

Prospect theory in the financial decision-making process: An empirical study of two Argentine universities

Prospect theory
in decision-
making process

Rogelio Ladrón de Guevara Cortés

Instituto de Investigaciones y Estudios Superiores de las Ciencias Administrativas (IIESCA), Universidad Veracruzana, Xalapa, Mexico

Leticia Eva Tolosa

Departamento de Estadística y Matemática, Universidad Nacional de Córdoba, Córdoba, Argentina and

Facultad de Ciencias Económicas y Administración, Universidad Católica de Córdoba, Córdoba, Argentina, and

María Paula Rojo

Facultad de Ciencias Económicas y Administración, Universidad Católica de Córdoba, Córdoba, Argentina and Facultad de Ciencias Económicas, Universidad Nacional de Córdoba, Córdoba, Argentina

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Abstract

Purpose – This paper aims to provide empirical evidence for using the prospect theory (PT) basic assumptions in the Argentine context. Mainly, this study analysed the financial decision-making process in students of the economic-administrative academic area of two universities, one public and one private, in Córdoba.

Design/methodology/approach – The analysis methodology included (1) the descriptive statistical analysis to identify the presence of the certainty, reflection and isolation effects; (2) the construction of a set of indicators on the application of the PT; (3) the chi-squared independence test, to determine if the decisions made are independent of the degree course taken; (4) the non-parametric Kruskal–Wallis test, to determine if the decisions made by individuals vary according to the semesters taken or students' levels of progress; and (5) the non-parametric Mann–Whitney test, to determine if there are differences between the decisions made by men and women.

Findings – The empirical results provided evidence on the effects of certainty, reflection and isolation in both universities, concluding that the study participants make financial decisions in situations of uncertainty based more on PT than on expected utility theory.

Originality/value – This study contributes to the empirical evidence in a different Latin-American context, confirming that individuals make financial decisions based on the PT independently of their degree course, semester, level of advance, gender or the kind of university where they belong (public or private).

Keywords Prospect theory, Behavioural finance, Financial decisions, Rationality and risk, Non-parametric tests, Córdoba, Argentina

Paper type Research paper

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1. Introduction

The expected utility theory (EUT) in finance provides the natural point of departure in the analysis of rational choice models for decision-making by individuals in scenarios of uncertainty since most of the theories can be understood as generalizations of this base theory. Before the 1940s, this theory was the dominant model used to describe financial decision-making decisions. At its core, EUT features a rational decision-maker with clear and comprehensive knowledge of the environment, a well-organized system of preferences and excellent technical skills to select optimal solutions. However, [Simon \(1979\)](#) claimed that decision-makers do not optimize but rather “satisfy”. The satisficing principle suggests that individuals forgo optimum solutions for a simplified world in search of satisfactory solutions for a more realistic world.

Years later, Behavioural Finance challenges traditional Finance and introduces psychological factors that affect decision-making. In this approach, [Tversky and Kahneman \(1974\)](#) demonstrated that the decision-making process of individuals in situations of uncertainty is affected by the existence of heuristics and cognitive biases. Behavioural Finance advocates believe that investors make decisions at different levels of rationality or satisfaction, according to [Mullainathan and Thaler \(2000\)](#), and individuals should realize the importance of understanding the notion of bounded rationality, as indicated by [Barberis and Thaler \(2005\)](#). In addition, investor judgment is influenced by factors such as crowd psychology, herd behaviour or unfavourable memory of a prior financial or investment decision. A well-established premise in Behavioural Finance is that investors make decisions according to the principles of prospect theory (PT).

The seminal work by [Kahneman and Tversky \(1979\)](#) advocated this new theory in which individuals deviate from the rationality espoused by classical decision theory and make decisions based on bounded rationality advocated by behavioural decision theory. PT is based on the notion that people are loss averse and are more concerned with losses than gains. Then a new version of prospect theory by [Tversky and Kahneman \(1992\)](#) incorporates the cumulative function and extends the theory to uncertain and risky prospects with any number of outcomes. The resulting model, called cumulative prospect theory (CPT), combines some attractive features of both developments. It gives rise to different evaluations of gains and losses, which are not distinguished in the standard cumulative model, and it provides a unified treatment of both risk and uncertainty.

[Kahneman \(2003\)](#) presents a model in which the fundamental characteristic of investors is not that they reason badly but that they often act intuitively. The behaviour of these agents is not guided by what they can calculate but by what they happen to see at a given moment. He performs an analysis in which he differentiates between two ways of thinking and deciding that correspond to the usual concepts of reasoning and intuition. Whereas reasoning is done deliberately and with great effort, intuitive thinking seems to present itself spontaneously to the mind, without conscious calculation or searching and without effort. Later appeared the third-generation prospect theory (TGPT), which explains choices and judgments of the highest buying and lowest selling prices of risky prospects. This theory combines cumulative prospect theory for risky prospects with the theory that judged values are based on the integration of price paid or price received with the consequences of gambles ([Birnbbaum, 2018](#)).

This research aims to provide empirical evidence for using the prospect theory’s basic assumptions in the Argentine context. Mainly, we analyse the financial decision-making process in students of the economic-administrative academic area of two universities, one public, the National University of Córdoba (UNC), and one private, the Catholic University of Córdoba (UCC), both in the city of Córdoba, Argentina. In that context, this study represents an extension of previous research where similar experiments were conducted in different universities in Mexico, Brazil and Colombia. The nature of this extension responds to our

interest in analysing if the financial decisions taken by the participants are different, responding to geographic, cultural, social and economic particularities in each university and country. Despite the PT and Behavioural Finance studies dating from the late 1970s, their development in emergent markets, particularly, Latin America, is scarce. Thus, the main contribution of this paper is to provide additional empirical evidence of the financial decision-making process in another geographic, cultural, social and economic context different from previous research that allows us to contribute to the generalizations of the framework of these alternative financial and economics approaches under the light of the scope and limitations of this study.

On the other hand, investment and financing decisions in different economies are essential in the economic development of the regions. In this context, in September 2015, world leaders adopted a set of global goals to eradicate poverty, protect the planet and ensure prosperity for all as part of a new sustainable development agenda. Each objective has specific goals to achieve. Objective No. 17 (SDG) is associated with strengthening the means of implementation and revitalizing the Global Alliance for Sustainable Development, Sustainable Finance and Financial Inclusion as a relevant aspect.

For this reason, this research relates to the aspect of financial decision-making by obtaining empirical evidence from undergraduate and graduate students who have training in economics as input to know how to proceed and adequate the programmes of study in the context of the sustainable development objectives addressed in the agenda proposed by the [United Nations Organization \(2015\)](#). [Kahneman and Klein \(2009\)](#) report on an effort to explore the differences between two approaches to intuition and expertise that are often viewed as conflicting: heuristics and biases and naturalistic decision-making. Starting from the obvious fact that professional intuition is sometimes marvellous and sometimes flawed, the authors attempt to map the boundary conditions that separate actual intuitive skill from overconfident and biased impressions. They conclude that evaluating the likely quality of an intuitive judgment requires an assessment of the environment's predictability. The judgment is made of the individual's opportunity to learn the regularities of that environment. Subjective experience is not a reliable indicator of judgment accuracy.

This document is structured as follows: [Section 2](#) presents the literature review, [Section 3](#) explains the methodological aspects and [Section 4](#) shows this research's empirical results. Finally, [Sections 5](#) and [6](#) present the discussion and some conclusions, respectively.

2. Literature review

The theoretical framework has been developed, from the most general to the most specific topics addressed in the investigation and answering consistent arguments to support the hypotheses presented. Firstly, we talk about classic economics and then present Behavioural Finance studies. Secondly, because of our content analysis and feature identification, we effectively provide a specific literature review of an individual's decision-making process.

[Agudelo \(2022\)](#) mentions that academic studies in Traditional Economy and Finance assume that people behave when making their decisions as "Homo Economicus", that is, they objectively weigh the options and possible contingencies, they do not ignore the relevant information, do not rush to conclude prematurely and do not allow themselves to be influenced by emotions. However, it is known that this is not a realistic description of the individuals.

[Ricciardi \(2008\)](#) asserts that since the mid-1970s, hundreds of academic studies have been conducted in risk perception-oriented research within the social sciences in various branches of learning. A significant issue within the risk perception literature is how an investor processes information and the various Behavioural Finance theories and issues that can influence a person's perception of risk within the judgment and choice processes.

The different Behavioural Finance theories and concepts that influence an individual's risk perception for different types of financial services and investment products include heuristics, overconfidence, prospect theory, loss aversion, representativeness, framing, anchoring, familiarity bias, perceived control, expert knowledge, feelings and concern, among others.

Based on that, [Muhammad *et al.* \(2020\)](#) argue that there are varying behaviours of decision-makers included in the framework of Behavioural Finance, like heuristics (representativeness, overconfidence, anchoring and gambler fallacy) and prospects behaviours (loss aversion and regret aversion). It also believes that personality characteristics are an integral part of investment decision-making (feelings, moods and ecological factors) because different personalities are different in the decision-making process.

Based on the assumption that people present risk aversion and are entirely rational, that decision-making subjects effectively process all information and that markets are efficient, the individuals make decisions to maximise expected utility. However, criticism of the current paradigm by several studies led to the emergence of a new financial theory: Behavioural Finance, based on the premise, therefore, that decision-makers do not behave in a strictly rational way but make judgments and choices under the influence of emotional aspects, using mental shortcuts or simplifying rules that can lead to systematic errors and deviations, considered cognitive biases.

PT is a more realistic description of how people evaluate risk in experimental settings. This theory was published in March 1979 in the journal *Econometrika*, becoming one of the essential references in the financial study. The PT is empirically based and aims to reflect how people behave, not how traditional theories mark it, which assumes that people make decisions rationally. Therefore, this theory is empirical and focuses on people's attitudes who act in risky conditions.

[Kahneman and Tversky \(1979\)](#) supported this theory by empirically testing how people focus on gains and losses but with a greater emphasis on risk appetite. For these authors, the choices made by individuals exhibit various effects (certainty, reflection and isolation) that are inconsistent with economic theories. Thus, these effects are the basic premise of research on choice problems and risky decision-making processes.

According to [Kahneman and Tversky \(1979\)](#). The certainty effect explains how people are risk-averse in situations with an assured profit and discard those options that include uncertain probabilities even though the profit could be higher. The reflex effect is the opposite of the previous effect; individuals are prone to risk when they have an imminent loss, so they prefer to accept assumptions with uncertain probabilities to minimize the loss already insured. Finally, the isolation impact originates when identical alternatives in different cases are discarded, which generates inconsistency in decision-making.

As mentioned above, the PT gave rise to the behavioural school of Finance, known as Behavioural Finance. [Sewell \(2007\)](#) defines Behavioural Finance as "the study of the influence of the behavioural psychology of finance professionals and the subsequent effect on the markets". This approach to Finance is based on how people behave, on average, in a world of uncertainty. A basic premise of Behavioural Finance is that individual decision-making deviates systematically from the behaviour of the predictions marked in traditional theories, such as the EUT. Likewise, the PT, derived from what is currently known as Behavioural Economics, whose primary reference is Richard Thaler, another winner of the Nobel Prize in 2017. [Thaler \(2018\)](#) states that human behaviour seems inconsistent with economic theory. In addition, he mentions that Behavioural Economics currently uses a whole range of modern tools ranging from theory to big data, structural models and neurosciences; thus, their applications reach all areas of economics. It is worth mentioning that [Ladrón de Guevara-Cortés *et al.* \(2019\)](#) provide a detailed literature review related to this theoretical framework.

Another aspect to consider, according to [Peterson \(2007\)](#), is that recent financial gains and losses change investor behaviour. Therefore, financial market participants need to monitor their internal reactions to see how their decisions are biased by their recent experiences. They must be careful not to let such biases affect decision discipline.

Following [Peterson \(2007\)](#), investors who have experienced a recent loss may note nervousness and other signs of irrational risk avoidance behaviour like hesitation in entering new positions, excessive deliberation about further potential losses and seeing more financial threats than usual. They must take special care not to let that anxiety affect future discipline in trading decisions. Conversely, investors who have recently earned significant gains may be feeling celebratory, extremely intelligent or somewhat invincible. They must also ensure to focus on something other than potential returns and ignore the risk control and monitoring aspects required to make financial decisions. Only some people can maintain a disciplined investment strategy during the simultaneous gains or losses accompanying stock market fluctuations.

In this research, we also address whether there are statistically significant differences between the financial decisions made by participants according to different variables associated with their academic formation and gender. On this subject, [Rasool and Ullah \(2020\)](#) intended to identify the extent of the relationship between individual investors' financial literacy level and behavioural biases in Pakistan. In addition, [Isidore and Christie \(2019\)](#) assert that mental accounting bias causes investors to see each stock in terms of its value. Finally, [Lobão et al. \(2017\)](#) conclude that a heuristic recognition portfolio yields poorer returns than a market portfolio.

Moreover, in our investigation, we present the hypothesis that decision-making is different between males and women, i.e. we try to detect if there is a distinction between the decisions made by gender. In this regard, different authors refer to this characteristic.

[Bogan et al. \(2013\)](#) found that understanding the role of gender diversity in risk management would help effect change. [Harzer et al. \(2016\)](#) found that women tend to be more risk-averse in win-win situations. [Ladrón de Guevara-Cortés et al. \(2020\)](#) confirmed, in general, a more conservative profile in women and a more aggressive one in men in making financial decisions.

Finally, advances in theory are mentioned that are not part of this research, but it is imperative to refer to them to avoid some objections made in the PT.

For example, CPT by [Tversky and Kahneman \(1992\)](#) is a variant of rank- and sign-dependent utility (RSDU), and TGPT proposed by [Schmidt et al. \(2008\)](#) as a unified theory to account for judgments of the value of risky prospects as well as choices between such prospects. In addition, this theory was intended to account for the discrepancy between willingness to pay (WTP) and willingness to accept (WTA) and preference reversals between choices and value judgments.

[Birnbbaum \(2018\)](#) analysed three properties implied by TGPT to show that empirical data violate them: complementary symmetry, first-order stochastic dominance and the Type 2 violation of restricted branch independence.

Finally, another aspect related to our research is that people are affected in their decisions by their cultures and experiences, and, in that sense, [Statman \(2008\)](#) made a study where he discussed the many cultural differences that may influence investor behaviour and financial advising. In the same mind, [Rieger et al. \(2017\)](#) surveyed on risk preference in 53 countries to estimate CPT parameters, finding significant differences related to economic and cultural differences.

3. Method

3.1 Research design

The general objective of this research is to determine if the individuals participating in this research also present the elements of irrationality in decision-making raised by the PT, considering the following particular objectives:

- (1) Determine if the certainty, reflection and isolation effects are present in the financial decision-making by individuals.
- (2) Identify statistically significant differences between the answer given to each question and the academic programme studied.
- (3) Detect if statistically significant differences are found between the different semesters they are studying.
- (4) Detect if there is a distinction between the decisions made by gender.

According to the mentioned above and the results of our previous research, we pose the following general work hypotheses to test in our empirical study:

- H1.* The students of the Economic-Administrative area of the UNC and the UCC make financial decisions based on the PT.
- H2.* There is no relationship between the answer to each question and the academic programme studied.
- H3.* The students of the Economic-Administrative area of the UNC and the UCC make financial decisions based on the PT, regardless of the semester attended.
- H4.* The students of the Economic-Administrative area of the UNC and the UCC make financial decisions based on the PT, regardless of gender.
- H5.* The female students of the Economic-Administrative area of the UNC and the UCC present a more conservative risk profile than the male students.

3.2 Data and variables

This study considered a preliminary sample of students from different academic programmes offered in the Economic-Administrative academic area of two Universities, one public, the UNC, and one private, the UCC, both in the city of Córdoba, Argentina. In this sense, the students who participated in this study included undergraduate students of the Economic Sciences of both universities who studied subjects related to Mathematics and Finance, graduate students of MBA and four specialties related to Economics of the Business School of the Catholic University of Córdoba.

The set of analysed variables included in the analytical procedure corresponding to the hypothesis tested in our study is the following. All of them have been extracted from the information collected in the questionnaires. These variables are: (1) Answers to each item related to decisions made under the PT or the EUT, (2) Academic programme, (3) Semester and (4) Gender.

3.3 Instrument

The applied questionnaire, distributed in each course through the Google Forms platform and made available to be answered over two months, derives from the original presented in the seminal article by [Kahneman and Tversky \(1979\)](#) and adapted from those used by [Genellhu and da Silveira \(2012\)](#) and [Marinho et al. \(2009\)](#) (The questionnaire is available at: <https://forms.gle/uudonn7tXCL6bqFj6>). The first part of the instrument contains identification and segmentation questions. The second part includes a set of questions where financial decisions must be made, representing two different scenarios of risk and rationality, one associated with the PT and another with the EUT. This questionnaire, which 620 students answered, produced a reliability coefficient of the Cronbach's alpha test of 0.692.

3.4 Analytical procedure

Our analysis procedure's steps are based on the techniques usually employed in empirical research about this topic. Those steps are the following: (1) a descriptive statistical analysis to identify the certainty, reflection and isolation effects; (2) the construction of a set of indicators about the degree of application of PT in financial decision-making; (3) the chi-squared test (χ^2) to identify whether the decisions taken are statistically independent of the academic programme studied; (4) the non-parametric Kruskal–Wallis test to identify whether decisions taken vary statistically according to the semester; (5) the non-parametric Mann–Whitney test to establish statistical differences between the decisions made by gender; and (6) the detection of the risk profile of women and men.

For the sake of saving space in this document and considering that the parametric and non-parametric statistical techniques used for analysing the collected data represent well-known statistical techniques, we will not get deep into their description or explanation. Nevertheless, the interested reader can find extensive information about them in the following sources: Peña (2014), Kraska-Miller (2014) and Laerd Statistics (2015, 2018), and we remark on the main aspects of each statistical technique used in our study.

The contingency tables, cross tables or crosstabs are a bi-dimensional representation of two variables that allow cross information between their frequencies. The chi-squared test (χ^2) of independence's objective is to determine if there is evidence of a relationship in the population posing a null hypothesis of independence. Rejecting the null hypothesis implies a relationship in the population between the two variables.

The indicators about the application of PT in financial decision-making proposed are constructed as an illustrative but straightforward index of occurrence in percentage terms of the cases that make decisions using the PT over the total number of cases, both in general terms and by each effect.

The Kruskal–Wallis test is a non-parametric rank test used to determine statistically significant differences among two or more groups of one independent variable concerning one continuous or ordinal dependent variable. It is considered a non-parametric alternative to the ANOVA or a generalization of the Mann–Whitney U test to compare more than two groups.

The Mann–Whitney U test, also known as the Wilcoxon–Mann–Whitney test, is a non-parametric rank test to prove differences between two groups of one independent variable concerning one continuous or ordinal dependent variable. It represents a non-parametric alternative to the independent samples t -test.

4. Results

In this section, we present the results of the empirical study. Firstly, in Section 5.1, we present the results of the contingency tables and the χ^2 test to analyse the possible differences in the decisions among the different academic programmes and the indicator of application of the PT in both universities. Secondly, in Section 5.2, we present the analysis of the differences in decision according to the semester and level of advance using the Kruskal–Wallis test. Finally, Section 5.3 discusses the differences in decisions and risk profiles according to gender.

4.1 Results according to the academic programme

This section analyses the three effects of PT: certainty, reflection and isolation. Then, we present each question's relevant responses classified by these three effects.

4.1.1 *Certainty, reflection and isolation effect.* Tables 1–3 present the answers regarding the certainty, reflection and isolation effect, respectively, using cross-tabulation analysis

Table 1.
Certainty effect in the academic programmes studied

Question	Option	Expected value	PT/ EUT	Bachelor in accounting	Bachelor in management	Bachelor in economics	Graduate studies: Ph.D., Master's degree and specialization	Total	Pearson χ^2	p-value
1	A) 33%: \$2,500; 66%: \$2,400; 1%: \$0	\$2,409	EUT	37%	37%	41%	46%	39%	2.8726	0.412
	B) 100%: \$2,400	\$2,400	PT	63%	63%	59%	54%	61%	7.1371	0.068
2	A) 33%: \$2,500; 67%: \$0	\$825	EUT	50%	53%	56%	65%	46%		
	B) 34%: \$2,400; 66%: \$0	\$816	PT	50%	47%	44%	37%	32%		
3	A) 80%: \$4,000; 20%: \$0	\$3,200	EUT	32%	29%	31%	39%	32%	2.7531	0.431
	B) 100%: \$3,000	\$3,000	PT	68%	71%	69%	61%	68%	3.3205	0.345
4	A) 20%: \$4,000; 80%: \$0	\$800	EUT	47%	45%	51%	56%	48%		
	B) 25%: \$3,000; 75%: \$0	\$750	PT	53%	55%	49%	44%	52%	6.5957	0.086
5	A) 50%: England, France and Italy; 50%: Not winning the trip	Non-monetary effect: uncertainty	EUT	28%	33%	17%	21%	27%		
	B) 100%: one week in England	Monetary effect: certainty	PT	72%	67%	83%	79%	73%		
6	A) 5%: a three-week trip to England, France and Italy; 95%: Not winning the trip	Non-monetary effect: uncertainty	EUT	52%	56%	59%	52%	53%	1.7346	0.629
	B) 10%: a one-week trip to England; 90%: not to win the trip	Monetary effect: certainty	PT	48%	44%	41%	48%	47%		
7	A) 45%: \$6,000; 55%: \$0	\$2,700	EUT	28%	29%	20%	23%	27%	2.2045	0.531
	B) 90%: \$3,000; 10%: \$0	\$2,700	PT	72%	71%	80%	77%	73%	3.5056	0.32
8	A) 0.1%: \$6,000; 99.9%: \$0	\$60	EUT	69%	77%	73%	70%	71%		
	B) 0.2%: \$3,000; 99.8%: \$0	\$60	PT	31%	23%	25%	30%	29%		

Source(s): Own elaboration with estimations computed in Stata 14®

Question	Option	Expected value	PT/ EUT	Bachelor in accounting	Bachelor in management	Bachelor in economics	Graduate studies: Ph.D, Master's degree and specialization	Total	Pearson χ^2	p-value
9	A) 80%; (-\$4,000); 20% \$0	-\$3,200	PT	87%	85%	80%	86%	85%	2.0039	0.572
	B) 100%; (-\$3,000)	-\$3,000	EUT	13%	15%	20%	14%	15%		
10	A) 20%; (-\$4,000); 80%; \$0	-\$800	PT	53%	51%	58%	58%	54%	1.7286	0.631
	B) 25%; (-\$3,000); 75%; \$0	-\$750	EUT	47%	49%	42%	42%	46%		
11	A) 45%; (-\$6,000); 55%; \$0	-\$2,700	PT	66%	69%	76%	74%	69%	3.9439	0.268
	B) 90%; (-\$3,000); 10%; \$0	-\$2,700	EUT	34%	31%	24%	26%	31%		
12	A) 0.1%; (-\$6,000); 99.9%; \$0	-\$60	PT	44%	41%	44%	45%	43%	0.3329	0.954
	B) 0.2%; (-\$3,000); 99.8%; \$0	-\$60	EUT	56%	59%	56%	55%	57%		

Source(s): Own elaboration with estimations computed in Stata 14®

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Table 2.
Reflection effect in the
academic programmes
studied

Table 3.
Isolation effect in the
academic programmes
studied

Question	Option	Expected value	PT/ EUT	Graduate studies:				Pearson χ^2	p-value	
				Bachelor in accounting	Bachelor in management	Bachelor in economics	Ph.D., Master's degree and specialization			Total
13	Stage 1: 75% 0 and 25% go to	\$800	EUT	26%	27%	27%	33%	28%	1.5446	0.672
	Stage 2: A) 80%,\$4,000 and 20%: \$0									
	Stage 2: B) 100%: \$3,000	\$750	PT	74%	73%	73%	67%	72%		
14	PI: Probabilistic insurance		EUT	57%	64%	56%	68%	61%	4.9961	0.172
	Take out the PI									
	Not to take out the PI		PT	43%	36%	44%	32%	39%		
15	In addition to what is possessed, \$1,000 extra	\$1,500	EUT	44%	41%	32%	34%	40%	5.0313	0.17
	A) 50%: \$1,000; 50%: \$0									
	B) 100%: \$500	\$1,500	PT	56%	59%	68%	66%	60%		
16	In addition to what is possessed, \$1,000 extra	\$500	EUT	66%	65%	71%	67%	67%	0.7316	0.866
	A) 50%: (-\$1,000); 50%: \$0									
	B) 100%: (\$500)	\$500	PT	34%	35%	29%	33%	33%		

Source(s): Own elaboration with estimations computed in Stata 14®

between questions and academic programmes. Both crosstabs and χ^2 test results were computed by Stata 14®. Since, from a classical perspective, academic programmes that focus on a quantitative or economic formation should take decisions more related to the classic economic approach, the null hypotheses tested for each question by using the χ^2 test were as follows:

$H2_0$, There is no relationship between the answer given to each question and the academic programme studied.

To show more straightforwardly the differences between alternatives corresponding to the EUT and those to the PT, in the third column of each table, we computed the expected value based on the EUT for each question according to the following expression:

$$EU = P * U \quad (1)$$

where

EU = Expected utility.

P = Probability of occurrence of the event.

U = Utility amount.

Tables 1–3 in the fourth column indicate which of the two alternatives corresponds to the decision based on EUT and which to PT. Our analysis of each effect is the following.

The results of the certainty effect (Table 1) show evidence in favour of the PT in almost all cases. In four questions, students of all the educative programmes opted for the alternative that considers the PT's principles over those of the EUT. Only two of the six questions that measure this effect showed the opposite result. In one of these questions (Question 5), which measures the non-monetary effect of uncertainty, the difference in the percentage of answers given to one alternative was negligible. However, in Question 8, which implies the same expected value but with alternatives that pose a high probability of not winning anything, the participants opted for the option related to the EUT.

Regarding the independence χ^2 test in all cases, we cannot reject the null hypothesis of independence at all levels of statistical significance. These results imply that the participants' answers are independent of their bachelor's or graduate studies. Consequently, their financial decisions in terms of the certainty effect were similar.

Concerning the reflection effect (Table 2), the results in three of four questions showed evidence supporting PT again. The only question where participants took decisions based on the EUT was the one that expressed a similar situation in the certainty effect, i.e. high probabilities of winning zero, but in the losses terrain in both alternatives. In all the cases, we cannot reject the null hypothesis of independence at all levels of statistical significance.

The isolation effect (Table 3) produced mixed results. Two questions showed evidence in favour of PT and two of EUT. Consequently, we cannot identify a clear tendency in the participant's financial decision-making regarding this effect. However, the results concur with those found in previous research and are aligned with the individual's financial decision-making process inconsistency considered in the PT. Therefore, in most cases, we cannot reject the null hypothesis at 5% of statistical significance regarding the independence chi-squared test.

According to the above-mentioned theory, we can confirm our general hypothesis 2 (H2) about the non-relationship between the answer given to each question and the academic programme studied.

Finally, Table 4 presents the results of the UNC's and the UCC students' PT degrees of application. This set of indicators allows us to test our general hypothesis 1 (H1) about the

Economic-Administrative students of these two universities' financial decisions based on the PT and not the EUT. The results produce a degree of application of PT in the financial decision-making process of 62.50%, representing a high percentage. Furthermore, the analysis segmented by the academic programme had the same results in all cases (62.50%), representing an intriguing finding in this study. Perhaps, this finding reveals that students of both universities and from all the educative programmes analysed receive a very similar formation, or maybe this behaviour can be associated with the cultural or geographical features of the people in Córdoba. In addition, the analysis by effect shows high degrees of application in both global terms and by the academic programme. The results ranged from 50% to 75%.

4.2 Results according to the semester

Following [Marinho et al. \(2009\)](#), we used the non-parametric one-way analysis of variance Kruskal–Wallis H test by ranks to analyse the possible difference in financial decisions made by students of different semesters or levels of advancement in their studies. Firstly, we performed the analysis globally; then, we replicated the analysis through the academic programme.

4.2.1 Global results by semester. Since, according to a classical approach, students with a more significant advance in their studies should have a more rational decision, we tested the following null hypothesis regarding the students' semester.

H3₀. There is no difference among the decisions taken by students of different semesters.

Firstly, we performed the following preliminary tests to ensure the correct utilization of the Kruskal–Wallis test. We visually inspected the complete set of histograms with fitted discrete normal distribution corresponding to each question grouped by each semester. In addition, we estimated the Jarque–Bera univariate normality test. Both preliminary tests proved the non-normal distribution and distribution shape similarity in nearly all the cases segmented by semester. Therefore, we proceeded to estimate the Kruskal–Wallis test.

Table 5 presents each question's *p*-values in global terms for the Kruskal–Wallis test. We took the *p*-value uncorrected for ties in almost every case since we detected asymmetry in the distributions using Jarque–Bera's test. However, we took the *p*-value corrected for ties only in questions 2, 4, 6 and 10. As a result, we could not reject the null hypothesis of equality among the different semesters' students' answers. Thus, there is no statistically significant difference in the financial decisions made among students of different semesters at 95% confidence.

4.2.2 Results by academic programme and semester. Since students from different academic programmes with other profiles could make financial decisions more related to one approach, we also made another type of segmentation, mixing programmes and semesters. Table 6 presents the Kruskal–Wallis test's *p*-values according to the segmentation above.

Table 4. Prospect Theory degree of application indicators: general and by effect

	Bachelor in accounting	Bachelor in management	Bachelor in economics	Graduate studies: Ph.D., Master's degree and specialization	Total
Certainty	62.50%	62.50%	62.50%	62.50%	62.50%
Reflection	75.00%	75.00%	75.00%	75.00%	75.00%
Isolation	50.00%	50.00%	50.00%	50.00%	50.00%
PT	62.50%	62.50%	62.50%	62.50%	62.50%

Source(s): Own elaboration

Question	UNC-UCC-Argentina	Prospect theory in decision- making process
1	0.92648	
2	0.46585	
3	0.73606	
4	0.37777	
5	0.72548	
6	0.14545	
7	0.84872	
8	0.35233	
9	0.97723	
10	0.61767	
11	0.57105	
12	0.42691	
13	0.99515	
14	0.81083	
15	0.95613	
16	0.65577	

Table 5.
Global Kruskal–Wallis
test results by semester

Source(s): Own elaboration with estimations computed in Stata 14®

Question	Bachelor in accounting	Bachelor in management	Bachelor in economics	Graduate studies: Ph.D., Master's degree and specialization	
1	0.55403	0.91218	0.81248	0.94974	
2	0.27632	0.20418	0.61682	0.12398	
3	0.74448	0.8738	0.93328	0.83529	
4	0.69197	0.78284	0.80122	0.06394	
5	0.3698	0.58887	0.85118	0.94078	
6	0.47273	0.83081	0.01747	0.52097	
7	0.94761	0.95143	0.71195	0.86899	
8	0.74045	0.6904	0.57932	0.42103	
9	0.9464	0.76987	0.75026	0.99667	
10	0.66916	0.3833	0.42517	0.64525	
11	0.46372	0.78891	0.87844	0.94753	
12	0.70838	0.63219	0.59527	0.9458	
13	0.7868	0.97028	0.56131	0.83683	
14	0.9994	0.95691	0.36628	0.79455	
15	0.99391	0.36078	0.42177	0.67641	
16	0.97161	0.60223	0.51649	0.95595	

Table 6.
Kruskal–Wallis test
results by academic
programme and
semester

Source(s): Own elaboration with estimations computed in Stata 14®

We could not reject the null hypothesis of equality among semesters at a 5% statistical significance except for question six regarding the Bachelor in Economics. This question belongs to the certainty effect and refers to a non-monetary aspect.

The Kruskal–Wallis is an omnibus test that, in the first stage, cannot identify which particular groups present differences. Therefore, we need to run an additional post hoc test to determine this. We used [Caci's \(1999\)](#) Stata script, which runs the Kruskal–Wallis test for all the possible combinations among the segmentation groups. [Table 7](#) presents the Kruskal–Wallis *p*-values estimated in this case. We can identify the semester combinations where we reject the null hypothesis of equality at a 5% statistical significance in students' decisions in different semesters. However, we can state that this difference among groups is negligible since it represents only one question in one academic programme.

In summary, in view of the results of this section, we cannot reject our general hypothesis 3 (H3) about the equality of the financial decision taken by the students from different semesters.

4.3 Results according to gender

Since it is believed that men and women are different regarding their financial decisions, following [Marinho et al. \(2009\)](#), we carried out the non-parametric Mann–Whitney *U* test to analyse the difference in the financial decision made between women and men. The null hypothesis tested was the following:

H4_o. There is no difference between the decisions made by women and men. Studies such as [Ricciardi \(2008\)](#) have shown that men are more aggressive in financial decisions than women. Therefore, we also used the Mann–Whitney test’s results to determine the participant’s risk profiles segmented by gender. The hypothesis tested was the following:

H5_o. Women present a more conservative risk profile than men regarding financial decisions.

We ensured the Mann–Whitney’s results reliability using the Jarque–Bera test and the visual inspection of histograms with fitted discrete normal distribution, which confirmed, in general, the non-Gaussian distribution and the distribution shape similarity segmented by gender.

[Table 8](#) presents the Mann–Whitney test results segmented by question and sex. The second column shows the estimated *p*-values to test the null hypothesis of equality between financial decisions taken between women and men. In this case, we reject the null hypothesis of equality at 5% statistical significance in six questions about the certainty effect. Derived from these results, we can state that in the gains terrain exists a clear difference in responding to the participants’ gender. However, there is no evidence of a difference in decisions in all other questions. Therefore, we partially reject our general hypothesis four (H4) about the equality of financial decisions taken by women and men.

The third column indicates women’s probability of taking the riskier alternative in each question, while the fifth represents the opposite. We marked the highest values for each question to quickly visualise the question where men or women selected the riskier alternative. Overall, we confirm the risk profile posed in general hypothesis 5 (H5), which states that women are more conservative than men. However, in line with previous research in other Latin-American countries, Questions 9 and 11 show evidence of a more aggressive profile for women in the losses terrain.

5. Discussion

In general, the evidence obtained in this research coincides with that obtained in seminal empirical studies about the PT and Behavioral Finance ([Kahneman and Tversky, 1979](#)), other

Question 6	Pair comparison			<i>p</i> -value
1	Semester 2	vs	Semester 7	0.031786
2	Semester 4	vs	Semester 8	0.043738
3	Semester 4	vs	Semester 8	0.016090
4	Semester 6	vs	Semester 7	0.023212
5	Semester 6	vs	Semester 9	0.046768
6	Semester 7	vs	Semester 8	0.005046
7	Semester 8	vs	Semester 9	0.010861

Source(s): Own elaboration with estimations computed in Stata 14®

Table 7. Kruskal–Wallis test results. Pairs of semesters. Bachelor in Economics

	<i>p-value</i>	Women > men	Men > women	Prospect theory in decision- making process
Question 1	0.00870	45%	55%	
Question 2	0.00000	39%	61%	
Question 3	0.02680	46%	54%	
Question 4	0.00000	41%	59%	
Question 5	0.32230	52%	48%	
Question 6	0.00060	43%	57%	
Question 7	0.02700	46%	54%	
Question 8	0.01790	46%	54%	
Question 9	0.18780	52%	48%	
Question 10	0.30650	48%	52%	
Question 11	0.60800	51%	49%	
Question 12	0.43390	48%	52%	
Question 13	0.90700	47%	53%	
Question 14	0.53260	49%	51%	
Question 15	0.40490	52%	48%	
Question 16	0.63910	49%	51%	

Note(s): Cells marked in Column 2 represent questions where the *p*-value was statistically significant at 5%. Cells marked in Column 3 represent cases where women showed a higher probability of taking decisions that imply more significant risk

Source(s): Own elaboration with estimations computed in Stata 14®

Table 8.
Mann–Whitney test
results by question
and sex

Latin-American studies related (Genhelu and Silveira, 2012; Marinho *et al.*, 2009), and our previous research (Ladrón-de-Guevara-Cortés *et al.*, 2020). There is a finding that we would like to remark on regarding the analysis by gender in line with our previous research in Brazil, Colombia and México. Although, in general, women showed a more conservative risk profile, our findings reveal a more aggressive profile of women in the losses terrain.

In this context, the theoretical implications of this research are given in the following. Firstly, despite the PT and Behavioural Finance studies dating from the late 1970s, their development in emergent markets, particularly Latin America, is scarce. Thus, this work contributes to the development of these lines of research, providing additional empirical evidence that proves that individuals in Córdoba-Argentina, in addition to those of Porto Alegre-Brazil, Cali-Colombia and different cities of Mexico, make financial decisions considering in a greater extent the alternative scopes of finance than according to the classic economy assumptions. Consequently, this document contributes to the eventual generalization of alternative financial theories' assumptions and principles in the Latin American context.

In addition, the findings of the present research contribute to the conclusion's generalization regarding the use of the assumptions of the PT and the principles of Behavioural Finance in the financial decisions making process by a different and broadly extended sample of students that belonging to two renown universities in a distinctive geographical, cultural and idiosyncratic in Argentina's centre–north region.

On the other hand, the policy or managerial implications can be analysed from different perspectives. Firstly, it is crucial to consider that the individual subjects of study will eventually participate as economic agents. Consequently, their decisions will impact the economic cycles or the financial markets in one way or another. In this context, the PT and the Behavioural Finance empirical research results can provide valuable information for regulators and public policymakers. Secondly, this kind of study can also provide new insights for Education Institutions in their regular updating processes regarding the scope and contents of their programmes in the context of the United Nations 2030 Agenda for Sustainable Development's goals, especially those involving financial education.

Finally, since we could not apply the questionnaire to other academic areas of both universities, those areas were out of the scope of this research. Instead, they will be studied in future extensions of this work, whose findings could provide deeper insights into understanding these issues. Moreover, other lines of future research may include replicating this study in other universities in Argentina and other Latin-American countries, using more robust statistical and econometric methods to test the hypotheses posed, and investigating alternative versions of PT such as the cumulative PT or the GTPT.

6. Conclusions

This paper aimed to provide empirical evidence about how economic-administrative students from two Argentine universities make financial decisions, departing from a general work hypothesis stating that their decisions were more based on the principles of Behavioural Finance than on the Classic Economic Theory.

In this context, our findings provided evidence that supports our general work hypothesis by showing the presence of certainty, reflection and isolation effects in the financial decisions made by students of different economic-administrative bachelor's degrees offered in both universities. These findings conclude that the study participants make financial decisions in situations of uncertainty more based on PT than EUT. Additionally, we confirm our hypothesis that there is no relationship between the decisions made by the students under study and their bachelor's degrees.

Regarding the hypothesis about the distinction decisions according to the semester studied, we conclude that there are no differences in global terms or the segmentation by the academic programme.

Finally, concerning the hypothesis related to the difference in the decision by gender, we conclude that there is a difference in the financial decisions made only in the gains terrain (certainty effect). On the other hand, in general, we confirm the hypothesis that women's risk profiles were more conservative than men's.

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About the authors

Rogelio Ladrón de Guevara Cortés, Ph.D. Researcher at IIESCA of the Universidad Veracruzana, Mexico; Ph. D. in Business Studies with Excellent Cum Laude Mention and Master in Financial Markets from the University of Barcelona, Spain; Member of the National System of Researchers of CONACYT and PRODEP Profile. Financial consultant, stock market investor and independent online trader; Professor of financial subjects in undergraduate and graduate programmes; and Coordinator of the Financial Research Group. He is the author of numerous articles in indexed journals and presentations at international conferences and referee of several international journals of economic research. Rogelio Ladrón de Guevara Cortés is the corresponding author and can be contacted at: roladron@uv.mx

Leticia Eva Tolosa, Ph.D. PhD in Economics, mention Business Sciences with an Accounting orientation, School of Economics, Universidad Nacional de Córdoba (2013), Professor and Member of Academic Committee "Business Financing", Specialization in Finance Management, Universidad Católica de Córdoba, Associate Professor of Financial Mathematics, Universidad Nacional de Córdoba; Speaker and moderator at scientific and professional Congresses, Seminars and Conferences. Director of a research team on capital markets issues and Research Project "Competitiveness, Clusters and Social Progress"; Director of the Competitiveness Center, Universidad Católica de Córdoba; President International Finance Conference (2020). Participant of Workshop Program Microeconomics of Competitiveness. (HBS); Vice – President of "PETRINI VALORES S.A.

María Paula Rojo, CPA. Public Accountant, Universidad Nacional de Córdoba (1997); Master's degree student in Business Administration; Assistant Professor, FCE Universidad Nacional de Córdoba; Assistant Professor, FACEA, Universidad Católica de Córdoba. She is the author of educational materials and co-author of research's publications subsidized by several public organizations; Speaker and moderator at scientific and professional Congresses, Seminars and Conferences; Participant in a research team on capital markets issues; Administrative Manager at Postgraduate School, FCE Universidad Nacional de Córdoba (2016–2018); Teaching Counselor FCE, Universidad Nacional de Córdoba de Córdoba (2014–2016); Independent consultant in Finance, Accounting, Auditing, Compliance and Anti-Money Laundering.

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