

# Behavioral finance and games: simulations in the academic environment

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## ABSTRACT

The contribution from this study lies in its reflection on the factors that influence market efficiency, which requires a multidisciplinary view to analyze the intervening factors that impact results of the financial system. It also contributes by reflecting on the need for new approaches for training professionals who will go on to work in financial and related areas and preparing them by using different financial analysis techniques; by reflecting on the fact that analytical practices are influenced by social, cognitive, and emotional aspects, enabling the students to be better prepared to act in the financial market; by presenting various technical possibilities and providing more comprehensive knowledge to choose the one that best suits the object of analysis and their preferences; and by reflecting on different ways of perceiving investment opportunities and risk, which can be expanded on in other studies on the segmentation of clients according to their preferences in the investor market. The aim of this study was to analyze how social and psychological aspects influenced the decisions involved in simulated trading operations. The relevance lies in its discussion of the philosophical and epistemological position in finance, which suffers from a vision that only focuses on the rationality of means and does not explain the anomalies verified in the financial market. The study originated from the application of a company game simulating the work of stock market trading desk operators, applied in the Stock Market Operations course and using fundamental, technical, and graphical techniques. The population was intentional and made up of undergraduate and graduate students from one of the four best Brazilian federal universities. The data analysis was performed by analyzing the content of the questionnaires applied and the journal entries made during participant observation.

**Keywords:** behavioral finance, business games, emotions.

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## 1. INTRODUCTION

How should finance, particularly the stock market, be taught in a way that enables students to reflect on the fact that decisions can be the sum of various factors, ranging from those considered as rational to those seen as non-rational? The initial idea of this article began to be constructed during the conception of an undergraduate and post-graduate course in Business Administration that answered this question.

The aims of the professor and her research group were to make the students reflect in a course that simulated the situation of a stock market trading operations desk at the São Paulo Stock, Commodities, and Futures Exchange (BM&FBOVESPA) and observe that the decisions, even financial ones, lie on a continuum between the rational and non-rational (Foucault, 1994; Machado, 2006), present social and psychological aspects (Simon, 1979), and will influence the actions taken in variable income financial operations.

Thus, by applying fundamental, technical, and graphical analyses (Brazilian Securities and Exchange Commission [CVM], 2014), and using the TOP Teacher Training program for evaluating buy and sell transactions involving company shares that are publicly-traded on the BM&FBOVESPA and form part of the Bovespa Index (Ibovespa), a course was elaborated that served as the basis for the reflections in this article.

Theoretically, the course was based on the work of Fershtman and Segal (2016), Hoff and Stiglitz (2015), and Tamborini (2016), and for the target reading it was proposed that the students reflect on the preferences and cognition of individuals, specifically investors. For these authors, subjects are influenced by the (i) social contexts to which they are exposed, and especially, accustomed to, and (ii) mental models, including mental and cultural categories, identities, narratives, and world views that they use to process information. According to the authors, these factors mold individual behavior by endogenously determining both their preferences and the lenses through which individuals see the world in accordance with their perception, categorization, and interpretation of situations.

The students had to think about these categories, especially in relation to the social contexts that the subjects' (investors) socialization and mental models were based on. Thus, the students had to ask where the investors came from – their social class, the social groups in which they coexisted, where they studied, what they knew about the stock market – since, for Hoff and Stiglitz (2015), choices are based on the mental models that reveal

the characteristics of each individual, which depend on the culture, identities, the perception, and the history to which the individuals are subjected and which they absorb through experience. The students needed to be aware of these social interactions, which, according to Fershtman and Segal (2016), adjust to individual preferences over time. In addition, the authors state that decision-making would be anchored in the history of the subjects and their social interactions, and it is this history that the students would also need to know.

In the seminar given by the professor on Kahneman and Tversky (1979) and their Prospect Theory, the students were able to observe some cognitive aspects derived from the heuristics in the decision-making processes. Decision-making would be limited to the time for the action of deciding, the processing of this information, and regulation of the control mechanisms for emotions; therefore, it is not only rational. Individuals would use mental shortcuts constructed during their socialization process and they would be subject to biases depending on the cognitive illusions constructed (Kahneman and Tversky, 1979; Rogers, Securato, and Ribeiro, 2007), in turn depending on these cognitive and emotional factors, which occur in a social context. The assumption was made that cognitive flaws would occur as in the findings of Kahneman and Tversky (1979) and the aim was to understand the students' experience within a social context and from their personal perspective, when they were encouraged to express themselves via metaphors, revealing the symbolism of their experiences.

Another relevant aspect that had to be shown to the students in order to better analyze the decisions was the time of exposure to the work activity, as shown in the study from Dal Ross, Nora, and Milani (2015), who analyzed risk aversion among financial sector professionals, concluding that this aversion increases in accordance with time of professional activity and number of dependents. More experienced professionals tend to become more risk averse as a result of their need for more professional stability due to their family responsibilities.

The scope of the course includes the ideas of Zanalda (2015), which reinforce the conclusions of Minsky (1986) regarding systems (in general) being fragile and cyclical. Thus, working with the students on this fragility using the games gave them the opportunity to recognize that investors are also social products inserted into the movements of the capitalist system, that this movement is cyclical, and that in the year in which the course was

taught, the system was in crisis. According to Fershtman and Segal (2016), in relation to crisis, human beings have fixed preferences and adopt a structure in which changes in preference depend on social interactions and social influence. Thus, in a period of crisis, social interaction would become important for the system to regain legitimacy (Berger and Luckman, 1978), and regarding the stock market, for investors to return to investing.

Empirically, as already stated, the study was carried out at a public faculty of Business Administration, based on company games, with the aim of building knowledge using a simulated experience of financial operations on the stock exchange.

It was found that company games in an academic environment can contribute to learning theoretical content, developing trading abilities, investment skills, critical thinking, and commanding emotions. This continued experience can prepare students emotionally

and cognitively to act in real situations.

During the course, the students that effectively participated were able to perceive the importance of studying investor behaviors, since in the search to understand the behaviors, the anomalies verified in the financial market that have a direct impact on the efficiency of that market can be monitored and reduced. In its search to work on these behaviors with the students, the course was able to contribute to understanding the rationalities and non-rationalities of such behaviors, as well as those of people in the face of the visible and unsaid (Foucault, 1996) in the financial market.

This article is divided into five parts: Introduction; Theoretical Framework, in which the topics of Behavioral Finance, Decision Theory, and Game Theory are discussed; Methodology; Results and Discussion; and finally, Conclusion.

## 2. THEORETICAL FRAMEWORK

The idea defended by Fisher (1993), Keynes (1936), Minsky (1986), Schumpeter (1934), and Zanalda (2015) is that crises are intrinsic to the financial cycle and form part of it. In the first stage of a financial cycle, loose monetary policy contributes to expanding credit and increasing asset prices. Excess optimism makes asset prices increase, which will continue to the point of becoming a bubble, when the price level for that specific asset category is not justified by underlying fundamentals. The bubble eventually bursts and will be followed by a fast decline in asset prices; in the case of big asset markets, such as real estate, a recession will follow.

Zanalda (2015) indicates that the misfortunes of the global economy have caused a strong impact on stock exchanges and affected the life of millions of investors. These misfortunes, such as financial crises, impact investor behavior, sometimes deterring them, sometimes attracting them to the financial market. Kindleberger and Aliber (2011) studied the crises of the XVII century onwards and their conclusions are consistent with these theories in finding that the irrational behavior of investors, poor political management, information asymmetry, and unreliable credit systems have contributed to the occurrence of financial crises. Dünhaupt, Betzelt, Evans, and Herr (2016) agree with the theory of Minsk (1986) concerning the cycles of crises, but add the decisive role of politics in the subprime crisis of 2008. For these authors, the policy of economic stagnation, decreasing wages, and the concentration of wealth into the hands of the few destabilize the economy and create financial crises.

Both Minsky (1986) and Kindleberger and Aliber (2011) highlight that there are five phases in a financial cycle: (1) Displacement phase, when new technologies, financial innovations, new markets, or new policies emerge that create extraordinarily profitable investment opportunities in a relevant sector of the economy or in a particular country or group of countries; (2) Overtrading or euphoria phase and earnings expectations that lead to an increase in assets prices; (3) Mania or bubble phase, when inexperienced investors enter the market and begin to take on debts in order to trade; (4) Affliction phase, when these investors perceive that the high prices of the goods are not confirmed by the economic fundamentals and begin to sell their assets; (5) The Repulsion phase, when asset prices fall and investors offload their assets onto the market and also exit from all other similar asset markets. From the 2008 financial crisis onwards, Minsk's ideas have been noted for the currentness of their projections.

For Pompian (2006), corroborated by Prosad, Kapoor, and Sengupta (2015), behavioral finance assumes two important aspects for studies in this field: individual investors and the entire financial market, with this field of study lying between macro and micro behavioral finance. According to the authors, the macro dimension describes the anomalies of the efficient market hypothesis, which can be explained by the behavioral models, while the micro dimension of behavioral finance analyzes the individual investor's behaviors and deviations.

The traditional theory of finance considers that decision-making in finance is based solely on mathematically proven data and concepts. This construct, considered the main pillar of decision theory, can no longer explain current financial market conditions. “The ideal trading conditions where all information is incorporated into prices is an utopian condition proven by the inefficiency of the markets” (Prosad et al., 2015, p. 2). The presence of anomalies in the financial market, such as bubbles, overreaction, and underreaction, proves that decision-making involves more than agents acting based on mathematical and rational data. Understanding the factors that affect human judgment is important to be able to understand the anomalies in the market and avoid them.

Choosing the analysis types for financial operations in the financial market has been the object of studies such as those developed by Park and Irwin (2007) and Po-Hsuan and Chung-Ming (2005), who discuss the applicability and efficiency of technical analyses and the markets in which they obtain the best results. Of the 95 studies (1988-2004), positive results in relation to applying trading strategies and techniques were found in 56. Twenty studies obtained negative results and 19 indicated mixed results. Modern studies also indicate that technical trading rules resulted in economic profits in the stock markets of the United States up to the end of the 1980s, but not after that. In foreign exchange markets, technical trading rules were profitable at least up to the beginning of the 1990s. The trading techniques applied to the futures markets were profitable up to the middle of the 1980s (Park & Irwin, 2007).

The choice of analysis technique, besides being based on some preference, needs to be based on the evidence of its results in the markets in which the intention is to act, since the evidence shows that the level of maturity of a market can influence its efficiency: younger markets are more efficient, according to the results of the study from Park and Irwin (2007). Despite their limitations, economic-financial models can play a useful heuristic role by representing the ignorance of the financial analyst (Ehret, 2014). From this arises the importance of enabling the teaching of different techniques and the experience of multiple and simultaneous analyses in order to achieve greater accuracy in the analyses when training future financial market actors.

In the area of economic sciences, game theory is fundamental in that it aims to find rational strategies in situations in which the result depends not only on an agent's own strategy and the market conditions, but also on the strategies chosen by other agents who possibly have different strategies and common objectives (Constantino,

Costa, Mendes, Silva & Garrute, 2016). The investigation and presentation of the behavioral decision-making of investors are of great importance for understanding the non-rational aspects of individuals and can lead to the establishment of criteria and factors that minimize distortions in assessment standards and the propensity to invest in stocks (Ávila, Oliveira, Avila & Malaquias, 2016).

The studies from Baker and Ricciardi (2014) and Fenton-O’Creavy, Soane, Nicholson, and Willman (2011) present results that indicate that investor emotion is a critical factor in investment decision-making. Fenton-O’Creavy et al. (2011) carried out a study with a sample of London investors in investment banks and observed that effectively regulating emotions appears to be a critical factor in successful investment and trading decisions. The strategies for suppressing feelings adopted by specialists and high performance traders were qualitatively better than those adopted by professionals with less experience. In truth, the first type of agents are more inclined to accompany impressions of self-management and cognitive change and can also be capable of dealing with negative feelings in a way that allows them to maintain objectivity and pursue long-term objectives. Baker and Ricciardi (2014) confirm these findings, stating that experienced and mature investors know that success depends on controlling emotions and overcoming preconceptions. This helps them to avoid the typical errors of new investors related to excessive confidence.

The work of Dal Ross et al. (2015) aimed to analyze the risk aversion of financial sector professionals and the most relevant results indicate that risk aversion increases with time of professional activity and number of dependents. They also perceived that female respondents are slightly less likely to assume risk than male ones. For Augusto and Freire (2014), monthly income influences the level of risk that investors are willing to incur. Their studies confirm that there is a positive relationship between the individual's level of income and his/her risk tolerance, with there even being a dampening effect between the investor and the potential losses resulting from the investment.

Albaity and Rahman (2012), Booth and Nolen (2012), and Speelman, Clark-Murphy, and Gerrans (2013) present the relationship between gender and risk as being strong, since females showed less risk tolerance and therefore seek low-risk investment options. Hibbert, Lawrence, and Prakash (2013) indicate the same conclusions and add the influence of financial education for a higher risk tolerance among females.

The presence of human idiosyncrasies that include individual and social aspects impacts decision-making and can prevail over other approaches, such as the classical rationality models. Post-modern approaches

have remarked on the role and influence of psychological aspects and have attracted the attention of researchers with regards to non-rational aspects in decision-making (Ciot, 2013).

For Loewenstein, Volpp, and Asch (2012), people interact with the perspective of risk in two ways: cognitively evaluating risks and reacting emotionally to them. Thus, cognition and emotion are interrelated, since cognitive evaluations generate emotions and emotions affect cognitive evaluations (Cardoso, Alvarenga & Oyadomari, 2012).

The person's life cycle can impact his/her risk tolerance, as according to studies from James, Boyle, Yu, Han, and Bennett (2015) and Koscielniak, Rydzewska, and Sedek (2016), which conclude that the more advanced the age, the lower the risk tolerance and the more diminished the decision-making performance.

## 2.1 Factors that Impact Financial Agents' Decisions

Ávila et al. (2016) indicate that the literature on behavioral finance obtained innumerable contributions after Tversky and Kahneman (1974) that supported the scientific findings that led to breaking the paradigm of the market efficiency hypothesis and showed that the decider absorbs and reacts to the impacts of family influences, beliefs, emotions, confidence, friendship, sex, optimism, astrology, superstitions, stimuli, cultural distance, and perceptions of risk and loss, among many others, which can lead to erroneous and prejudicial evaluations by decision-makers.

The article *Judgment under uncertainty – Heuristics and biases*, from Amos Tversky and Daniel Kahneman (1974), indicates that people base their decisions on a limited number of heuristic principles, reducing the complexity of evaluating probabilities and predicting values based solely on judgment. The flaws resulting from the use of heuristic rules were identified in the article from Tversky and Kahneman (1974) and the flaws caused by the use of mental structures were described in the work of Kahneman and Tversky (1979). For these authors and Rogers et al. (2007), individuals use mental shortcuts and are subject to biases depending on the following cognitive illusions: (i) Certainty effect – originating from the propensity of investors to emphasize the possibilities with the greatest probability of occurrence; (ii) Reflection/aversion to loss effect – when agents tend to be risk-averse given two earnings possibilities with the same expected utility and tend to accept risk when these possibilities are presented in the domain of losses; (iii) Isolation effect

– this occurs because, with a view to simplifying the decision, individuals ignore part of the characteristics of each choice option, centering their analysis on the components that distinguish the choice options.

The limits to rationality derive from characteristics both of the decision-maker and of the environment in which he/she finds him/herself, thus including: cognitive limits of the individuals, who always have a limited ability to collect, process, and interpret information; the complexity of the decision-making problem that the relevant agent faces, resulting from him/her acting in an environment whose causal relationships and regularities are difficult to discern; the uncertainty with regard to exogenous events (Pondé, 2014).

Kuhn (1983) and Simon (1979) argue that rational decision-making procedures cannot be disassociated from the social practices they form part of, since they involve a broad diversity of criteria for evaluating and choosing alternatives and evolve in historical time based on evolutionary processes caused by the interaction between the decisions and their results. The authors reformulate the concept of rationality, which is characterized as being social, plural, and historical (Pondé, 2014).

The interference of emotion is found both in perception and in the decision that involves risk. The theoretical basis for the interference of emotion in perception is based on the priming effect and on risk as a sentiment, and suggests that positive emotion encourages the decider to positively evaluate a decision, envisaging less risk and higher return, while native emotion encourages the decider to negatively assess a decision, envisaging more risk and lower return (Cardoso et al., 2012).

## 2.2 Learning Outside Models?

Learning about people's behavior is important for any business administration and accounting student to be able to understand that mathematical models are a simplification of reality for better comprehension and decision-making. However, decisions always depend on multiple factors, such as individual and social ones, as the studies on behavioral finance indicate.

According to Bellotti, Kapralos, Lee, Moreno-Ger, and Berta (2013) and Tan, Tse, and Chung (2010), learning through games has four main objectives: making knowledge more accessible, making the thinking more visible, making learning fun, and promoting autonomous learning. For Sauaia (2010), the aims of company games, particularly for undergraduates, include the imposition of a systemic overview of organizations, the insertion of economic questions, and the development of critical thinking in decision-making.

Motta, Quintella, and Melo (2012) indicate that in Brazil two higher education institutions (HEIs) have stood out in their role as developers, users, and researchers of company games: the Federal University of Santa Catarina (UFSC), in its *stricto sensu* post-graduate course in Production and Systems Engineering, has contributed a lot with the development of various company games (GI-MICRO, GI-EPS, LIDERSIT, LIDER, GS-ENE, GEBAN, GI-LOG, among others); and the University of São Paulo (USP) in its *stricto sensu* post-graduate courses at the Faculty of Economics, Business Administration, and Accounting, which gave rise to the first Brazilian dissertations (Beppu, 1984; Martinelli, 1988; Sauaia, 1990; Tanabe, 1973) and thesis (Sauaia, 1995) on company games.

Neves and Lopes (2008) and Sauaia (2006) state that the main favorable aspects for increasing the popularity and adoption of company games in business administration undergraduate courses have been: the importance of games in the professional training of administrators; the students' increased interest resulting from the dynamic of the games; the importance of the cognitive learning provided by the games; the bringing together of theory

and practice; the encouragement of systemic thinking; the encouragement of teamwork; and the integration of the contents of different disciplines from the business administration course.

Vergara, Barbosa, Lima, Yamanari, and de Andrade Pache (2016) applied company games in a Production Engineering class during the course and claimed to have achieved the following benefits: the development of managerial abilities, such as negotiating, planning, leading, organizing, time and resource management, administrating finances, and creating strategies, among others; the addition of new knowledge (integrating that obtained in the academic environment with important company strategies, and contact and assimilation of new information provided by the game, thus expanding the students' know-how); and encouraging rapid problem-solving.

Not many studies were found and presented here regarding the results of applying games in an academic environment; however, all of the papers consulted present relevant conclusions that support the idea that a teaching strategy using games can be a positive experience.

### 3. METHODOLOGY

Here, a study was carried out using the qualitative and quantitative approaches. The quantitative data calculated and the cross-checking of these with the qualitative-type research can show the limits and contributions of rationality in the technical procedures and add value to the findings of the research in light of the theory of behavioral finance.

The didactic aim was to teach techniques and study scenarios to analyze behavior developed while evaluating investments. The students were also able to reflect on the training process involving financial operations that they were being taught. A simulation was adopted as a teaching didactic in order for the students to experience buy and sell operations for shares on the BM&FBOVESPA using the Metatrader and TradingView softwares during the classes and in the evaluative activities, when they would have to plan, for a period of up to one month, buy and sell operations with entry and exit thresholds.

Besides studying the texts and the seminar with the professor and her research group, it was proposed that the students carry out simulations of investing in stock exchange securities in a sequential way involving decision-making built around the analysis models presented, in which the participants would carry out the task of buying and selling company shares based on real and daily data

on the movement of the BM&FBOVESPA. On a weekly basis and for the following week or the following month, the students planned their buy and sell objectives. They carried out group work and two evaluations with the same objective. The final score for the evaluated activities depended on the accuracy or error of the projection that they had made regarding the movement of the financial market.

The data was gathered over the period that the course lasted, covering 30 classroom hours. The sampling was intentional and composed of two groups of students, one undergraduates, initially composed of 32 students from the Business Administration, Controlling and Finance, Production Engineering, Statistics, and Mathematics courses, and the other composed of eight post-graduates, that is, masters or doctorate students, from the Business Administration, Production Engineering and Metallurgy, and Actuarial Sciences courses – male and female students, aged between 18 and 50 years old, mostly Catholic, and with a family income of more than six minimum wages. The undergraduate students from Group 1 did not consider that they had any financial education, and the post-graduates from Group 2 believed that they had this knowledge.

The data was gathered by means of participant observation, the application of a multiple choice, Likert

scale, and open questions questionnaire, and the Google Forms tool on the last day of class and after the final evaluation. Field journals were used, which were useful for recording subjective reactions and experiences that can support the analysis of the observed phenomena (Garcia, Standlee, Bechkoff & Cui, 2009).

Participant observation follows some essential stages, according to Queiroz, Vall, Souza, and Vieira (2007). In the first, the researcher introduced herself to the group and explained the reason for her presence in the classroom to carry out the research. The researcher felt accepted by the group and sometimes established contact in the subjects that were being addressed. In the second stage, an effort was made to achieve a vision of the whole community that was the object of study, for example identifying the roles assumed by the participants and reactions during the classes from the first day, when the rules of the game and the proposal of the course were established, until the last day, during closing.

The questionnaire, which was worth points, was applied on the last day of class, when the students carried out the final evaluation, and was composed of a plan covering a period of one week for investing in the BM&FBOVESPA. Immediately after carrying out the evaluation, the students answered the form under the emotional effect of their decisions. The questionnaire contains questions with the attributes that are traditionally associated with risk tolerance, training, financial education, religion, and own or family income, in line with what is found in the theoretical framework, among other factors that influence decisions, such as investment timeframe, motivation by image, recognition of the intensity of the reason and emotion in the decisions, metaphors to identify the sense of their choices, and the influence of financial education for changing behavior after the course.

Some questions were elaborated based on the Likert scale, with five answer options, and two open and non-obligatory questions. An evaluation of emotions was introduced into the applied protocol. The two tasks were applied after carrying out a simulation of investing in the BM&FBOVESPA to investigate the relationship between how the investor carries out the investment, how he thinks about this question (rationalizes), and what emotions

are most present and most intense, in order to capture the participants' emotions at that specific moment. The questionnaire on how to rationalize regarding their experience was developed by the team itself. The emotions analysis was based on the *Positive and Negative Affect Schedule - Expanded Form* (PANAS-X) emotional scale.

This evaluation was developed in the Likert format, in which the respondent must select which intensity (a little, slightly, moderately, very, and extremely) he/she is feeling a particular emotion at a particular time. Sixty emotions are considered in the original scale. However, only 46 emotions were considered here, with those whose translation does not exist in Portuguese being discarded, as well as the emotions that in Brazil have the same meaning as others used previously. The emotions are divided into two general dimensions: positive effect (joy, self-confidence, and alertness) and negative effect (fear, guilt, hostility, and sadness), besides some subdivisions that do not fit into the previous groups: shyness, tiredness, serenity, and surprise.

The results analysis was carried out by means of a quantitative analysis of the researcher's observations and journal entries, as well as the interpretation of the data resulting from the descriptive statistics, which are a combination of methods used to present, organize, and describe the data with the aim of enabling the understanding and use of the information contained in the data gathered (Morettin & Bussab, 2010; Silvestre, 2007). Here the decision was also made to analyze the metaphors used by the students, which were provoked by the question: What is the metaphor that best describes you as an investor? According to Martins (2008), the metaphor occurs at the intersection between comparer and compared, that is, it enables us to understand the role of the students who posed as investors during the games and how they see themselves as investors. The metaphors revealed here should be understood as creations influenced by the history, by the biography, and by the social factors in which the students are immersed. It is always important to remember that the interpretation of these is a collective understanding of the event, of the organization, and of the culture (Kövecses, 2015).

## 4. RESULTS AND DISCUSSION

### 4.1 The Rules

The rules were presented by the professor on the first day of class. The aim of the game was to learn tools for carrying out trading operations on the BM&FBOVESPA. The tools for the simulation were used in the World Wide Web with the Metatrader and TradingView software packages in a simulated environment of stock exchange operations. The tools of the software packages and the situations in which they should be used were also presented; the decision-making variables based on the fundamental, technical, and graphical analyses were also explained; there was interaction between the simulated object, which in this case was the virtual environment of the BM&FBOVESPA, and the participants in the game (students); the participants met in groups, since there were collective decision-making moments and others for individual decision-making; the game had a final date stipulated and established rules that would determine the results, that is, the scores that would define having passed the course or not. The scores would indicate the winners and losers of this game and would be given based on the result of the BM&FBOVESPA trading strategy adopted by the student. The students carried out group and individual evaluations in which they were asked to present, with reasons, their share-buying and share-selling strategies, with entry, exit, stop loss, and stop gain limits.

The professor presented the purpose of the game, showing enthusiasm for the innovative experiment in the business administration course of this HEI. The students were quite surprised to receive the proposal and showed concern and apprehension due to the evaluation being carried out by the market and without the professor's interference in the result. Being evaluated by the financial market was perceived to be threatening. Formally, 100 points were given via the group activities and two individual evaluations. In the undergraduate group, the researcher and observer was able to interact with the students, observing, experiencing, and operating just like them. The perceived emotions were apprehension, hope, excitement, and fear. In the post-graduate group, the researcher did not coexist with the students during the whole course. On the last day of class, they were asked to answer the questionnaire, there having been 88% student adhesion in Group 1 and 100% in Group 2.

There was 50% dropout rate for the total of 32 students throughout the course. The 16 students that remained were grouped by their affinity for fulfilling

the work activities. The causes for the students dropping out were not the object of analysis, but two possibilities were suggested: the first and more common in public university Business Administration courses is that during student matriculation there is an enormous demand for optional and general interest subjects, but after the classes begin, dropouts occur due to the "rigor" of the subject, which requires dedication. The second possibility may be related to aversion to uncertainty, to risk, and to loss (Kahneman & Tversky, 1979), due to the result of the evaluations also being conditioned by the luck of events not supervening that alter the expected results (Bachelier, 2006) and the lack of prior knowledge regarding financial operations, which was not a pre-requisite but would help in understanding, since most students dropping out were from courses outside the area of finance.

The psychological pressure to perform well was present, with competition between the students being expressed, but in a contained way. There were some expressions of insecurity and uncertainty with relation to the projections carried out, and fear and considerable expectations regarding the results. The professor encouraged the students to engage in intergroup interactions, but this generally did not occur, having only been seen between groups of students from the same undergraduate course who already knew each other and took part more interactively during the classes.

In the classroom the students received the explanations regarding the technical analyses of the operations, but what led them to decide and put together a trading strategy involved a process that went beyond using the techniques learned and the ability to rationalize, as indicated by Pondé (2014). The psychological atmosphere at the time of defining the operations was one of contained euphoria for most and of anxiety and uncertainty for some. These findings of the study are consistent with those of Ávila et al. (2016) and Fenton-O'Creavy et al. (2011) with regard to the influence of emotions as a critical factor in investment decision-making and of experience on maintaining control in the situation. The students were encouraged to seek information in investor forums, economic newspapers, or any other source of information that supported their decisions. It was observed that there was a lapse between the time the students had already concluded their search for information and their final decisions. This interval can be explained as the time needed to process the information and consider all of the internal aspects, to only later make a decision, as according to Balestrin (2002).



## 4.2 The Creations and Understandings

In the study of the profile of the students that answered the questionnaire, a greater number of male students than female ones was identified in groups 1 and 2, with 57.1% and 75%, respectively, which may be explained by the fact that males are more risk-tolerant than females, according to studies from Albaity and Rahman (2012) and Speelman et al. (2013). For these authors, women prefer long-term investments. The age of the students in Group 1 varied between 18 and 37 years old, which can also be corroborated by the studies that indicate that younger subjects are more tolerant of risk and uncertainty, as according to James et al. (2015) and Koscielniak et al. (2016). The social-economic level of the students from

Group 1 is in the range between 10 and more than 20 minimum wages and for Group 2 it is between six and 10 minimum wages, which can be considered a good salary level, thus putting them in the more risk-tolerant group of individuals, according to Kuzniak, Rabbani, Heo, Ruiz-Menjivar, and Grable (2015). The result of the questions on religion and financial education did not enable any conclusion to be reached regarding the aspects involving more or less risk tolerance.

The questions in the questionnaire aimed to cover what the criteria were that motivated them to take decisions, in the individual, social, and emotional dimensions, as well as the orientation regarding the investment period, and whether this was long- or short-term.

**Table 1**  
*Quantitative analysis of the answers to Questionnaire 1*

Individual	Social	Financial education
They seek financial success	Social recognition	Financial fundamentals
They invest in variable income for their own reasons	Political context	Technical analysis
They wish to accumulate wealth	Financial market	Share performance
	Friends' recommendations	Company balance sheet
		Company credibility

**Source:** *Elaborated by the authors.*

Regarding the individual aspect, most of the respondents from Group 1 stated that they would or do invest in variable income because they seek financial success, the accumulation of wealth, and professional ascension. This result was confirmed by the images chosen by most of the respondents with regard to their investment expectations. Most chose the projected image of a man climbing a ladder, with one of the respondents interpreting the figure as "*Climbing towards the future*" and "*Step by step we get there*". In the social aspect, they seek social recognition and admit to the influence of friends and of the political and economic context. Their investment decisions are subject to criteria of knowledge about finance and they follow financial fundamentals, carry out technical analyses, study previous share performance, analyze company balance sheets, and company creditability in the financial market.

In Group 1, the undergraduates, 78.60% of the students admitted that they based their decisions on financial fundamentals. Being recognized as an investor divided the percentage into 50% for those that sought this and 50% for those that did not identify this as a priority; 71.4% stated that they would invest in the stock exchange on their own initiative; 93% wished to become rich by investing in the stock exchange; 63% related investing in

the stock exchange to playing a game; 57.2% admitted to assessing the political environment before deciding; 72% carried out an analysis of the financial market beforehand; 64.3% stated that they did not use investor forum recommendations; 71.4% carried out a technical analysis; 71.4% decided based on share performance; 64% analyzed company balance sheets; 71% analyzed company credibility; 50% decided in accordance with friends' recommendations, which shows the use of various techniques or forms of analysis; 50% preferred to invest in the short term; 68% carried out long-term investments; 50% had expectations with regard to obtaining success and ascension as investors; and 92.9% admitted that reason and emotion are present when they make decisions, but that reason overcomes emotion.

In the questionnaire, the students were asked to answer what metaphor best defined them as investors. The analysis of the metaphors used by the students from Group 1 showed that the students felt apprehension taking risks and prefer caution when making stock market investment decisions. There is a curiosity and search for investment opportunities, but to a lesser extent a fear of losing personal security was also present. These results can be explained by the professor's guidance during the classes, since she emphasized that the investment strategy can

reduce the risk, but that caution needed to be used in the investment activities. The possibility can also be suggested

that the caution mentioned by the students forms part of the learning of the course content.

**Table 2**

*Analysis of the metaphors for Group 2*

Metaphor	Analysis
<i>Excited, but cautious.</i>	Caution
<i>Curious investor with regard to the workings of the market.</i>	Curiosity
<i>A bird in the hand is worth two in the bush.</i>	Caution
<i>Slow and always avoid losing money.</i>	Caution
<i>A fish out of water.</i>	Risky, hostile, dangerous environment
<i>Discreet.</i>	Caution
<i>Haste makes waste.</i>	Caution
<i>Calm, confidence, and reason.</i>	Feeling and reason
<i>A lion in search of an opportunity.</i>	Precaution, caution
<i>A bird in the hand is worth two in the bush; better safe than sorry.</i>	Caution
<i>Act with stealth.</i>	Caution
<i>A bird in the hand is worth two in the bush.</i>	Caution

**Source:** *Elaborated by the authors.*

Group 1, the undergraduates, did not answer the last question about evaluating the course with regard to their learning.

The results for Group 2 differed a little from the results for Group 1 and revealed differences regarding accumulating wealth by investing in the stock exchange, which obtained a balanced result – following friends' recommendations – which may be explained by the fact that half of the respondents have more knowledge of the

financial area and are in the 26-49 age group. Regarding the investment timeframe, a balanced result was obtained between short- and long-term, which may reveal that the respondents can choose the two forms of investment and mean a strategy for reducing risk. Most of the students chose the image of a man climbing a ladder, with two of the respondents interpreting the figure as: "*Laying the groundwork for a successful trade*" and "*Victorious in relation to what I could be*".

**Table 3**

*Qualitative analysis of the answers to Questionnaire 2*

Individual	Social	Financial education
They seek financial success	Social recognition	Financial fundamentals
They invest in variable income for their own reasons	Political context	Technical analysis
	Financial market	Share performance
		Company credibility

**Source:** *Elaborated by the authors.*

The results revealed that in Group 2, the post-graduates, 62.5% of the students admitted to basing their decisions on financial fundamentals; 62.5% wished to be recognized as investors; 75% stated that they would invest in the stock exchange on their own initiative; 50% wished to become rich by investing in the stock exchange and another 50% stated that they did not; 62.5% related investing in the stock exchange to a game; more than 50% admitted to carrying out an analysis of the political environment before deciding; 87% carried out an analysis of the financial market beforehand; 62.5% stated that they did not use investor forum recommendations; 62% carried out a technical analysis; 75% decided based on share performance. Balance sheet analysis for investing divided opinions and returned an inconclusive result:

75% analyzed company credibility; 74% did not decide using friends' recommendations. In these results, the evidence stands out that the students use different types of trading analyses. Regarding the investment timeframe, the answers did not reveal a preference for any one option, all receiving percentually balanced answers. Most showed expectations with regard to obtaining success and ascension as investors; 87% admitted that reason and emotion are present when deciding, but that reason overcomes emotion.

In the analysis of the metaphors used by Group 2, it can be identified that the contents projected by the students were those of caution, which may be related to the understanding of teachings passed on by the professor with regard to taking care to minimize risks. In addition,

the search for opportunities can also be identified, as well as the need to be persistent in order to achieve aims

and the perception of risk as dangerous, as can be seen in Table 4.

**Table 4**

*Analysis of the metaphors for Group 2*

Metaphor	Analysis
<i>I feel like an eagle.</i>	Feel intellectually stimulated
<i>Courage and responsibility.</i>	Opportunity and caution
<i>Some clouds cannot darken the beauty of the blue sky.</i>	Crisis and opportunity
<i>Caution with ambition.</i>	Caution and motivation
<i>Like a cat that tends to take risks, but also evaluating the possible risks and gains.</i>	Caution for taking risks
<i>Constant dripping wears away the stone.</i>	Persistence
<i>A bird in the hand is worth two in the bush.</i>	Caution
<i>Lost in a jungle of snakes and lions that want to crush your heart.</i>	Danger, hostile environment, risk

**Source:** *Elaborated by the authors.*

Two students, one from each group, mentioned as metaphors: “*A fish out of water*” and “*Lost in a jungle full of snakes and lions that want to crush your heart*”; they do not appear to feel comfortable in this decision-making environment because they have not developed the skills to deal with all of the variables that can influence them directly or indirectly at the time they decide. This feeling of discomfort is also perceived in the emotions of these participants straight after the final evaluations, observed via the answers marked on the PANAS-X scale. These participants had a greater intensity in the negative emotions compared with the general result. The emotions of fear and apprehension stood out in both. One of the students showed more discomfort than the other, marking “extremely” for the following emotions: fear, tiredness, hostility, dissatisfaction, boredom, and sadness, with these fitting into the negative emotions. Baker and Ricciardi (2014) confirm that experienced and mature investors know that success depends on controlling emotions in order to avoid the typical mistakes of new investors.

The students from Group 2, the post-graduates, answered the question: At the end of the course do you feel that anything has changed in the way you decide on investments? In general, they positively evaluated the course and stated that it had changed the way they think about carrying out investments. They know the market better and feel more confident investing.

To analyze the emotions present in the activity of investing, the decision was made to follow the analysis based on the PANAS-X. Those emotions whose sum of the most expressive intensities, “very” and “extremely”, which was greater than 35%, were considered relevant. The emotions in which the option “a little” also presented expressive values were also analyzed.

Based on the descriptive statistics analysis, it is perceived that the positive emotions that stood out

the most were: enthusiasm, attention (these being in the joviality subgroup), confidence (self-confidence subgroup), and interest. In the group of negative emotions, those that stood out were: nervousness, fear, apprehension, and boredom. However, the negative emotions previously mentioned are much less significant, considering the intensity percentage, than the positive emotions.

Studies have shown that in decision-making situations such as carrying out an investment, there is a prevalence of emotions such as self-confidence and aversion to loss, which may be related to emotions such as fear and nervousness (Halfeld & Torres, 2001). The negative feelings may be linked to a greater social concern and sense of justice, while the positive emotions may be associated with egotism in the expectation for one’s own interests (Forgas & Tan, 2013).

Another possible observation is that people tend to express positive emotions more intensely than negative emotions (Halfeld & Torres, 2001). This is very clear in the emotional questionnaire, since the positive emotions had a more disperse distribution between the different levels of intensity and the “very” option was chosen by 24.47% of the people, in the case of positive emotions, and by only 8.02% for the negative emotions. A large portion of the participants, mostly in the items related to the negative emotions, marked the most neutral and inexpressive options, such as “a little”, which corresponded to 50.72%.

Besides the evaluation based on intensity, it was possible to assess some emotions that can be considered opposite, such as joy and sadness. In some cases, it was possible to make the correlation between a positive emotion and a negative one, proving the presence of one of the emotions even more. This can be perceived in the case of the “nervous” emotion compared to the “calm” and “relaxed” emotions. In general, people judge that they are feeling more nervous, less calm, and less relaxed. Other

emotions that can be compared are “confidence” and “instability”; the people revealed that they were confident and less unstable.

Rationality is dependent on different individual psychologies or personalities, as well as differences in education or in income. If a decision is economically rational or irrational, it is influenced by the differences

between individuals in terms of their knowledge regarding alternatives, prior experience of similar decision-making, the availability of quick feedback regarding the consequences of the decisions, and the ability to objectively reflect on the decisions or make decisions quickly when emotionally stressed (Loewenstein et al., 2012).

## 5. FINAL REMARKS

This study achieved its aims, which were primarily to conceive of and carry out a course that created a simulated stock market investing environment, enabling the students to better understand the social contexts, the basis for the subjects’ (investors) socialization and their mental models. For this to happen, the professor and her research group encouraged the students to interact with each other and get to know their peers, with the aim of learning a little about their histories (and mental models) in order to be able to play together. This perspective is based on the conception that everyone is constituted as a human being through the relationships he/she establishes with others and on the assumption that his/her development is produced by experiencing differences and not only by the sum of experiences (Vygotsky, 1989). Thus, the relationships established in the academic environment are subject to emotional, intellectual, and social aspects when the students are encouraged to interact through interpersonal experiences.

The chosen didactic, even with the directed study and the seminar, gave the students the notion of gain in and loss of value, which in this case were the evaluation points and not some currency as in BM&FBOVESPA operations, but which reproduced, almost faithfully, the setting of a financial trading desk. This was important for them to be involved in the experience just as in a real situation, which enabled veracity in the experience and learning based on real financial market data.

The experience revealed that company games can contribute to learning content, developing skills and competencies, and preparing students emotionally and cognitively to act in real situations. In this didactic modality, the students are an active part of their learning process and can experiment with strategies for dealing with situations, enabling self-awareness and training competencies. Memory and the result of preceding decisions form a critical cognitive function with strong implications for current and future decisions. Given this complexity of aspects and variables, human behavior is dynamic, contingent, adaptable, and dependent on the

context and perceived conditions.

By aiming to establish a trading platform, as in the games, the students were able to experience conflicts and discrepancies in an entertaining way and seek agreements always mediated by other partners and by the professor. In this educational setting, when the knowledge is the result of social interactions and the expression of subjectivities, it can be supposed that the reality is transformed and the human being is reinvented, resulting in individual autonomy.

It is concluded from the results analyzed in light of the theories laid out in the theoretical framework that the rationality present in the technical analysis models is not the only determining factor in investment decisions. Risk assessment and decision-making involve three types of perception: social, cognitive, and emotional. That is, these three aspects are inter-related: cognitive perception considers theoretical aspects, market history, and analyses; social perception considers the political and economic context and the behavior of other players; emotional perception takes into account current feelings and aspects of the person’s personality, such as his/her life history, experience, values, and culture.

An example of this were the metaphors created by the students who did not feel comfortable in the decision-making environment created by the course: “*A fish out of water*” and “*Lost in a jungle full of snakes and lions that want to crush your heart*”, revealing a certain discomfort with the pressure, the competitive emotions, and mistakes that appeared in their decisions (Baker & Ricciardi, 2014).

An important point highlighted by the group of students were the assessments that they carried out, individually and in group, that decisions are not only rational, as some finance theories explain, but that there are important aspects that should be observed and are often only called irrational – this vocabulary is much discussed and the group opted to substitute it for the use of non-rational, in the sense that there may always be some rationality that is not known to us or thought of from another point of view (Simon, 1979). Finally, for the

students, the training proposal simulating a stock market trading desk situation was important and interesting, and this proposed course should be obligatory.

Prior training of market players could prevent the cognitive errors that have led the global capitalist system to collapse, due to the non-rationality of the decisions that have made to prevail some group's individual interests or only those of a nation or group of nations, without any concern for the social and globalized effects of these decisions. Corroborating with Weber (2009), the rational decisions of stakeholders are rational due to the means and not the ends, which has impoverished the area of economics, which since its modern era has been emptied of the ideology of social well-being and has been based on rational actions via the means, blind to the disastrous effects of this single vision. The interdisciplinary of the areas of Economics, Psychology, and Sociology, just as they were indivisible in the early days of these disciplines, could lead to the reemergence of the ideology of social well-being, for which reason the financial system was created, and provide the equilibrium needed for economic and financial decisions.

The findings of this research can lead to reflections regarding the factors that can explain the systematic errors committed in the financial market and indicate that the financial education and cognitive and emotional training of future financial market players can minimize

the risks. We sought to show that the process of training future market operators needs to enable the experience of testing the analysis modalities that exist in the market and knowing how to criticize them for their limitations. In addition, we sought to help the students to acquire knowledge regarding other variables that interfere in the analyses of operations, such as preferences, emotions, prior knowledge, interpersonal aspects, and aspects of personality.

The contribution from this study lies in its search to understand the factors that interfere in market efficiency; in the interdisciplinary study to understand the phenomena that impact the behavior of market operators; in proposing a teaching methodology that can prepare future market players to act clearly; in presenting various technical possibilities, providing students with knowledge regarding the techniques, their applicability, and limitations; and in the reflections concerning the different forms of perception regarding investment opportunities and risk, which could expand on in other studies involving the segmentation of clients according to their preferences in the investor market. Limitations of this study include the fact that since it involves participant research its conclusions cannot be generalized. Also, the cause of the students dropping out from the course was not studied, but presents indications that could be better analyzed in more in-depth studies.

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