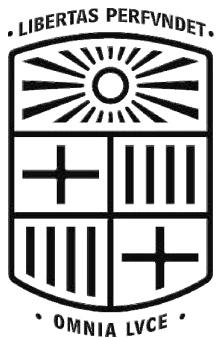


**INVERSORES CONDUCTUALES:
¿QUE PERFIL ES MEJOR A LA HORA DE INVERTIR?**



**UNIVERSITAT DE
BARCELONA**

PAULA ALEJANDRA MONTES ALVAREZ

JOAQUÍN TURMO GARUZ

ECONOMÍA

Abstract

This work is based on some of the ideas defended by behavioral economics, a branch that is gaining more and more strength within this field of social sciences, so dominated by mathematics, and which wants to make us see that the human being is far from resembling the well-known homo economicus scheme. With this study I want to show the intrinsic relationship that exists between psychology and economics, and how the contributions of the former can play a key role in the understanding of human beings within an economic environment. Thus, I try to answer whether people's personal traits, in this case, their way of dealing with problems, plays a determining factor when making investments.

For this, a quick test has been carried out to classify the participants as rational or intuitive. Subsequently, the methodology used was to carry out a quantitative study, through the use of an investment simulator, over a period of a month and a half, in order to collect data on the performance of each of the groups. based on the initial classification.

The results of this experiment and the conclusions reached will be presented at the end of this work.

Key words: behavioral, economy, investments, rational, intuitive, psychology

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1. INTRODUCTION

1.1. What is behavioral economics

Behavioral economics is a branch within neoclassical economics. A clear example of this criticism is the famous phrase by Dan Ariely, according to which "we are predictably irrational" and that is precisely what this economic branch wants.

Neoclassical economics, the currently dominant paradigm in economics, focuses on analyzing the economy from a perspective based on the efficient use of scarce resources, with the aim of maximizing individual utility.

Neoclassical economics is based mainly on the mathematical analysis of facts, in order to develop economic analysis.

The neoclassical paradigm considers that human beings are rational creatures, when it comes to allocating or organizing these resources and obtaining the maximum utility from them. This vision of the human being has led many to coin the term homo economicus.

In any case, as Thaler (2016) mentions in his book "MisBehaving", this economic representation of Homo Sapiens, with the aim of adjusting to the economic model, is still fictitious. In fact, in general, the behavior of human beings tends to deviate greatly from the predictions made by these economic models. In any case, Herbert Simon (1995) was the first to propose a paradigm shift, with his notion of limited rationality.

This has generated that many economic theories, too generalist about human behavior, although valid and useful, present a large number of inconsistencies and defects in their postulates, which make their application to real life difficult.

For many years, these deviations were attributed to the so-called "margin of error". This assumption would be possible if these errors were random, because in the end, the errors would neutralize each other. But as Thaler (2016) explains, researchers Daniel Kahneman and Amos Tversky showed that these errors were far from random.

With the aim of responding to these deficiencies of the current neoclassical economic model, behavioral economics was born.

Behavioral economics, in its need to understand people's behavior, has taken as its own concepts from other fields outside of economics, such as psychology and other social sciences, including even neuroscience.

This branch tries to offer a new interpretation to utility theory, an example is Matthew Rabin (2002) who has proposed three deviations from the expected utility theory, allowing a better adaptation of it to the real world, and therefore offering better predictions about human behavior. And moving away from the perception of the human being as a rational creature or from the Homo economicus concept, and including emotional elements of human behavior in the analysis.

The latest psychological discoveries and advances, together with sociology and neuroscience, have given more and more arguments and force to the ideas advocated by behavioral economics, especially at the microeconomic level, but it is expected that over time, it will also be applicable at the level. macroeconomic, although this last point is not yet well developed and presents some difficulties. Anyway, the first attempts are starting to appear.

1.2. Implication of behavioral economics in finance

Behavioral economics has been gaining strength in different branches of economics and other branches, such as Marketing. Within the economy, contributions within finance, especially the stock market, and in public policy advice gain strength.

As Aya & Ospina (2019) exposes, behavioral finance aims to explain the behavior and skills of the investor based on neuroscience. These authors expose three fundamental pillars within this discipline: "the psychological and sociological study of the behavior of financial consumers, the brain analysis of investors and the investor's relationship with their environment and how this directly influences their financial decisions in the short term. term." (Aya & Ospina, 2019)

Within this field of work, the study of biases is highly relevant. The human being faces different problems in his day to day, these problems can have different degrees of complexity and the way in which we face it, depending on its complexity, varies. Daniel Kahneman refers to his two systems in relation to our strategies to deal with these problems, systems that I will deal with in the next section of this study. On many occasions, the decisions we make about these problems lead us to commit cognitive biases.

According to Tversky and Kahneman (1974) in their article Judgment under uncertainty: Heuristics and Biases, cognitive biases come from reliance on heuristics. Which causes people to end up taking the wrong path, unconsciously, often motivated by their intuitions.

In the case of behavioral finance, as explained by Aya & Ospina (2019), the main cognitive biases that affect decision-making are the frame effect and the anchor effect.

As Kahneman (2011) explains, the frame effect consists of a differentiated interpretation of the same argument, depending on the presentation made of it. A good example of it, is expose by the author:

The statement that "the probability of survival one month after surgery is 90 percent" makes us feel more confident than the one that "mortality one month after surgery is 10 percent." Similarly, cold cuts that are specified to be "90 percent fat free" appeal to us more than if they are specified to be "10 percent fat".
(Kahneman, 2011, p. 120)

On the other hand, the anchoring effect is defined as that which occurs when people take a given value as a reference (and in some cases without any relationship) in order to estimate an unknown quantity. (Kahneman, 2011). Another example in this case, stated by the author is:

If someone is asked if Gandhi had more than one hundred four years when he died, you will end up making a higher estimate of the age at which he died than you would have done if the anchor question had spoken of thirty-five years. If someone considers how much they would pay for a house, they will be influenced by the asking price. The same house will seem more valuable to you if your set price is high than if it is low.

(Kahneman, 2011, p. 162)

In recent years, the trend within behavioral finance is to focus on issues such as over-optimism, risk aversion, and overcoming anxiety bias.

Of course, the field of behavioral finance offers many possibilities, and takes special relevance in times of uncertainty, and the behavior of investors during these periods.

Finally, I would like to mention that, although different studies carried out in recent years have shown that there are at least 4 types of investors, intuitive, explorers, realistic and strategic (Aya & Ospina, 2019), We decided to simplify our study by differentiating only two types of investors, rational and intuitive, a differentiation that I will explain in more detail later.

As we have already said before, behavioral economics assumes that people are very far from being the rational beings that economic neoclassicism defends. Human behavior presents a series of patterns and biases, and is usually guided by emotions.

Studies within this new branch consider that investors today, and their investment decisions, are influenced by their emotions and intuition. These biases can be predictable, and as a result, work on them to try to correct them, with the aim of optimizing the investor's decisions.

1.3. Contributions from Daniel Kahneman

In order to carry out my work, we always had Daniel Kahneman and his work as a reference. Kahneman is an Israeli-American Psychologist who for many years, together with Amos Tversky, focused on the study of the psychology of judgment and decision making. His discoveries in these fields led him to delve into other areas, such as behavioral economics. His contributions within this field led him to receive the Nobel Prize in Economics in 2002.

Their studies carried out with Amos Tversky during the 1970s led them to question two of the basic foundations of the social sciences. The first one assumes that people were generally normal rational beings, since they presented normally healthy thinking. The second, on the other hand, suggested that emotions, especially fear, affection and hatred, can explain by themselves the deviations within this rationality.

The results of these studies were reflected in the article "Judgment Under Uncertainty: Heuristics and Biases" published in 1974. In it, they described the strategies of intuitive thinking and explained at least 20 biases as a manifestation of this heuristic. In short, the article exposed, as the author comments, "a systematic way errors in the thinking of normal people and we look for the origin of these errors in the design of the machinery of cognition rather than in the alteration of thought for the emotion" (Kahneman, 2011, p. 20).

This study challenged the neoclassical dogma of homo economicus.

However, their studies did not end there, and both researchers decided to focus on making decisions under conditions of uncertainty. His goal in this case was to find out how people make decisions on simple bets, and from there to develop a psychological theory. The results of this second were published in "Prospect Theory: An Analysis of Decision Under Risk".

Kahneman and Tversky showed that biases are also present in systematic decision making, diverting our preferences from what would be considered rational.

Later, and alone, Kahneman wrote the book "Thinking, fast and slow" (Image 1). His intention with this book is to present in a simple way the workings of our mind. In this case, in order to make reading and comprehension easier for the reader, Kahneman differentiates two systems, which he calls System 1 and System 2.

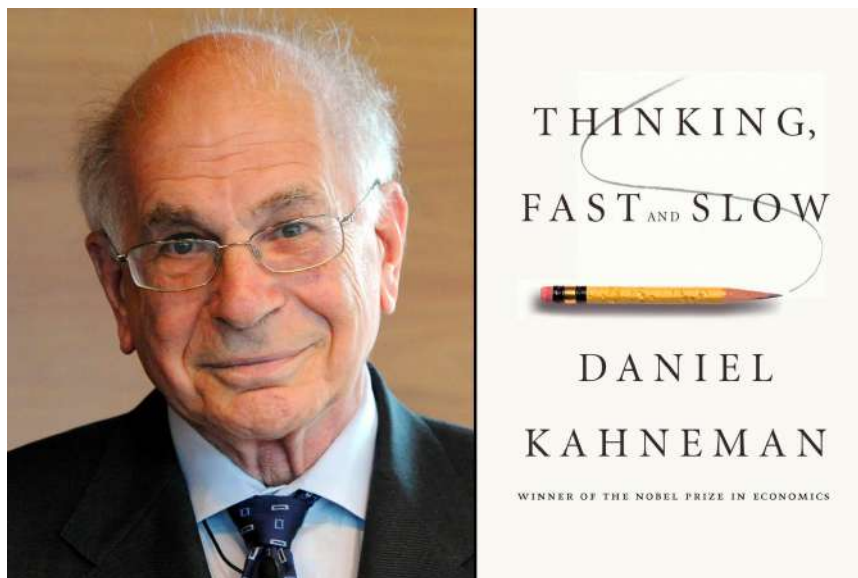


Image 1. Daniel Kahneman and the cover of his bestselling book "Thinking, fast and slow"

A brief description of both systems, according to the author, defends that "System 1 operates quickly and automatically, with little or no effort and without a sense of voluntary control." (Kahneman, 2011, p. 35) On the other hand, "System 2 focuses attention on the demanding mental activities that demand it, including complex calculations. System 2 operations are often associated with the subjective experience of acting, choosing, and concentrating. " (Kahneman, 2011, p. 35)

We consider that these descriptions, although brief, do not allow us to understand exactly the scope of both systems. So we would like to expand the qualities of each of them.

Thus, System 1 is actually the one that generally guides much of our thoughts and actions. It is closely related to our associative memory and has a broad representation of the world in which we live. It allows us, among other things, to give interpretation and response to "surprising" events that are outside of what our mental schemes consider normal. Being associated with memory, System 1 is also related to those activities or learning acquired

through practice, and allows us to respond to routine situations efficiently and effectively. In short, System 1 is characterized by the cognitive ease and speed with which it responds to huge amounts of information that come from the world in which we live. As a final conclusion, it could be said that System 1 is a primarily intuitive system.

On the other hand, System 2, as Kahneman (2011) says, is who we think we are. System 2 functions as a kind of filter for System 1, it is in charge of analyzing the ideas and sensations generated by System 1, and assessing whether these ideas are valid or whether it is necessary to "rationalize" them. Therefore, System 2 is responsible, among other things, for endorsing the ideas of System 1, if they have been previously validated. Or, on the other hand, prevent ourselves from falling into the error and erroneous intuitions generated by System 1. As a final conclusion, it could be said that System 2 is a mainly rational system.

We must make it clear that neither of the two systems described by Kahneman in his book is perfect. Although it is true that much of the book focuses on the errors of judgment and intuitive choice attributed essentially to System 1. System 2 also presents serious limitations, especially due to the amount of information to which it has access, therefore, in many cases, the mistakes we make are not due solely to System 1, but to the wrong doing of System 2, which does not know how to perform the task correctly.

Finally, it is important to clarify, as Kahneman says that these two systems that he mentions, do not really exist within the human mind. His intention is that the reader understands that when he refers to "<<System 1 does X>>" it is a way of saying that "<<X is done automatically>>". And "<<System 2 is mobilized to do Y>>" is a way of saying that "<<the mind is enlivened, the pupils dilate, the attention is focused and the activity Y is executed>>". (Kahneman, 2011, p. 540)

This differentiation between System 1 and System 2 is what has allowed us to develop this work.

2. EXPERIMENT

2.1. Objective/Hypothesis

As we mentioned at the beginning, the objective of this work is to analyze the effect that people's "personality" has, defined in this case by what is defined by Daniel Kahneman in his book "Thinking, fast and slow", where two differentiate systems within the functioning of the human mind, System 1 and System 2, in the final performance of the participants in an investment simulator.

Depending on whether a person is dominated by System 1, they will be classified as intrinsically intuitive. On the other hand, if a person has a more developed System 2, he could be considered a rational person.

With our experiment we want to show that, in fact, depending on the dominant system in each person, the performance within the simulator will be better or worse.

This has led us to propose the main hypothesis of my work, according to which, we state that, if a person is rational, then their performance within the investment simulator will be much more positive than those people who are classified as intuitive.

Our experiment consists of the use of an investment simulator, so we considered at the beginning that it would be difficult to obtain real results of the performance of the participants in a short period of time, as it could be a single use, for which we decided to carry out a study of the performance of the participants over a period of a month and a half. In this way, it would be easier to analyze the real performance of the participants, and not associate it with the good or bad fortune that they could have on a specific day.

This extension in time has led us to propose our second hypothesis. According to which we consider that the continued use of the application over time will lead to better performance in the simulator over the different weeks.

We must bear in mind that none of the participants had experience in the investment world, so in the end, the same simulator would involve a learning process for them.

2.2. Muestra

Being an experiment, and after so many years studying statistics in the career, we knew that the choice of the sample was a key factor, especially as far as the validity of the results is concerned.

Due to this, we got in touch with my old econometrics professor, Josep Carrion, and he recommended that we should contact professor Santiago Forgas Coll, who in his opinion, carried out a study that has certain similarities with ours, and could give us an approximate idea of the necessary sample to perform our experiment while maintaining the minimum efficiency. After consulting with Forgas, he recommended that in order to achieve maximum efficiency, it would be recommended that both sample groups be made up of 63 (on average), 385 for maximum precision and at least 26 participants.

We are happy to say that a total of 65 people participated in our experiment.

The age range of the participants is between 18 and 57 years of age. Most are in the age range of 18 to 24 years, a total of 36 participants, 55,38% of the sample. In the range of 25 to 29 years, there are 7 participants, 10,76%. On the other hand, in the range of 30 to 34 years, we only have 4 participants, which represents 6,15%. We have 3 participants from 35 to 39, which supposes 4,62%. The next age range in which there are participants is 40 to 44 years, with 6 participants, which is 9,23%. Two people in the range of 45 to 49, with 48 years and 3,08%. In the range of 50 to 54 years, there are a total of 4 participants, which is 6,15% of the total. And finally, from 55 to 59 years we have 3 participants, 4,62% of the sample

Regarding educational level, we have 12 participants with basic training, which represents 18,46% of the sample. On the other hand, we have 16 participants with an average

educational level, 24.61%. And finally, there are 37 participants with a higher educational level, which represents 56.92% of the total.

Finally, If we take gender into account, we have a total of 30 women, 46.15%; and 35 men, which represents 53.84%.

2.3. Metodología

As we explained previously, our objective with this work is to focus on which people are better at making a profit investing in the stock market, depending on which of the two systems of the functioning of the mind dominates in each of the participants.

To do this, we have had to develop a whole series of steps in order to obtain the desired results. In the first place, it was necessary to use a test, to be able to classify the participants in one group or another. And secondly, it was necessary to participate, for a month and a half, in an investment simulator in the stock market.

Regarding the test, we decided to use it to classify the participants of the experiment into two groups, rational and intuitive.

This classification was possible thanks to a series of logic questions posed in the book "Thinking, fast and slow" by Daniel Kahneman. Following the author's idea that there are two systems of functioning of the mind, System 1 and System 2; this posed a series of questions throughout several chapters that tend to cause cognitive biases in the participants. These cognitive biases, the author explains, are given as a consequence of errors in System 1, which tends to give quick and intuitive answers to the problems we encounter in our day-to-day lives. In the case of the bat question, as Kahneman explains, "more than 50 percent of Harvard, MIT, and Princeton students gave the wrong intuitive answer." (Kahneman, 2011, p.65) Something similar occurs in the case of Rosa's argument, which, says Kahneman, most take for granted.

Therefore, from these questions, it was feasible to discover if the participants are more likely to face the problems raised guided by one or the other system.

The questions posed by Kahneman in his book, and which I decided to use as part of my experiment, totaled 4 (Annexes A). And they were the following:

1. A bat and a ball cost 1.10. The bat costs a dollar more than the ball. How much does the ball cost?
2. If 5 machines take 5 minutes to make 5 pots, how long will it take 100 machines to make 100 pots? 100 minutes or 5 minutes
3. In a lake there is an area with water lilies. Every day the area doubles in size. If the area takes 48 days to cover the entire lake, how long would it take to cover half the lake? 24 days or 47 days
4. All Roses are flowers.

Some flowers wither soon.

Then some Roses, they wither soon.

Do you think this argument is valid?

After applying this test, and with regard to the classification of the sample as rational and intuitive. We have obtained a total of 34 intuitive participants, which represents 52.3% of the sample; while there are 31 rational participants, which represents 47.69% of the total participants.

When evaluating the responses and making a standardized and homogeneous classification of the participants, we decided that all those who answer 2 questions or less correctly will be classified as intuitive. On the other hand, those people who make 3 or more correct answers will be classified as rational.

Once the first phase of the experiment (the test) had been carried out, the second phase began, during which the use of the investment simulator was necessary.

Before starting the experiment, we did a detailed search of the different simulator offers available. For me, three things were fundamental:

- Its availability for each operating systems (iphone or android)
- Easy to use
- Free to play

Finally, the program chosen to carry out the experiment was the investment simulator known as Trading Game (Image 2).



Image 2. Trading Game application logo

It is a free app you can use with the mobile, which makes the use easier for the participants. This application, in addition to offering a real reflection of the market, allows participants to access a wide variety of actions to invest in. From currencies, stocks, cryptocurrencies, commodities and stock indices.

Another factor that we took into account when choosing this app was that it offers optional training before starting the experience. In fact, with this training, you can access a greater number of income, which allows greater diversification in the market.

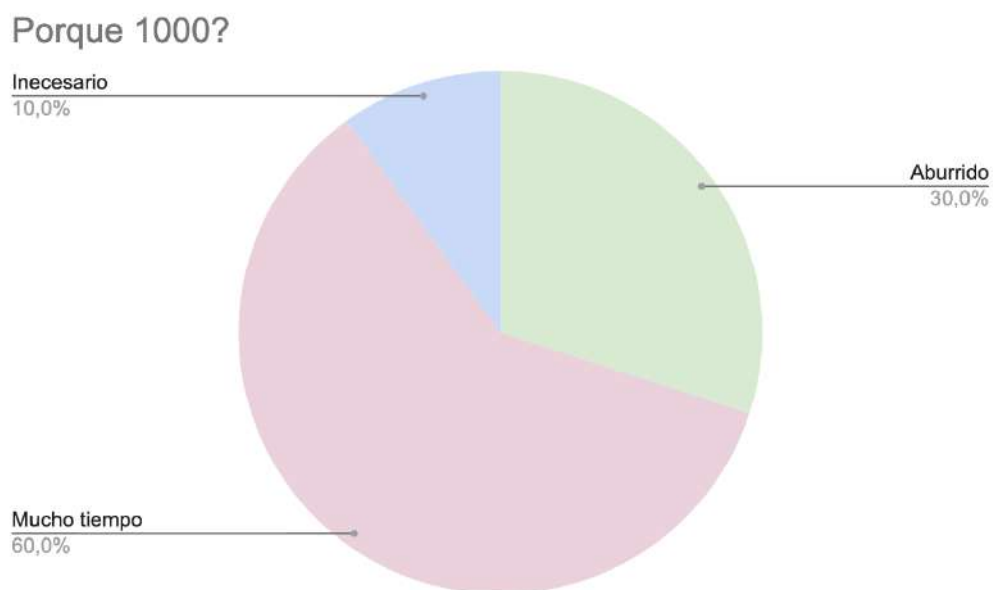
We would like to add that all the participants who carried out the experiment received a total of two informative documents to facilitate the use of the application and with tricks to get a greater benefit from their investments. In addition to a PDF, with all the answers of the application training, in case they did not want to do it, but if they could access the common base starting amount for all participants, 8,500 euros. (Annexes B)

During the month and a half that the experiment lasted, we followed up weekly with all the participants. Obtaining a total of 6 samples for each participant. All samples were collected in an Excel.

3. RESULTS

Before starting, we would like to say that, although the initial idea is that all participants started with the same monetary base, in this case, there were some participants, 10 in total, who started with a monetary base of 1000, 15,38% of the total number of participants. The reason why they started with 1,000 euros instead of 8,500, like the rest of the participants, was because they did not complete the initial training proposed by the application.

When these participants were asked why they did not undergo the initial training, the reasons given were, broadly speaking, that they found it boring, 3 participants; time consuming, 6 participants; and 1 of them considered it unnecessary.



Graph 1. Reasons why the participants did not complete the initial training

In order to carry out the study, therefore, it was necessary to standardize all the data, in such a way that they all had the same initial value. If we had not carried out this standardization, it is possible that there would be some later errors in the analysis of the final results, or a deviation from them.

Having made this clarification, we will go on to detail the results obtained. First we will expose the data week by week, then we will show the global results.

Our main objective is to check if there is a correlation between the classification of the participants, whether rational or intuitive, and their performance in the investment simulator, measured both through the amount of money obtained by each participant, as well as in their profitability obtained

It is important, before beginning to present the results of the experiment, make a brief description of each of the variables used in the study. In this case, we find a dependent variable, *Semana X*; and 5 independent variables, which are *Racional*, *Nivel de estudios*, *Edad*, *Género* and *Estrategia*.

Our dependent variable, *Semana X*, is a variable that includes all the results obtained by the participants of the experiment, these results are evaluated in dollars. It is important to note that the *Semana X* variable changes every week. Therefore, we will have a total of 6 dependent variables initially. Although it is true that the definition of each of them is the same, the data recorded in each of them changes, depending on how the results have fluctuated from week to week.

If we go on to comment on the dependent variables of the study, we find that:

- *Racional*, it is a dummy variable, this means that it takes a value of 1 when the participant has been classified as such, and a value of 0 if it has been classified as intuitive.
- *Nivel de estudios*, it is a qualitative variable, it includes three types of training, basic, intermediate and higher. In this case, the participants classified as rational are categorized as 1, those with a medium level of training are renamed as 2, and those who are considered to have a basic level of training are categorized as 3.
- *Edad*, it is a quantitative variable, which records the age of each participant.
- *Género*, a variable that evaluates the sex of the participants, for this experiment we have focused on a binary categorization, differentiating only between men and women. Women are rated 1, and men 2.
- *Estrategia*, it is another qualitative variable. The objective of these variables is to evaluate the behavior of the participants with respect to their investments. This variable has been divided into three possibilities. Fixed, it occurs in the event that the participants buy one or more shares at the beginning of the experiment, and remain with the same variables until the end of the experiment; purchase, when participants buy and sell one or more shares, repeatedly, each week, until the end of the

experiment; and finally mixed, when the participants have acquired one or more shares, and some of them follow a fixed behavior pattern, and others of them, a buying pattern. Those participants who have followed a mixed strategy are renamed with a 1, those who follow a fixed strategy are classified with a 2 and, finally, those who follow a buying strategy, are renamed with a 3.

Once all the variables of the experiment have been exposed and described, we can go on to present the results obtained.

If we focus on the results of week number 1, Model 1, we can observe that taking as independent variables, the variables *Racional*, *Nivel de estudios*, *Edad*, *Género* and *Estrategia*, the only variable that shows a slight relationship with the dependent variable "*Semana 1*" is the *Estrategia* variable, with a p-value of 0.0735, this is because the p-value is lower than the 0.1 significance level, but is still higher than the 0.05 significance level, which is the level of significance that we take as significance reference for this study, so we cannot consider it to be a statistically significant relationship. In this case we find a very small R-square, of just 0.081760. Therefore these variables do not seem to explain much about this econometric model.

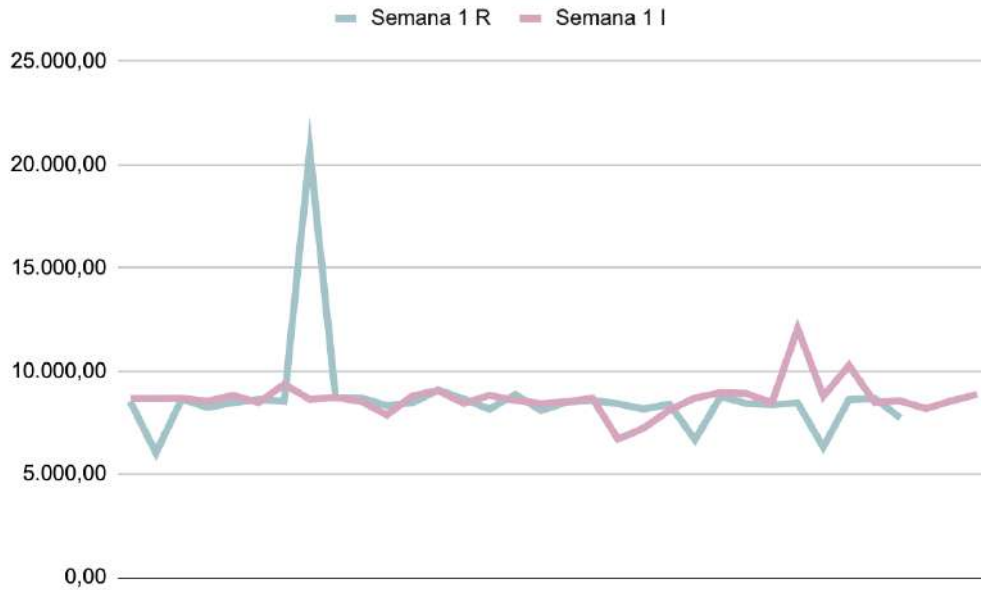
Model 2: OLS, using observations 1-65
Dependent variable: *Semana1*

	coefficient	std. error	t-ratio	p-value
const	6785.02	1029.00	6.594	1.31e-08 ***
Racional	-178.847	455.179	-0.3929	0.6958
Niveldeestudios	340.386	288.928	1.178	0.2435
Edad	5.57118	19.3994	0.2872	0.7750
Genero	215.975	446.002	0.4842	0.6300
Estrategia	590.077	323.871	1.822	0.0735 *
Mean dependent var	8674.611	S.D. dependent var	1702.959	
Sum squared resid	1.70e+08	S.E. of regression	1699.598	
R-squared	0.081760	Adjusted R-squared	0.003943	
F(5, 59)	1.050676	P-value(F)	0.396866	
Log-likelihood	-572.5629	Akaike criterion	1157.126	
Schwarz criterion	1170.172	Hannan-Quinn	1162.273	

Excluding the constant, p-value was highest for variable 17 (Edad)

Model 1: Model with *Semana 1* as the dependent variable

It would be interesting to mention the values obtained by the participants during this first week, Graph 2, contrasting the results obtained by the rational against the intuitive. As we can see, in general the values tend to be quite homogeneous this first week, with the exception of one participant, who stands out especially, this is within the group of rationals. This participant obtained a result for week 1 of 20,6661.85 and a return of 162.50%. Apart from this striking data, we can see that the median for the rational group is 8532.08, while for the intuitive group it is 8647.13. Both medians show that overall, both groups have made a profit on their investments.



Graph 2: Comparison of the results obtained between rational and intuitive in Week 1

Before moving on to the analysis of week 2, I would like to delve into the slight correlation detected in Model 1 of Week 1, between the dependent variable and the independent variable Strategy. In that case, as it is a variable with three possibilities, we convert it into a dummy variable, in order to more easily detect which one or which of the three possibilities seems to show such a correlation.

If we look at Model 2, we find that with the introduction of the Dummy variable *DEstrategia_3*, with which the people who have followed a Purchase strategy are scored with a 1, and the other 2 strategies, with a 0; appears to be statistically significant, with a p-value of 0.0452. Note that in this alternative model, the R-squared, whose value is 0.094367, is better than that of Model 1.

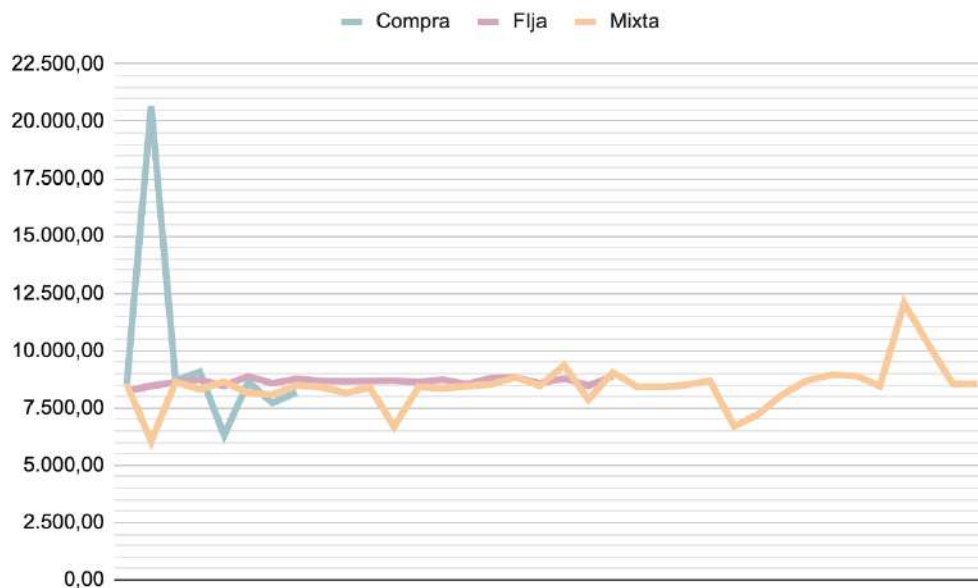
Model 3: OLS, using observations 1-65
 Dependent variable: Semana1

	coefficient	std. error	t-ratio	p-value	
const	7547.25	906.443	8.326	1.54e-11	***
Racional	-276.801	461.024	-0.6004	0.5505	
Niveldeestudios	327.463	285.489	1.147	0.2560	
Edad	9.20198	19.5328	0.4711	0.6393	
Genero	179.647	444.715	0.4040	0.6877	
DEstrategia_3	1450.50	708.871	2.046	0.0452	**
Mean dependent var	8674.611	S.D. dependent var	1702.959		
Sum squared resid	1.68e+08	S.E. of regression	1687.890		
R-squared	0.094367	Adjusted R-squared	0.017619		
F(5, 59)	1.229562	P-value(F)	0.306786		
Log-likelihood	-572.1136	Akaike criterion	1156.227		
Schwarz criterion	1169.274	Hannan-Quinn	1161.375		

Excluding the constant, p-value was highest for variable 18 (Genero)

Model 2: Model with *Semana 1* as the dependent variable and the dummy variable *DEstrategia_3*

If we go to check Graph 3, it can be seen that among the participants who follow a buying strategy, there is one of them that stands out especially above all the others. While, in the rest of the strategies, the results seem to be quite homogeneous.



Graph 3: Comparison of the results obtained between the different strategies in Week 1

If we turn to the analysis of week two of the experiment, in this case we have to focus on Model 3, we see that in this case, using the same independent variables as in the first week, none of them appear to be statistically significant. Only the variable "*Racional*" seems to have a small relationship with the results obtained in week 2, which are reflected in the variable "*Semana 2*". This is because, as we talked about in the previous case, the p-value of the *Racional* variable is 0.0656, which is lower than the 0.1 significance level, but is still higher than the 0.05 significance level. As in the previous model, the R-squared is still low, with 0.085169.

Model 3: OLS, using observations 1-65
Dependent variable: *Semana2*

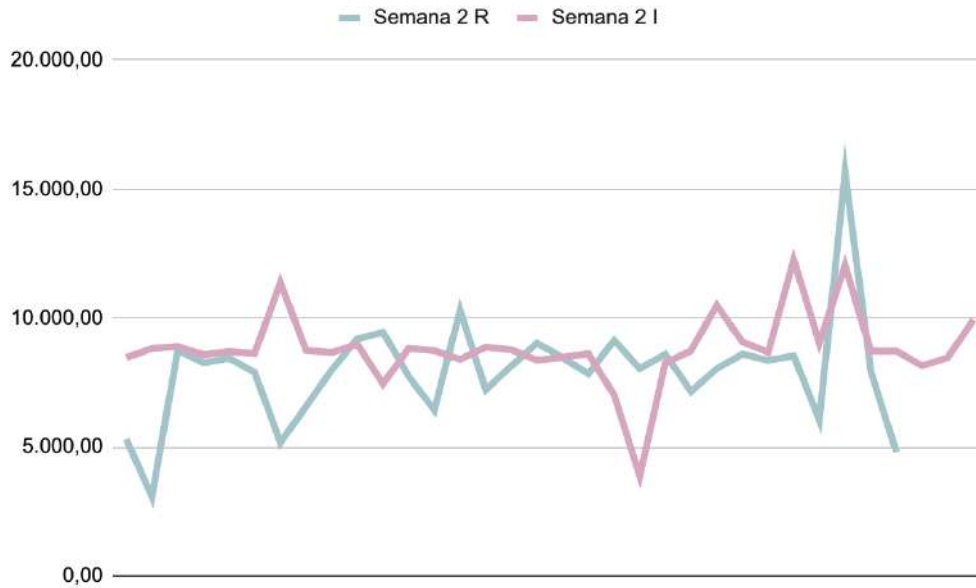
	coefficient	std. error	t-ratio	p-value	
const	8273.41	1088.40	7.601	2.59e-10	***
Racional	-903.236	481.452	-1.876	0.0656	*
Niveldeestudios	70.1513	305.605	0.2295	0.8192	
Edad	22.8302	20.5191	1.113	0.2704	
Genero	-154.342	471.745	-0.3272	0.7447	
Estrategia	-1.29314	342.565	-0.003775	0.9970	
Mean dependent var	8399.980	S.D. dependent var	1804.606		
Sum squared resid	1.91e+08	S.E. of regression	1797.698		
R-squared	0.085169	Adjusted R-squared	0.007641		
F(5, 59)	1.098559	P-value(F)	0.370924		
Log-likelihood	-576.2104	Akaike criterion	1164.421		
Schwarz criterion	1177.467	Hannan-Quinn	1169.568		

Excluding the constant, p-value was highest for variable 19 (*Estrategia*)

Model 3: Model with *Semana 2* as the dependent variable

As in the first week of the experiment, making the comparison between both groups, Graph 4, allows us to verify that there are still few differences between the two groups, at least with the naked eye, although the results do seem to be much more heterogeneous within each of the groups, compared to the previous week. As in the previous week, the participant who obtained the highest return on his earnings was a rational, which obtained a result of 15,667.34 and a return of 53.00%. We should mention that it is not the same as the one highlighted last week. In any case, the participant who obtained the worst result was also a rational, who obtained a result of 3,063.37, with a negative return of -63.96%.

If we go on to check the medians of both groups, the margin between both groups begins to widen, in favor of the intuitive ones. In week 2, the intuitive have a median of 8,717.47, while the rational have a median of 8,050.35. It can be seen that in this case, the intuitive seems to have positive returns, above the initial value of 8,500. On the other hand, the rationals seem to have fallen below the initial amount in their results.



Graph 4: Comparison of the results obtained between rational and intuitive in Week 2

Regarding week three, Model 4, we can see that the dependent variable *Semana 3* seems to have a statistically significant relationship with the independent variable "*Racional*". The rest of the variables, *Nivel de estudios*, *Edad*, *Género* and *Estrategia*, continue not to be statistically significant. The p-value in the case of the *Racional* variable, with respect to the *Semana 3* variable, is 0.0296. In this case, the R-squared value continues to be very small, just 0.192287, therefore these variables alone have little explanatory value with respect to the performance obtained in *Semana 3*. However, it seems to increase the explanatory level of the model with respect to the previous proposed models (Model 1, Model 2 and Model 3).

Model 4: OLS, using observations 1-65
Dependent variable: *Semana3*

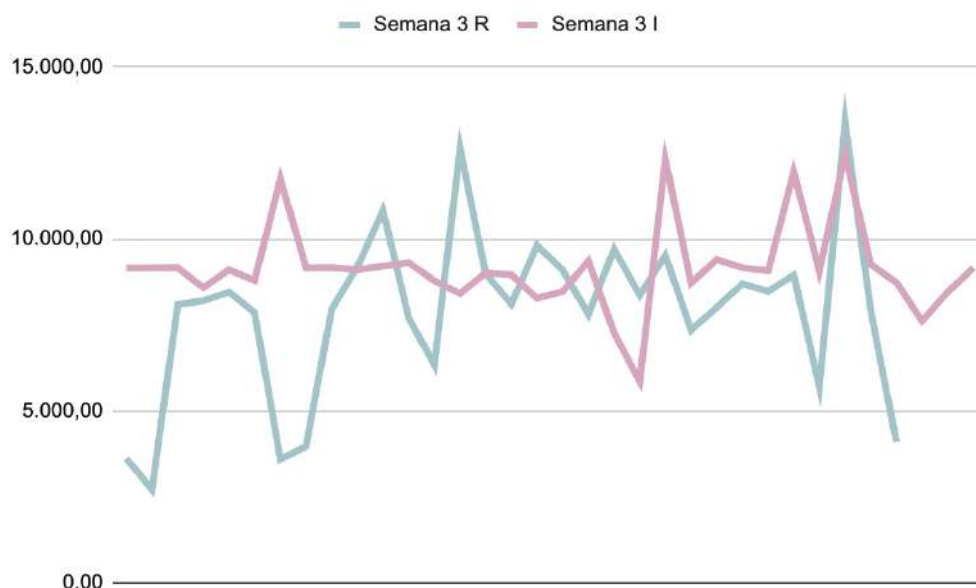
	coefficient	std. error	t-ratio	p-value	
const	8832.05	1143.62	7.723	1.61e-10	***
Racional	-1128.15	505.880	-2.230	0.0296	**
Niveldeestudios	152.409	321.111	0.4746	0.6368	
Edad	32.7895	21.5603	1.521	0.1336	
Genero	-60.5555	495.681	-0.1222	0.9032	
Estrategia	-549.730	359.946	-1.527	0.1320	
Mean dependent var	8566.066	S.D. dependent var	2017.989		
Sum squared resid	2.11e+08	S.E. of regression	1888.910		
R-squared	0.192287	Adjusted R-squared	0.123837		
F(5, 59)	2.809151	P-value(F)	0.024228		
Log-likelihood	-579.4275	Akaike criterion	1170.855		
Schwarz criterion	1183.901	Hannan-Quinn	1176.003		

Excluding the constant, p-value was highest for variable 18 (*Genero*)

Model 4: Model with *Semana 3* as the dependent variable

If we go on to analyze the comparison of both groups, Graph 5, a slight difference between the two groups begins to be seen. Interestingly, we see that these differences occur even within each group, especially within the group of rationals, where there are large fluctuations among its members. On the other hand, the intuitive group seems to show greater homogeneity between the data obtained. In this case, the median obtained by the rational group is 8,111.60, while the median in the intuitive group is 9,108.58.

As in the previous week, the rationals are again characterized by standing out in the two extreme values of the experiment. Within this group we find the participant who has obtained a greater profit on their investments, which has reached a result of 13,425.63 and a profitability of 31.11%, it is the same participant from the previous week. On the other hand, the participant who obtained the worst results, also rational, achieved 2,711.29, which means a loss of 5,788.71, and a negative return of -68.10%



Graph 5: Comparison of the results obtained between rational and intuitive in Week 3

Regarding week 4, Model 5, we see that the dependent variable *Semana 4* has a statistically significant relationship with the independent variable Rational, with a p-value of 0.0009, so it seems to have a fairly strong relationship. In this model, the *Estrategia* variable, as in Model 1, seems to have a slight relationship with the *Semana 4* variable, in this case with a p-value of 0.0860. In any case, as we have already said, since it is above the 0.05 level of significance, we cannot consider it statistically significant. The R-square in this case, of 0.333630, although still reduced, stands out compared to the value obtained in R-squared in the other models. Therefore, it seems that the explanatory variables begin to gain more and more weight within the model, increasing their predictive level.

Model 5: OLS, using observations 1-65
 Dependent variable: Semana4

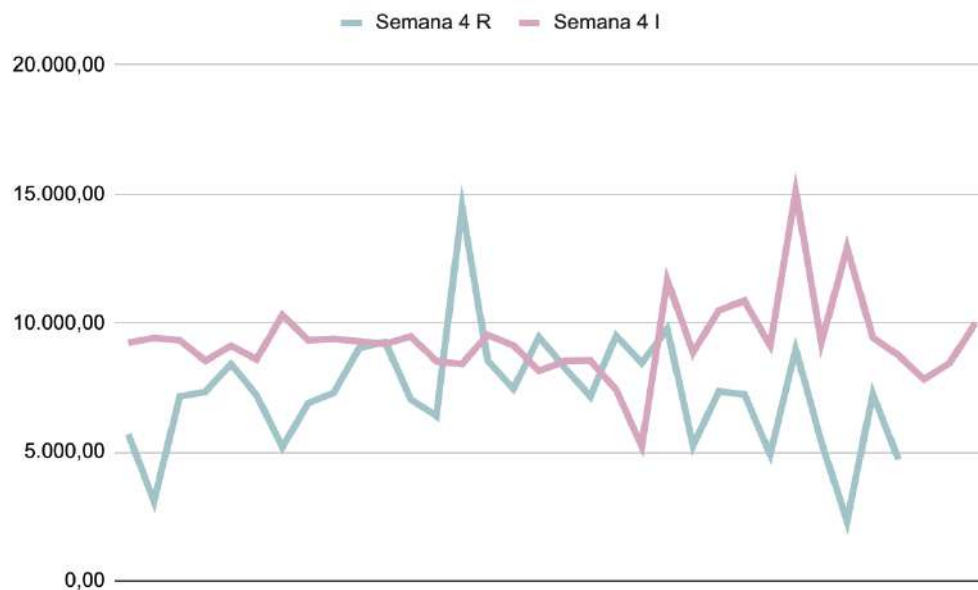
	coefficient	std. error	t-ratio	p-value	
const	8883.77	1126.67	7.885	8.56e-11	***
Racional	-1739.61	498.382	-3.491	0.0009	***
Niveldeestudios	526.146	316.352	1.663	0.1016	
Edad	21.1976	21.2407	0.9980	0.3224	
Genero	-130.083	488.334	-0.2664	0.7909	
Estrategia	-619.283	354.611	-1.746	0.0860	*
Mean dependent var	8366.737	S.D. dependent var	2188.793		
Sum squared resid	2.04e+08	S.E. of regression	1860.914		
R-squared	0.333630	Adjusted R-squared	0.277158		
F(5, 59)	5.907882	P-value(F)	0.000172		
Log-likelihood	-578.4569	Akaike criterion	1168.914		
Schwarz criterion	1181.960	Hannan-Quinn	1174.061		

Excluding the constant, p-value was highest for variable 18 (Genero)

Model 5: Model with *Semana 4* as the only dependent variable

On the other hand, the comparative analysis of both groups for week 4 continues to show similar trends to week 3, Graph 6, with the great difference that, for the first time, the participant with the best result obtained is intuitive. In this case, the participant obtained a result of 15,080.24 and a profitability of 74.92%. On the other hand, the participant with the worst result of the week, like the previous ones, continues to belong to the rational group, with a result of 2,298.40, which implies losses of 6201.6; and a profitability of -72.96%.

In this case, the medians obtained by each group are 7,246.78 for the rational ones and 9,209.98 for the intuitive ones. This implies that there is a difference of 1963.2 between the two groups in favor of the intuitive.



Graph 6: Comparison of the results obtained between rational and intuitive in Week 4

As in Week 1, in Model 5 linked to Week 4, we find that the independent variable *Estrategia* shows a slight correlation with the results obtained in that week, collected in the dependent variable *Semana 4*. To analyze it in depth, we turn the *Estrategia* variable into a Dummy variable, with three possibilities.

When analyzing the model with each of the three variables separately, we find that the *DEstrategia_3* variable is again statistically significant, with a p-value of 0.0369. This is shown on Model 6. Furthermore, it is curious that, with the introduction of this dummy variable, another of the model's variables, in this case, *Nivel de estudios*, seems to show a slight correlation with the dependent variable *Semana 4*.

We must add that, as in the case of Week 1, the R-squared obtained in Model 6, which is 0.349443, is better than that obtained in Model 5, where the R-squared has a value of 0.333630. So it seems to have a better adjustment.

Model 7: OLS, using observations 1-65
Dependent variable: *Semana4*

	coefficient	std. error	t-ratio	p-value	
const	8093.31	987.432	8.196	2.55e-11	***
Racional	-1614.61	502.216	-3.215	0.0021	***
Niveldeestudios	533.854	310.997	1.717	0.0913	*
Edad	16.6356	21.2781	0.7818	0.4374	
Genero	-74.1282	484.450	-0.1530	0.8789	
DEstrategia_3	-1648.63	772.208	-2.135	0.0369	**
Mean dependent var	8366.737	S.D. dependent var	2188.793		
Sum squared resid	1.99e+08	S.E. of regression	1838.702		
R-squared	0.349443	Adjusted R-squared	0.294311		
F(5, 59)	6.338300	P-value(F)	0.000090		
Log-likelihood	-577.6764	Akaike criterion	1167.353		
Schwarz criterion	1180.399	Hannan-Quinn	1172.500		

Excluding the constant, p-value was highest for variable 18 (Genero)

Model 6: Model with *Semana 4* as the dependent variable and the dummy variable *DEstrategia_3*

If we focus on Graph 7 and the comparison between different strategies, we find that in this case, one of the participants with the purchase strategy stands out over the others, although in this case, due to the large losses suffered.



Graph 7: Comparison of the results obtained between the different strategies in Week 4

In the case of week 5, Model 7, it seems that the existence of a statistically significant relationship between the independent variable *Racional* and the dependent variable *Semana 5* is confirmed again, with a p-value $2.48e-06$, which is well below the significance level of 0.05. Interestingly, in this model, it seems that the explanatory variable *Género* seems to have a weak relationship with the dependent variable *Semana 5*, with a p-value of 0.0718, since it is below the significance level of 0.1. As in week 4, the R-squared value of Model 7, in this case 0.452066, is much higher than in previous weeks, even higher than that obtained in week 4, so it seems that the power explanatory of the selected variables seem to be gaining weight.

Model 6: OLS, using observations 1-65
Dependent variable: *Semana5*

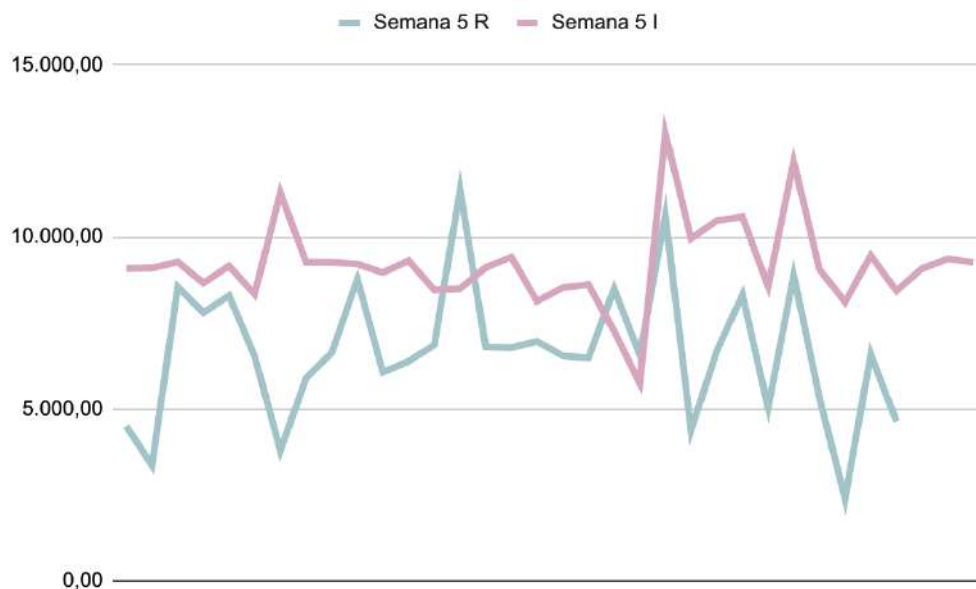
	coefficient	std. error	t-ratio	p-value	
const	9755.07	968.930	10.07	1.99e-14	***
Racional	-2235.15	428.606	-5.215	2.48e-06	***
Niveldeestudios	330.544	272.061	1.215	0.2292	
Edad	13.8349	18.2669	0.7574	0.4518	
Genero	-769.935	419.965	-1.833	0.0718	*
Estrategia	-301.220	304.964	-0.9877	0.3273	
Mean dependent var	7980.027	S.D. dependent var	2075.841		
Sum squared resid	1.51e+08	S.E. of regression	1600.377		
R-squared	0.452066	Adjusted R-squared	0.405631		
F(5, 59)	9.735433	P-value(F)	8.11e-07		
Log-likelihood	-568.6530	Akaike criterion	1149.306		
Schwarz criterion	1162.352	Hannan-Quinn	1154.454		

Excluding the constant, p-value was highest for variable 17 (Edad)

Model 7: Model with *Semana 5* as the dependent variable

Again, when we go on to analyze the comparison of both groups in terms of their performance in the week, Graph 8, in this case, week 5. We see that a clear margin begins to be created between both groups, except for three participants. When we go to check the medians of both groups, we find that the rational group has obtained \$6,587.29, while the intuitive group has had a median of \$9,104.95, which means a difference of \$2,517.66 in favor of the intuitive group.

In this case, the participant who obtained the best results belongs to the intuitive group, obtaining a total of \$13,013.73 and a profitability of 53.10%. On the other hand, the participant who obtained the worst results belongs to the rational group, in this case, he obtained \$2,379.15, which implies losses of \$6,120.85; and a profitability of -72.01%



Graph 8: Comparison of the results obtained between rational and intuitive in Week 5

In the case of Week 5, Model 8, the independent variable that shows a slight correlation with the dependent variable is *Género*. In order to deepen this relationship, we convert this variable into a Dummy variable, where *DGenero_1*, the participants who have been classified as women are scored with a 1, and those classified as men, are scored with a 0. In the case of the variable *DGenero_2*, the same thing happens but in reverse.

In our case, in Model 8, we have decided to introduce *DGenero_2* as an independent variable.

As can be seen in Model 8, despite the applied modification, the variable continues to show a slight correlation with the dependent variable, *Semana 5*, so it does not seem to create

major changes in the model. In this case, the p-value is 0.0718, the same as in the previous model.

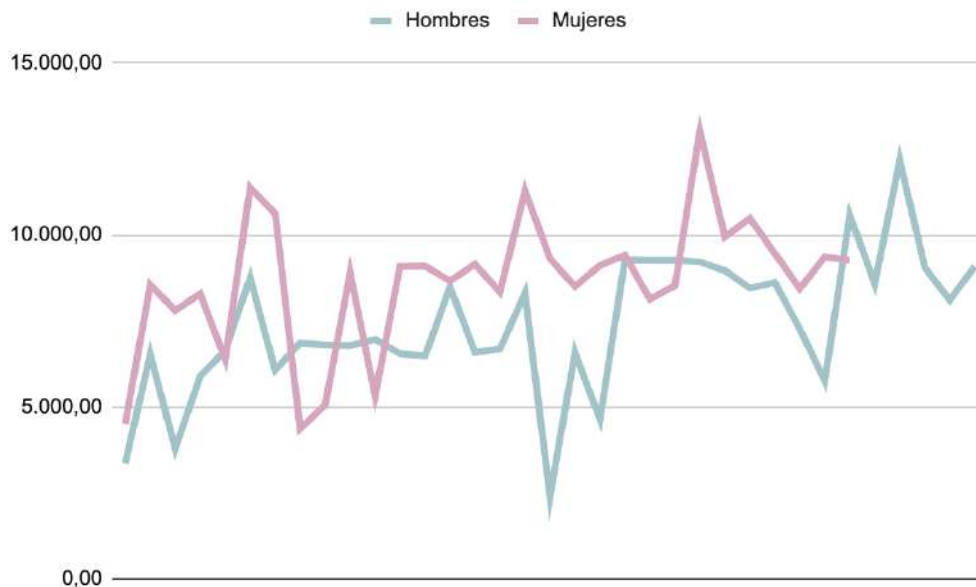
The same goes for the R-squared.

Model 10: OLS, using observations 1-65				
Dependent variable: Semana5				
	coefficient	std. error	t-ratio	p-value
const	8985.13	862.781	10.41	5.50e-15 ***
Racional	-2235.15	428.606	-5.215	2.48e-06 ***
Niveldeestudios	330.544	272.061	1.215	0.2292
Edad	13.8349	18.2669	0.7574	0.4518
DGenero_2	-769.935	419.965	-1.833	0.0718 *
Estrategia	-301.220	304.964	-0.9877	0.3273
Mean dependent var	7980.027	S.D. dependent var	2075.841	
Sum squared resid	1.51e+08	S.E. of regression	1600.377	
R-squared	0.452066	Adjusted R-squared	0.405631	
F(5, 59)	9.735433	P-value(F)	8.11e-07	
Log-likelihood	-568.6530	Akaike criterion	1149.306	
Schwarz criterion	1162.352	Hannan-Quinn	1154.454	

Excluding the constant, p-value was highest for variable 17 (Edad)

Model 8: Model with *Semana 5* as the dependent variable and the dummy variable *DGenero_2*

As can be seen in Graph 9, in effect, it seems that at least for Week 5, there is a slight difference between the results obtained by women and those obtained by men.



Graph 9: Comparison of the results obtained between men and women in Week 5

Finally, when we analyze week 6, Model 9, we find that both the *Racional* independent variable and the *Estrategia* independent variable show a statistically significant relationship with the dependent variable *Semana 6*. In this case, the p-value is 0.0092 and 0.0365, respectively. In this case, the R-squared is 0.260743, in this case the explanatory power of the model to decrease.

Model 8: OLS, using observations 1-65
Dependent variable: *Semana6*

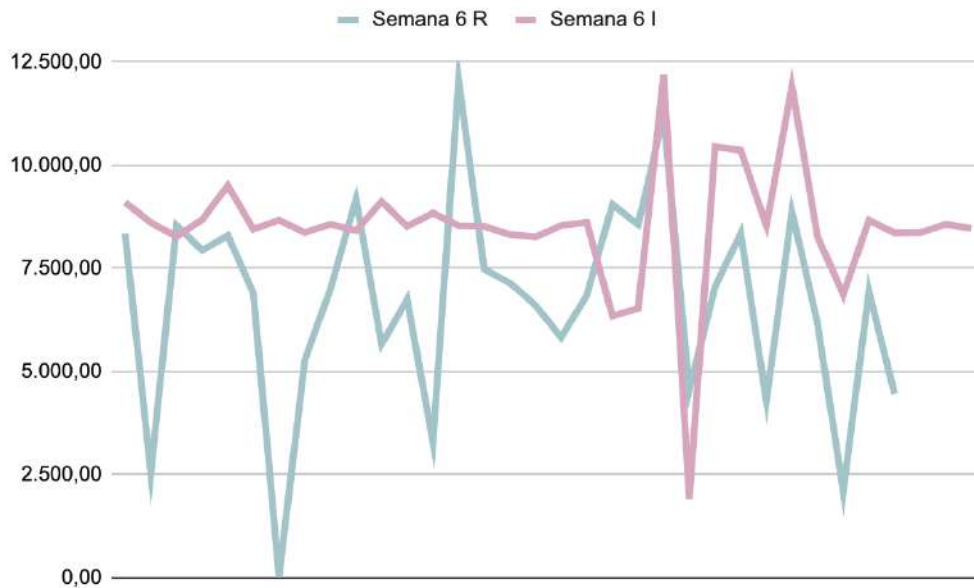
	coefficient	std. error	t-ratio	p-value	
const	10411.7	1170.59	8.894	1.49e-12	***
Racional	-1452.22	539.652	-2.691	0.0092	***
Edad	9.35189	22.8601	0.4091	0.6839	
Genero	-685.198	530.773	-1.291	0.2017	
Estrategia	-826.757	386.388	-2.140	0.0365	**
Mean dependent var	7647.574	S.D. dependent var	2310.358		
Sum squared resid	2.53e+08	S.E. of regression	2051.593		
R-squared	0.260743	Adjusted R-squared	0.211460		
F(4, 60)	5.290655	P-value(F)	0.001022		
Log-likelihood	-585.3438	Akaike criterion	1180.688		
Schwarz criterion	1191.560	Hannan-Quinn	1184.977		

Excluding the constant, p-value was highest for variable 17 (Edad)

Model 9: Model with *Semana 6* as the dependent variable

When analyzing Graph 7, we find that the margin that had been forming in the previous weeks between both groups, although it remains, seems to be reducing. Indeed, when we analyze the medians of both groups, we find that in the case of the rational ones, the median is \$6,951.00; while in the case of the intuitive ones it is \$8,538.20. The difference in this case between the two groups is \$1,587.2. This shows the reduction in the advantage of the intuitive group compared to the rational ones, although they continue to maintain the advantage.

In this case, the norm that has been shown in recent weeks continues to be maintained, where the best participant belongs to the group of the intuitive, and the worst belongs to the group of the rational. Thus, the best participant has obtained a result of \$12,196.55, with a profitability of 43.49%; while the worst participant has obtained a result of \$19.32, which implies a loss of \$8,480.68, and a profitability of -99.77%. The case of this last participant is striking, since he has reached almost 100% loss.



Graph 10: Comparison of the results obtained between rational and intuitive in Week 6

As we have already mentioned, in week 6, unlike in previous weeks, the *Estrategia* variable does appear to be statistically significant with the results obtained in that week.

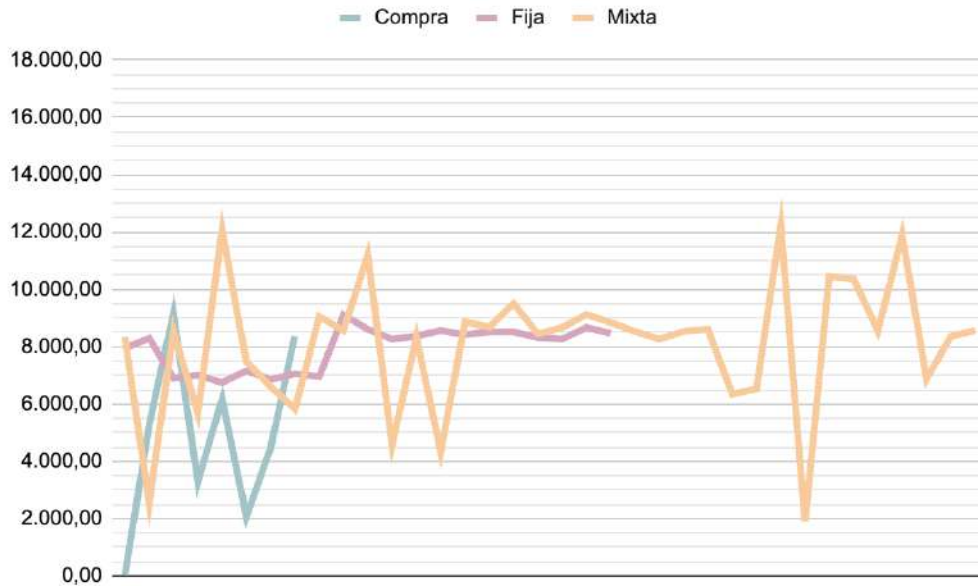
When we go on to analyze the models with the introduction of the dummy variables, we find that the *DEstrategia_3* variable is statistically significant, with a p-value of 0.0090. In fact, Model 10 shows an R-squared of 0.320312, better than that obtained in Model 9, where the R-squared was 0.260743. Therefore, the explanatory capacity of the model improves.

Model 8: OLS, using observations 1-65
Dependent variable: *Semana6*

	coefficient	std. error	t-ratio	p-value	
const	8935.21	1065.35	8.387	1.22e-11	***
Racional	-1121.92	541.848	-2.071	0.0428	**
Niveldeestudios	450.027	335.539	1.341	0.1850	
Edad	-4.27954	22.9572	-0.1864	0.8528	
Genero	-698.319	522.680	-1.336	0.1867	
DEstrategia_3	-2251.20	833.145	-2.702	0.0090	***
Mean dependent var	7647.574	S.D. dependent var	2310.358		
Sum squared resid	2.32e+08	S.E. of regression	1983.801		
R-squared	0.320312	Adjusted R-squared	0.262711		
F(5, 59)	5.560910	P-value(F)	0.000291		
Log-likelihood	-582.6134	Akaike criterion	1177.227		
Schwarz criterion	1190.273	Hannan-Quinn	1182.374		

Excluding the constant, p-value was highest for variable 17 (Edad)

Model 10: Model with *Semana 6* as the dependent variable and the dummy variable *DEstrategia_3*



Graph 11: Comparison of the results obtained between the different strategies in Week 4

After having carried out the individual analysis of each of the weeks separately, we proceeded to carry out the joint study of all of them. To do this, we have calculated the average obtained by each of the groups with regard to the weekly results. Thanks to this calculation, we have been able to create the new variable *MediaFINAL*, which we will use as the dependent variable of the next model. As independent variables we will use the same variables that we used in the previous models, *Racional*, *Nivel de estudios*, *Edad*, *Género* and *Estrategia*.

Thus, in the following model, Model 11, we can verify how, when introducing all these variables in a single model, it turns out that only the *Racional* variable appears to be statistically significant with respect to the dependent variable *MediaFINAL*, with a p-value of 0.0003. The R-squared of this model is 0.283397.

Model 9: OLS, using observations 1-65
 Dependent variable: MediaFINAL

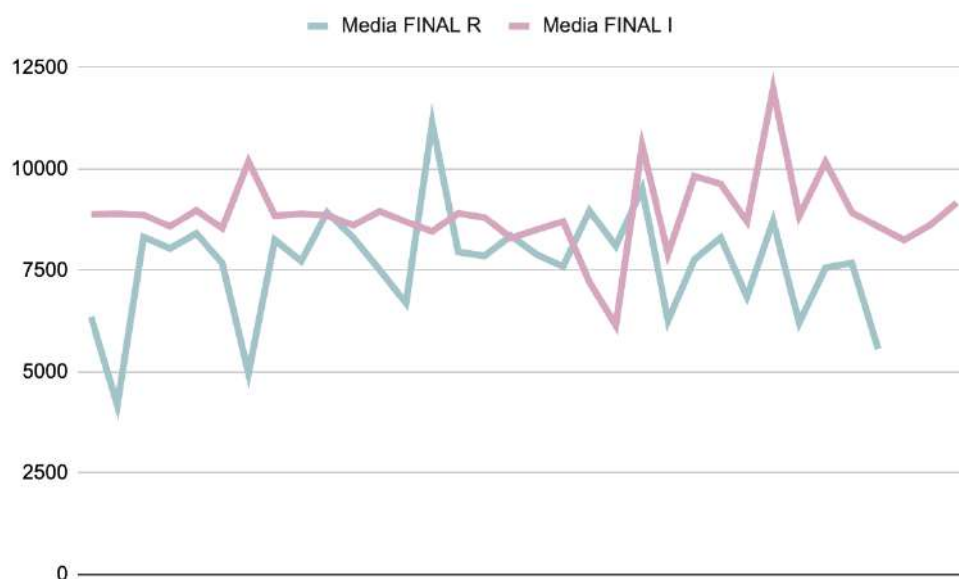
	coefficient	std. error	t-ratio	p-value
const	9018.55	650.241	13.87	2.25e-20 ***
Racional	-1149.80	299.767	-3.836	0.0003 ***
Edad	17.9912	12.6984	1.417	0.1617
Genero	-172.948	294.835	-0.5866	0.5597
Estrategia	-278.533	214.632	-1.298	0.1993

Mean dependent var	8305.659	S.D. dependent var	1303.489
Sum squared resid	77924436	S.E. of regression	1139.623
R-squared	0.283397	Adjusted R-squared	0.235623
F(4, 60)	5.932082	P-value(F)	0.000433
Log-likelihood	-547.1290	Akaike criterion	1104.258
Schwarz criterion	1115.130	Hannan-Quinn	1108.548

Excluding the constant, p-value was highest for variable 18 (Genero)

Model 11: Model with *MediaFINAL* as dependent variable

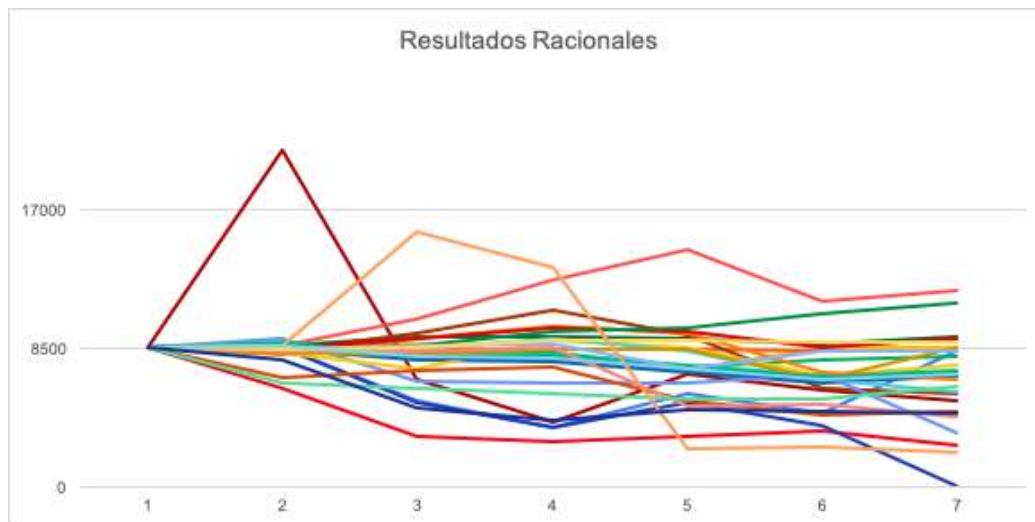
In order to make a comparison of both groups in this case, we calculate the average of each participant over the 6 weeks. The results are reflected in Figure 12. When we focus on it, we can visualize a small difference. With a few exceptions, the mean values obtained by the intuitive participants appear to be better than those obtained by the rational participants. If we focus on the extreme values of the graph, we find that, as reflected in the weekly analyzes, the participant who, on average, obtained a better result throughout the six weeks of the experiment, belongs to the group of the intuitive ones, and obtained a result of \$11,992.40. While the participant who has obtained the worst results in the experiment belongs to the group of rationals, his average result was \$4,180.86.



Graph 12: Comparison of the results obtained between rational and intuitive in Week 6

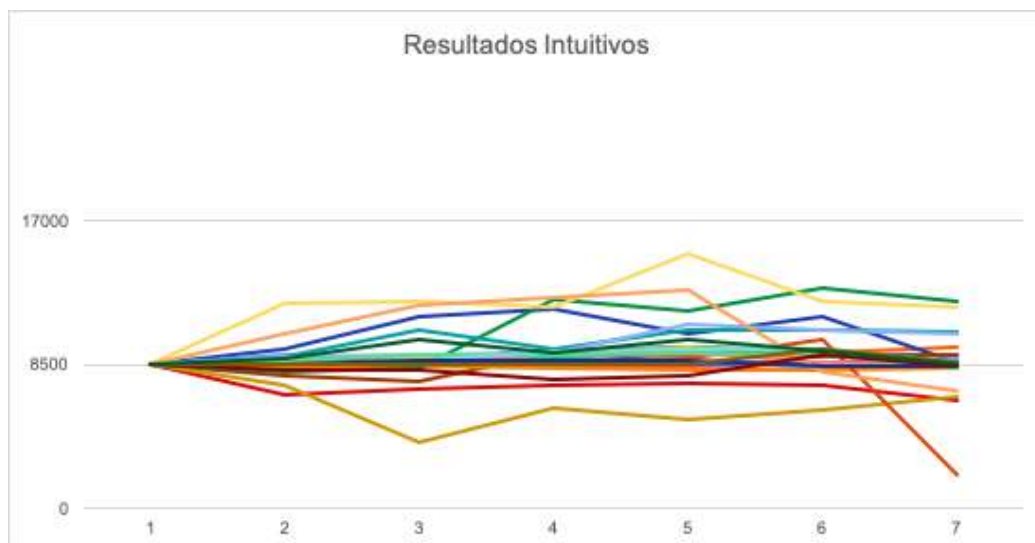
Finally, we consider that it could be interesting to analyze the behavior of individuals over the weeks.

Graph 9 shows the behavior of each of the rational individuals throughout the six weeks. It can be seen how, in general, most of the participants in this group end up with a result below the initial amount, equivalent to \$8,500. Indeed, only 7 of the 31 participants, classified as rational, managed to obtain a result higher than \$8,500 in the last week, which represents 22.58% of the sample.



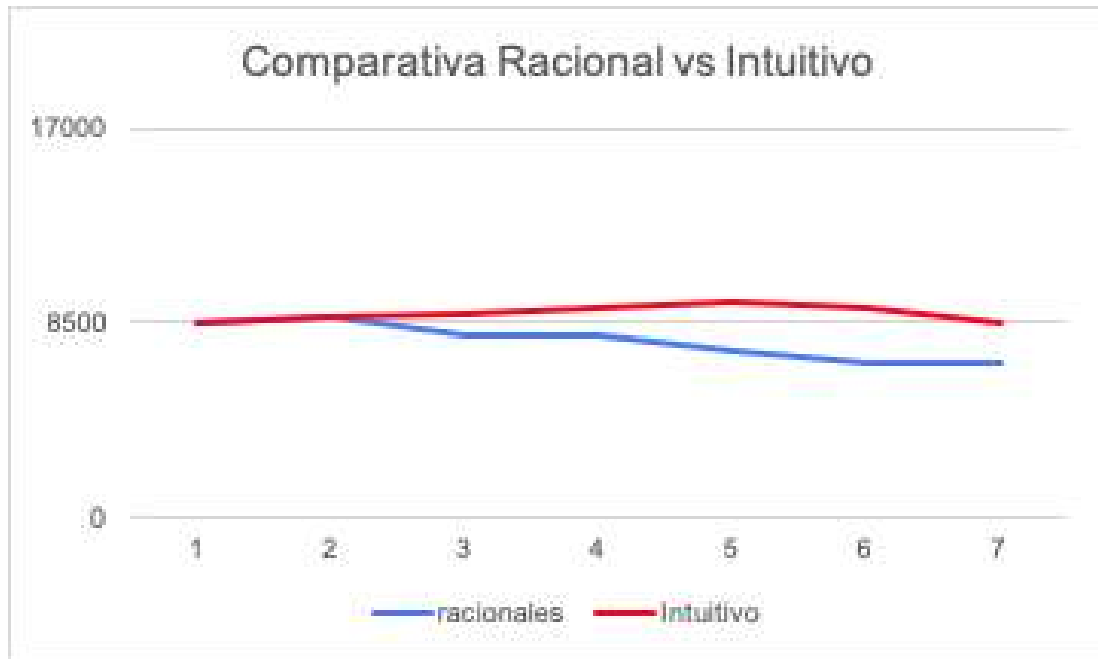
Graph 13: Comparison of the results obtained between rational and intuitive in Week 6

If we look on the other hand, in the group of intuitives, reflected in graph 10, we see that, on the contrary, most of the participants are above \$8,500 at the end of week six of the experiment. In fact, when analyzing the data, we found that 28 of the 34 participants belong to the intuitive group, 82.35% of them are above the \$8,500.



Graph 14: Comparison of the results obtained between rational and intuitive in Week 6

As a last point to consider, we wanted to calculate the average of the two groups for each of the six weeks. If we see graph 11, we find that, even though there seem to be hardly any differences between the two groups in weeks 1 and 2; From week 2 on, a gap begins to show between the two groups. Both groups seem to diverge until week 5. This is when, since week 6, there seems to be a small convergence, due to a sharp drop in the averages of the intuitive group.



Graph 15: Comparison of the results obtained between rational and intuitive in Week 6

4. CONCLUSIONS

In the previous section, all the results obtained in the experiment presented in this work have been exposed.

As with the results, the conclusions will be presented following a similar format. First we will focus on delving into the data obtained in each of the weeks, then going through a joint and more general analysis.

Throughout the development of these conclusions, we will try to respond to the two hypotheses raised at the beginning of this work. The first one suggested that if a person is rational, then their performance within the investment simulator will be much more positive than those people who are classified as intuitive.

And the second, according to which the continued use of the application over time will lead to better performance in the simulator over the different weeks.

We would like to clarify, before continuing with the development of the conclusions, that when we say that System 1 is a mainly intuitive system, and later classify people dominated by this system as intuitive, do not take it as a negative connotation.

The designation of the participants as rational or intuitive / irrational is merely classificatory. It does not mean that people classified as intuitive are exempt from rationality, and vice versa. We must be clear that, as Kahneman (2011) explains, the human being is not well described in the rational agent model.

Thus, when we analyze the data obtained in Model 1, we find that none of the independent variables is significant. This is correlated with what is reflected in Graph 2. If we look at the marks obtained by rational and intuitive, both seem to overlap along an imaginary line, around \$8,500, with a few exceptions. In fact, taking into account the medians obtained, which, as we mentioned in the results, were \$8,532.08 for rational and \$8,647.13 for intuitive, the difference between groups is practically nil. As we can see, both groups, on average, obtain positive results, above the initial amount of \$8,500.

The only relevant data to highlight this week is the excellent result achieved by one of the rational participants. The problem in this case is that, as we will see in week 2 and the results shown in Model 2 and Graph 3, the good results obtained by this participant do not seem to be sustained over time.

In the data from week 2, we see that, as in week 1, there are no statistically significant variables. Although unlike in the previous week, this week seems to detect a slight correlation between the dependent variable and the independent variable, *Racional*. As it is not yet considered a statistically significant variable, we will not go on to analyze in depth.

Similarly, we would like to highlight the results reflected in Graph 4. Unlike Graph 2, the results obtained by the participants no longer seem to be around the same position, very close to the initial amount of \$8,500, on the contrary, in Graph 2, the results obtained by the participants begin to diverge between them. If we look at the medians obtained, we find that the rational ones, in this case, obtained a result of \$ 8,050.35, while the median for the intuitive ones was \$ 8,717.47. The difference between the medians in this case is \$ 667.12. A big difference compared to the previous case.

We would like to add that, in this week 2, the intuitive participants have a median value higher than the initial \$8,500, specifically \$ 717.47; although the rational participants, who in the previous week remained above this amount, in this week, the median of these participants is \$ 449.65 below. Therefore, intuitive participants appear to be making gains, while rational participants appear to be making losses.

If we focus on week 3, and on Model 3 and Graph 4 related to it, we find for the first time a statistically significant independent variable, in this case, the *Racional* variable. In this case, analyzing Model 3, we can say that those participants who have been classified as rational obtain \$ 1,128.15 less than the intuitive ones in the results collected in week 3.

These results seem to correlate with those shown in Graph 5. We see how some significant differences begin to be detected between the results obtained by the rational and intuitive participants. The losses obtained by the group of rationals are numerous and in many cases, large. Of the 31 rational participants in the sample, 6 have losses greater than 25%, which represents 19.35% of the total; And as if that were not enough, 5 of them have losses greater than 50% of the initial sample, which represents 16.13% of the total.

If we look, in effect, at the medians of both groups, these losses are reflected, since the rational ones present a median of \$ 8,111.60; while the intuitive ones have a median of \$9,108.58. The difference between both groups is \$ 996.98, a more than considerable margin, which explains why this categorization of participants turns out to be significant.

As in week 2, we see that the intuitive group appears to have a median above \$8,500, with a profit margin of \$ 608.58. And the rationals, on the contrary, seem to continue with a median below \$8,500, with a loss margin of \$ 388.4. Although it is true that both the profit margin of the intuitive and the loss margin of the rational is less than that shown in the previous week, these losses or gains, although perhaps lower in terms of quantity, are more widespread in terms of being affected or benefited.

Regarding week 4, reflected in Model 5, again, the independent variable *Racional* is again statistically significant with respect to the dependent variable *Semana 4*. In this case, we could say that the fact of being classified as *Racional* implies that participants will earn \$1,739.61 less than those participants classified as intuitive.

It should be mentioned that, although a statistically significant variable is not considered, it seems that the independent variable *Estrategia* once again shows a certain correlation with the dependent variable *Semana 4*.

In fact, after separately analyzing the three strategies used, we find that the variable *DEstrategia_3* in Model 6, is statistically significant. From this model we can extrapolate that all participants who have followed a Buy strategy will obtain a result of \$ 1,648.63 worse than with the other strategies.

All this is evident in Graph 6, in which we can see how a gap begins to form between the two groups. In fact, intuitive participants seem to show much more homogeneous values than rational participants, around \$ 9,000, and many of them even exceed \$ 10,000, specifically 6 out of 34 participants, 17.65% of the total. The group of rationalists, much more heterogeneous, shows much lower results, as a curious fact, only one of the rational participants has achieved a result above \$ 10,000, which represents 2.94%.

On the opposite side of the scale, and as we mentioned before, the number of rational participants with more than 25% losses is 7 out of 31 total participants, which is 22.58%. Interestingly, the number of participants with losses of more than 50% has decreased within the rational group, only 2, which represents 6.45% of the sample. Note that there is no intuitive participant with losses greater than 25%, therefore, not greater than 50%.

These differences are reflected in the medians calculated for both groups. In the case of the intuitive ones, this was \$ 9,209.98, while in the case of the rational ones it was \$7,246.78. Which implies a gap of \$1,963.2, a more than considerable difference between both groups, in favor of the intuitive ones. For the first time, the group of rationals falls below \$ 8,000.

So, taking the medians into account, the intuitive have posted overall gains of around \$709.98. The losses presented by the rationals, taking into account the median, reach \$1,253.22. It seems that this week, both the number of beneficiaries and those affected, as well as the amount obtained in both directions, is accentuated, especially negatively in the group of rational people.

If we focus on week 5, we find that the *Racional* variable appears again as statistically significant. In this case, we could say that those participants who have been classified as rational will have results \$ 2,235.15 worse than those obtained by intuitive participants.

This is partly reflected in Graph 8, if we look at it, practically all the rational participants have results below those obtained by the intuitive ones, with some exceptions. As in the previous week, the intuitive participants seem to have much more homogeneous values and with a range that goes from \$9,000 to \$10,000, in fact there are 16 participants out of 34, which represents 47.06% of the sample. And above \$10,000 there are 5 participants in total, which is 14.71%.

The rationals on the other hand, are in an opposite position, where the majority are in values within the range of \$7,000 and \$6,000, in fact 13 participants will be within this margin, which represents 41.94% of the total. The curious thing is that there are also a large number of participants, with even lower values, a total of 9 of them, which means that 29.03% of them are below \$ 6,000.

This divergence is reflected in the medians obtained by both groups, since the intuitive ones have obtained a value of \$ 9,104.95 and the rational ones, on the other hand, a value of \$6,587.29. Which implies a difference of \$ 2,517.66 in favor of the intuitive group. In fact, even if the intuitive have obtained a lower median than last week, the drop in the results of the rational ones has been so great that this data is barely reflected.

We must add that, although the *Racional* variable was the only statistically significant variable, there is another variable in the model, which shows a certain correlation with the result obtained, which is included in the dependent variable *Semana 6*. The variable that in this case, seems to have this slight correlation is the independent variable *Género*. It is the first time that this variable has shown to have any significance within it, throughout all the weeks analyzed. In any case, as it is not statistically significant, we will not go into detail beyond what is commented on in the results.

When analyzing week 6, Model 9, for the first time we see that two of the 5 proposed variables are statistically significant, specifically the dependent variables *Racional* and *Estrategia*. In this case, we could say that those participants who have been classified as rational will have results \$ 1,452.22 worse than those obtained by intuitive participants.

Rational participants finished the experiment with a median of \$ 6,951, while intuitive participants obtained a median of \$ 8,538.20. As can be seen, during this week, the rationals, although still with a median below \$7,000, have improved compared to the previous one at \$ 367.71. The intuitive ones, on the other hand, although they manage to stay above the initial amount of \$8,500, have suffered a more than considerable fall, in total their results have fallen by \$ 566.75. We must emphasize that this fall has taken place in just 1 week of difference.

Despite the improvement experienced by the rationals, taking into account the median, the group has had an average loss of \$ 1,549, while the group of intuitive have had an average profit of \$ 38.20.

If we go on to analyze the number of rational participants who have had losses greater than 25%, they are 11 out of 31, which represents 35.48% of the sample; In the case of the intuitive, only 2 participants had losses greater than 25%, which represents 5.88%. In the case of the intuitive, in fact, only 1 participant has obtained losses greater than 50%, which implies 2.94%, in fact this single participant obtained losses of 77.58%. On the other hand, in the case of the rational, there are 5 participants who have exceeded 50% of losses, which means 16.13%. We must highlight that one of the rational participants reached 99.77% losses.

When it comes to earnings, most intuitive participants have ended up with values very close to \$8,500, with a margin of \$ 200, in total, 12 out of 34, which represents 35.29% and 58.82% of them have obtained benefits, a total of 20 participants. On the other hand, the rational ones, only 7 of 31 have obtained benefits, 22.58%, of which 2 of them have obtained benefits around \$8,500, which represents 6.45%.

Regarding the other statistically significant independent variable, *Estrategia*, as with weeks 1 and 4, we have created three Dummy variables from it. In this case, and like the other weeks, the variable that has turned out to be statistically significant, out of the three possible ones, is *DEstrategia_3*. This means that all those participants who have followed a Buy strategy obtain \$2,251.20 worse results than those who have used other strategies, as reflected in Model 10.

These data are reflected in Graph 11, where it can be seen that, except for one participant in the group, all the others have obtained results well below the rest of the participants.

Finally, after analyzing the weekly models, we went on to analyze the general model, which agglomerates the 6 weeks that the experiment lasted.

From what we can see in Model 11, the results obtained are not very different from what we have been observing throughout the weekly analyzes. The only statistically significant independent variable is the *Racional* variable. According to this model, it could be said that the fact of being classified as rational implies that it obtains \$1,149.8 worse results than the intuitive ones.

This variable has been repeating itself in the weekly models, so it is not surprising and confirms that indeed, the classification of individuals as rational and intuitive plays a fundamental role in predicting their investment performance. In any case, it is important to note that our first hypothesis, which stated that if a person is rational, then his performance within the investment simulator will be much more positive than those people who are classified as intuitive, is false.

Throughout the six weeks of the experiment, the same pattern has been repeated, according to which the participants classified as intuitive have exceeded the results obtained by the rational ones in terms of the estimated medians. And even though in the first weeks of the experiment, this difference between groups did not seem to be statistically significant, from week 3 onwards, the *Racional* variable has been maintaining its statistical significance. This is reflected in Figure 12, where the difference between the different participants in the experiment can be seen, depending on their classification.

Although in this case our hypothesis has turned out to be false, we would like to highlight that the underlying idea, by which the personality or human qualities of individuals play a key role in the development of investments, is true. This same idea is defended in the article “*Economía, Psicología e Inversión en Bolsa: análisis de las variables que participan en la toma de decisiones*” written by David Pascual, Beatriz Gil-Gómez and Bárbara Scandroglio (2012). These authors wanted to analyze in their study the relevance of the “psychological” and “economic” variables in the decision-making of Spanish investors. His final conclusion was that psychological variables, normally relegated to second place, played a more than significant role in determining the behavior of these investors.

We would like to highlight a phrase by Oberlechner and Hoking (2004) extracted from the text of Pascual et al. (2012) according to which “it is already widely accepted that the way we process the information we receive and the expectations we generate from it is much more important than the information itself” (Pascual et al., 2012, p.15).

Obviously, other variables play an important role in the performance of the participants, something that we have also seen throughout the experiment and our results. In this case, variables such as the *Estrategia* used and *Género* stand out, which seem to show a certain correlation with the dependent variable *Semana X*. In fact, with regard to the *Estrategia* variable, we must say that the variable that has stood out in terms of significance is the dummy variable *DEstrategia_3*, which is correlated with the Purchase strategy, followed by the participants. In any case, only 8 of the 65 participants followed this strategy, so it would be necessary to increase the sample of this group of investors, to be able to take in value the conclusions drawn from these variables, since we could fall into the Law of the small numbers.

Before going on to analyze and check if it is fulfilled or not, our second hypothesis. We believe that it is necessary to clarify a significant fact. We are aware that the R-squares obtained in our experiment for each and every week are below 0.5. In any case, we must bear in mind that this study has a strong psychological component, and that as explained in the article written by Jim Frost (2018) the R-squares obtained in many psychological studies

are below 50%, since that human behavior is difficult to predict, and the data obtained by so many can contain a large amount of information that is difficult to explain. Likewise, as Frost (2018) says even if R-squared is low, if we have significant levels of p-value, this is enough to indicate a real relationship between the different variables.

Finally, add that, seeing the results obtained, it is normal for the R-squared of the first models to be so low, since the variables used in the study could hardly explain the variability of the investments, mainly because all the participants started from the same starting point, and the variations in results do not begin to become apparent until 2 and even 3 weeks, and it is probably not from then on that the intrinsic characteristics of each individual begin to become apparent. After all, that's why we decided to do a long-term study, and why our second hypothesis.

Our second hypothesis proposes that the continued use of the application over time will lead to better performance in the simulator throughout the different weeks.

With regard to this second approach, it is more difficult to reach a definitive conclusion. If we look at Graphs 13, 14 and 15, we could conclude that time does not seem to favor the performance of the participants. If we focus especially on Graph 15, it seems that the intuitive participants show an improvement in their performance as the weeks go by, until they reach week 4. From there, the participants belonging to this group seem to regress and return to initial investment values for week 6.

On the contrary, in the same Graph 15, the rational participants show an opposite behavior. At first they suffer large losses, and once they reach week 5, they show a slight correction until the end of the experiment in week 6.

It is likely that other external variables unrelated to the passage of time and the usability of the application play a significant role in this regard. We must also emphasize that this study has only been viable for about 6 weeks due to a question of delivery times. It would have been interesting to see if, with a longer time frame, the results in this regard would have been different.

In the absence of more data, and as no group has shown a significant improvement at the end of the experiment in Week 6, we conclude that the second hypothesis is also false. In any case, this second hypothesis is subject to future analysis, since it is possible that an extension in the duration of the experiment offers different conclusions.

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6. ANNEXES

A

TEST

Gracias por participar en el estudio!!

Recuerde que este test tiene un motivo clasificatorio. Las respuestas correctas o incorrectas no tienen efecto en el desarrollo del experimento.

Responda todas las preguntas de la forma más honesta posible. No es posible el uso de calculadoras o cálculos a papel. Debe utilizar su propia lógica a la hora de responder las preguntas.

Pregunta 1:

Un bate y una pelota cuestan 1.10. El bate cuesta un dólar más que la pelota. ¿Cuánto cuesta la pelota?

Respuesta:

Ya habías escuchado esta pregunta antes?

Si..... No.....

En caso afirmativo, en este caso, la respuesta fue la misma?

Pregunta 2:

Si 5 máquinas tardan 5 minutos en hacer 5 cacharros ¿Cuánto tardarán 100 máquinas en hacer 100 cacharros?

Respuesta:

Ya habías escuchado esta pregunta antes?

Si..... No.....

En caso afirmativo, en este caso, la respuesta fue la misma?

Pregunta 3:

En un lago hay una zona con nenúfares. Todos los días la zona duplica su tamaño. Si la zona tarda 48 días en cubrir todo el lago ¿Cuánto tardaría en cubrir la mitad del lago?

Respuesta:

Ya habías escuchado esta pregunta antes?

Si..... No.....

En caso afirmativo, en este caso, la respuesta fue la misma?

Pregunta 4:

Todas las Rosas son flores.

Algunas flores se marchitan pronto.

Luego, algunas Rosas, se marchitan pronto.

Crees que este argumento es válido? Si..... No.....

Ya habías escuchado esta pregunta antes?

Si..... No.....

En caso afirmativo, en este caso, la respuesta fue la misma?

B

HOJA EXPLICATIVA: TFG INVERSIONES

Antes de empezar, muchas gracias por colaborar con este experimento. Los datos obtenidos serán confidenciales y únicamente de uso para este estudio.

Este experimento consta de 2 fases.

- Test clasificatorio
- Simulador de inversiones

Test clasificatorio

Se trata de un breve cuestionario de 3 preguntas, que permitirá dividir la muestra en dos grupos. Los resultados obtenidos en este test no son relevantes por sí solos, por lo que es importante que el participante no sienta presión a la hora de responder, y preocuparse por si la respuesta es o no es errónea, ya que es de carácter meramente clasificatorio. El correcto desarrollo de esta fase no determinan el posterior desarrollo en la siguiente.

Simulador de inversiones

Esta segunda parte del experimento requiere la utilización del simulador de inversiones "Trading Game" Esta aplicación es apta para cualquier dispositivo móvil o tablet, ya sea Android o Apple.



La fase del simulador consiste en el uso, por parte del participante, de la aplicación, con el fin de obtener el máximo beneficio posible a raíz de las inversiones que este crea conveniente. El participante tiene a su disposición diferentes mercados en los cuales invertir, tales como la Bolsa; Materias primas, como el petróleo y el oro; Forex, o mercado de divisas (valor de las monedas); y las criptomonedas.

A continuación se incluirá un anexo con una serie de instrucciones básicas, con las cuales el participante podrá sacar un mayor partido a la aplicación.

Es importante remarcar que el dinero utilizado durante la realización del experimento es virtual, por lo que el participante no debe preocuparse en caso de sufrir pérdidas. Obviamente, tampoco es posible obtener beneficios reales.

Esta fase tiene una duración de 2 meses. Durante este tiempo es necesario recopilar los datos obtenidos una vez a la semana en la Tabla (la encontrarás al final). Esta tabla debe ser entregada al final de las dos semanas, para su posterior proceso de análisis.

AVISO!! Es importante que los datos aportados en la tabla sean fieles a los resultados que obtengas en el simulador. El objetivo de todos los participantes es obtener el máximo beneficio posible. Pero como en la vida real, las inversiones, pueden implicar pérdidas. No te preocupes. Ninguno de los participantes del experimento es un experto ni vive de ello. Cabe la posibilidad de que muchos también sufran pérdidas. Pero recuerda, es un juego, y lo importante es participar.

COMO SACAR MAYOR PARTIDO A TRADING GAME

Los dos grandes mercados con los que más suele invertir la gente, son la Bolsa y el mercados de divisas o Forex.

Cada mercado tiene sus particularidades, y con los dos se pueden conseguir grandes beneficios. Aunque, si tenemos en cuenta el grado de apalancamiento (el grado de riesgo que aceptamos, actúa como un multiplicador) cuanto mayor es, este nos proporciona un mayor beneficio, pero también unas mayores pérdidas. Puedes cambiar el grado de apalancamiento en cualquier momento en el simulador. Pero es importante usar el apalancamiento con precaución

En Bolsa, por lo general, el máximo grado de apalancamiento es 1:5. Mientras que en el mercado de divisas es de 1:200. Que en el caso de invertir 1.000. La Bolsa, nos proporciona un retorno de 5.000 y el mercado de divisas un retorno de 200.000. Evidentemente en ambos casos habría que tener en cuenta el ratio de interés. Pero queda claro, que por lo general, se puede llegar a obtener mayores beneficios en el Mercado de divisas.

Análisis de las gráficas

En la aplicación podrás encontrar 3 tipos de gráficas. Su correcta interpretación te permitirá invertir con más seguridad

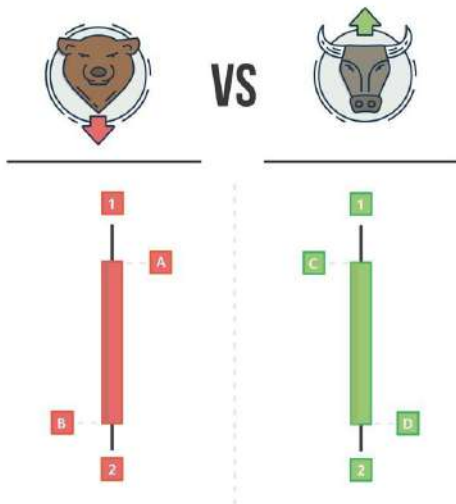
Gráficos Normales



Las tendencias se ven en este gráfico. Con un rango de tiempo de 1W (1 semana), 1M (mes), 1Y y 5Y (años). Los otros rangos de tiempo, sirven para ver el mejor momento de compra, pero **lo importante es la tendencia, nunca vayas en contra.**

Gráficos de Velas

< CÓMO LEER LAS GRÁFICAS 



De oso Bearish
— El precio disminuye

- 1. Precio más alto
 - a. Precio de apertura
 - b. Precio de cierre
- 2. Precio más bajo

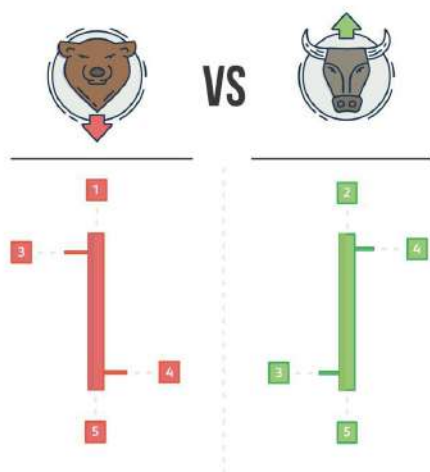
De toro Bullish
— El precio aumenta

- 1. Precio más alto
 - c. Precio de cierre
 - d. Precio de apertura
- 2. Precio más bajo

Gráficos de Barras

< CÓMO LEER LAS GRÁFICAS

la de abajo representa un día de operaciones.



1. Tendencia descendiente (rojo/de oso), el precio más alto del día
2. Tendencia ascendente (verde/de toro), el precio más alto
3. Precio de apertura (abrir)
4. Precio de cierre (cerrar)
5. Precio más bajo

EUR/USD

Mejores días y horas para invertir

Una vez hemos identificado las tendencias de nuestras posibles inversiones, gracias a los gráficos. Debemos tener en cuenta cuales son los mejores días u horas para obtenerlas al mejor precio o para poder sacarles el mayor beneficio tras su venta. Evidentemente esto es una guía, y se puede invertir en cualquier momento del día.

Esta guía es especialmente importante en el caso de las divisas (intercambio de valor de las monedas)

Los mejores días para comprar o vender acciones suele ser los **Martes y Miércoles**, durante todo el día, **y los Viernes por la mañana**. Los peores días suelen ser el fin de semana.

En cuanto a las horas, esto depende de si están abiertas al mismo tiempo, alguna de las grandes sesiones de bolsa del mundo, como pueden ser la de Nueva York, Londres, Tokio o Sydney. Para nosotros, las horas clave serían las 9 de la mañana y el rango de horas que va desde las 14:00 a las 17:00.

¿Cómo empezar?

Es recomendable no invertir todo tu dinero de golpe (**se recomienda no invertir más del 25% de tu dinero**). E intentar diversificar lo máximo posible, pero sin pasarse. Piensa que cuanto más diversifiques, más atento tendrás que estar a diferentes acciones. Empieza con unas pocas, y ve ampliando a medida que te sientas cómodo.

Factores positivos y factores negativos (especialmente divisas)

Positivos	Negativos
Bajada del Desempleo Subida de cualquier factor de una economía Tipo de interés alto Deflación Balance comercial positivo (más exportaciones que importaciones) Políticas inestables e inciertas	Subida Desempleo Bajada de cualquier factor de una economía (PIB, por ejemplo) Tipo de interés bajos Inflación Balance comercial negativo (más importaciones que exportaciones) Políticas estables y predecibles Desastres naturales

¿CÓMO USAR LA APLICACIÓN?

En la página de inicio, verás que en la parte superior aparecen el nombre y logo de diferentes empresas, al igual que materias primas y pares de divisas.

Si clicas dentro de una de ellas, y si el mercado está abierto en ese momento, verás que tendrás abiertas las opciones de compra y venta. (Todas las acciones de empresas, están abiertas desde las 14h hasta las 22h) Las divisas y materias primas están abiertas las 24h. Los findes, cierran todas las operaciones.

Compra cuando veas que las acciones están bajas o que van a subir (tendencia ascendente). Y vendes cuando ves que estas empiezan a bajar o si ves que sufres pérdidas.

También puedes vender (incluso si no tienes acciones) si ves que las acciones están altas o ves que siguen una tendencia descendente. Compras cuando ves que los precios han tocado fondo.



En la esquina superior puedes cambiar las empresas o las acciones disponibles o ver tus estadísticas y evolución



Una vez clicas, verás una lista de empresas, divisas, materias primas e índices en los cuales invertir. Puedes elegir el que más te interese.



TABLA DE REGISTRO DE ESTADO DE LA INVERSIÓN

Escribir semanalmente el estado de la inversión (da igual si ha aumentado o disminuido con respecto a la semana anterior) las variaciones en un sentido u otro también son relevantes Intente anotar los datos más o menos los mismo días cada semana.

No pasa nada si lo anotas un día antes o después (si no tienes tiempo)

SEMANA 1	SEMANA 2	SEMANA 3	SEMANA 4	SEMANA 5	SEMANA 6	SEMANA 7	SEMANA 8

