfolio, however, this advantage can be realised less if the above-mentioned class structure is employed. The first class, which satisfies short-term liquidity needs, consists of short-term, less volatile instruments, and therefore the further reduction of volatility is less of an issue here. In the case of the second class, which is aimed at long-term wealth accumulation, the focus is on long-term expected returns instead of short-term volatility. In this class, diversification reduces the expected financial performance due to the fact that the investments are made in asset classes with lower expected returns in order to mitigate short-term volatility.

When building long-term portfolios, the standard recommendation in the industry is 60 per cent stock and 40 per cent bond allocation. In the case of long-horizon portfolios, only expected returns count, and therefore considering the long-term returns of bonds and stocks, only investment in the latter is rational. Diversification may make sense if the expected returns of the asset classes are similar. Howard rejects investments in alternative asset classes also based on return considerations, albeit they exhibit low correlation with traditional asset classes (stocks, bonds).

Does diversification make sense in a stock portfolio? According to the average financial expert, the answer is yes, at least 50 different stocks are necessary to achieve the appropriate level of diversification. However, empirical studies have pointed out that 83 per cent of the diversification advantages can be

achieved with as few as 10 stocks, and 91 per cent can be achieved with 20 stocks. In order to realise the remaining 9-per cent advantage, further 275 individual stocks are required. In light of this, it comes as a surprise that the typical US actively managed investment fund holds 100 stocks. This is partly due to the size of investment funds, as it is difficult to concentrate on a few good investments in a larger portfolio. Instead, funds diversify to avoid style drift, and hold well-known and popular stocks and reduce volatility, i.e. satisfy clients' emotional needs.

From a financial perspective, diversification provides limited added value overall in the case of long-horizon portfolios. It is better to be on the market, i.e. invest, than to stay away completely. From this perspective, diversification, i.e. the "bubble wrapping" of the portfolio, is warranted, since it reduces emotional costs. However, diversification is only the second best solution after a portfolio with concentrated, high-conviction positions. Diversification is the trade-off between emotions and returns, not a trade-off between risk and returns.

4.2.4 The volatility trap

When fluctuations on equity markets are heightened, i.e. volatility increases, emotional investors panic and sell their stocks, thereby falling into the volatility trap. In reality, high stock price fluctuations and low or even negative returns observed in the present are predictors of future lower volatility and above-average returns. This is confirmed by Howard's (2014) empirical studies conducted on the available weekly data from the S&P stock price index between 30 December 1927 and 14 October 2011.

The reaction of the emotional crowd and the fact that investors sell their stocks cause a further increase in volatility and a drop in prices, and future higher returns are also generated by the decisions of emotional investors after they finish selling and start buying. Accordingly, in a volatile period, the rational investment decision is to stay on the market or increase exposure rather than to liquidate equity investments. Rising volatility should be regarded as an opportunity rather than a danger, which is a practical example for the application of the behavioural approach.

4.3 Becoming a behavioural investor

4.3.1 Investment strategy

According to Howard (2014), the key to successful investments is the *consistent* implementation of a *narrowly defined* strategy by assuming *high-conviction positions*.

This enables the portfolio manager to utilise behavioural factors, which are controlled by the emotional crowd and to achieve better financial performance.

Based on the analysis of US investment fund prospectuses, ten narrowly defined primary strategies can be identified: Competitive position, Economic conditions, Future growth, Market conditions, Opportunity, Profitability, Quantitative, Risk, Social considerations and Valuation. With a Value strategy, portfolio managers strive to identify undervalued stocks. For this, they use various variables, for example the PE ratio (price/expected future earnings) or expected future cash flows. These variables (strategy elements) can be conceived as the proxy variables of the non-observable behavioural variables. All in all, 40 strategy elements can be identified.

Below the level of strategy and strategy elements, there is the "secret sauce" of the managers, for example that they only buy stocks whose PE ratio is lower than 15.

The individual stocks can be clearly associated with the 10 primary strategies based on which a fund following the strategy holds the most of them in a given month. Therefore, the strategy-based stock pools are not determined based on the stocks' features (e.g. market capitalisation or PE ratio) as in the "style grid", but based on the managers' collective knowledge and views. The strategy-based stock pools are not fixed, they change from one month to the next: a stock is in one pool for 14 months on average.

Strategy-based sets are good for measuring the *consistent* implementation of an investment fund's narrowly defined strategy. The greater the proportion

of the stocks belonging to the current stock pool of the given strategy, the more consistent the implementation of the strategy is. Of course, this does not mean that two maximally strategy-consistent funds hold the same stocks. According to empirical results, a maximally strategy-consistent fund outperformed the least consistent portfolio by 2 per cent over a one-year horizon.

The other element of the successful implementation of the investment strategy is the assumption of *high-conviction* positions, i.e. the implementation of the portfolio manager's best ideas. This can be measured with various indicators, for example the number of stocks in the portfolio (the fewer, the better), concentration within the industry (the higher, the better), tracking error (the bigger, the better).

By combining the measures of consistency and conviction, we can create a classification system that may predict future performance. Funds with the highest score for consistency and conviction ("Fund Rate 5 – FRD5") significantly outperformed those with the lowest scores ("FRD1") over a one-year horizon. Past performance is not a predictor of future performance, but the behaviour of the portfolio managers with respect to the choice of strategy, the consistency of implementation and their conviction may be suitable for that.

4.3.2 The best (and worst) ideas of equity fund managers

According to popular belief, the average active equity fund manager does not have the ability to pick the right stocks, and therefore the average manager is outperformed by the market index. Yet 20 years of continuously expanding literature has found precisely the reverse. According to a study (Cohen et. al. 2005), the US equity market does not seem to be efficiently priced, since the average investment fund manager is able to identify stocks that outperform the market average. Stock-picking may be based partly on the processing and analysis of huge amounts of data. This is the harder way, considering the competition within the analyst community. The other option is the identification of behavioural price distortions. However, the two

factors are inseparable. Of course, equity market participants process lots of information, but this is not to say that behavioural factors do not play a role, since the information mosaic also satisfies clients' desire for market stories.

If stock-picking skill is so widespread, why are there many underperforming investment funds? The typical fund holds 100 stocks, i.e. it is over-diversified, instead of implementing its best, high-conviction investment ideas, and this hampers financial performance. The reason behind over-diversification is the system of incentives widespread in the industry: the remuneration of portfolio managers that depends on the size of the fund, the use of the "style grid", the controlling of volatility, the avoidance of criticism and legal issues and the fact that regulators encourage holding more stocks.

Stocks can be ranked by taking into account quantitative and qualitative aspects at the same time. In the quantitative dimension, a higher score can be earned if as many investment funds hold the given stock as possible, while in the qualitative dimension, the proportion of the given stock held by the best funds (FRD4 and FRD5) is taken into consideration. Based on this classification ("Stock Diamond Rating – SDR"), the best stocks ("SDR5") generated higher returns than the worst ("SDR1") by 4.76 percentage points after adjusting for other influencing factors. According to the results of the same study, the average stock held by investment funds outperforms market indices, which suggests that investment fund managers are able to pick the right stocks. These stocks outperform others by 1.56 per cent annually, which is approximately the same as funds' costs, i.e. the average investment fund earns zero extra return. It must be noted that investment funds manage 11 per cent of the US equity market worth USD 22 trillion.

4.3.3 Developing the equity market investment strategy

The author recommends the following steps for developing the equity market investment strategy.

• Choosing the primary strategy

Out of the ten primary strategies described above, portfolio managers should choose the one best fitting their experience and personalities.

• Choosing the secondary strategy

The fund manager can choose from the ten primary strategies based on client demand and the expected success rate. The three most popular combinations: Value/Competitive position, Future growth/Competitive position and Competitive position/Future growth. There are strategy combinations that were not chosen by any fund, for example the Profitability/Market conditions or the Risk/Social considerations.

• Choosing the strategy elements

40 strategy elements or behavioural proxy factors have been identified in the literature. The most popular is the "Strong fundamentals" strategy element, while the least used is "Religious topics". The average actively managed investment fund uses seven strategy elements.

• Assessing the individual strategy elements

There are different approaches for the different strategy elements by funds, and these constitute a part of the fund managers'"secret sauce". For example the "Quality of management" strategy element can be assessed through the quantitative data from financial statements, based on the opinion of competitors or based on the notes to the company's report. Furthermore, the technique for ranking the individual stocks with respect to a given strategy element also needs to be determined.

• The examination of financial literature in order to identify the anomalies that may improve performance.

David McLean (University of Alberta and MIT) and Jeffrey Point (Boston College) identified 82 market anomalies in 68 academic articles. They tested whether the anomalies were significant in the estimation period, in the period after that and in the period after publication. Their results show that anomalies could be detected in the estimation period and even after that, which renders the presence of statistical distortion or data error impossible. The extra returns linked to anomalies dropped by 35 per cent in the period after publication as compared to the estimation period. The researchers

concluded that the anomalies cannot be attributed to risk premium but confirm the presence of price distortions. The extra returns deriving from anomalies persisted five years after publication, in fact, the decline in extra returns did not gain momentum with the reduction of trading costs and the rise in trading volume.

• Implementing the investment strategy

The implementation of the strategy by focusing on strategy elements and the "secret sauce" through high-conviction positions, disregarding the given stock's irrelevant features ("style grid").

4.3.4 The power of the dividend

As the behaviour of the portfolio manager in the consistent and convinced pursuance of the strategy is the predictor of future financial performance, the corporate management's announcement linked to dividend payments can be considered as a similar behavioural factors from the perspective of the future performance of the company's stocks.

Several investors believe that dividend-paying stocks underperform, since dividend payment reduces the returns from price gains, and dividend payment suggests that the company lacks investment opportunities or that the company has reached the end of a growth cycle. Moreover, dividend payment may be subject to a higher tax rate. Yet research has shown that the higher the dividend yield of an equity portfolio is, the higher its holding period return.

Both on the equity market as a whole and at the level of individual stocks, dividend yield is a good predictor of future profitability and the return on equity. Based on the S&P 500 data between January 1973 and September 2010, stocks whose dividend yield increased achieved a holding period return higher by 10 per cent on average over one year horizon than those that reduced their dividend. The research also showed that as dividends rise, the return on equity increases and the volatility of the return is reduced. The impact of the dividend on returns and volatility rises as company size

becomes smaller, i.e. the effect is stronger in the case of the stocks with low capitalisation than in the case of large enterprises.

CEOs often publish optimistic forecasts about their company's future or profitability, but the cost of such announcements is low, and therefore their credibility is limited. The information obtained from financial statements paints a more realistic picture, but the auditing process is not perfect either. By contrast, raising the dividend, share buybacks and other financial decisions entail high costs, and therefore management is cautious when sending such signals. This is why dividend payment can be regarded as a measurable and persistent behavioural factor in the case of equity markets.

4.4 Overcoming clients' behavioural constraints

Not only institutional and professional investors have to overcome their behavioural constraints, financial advisers also need to help small, retail investors make rational financial decisions.

4.4.1 Reducing emotional costs

The emotional costs of investment activities arise from the fact that people respond with strong emotions to everyday news: hearing about falling stock prices in the media or the negative comments of a friend or acquaintance about a concrete stock may lead to rash decisions.

Financial advisers have two choices to react to their clients' emotional responses: one way is to satisfy the emotions, the other is to reduce the emotional costs. The first business model may be successful over the short term in acquiring and retaining clients, since clients hear what they want to hear from the investment adviser. However, in the longer run, the "panic reaction" of investors affects wealth accumulation adversely. If the financial advisers have abandoned their emotional breaks, and listen to their clients but guide their attention to the relevant factors that trigger moderate emotional responses, for example by using the above-mentioned portfolio class structure, then emotional costs are considerably reduced.

One practical example of client communication is the way advisers present the development of the S&P stock price index. The value of an investment of USD 100,000 in January 1975 would have increased to USD 756,000 by June 2013, which means annual returns of around 12 per cent. If we plot the development of the investments' value on a line chart, the fluctuations of the equity market become obvious, i.e. we can clearly see the dynamic rise in the 1990s, the plunge between 2000 and 2002, and the subsequent variation. These market movements, and especially the price drops, trigger strong and long-lasting emotional responses from investors, diverting their attention from the long-term annual returns generated by the equity market.

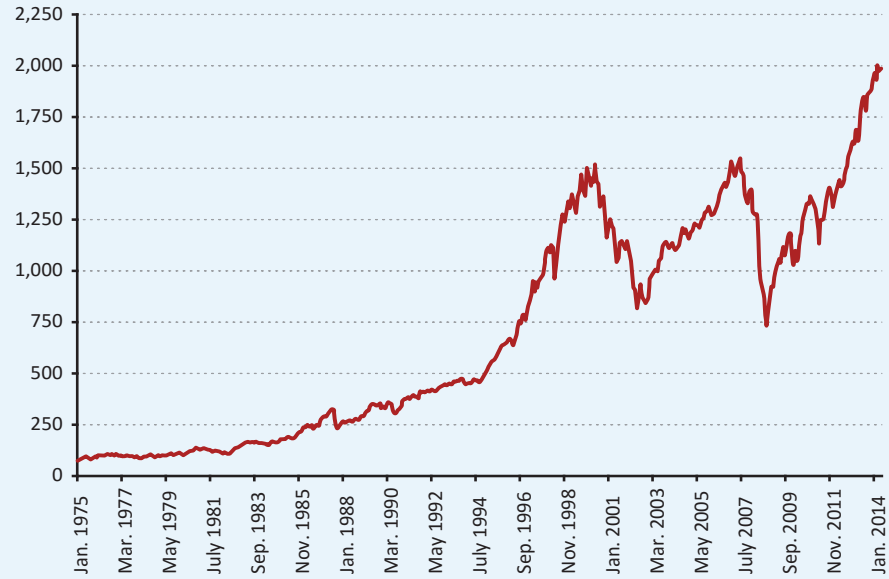
By contrast, if monthly returns are shown on a histogram representing the distribution of returns, a completely different message can be relayed. The average returns are positive, and 63 per cent of the returns are positive. This means that in the case of an equity market investment, the chances are good with regard to long-term wealth accumulation.

The long-term success of an investment does not mean that the portfolio consistently generates positive returns each month, but that we profit from the chances.

In another approach, monthly returns can be put in pairs, the highest with the lowest, then the second highest with the second lowest, and so on. Out of the 462 monthly data points, we get 231 pairs of returns, only five of which are negative. In addition, after a negative return, nine months pass on average until a positive one offsetting it emerges, which highlights the nature and quickness of equity markets' self-healing processes.

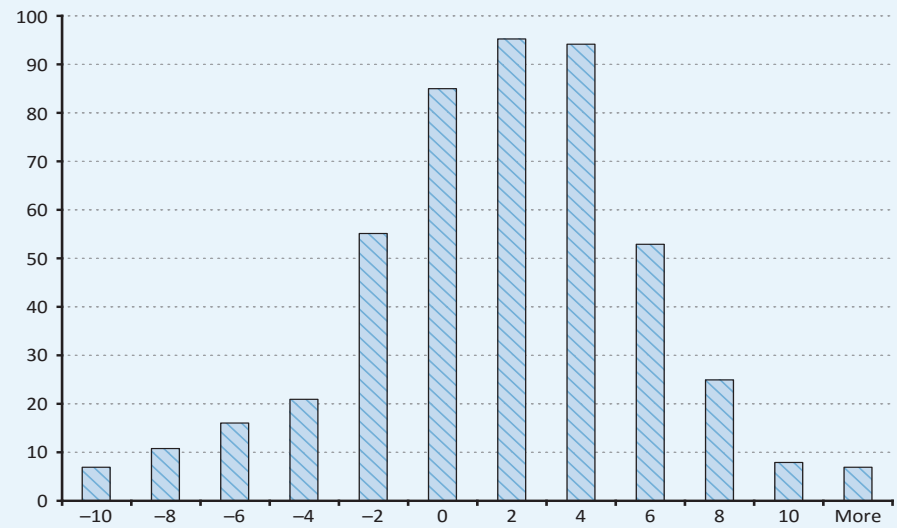
Now we understand how harmful investors' emotional response to a falling equity market is in the wealth accumulation process, and how detrimental the exiting of the market or the liquidation of investments triggered by myopic loss aversion can be. Compared to investors' emotional decisions to enter the market, a buy-and-hold strategy is more successful, and it requires no special knowledge, only patience.

Chart 3
Development of the S&P stock price index



Source: Reuters

Chart 4
Distribution of the monthly returns on the S&P stock price index
(Between January 1975 and June 2013)



Source: Reuters

4.4.2 Taking into account behavioural biases in financial planning

In addition to the previous illustrative example, we present another example that aims to convince clients in general not to fall into the traps identified by behavioural science. Pompian (2006) believes that financial advisers need to be more thorough about reforming the financial planning process provided to clients. The presently applied process – assessment of risk tolerance, exploration of financial objectives and limits, mean–variance optimisation – should include the identification and management of behavioural biases as well. Pompian (2006) gives an overview about the correlation between the classification based on gender and the Myers–Briggs personality types and behavioural biases. Men are characterised by overconfidence and high risk tolerance, while in the case of women we see overcautiousness and risk aversion. Similar to gender, the decision-making features of the different personality types can also be identified.

Pompian (2006) claims that from a practical perspective, not all behavioural biases can be corrected in the case of the majority of clients. However, depending on the financial situation of the client and the nature of the bias, an appropriate balance can be struck. This can be implemented along two principles.

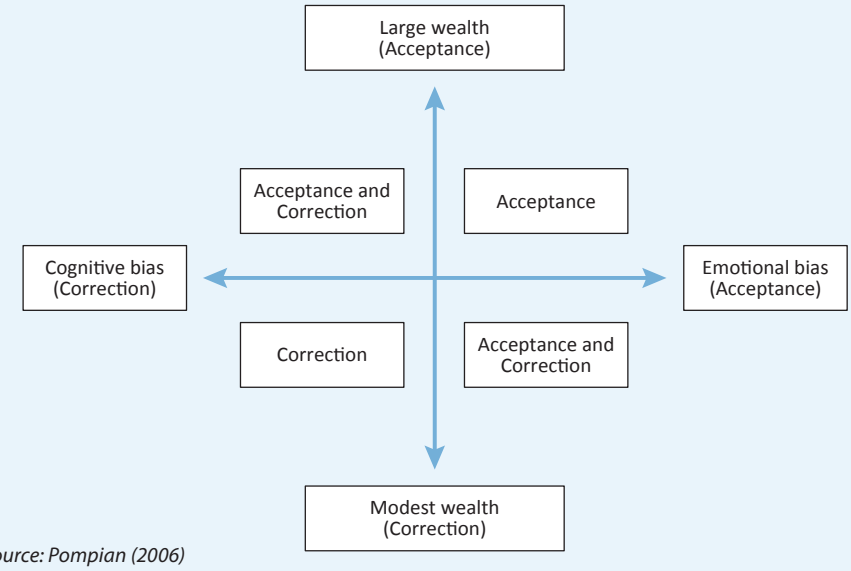
- First principle: In the case of a less wealthy client, the behavioural bias should be corrected, while in the case of a wealthier client, it should be accepted.

In the case of a small investor saving for retirement, the greatest risk is that the accumulated wealth will be insufficient to cover all financial needs until the end of the client's life. In such a case, the wrong asset allocation threatens the long-term financial security of the client, which warrants the correction of behavioural biases. By contrast, in the case of a wealthy investor, when only a low-probability event, for example an equity market meltdown, threatens the client's day-to-day financial security, behavioural biases can be tolerated and accepted. We have to emphasise that improving the client's financial literacy is warranted in this case as well.

• Second principle: The behavioural bias should be corrected if it is cognitive, and accepted if it is emotional.

Behavioural biases may be either cognitive or emotional. The cognitive biases such as anchoring or the availability or the representativeness bias can be corrected through a wider information base and appropriate advice. By contrast, emotional biases mainly based on intuition such as the ability to accept potential loss, are harder to control.

Chart 5
Visual representation of the two principles



Source: Pompian (2006)

Pompian (2006) proposes a framework for deviating from the result of the standard mean–variance optimisation by taking into account the client's financial situation and behavioural biases. The basis of the framework is that investment policies typically allow for a +/-10% divergence in the individual asset classes as compared to the equilibrium allocation. Based on this, the author proposes a maximum divergence from the mean–variance optimisation of 20% in total, to take into account the financial situation and the behavioural factors. The difference between the behavioural allocation

and the mean–variance allocation can be calculated as the sum of the relative differences between the two, weighted by asset classes.

Table 2
Example for an asset allocation adjusted with behavioural factors

Asset class	Mean–variance optimisation	Behavioural allocation	Absolute difference	Relative difference	Weighted relative difference
Stock	70	75	-5	7%	5%
Bond	25	15	10	40%	10%
Cash	5	10	-5	100%	5%
	100	100	Behavioural adjustment factor=20%		

Forrás: Pompian (2006)

The asset allocation proposed by Pompian (2006) accepts the satisfaction of emotions to a certain extent, therefore it does not produce an extreme solution like Howard, who proposes 100% equity investment and completely rejects mean–variance optimisation. Overall, there is no consensus approach in the literature regarding how to take into account behavioural factors in the investment process.

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