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The Price of Luck

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Abstract

We find that the vast majority of students taking an advanced undergraduate finance course show a preference for luck in a classroom experiment. In Phase I of the experiment part of the students, group A, were asked to guess a coin toss five times in a row. In Phase II the rest of the students, group B, were given 10 EUR to bet on some of the Group A students taking a second go at guessing a sequence of five coin tosses (Phase III). Group B students' bets were by default allocated to the worse performing student in Phase I. Switching to better performing Group A students was costly. A total of 23 out of 28 students were willing to pay for switching and thus showed a preference for luck.

Keywords: Decision heuristics, hot hand fallacy, experiments.

JEL numbers: C90, G02 (behavioral finance), G11 (portfolio choice: investment decisions.

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1. Introduction

Statistical inference is an essential building block of the behavioural model known as Homo Oeconomicus on which standard microeconomics and finance are based. We present the results of an experiment that shows how the vast majority of students attending an advanced undergraduate Finance [1] course fail to understand the independently distributed nature of random events.

Our experiment is divided in three phases. In Phase I part of the students in the classroom (Group A) were each asked to guess a sequence of five coin tosses in an incentive based manner. In Phase II the rest of the students (Group B), who acted as observers in Phase I, had to place a bet on Group A students guessing another sequence of five coin tosses in Phase III. By default all the bets were allocated to one of the lowest performing students in Group A and students were asked to quote prices at which they would be willing to switch to another Group A player. Specifically, Group B students needed to provide their willingness to pay to switch from any level of performance to each of all possible higher levels of performance. This task was incentive-based according to the well-known Becker-DeGroot-Marschack mechanism (BDM). If students were able to understand the i. i.d. nature of coin tosses they should be willing to pay nothing to switch to a better performing student. Only 18% behaved in this manner, while the remaining 82% (23 out of 28) were willing to switch their bet from the default assignment to a luckier Group A student.

A preference for luck might be the result of a "hard wired" or System 1 behaviour (Kahneman, 2011). Typically, good results are caused by a combination of ability and chance. However, those two causes are very difficult to disentangle. Therefore betting on (or going for) the individual or option who did best in the past looks like a sound evolutionary strategy, and therefore a good candidate for a heuristic. Our results go in line with previous research on the gambler's (Tversky and Kahneman, 1971) and hot hand fallacies (Gilovich et al, 1985). It could be said that we are studying the hot hand *of others* fallacy. In a similar vein Powdthavee and Riyanto (2012) found how participants pay for expert predictions even when events are unpredictable.

It needs to be stressed that our experiment was run in a classroom environment. Our participants are fourth (last) year business students who are taking an optional advanced finance subject. The lecturer was present in the classroom while the experiment was run. Note that under those circumstances the potential demand effect should push students to act in the way they are taught in the course.

[1] Capital Market Analysis, 4th year Business Bachelor at the Universitat Autònoma de Barcelona.

2. Experimental design

The experiment took place in a large classroom in which participants could be seated apart so they could not observe others' decisions. The experiment was conducted by six experimenters. Upon arrival at the classroom door participants were randomly assigned to one of the three types of players: A, B or X. We had 20 A players, 28 B players and one X player, whose task was to toss a coin. Students were also assigned a participant number and then individually led to their seats. At the very moment of entering the room each participant was instructed not to communicate with any of the other participants. Once all participants were seated, one of the experimenters read the instructions aloud.[2] Then Phase I of the experiment began. The X player tossed the coin five times. Before each coin toss each A player had to place a bet on either heads or tails. A players earned EUR 2 for each hit, nothing for a miss. B players just observed the coin tosses during Phase I, but did not make any decisions.

After all five coin tosses had taken place we asked six of the A players to leave the room with one of the experimenters. Note that six is the number of possible different numbers of hits of the A players (0 to 5). Among these six participants there were the A players with the highest and the lowest number of hits.

Then Phase II of the experiment began. B players were told that in Phase III:

- The two A players with the highest and lowest numbers of hits would be betting on five subsequent throws of the coin.
- All the B players would initially be assigned to the A player with the lowest number of hits.
- Each B player could either stick to this assignment or switch to the one with the highest number of hits.
- To switch to being assigned to the player with the highest number of hits, B players would have to pay a price.

To determine whether a B player was allowed to switch she had to fill out a table indicating the conditional prices for each possible combination of highest and lowest numbers of hits. They were allowed to give prices from zero to ten EUR by increases of half a EUR. Once every B player made these decisions, the two A players with the effective highest and lowest numbers of hits were asked to come back into the room and the B players were informed what the highest and lowest numbers of hits are. This determined for each B player the "personal change price," that is, the price a B player had given to switch from the *actual* lowest number of hits to the *actual* highest number of hits. We then used a Becker-DeGroot-Marschack mechanism to determine whether each of the B players was allowed to switch. If the randomly chosen price was above a B player personal change price, she was not allowed to change and, hence, did not incur in any cost. If the randomly chosen price was smaller or equal

[2] An English translation of the original instructions can be found in Appendix B.

than the personal change price then the B player was allowed to change, and paid the randomly chosen price.

Then, Phase III of the experiment started. The two A players with the highest and lowest number of hits placed bets on five subsequent coin tosses by player X. B players who did not change their default A player went with the A player with the lowest number of hits in Phase I. They bet EUR2 on each of the corresponding A player's guess of the coin flip. If the A player got a hit the B player earned twice his bet, EUR4. If the A player got a miss, the B player earned nothing.

The B players who changed players went with the A player with the highest number of hits in phase in Phase I. They bet EUR (10 – randomly determined price)/5 on each of the corresponding A player's guess of the coin flip. If the A player got a hit the B player earned twice his bet 2*((10 – randomly determined price)/5), if the A player got a miss, the B player earned nothing.

Once Phase III was finished, we paid participants individually and the experiment was over.

3. Results

Table A1 in Appendix A shows all the change-prices elicited from each of the 28 B players. The first column identifies the player, the second column shows the gender and the rest of the columns indicate the prices that each player is willing to pay to switch from the initial assigned player A to a more successful one. There are only 5 players who behave as if they understand statistical inference, representing 18% of the sample, while 82% of the players put positive prices on luck.

Figure 1 shows the change-prices elicited from the 28 B players for each of the possible differences in previous hits, distributed in the four quartiles (the * denote outliers). The larger the increase in hits the larger the price participants' are willing to pay.

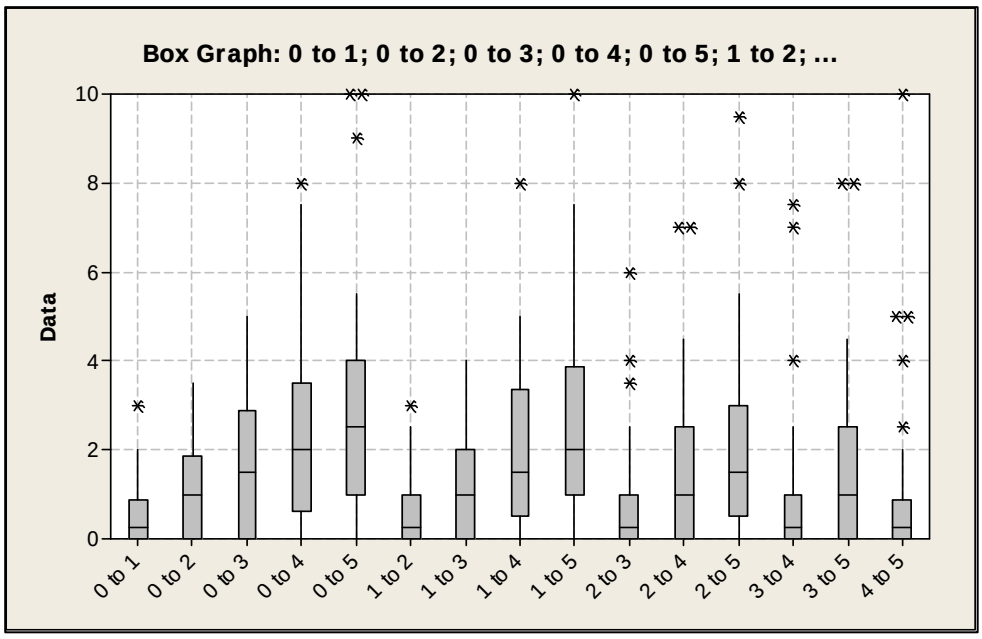

Figure 1: Box-plot of distances

In Table 1 D1 refers to the average price for all distances of size 1.[3] D2, D3, D4 and D5 have the analogous interpretation. The table shows the t-statistics and p-values for the comparison of averages of D1 and D2, based on individual data.

	D1-D2	**D2-D3**	**D3-D4**	**D4-D5**	**D1-D3**	**D2-D4**	**D3-D5**	**D1-D4**	**D2-D5**	**D1-D5**
t	-1,18	-1,37	-0,94	-0,65	-2,5	-2,23	-1,54	-3,2	-2,71	-4,42
p-value	0,25	0,18	0,35	0,52	0,0015	0,03	0,13	0,002	0,009	0,0004

Table 1: t-tests for difference in average distances

One can see that the differences for one-step distances are not significant, while for higher distances they are significant, with just one exception. The level of significance and the price of change tend to increase with the distance.[4]

Variable	**Constant**	**D1**	**D2**	**D3**	**D4**
Coefficient	3,6304	-2,5739	-2,0098	-1,21774	-0,5543
p-value	0,000	0,000	0,001	0,045	0,358

Table 2: Regression of prices on average distances

Table 2 shows the results of an OLS regression of average prices on the different distances, with R-square (adjusted) = 0,15. The regression is based on the individual data of all those who do pay a positive price for one of the distances. Except for D4 all coefficients are significant. The constant captures the average price for highest distance, D5. To find the price for say, D1, one subtracts the value of the D1 coefficient from the constant. One can see that the prices are increasing in the distance.

[3] Changing from 0 to 1, from 1 to 2, from 2 to 3, from 3 to 4 and from 4 to 5.

[4] Figures A2 to A9 in Appendix A illustrate these results. They all show a positive relation between distance and willing to pay.

4. Conclusion

We were surprised by the results reported above. In fact, previous to the experimental session reported, we run another session with the same design with 53 participants (31 B players) in which we found an even smaller proportion (13%) of seemingly rational players. We were a bit sceptical about the result then: the experiment took place in a small, rather packed, classroom and we had the impression that some contagion could have taken place. For this reason, we ran a second experiment in a bigger classroom and we were very careful in not allowing any type of communication between players.[5]

Given previous work we conjectured that some participants would pay for luck, but we did not anticipate that 82% of well trained students of Finance would do so. We also observe that the willingness to pay for luck increases with the degree of luck.

According to our results the taste for luck heuristic seems very relevant. It may have a strong explanatory power of real world phenomena. For instance, past performance is often used as a marketing tool when selling pension or investment funds. In that case customers would be typically unable to disentangle managerial skill from sheer luck and thus decide on past performance. Our experiment, explicitly excluding ability as a rational explanation, shows how deep rooted this heuristic may be.

[5] With hindsight we now think that the results of the earlier session were legitimate. The results of the other session are available from the authors on request.

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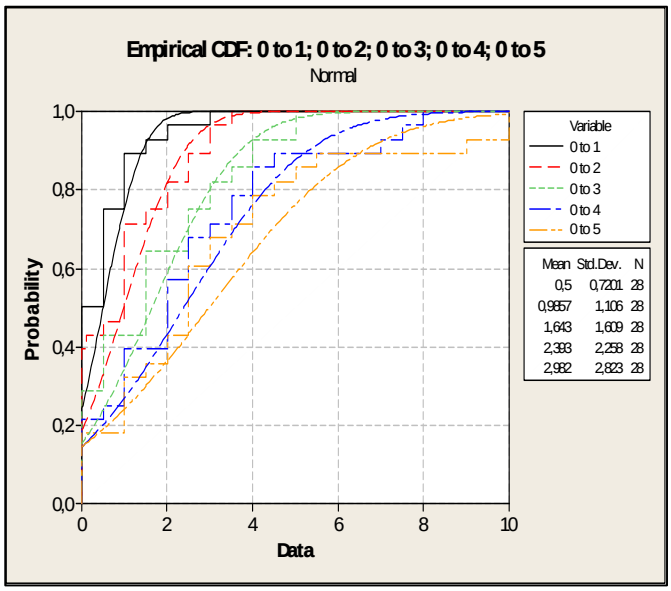
Appendix A: The first column identifies the player, the second column shows the gender andthe rest of the columns indicate the prices that each player is willing to pay to switch from the initial assigned player A to a more successful one.

Player number	Gender	From 0 to 1[6]	From 0 to 2	From 0 to 3	From 0 to 4	From 0 to 5	From 1 to 2	From 1 to 3	From 1 to 4	From 1 to 5	From 2 to 3	From 2 to 4	From 2 to 5	From 3 to 4	From 3 to 5	From 4 to 5
1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3	1	0,5	1	2,5	3,5	4	0,5	1,5	2,5	3,5	1	2	3	1	2	0,5
4	0	0	0	0,5	0,5	1	0	0	0,5	0,5	0	0	0,5	0	0	0
5	0	0	0	0	1	1	0	0	1	1	0	0,5	0,5	0	0	0
6	1	1,5	2	2,5	2,5	2,5	2	2	2,5	2,5	2	2,5	2,5	2,5	2,5	2,5
7	1	0,5	1	1,5	2	2,5	0,5	1	1,5	2	0,5	1	1,5	0,5	1	0,5
8	1	3	3,5	4	4,5	5	2,5	3	3,5	4	2	2,5	3	2	2,5	2
9	1	1	3	4	8	10	1,5	3	8	10	3,5	7	9,5	7	8	5
10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12	1	0	0	0	0	1	0	0	0	1	0	0	0,5	0	0,5	0
13	0	0,5	1	1,5	2	3	0,5	1	1,5	2	0,5	1	1,5	0,5	1	0,5
14	0	0,5	1	1,5	2	2,5	0,5	1	1,5	2	0,5	1	1,5	0,5	1	0,5
15	0	1	3	5	7	9	1	3	5	7	1	3	5	1	3	1
16	0	0	0	0	2,5	2	0	0	2,5	3	0	0	0	0	0	0
17	1	0	0	0,5	1	1	0	0	0,5	1	0	0	0,5	0	0	0
18	0	0	0,5	0,5	1	2	0	0,5	0,5	1	0	0,5	0,5	0	0,5	0
19	0	0	0	0,5	1	1,5	0	0	0,5	1	0	0	0,5	0	0	0
20	1	0,5	1	1,5	2	2,5	0,5	1	1,5	2	0,5	1	1,5	0,5	1	0,5
21	1	1	2	2,5	3	3,5	3	4	5	6	6	7	8	7,5	8	10
22	0	2	2,5	3,5	4	5,5	2,5	3,5	4	4,5	4	4,5	5,5	2,5	4,5	4
23	1	0	2,5	5	7,5	10	0	2,5	5	7,5	0	2,5	5	0	2,5	0
24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
25	1	1	1,5	3	3,5	4	1	1,5	3	3,5	1	1,5	3	1	1,5	0,5
26	1	0,5	0,1	1,5	2,5	3	1,5	2	3	3,5	2,5	3,5	4	4	4,5	5
27	1	0	1	1,5	2	2,5	0	1	1,5	2	0	1	1,5	0	1	0
28	0	0,5	1	3	4	4,5	0,5	1	4	4	0,5	1	3	0,5	1	0,5
Mean		**0,50**	**0,99**	**1,64**	**2,39**	**2,98**	**0,64**	**1,16**	**2,09**	**2,66**	**0,91**	**1,54**	**2,21**	**1,11**	**1,64**	**1,18**

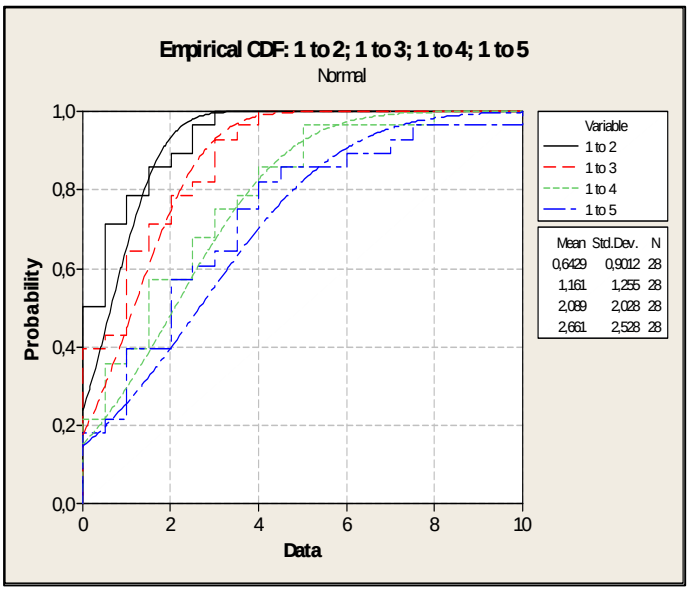
Table A1: Willingness to pay for changes of all subjects

[6] From 0 to 1 refers to changing from an A player with zero of five possible hits to a player with one hit.

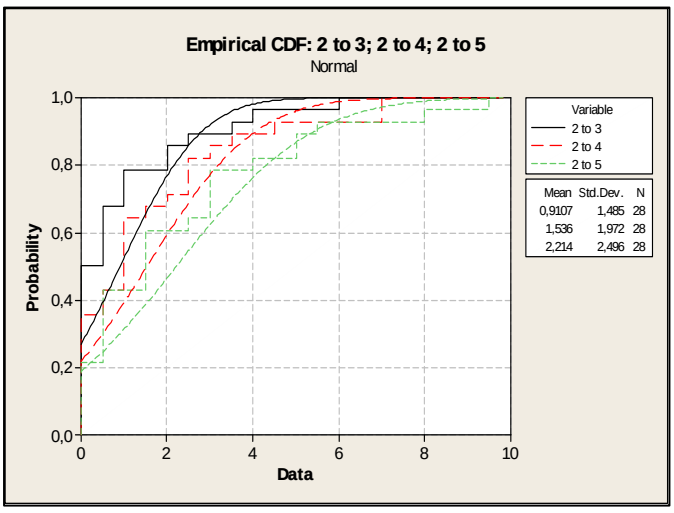
A.2



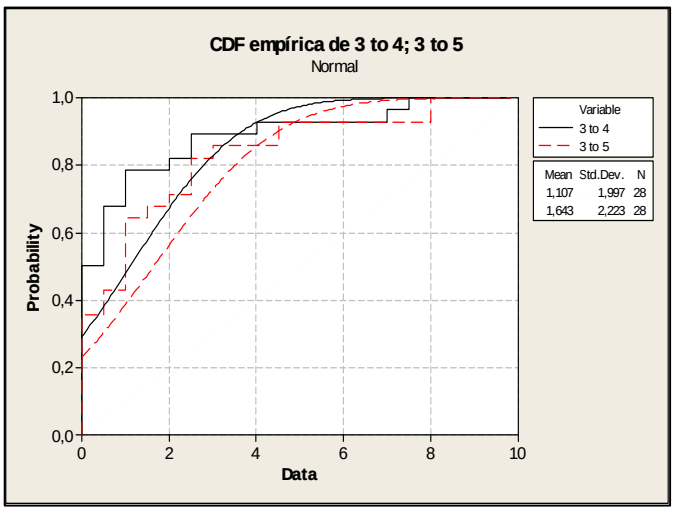
A.3



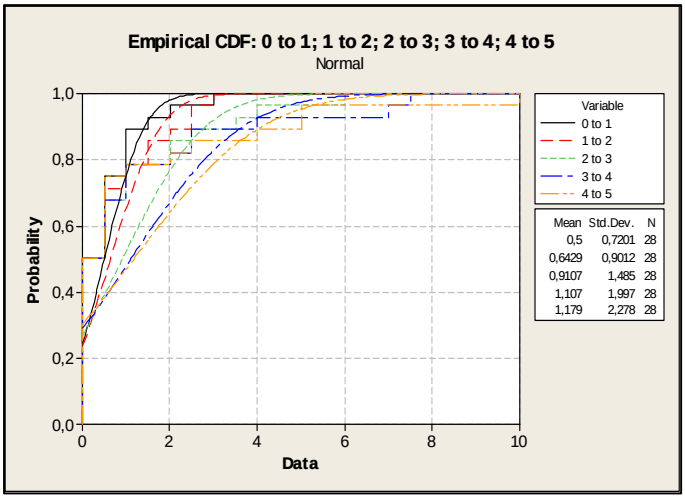
A.4



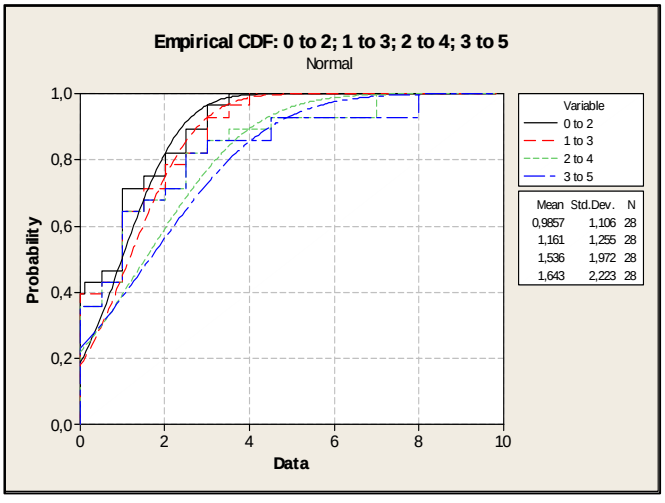
A.5



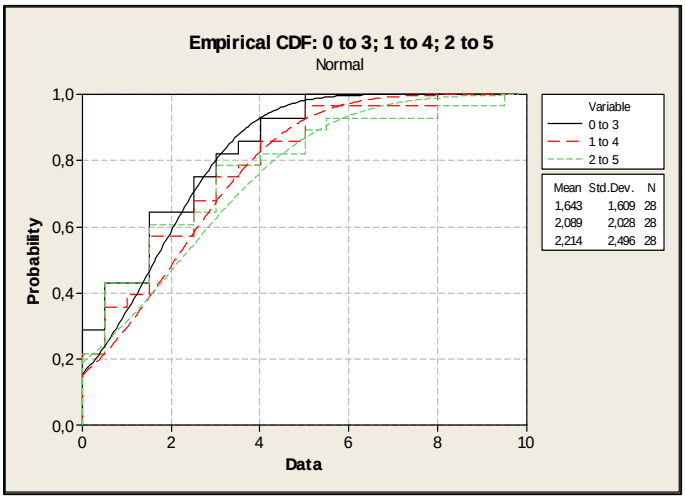
A.6



A.7



A.8


Empirical CDF: 0 to 3; 1 to 4; 2 to 5
Normal
Probability
Data
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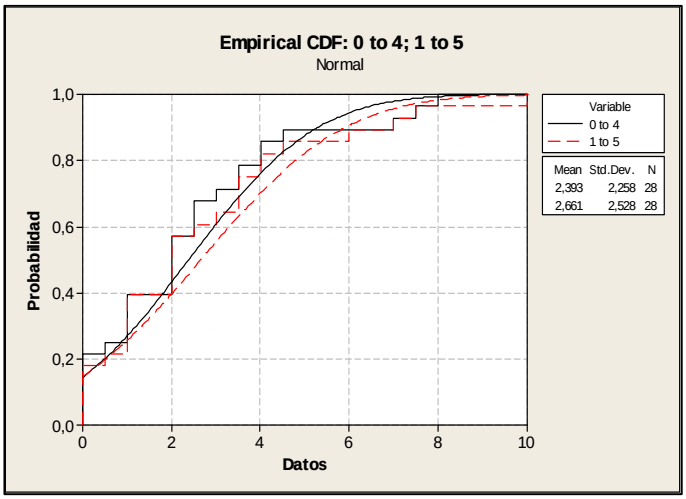
0,8
0,6
0,4
0,2
0,0
0
2
4
6
8
10
Variable
0 to 3
1 to 4
2 to 5
Mean Std.Dev. N
1,643 1,609 28
2,089 2,028 28
2,214 2,496 28

A.9


Empirical CDF: 0 to 4; 1 to 5
Normal
Probabilidad
Datos
1,0
0,8
0,6
0,4
0,2
0,0
0
2
4
6
8
10
Variable
0 to 4
1 to 5
Mean Std.Dev. N
2,393 2,258 28
2,661 2,528 28

Appendix B

GENERAL INSTRUCTIONS

Welcome to this experiment,

IT IS VERY IMPORTANT TO REMAIN SILENT DURING THE WHOLE EXPERIMENT!!!

If you have any doubts about the instructions please raise your hand and wait until one of the experimentalists comes to your place to solve it.

You will receive 4 € as a show-up fee.

This experiment has three phases that called PHASE ONE (only Group A plays), PHASE TWO (only Group B plays), and PHASE THREE (Group B and part of Group A plays).

There are three types of players:

Players from group A

Players from group B

Player X: (THE INNOCENT HAND)

PHASE ONE

In this phase players in group B do not play, they only observe, so only the group A players act. Group A players must bet heads or tails when player X throws a coin. The players that guess right will obtain 2 € and the ones that don't get 0 €. Player X earns 10 € for her participation.

The process will be as follows:

1- Every player A will make her bet in an individual way: if she bets that heads will come out, she writes down a C in the cell "Bet" and if she that tails will come out she writes a + in the cell "Bet" in the folder that has been given to her.
2- Player X will throw the coin
3- Every player A will check the result (heads or tails) and will fill the cell "result" by writing a✓ if she had the right answer and an X if she didn't. All these can be found in the documents that have been given to players A.

There will be five rounds of this process. The bets will be made before each one of the throws. We will check that before each throw all players in group A have made their bets. Once the five rounds have been completed the documents will be collected.

After that a group of 6 players A will be selected and we will invite them to go out of the room. The selection will be made according to the different possible results that might come out in the five rounds.

The selected players A will go out of the room and wait for instructions.

The rest of players A will remain seated in their places during the rest of the experiment until they are called to be paid what they earned in the experiment.

PHASE TWO

This is the phase where players from group B participate in an active way in the experiment.

Each player B has an initial endowment of 10 €.

We assign by default to every player B one of the players that have been selected to leave the room, specifically the one that had the lowest number of right answers in PHASE ONE.

In phase three we will repeat the five rounds of coin throws as in the first phase. Players from group B will not bet. Players B's earnings will be determined by the player A that has been assigned to them (minimum number of right answers). This earnings will be of 2 € per right answer. But players B have the opportunity to change from the assigned player A to the one that had the maximum number of right answers in phase one.

To switch from the assigned player to the one with the highest number of right answers B players must pay a price.

The way to determine if a player B will switch from the assigned player A to the one of maximum number of right answers or will remain with the assigned player A works as follows:

1- First, every player B will determine the price that she is willing to pay to switch from the A player with the minimum number of right answers to another A player with higher number of right answers. This will be done by filling in the table that has been given to them in the documentation.

PLAYER Nº				**GRUP B**		
	Player to switch to					
Assigned player	0 right answers	1 right answers	2 right answers	3 right answers	4 righ tanswers	5 right answers
0 right answers						
1 right answers						
2 right answers						
3 right answers						
4 right answers						
5 right answers						

The prices for changing can be expressed in fractions of 0.5 €.The maximum price that can be paid is the initial endowment of 10 €.

2- Second, the organizers will reveal the results of the selected players A so players B will know the number of right answers that the player they have been assigned to had, and will also know the score of the maximum number of right answers. This will allow players B to know which cell in the table they are playing with.
3- Third, we will determine the random price of change by a lottery. If the price of change that player B has set is lower than the lottery price then player B doesn't switch. If the price of change that player B has set is equal or higher than the lottery price then player B switches to the player with the maximum number of right answers by paying that lottery determined random price. Each player B must write down the player that finally is assigned to her in the cell on the first page of the documentation she has been given.

4- If player B does not change, she bets 2 € per round.
If player B does change, her bet will be:

$$bet = \frac{(10€ - random\ price\ of\ change)}{5}$$

The earnings will be double the bet.

*As an example: If the random price of change is 2.5 €. Player B bets (10-2.5)/5=1.5 per round, so if she get the right answer then the earnings will be double = 1.5*2=3. Wrong answers have a cost of 0 €.*

After that we will let into the room the 6 players A and identify the player with the minimum number of right answers and the one with the maximum number of right answers and they will proceed to play the five rounds of coin throws.

While players A come into the room we will collect the documentation from B players.

PHASE THREE

In this phase we will proceed as follows:

1- Player A will make her bet out loud: Heads or Tails
2- Player X throws the coin
3- Te result will be written on the board.

There will be five rounds for each of the two players (minimum and maximum number of right answers). Bets will be made before each throw.

Players A do not earn money in this phase.

Players B's earnings depend on the amount of right answers that the A player they are assigned gets.

Once the experiment has finished it is important that all players remain seated until they are called by their number to be paid what they have earned in the experiment.