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Behavioral finance and the imperative to rethink market efficiency

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Abstract: *According to traditional finance, investors with rational behaviors examine risk and return before making a decision to obtain maximum profit. However, the exploration of the behavioral path results in deciphering the emotions of participants in the financial markets. The purpose of this work is to examine the role of the psychological theory. The aim is to see how the psychological attractions of actors have been able to acquire a central place in finance, giving rise to behavioral finance, which allows a deeper understanding of investment in the financial markets. This finance is not just a simple presentation of behavioral biases, it aims to use results from cognitive psychology to explain behavioral finance and the imperative to rethink market efficiency. Behavioral biases challenge informational efficiency and can be reflected in prices. Thus, it is a question in this work of explaining behavioral of analyzing how the limit of the efficiency of the financial markets marks the starting point of this approach. This is to highlight its main contribution, which improves decision-making process, and study the factors allowing its integration into the field of finance as an alternative model.*

Keywords: Behavioral biases, emotion, financial market, decision-making process, rationality.

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Introduction

Some authors have developed the prospect theory, which postulates that the rationality of economic agents is limited. They based themselves on experimental studies to describe preferences by introducing the notion of risk aversion. The formalization is a descriptive theory of choice under uncertainty based on the results of

numerous experimental psychological studies (El Amri *et al*., 2020). This theory helps to understand the importance of behavioral finance.

Prospect theory shows, in a situation of uncertainty, that individuals follow a reasoning that accounts for behavioral biases. That is to say, that they make their decisions at different levels of rationality where the understanding of this reasoning requires the inclusion of the elements, which come under psychology, and which influence the decision-making process. According to this logic, their decisions can be biased by the elements that affect their reasoning process (Thaler, 1999). This author also argues that, in an efficient market and on events expected in the future.

Before the development of the concept of behavioral finance, many financial and economic theories attempted to explain how investors made decisions and how financial markets worked (Valcanover *et al.*, 2020). Lahouirich *et al.* (2022) claimed that the beginning of behavioral finance occurred around the 1980s, when many theoretical researches developed models of financial markets considering not very rational agents (Birindelli *et al.*, 2023). This approach responds to these challenges by mobilizing the empirical results obtained by Tversky & Kahneman (1992).

The adoption of this behavioral path has made it possible to explain both the dysfunctions observed on the financial markets (Albouy & Charreaux, 2005) and the anomalies contradicting the hypothesis of rationality where individual cognition is reduced to rational calculation alone (Shiller, 2003). Thus, modern finance has included psychology in the financial field (El Amri *et al.*, 2020). An agent is rational when he is able to produce long-term forecasts and make rational choices without being influenced by his emotions.

In the 1990s, Thaler (1999) accepted that cognitive biases could influence asset prices. This area of finance offers (Sahi, 2017). In particular, it makes it possible to provide interesting answers to questions that have remained unanswered concerning the classic model in finance (Albouy & Charreaux, 2005). By taking human behavior into consideration, behavioral finance integrates cognitive biases and investor preferences in order to study their effects on decisions and therefore on financial markets (Bouattour & Miloudi, 2016). Therefore, they are considered as individuals under the influence of their emotions (Wiagustini *et al.*, 2023).

In sum, that is to say that they are affected, when making their choice of investment, by elements, which do not depend solely on the markets but also on human factors. This highlights a dependency between financial choices and psychological considerations. Thus, this discipline gives particular importance to the conduct and emotions of participants in the financial markets, which seems to serve to better, understand the actual functioning of these markets.

This paper initiates a conversation about behavioral finance as a model substitute for traditional finance, along with suggestions for integrating it. The idea is to demonstrate how an investor's conduct is influenced by their emotional condition. To improve decision-making in the financial markets, it is crucial to control the ensuing behavioral biases (Mallard & Durat, 2022). Therefore, after questioning the premise of perfect rationality, this article challenges it by outlining the primary behavioral biases and how their consideration might aid in the development of behavioral finance through a review of the literature and conceptual analysis. What qualities distinguish conventional finance? This work's contribution emphasizes the need of rethinking decision-making processes by highlighting the need to take emotions into account when analyzing investor and market behavior.

The findings hold significance as they enable financial market players to modify their decision-making procedures by enhancing their capacity to identify potential biases that could intensify while choosing assets. These findings contribute to the diversification of options for financial market participant attitude monitoring, which will aid improve risk preference management. Since they give policymakers useful information to help them allocate the resources needed to reduce risks in the financial markets, they are also pertinent to policymakers. This further emphasizes how crucial it is to reevaluate rationality assumptions in order to create models that account for the emotions of financial and economic actors (Aliouat *et al.*, 2022).

According to this perspective, in the first section, we endeavor to present the main features relating to informational inefficiency and behavioral biases. The following section sets out to examine the contributions of this discipline, which have led to it being placed back at the center of the understanding of the anomalies noted on the financial markets. In the fourth section, it is a question of examining the factors allowing the

integration of the behavioral dimension in the field of finance. We conclude by discussing the place of the behavioral dimension and its future in finance and economics in general.

1. Prospect theory and financial markets

1.1 Informational inefficiency

The theory of efficient markets can lead to incorrect interpretations relating to stock markets (Shiller, 2003). Because the financial markets are efficient if they contain all the information continuously. Thaler (1999) argued his position by the fact discovered with the improvement of the studies (Shiller, 2003). However, human intuitions and behavioral biases play a key role in financial decisions. Traditional finance suggests that investments are made by considering risk and return before decision making to maximize profit. In contrast, it introduces the psychological factors that affect decision-making (El Amri *et al*., 2020).

The efficient market hypothesis is based on the idea that most, or at least the most important, investors are rational in the processing of information (Hnaka *et al.*, 2019; Bogatyrev, 2019). This violated the efficient market hypothesis, which asserts that prices accurately reflect publicly available information (Hnaka *et al.*, 2019). In the era of big data, investors are daily confronted with a huge flow of information at a time when economic agents have limited computing capacity. This shows the inadequacy of the notion of market efficiency in the modern big data society. The literature addressing information overload focuses on cognitive problems in particular (Boutti *et al.*, 2019).

The behavior of individuals does not conform to the predictions of expected utility theory (Bouattour & Miloudi, 2016). Hence, the importance of taking into account these cognitive biases of investors and their preferences to better describe and understand their behavior in financial markets (Sahi, 2017).

In processing information, individuals attempt to either overvalue the impact of the information, or undervalue it (Sahi, 2017). This is why De Bondt and Thaler (1995) oppose the market efficiency hypothesis. Prospect theory forms a solid foundation. According to Tversky and Kahneman (1983), utility functions of investors are not defined in absolute terms, they are defined for losses and gains relative to some reference point. According to this theory, individuals are sensitive to variations in wealth (gains or losses) according to a value function, which takes an S-shape (Bouattour & Miloudi, 2016).

More specifically, the concept of loss aversion indicates that investors assess their wealth from a point of reference, and the realization of profits (Mankert & Seiler, 2012). Thisbias guides individual investors' decisions to buy and sell securities and today seems to be accepted by an abundant theoretical and empirical literature (Bouattour & Miloudi, 2016). If financial behavior is not always strictly rational, then a decisive step has been taken in the refutation of the foundations of the standard approach, which puts forward the hypothesis of *homo oeconomicus* and the primacy of markets (Bouattour & Miloudi, 2016).

Thus, the theory of efficient markets is rejected in favor of this behavioral approach, which emphasizes the psychology of investors. Admittedly, for Thaler, the markets are perfect, but for Shiller and Thaler this postulate is rejected in favor of behavioral finance (Levy & Akeb, 2016).

1.2 Behavioral biases

Generally, behavioral theories account for the several types of bias observed (Albouy & Charreaux, 2005). A bias is assimilated to a mental shortcut, which can generate in the individual the recourse to an erroneous interpretation of the situation of choice (Tversky & Kahneman, 1992). These biases are called emotional, when behaviors are guided by emotions and cognitive when it comes to collecting and processing information (Sahi, 2017). The main biases can be presented as follows.

1.2.1 Familiarity bias

Familiarity Bias means that an individual may favor one option over another because it is more familiar to them, even though it has the lowest probability of success. Indeed, between two options offering the same gain, individuals will obviously opt for the choice they know best. In this sense, Albouy and Charreaux (2005) found that companies with the best-known brands to the public are those with the largest shareholding. This preference for familiar titles can give rise to a bias qualified as regional or national depending on the

geographical location of the preferred titles, or even to a bias known as employer when an individual favors the titles of the company that employs him (Sahi, 2017).

1.2.2 Representativeness bias

As an event is observed in the past, investors are led to overestimate its probability that it will still occur in the future. Jegadeesh and Titman (1993) show that the effect of this bias can imply positive returns. However, this effect may be the cause of the overreactions of the prices of financial assets to past information, since the subjects tend to make purchases among the securities whose prices are increasing.

1.2.3 Conservatism bias

Conservatism bias causes investors to overestimate the value of information that confirms their opinions and underestimate information that refute them. In this regard, Barberis *et al*. (1998) show that this bias is at the origin of an under-reaction to public information such as company results announcements. Several works in psychology have highlighted this type of phenomenon, it calls into question the efficient market hypothesis (El Amri *et al*., 2020). The efficient market hypothesis suggests that a stock price reflects all available information (Singh, 2021).

1.2.4 Confirmation bias

According to Jegadeesh and Titman (1993), this bias stipulates that individuals constantly seek information that supports their opinions and avoid those that are discordant. It is therefore a question of granting more importance to the information of the individual which confirms his reasoning. Thus, new information can be rejected if it contradicts an idea already constructed during his experience.

1.2.5 Disposition bias

The disposition effect is that investors keep certain losing securities in their portfolios longer than winning securities. This bias leads investors to sub-optimal management of their portfolios: they sell the securities on which they earn money too quickly. It can create imbalances between supply and demand in a market and consequently alter price formation (Sahi, 2017). This bias is widely studied and admitted by a large number of empirical works (Bouattour & Miloudi, 2016; El Amri *et al*., 2020; Valcanover *et al.*, 2020). These bias impacts decisions to buy and sell securities, which influences price dynamics.

1.2.6 Reverse layout bias

Bouattour and Miloudi (2016) validated the presence of the effect of this bias according to which investors who have securities that incorporate good news tend to keep them, while individuals who hold losing securities prefer to sell them. This behavior seems to be the consequence of a negative relationship effect between the turnover rate and the profitability of securities. In other words, subjects holding securities that incorporate good news will tend to keep them, which translates into a decrease in transaction volume. This phenomenon also explains why the subjects present in the loss region tend to sell their securities, which results in an increase in the volume of transactions. In contrast, those in the gain region are less risk averse and tend to hold on to their winning titles (Bouattour & Miloudi, 2016).

1.2.7 Attribution bias

This bias consists of attributing success to oneself and failure to bad luck. Daniel *et al*. (1998) rely on the effect of this bias to explain abnormal price movements, so by being aware of the attribution bias, subjects can remain humble in both success and failure. This shows that financial market participants can overreact to their private information, which can induce negative long-term profitability.

1.2.8 Overconfidence bias

This bias is the most studied along with the dispositional bias, researchers to explain the extremely high trading volumes in stock markets (Sahi, 2017) often put it forward. A wealth of literature reveals that people tend to be overconfident in their financial and investment decisions. This behavior involves excessive trading and over-active investing leading to lower investment returns (Sahi, 2017). This phenomenon shows that investors overreact when they succeed in a project. This bias means that people believe their investors will overestimate their own skills and expectations of success (Sahi, 2017).

De Bondt and Thaler (1995) announce that overconfidence affects the financial markets in such a way that it constitutes one of the behavioral biases most encountered in the behavior of investors. Over-trust results from the fact that the individual attaches too much importance to his private information. It leads the investor to trade large volumes and too frequently, to the detriment of the total performance of his portfolio. It is associated with excessive risk taking (Lahouirich *et al.*, 2022). Daniel *et al*. (1998) relied on phenomena linked to overconfidence to explain abnormal price movements on the markets. The tendency to attribute the reasons for success to oneself and to reject the causes of failure on others or bad luck can lead to an excess of optimism in investors.

1.2.9 Optimism bias

This bias underlines the optimistic attitude of individuals towards investing. It involves a subjective assessment of risk that leads to overestimating the chances of success and underestimating the risks of failure. To this end, investors can buy securities with high prices compared to their fundamental values, because they anticipate the possibility of reselling them to investors who are more optimistic than they are. Therefore, the moods can have a major effect on the perception of risk, since a good mood leads to optimism and a bad mood exacerbates critical thinking (Sahi, 2017).

1.2.10 Follower behavior bias

Imitation appears to be at the root of follower behavior (Shiller, 2003). This phenomenon is justified by the existence of investors who are not able to process all the information available because of their limited rationality, and they are content to adopt this behavior by following others. Shiller (2003) suggests that these investors are at the origin of the phenomena of excessive reactions. Thus, this behavior is likely to cause prices to diverge in the financial markets by leading to deviations from prices relative to fundamental values.

1.2.11 Emotional bias

Emotions are useful because regulate action's individuals; on other hand, they limit the ability of investors to analyze this process in an objective, reasonable and correct way. Thus, the effectiveness of their decisions decreases because they can experience several emotional states ranging from joy to fear through anxiety and anger (Mallard & Durat, 2022). These emotions lead to more or less determined actions. However, it should also be mentioned that it is emotional prejudices linked to their beliefs that, on the other hand, affect their judgments or their vision. This bias is called emotional because investors' behavior depends on these emotional states (Sahi, 2017).

1.2.12 Framing bias

This bias is also called the presentation effect; Tversky and Kahneman introduce it during their work on behavioral economics. It refers to the fact that faced with a decision or a problem presented in different terms, investors will not have the same decision-making behavior. Finally, it is a tendency that reflects the influence exerted by the way, in which a problem is presented (Tversky & Kahneman, 1992).

1.2.13 Availability bias

This bias reflects the tendency of individuals to estimate the probability of occurrence of an event based on the ease with which they are able to identify examples of this type of event. In the financial context characterized by the financial crisis of 2008 and the sovereign debt crisis of 2011, the availability bias can lead the investor to overestimate the probability of a future crisis (Sahi, 2017). This bias reveals how a complex mix of heuristics and emotions influences investor behavior. It can be qualified as emotional because the behavior will be guided by the emotions of the subjects (Sahi, 2017).

Table 1. Behavioral biases, their impact on choice and the risk that results in the decision

Behavioral biases	**Impact on choice**	**Risk of the decision**
Familiarity bias	Favor the familiar choice	Favor the option whose success is least likely
Representativeness bias	Favor the choice that represents itself well in the past	Overreactions of financial asset prices to past information
Conservatism bias	Choose what preserves your own opinion	Underreaction to public information

Table 1 (cont.). Behavioral biases, their impact on choice and the risk that results in the decision

Confirmation bias	Seek the option that supports past choices	Good information can be rejected if it contradicts the reasoning already constructed
Disposition bias	Holding losing stocks longer than winning stocks	Sub-optimal portfolio management: sell securities too quickly that can yield more
Reverse disposition bias	Keep titles that incorporate good news for longer	Effect of negative relationship between turnover rate and profitability of securities
Attribution bias	Overreaction to private information	Abnormal price movements induce negative profitability
Overconfidence bias	Being overconfident about your decisions	Extremely high trading volumes in stock markets: excessive trading and overly active investing leading to lower investment returns
Optimism bias	Overestimating the chances of success and underestimating the risks of failure	Purchases of securities with high prices relative to their fundamental values
Follower behavior bias	Excessive reactions	Cause prices to diverge on financial markets by leading to deviations from prices relative to fundamental values
Emotional bias	Limit of the ability to analyze the decision process	Judgments or visions are impacted and decisions are more or less determined
Framing bias	Decision behavior depends on the terms and framework of the choice and not on the problem itself	The decision depends on how the problem is presented
Availability bias	Make mental shortcuts based on readily available information	Investor behavior is influenced by a complex mix of heuristics and emotions

Source: established by the authors.

The essence of finance is that the existence of biased assets affects the behavior of investors. This is primarily due to reasons that lead to observing financial market behavior and recommending behavior based on financial economics standards.

This is important when making investment decisions and poses risks to financial markets. In this regard, financial markets may not be efficient enough because the observed behavior is biased and contradictory based on the analysis of financial markets in the classic sense.

2. Development of behavioral finance

2.1 Challenging the hypothesis of perfect rationality

Traditional finance was built around three essential elements, namely the perfect rationality of individuals, the efficiency of markets and the maximization of expected utility. This rationality has two implications. Individuals adjust consistent with maximizing their level of satisfaction according to expected utility theory (Lahouirich *et al.*, 2022).

Indeed, the traditional financial paradigm suggests that agents are rational and therefore maximize their expected utility and all agents update their beliefs according to Bayes' law (Singh, 2021). Rationality involves the ability to reason fairly and objectively. But, according to Simon (1959), there is strong criticism against the assumptions on which many studies have shown results that do not conform to what expected utility theory predicts (Sahi, 2017).

In this sense, Jensen (1978) asserts that none of the statements of economics are truly supported by empirical studies. This is why behavioral finance proposes to abandon the axioms of rational decision, and therefore the thesis of market efficiency (Tadjeddine, 2013. Behavioral finance has its roots in Bounded Ratioality (Wiagustini *et al.*, 2023). They offer a review of the literature on behavioral finance, which shows that it is moving away from maximizing or perfect rationality.

This financial approach addresses the question of decision-making in a situation of risk and offers a new perception of preferences. The discrepancies observed between the results obtained by models constructed based on expected utility and the behaviors observed from experimental studies reveal the existence of biases that contradict perfect rationality. These are factors that explain the dysfunctions observed in the financial markets (Schmidt, 2006). Moreover, the instability of preferences leads to a new conception of rationality, which assumes prospective behavior regarding future preferences (Campbell & Cochrane, 1999).

Indeed, the change of preferences is a reality in the behavior of the agents, this change can directly affect the economic environment, and it is therefore necessary to recognize the existence of a risk due to the variations of these preferences (Cucinelli & Soana, 2023). However, if the agent knows that his preferences will change over time, then his rationality will reside in his correct anticipation of his changes. This is why the approach of Tversky & Kahneman (1992) proves to be more demanding in its definition of rationality.

This approach indeed shows that the maximization of utility does not necessarily coincide with the maximization of preferences. In this regard, behavioral biases, which account for the emotional factors involved in the decision-making process, are responsible for deviations from what perfect rationality recommends. To this end, investors behave with psychological specificities specific to each, and not as a more or less homogeneous set of individuals, as suggested by perfect rationality according to the dominant paradigm in economics.

2.2 Emergence of the concept of behavioral finance and its expansion

It highlighted several phenomena such as stock market anomalies, market bubbles and crashes. To this end, this discipline studies the behavior of the individual, which explains how to understand his investment choice. It greatly shaped this field of analysis, because when finance had become an essentially mathematical discipline, in the 1980s, he initiated work that marked a turning point by reintroducing a human and psychological dimension.

Thus, several researchers have studied behavioral finance with the experimental method (Valcanover *et al*., 2020). It is mainly based on highlighting behavioral biases of an individual nature that violate the assumptions of standard rationality (Albouy & Charreaux, 2005). Thus, she explores how investors make decisions with biases that do not fall within this rationality (El Amri *et al*., 2020).

Economists will routinely incorporate as much "behaviour" into their models as they observe them in the real world, since to do otherwise would be irrational (Thaler, 1999). Today behavioral growing in financial decision and investment by fusing behavior, psychological theories and traditional finance (Singh & Nag, 2016). It proposes to illustrate anomalies in the stock market with the objective of studying this subject (El Amri *et al*., 2020).

In short, the questioning of the hypothesis of perfect rationality has been done. In reality, it is the contribution of Tversky and Kahneman, which constitutes the main reference. The existence of a set of cognitive biases underlines the dependence of behavioral finance on the results of psychological studies (Bouattour & Miloudi, 2016).

3. Contribution of behavioral finance

3.1 Behavioral finance and decision making

Standard financial theory predicts that only the profit-sharing rule can affect prices, but in practice, other more behavioral factors therefore seem to be at work (Bouattour & Miloudi, 2016). Supporters of behavioral finance believe that the prices formed on the market are far from the predictions of standard models (Albouy & Charreaux, 2005). That is to say, investors do not make their decisions in a way that conforms to the axioms of von Neuman and Morgenstern. However, investor's utility function is based on a benchmark, and investors estimate losses and gains relative to that benchmark (Mankert & Seiler, 2012). The aim is to reveal the psychological impact on decision-making behaviors (El Amri *et al*., 2020).

Financial decisions are not immune to emotions. Nevertheless, they are even almost all affected by mood and feelings because these affective states contain information used to draw conclusions about the environment. Research has also shown that a good emotional state might increase a person's sense of optimism and risk-taking propensity (Sahi, 2017). By taking the human aspect into consideration, behavioral finance integrates cognitive biases and investor preferences in order to explain their effect on financial markets (Bouattour & Miloudi, 2016).

Moreover, the interpretation of information on the environment, available to the decision maker, depends on the emotions linked to his life and his personal experience. These are the emotions, such as doubt and fear that can give rise to behavior that can prevent investors from making rational and consistent decisions.

The influence of cognitive and emotional factors is central to behavioral finance, which relies on psychology to better describe and understand the behavior of investors and markets. Indeed, agents do not update their beliefs correctly (Lahouirich *et al.*, 2022). These behaviors can create asset price anomalies, which is likely to lead to market failures. This contradicts the traditional framework of finance where the price of a security is equal to its fundamental value. This is why behavioral finance and neo-classical finance give a different meaning to asset prices (Bogatyrev, 2019).

In this sense, the decision-making process is governed by rules that psychologists try to highlight through the notion of behavioral biases. Changing the decision environment also improves the decision process when it positively affects the behavior of the decision maker. It is therefore important to debias decisions to improve their quality and create more value. A successful "debiasing" implies a regular questioning of the behavior of the decision-maker, without him actually returning to his initial behavior. Above all, this makes it possible to diagnose many weaknesses of which investors are victims. In short, this is why behaviors can better explain the actions of investors.

3.2 Behavioral finance and the need to rethink rationality

Rational behavior means that the individual maximizes his expected utility by choosing the alternative that gives him the most satisfaction. This rationality means a correct interpretation of information (Bouattour & Miloudi, 2016). Nevertheless, when errors or biases are systematic in nature, the result of collective actions will deviate from what a financial model, based on the perfect rationality of individuals, can anticipate. This is why behavioral finance contributes to finance by providing a better understanding of the systematic nature of these biases (Sahi, 2017).

Experimental work in the laboratory reveals that individuals decide by following a behavior closer to that of agents in a situation of uncertainty (Bouattour & Miloudi, 2016). They make their decisions at different levels of rationality and satisfaction. This emphasizes the importance of realizing that this rationality is limited.

Bounded rationality is that people's ability to control their emotions is a limited resource. According to the theory of prospects, it is necessary to distinguish two main types of errors: cognitive errors (beliefs, habits, irrationality) and emotional errors (fear, risk aversion, over-confidence, and over-optimism). Cognitive errors come in the form of lack of knowledge, which gives rise to errors in reasoning. These errors are in turn divided into two groups: individual cognitive errors and collective cognitive errors (Mankert & Seiler, 2012).

Individual cognitive errors refer to the fact that individuals appeal, in their choice, to the system of values characteristic of their culture. Thus, the individual's experience is present in his decision-making process. The more experience the agent has, the more he is inclined to make decisions based on his experience, which reflects his history and experience. In the markets, it is possible to observe trends that confirm the actions of individuals based on their habits and experiences. In contrast, collective cognitive errors are those errors that affect investors as groups constituting categories intervening in markets (Mankert & Seiler, 2012).

Indeed, by being a group, investors share collective emotions and act as a whole, going so far as to commit excesses that they would not have committed individually. This inevitably leads to follower behavior, which leads to speculative bubbles and crashes. These phenomena are the most obvious proofs of the irrationality of agents. This therefore requires building a model of rationality that takes into account individual limits by considering the psychological and emotional dimensions in the behavior of investors.

Thus, on the financial markets, mimetic behavior is at the origin of the speculative episodes regularly observed. Shiller (2003) confirms that informational mimicry consists for an individual in copying the action of another because it lends him a better knowledge of the situation. Therefore, the markets financial constitute the place where sit collective dynamics whose main driving force is the game of individuals, which consists in copying each other (Shiller, 2003). This phenomenon is at the origin of the behaviors that can cause prices to diverge on the financial markets.

Generally, emotions influence the decision and lead it away from the optimal choice resulting from classical rationality. To this end, rationality is limited. It consists in introducing the possibility of strategic interactions between participants on the markets where each one calculates his anticipation as well as possible from his information. According to this rationality, individual perceptions of risk in financial markets are directly associated with personal experiences as well as social norms. This is why this rationality is not to be confused

with the rationality indicated by classical economic theory. It is an approach, which consists in leaving the *homo-economicus* in favor of a limited rationality.

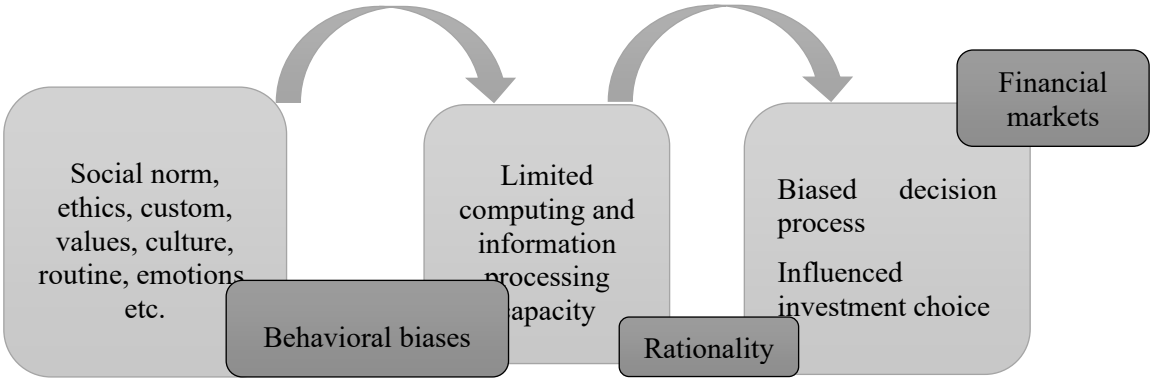

Figure 1. Relationship between the limits of rationality and the decision-making process

Source: established by the authors.

Thus, this financial approach considers the rationality that better matches the way decisions are actually made in the financial markets. It is an extension of rationality that aims to better understand financial decisions (Albouy & Charreaux, 2005). These elements show that investors do not always make rational choices. This conception allows the transition from perfect economic rationality to limited rationality which, when used in behavioral finance, refers directly to the procedural rationality of Simon (1959).

4. Behavioral finance as an alternative model: myth or reality?

4.1 Behavioral biases and informational inefficiency: which behavioral model is most appropriate for financial markets?

Due to their ease of application, rational behavioral models become the norm (Thaler, 1999). The argument of simplicity is also often invoked to explain the success of theoretical models based on the perfect rationality of individuals (Bouattour & Miloudi, 2016). However, the behavior of the decision maker is included in the framework of behavioral finance in the form heuristics (Wiagustini *et al.*, 2023). Understanding these heuristics gives predictive power to this behavior model. Now, market anomalies can be perceived by understanding the investor psychology involved in the decision process El Amri *et al*., 2020).

However, many decisions that differ from what is considered optimal depend on wants and desires that are not taken into account in traditional models (Moy & Pactwa, 2022). According to evolutionary psychology, biases are not always bad, because sometimes they made, thus helping the individual to adopt satisfactory behavior (Sahi, 2017).

Understanding an investor's psychology helps to better understand how investment decisions are made. The perceptions and beliefs of the financial consumer are important in understanding the purchasing behavior of financial products (Sahi, 2017). Behavioral finance recognizes that people tend to show loss aversion instead of risk aversion, and relies on heuristics as a decision support tool (Bracker, 2013).

There is strong evidence for the existence of over- and under-reaction. This result directly calls into question the rationality of investors, who do not revise their opinions correctly. This is the case of financial analysts who show excessive optimism (Bouattour & Miloudi, 2016). This is why it is necessary. Thus, behavioral finance can be considered as a set of theories such as the modern theory of the portfolio, it cannot be based solely on calculation, but can call on other disciplines in particular, computer science, psychology and even sociology (Sahi, 2017).

It was found that increasing financial literacy was able to reduce biases in financial behaviors (Cucinelli & Soana, 2023). Indeed, performance can improve this financial literacy, and thus reduce behavioral financial biases (Wiagustini *et al*., 2023). However, behavioral aspects are essential enablers of the decision-making process (Wadhawan & Kulkarni, 2022). Therefore, the research is not on the rational or irrational man, but on a real person. This is to bring to light the various heuristics and biases so that they are predictable and can be taken into account (Singh & Nag, 2016).

This study highlights a variety of behavioral biases that influence the decision-making process. (Bracker, 2013). It is the case that the demand for more information about individual investors to be more easily accessible (Thaler, 1999). Recently, studies have examined whether new information is immediately and fully incorporated. However, heuristics and biases are described as the factors that mark the cognitive process of choice, and therefore errors can occur in the acquisition and processing of information (Singh & Nag, 2016).

Emerging trends in this finance show that it can be a system in order to accelerate the maturity of behavioral finance and make its model truly alternative. His contributions are not limited to the academic world. It also concerns regulators and financial advisers in order to better serve the interests of investors. It is in fact a question of understanding their weak points in order to avoid the pitfalls that their intuitions, their heuristics, their emotions or their overconfidence can induce (Sahi, 2017).

As a result, behavioral finance has become an interdisciplinary research field, which aims to better integrate results from cognitive psychology. It showed that there are several behavioral biases that often follow the same patterns among investors, that is to say that they have a systematic character that this finance must take into account. This discipline should enable the various actors and participants in the financial markets to better serve the interests of investors (Sahi, 2017). His contributions bring challenges and perspectives for a modern financial theory (Lahouirich *et al.*, 2022).

4.2 Tools for integrating behavioral finance as an alternative model

4.2.1 Role of research

Many publications indicate that biases must be corrected because they have a negative impact on the financial behavior and well-being of individuals (Sahi, 2017). Several researches can provide useful insights for investors to make investment choices tailored to predict characteristics (Hnaka *et al*. 2019). Nevertheless, to fully grasp its complexity, a step forward is necessary (Wiagustini, Ramantha and Putra, 2023). Researchers need to deepen their thinking (El Amri *et al*., 2020). This may include studies of simulation models to predict this behavioral perspective (El Amri *et al*., 2020). Much of the research is carried out on aggregated data from different stock prices or on empirical data from experiments often carried out with students (Mankert & Seiler, 2012).

Recent advances in computational science, provided in particular by algorithms, can be used to solve complex behavioral problems (Lahouirich *et al.*, 2022). In this sense, the introduction of powerful computerized processing techniques can restore efficiency and deal with the limited nature of machines, since as the amount of information increases; it will no longer be possible to process all the information (Pernagallo & Torrisi, 2022).

It is also necessary behavior when an investment (Sahi, 2017). Both theoretical and empirical studies are needed on how feelings affect financial decisions, and the implications of these effects on actual prices and outcomes (Hnaka *et al.*, 2019). In this regard, the literature is also interested in the ability of employees to connect emotionally with investors; it considers the ability of employees to connect with other human beings as a major advantage for investors (Königstorfer & Thalmann, 2020). The contribution of Feldman and Liu (2023) was made by operationalizing the static parameter of risk aversion from a sentiment indicator. The results improve when the author replaces the traditional risk aversion parameter with a dynamic sentiment indicator from the behavioral finance literature when allocating between a risky portfolio and a risk-free asset (Feldman & Liu, 2023).

Wadhawan & Kulkarni (2022) examined the choices and deeds of investors and financial institutions from a behavioral finance perspective. They found that these decisions are not only defined by economic needs and the goal of maximizing desires, but also by psychological and sociological motivations. Thus researchers, based on surveys, can set up research programs focused on individual behavior to seek implications for financial markets (Königstorfer & Thalmann, 2020). Besides, strategies in markets to provide a comprehensive picture that strengthens the understanding of trading in the stock market (El Amri *et al*., 2020). Portfolio managers can use their results to optimize the allocation between a risky and risk-free portfolio (Feldman & Liu, 2023).

Nevertheless, the weakness of behavioral finance remains the lack of studies on the real world. The research of El Amri *et al*. (2020) is in this sense, the content and methods used in their article can be instructive for

research in this field. The findings are intended to help practitioners and researchers had better understand the context of behavioral finance theory (Lahouirich *et al.*, 2022).

4.2.2 Role of social interactions

Social interactions and the environment influence investors in their the findings that are valid both for individual investors and for professionals who are not free from bias. However, any behavior or interaction is based on psychology (Thaler, 1999). The impact of social interactions on individuals' financial decisions can generate a tendency to mimicry that encourages them to adopt follower or conformist behavior. Moreover, the development of means of communication and social networks reinforces these contagion phenomena (Sahi, 2017).

Some biases can come from the social environment (Boutti *et al*., 2019). It helps to understand how an investor deviates from rational decision-making and does not update new information according to Bayes' rule (Singh, 2021). Indeed, it can happen to make decisions under the influence of the social environment by interacting with other individuals. In this case, the result of the collective actions will deviate from what a financial model based on the perfect rationality of individuals can anticipate. In addition, this is where behavioral finance contributes to finance as a scientific discipline (Sahi, 2017).

This field of finance therefore offers rising and falling prices (Sahi, 2017). Future research should aim to understand individual investors and the impact of societal opinion on their behaviors (Kumar *et al*., 2022). However, it should be noted that there are social influences allowing a better allocation between risk-free and risky assets (Feldman & Liu, 2023).

Behavioral finance is usually divided into two main parts, as in Lahouirich *et al.* (2022). Part of behavioral finance addresses the issue of inefficient markets. The other part focuses on the individual investor and the impacts of psychological and sociological factors on investment decisions (Mankert & Seiler, 2012). To this end, it has been established that age and gender play a role, particularly in the perception of risks. Some studies even look at the impact of religion or culture (Sahi, 2017). Similarly, according to Mohammed *et al.* (2023), sentiments influence prices and lead to different interpretations of risks and returns in behavioral finance theories (Bogatyrev, 2019). This is why the social context and its influences on investors' actions seem interesting and relatively unexplored (Mankert & Seiler, 2012).

This new paradigm is also mentioned that social interactions and the environment can influence the investor in his decision-making, insofar as religion and culture have their impact in this area. Similarly, age or gender can play a role in decision-making, for example, women may have greater risk aversion, leading to more conservative decisions (Sahi, 2017).

Ethical concerns have grown in the financial field following numerous managerial excesses and financial crises. Thus, the emergence of the importance of ethics makes it possible to increase trust (Hasnaoui & Biot-Paquerot, 2010), and consequently the creation of value (Albouy & Charreaux, 2005). In this sense, ethics and an individual's values are similar to mental schemas that participate in the orientation of decisions and therefore counteract aspects relating to emotions and preferences (Thaler, 1999). Thus, values, norms and moral attitudes can be used to guide decisions in a risk-taking context (Hnaka *et al.*, 2019; Simon, 1959).

Mankert and Seiler (2012) show that ethical competence can contribute to developing other competences such as cooperation and partnership. On the other hand, few authors have worked on organizational and strategic skills that integrate individual behaviors such as ethical conduct (Durand, 2015).

5. Implications

5.1 Theoretical implications

Emotions are useful in the decision-making process because they regulate the actions of individuals, but they limit the ability of investors to analyze this process in an objective, reasonable and correct way. Thus, the effectiveness of their decisions decreases because they can experience several emotional states (Mallard & Durat, 2022). This reveals the importance of rethinking perfect rationality, and proposing a way of realizing limited rationality in the economic domain, and in this case the financial domain. The economic study of human action shows that it depends on the cognitive and motivational abilities of investors. But some

behavior, to the extent that it is governed by emotions, can escape the scope of conscious attention. Consequently, behavioral responses must be considered as sometimes resulting from decisions and sometimes from simple responses to emotional affects (Mallard & Durat, 2022).

The bounded rationality choice model combines the enormous complexity of this world with the modest abilities people have to process information and make decisions. Thus, unlike the use of models which constrain choices and propose optimal solutions, decision-making behaviors of the limited rationality type improve the quality of choices by proposing a model which takes into account several dimensions resulting from the context of the choice. This is a model whose objective is to obtain a real description of decision-making behavior. This model consists of a radical change in approach to decision-making. It is no longer a question of evaluating the decision as a result using an objective criterion of optimality, but it is a question of proposing a more realistic vision of decision-making behavior by including other criteria than the calculation and objectivity (Aliouat *et al.*, 2022).

Thus, in light of the limited access to information, and according to the cognitive limitations that characterize economic agents, the latter do not generally optimize, they adapt to the environment and seek solutions rather satisfactory. The investment choice considered in this way is much more successful in linking the micro and macro levels where the levels of individual action and collective action will be thought of together. Thus, numerous research studies on individual decisions have been stimulated by this conception of limited rationality which characterizes the behavior of agents in several ways (Cucinelli & Soana, 2023).

This is why the model of choice in limited rationality is rooted in a critique of classical models of choice, models which serve in particular as a basis for classical analysis. The choice can also be made by respecting norms or rules or by reproducing other behaviors already adopted. Thus habit, social norm, routine behavior, custom, culture and practices specific to a certain social environment are also considered as modes of choice. This makes the decision a complex process and rules out the idea of perfect and objective rationality (Simon, 1955).

The objective is to strengthen microeconomic analysis using a more realistic representation of economic behavior than that of *homo oeconomicus*. Consequently, rational investment is an action implemented by an actor who reasons, calculates, decides logically, but his decision is also affected by his emotions. Its rationality does not only have substantial limits such as the uncertainty of the environment, but also procedural limits. These relate to limited computational capacity and information search and processing procedures (Birindelli *et al.*, 2023).

5.2 Managerial implications

Taking emotions into account is important in decision-making. This research highlights the importance of identifying ways to guard against disruptions that originate in investor psychology and can reinforce environmental uncertainty. The decision maker is constrained by a realistic and psychological characterization of his behavior. This can replace any lack of cognitive skills with ethical, social, psychological or cultural motivational judgments (Travkina *et al.*, 2023). Investors and stakeholders should consider the existence of these biases in decision-making, which constitutes an advantage compared to other investors. Likewise, it is appropriate to include the different psychological biases and their repercussions on choice in the training of participants in financial markets (Mallard & Durat, 2022).

These results are important because they inform participants in financial markets to adjust decision-making processes by increasing the capacity to monitor the risk of certain biases which can be amplified due to the appearance of certain particular events. They are important and imply the need to diversify the means of monitoring the emotions of participants in the financial markets. Furthermore, the results of this research support the idea that this diversity could be a risk management factor for effective governance while strengthening risk mitigation measures. Likewise, it is important to take into account the limited rationality of actors involved in financial markets, and economic actors in general, in the design of decision support models (Mohammed *et al.*, 2023).

Overall, these findings have important implications for investors, managers and policy makers to promote risk containment by increasing the understanding of financial market feedback behavior. Thus, by being aware of

their behavioral biases, investors can remain humble by adopting correct attitudes and avoiding under- or over-reactions that negatively impact market behavior.

Discussion and conclusion

Its emergence is based on three origins, namely psychological origin, economic origin and financial origin (El Amri *et al*., 2020). In the world of finance, and more broadly that of economics, *homo oeconomicus* should die out to give way to another species (Bouattour & Miloudi, 2016). This interest in the underlying psychology of human behavior brings economics back to its earliest roots (Thaler, 1999). Although more than forty years have passed since the appearance, one of the milestones of behavioral finance, it continues to be widely discussed in academia, just like cognitive and emotional heuristics and biases (Valcanover *et al*., 2020). The results prove the relevance of Tversky and Kahneman's work (Boutti *et al*., 2019).

Behavioral finance studies the application of psychology to finance, with a focus on cognitive biases at the individual level (Hnaka *et al.*, 2019). This field, both theoretical and empirical, offers an alternative approach (Mankert & Seiler, 2012). Behavioral finance offers a different approach to making investment decisions (Wiagustini *et al.*, 2023). Through a work of El Amri *et al*. (2020) highlights the shortcomings of classical theory that have led to behavioral finance being accepted as an alternative approach.

Indeed, standard finance asks too much when it asks for market efficiency in the rational sense (Thaler, 1999). Thus, the optimistic vision of the proponents of market efficiency is refuted, and the markets cannot correct at the aggregate level the biases observed in the behavior of investors (Albouy & Charreaux, 2005). These biases reveal how a complex mix of heuristics and emotions influences investor behavior. Moreover, certain individual and collective factors can affect the quality of financial decisions and reinforce the impact of certain biases. Psychology was to play an important role in economics (Thaler, 1999). The economist may try to ignore psychology, but it is impossible to ignore human nature.

According to Thaler (1999), any rational economist must incorporate this behavioral dimension. That is to say, for Thaler (1999), behavioral finance has become the dominant paradigm and there would be no more finance than behavioral, so any economist who does not incorporate the behavioral dimension is obviously irrational (Albouy & Charreaux, 2005). However, microeconomic or macroeconomic models can understand the facts observed on these markets (Tadjeddine, 2013). In this area, results obtained from several primate and non-human species reveal a certain significant proximity to the behavioral biases of humans in an uncertain decision-making context (Sahi, 2017). The orientation is to be an important asset for economic theory. For some, behavioral finance cannot be disavowed, but on the contrary is part of the continuity (Boutti *et al*., 2019).

Behavioral finance has moved away from this notion of investor rationality. However, one should not hastily conclude that the investor is irrational but that his rationality is limited in the sense of Simon (Simon 1955). Indeed, the investor has neither an unlimited capacity to process all the information nor sufficient cognitive capacities to make a relevant analysis of all the occurrences in terms of profitability/risk. He cannot therefore make an investment choice with optimal profitability but take the satisfactory solution (Simon, 1955).

Behavioral finance is therefore contributed to developing a modern financial theory (Lahouirich *et al.*, 2022). In this sense, financial market participants neither have an unlimited capacity to process all available information nor sufficient cognitive capacity to do all the necessary calculation (Levy and Akeb, 2016). As a result, prospect theory manages to better explain the behavior of subjects than expected utility theory (Bouattour & Miloudi, 2016).

There are two breaks that allow finance to be currently one of the most fruitful and at the same time interdisciplinary fields of economics. This makes it possible to renew the factors influencing human decision-making. However, while behavioral finance has opted for cognitive and psychological aspects, others may favor cultural or social factors; hence the importance of enriching this field with elements from different disciplines (Tadjeddine, 2013).

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