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Estudio de la Influencia de los Incentivos en la Conducción de Experimentos

Study of the Influence of Monetary Incentives in Conduction of Experiments

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RESUMEN

El uso de incentivos monetarios en los experimentos es objeto de un intenso debate en la literatura académica debido a que no existe un consenso sobre su conveniencia como herramienta para incentivar a los participantes de un experimento, diversos

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autores lo consideran imprescindible y otros desestiman su uso. En este artículo se estudia la influencia que los incentivos monetarios puedan o no generar en los resultados provistos por los participantes de un experimento.

Para esto, se condujo un experimento a 280 estudiantes universitarios y consistió en pronosticar el valor futuro de un índice financiero. El experimento compuesto por dos fases se aplicó a dos grupos. El grupo uno estuvo conformado por 124 estudiantes a quienes se les ofreció un incentivo monetario por su participación. El grupo dos con 156 estudiantes, quienes se les aplicó el mismo experimento con la diferencia que no se les ofreció incentivo monetario, siendo su participación libre y voluntaria. Esto permitió comparar los resultados de ambos grupos para establecer el grado de influencia del incentivo monetario. Además, como se realizó un pronóstico financiero basado en un valor presente, se midió la influencia de la heurística de anclaje y ajuste al realizar el pronóstico financiero.

Los resultados se analizaron mediante el test no-paramétrico Mann-Whitney y la prueba Chi2. Se concluye que el incentivo monetario no influye en las respuestas de los participantes y se confirmó la influencia de la heurística de anclaje y ajuste en los pronósticos del índice financiero utilizado en el estudio.

PALABRAS CLAVE
Finanzas conductuales; Pronóstico financiero; Heurística de anclaje y ajuste; Juicio; Incentivo Monetario.

ABSTRACT

The use of monetary incentives in experiments is a subject of intense debate in academic literature, since there is no consensus regarding its suitability as a tool to encourage the participants of an experiment. Several authors consider it essential, others, however, dismiss its use. This article studies the influence that monetary incentives may or may not produce on the results provided by the participants of an experiment.

To this end, an experiment was conducted with 280 university students, which involved forecasting the future value of a financial index. The experiment was comprised of two phases and was applied to two groups of people. Group 1 was formed with 124 students, to whom a monetary incentive for their participation was offered. Group 2 consisted of 156 students, although considering the difference of not offering a monetary incentive, their participation being free and voluntary. This permitted the comparison of results of both groups with the aim of establishing the degree of influence of the monetary incentive. Likewise, taking into consideration that a financial forecast based on the present value was performed, the influence of the anchoring and adjustment heuristics was measured.

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Results were analyzed by means of the Mann-Whitney non-parametrical test and the Chi2 test. It can be concluded that the monetary incentive does not have an impact on the participants' responses, and the influence of the anchoring and adjustment heuristics in the forecasting of the financial index used in the study was confirmed.

KEYWORDS
Behavioral Finance; Financial Forecast; Anchoring and Adjustment Heuristics Judgment; Monetary Incentive.

Clasificación JEL: D9; G1; G4; G41.

MSC2010: 91C05; 91B82

1. INTRODUCTION

The advancement of multiple scientific disciplines has been achieved due to the scientific method, and the conduction of experiments has become the fundamental basis in the construction of knowledge. However, in the case of study of economic phenomena, the adoption of experimentation is relatively recent; in fact, between the nineteenth and twentieth centuries, the conduction of controlled experiments in this field was discarded. Economists such as Milton Friedman, Lionel Robin, Paul Samuelson or William Nordhaus (Guala, 2005) would not conceive an economic laboratory as being comparable to a physics laboratory. This changed dramatically from the middle of the twentieth century onwards, with the prolific intellectual production of numerous scientists, who from such different fields such as economics, finance and psychology, accomplished successful experiments controlled in laboratories, with the aim of understanding the economic phenomena that led to producing valuable scientific documents.

Duxbury (2015a) highlights behavioral finance as a long-standing tradition in the application of experiments for the development of empirical analysis that seek to comprehend the workings of the financial markets and the behavior of its participants.

Two renowned researchers authoring seminal works in their respective fields are Daniel Kahneman, in behavioral finance, and Vernon Smith, in experimental economics. Both conducted research on controlled laboratory environments in the seventies, founded the procedures for conducting experiments and described how they would be used as a tool to implement empirical analysis. This led to their winning the Nobel Prize for Economics in 2002, to Kahneman for having integrated the knowledge of psychological research into Economic Science, and to Smith, for setting up laboratory experiments as a tool in empirical economic analysis (Pompian, 2021). This moment marked a point of inflection in the scientific community, since it led to the recognition of the importance of experiments to generate external validation of research.

Nevertheless, an academic debate relating the use of monetary incentives has sparked off a debate among the researchers that use experiments. For some, it is absolutely essential to compensate the experiment's participants with money. However, for others, monetary incentives are not necessary, and opt for a different type of incentive. This is a permanent debate and there is no meeting point, since there are contrasting opinions regarding its relevance, which reflects on the methodological differences on how experiments should be conducted (Camerer & Hogarth, 1999).

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Hertwig and Ortmann (2001) show the advantages of monetary incentives by presenting four arguments: (1) monetary incentives are more straightforward to apply than other incentives such the primary ones (basic incentives), (2) money is particularly appropriate when complying with the non-satiation requisite, which would encourage a greater effort from the participant, (3) from its beginning, experimental economic theory has validated monetary incentives in experiments, and finally, (4) monetary incentives decrease the variation in the subjects' performance.

Therefore, is a financial reward indispensable to encourage their motivation to carry out effective work? Tversky and Kahneman (1986) suggest that the studies in economic and psychological literature have demonstrated that there is no difference when a monetary incentive is provided. This was documented when verifying that the mistakes generated in the experiments continue, despite the incentive being high, which does not produce an improvement in the participant's performance. Their conclusion is that monetary incentives do not enhance the process of decision making. This finding is not only limited to laboratory experiments, but to real life, as there are numerous examples of projects with high profitability forecasts that have failed due to errors of judgment and decision making.

Various research studies support this argument. Findings show that the effect produced by monetary incentives is slight (Cesarini et al., 2006; Vinogradov & Shadrina, 2013), and even so, they could be counterproductive since they destroy intrinsic motivation for participating in the task, which results in the deterioration of performance (Bahrick, 1954; Deci, 1971; Eisenberger & Cameron, 1996; Gneezy & Rustichini, 2000; Ryan & Deci, 2000; Heyman & Ariely, 2004; Meloy et al., 2006).

An additional element to be taken into account as a criticism of the use of monetary incentives in the conduction of experiments is the amount to be paid. Read (2005) points out budget restrictions present in any experiment when seeking to reward the participants with money. This difficulty results in small sums of money being granted, and if external validation is sought to imitate decision making in real life, these small quantities of money can be unsatisfactory to the participants and distort the final result. The problem of the amount of the incentive is supported by Thaler (1986) as he recognizes that there is no research with sufficient budget to replicate experiments which have had a great economic incentive. Furthermore, the argument put forward by experimental economists such as Grether and Plott (1979), that systematic errors in experiments tend to disappear to the extent that the incentive is higher, is a statement that remains unsupported by any research.

In this context, the main objective of this article is to study whether the use of monetary incentives in the forecasts carried out by the participants affects the future value of the financial index S&P MILA Pacific Alliance Select, with a time horizon of one day, one week and one month. To complete this task, an experiment was performed with participants who were divided into two groups A monetary incentive was offered to the first group, and no monetary incentive was provided to the second group. The only difference between these two groups is the offering of a monetary incentive to the first one.

Empirical evidence shows that in general terms, the use of monetary incentives does not have an effect on the participants' responses. Therefore, the main contribution of this article is to explain, based on an ample academic debate, the appropriateness of the use of monetary incentives, thus concluding that is not necessary.

The structure of the article consists of five sections. Section two describes the importance of experiments, the role of monetary incentives and the debate on their appropriateness. Section three provides detailed information on methodological aspects. The study's findings are addressed in section four. Finally, the conclusions of this research are examined.

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2. THEORETICAL FRAMEWORK

2.1. The importance of the experimental method

Experiments are a suitable complement to theoretical argumentation, and the way in which new knowledge is created. These are experienced-based by means of objective and direct observation, and they are executed in a controlled environment, seeking to simulate real conditions through a causality process that permits the analysis of the dependent and independent variables obtained to confront the hypotheses that were initially proposed. Thus, every new scientific proposal is validated to the community once it has been proven by means of an experimental method that establishes favorable results that have been validated by independent peers. In the absence of this procedure, theories would not receive general acceptance.

According to Vignais and Vignais (2010), the experimental method is developed within a well-defined theoretical framework, with well-established rules and the use of appropriate instruments. This is what science has been developing, particularly since the scientific revolution in the renaissance, with authors such as Francis Bacon (1762), Robert Boyle (1661) and René Descartes (1637). Their works describe the design and role of an experiment; the elements that are used to obtain conclusions based on results, with their margins of error, taking into consideration contemporary traditions and prejudices. From those origins to present day, experiments are the best-known way to test the veracity of scientific theories, eliminate alternative explanations, design novel solutions to practical problems, and provide clues to causal inference (Thye, 2014).

According to Duxbury (2015b), experiments challenge specific aspects of the finance-related theory and the market's anomalies, thus allowing the understanding of diverse fields such as the behavior of investors, by analyzing the numerous heuristics and cognitive biases, and how these affect financial markets. This is an advantage of the experimental method relating empirical field research, due to its capacity to have more control of the study variables that allow us to determine their effect on individuals' financial behavior (Bloomfield & Anderson, 2010).

With respect to the use of experiments in research, the general consensus of numerous areas of knowledge is that they are an important and effective tool to obtain conclusions on the subject under study. However, a component of experiments that creates theoretical gaps are monetary incentives and due to this, two groups of researchers can be differentiated. One group supports the idea that the participants of an experiment must be financially compensated, otherwise the effort put into the task will not be efficient. Nonetheless, this is not a unanimous standpoint, considering that the other group believes that this type of monetary compensation minimizes the participants' intrinsic motivation (Deci, 1971). They recommend using different type of motivation such as the primary, which reflects the propensity to participate in activities of their interest, and as a result, they learn and expand their skills (Ryan & Deci, 2000).

The debate between these two extreme positions that categorically recommend or reject the use of monetary incentives, does not contribute to understanding the role of incentives in experiments. One fact is that there are studies that show that the effects of incentives are mixed and complex, however, there is evidence that its influence is slight (Camerer & Hogarth, 1999). Based on this debate, numerous research that concludes with validating or rejecting the use of monetary incentives have arisen, and those works justify their position by means of the significant results of the experiments, which are carried out by granting monetary incentives, and not granting them. Nevertheless, the uncommon aspect in this type of research is that the experiments do not tend to be replicated using both alternatives. For this reason, considering the approach of behavioral finance, this research involves an experiment with two groups, by using and eliminating the monetary incentives in order to analyze whether there is evidence of the effect of this incentive in the participants. Taking this context into account, and considering the

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extensive literature available on monetary incentives, it is to be expected that the former would have some influence.

The experiment consisted of forecasting the future value of the Latin-American financial index S&P MILA Pacific Alliance Select with time horizons of one day, one week and one month. The forecast activities in finance are a constant operation of investors, who, from the historic information of the financial asset, attempt to predict its future value. This becomes a judgement of value, reached through a cognitive process (Peña & Gómez-Mejía, 2020). These processes are not exempt from diverse affectations. Tversky and Kahneman (1974) confirmed that individuals make judgements and decisions based on simplified mental processes, named heuristics, and this process is vulnerable to suffering from cognitive biases that result in errors. The process of decision making managed in finance tends to be affected by specific heuristics, named anchoring and adjustment heuristics. which mainly affect those who make forecasts.

The forecast estimates the future value of an uncertain amount and may be inefficient due to the influence of a numerical value previously presented. When the cognitive process that leads to the forecast is carried out, individuals tend to adhere to the value initially presented. That initial value ends up affecting future predictions, although the probability that this value continues in the future is minimal. The anchoring and adjustment heuristics creates a bias towards the expectation that the future tends to behave as the present does (Pompian, 2012; Givi & Galak, 2019).

2.2. The role of monetary incentives in experiments

A social science such as economics embarked on the analysis of economic phenomena under a laboratory-controlled environment with the development of experimental economics. Roth (1993) conducted an historic recompilation of economic-related experiments named the Saint Petersburg paradox, beginning with the work of siblings Daniel and Nicholas Bernoulli in 1738. However, more contemporary works highlight the Theory of Ordinal Utility and Thurstone indifference curves (1931), along with Theory of Games and the Von Neumann and Morgenstern's (1944) economic behavior, which profoundly affected the development of experiments. Amongst the innovators that initiated the development of controlled experiments is (Chamberlin, 1948) with his work on imperfect markets, and Allais (1953) who takes a critical standpoint relating the Expected Utility Theory.

Subsequently, Vernon Smith, who would later be considered as the father of experimental economics, contributed by performing major experiments such as the study of the behavior of decision making in individuals and groups (Smith, 1976), and the research of microeconomic systems in laboratories (Smith, 1982). It is Smith (1994) who provided a detailed description of the experiment's components. Firstly, the environment is made up by a controlled scenario in which the participants know the initial resources, preferences and costs that encourage them to participate. Secondly, formal institutions, which correspond to the set of rules that specify the way in which the participants perform in the experiment (Cárdenas & Ostrom, 2004). The final component is the specific behavior of each individual. Figure 1 summarizes the structure of an economic experiment carried out in a controlled environment, in which the participants execute the decision making process by means of institutions that results in the participants' behaviors.

The purpose of an experiment is to study human behavior when placed in a structured social environment. A series of explicit rules established and controlled by the experimenter are required. In addition to this, instructions and procedures of each phase or treatment of the experiment are provided. Implicit rules inherent to the participants' idiosyncrasy such as their attitude, experiences, habits and elements that are not under the experimenter's control are also taken into account.

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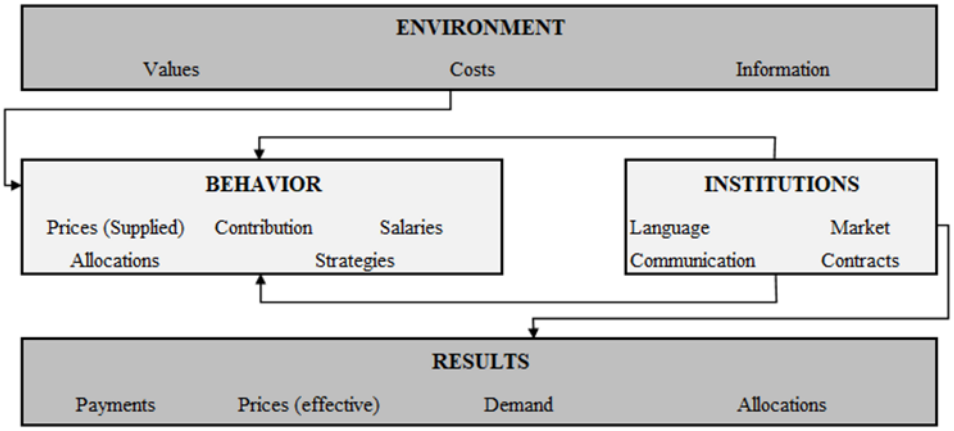
Figure 1 The Economic Experiment.



Note: The graph represents the diagram of an economic experiment. Source: La Introducción a la Metodología Experimental en Economía (p.11), by (Fatás & Roig, 2004) Cuadernos de Economía, 27(75), 7-36.

An essential characteristic is the concept of the induced value (Smith, 1976; 1982) and consists of a monetary stimulus granted for the participant, with the aim of affecting the participants' behavior and controlling that the implicit rules of each individual do not obstruct the experiment. Fatás and Roig (2004) describe the importance of the incentive and the three conditions that must be achieved in order to affect the behavior: monotonicity, prominence and dominance. Monotonicity refers to the fact that participants would always rather receive a greater incentive and would not be satisfied. Prominence implies that incentives depend on the participant's own actions and those of the other participants; this is described in the explicit rules. Finally, dominance specifies that the record of the obtained profits by each subject is only known by the participant. In this way the participants are not distracted by the profits obtained by the other participants. If these three conditions are fulfilled, then the participants' characteristics would be under control.

2.3. Monetary and Nonmonetary Incentives

One of the most important elements for the satisfactory development of the experiment is the participants' motivation, hence it directly impacts the cognitive process when carrying out the activity. A method of encouraging this is by means of the use of monetary and non-monetary incentives. As previously mentioned for a group, the use of monetary incentives is a basic input to accomplish experiments, in as much as it is based on the argument that they allow the process to be controlled. Under this approach, the participants would be sufficiently motivated to participate, considering that their final profit would be subject to their performance in the experiment (Davis & Holt, 1993; Friedman & Sunder, 1994). It can be speculated that participants would not work without being remunerated, so they would require a monetary incentive as a boost to give their best effort and therefore be more persistent and effective for carrying out the experiment. Monetary incentives in experiments are frequently used as motivating tools and are considered as extrinsic motivational elements, since their value is associated with what the participant can accomplish according to the economic context in which they are involved (Krug & Braver, 2014).

Nevertheless, a different position is held by researchers who use non-monetary incentives, also known as intrinsic motivation, and are considered as sufficient to produce a decided effort

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(Camerer & Hogarth, 1999). These correspond to the individual's impulse to carry out an action of their own volition (Deci, 1971), that directly satisfies the individual's basic needs. From a biological perspective, Murayama et al., (2010) based on a neuronal analysis, find that extrinsic or monetary motivation tend to weaken the individual's intrinsic motivation to carry out a task solely for the pleasure of doing it, thus casting doubts on incentive systems based on money. Diverse research works support this conclusion. Based on a meta-analysis including 128 different studies on the effect of incentives on experiments Deci et al., (1999), establish that although there is evidence that monetary incentives may control people's behavior, which is a valid reason for its ample use, its main negative effect is weakening intrinsic motivation, impeding self-regulation or the breaking down of the individuals' responsibility to motivate or regulate themselves.

In research in which monetary and non-monetary incentives are applied simultaneously, it was found that financial incentive did not affect the average performance of participants, and incentives tend to be unimportant when the marginal economic return per effort made is perceived as low (Kahneman & Peavler, 1969; Kohn, 1993; Forsythe et al., 1994; Jenkins et al., 1998; Camerer & Hogarth, 1999; Bonner & Sprinkle, 2002).

In fact, Gneezy and Rustichini (2000) find evidence that when the amount of money granted is small, at the participant's discretion, monetary incentives are counterproductive for the experiment, because the level of effort of the participant is higher in experiments without monetary incentive than in incentives of low financial value. So, would a marginal increase in monetary incentive improve performance? Araujo et al (2016) find that this is not the case in research with three types of monetary incentives of 0.5 cents, 2 cents and 8 cents per task completed. Despite the 1500% increase in incentives, they only found a 5% increase in performance.

3. METHODOLOGICAL ASPECTS

3.1. General considerations

The research is carried out by means of an experiment, involving a first group offering monetary incentive and to the second with no monetary incentive. Both groups were the same, the only difference being in the offering of the monetary incentive to the first.

The methodology of the results analysis sought to:

a) Establish whether the use of monetary incentive influences the participants' responses. This is done by analyzing the distributions of the anchor index selected for the study.

b) Establish whether the use of monetary incentive influences the forecasts of the participants.

This is done by analyzing the distributions of the forecasts for a day, a week and a month.

Both points are analyzed using the non-parametric Mann-Whitney U test, validating it in terms of the following hypotheses:

- $H1_0$: There are no significant differences in the distributions of the anchor index of the groups with monetary incentive and with no monetary incentive.
- $H2_0$: There are no significant differences in the forecasts of groups with monetary incentive and with no monetary incentive.

c) Measure the anchoring and adjustment heuristics by the degree of anchorage that the participants have when making their forecasts. This was assessed using the non-parametric Mann-Whitney U test and Chi^2. Based on the above, the following null and alternate hypotheses are proposed:

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- $H3_0$: There is no influence of anchoring and adjustment heuristics on 1-day forecasts in phase 1 of the experiment.
- $H4_0$: There is no influence of anchoring and adjustment heuristics on 1-week forecasts in phase 1 of the experiment.
- $H5_0$: There is no influence of anchoring and adjustment heuristics on 1-month forecasts in phase 1 of the experiment.
- $H6_0$: There is no influence of anchoring and adjustment heuristics on 1-day forecasts in phase 2 of the experiment.
- $H7_0$: There is no influence of anchoring and adjustment heuristics on the 1-week forecasts in phase 2 of the experiment.
- $H8_0$: There is no influence of anchoring and adjustment heuristics on 1-month forecasts in phase 2 of the experiment.

The experiment was carried out with the participation of undergraduate and graduate students with previous knowledge of statistics and finance, using an instrument with which they would forecast the future value of the S&P MILA Pacific Alliance Select financial index, which measures the performance of the 67 largest and most liquid companies in Chile, Colombia, Peru and Mexico (S&P Global, 2019).

3.2. Description of the experiments

The experiment was carried out with two groups, the first with 124 participants who were offered a monetary incentive, and the second with 156 participants with no monetary incentive, using an instrument to verify if there were differences when a monetary incentive is granted or not when carrying out a forecasting operation.

Additionally, the influence of the Anchoring and Adjustment Heuristics was measured when making the financial forecast. Both groups were treated with the same conditions and the only differentiating element was the monetary incentive of the first. The experiment consisted of two phases and was guided by a tutor who explained the procedures, the objectives to be achieved, and the informed consent by which each person had to voluntarily accept their participation. In each phase there was a time limit of 7 minutes, and with the main rule that the participant could not talk to others or use information different from that provided in the experiment. If any participant contravened these rules they would be removed from the experiment.

Following the procedures of Jacowitz & Kahneman (1995), prior to the experiment we worked with a control group, who predicted the future value of the financial index S&P MILA Pacific Alliance Select. Their answers enabled us to set the mean value of the prognosis and two standard deviations (upper and lower) of the mean value were taken, with which two values were established, called low anchor and high anchor, that would be used in the first phase of the experiment.

The first phase was called the "phase with uncertainty," and participants were asked to forecast the future value to a day, a week and a month of a financial index (without specifying its name) that monitored the price fluctuation of various Latin American assets. As basic information they were presented with one of the two anchors obtained from the control group. In group one, 60 participants received the high anchor and 64 the low anchor; and in the group two 73 participants received the high anchor and 83 the low anchor.

The second phase of the experiment was called the "phase without uncertainty", and again the participants had to forecast the future value to one day, one week and one month of the index specifying that it was the S&P Pacific Alliance Select financial index. As a source of information,

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they were provided with graphs that showed the fluctuation of the movements of the index during a year, a month and a week (Kinari, 2016; Theocharis et al., 2018). Additionally, the latest available value of the financial index was presented, which acted as an anchor at the time of making the forecast. In group one with monetary incentive, 124 participants made the forecast and 156 in group with no monetary incentive.

3.3. Method of Analysis

In both groups, the procedures of Jacowitz and Kahneman (1995) were used as a methodological base; these authors use an indicator to measure the degree of anchorage of the participants. Equation (1) represents how the Jacowitz and Kahneman anchor index (AI) is calculated, estimating that a result between 0.55 and 1 indicates that the influence of the anchor is strong when performing the forecast, and a result whose range is between 0 and 0.55 denotes zero influence of the anchor.

$$AI = \frac{median\left(High\,anchor\right) - median\left(Low\,anchor\right)}{High\,anchor - Low\,anchor} \quad (1)$$

As can be seen, the AI indicator used in the experiment of Jacowitz and Kahneman, does not measure the level of anchorage of each individual but that of a group, because it uses general averages. In order to determine the level of anchorage of each individual and find their respective distribution, a modification of the AI index was made. This new index was called the Modified Anchor Index (MAI), which can be seen in equation (2). Its components are the value of the index that acts as an anchor (VA) and the forecasts of the value of the index to a day, a week and a month E(xi). With this new index it was possible to find and compare the distributions to observe whether or not there are differences between the groups with and without monetary incentive.

$$MAI = 1 - \frac{\left|VA - E_{(x_i)}\right|}{E_{(x_i)}} \quad (2)$$

Hence, in phases 1 and 2 carried out for each group, the MAI index permitted the measurement of the anchoring index of each individual, which as with the AI index, is done by means of a continuous value between 0 and 1, in which zero indicates that there is no influence of the anchoring and adjustment heuristics in the forecast, and 1, a significant influence of the heuristics.

4. RESULTS

4.1. Results of phase 1 and phase 2

The analysis of the distributions of the groups confirmed that they did not follow normal distribution, and that they have a similar form between both groups. For this reason, the interpretation of the results was made through the Mann-Whitney U Test, which allowed us to establish whether there were differences between the medians of the groups (Ladrón de Guevara-Cortés et al., 2020), thus verifying if the presence of the monetary incentive has an

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influence or not.

Table 1 shows the results of phase 1 of the experiment, in which the anchoring index MAI at one day, one week and one month was applied. When analyzing the distributions of both groups by means of the Mann-Whitney U Test, the null hypothesis of the test that determines that the distributions of both groups are the same, is not rejected in all cases.

Table 1. Comparison of the distributions of phase 1 of the groups with and without incentive.

Phase	Index	Z	p-value	Conclusion
Phase 1 – 1 day	Modified Anchoring Index MAI	8719	0,157	Ho is not rejected.
Phase 1 – 1 week	Modified Anchoring Index MAI	9421	0,7097	Ho is not rejected.
Phase 1 – 1 month	Modified Anchoring Index MAI	9582	0,8936	Ho is not rejected.

Source: author's production

These results show no significant differences in the distributions of the anchoring indexes of the individuals in phase 1 of the groups "with incentive" and "without incentive", demonstrating, therefore, that a monetary incentive does not generate differences in the participants' decisions in the phase in which there is uncertainty, due to the limited information presented.

Table 2 presents the results of phase 2, entitled "without uncertainty", in which graphic information of one year, one week and one month, and the latest value of the S&P Pacific Alliance Select index were shared with the participants. The comparison of the distributions of both groups at one day, one week and one month, show that the null hypothesis is not rejected and show that in the phase in which there is no uncertainty, neither does the monetary incentive generate differences in the participants' decisions.

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Table 2. Comparison of the distributions of phase 2 of the groups with and without incentive.

Phase	Index	Z	p-value	Conclusion
Phase 2 – 1 day	Modified Anchoring Index MAI	9686	0,984	Ho is not rejected.
Phase 2 – 1 week	Modified Anchoring Index MAI	10219	0,4167	Ho is not rejected.
Phase 2 – 1 month	Modified Anchoring Index MAI	10110	0,5156	Ho is not rejected.

Source: author's production

After evaluating both phases, the hypothesis $H1_0$ of the research that there are no significant differences between the distributions of the anchoring index of the groups with a monetary incentive and without monetary incentive is confirmed.

4.2. Results of the financial forecast

The previous analysis demonstrates that offering a monetary incentive does not generate differences, and the distributions of the anchoring MAI indexes of the groups with an incentive and without an incentive show no differences. With the aim of widening the results obtained when evaluating the distribution of the MAI index, and of establishing whether the same conclusion can be sustained, an analysis of the distributions of the forecasts at one week, one month and one day within groups was carried out. By using the distributions of both groups, these were organized between low anchor and high anchor groups per each phase.

Table 3 shows the results when comparing the distributions of the low-anchor and high-anchor groups of each phase of the experiment, except for the forecasts at one day of the low-anchor group of Phase 1 that rejects the H_0. The analysis of the distributions of the low and high anchors, using the Mann-Whitney U Test, does not reject the null hypothesis, resulting in confirming that there are no differences between the groups. Therefore, after evaluating both phases, the hypothesis $H2_0$ of the research is confirmed, which affirms that there are no significant differences in the forecasts of the groups with and without monetary incentives.

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Table 3. Comparison of the distributions of the forecasts in both phases of the groups with and without incentive.

Phase	Groups	Z	p-value	Conclusión
Phase 1 – 1 day	Low Anchor	1949	0,006	H0 is rejected.
	High Anchor	1980,5	0,345	H0 is not rejected.
Phase 2 – 1 day	Low Anchor	2376	0,275	H0 is not rejected.
	High Anchor	1806	0,083	H0 is not rejected.
Phase 1 – 1 week	Low Anchor	2280,5	0,143	H0 is not rejected.
	High Anchor	2212	0,923	H0 is not rejected.
Phase 2 – 1 week	Low Anchor	2355,5	0,241	H0 is not rejected.
	High Anchor	2386,5	0,376	H0 is not rejected.
Phase 1 – 1 month	Low Anchor	2470,5	0,470	H0 is not rejected.
	High Anchor	2385,5	0,378	H0 is not rejected.
Phase 2 – 1 month	Low Anchor	2776	0,641	H0 is not rejected.
	High Anchor	2383	0,384	H0 is not rejected.

Source: author's production

4.3. Results of the anchoring and adjustment level

On confirming that there are no differences between the distributions of both groups, the databases were unified with the purpose of measuring the level of anchoring in the financial forecasts performed by the participants in phases 1 and 2. Phase 1 (with uncertainty) was assessed with the AI index at one day, one week and one month. Phase two (without uncertainty) was evaluated with the MAI index.

The distributions of the respective anchoring indexes, separated into the groups Low Anchor and High Anchor, were compared in both phases.

Table 4 shows the degree of anchoring of the participants in phase 1, by using the methodology by Czerwonka (2017), in which a comparison between the groups Low Anchor and High Anchor

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was carried out through the Mann-Whitney U Test. The result shows that both distributions are independent. Since the distributions of the groups High Anchor and Low Anchor possess their own characteristics, they allow the use of the forecasts of the averages at one day, one week and one month in each of the distributions to measure the proximity with the anchors used during phase 1 of the experiment. Based upon Czerwonka (2017), who suggests that the independence between distributions enables the appropriate measurement of the anchoring level carried out with the AI index by Jacowitz and Kahneman (1995), results suggest that both groups are anchored to a different level every time that a forecast is carried out, the degree of anchoring is higher for the forecast at one day (1,03) and one week (1,04), and lower at one month (0,88).

The hypotheses $H3_0$, $H4_0$, $H5_0$ of the research are rejected for phase 1, resulting in inferring that there is influence of the anchoring and adjustment heuristics in the forecasts to one day, one week and one month with different anchoring degrees.

Table 4. Comparison of the groups Low Anchor and High Anchor of phase 1, with a unified base.

			Mann-Whitney test	
Phase	**Index**	**Value of the index**	**Z**	**p-value**
Phase 1 (1 day)	Anchoring Index AI	1,03	1986,00	0,0000
Phase 1 (1 week)	Anchoring Index AI	1,04	1068,00	0,0000
Phase 1 (1 month)	Anchoring Index AI	0,88	1361,5	0,0000

Source: author's production

Table 5 consolidates the information gathered from phase 2, which takes into account the graphs at one day, one week and one month, in addition to the last value of the index Graphic Anchor, that were presented to the participants of the experiment. The Chi Squared test verifies the statistical validity in the forecasts, seeking to determine whether there is independence between the graphic anchor and the forecasts at one day, one week and one month. The results measured with the average value of the MAI, indicate a strong level of anchoring of the forecast at one day (0,9646), one week (0,9733) and one month (0,9655). Nevertheless, despite the evaluation between the averages of the estimations and the anchoring level of the MAI being close to 1, in the results of the MAI to one day, the hypothesis $H6_0$ is not rejected, which implies that there is no statistical validity that determines the association between the graphic anchor and the forecasts at one day. The hypotheses $H7_0$ and $H8_0$ are rejected, with which it can be inferred that there is influence of the anchoring and adjustment heuristics in the forecasts at one week and one month.

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Table 5. Effect of the graphic anchor in the forecasts of phase 2, with joint bases

			Graphic Anchor: 4438,39		Chi Squared Test	
Fase day	**Tipo Índice**	**Valor índice**	**n**	**M**	**X2**	**P-value**
Phase 2 (1 day)	Modified Anchoring Index MAI	0,9646	280	4432,84	157,7	1,0000
Phase 2 (1 week)	Modified Anchoring Index MAI	0,9733	280	4440,02	445,1	0,0000
Phase 2 (1 month)	Modified Anchoring Index MAI	0,9655	280	4465,15	1620,9	0,0000

Source: author's production

5. CONCLUSIONS

The main objective of this research consisted of comparing two types of incentives in one experiment, with the aim at analyzing whether they produced the same degree of influence on the results, or conversely, whether they generated a different outcome in the participants' responses. The aforementioned are the monetary incentives and the primary incentives, which do not represent monetary compensation. In this case, the primary incentives are based on altruism considering that the subjects of the experiment participated objectively.

The first hypothesis of the research proposed that the distributions of the modified anchoring index of both groups were the same, which was confirmed in both phases. This suggests that the monetary incentive did not modify the participants' performance. With the purpose of reinforcing these findings, hypothesis 2 is put forward. This proposes that there are no differences in the distributions of the forecasts to one day, one week and one month between both groups, which can be confirmed in both phases of the experiment. Therefore, it is once again concluded that monetary incentives do not have an effect on the participants' responses.

These results suggest that providing financial incentives to the participants is the same as not doing so. These findings are in line with those of (Deci, 1971; Camerer & Hogarth, 1999; Gneezy & Rustichini, 2000) who affirm that monetary compensations do not have an effect on participants' performance in an experiment.

The secondary objective of this research was to verify the influence of the anchoring and adjustment heuristics in the financial forecast. In order to do this, the database was reorganized to unify the forecasts of both groups, and separating the groups in Low Anchor and High Anchor. Results confirm the influence of the anchoring and adjustment heuristics in phase 1, which is aligned with the findings by Peña & Gómez-Mejía (2020) that indicate that the financial forecast tends to anchor before a presented value. In this phase, the subjects had to predict the future value of the index at one day, one week and one month, with very little information. As a result, the participants were anchored differently to the value presented prior to the forecast.

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Results from phase two were similar. This phase included ample information of the index, such as graphs at one year, one month and one week, a part from the last known value of the index, which served the purpose of an anchor. There was statistical validity to corroborate the influence of the anchoring and adjustment heuristics to one week, one month, although not to one day.

The limitations found in this research are related to the data and methodology. Regarding the data, the base could be wider, and the quantity of participants per group could be balanced. With reference to the methodology, the participants had financial knowledge and could have a similar forecast methodology. Future research could include more heterogeneous individuals, with specific knowledge, and a more common type of phenomenon could be forecasted.

This research offers interesting insights. The novelty of the methodology lies in designing and executing an original experiment that responds to the academic debate on the use of monetary incentives in experiments, demonstrating through various methods of analysis that when making a financial forecast, monetary incentives do not influence the participants' responses. The aforementioned is a substantial conclusion because the budgetary variable is essential when designing and executing experiments in Finance and Economy. Eliminating the variable of monetary compensation of the participants would allow us to have more resources to amplify the number of participants and therefore improve the conclusions in the data analysis.

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