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Emotional Finance: The Impact of Emotions on Investment Decisions

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Abstract

Emotions have a decisive influence on individual investment decisions and thus on market developments. Collective behavior, which often prevails in markets, can trigger the development of speculative bubbles as, more often than not, investors rely on trust in an attempt to reduce the uncertainty and complexity prevailing in markets. Based on the developments surrounding German financial services provider Wirecard in 2020, this contribution explains why retail and institutional investors decided to trust the company's narrative in an attempt to reduce uncertainty, despite increasingly obvious large-scale accounting inconsistencies.

Keywords

Behavioural Finance, Emotional Finance, Uncertainty

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*"Individuals who cannot master their emotions
are ill-suited to profit from the investment process."*

Benjamin Graham (1894-1976)

I. Introduction

In virtually every single aspect of human life, decision-making features emotional components. Decisions are not based on strictly rational behaviour. Yet, the overwhelming number of economic models is based on precisely the assumption that they *are*. Even contemporary models still consider the impact market participants' (unconscious) emotions exert on behaviour in general and on investment decisions in particular to be, at best, moderate.

While classical investment theories assume that investment decisions always result from a strictly rational process and that investors can forecast future developments free from any distortion, behavioural finance (more realistically) assumes that investors frequently act irrationally, thereby being subject to considerable distortions (biases) with regards to perception and evaluation. However, provided market participants understand these, adverse consequences might be accounted for *ex-ante*.

Neurofinance (Emotional Finance), which typically benefits from a sound microeconomic foundation, attempts to determine to what extent unconscious processes influence individual investment decisions, i.e. what significance emotions have for investment decisions and the perception of risk. It is crucially important to obtain a better understanding of the individual decisions ultimately determining group dynamics (i.e., collective behaviour) prevailing in selected markets as any such herd behaviour can indeed favour the development of speculative bubbles.

II. Human Behaviour Under Uncertainty

II.1. Homo Oeconomicus

The homo oeconomicus is the always rationally-acting agent of neoclassical economics. However, this assumed persona only stands up to scrutiny in an (unrealistic) environment of certainty or risk. Within a decision-making process, the homo oeconomicus is neither subject to emotions, nor is his consciousness subject to limited absorption capacities (Thaler and Sunstein, 2017, p. 16). In a nutshell: the homo oeconomicus is able to swiftly and precisely determine all options on the basis of objective probabilities known to him as there are no information asymmetries. This allows him to always maximize his own benefit. Social benefits such as fairness or altruism are entirely irrelevant in this context (Camerer, 1999, p. 10576).

Needless to say, the concept of the homo oeconomicus is unrealistic. Nevertheless, in order to develop (economic) models, it is indispensable to make simplifying assumptions regarding the decision-making behaviour of market participants; a modus operandi comparable to laboratory experiments in physics conducted in a vacuum. This procedure derives from highly simplified assumptions, without which meaningful results simply could not be obtained. Models are intended to depict an excerpt from reality, which means complexity must inevitably be reduced (Beck, 2014, p. 7). In order to fully understand market participants' investment decisions under uncertainty (particularly ignorance), preference adjustments subject to environmental conditions, and in clear contradiction to the concept of the homo oeconomicus, need to be taken into consideration.

Traditional economic models assume that market agents operate independently of any personal reference points. Behavioural economics, however, refutes this assumption through

experiments in which decision-makers repeatedly behave in contradiction to neoclassicism's axiom of ratio. The most prominent example perhaps are investors holding on to losing stocks for far too long so as not to accept/realize the loss. In the event of a sale, homeowners typically consider the price they had paid in the past, i.e. they refer to a mental anchor based on historic prices. Current market conditions, which from a strictly rational point of view are crucially relevant for pricing, are often not taken into account (Söllner, 2015, p. 272).

II.2. Behavioural Economics

Behavioural economics aspires to describe actual human decision-making by complementing neoclassical concepts with psychological findings from experiments. It is based on methodological diversity. Findings from Thaler (1980, 2017) and Kahneman and Tversky (1979, 2011) emphasize – not least in the context of Prospect Theory – weaknesses and limitations of human thinking. Gigerenzer (et al. 2008 and 2011) and Simon (1990), on the other hand, show that intuitions and simple mental abbreviations (heuristics) can also be efficient tools for forming a judgment – and do not necessarily lead to systematic errors in reasoning and cognitive distortions. This applies to an environment of uncertainty. Therefore, the differentiation between risk and uncertainty, according to Knight (1921), is the foundation of recognition and evaluation – and thus a prerequisite for any successful application of heuristics (as in the so-called heuristics revolution). Gigerenzer pursues the Enlightenment approach and thereby extends Simon's concept of ecological rationality and bounded rationality (Simon, 1990, p. 7).

Within the recognition process, the decision maker recognizes that a problem can be solved by applying a heuristic. The evaluation process which follows thereafter then relates to which heuristic is most suitable (Gigerenzer, 2008, p. 58). Gigerenzer and Goldstein (2011)

were able to demonstrate that these supposedly simple decision-making strategies (i.e., rules of thumb) regularly exceed the quality of neoclassical mathematical models when it comes to providing correct answers under time pressure and limited access to information, or in a domain in which the decision-maker has less knowledge: knowing too much can in fact be a disadvantage when applying the recognition heuristic.

In the case of risk, however, neglecting objective probabilities and instead relying on less complex decision-making processes is outright negligent. In the event of uncertainty (e.g. a black swan event), an analysis of how heuristics influence judgements represents an equally important and relevant extension of traditional economic theories.

III. Neurofinance

III.1. The Impact of Emotions

In contrast to logical reasoning or knowledge, emotions constitute an instinctive or intuitive feeling, which usually arises outside the scope of an individual's consciousness, and therefore cannot be directly influenced (Taffler, 2014, p. 2). However, a cognitive process is a prerequisite for the occurrence of emotions, i.e., emotions always have a cognitive basis (according to cognitive theory).

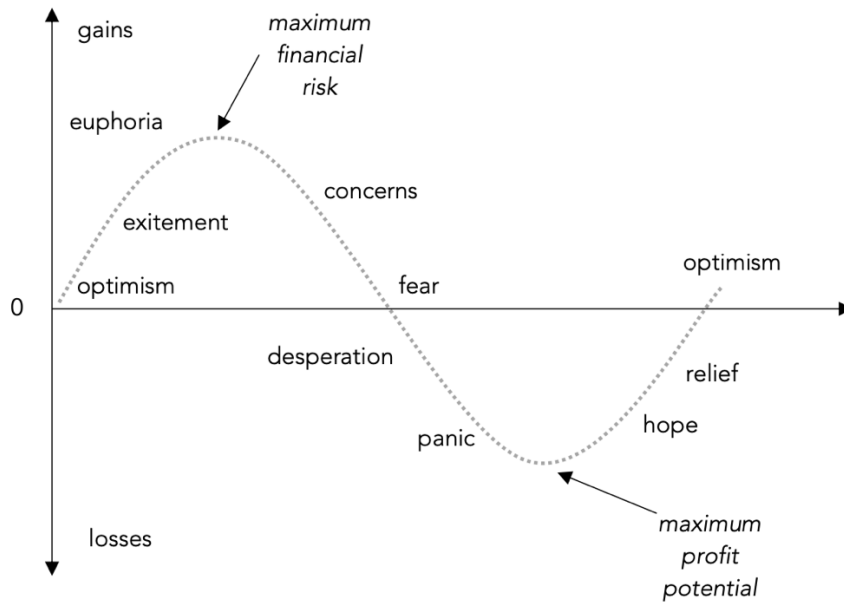
Any human's conscious personality corresponds, inter alia, to their socialized personality – and unconscious patterns do so even more. The conscious personality is responsible for corrective and restraint functions and for reducing the egoistic motives related to the subcortical limbic centres which process emotions. During late childhood humans typically learn what is considered correct behaviour in a social context – a process also underlying the concept of

herd behaviour in financial markets. A socialized personality might well have clear and reasonable insight (reason/rationality) into certain issues, but could nonetheless behave abnormally as a result of the limbic system's influence. Cognitive-intellectual abilities (mind-based) appear to only be of subordinate relevance in determining behaviour (Roth, 2017, p. 143).

Intellect refers to the convergence of reasoning and understanding. More than 2,400 years ago, Greek philosophy argued that through their intellect, humans had the ability to discover and maintain the principle of (world) order. Whereas Plato understood this to have been obtained through pure reasoning, Aristotle argued that empirical studies were the basis. Their opinions have left their mark on today's discussion as they are reflected both in modern natural sciences and in Locke's and Hume's empiricism, which differentiates itself from pure rationalism. Ancient and later stoic principles of mind and reason explicitly exclude the role of emotions within decision-making as these could not be related to rational reasoning and actions (Roth, 2017, p. 146). It was not until the late 20th century that Freud considered the impact of predominantly unconscious emotions in the context of psychoanalysis. However, he understood reasoning and understanding to have little more than an *ex post* rationalizing function (Roth, 2017, p. 148).

Decisions made on the basis of emotions are usually not based on rational evaluations (i.e., maximizing expected utility in accordance with available fundamentals), but on feelings such as optimism or euphoria (known as affect heuristics) which humans perceive in a certain situation (Fig. 1, Kahneman, 2011, p. 175).

Figure 1: Stock market development and emotions



Source: Authors' own work based on Beck, 2014.

The uncertainty related to an investment process and the difficulties in correctly assessing future developments trigger a feeling of excitement and tension. Depending on the performance of their investment, investors go through different emotional states which are often self-reinforcing (see Fig. 1, and the Wirecard bankruptcy case below).

Developments in financial markets are inherently unpredictable. This uncertainty causes two types of emotional reactions among market participants: a neurological and a psychological one. Neurofinance seeks to ascertain to what extent unconscious processes influence individuals' behaviour and thus developments in financial markets. In this context, particular emphasis is placed on illusion (i.e., imagination), which, from a psychoanalytical perspective refers to the idea of wish fulfilment and distorted reality (Taffler, 2014, p. 3).

From a neurological perspective the functioning of mirror neuron systems is of central importance. The pictorial representation of a certain event in a mental image is typically sufficient to evoke emotions which trigger actions in line with the narrative – *without this event actually having occurred* (Bauer, 2005, p. 23). In such a case, the human brain does not distinguish between *information generated by imagination* and *information gained through actual experience*. Both alternatives show the same impact on the evaluation of a problem that needs to be solved in order to avoid cognitive dissonances and regain a feeling of certainty and control. The mind tries to process thoughts either in pictures or in sentences even though neither language nor pictures are sufficient to represent the content of impressions as most of them are not accessible to conscious inspection (Pylyshyn, 2003, p. 113).

Further, the tendency to neglect distinctions between evaluations based on narratives or imagination and evaluations based on actual experience is fundamental to the formation of illusions. Illusions result from the human brain's limited perception capabilities. Such limitations are advantageous as they enable humans to exclusively focus on the most relevant information; in addition, they enable abstract thinking. This helps humans develop the ability to draw conclusions from a particular experience and apply the newly gained knowledge to a related decision-making challenge in a different environment. The brain needs c. 150 milliseconds (this is the same time as the proverbial blink of an eye) to process a visual stimulus (Thorpe et al., 1996). As the brain is not able to process every relevant impression at once it seeks to accelerate the process in order to obtain a faster outcome. In that case, the brain does not experience the presence itself as to do so would take too much time. Instead, it creates an "individual presence" by making inferences out of limited data to predict what might follow next. As a result, cognitive dissonances could arise, that need to be rectified afterwards. It is

precisely these cognitive dissonances which, in turn, pave the way for humans' illusions (Thorpe et. al., 1996).

Traditional psychoanalysis divides emotions into two categories: pleasant and less pleasant ones (Taffler, 2018, pgs. 630-653). This division is largely consistent with the neurobiological explanation, according to which emotions are pleasant or less pleasant mental states in the limbic system. Emotions arise in the interplay of different areas of the brain, of which the limbic system is generally considered to be the most significant. The prefrontal cortex (as part of the neocortex) converts emotional stimuli from the limbic system into conscious feelings, i.e., it processes emotions by integrating them into the general view, allowing humans to act in a manner they perceive to be optimum.

Inter alia, the limbic system includes those functions which are responsible for the unconscious development and regulation of physical needs, emotions and feelings as well as the release of the neurotransmitter serotonin (Roth, 2017, p. 66). Another area, the so-called amygdala, is the centre of behavioural assessments based on fear. The mesolimbic system represents the brain's reward system as it produces the human body's very own opioids which trigger positive emotions such as euphoria and ecstasy. Decision makers are motivated to repeat events that caused strong positive emotions and thus an increase in the dopamine level (emotional learning) (ibid., 2017, p. 69). Considering the lessons learnt from cognitive biology, this process can explain the so-called fear of missing out (FOMO) (see the Wirecard bankruptcy case below).

Investment decisions (both in the case of retail and institutional investors) are inevitably associated with nervousness, excitement and tension concerning potential gains (satisfaction) or losses (dissatisfaction). This conflict of interest between diametrically opposed emotions is

usually attenuated by (unconsciously) suppressing or even generally negating the less pleasant feeling, while success leads to confidence and a heightened appetite for risk (Coates, 2012, p. 166). How individuals perceive and react to threatening or positive situations depends on the degree of confidence, self-assessment, self-efficacy and experience they have. The classification of perceived information depends on the agent's neuronal disposition and thus, on already existent conditioning and associations toward a specific (financial) matter (Rapp and Cortés, 2017, p. 84). Even though any strictly rational investor is well aware that a security's price might either rise or fall, psychological reality always (wrongly) suggests an economic gain.

III.2. Purchasing Securities versus Gambling

Speculating with securities features remarkable parallels to gambling. The tendency to take on highly speculative commitments such as investing in penny stocks, for example, correlates positively with the willingness to gamble (Kumar, 2009, p. 1891).

According to endocrine approaches, securities trading (depending on the amount of capital invested) is like physical exertion which, in evolutionary terms can be compared to the release of hormones during a physical fight for survival. The release of steroids and dopamine triggers the so-called winner effect. Once the mesolimbic system has registered a success, the brain transmits the signals which demand a continuation. Thus, only few gamblers (investors) manage to stop gambling once they have made a profit. What is more, the vast majority of gamblers assume that, in due course, they will be able to convert losses into profits. Both speculation and gambling lead to the erroneous assumption of a possible control of the uncontrollable (the so-called control illusion bias) among market participants (Kumar, 2009, p. 1893). Humans, more often than not, act as if they can control and change the outcome of chance

events (Langer, 1975). Under certain circumstances, this can lead to an overestimation and *ex post* idealization of investment decisions (so-called hindsight bias) on behalf of market participants: a (systematic) error which is often reflected in investment decisions of both retail and institutional investors.

III.3. The Importance of Trust

In an attempt to reduce financial markets' increasing complexity and the uncertainty relating to it, retail investors often appear to be satisfied with supposedly simple answers to complex questions. This illustrates the fundamental importance of trust in the context of any investment decision. Investment decisions cannot be separated from uncertainty as investors are unable to accurately predict the consequences of their actions. More often than not, this leads to anxiety or even fear, which is (unconsciously) suppressed. Within this process, trust is of fundamental importance, as without trust (and confidence), investments are impossible. Trust, however, in the absence of *ex ante* knowledge concerning the outcome of an investment decision, triggers an (emotional) bond with the securities in question. An uncertain outcome, in turn, makes an investor vulnerable, as it requires the investor to rely on the market – or other market participants (Shapiro, 2012, p. 105). Put simply, humans seek to reduce the inevitable uncertainty related to investment decisions through trust (Dierks, 2005).

III.4. Herd behaviour in Financial Markets

In contrast to so-called econs, humans are indeed influenced by their social environment; an instinctive feature which bears with it both advantages and disadvantages. Through their ability to imitate others' behaviour, humans can adapt and learn without having to previously gain the relevant experience themselves. Even though this can greatly enhance efficiency

in a decision-making process, it can also lead to systematic errors of judgment if the behavioural patterns which are imitated remain unquestioned.

III.5. Investors' emotions and the 2020 Wirecard bankruptcy

The peculiar interplay between emotions and investment decisions can be exemplified using the case of German financial services provider Wirecard, whose market capitalization of €22.5bn in September 2018 (at that time more than Deutsche Bank) meant it replaced Commerzbank in the German blue-chip DAX-30 stock index. Between 2008 and 2018, Wirecard's share price had skyrocketed, growing 3,000% to a peak of more than €190. Nonetheless, from 2015 onwards, UK newspaper Financial Times (FT) had repeatedly highlighted inconsistencies in Wirecard's accounting. The FT's message, however, had little to no effect on the development of Wirecard's share price; investors (i.e., the market) placed more trust in the potential growth prospects of Wirecard than in a newspaper's cautionary tales (which *ex-post* proved to be well-founded). This (blind) trust was a feature exhibited by retail and institutional investors (e.g., DWS) alike.

A variety of cognitive distortions and the attempt to avoid cognitive dissonances caused this behaviour. Among others, these include investors' fear of missing out on future price gains (FOMO), the tendency to ascribe a higher level of truth to statements that have already been heard than to those that are heard for the first time (truth effect), or the continued persistence in following a path based on a (questionable) hypothesis, which has long been largely proved wrong by the availability of more recent information (backfire effect). Cognitive dissonance arises within an environment of conflicting attitudes, beliefs or behaviours. This causes a feeling of mental discomfort leading people to the adjustment of conflicting factors in order to

restore balance and reduce discomfort and thus uncertainty (McLeod, 2018). The principle of cognitive consistency, or, in other words, the principle of avoiding dissonance, suggests that humans strive for harmony in their attitudes and behaviour (Festinger, 1957). When inconsistencies arose in the case in question – e.g. continuous information about the untrustworthiness of Wirecard’s accounting versus the personal social environment’s opinion about how Wirecard might be a “once in a lifetime” investment – investors obviously chose to continue investing and took crashing prices as a signal to buy more shares. They chose trust over reason and followed the company’s narrative.

Trust further favours investors’ herd behaviour, i.e., imitating other investors’ behaviour whilst wilfully neglecting their own information, thereby encouraging the formation of speculative bubbles. In other words, there appears to be a clear causality between (retail and institutional investors’) emotions, herd behaviour (in financial markets), irrational overvaluations and, finally, potentially devastating speculative bubbles (Dierks and Tiggelbeck, 2019, p. 260). Wirecard filed for bankruptcy in June 2020.

III.6. Trust, Narratives and Investment Decisions

The negative stance vis-à-vis uncertainty, *in extremis* being fear, can be attributed to emotions which have been adopted, i.e., learnt, in a social environment. Accordingly, even (instinctive) fear need not necessarily be an emotion which results from personal experience. Instead, the instinct to imitate others’ emotions – even without having previously gained any related experience – is little other than a highly efficient mechanism to protect one own’s integrity. Put simply: observing, analysing and eventually mimicking others’ behaviour can indeed be considered efficient – even if it means disregarding the potential outcome for the time being (Rizzolati and Craighero, 2004, p. 169).

However, imitating others' emotions – and consequently their behaviour – might trigger the opposite effect, as humans could display rejection or an inappropriate fear in situations in which this proves to be a hindrance or, even worse, outright dangerous. Ultimately, this could trigger irrational phenomena, among them bank-runs and other self-fulfilling prophecies, which arise from market participants observing their peers' potentially irrational behaviour, correctly assessing it to be irrational – but nonetheless imitating it (Dierks and Tiggelbeck, 2019, p. 269).

IV. Conclusion

(Economic) models are little more than an axiomatically simplified exemplification of reality. This becomes particularly evident when portraying human behaviour in the face of uncertainty: a supposedly objective reality is ultimately merely a phenomenon attributed to each individual's subjective perception. This is where emotional finance begins: it is a refinement of economics based on the assumption that emotions have a decisive influence on individual investment decisions – and hence market developments. This article has demonstrated that humans seek to (partially) reduce the uncertainty prevailing in (financial) markets through trust. Using the example of German financial service provider Wirecard's bankruptcy in summer 2020, this article has explained why, notwithstanding evident accounting inconsistencies, both retail and institutional investors (mis)- placed their trust in the company's narrative in an (increasingly desperate) attempt to reduce uncertainty, obviously acting against their better knowledge.

Neurofinance is still in the early stages of being accepted as an interdisciplinary sub-discipline of economics and neuroscience, sociology and psychology. Empirical reviews, to

the extent that these are possible, are pending. Nonetheless, there can be no doubt that further insights into this relatively new area of research will significantly enhance our understanding of both individuals' behaviour under uncertainty and the functioning of financial markets.

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