

UNDERSTANDING THE FINANCIAL DECISION-MAKING PROCESS: INSIGHTS FROM NEUROSCIENTIFIC, PSYCHO-EMOTIONAL, AND CULTURAL PERSPECTIVES

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Abstract: Behavioral finance designates a field of study that analyzes the behavior of individuals in general and of investors in particular. More, it follows to look into how decisions are taken in a financial context. The investigation of investor behavior considers a series of approaches that range from traditional finance to modern finance and behavioral finance (and even neurofinance). Nowadays, investors are constantly exposed to a vast amount of information, including quantitative financial data and financial news presented in the media. They can also be influenced by the opinions and recommendations of their peers in the social environment. Processing this information can be a difficult task, and market participants often use heuristics to simplify the process. Although the human brain is capable of learning and adapting, the decision-making process involves complex cognitive, emotional, and motivational factors that must be carefully considered. Therefore, this paper aims to enhance our understanding of the financial decision-making process by exploring multiple perspectives proposed by the literature, including the neuroscientific, psycho-emotional, and cultural ones. By undertaking a holistic approach into understanding financial decision-making, this paper follows to provide insights that could help investors make better-informed decisions in the future. Ultimately, a deeper understanding of the factors that underlie financial decision-making could have far-reaching implications for the field of finance and not only.

Keywords: Finance, Investor Behavior, Financial Decision-Making, Behavioral Finance

JEL classification: G40

1. Introduction

Traditional finance theory suggests that rational investors carefully analyze risks and returns before making investment decisions in order to maximize profits. However, behavioral finance challenges this perspective by introducing psychological factors that can influence decision-making processes.

The decision-making process is a fundamental cognitive function that involves selecting a preferred option from a range of alternatives based on specific criteria. Decisions in the financial domain (e.g. stock market investments) should meet normative expectations by assessing trade-offs between calculated utilities (such as expected values) and certain financial alternatives. Given a rational decision maker, the investor should choose the alternative with the highest utility regardless of the decision context. According to normative theory (Yates, 1990), information that cannot be calculated from the expected value of the options should not influence the choices made.

In general, economists (typically) rely on axiomatic normative assumptions in explaining the making of an investment decision, while sciences such as psychology and neuroscience provide strong empirical support for interpreting the effects of human emotions on investor behaviour. Understanding the role of emotions in decision-making and their neural basis plays an important role in economic and psychological science. Nonetheless, the cultural factor can play a significant role on investment aspects

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(e.g. risk taking in the case of two investors who possess identical wealth and job security but reside in different regions of the world that will exhibit contrasting responses when it comes to taking risks).

2. Developing the premises in understanding investor behaviour

The human brain is naturally wired to engage in goal-oriented behavior, by employing particular learning and coping mechanisms (Flynn, 2016). Also, humans get to develop certain practices that guide their actions and choices in order to achieve their goals, and these practices are regularly established within the brain. The process of decision-making requires the (synchronized) interplay of motivational, emotional, and cognitive connections to formulate, perceive, and evaluate potential choices. Once a decision is made, our brain – typically - seeks to construct an interpretation of the final outcome that generates functional incentives, both direct (e.g. the experience and joy of opening a bottle of champagne) and indirect (e.g. the value assigned/given to money). Throughout this process, as we come across incentives, our motivational system assesses the value of the anticipated incentive even before the final outcome is known, allowing us to construct an expected interpretation of the future.

According to the findings of Libey and Fetz (2017), when there is a link between the final outcome and a sense of commitment, the motivational system computes the actual value achieved and compares it to the expected value. If there is a difference between the two, the brain calls for additional resources to readjust its course of action. In the case of investors, by the time they have to make an investment decision, their brain is already hardwired to distinguish between the economic and social components of the choice. Such components (of economic and social nature) are rooted in distinct neural networks. These neural networks work together in a coordinated manner and guide the brain in 'regulating' human decision-making (Popescu, 2016).

In examining the foundation(s) of investors' investment decisions, we identified the decision-making process in eight sequential steps (Figure 1) as outlined by Wang and Ruhe (2007). The assumption is that decision-making is a cognitive and intuitive process inherent to human behavior. More, the decision-making process unfolds when we generate choices or when we are faced with selecting a course of action from multiple alternatives, all of which are evaluated based on specific criteria.

Figure 1: The process of decision making

Decision-making process in eight steps			
Step 1 Identifying the problem	Step 2 Establishing the decision criteria	Step 3 Assessing the weight of the decision criteria	Step 4 Determining available alternatives
Step 5 Evaluating alternatives	Step 6 Choosing the optimal alternative	Step 7 Implementing the decision	Step 8 Final evaluation

Source: Adapted from Wang and Ruhe (2007)

The process introduces the step of problem identification (1), followed by grounding the decisional criteria (2). The next step (3) consists in appraising the weight of the decisional criteria. The fourth step (4) or establishing which are the alternatives, comes before evaluating the available alternatives (step 5). Naturally, the next stage in the process (6) involves electing the most advantageous alternative, which comes before implementing the decision (step 7). Last but not least, there is also the final evaluation (step 8).

Multiple studies across various disciplines (including finance, strategic management, behavioral science and not only) have been conducted to better understand the decision-making process with regard to risk (Guthrie, 2003; Elliot et al., 2018). Most of these studies indicate that both organizational and cognitive factors play a role in decision making related to risk (Wang and Ruhe, 2007). Although several theories have explored the influence of economic and psychological factors on risk-taking behaviour (in general), few have been dedicated to investigating the influence of complex emotional and behavioural (or even hormonal) factors on risk preferences and risk assessment in the decision-making process.

Talking about emotions, these can be divided into two categories: (1) immediate emotions and (2) anticipated emotions (Schlösser et al., 2013). Anticipated emotions encompass the feelings that individuals expect to experience as a result of choosing one alternative over another. In contrast, immediate emotions are the actual emotional states that individuals may undergo at the very moment of decision-making. Recently, economists have focused on studying anticipatory emotions such as regret and disappointment, while psychologists have primarily studied immediate emotions.

In this regard, literature has shown that anxiety is often associated with making low-risk investments and conservative financial decisions, whereas anger tends to be linked with higher levels of financial risk-taking. Experimental studies have also shed light on the relationship between emotions and financial behaviors. For instance, individuals who experience greater happiness tend to spend less and are less likely to accumulate financial debt. Moreover, they exhibit greater concerns about the future and tend to save more money. In contrast, individuals are inclined to spend more money when they are feeling sad and depressed (Cryder et al., 2008).

Behavioral finance is a field that examines the real-life behaviors and decision-making of individuals, including investors. In the literature, various approaches distinguish throughout investment behavior analysis. These approaches include: (1) behavioral finance, which explains individual actions and behaviors from psychological and social viewpoints, considering factors such as biases, heuristics, and emotional influences on decision-making, (2) modern finance, which analyses actions through the lens of individuals with economics expertise (emphasizes economic theories and market efficiency), and (3) traditional finance, which advocates for decisions made by considering all the relevant information available (it focuses on quantitative analysis, risk assessment, and expected returns). By exploring these distinct approaches, researchers aim to gain a comprehensive understanding of investment behavior and its underlying factors.

Oftentimes, investors happen to be unaware of their behavioural biases. However, if they were aware of biases, they might act more rationally. When referring to behavioural biases, they include both cognitive biases (anchoring, representativeness, mental accounting and availability bias) and emotional biases (risk aversion, regret aversion and overconfidence). Kahneman and Tversky (1974) examined the cognitive mechanisms behind systematic errors in ordinary people's thinking. They discovered that emotional and psychological factors were responsible for altering the behavior of the individuals they sampled, particularly in situations in which individuals were confronted with unfamiliar information.

Pompain (2006) states that standard economic theory is designed to provide primarily mathematically structured solutions, viewing individuals as economically rational subjects. In contrast, behavioral finance aims to replicate the complexities of the human mind, being grounded in observed behaviors. This emerging field within economics focuses on the economic aspects of deviations from rational behavior exhibited by individuals. It explores the effects of cognitive distortions, as well as the psychological and emotional states of individuals. Consequently, human behavioral factors play a significant role in shaping decision-making processes. Related to human behavior, Dolan (2002) identified several key psychological, emotional, and cognitive factors as it follows: (1) emotional factors (love, hate, sadness, happiness, panic, anxiety, helplessness, depression, despair), (2) cognitive factors (expertise, knowledge, recognition, concentration, logical thinking, short and long-term memory process, human character), and (3) psychological factors (personality, power, security, self-esteem, certainty, shame, freedom, self-actualisation, health, friendship, attractiveness).

Financial decision-making involves a choice given multiple courses of action - which may also include inaction when necessary. In light of this, there are four distinct decision-making concepts (Figure 2) as proposed by Frydman and Camerer (2016) that investors can employ, based on factors such as the available alternatives, the clarity of criteria, or time constraints.

Figure 2: Concepts of investment decision making

Concept	It is recommended when
Rationality	Information on alternatives can be quantified and centralised; The decision is important; Maximising the outcome is desired.
Bounded rationality	There are few clearly defined criteria; There is unwillingness to allocate a lot of time to make the decision; There is no desire to maximise the outcome.
Intuition	The objectives are unclear; There is time pressure and the analysis involves costs; There are previous similar experiences.
Creativity	The available solutions are not clear; New solutions are needed; There is sufficient time to analyse the problem(s).

Source: Adapted from Frydman and Camerer (2016)

In finance, over the last years new areas of study began to emerge, bringing novelty to financial markets and investment (Tseng, 2006). Among the new areas of study is Neurofinance, which seeks to provide answers to decision-makers' behaviour through neuroscience tools. Neurofinance is a relatively new area of research that seeks to gain a better understanding of financial markets and to highlight the neurobiological mechanisms underlying financial decision-making (Tseng, 2006). Neurofinance aims, among other things, to reconcile traditional and behavioural finance (and to provide additional answers to behavioral finance), demonstrating that emotions are central to decision-making, despite the fact that they are also components of biases. Neurofinance investigates the nervous system and the brain (as unit of analysis), and does not consider whether investors are rational or irrational, but seeks to analyze the brain areas active at the time of decision making using special processing equipment (Ascher et al., 2016).

3. Financial decision-making viewed from the neuroscientific perspective

Decision theories are widely applied in many disciplines such as computer science, management, economics, sociology, psychology, political science and statistics. Over the past years, different decision strategies have been studied, explained and analysed from different angles and fields of application. For instance, the Expected Utility Theory (EUT) – axiomatic theory - explains the decision-making process through investors' rational expectations of payoffs. However, to date there is no consensus on a mathematical decision model nor a rigorous cognitive process for decision making.

Decision-making is a crucial aspect of human behavior that involves integrating various types of information (such as sensory inputs, emotional responses, past experiences, future goals etc.). This information must be combined with data regarding uncertainty, time, cost-benefit assessment and risk assessment in order to determine the optimal choice for each individual (Lynn et al., 2015). The decision-making process also operates under additional constraints like speed and adaptability to dynamic environments (while still maintaining a level of flexibility). Although the complexity of the process can appear frightful, researchers already began working on underlying its mechanisms by examining the neural processes in the human brain. Thus, this crossroads of research has laid the foundation for what we know today as the field of cognitive neuroscience.

In the literature, the neuroscientific component of decision-making is not yet addressed in depth. However, decision-making problems are recognised in the neuropsychiatric hemisphere, particularly

when it comes to dementia or drug addiction. Nevertheless, the development of non-invasive techniques for studying brain activity in recent years has undoubtedly led to the emergence of a new phenomenon in neuroscience. These, together with advanced statistical methods, have opened up new horizons and created new disciplines (e.g. Neurofinance, Neuromarketing, Neurostrategy etc.), focusing on investigating the neural circuits involved in different types of decisions (Da Rocha et al., 2013). The neural approach to financial decision making has become increasingly evident with early studies in the field (Lo and Repin, 2002; Kuhnen and Knutson, 2005; Hsu et al., 2005), looking beyond the psychological aspects and deeper into the minds of decision makers. Thus, a more realistic model of decision making was created, which was able to explain different individual economic behaviours (Dedu and Turcan, 2010) and which combines neurological and physio-psychological tools with experiments already used in the study of behavioural economics.

The distinction between (1) behavioural finance and (2) neurofinance is that the former (1) investigates how individuals act and interact in the process of making financial decisions and interprets these actions based on psychological concepts and theories, while the latter (2) examines how and why these behaviours occur based on observations of people's brain and hormonal activity (Tseng, 2006). These two approaches have different units of analysis. Neurofinance uses the brain as the unit of analysis, whereas behavioral finance uses the individual (Gippel, 2013). Overall, Neurofinance analyses capital markets by applying neurotechnology to observe and understand the investment and trading behaviour of participants. This is done by (1) identifying the psychological aspects that affect behavior, (2) associating these with outcomes, and (3) developing methods to improve individual performance in the capital market (Tseng, 2006).

There are two main cognitive neuroscience approaches to date. (1) The first approach focuses on capturing key aspects of difficult decisions, such as choices that involve trade-offs between the value of a reward and the associated risk. Studies of these decision-making processes highlight the important relationship between emotion and cognition, and demonstrate that the frontal lobes of the brain play an important role in making more difficult choices (Collins and Koechlin, 2012). However, efforts to understand neural processes at a much more detailed level have led to inconclusive results. (2) A second approach, which can help elucidate neural activity in decision-making, seeks to examine the whole process by taking into account all the factors that may influence decision-making. Thus, the extensive literature on human decision making is used in order to identify the processes involved decision-making from a theoretical standpoint. In addition, existing data from several areas of neuroscience, such as associative learning, addiction research, or impulsivity studies, provide starting points for developing hypotheses about the neural basis used in the entire decision process.

4. Financial decision-making viewed from the psycho-emotional perspective

Behavioural finance brings together economics and traditional finance with the application of social science. Behavioural finance tries to find answers for abnormal situations in the financial market and looks into how investors make (unavoidable) mistakes in their investment decisions. Although classical finance is at the core of behavioural finance, psychology and social science are considered integrant parts of it (Kroszner and Shiller, 2011).

Among the behavioural factors that are considered in individual investors' financial decisions heuristics distinguish themselves. Heuristics can be defined as mental shortcuts that individuals use to simplify complex decision-making processes (Kahneman and Tversky, 1974). These are based on past experiences, biases, or generalizations, and they provide a simplified approach to problem-solving and decision-making. Individuals resort to such cognitive strategies because they are able to make judgements and decisions in a quickly manner, oftentimes relying on limited information or cognitive resources. Still, heuristics can also lead to cognitive biases and errors in judgement when applied inappropriately.

In the cyclical investment process (which includes gathering information, selecting investment preferences, the process of investing, holding investments and selling them), there are many emotions

and unforeseen events involved. When emotions are mismanaged, the outcome can lead to high costs for the investor. Professor Thorsten Hens (2016) of the University of Zurich associates a rollercoaster with the entire investment process, where psycho-emotional experiences lay at the base of the process.

Hens explained the investment decision-making process through an (hypothetical) investor that invests in shares on a stock exchange at a given time. According to Hens, the psycho-emotional component is present throughout the financial cycle. Market fluctuations are exemplified by the author (through the rises and falls of the market over a given time frame), thus creating the image of a rollercoaster. Throughout the rollercoaster, initially, the investor senses a rise in the financial market, expresses feelings of excitement (positive emotions) and thinks about converting his money into securities if the market continues to follow this trend. Next, the investor observes that the market is going up and decides to buy shares even at a higher value than he started with. As the price of the shares he buys continues to rise, he experiences feelings of happiness and self-confidence (positive emotions). His feelings of happiness turn to euphoria and the emotional component takes precedence over the rational one so that, even if the market falls, he continues to invest money, blaming it all on a short-term market correction (positive emotions). Negative emotions (disappointment) arise when the investor finds that the market is not recovering/trending upwards and, being highly risk averse, decides to sell all the shares he owns in the portfolio at a price much lower than the purchase price (negative emotions). Despite the fact that he no longer owns financial securities, he continues to follow the market movements and when he sees a price rise again, guided by emotions of excitement, he decides to invest again (positive emotions). He puts this decision down to a chance of future gains, basically returning to the initial point in the rollercoaster.

5. Financial decision-making viewed from the cultural perspective

The cultural component is another factor worth considering in the investment decision-making process. According to Hofstede (2001), culture represents a collective programming of the mind that manifests itself in individual values and norms and is reflected in everyday actions. Culture can be described as a “software of the mind”, being stable over time. This implies the existence of a social value system shared by dominant groups/institutions (family, school, etc.) in which certain behaviors are encouraged and lead people to behave consistently. These shared features of culture are passed on from one generation to the next through structures and systems that they themselves have created.

It is important to note that with regard to investors, their behavior and social interactions are also dependent on the country in which they live, as a result of the fact that the cultural environment determines their view of reality. Although cultural finance is a recent field of research, there is already a noticeable interest in the literature. Contributions focus on diverse topics such as investor strategies (Chui et al., 2010), mergers and acquisitions (Ferris et al., 2013) or international asset allocation decisions (Anderson et al., 2011).

The interpretation of human decisions can be explained on the basis of cultural background through the lens of dimensions defined by Geert Hofstede. Hofstede's five dimensions have been summarised from a social-cultural study of more than 100,000 IBM employees in over 40 countries as follows over the next paragraphs.

Individualism vs. collectivism. An individualistic culture stresses the uniqueness of the individual in relation to the social group. The individual is rewarded for the time he or she devotes to himself and for having freedom of choice. In contrast, a collectivist culture emphasises that the needs of the group take precedence over the needs of the individual and holds that each individual is an integral part of the group. Such cultures reward interdependence and group action. Individualism is associated with excessive trust and attribution bias (Chui et al., 2010). More, individualism encourages individual actions and choices (Li et al., 2013), leading individuals to be more confident in their own abilities, overestimating the accuracy of the predictions they make and being more risk tolerant (Ferris et al., 2013). Distinctly, in collectivist cultures, investors rely more on the opinion of others (Chui et al., 2010), thus noting the herd effect.

Power distance. Cultures with high power distance function on strict hierarchical relationships between subordinates and superiors, so that the latter are solely responsible for decision-making. Low power distance cultures see people as equal contributors to decision-making and the information that shapes those decisions is considered equally important, regardless of who they come from. According to Hofstede (2001), in countries where high power distance is manifested, people tend to be more dependent and have less initiative, which is consistent with the presence of higher levels of herd effect.

Masculinity vs. femininity. Masculine cultures emphasise achievement and wealth and have distinct roles for men and women. This category of cultures sees leaders as the most important decision makers in the workplace. Feminine cultures, on the other hand, emphasize well-being, egalitarianism, development and maintenance of social relationships. These cultures favour group decision-making through open dialogue and shared consensus. In the investment area, studies show that masculinity is usually associated with overconfidence and risk-taking behaviour (Beckmann et al., 2008). Barber and Odean (2001) found that confident investors tend to trade more. Moreover, the same study - conducted on US respondents - found that men traded 45% more than women. In addition, Anderson et al. (2011) concluded that masculinity leads to a higher degree of international portfolio diversification, as a result of the fact that investors tend to believe they have superior information than others.

Uncertainty avoidance. Cultures with high levels of uncertainty avoidance emphasise the use of rules, structures, policies and regulatory practices to control processes. In contrast, low uncertainty avoidance cultures are more tolerant of ambiguity and open to creativity, allowing people to be less stressed. Studies on uncertainty avoidance in financial decisions suggest a positive association between the discussed cultural dimension and risk aversion (Nguyen and Truong, 2013). According to Anderson et al. (2011), investors in countries with higher uncertainty avoidance tend to exhibit a stronger familiarity bias because they prefer to hold safer and more familiar investments. On the other hand, Hofstede (2001) argues that uncertainty avoidance captures the tendency of people to follow the same set of rules, which may denote a tendency to follow the decisions of others.

Long-term vs. short-term orientation. Long-term oriented cultures argue that planning and saving for the future is important. Short-term oriented cultures promote immediate gratification and guide their actions by the principle of "live in the moment". In relation to finance, Shiller (2000) argues that short-term investors tend to join the group (the herd) and enter or exit the market, ignoring crucial factors such as the intrinsic value of the assets they trade.

These five cultural dimensions have proven useful in understanding the decisions investors make. For example, Chui et al. (2010) made the connection between individualism and the impulse phenomenon, finding that investors in individualistic countries produce higher impulse returns. Ferris et al. (2013) applied Hofstede's dimensions to mergers and acquisitions and concluded that executives in countries characterized by higher scores on the individualism scale, lower scores on the uncertainty avoidance scale, and lower scores on the long-term orientation scale tend to underestimate the risk behind mergers and tend to overestimate synergistic gains. Similarly, Mihet (2012) and Li et al. (2013) observed that managers in countries with higher individualism, lower uncertainty avoidance, and lower power distance tend to be more likely to make high-risk decisions. Anderson et al. (2011) concluded that investors from countries with higher individualism invest more in foreign markets and investors from long-term oriented countries tend to hold more diversified portfolios.

6. Conclusions

Understanding the financial decision-making process is a complex endeavor that requires considering multiple perspectives. The present paper explored various approaches, including neuroscientific, psycho-emotional, and cultural perspectives. The decision-making process follows a series of sequential steps, including problem identification, establishing decision criteria, assessing alternative options, evaluating alternatives, choosing the optimal alternative, implementing the decision, and making the final evaluation.

Traditional finance theory assumes that investors make rational decisions based on careful analysis of risks and returns. However, behavioral finance challenges this perspective by recognizing the importance of psychological factors on decision-making processes. Emotions play a major role in financial decision-making. Behavioral biases can affect decision-making and may lead to deviations from rational behavior. Behavioral finance has emerged as a field that considers psychological and social factors in explaining individual actions and behaviors. Moreover, cultural factors can significantly shape an individual's standpoint towards risk and financial decision-making. These factors also highlight the need for a comprehensive understanding of individuals' beliefs, values, and behaviors in different cultural contexts. Last but not least, the field of neurofinance has gained attention by investigating the neural mechanisms underlying financial decision-making. By studying brain activity and using advanced statistical methods, researchers aim to provide a deeper understanding of decision-making processes. Neurofinance complements behavioral finance by examining the brain's role in decision-making and exploring the neural circuits involved.

All in all, a holistic understanding of the factors that underlie financial decision-making can have far-reaching implications for the field of finance. By acknowledging the key role of emotions, biases, and neural processes, investors can make better-informed decisions.

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