Information Cascades

Team B

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Abstract:

This paper discusses an experiment where participants are provided private information regarding an urn color. Participants make sequential predictions, with access to their private signal and prior participants' public predictions, and receive a payoff. If public decisions match, successive participants should follow the pattern regardless of their private information, creating "information cascades." The second part of this report discusses further experimentation on participants' risk aversion, manipulated through payoff amounts.

Introduction

We ran an experiment to test the following question – do participants rely and trust public predictions of other participants over their own private information? Information Cascades affect rational decision making and allow economists to analyze herding behavior. That is, when other's decision making has a greater impact on a subsequent individual's choices than their private information. As stated by Anderson and Holt (1997), this experiment is particularly useful for analyzing investment patterns, marketing and voting implications.

Procedure

To test this experiment, we divided thirty-six participants divided into six groups, each consisting of six subjects. We decided to remove group six subjects from our data because they could not complete the experiment after round two. Our data consists of thirty participants split between five groups of six people and each group played a total of five rounds. We replicated Anderson and Holt's original experiment and told participants there were two urns. The blue urn had two blue balls and one red ball. The red urn had two red balls and one blue ball. The program ordered participants sequencially, from positions one to six - with participants assigned to new positions each round. The first participant in each group saw a private draw, either red or blue, and had to predict which urn the ball came from. In addition to seeing their own private information, each participant could see what players before them predicted and make their own prediction regarding which urn the ball came from. Once the round ends, the correct answer is given. Participants are given an initial endowment of $6.00. Those who predicted correctly received a $2.00 payoff, while those who guessed incorrectly received a $0.50 payoff.

An information cascade occurs when a participant disregards the private information presented to them, and uses previous players' choices to make their predictions. In both our experiments, we follow Anderson and Holt's (1997) definition of an information cascade, where an information cascade forms after the third player in a sequence deviates from their own private color information and chooses the color prediction consistent with the two previous players before them. If the first player received private information to choose red, we expect that they would predict red. If the second player received a private signal to choose red, we also expect the participant to choose red. If the third player drew blue, and they predicted red, then an information cascade was formed (Anderson & Holt, 1997).

Prediction

Based on our team's execution of this experiment and the results of Anderson and Holt (1997), we hypothesized the Bayesian rule would hold. If the first two participants' predictions match, the third participant will use prior participant's predictions to make a decision, disregarding their private information. In turn, this should create a chain of decision making that encourages a false sense of certainty, all driven by the first two predictions. Our hypothesis answers our research question by demonstrating people's tendency toward herd mentality. Since predictions are made publicly, there is a larger incentive to maintain consistency.

Analysis

In total, we ran our experiment over the course of 15 minutes for all five participating groups. In 25 rounds of our experiment, 11 cascades formed (44%). We categorized participant decisions using the following: in orange, participants made random choices prior to other player's public predictions, deviating from their own private information. In green, participants deviated from the information cascade, following prior predictions or private information. In yellow, participants formed an information cascade. In this analysis, we will highlight and compare group two and group four as shown in Figures 1.

Group 2 Data

Round	Position	ID	Own Signal	Prediction	Actual Urn	Earnings	Sensible Prediction
1	1	7	b	r	r	$2.00	b
1	2	8	b	r	r	$2.00	r
1	3	9	r	b	r	$0.50	r
1	4	10	r	b	r	$0.50	b or r
1	5	11	r	b	r	$0.50	b or r
1	6	12	r	r	r	$2.00	b or r
2	1	9	r	b	b	$2.00	r
2	2	7	b	b	b	$2.00	b
2	3	11	b	b	b	$2.00	b
2	4	12	b	r	b	$0.50	b
2	5	10	b	r	b	$0.50	b or r
2	6	8	r	r	b	$0.50	r
3	1	12	b	b	b	$2.00	b
3	2	11	b	b	b	$2.00	b
3	3	9	b	b	b	$2.00	b
3	4	7	b	b	b	$2.00	b
3	5	8	r	b	b	$2.00	b or r
3	6	10	b	r	b	$0.50	b
4	1	8	r	r	b	$0.50	r
4	2	10	b	r	b	$0.50	b or r
4	3	7	r	b	b	$2.00	r
4	4	11	r	b	b	$2.00	b or r
4	5	9	r	r	b	$0.50	b or r
4	6	12	r	r	b	$0.50	r
5	1	11	b	r	b	$0.50	b
5	2	7	b	r	b	$0.50	b or r
5	3	10	b	r	b	$0.50	b or r
5	4	8	b	b	b	$2.00	b or r
5	5	12	r	r	b	$0.50	b or r
5	6	9	b	r	b	$0.50	b or r

Group 4 Data

Round	Position	ID	Own Signal	Prediction	Actual Urn	Earnings	Sensible Prediction
1	1	19	r	r	r	$2.00	r
1	2	20	b	b	r	$0.50	b or r
1	3	21	b	r	r	$2.00	b
1	4	22	r	r	r	$2.00	r
1	5	23	r	r	r	$2.00	r
1	6	24	r	r	r	$2.00	r
2	1	23	r	r	r	$2.00	r
2	2	21	b	r	r	$2.00	b or r
2	3	24	r	r	r	$2.00	r
2	4	22	r	r	r	$2.00	r
2	5	20	r	r	r	$2.00	r
2	6	19	b	r	r	$2.00	b or r
3	1	21	b	r	r	$2.00	b
3	2	23	b	b	r	$0.50	b or r
3	3	20	r	b	r	$0.50	b or r
2	4	22	r	r	r	$2.00	b or r
3	5	19	b	b	r	$0.50	b or r
3	6	24	r	b	r	$0.50	b or r
4	1	24	r	r	b	$0.50	r
4	2	19	b	b	b	$2.00	b or r
4	3	23	b	b	b	$2.00	b
4	4	20	r	b	b	$2.00	b or r
4	5	21	b	r	b	$0.50	b
4	6	22	b	b	b	$2.00	b
5	1	19	b	b	b	$2.00	b
5	2	21	r	r	b	$0.50	b or r
5	3	24	b	r	b	$0.50	b or r
5	4	23	r	r	b	$0.50	r
5	5	20	b	r	b	$0.50	b or r
5	6	22	b	b	b	$2.00	b or r

Figure 1: Group 2 and Group 4 data

In group two, five out of six players made random decisions (83%). The sixth player deviated from an information cascade by following their private

information. Using group two's data does not provide sufficient support for our hypothesis. In group one, 33% of participants made multiple random predictions. In groups three, 67% of participants made random decisions. In group four, approximately 17% of participants made random predictions. In group five, 50% of participants made random predictions. While all groups faced random decision making, group two had disproportionate amounts of random guessing at 83%.

When studying group four's results, we see multiple information cascades. ID 21 used public predictions to deviate from their own private draw, eventually influencing ID 19, in the last position, to make a prediction consistent with all the public predictions and inconsistent with their own private information. We see subsequent examples of this cascade formed in their later fourth and fifth rounds. Although information cascades in our experiment occurred only 44% of completed rounds, the occurrence of information cascades by the third player to make a decision, utilizing public predictions over their own private information, supports our hypothesis.

Comparison

Anderson and Holt used 72 subjects in their 1997 experiment. Each session lasted 15 rounds, consisting of six people per group. Cascade behavior formed 41 out of 56 periods (Anderson and Holt, 9). Similarly to our experiment, Anderson and Holt observed 4% of participants making predictions that were inconsistent with Bayes' Rule and private information (p. 9,10). In our experiment, groups ranged from 17% to 50% of participants per group making random decisions. Unlike our experiment, Anderson and Holt held "several practice periods" to allow subjects to become familiar with the experiment (p. 8). If we had time to do the same, we expect that we would observe similar results.

Similarly to Keynes' beauty contest, the premise of this experiment lies around others' decisions and expectations. The beauty contest consisted of participants' predictions of which contestants will receive the most votes based on attractiveness. Anderson and Holt note the further similarities of this experiment[1] to predictions of financial market analysts.

[1] Part 2: pages 1-3.
Part 3: pages 4-6.

Introduction to Novel Experiment

"Information Cascades in the Laboratory" poses a series of interesting questions regarding behavior in a social contagion environment (Anderson & Holt, 1997). A novel, tangential experiment we will explore is the effect of loss aversion on information cascades**.** Specifically, how will player behavior change in the information cascade, given a larger penalty for loss? Loss aversion can be defined as the people's tendency to avoid losses more than equivalent gains (Chrakraborty, 2020**)**.

Procedure

By dividing the subjects into two conditions: one with control payoffs and another with inflated losses for incorrect guesses, we will be able to identify if subjects conform to group decision in a different pattern to avoid a larger penalty. We hinge our experimental investigation on a key result from Prospect Theory: subjects faced with a risky choice leading to potential losses may opt into risk-seeking decisions more often (Kahneman and Tversky, 1979**)**.

For both our control and treatment groups, there would be a total of thirty participants split into five groups with six participants per group, and each group is expected to play a total of five rounds. Before the game starts, each participant in both groups would begin with an initial cash endowment of $6.00. In the control group, participants in each round would earn $2.00 if they guessed the correct urn and $0.50 if they guessed the incorrect urn. In the treatment group, participants in each round would earn $2.00 if they guessed the correct urn and lose $2.00 if they guessed the incorrect urn.

In order to test the efficacy of Prospect Theory and risk aversion's influence on this experiment, we need to check where the information cascade first occurred in both groups. In the control group, we would count the number of cascades that formed in the same manner we counted them part two. By following the same procedure for the experimental design group, we can compare the differing speeds to converging decisions between the experimental and control groups.

Prediction

We have designed a new experimental design group keeping loss aversion in mind. With regards to the experimental group, we predict that a higher cost for incorrect guesses will cause players to choose their predictions more carefully. This would cause an information cascade to occur in earlier rounds in the experimental group, as compared to the control group. Based on Prospect Theory, experimental group participants are now faced with higher risk, affecting how often they conform to prior participants behavior. The introduction of loss

attached to an incorrect decision should drive quicker conformity to others' previous predictions.

If our prediction is correct, we hypothesize that there will be a smaller average number of rounds without information cascades in the experimental group than the control group. When faced with a risky decision of selecting which urn was used, subjects will stray from the less-risky private draw and conform more often than their control subject counterparts.

Analysis

For the control group, we assume the data collected to be the same as the experiment analyzed in part two. In the data, we did not observe many information cascades, as seen in Figure 2. We assume this occurred because there were no punishments for correct versus incorrect guesses, as both cases yielded participants a monetary reward. Hence, participants are not exposed to risk of loss and there is significantly less incentive to deviate from their private information.

Round	Group	Position	ID	Own Signa	Prediction	Actual Urn	Earnings	Cumulative Earnings
4	1	1	4	b	b	b	2	12.5
4	1	2	6	b	b	b	2	11
4	1	3	3	b	b	b	2	12.5
4	1	4	5	b	r	b	0.5	9.5
4	1	5	1	r	r	b	0.5	11
4	1	6	2	b	r	b	0.5	9.5
5	2	1	11	b	r	b	0.5	13
5	2	2	7	b	r	b	0.5	14.5
5	2	3	10	b	r	b	0.5	8.5
5	2	4	8	b	b	b	2	11
5	2	5	12	r	r	b	0.5	11.5
5	2	6	9	b	r	b	0.5	11.5
1	3	1	13	b	b	b	2	8
1	3	2	14	r	r	b	0.5	6.5
1	3	3	15	b	r	b	0.5	6.5
1	3	4	16	b	r	b	0.5	6.5
1	3	5	17	b	r	b	0.5	6.5
1	3	6	18	r	r	b	0.5	6.5

Figure 2: Sample of data collected from our experiment representing our control group.

However, with the addition of a cost of $2.00 for an incorrect guess in the treatment group, we assume that participants are more risk-averse to losses and take their aversion into account when making decisions. This motivates participants of the treatment group to weigh previous participants' guesses more heavily than the private information received. As a result, more information cascades are expected to occur, as demonstrated in Figure 3.

Period	Urn used	Subject number: Urn decision (private draw) 1st round	2nd round	3rd round	4th round	5th round	6th round	Cascade outcome
5	B	S12: A (*a*)	S11: B (*b*)	S9: B (*b*)	S7: B (*b*)	**S8: B (*a*)**	**S10: B (*a*)**	cascade
6	A	S12: A (*a*)	S8: A (*a*)	**S9: A (*b*)**	**S11: A (*b*)**	S10: A (*a*)	S7: A (*a*)	cascade
7	B	S8: B (*b*)	S7: A (*a*)	S10: B (*b*)	S11: B (*b*)	S12: B (*b*)	**S9: B (*a*)**	cascade
8	A	S8: A (*a*)	S9: A (*a*)	S12: B* (*b*)	S10: A (*a*)	**S11: A (*b*)**	S7: A (*a*)	cascade
9	B	S11: A (*a*)	S12: A (*a*)	**S8: A (*b*)**	**S9: A (*b*)**	**S7: A (*b*)**	**S10: A (*b*)**	reverse cascade

Figure 3: Data collected from Anderson and Holt (1997) which we believe would be similar to our treatment group.

Final Thoughts

Participants can be influenced by other participants' decisions. However, their influence is fragile. If we were to re-run our novel experiment with the ECN 190 class, the data on page two would likely look different. Since college students tend to live on a tight budget, their aversion to losses of $2.00 should be significant. As mentioned above, we expect to see more students creating information cascades in earlier rounds. However, they should also consider their private information to prevent a major loss.

In our analysis, Information Cascades produced highly illustrative results with economically tangible consequences. As demonstrated in our post-hoc experiment, adjustments in the structure of the experiment reveal herding behavior patterns and strong loss aversion – topics that are instrumental to subject participation in economic decision making in small laboratory settings, as well as their everyday environments.

References

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