International Journal of Social and Administrative Sciences
ISSN(e): 2521-0556
DOI: 10.55493/5051.v10i1.5315
Vol. 10, No. 1, 1-10.

URL: www.aessweb.com

How to design a financial market experimentation: The qualitative approach

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Article History
Received: 19 December 2024
Revised: 25 February 2025
Accepted: 13 March 2024
Published: 24 March 2025

Keywords
Biases
Decision making process
Emotions
Experimental design
Experimental finance
Individual investors
Qualitative research
Stock markets
Uncertainty.

ABSTRACT

This article aims at strengthening financial literature by providing a qualitatively inspired experimental protocol for analyzing the influence of emotions and cognitive and behavioral biases on the decision-making of individual investors. Most studies in this field generally rely on a quantitative approach, which is restricted to demonstrating cause-and-effect relationships based on large sample sizes, without actually analyzing the psychological reality of individual investors. Consequently, the literature shows a growing interest in the use of qualitative methodologies to better understand the financial decision-making process. However, laboratory experimentation must be based on a well-designed experimental protocol, so that other researchers can replicate the experiment with a precise understanding of the set-up and conditions. Accordingly, this article details the fundamental principles of experimental protocol design, based on existing literature. We then propose the practical set-up of an experiment on financial markets, using qualitative tools such as questionnaires, semi-directive interviews and a focus group. The article demonstrates the advantages of the qualitative approach in understanding the emotional and cognitive influence on the decision-making process. This methodology and the protocol offer a more precise analysis of people's psychological reality, often ignored by quantitative approaches.

Contribution/ Originality: The originality of this article lies in the construction of an experimental protocol offering a new perspective for studying the behavior of individual investors. This protocol can also be replicated to other areas of research related to financial decision-making.

1. INTRODUCTION

Emotions appear to play a crucial role in financial decision-making, particularly for small investors. However, both emotional responses (although adaptive in some situations) and the development of cognitive and behavioral biases may be irrelevant in a context, where cognitive functions, such as logical reasoning and planning, seem essential (Lo, Repin, & Steenbarger, 2005). Accordingly, individual investors do not always behave rationally, as they are subject to the influence of psychological, emotional and cognitive factors (Sakthivelu & Karthikeyan, 2024).

The methods selected to assess the possible influence of emotions and cognitive and behavioral biases on decision-making remain very much based on a quantitative perspective (Bubić & Erceg, 2018; Kumalasari, Karremans, & Dijksterhuis, 2022; Stevenson & Hicks, 2016; Widyarini, 2017). The results of quantitative processing would be limited to the identification of cause-and-effect relationships from large sample sizes, without necessarily controlling for the psychological nuances of human elements. To address this weakness, the literature is showing increasing interest in using qualitative methodologies (Severin et al., 2022).

We think that a qualitative methodological orientation seems necessary to closely address the emotional influences (supported by psychological elements) on the decision-making process of individual investors. To justify this positioning, we refer to Floyd and List (2016) who argue that field experimentation would provide a more accurate understanding of financial decision-making.

The article is as follows. The first section discusses the various methodological approaches and identifies their weaknesses. The second section discusses the building of experimental protocols and their implications. The third section describes an example of a qualitatively inspired experimental protocol for the development of research on the influence of emotions on decision-making. The article concludes with a discussion about the implications and future perspectives for research.

2. STATE OF THE ART

Studies concerning the role of emotions in decision-making generally rely on quantitative methodological tools (Chhapra, Kashif, Rehan, & Bai, 2018; Gabbi & Zanotti, 2019). Although this type of study generally uses questionnaires for data collection, the authors use statistical models to analyze the impact of emotions on financial decision-making. The results of these studies focus on identifying possible causal relationships between several variables, without necessarily considering the psychological nuances of the participants. A review of the literature shows a chronic under-representation of qualitative approaches in the field of individual investor decision-making. This approach, however, has the advantage of considering the individual's reality (psychological and socio-demographic).

We believe that, although individual investor behavior can be assessed using quantitative data, the explanatory variables used are often limited to simple demographic data (age, gender and level of education). Experimental psychology therefore represents a major contribution to behavioral finance. It has been widely shown that the use of qualitative research methods would be costly, and this cost could explain the lack of using them (Muradoglu & Harvey, 2012) without however questioning the relevance of their use. Pérez-Sánchez and Delgado (2022) found that, in most qualitative studies, data on individual investors was collected orally (21 out of 25 studies) or based on written documents (3 out of 25 studies) or focus group data (one study).

Moreover, it's also worth mentioning that some qualitative studies make use of neurophysiological measuring instruments, using integrated technologies to study emotional responses. Alsharif, Salleh, and Baharun (2021) selected brain imaging techniques such as fMRI (functional magnetic resonance imaging), EEG (electroencephalography) as well as pupil dilation, sweating, ECG (electrocardiogram), breathing and facial expressions. Campanella et al. (2004) and Lighthall et al. (2012) have also used cervical imaging and magnetic resonance to identify gender differences in behavior.

3. BUILDING EXPERIMENTAL DESIGNS: A THEORETICAL APPROACH

The construction of experimental protocols is based on basic principles designed to ensure scientific rigor and reliable results. According to Serra (2012) several key concepts need to be considered: internal and external validity, control of variables, experimental design, financial incentives as well as context neutrality.

Internal validity refers to the experiment's ability to measure its intended purpose, while external validity concerns the ability to generalize results. Both dimensions are important to ensure that conclusions can be applied beyond the laboratory. Variable control is also essential to separate the effects of the factors studied. This step requires careful planning, as does the overall design of the experiment, which includes the formulation of hypotheses, the definition of methodologies and the choice of analysis tools. Financial incentives also play a crucial role in encouraging subjects' active involvement. They contribute to aligning participants' motivations with the objectives of the study, thus reducing the risk of poor involvement. Finally, contextual neutrality ensures that experimental conditions do not bias the behaviors observed, thus providing greater validity for the data collected. These criteria make it possible

to define a robust theoretical framework, essential for designing reliable experiments that can be applied in the field of experimental finance.

3.1. The Treatment Method

Referring to Smith (1982) mentioned by Serra (2012) three elements must be defined precisely for the construction of the experimental design: the environment, the institution and the results.

- The environment corresponds to a set of factors describing the initial conditions and includes the personal characteristics of the participants involved, the technologies selected, and any incentives offered.
- The institution includes the tasks to be done, the decisions to be made and the rules to be followed.
- The results represent the observations induced by the decisions made by the participants during the experiment; these can be analyzed individually or globally. Results are therefore seen as a function of the environment and the institution.

A similar structure can be applied to studies in psychology, replacing environment with personality, institution with situation and results with reactions (Serra, 2017).

- Personality refers to a person's preferences and their attitude to a situation, including personality traits and emotional reactions.
- The situation depends on what the participants have to do, and on the instructions given.
- Reactions reveal how the participants react to the situation, according to their psychological reality.

A process must then be applied to the environment/personality or institution/situation to analyze its effect on results/reactions. For example, a reward could be given to participants with the best performance. The experiment then begins, without people knowing about it. The organizer then announces the experiment, so as to observe how participants' behavior changes as a result of this new information.

3.2. Selecting Emotional Stimuli

Some studies use visual or audio stimuli in order to potentially guide participants' physiological and emotional responses. The idea is that physiological responses can be influenced by specific sensory inputs, pointing to the interaction between visual and auditory modes in emotional processing (Polo, Farabbi, Mollura, Mainardi, & Barbieri, 2024). For instance, Xing (2014) used a visual stimulus (video clip) to study the effects of anger and sadness on decision-making. Other authors use the scenario method to study the influence of emotions in the decision-making process. In order to create a questionnaire on discrete emotions, for example,, Harmon-Jones, Bastian, and Harmon-Jones (2016) first asked participants to recall memories and then to write down the emotion that best corresponded to the scenario they were considering.

3.3. Selecting Measuring Tools

Controlling preferences is a central aspect in the design and conduct of laboratory experiments. It is necessary to control participants' preferences to ensure that results are influenced only by the measures under study and not by individual preferences. Serra (2012) mentions three main methods of controlling participants' preferences:

- Induction: Used to infer causal relationships between monetary reward, financial incentives and behaviors in economics experiments, which contributes to understanding decision-making mechanisms and individual preferences;
- Measurements: Used to provide an in-depth understanding of people's preferences, behaviors, and decision-making processes. Measurements can be direct or indirect. The former involves the acquisition of completely objective information. The latter involves the use of signals or responses that are not necessarily fully explicit (psychometric measurements, physiological measurements, and oculometric measurements);

- Hypotheses: these are assumptions used to formulate research questions, design experiments and then interpret the results.

Qualitative research can theoretically involve the use of various tools to assess participants' preferences : structured questionnaires (Glaser & Weber, 2007; Tekin, 2018) online surveys (Hoffmann & Post, 2016) psychometric tests (Abdeldayem & Sedeek, 2018) personality measurement scales (Hassin & Trope, 2000) as well as semi-structured interviews and even focus groups (Finet, Kristoforidis, & Viseur, 2021).

3.4. Population and Sample

Etchart-Vincent (2006) points out that experimental studies are often based on student populations, which raises the question of the representativeness of the subjects chosen in relation to the general population. In addition, the choice of participants can be questioned because of their level of education and their ability to understand the objectives of the experiment (the question of "familiarization"). According to the state of the art, the use of student populations would therefore present advantages and disadvantages. In brief:

- On the one hand, for advantages, we can put forward the easy recruitment of this type of participant, with, as a corollary, a reduction in the costs and time required for recruitment. Furthermore, the students would have a certain level of education, which could make it easier to understand the instructions and experimental tasks. Fréchette (2011) also shows that the behavioral patterns of students and professionals would be relatively similar.
- On the other hand, some researchers have expressed concern that the students' level of education may bias the results or make them unrepresentative of the general population. In addition, the students would not be adults in a position to make real financial decisions.

In any case, in experimental finance (and, more generally, in the analysis of the effect of emotional fields on decision, Rossignol, Anselme, Vermeulen, Philippot, and Campanella (2007) and She, Eimontaite, Zhang, and Sun (2017), using student populations is widely accepted (see the study by Ackert, Church, Tompkins, and Zhang (2005) and would seem to make scientific sense (Biais, Hilton, Mazurier, & Pouget, 2005; Bruguier, Quartz, & Bossaerts, 2010; Widyarini, 2017).

4. BUILDING EXPERIMENTAL PROTOCOLS: THE PRACTICAL APPROACH

Replicating experimental protocols is a basic principle underlying the experimental approach. This means that the more a result is replicated in different experimental contexts, the more robust it is. However, although well-designed experiments can provide a controlled environment, behavioral finance theories have only been tested through a limited number of experiments, and only occasionally (Xia & Madni, 2024). In the following section, we therefore propose to develop a general experimental protocol for studying the influence of emotions and cognitive and behavioral biases on stock market decision-making. This protocol, depending on the contexts analyzed, could be more or less strongly modified and developed.

4.1. Describing the Participants

Theoretically, participants could be selected from a student population or from a population of inexperienced individual investors. According to Kabbaj (2011) these two types of people are the main victims of emotional fields and psychological biases. Unlike institutional investors, individual investors may experience a lack of familiarity with stock markets and may overreact to weak signals. Given that the definition of the "novice" nature of individual investors is highly unpredictable and depending on what has already been specified (particularly in terms of costs), the use of student populations seems to us to be an appropriate option.

Financial rewards may be offered to ensure that participation is voluntary. Without an incentive mechanism, participants may choose to minimize their effort, which would be damaging to the quality and reliability of data

collected. In any case, the financial incentive and the analysis of results generated using time-consuming qualitative tools have restrictive effects on the construction of the sample, which will therefore only include a relatively limited number of participants. In this type of analysis, a high level of comprehensiveness is needed to understand behavioral mechanisms, rather than focusing on the size effect of the sample studied. Obviously, this raises the question of whether the results can be generalized and whether the scientific "saturation point" has been achieved. This means that we need to define a methodological criterion that precisely indicates when data collection can be stopped. In other words, the "saturation point" would indicate that the addition of further observations no longer modifies the results.

4.2. Organizing the Different Steps

Following the treatment method described above, we construct an experimental protocol according to the environment, the institution and the results.

For the environment, the duration of the experiment is defined according to the resources available to the researcher, considering financial constraints and the qualitative tools used. In this case, the experiment focuses on decision-making on stock markets, where participants are asked to place orders on a stock market platform (via a stock market game).

The selected platform will include macroeconomic, political, and company information, as well as the usual technical analyses (Moving Averages computed over various time intervals and Relative Strength Index). All these features provide participants with a realistic framework for making their decisions and offer an opportunity to discuss their strategies and reasoning. The stock market game, based on a fictional financial portfolio, offers a twofold advantage. On the one hand, it gives the organizers an overview of all the movements made by each participant over the period of the experiment, as well as their financial size. On the other hand, the stock market game can be used to rank participants according to the value of their portfolios.

This ranking can generate a kind of competition between participants, adding an additional emotional influence that could influence the decision-making process. This raises the question of the initial composition of the fictional financial portfolio. The organizers may provide a preliminary portfolio composition, or alternatively participants may choose to set the direction of their initial investments. We have noted that investment strategies were much more cautious when participants had to choose their own initial investments than when the organizers already set up an initial portfolio (Finet, Kristoforidis, & Viseur, 2022; Finet, Laznicka, & Palumbo, 2024). Initial choice would thus influence the direction of future investments. Regarding the duration of the experiment, we believe that a minimum of three days is necessary. The first day should be given over to "familiarization" with, firstly, the stock market platform and, secondly, the main rules of stock market operation. It is only after this familiarization that trading operations can be analyzed in a relatively homogenous manner.

At the institutional level, the instructions given to participants must simultaneously be clear and detailed. A set of preliminary indicators can be provided for participants: the evolution of indices on other markets the day before the experiment, the price of some raw materials, the exchange rate between currencies... Comments can also be provided on the information that should be announced (e.g. the presentation of the results of a particular company). Once the experiment has been officially started, participants place orders individually for the duration defined by the experimenters. Investments may be restricted to a stock market index of well-known companies to facilitate investment decisions.

There is no limit to the number of transactions that can be carried out, although transaction costs may apply (which could limit the number of transactions). In order not to complicate the use of the platform, transactions are carried out at the market price (some stock exchange platforms also offer the option of defining a limit price). To the extent that stock markets are subject to high levels of uncertainty, as well as a density of information flows (more or less directly associated with the stock market life of companies), it seems unnecessary to add further emotional

stimuli. Regarding the results and their analysis (as presented in the following section), the data collected came from questionnaires issued before, during and after the experiment, trading journals, semi-structured interviews and a focus group.

4.3. Measurement Tools

Operationally, before starting the experiment, closed questions are used to collect socio-demographic data on the participants (age, gender, previous knowledge of stock markets, etc.). The experiment can then begin. Participants are provided with a trading journal, in which each transaction is recorded. The journal includes the name of the company, the number of shares bought or sold, the price at which the transaction was carried out, the total financial amount involved, and the moment at which the transaction was carried out. The trading journals include all the transactions carried out during the experiment and their amounts, so that we can analyze the possible development of some cognitive and behavioral biases. Firstly, to approach overconfidence, the construction of a frequency table of holding times makes it possible to classify trading strategies according to the investment time horizon, using three positions (Kabbaj, 2011) : scalping, day trading and swing trading. We assume that the shorter the holding time, the greater the degree of overconfidence. Secondly, attention can be paid to the degree of concentration versus diversification of investments to approach the general orientation - prudential versus risky - of the strategy chosen. Thirdly, the fact that participants tend to focus on a specific number of companies in the spotlight, while neglecting others, offers an opportunity to analyze the "all that glitters attracts" and availability biases. Fourthly, the trading journal could also be considered as a diary in which participants would be asked to report on the reasons for their investment choices, as well as the main stock market themes they have chosen. Among other things, the information collected could be used to approach availability and anchoring biases. It is also important to measure participants' emotional feelings during the experiment, as people tend to quickly forget emotional peaks (Can, Arnrich, & Ersoy, 2019). This can be achieved by assessing emotions in two stages:

- Firstly, participants are asked to write down, in the trading journal, a word that best describes the emotion they feel when placing an order.
- Secondly, at the end of the trading sessions, participants fill in a questionnaire on their emotional state (for example, the discrete emotions questionnaire by Harmon-Jones et al. (2016).

At the end of the experiment, scales for the measurement of biases and transcriptions of the emotions could be used. Two methodological perspectives drawn from literature can be considered when addressing biases and emotions.

On the one hand, the biases potentially displayed by participants are analyzed using a questionnaire adapted and modified from the version proposed by Mer and Vishwakarma (2024). In our version, the questionnaire includes statements relating to availability bias, representativeness bias, overconfidence, anchoring bias, heuristics and the rank effect. In order not to influence the choice of participants, only items (without mentioning the bias analyzed) are included in the questionnaire. For each statement, subjects are asked to select a position on a six-position Likert scale. We decided to use six positions to prevent participants from choosing a neutral position, while providing them with detailed proposals designed to reflect their feelings. These results will also be reinforced by data from participants' trading journals.

On the other hand, to identify the emotions experienced, one of the steps in the development of the discrete emotions questionnaire by Harmon-Jones et al. (2016) has been modified to the context of trading decision-making. For each emotion, participants are asked to recall a specific moment during the experiment when, for example, the market configuration did not correspond to their expectations and had a negative influence on the value of their portfolio. After recalling the memory, subjects are asked to provide a word that best describes the emotion experienced and four additional words to name the emotion. Once again, participants are unaware of the emotion being analyzed, so as not to bias their responses.

In order to get a deeper understanding of individual investor behavior and the influence of emotions and cognitive/behavioral biases, semi-structured interviews can be conducted with each participant, to analyze their feelings and how various cognitive/behavioral biases may have been developed. For this purpose, it is necessary to draw up an "interview guide" which will be used as a guideline for the interviews. Interviews should last between thirty minutes and one hour per person. All interviews can be recorded so that they can be transcribed for data analysis purposes using, for example, Nvivo software or a textual analysis conducted by the researcher. Data from semi-structured interviews are generally analyzed through a coding process, which is an important step in the analysis of qualitative data, helping to structure the information collected. The literature considers three different forms of coding: open coding, selective coding and axial coding. Each of these approaches is aimed at bringing out central categories from the data collected and connecting them to sub-categories offering a detailed analysis of different aspects of the research object (Kristoforidis, 2023).

Based on existing literature and to complete the data collected or identify any differences, semi-structured interviews can be combined with a focus group. The focus group comprises between six and twelve people, creating a homogeneous group. The discussion can be organized according to the experimentalist's planned direction. For the purposes of our analysis, we will consider the methodology presented by Kitzinger, Markova, and Kalampalikis (2004). This paper suggests the use of a series of themes on cards. During the discussion, participants classify these cards into piles, for example, according to their degree of agreement or disagreement with the topic presented, but also according to the importance they give to the different aspects. By involving the participants in the process, this stimulates their attention and encourages them to explain their differing opinions. The discussion is also recorded and transcribed so that the data collected can be coded and potentially similar themes can be identified.

In summary, in order to provide a practical and operational framework, Table 1 presents the development of the experimental protocol, step by step, to fit the reality of other areas of financial decision-making (cryptocurrency trading, bond markets, derivatives, FOREX...).

Table 1. Path for designing an experimental protocol.

Steps	Description	Goals
Define the purpose and objectives of the research	Clearly identify the issues to be analyzed and the objectives sought	Structuring the experiment around the research's object
Selecting participants	Identify and recruit participants according to criteria predefined by the purpose of the research	Defining the appropriate population for the purpose of the research
Choosing the data collection method	Define the tools to be used to collect the relevant data and the most appropriate time to collect this data	Selecting reliable measurements that are relevant to the purpose of the research
Designing the experimental environment	Determining the conditions under which the experiment will take place	Precise definition of the 'Environment' element
Identify the task to be performed	Determining the precise instructions for the task to be carried out by the participants	Precise definition of the 'Institution' element
Defining the treatment to be applied	Implement a controlled modification on the 'environment' or 'institution' element	Encouraging analysis of behavioral differences among participants
Introducing an incentive mechanism	Provide remuneration or rewards to motivate participants	Keep participants motivated and encourage cognitive effort
Planning the stages of the experiment	Defining all the phases of the experiment	Ensure that the experiment is conducted on a coherent basis and that observations are consistent
Data collection and analysis	Collecting and analyzing data according to the tools used	Drawing conclusions to reinforce the state of the art associated with the issue analyzed

5. CONCLUSION

The state of the art in the field of bias and emotion shows a chronic under-representation of qualitative methodologies. When they are used, the articles focus essentially on the results, without specifying the experimental protocol in any detail. For this purpose, our contribution aims at contributing to literature related to the use of a qualitative approach to measure the influence of emotions and cognitive and behavioral biases on decision-making. By focusing on theoretical approaches, as well as the practical and highly operational aspects of setting up an experimental protocol, we aim at highlighting the crucial nature of this step in ensuring a high level of reliability and replication of the results.

According to us, the limits of quantitative approaches can be overcome by adopting qualitative methodologies, in particular by offering a more precise understanding of the influence of people's psychological reality. Even if this approach is not exempt from criticism, our experimental protocol is designed to limit its effects, starting with a combination of data and results (before, during and after experimentation). This approach makes it possible to objectify the conclusions drawn by highlighting their similarities and their convergent nature.

Funding: This research is supported by the Walloon-Brussels Federation, Belgium (Grant number: ARC-25/29 UMONS5).
Institutional Review Board Statement: Not applicable.
Transparency: The authors state that the manuscript is honest, truthful, and transparent, that no key aspects of the investigation have been omitted, and that any differences from the study as planned have been clarified. This study followed all writing ethics.
Competing Interests: The authors declare that they have no competing interests.
Authors' Contributions: All authors contributed equally to the conception and design of the study. All authors have read and agreed to the published version of the manuscript.

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