Final Project: How Different People React with Different Payments? – Experiment from Obese and Vegan Diet

Xiaoyi Guo (Matriculation number: 4732464)

August 9, 2023

1 Introduction

This project connects subject's demographic information of eating habits, such as BMI and vegan eating style, with the choice of delayed or probable payment. Using experimental methods, subjects' personal information and their preference of future payment will be collected and their future payment preferences will be calculated with exponential methods.

2 Samples

This experiment is looking forward to collecting about 1,000 samples from the whole society.

All participants must be more than 18 years and should know their precious heights and weights as this experiment requests an actual measurement of BMI.

3 Procedures

Participants will be invited to a room and access the questionnaire via a computer. They will first read the welcome and the instruction page. After reading these basic information, they will be requested to provide some demographic information, including the age, physical gender, academic background (degree and field), diet (the percentage of vegan/vegetarian foods in the daily diet), and the heights and weights (in order to calculate the BMI). Then they will be redirected to a sample page in which all parameters are same constant ($c = 100$). After that, participants will start the formal experiment, which includes 21 questions. The formal question pages deploy the following logic:

1. All questions have a 120-second-limit, which is displayed via a count-down clock on the experiment interface to remind participants of the timing.

2. All questions have a confirmation page that will be popped out after click the "submit" button.

3. After the time limit reaches, the system opts **immediate payment** and redirects the participant to the next question.

These three rules **nudges** participants to respond more carefully under a time pressure. As some previous researches show that participants provide their 21 answers within 16 minutes on average, this research gives a time reference of 40 seconds per question so that they know they can take time and the reconfirmation enhances such nudging of careful behavior.

In prior and in the welcome page, the participants will be told that they will be granted 2.5 euro as a compensation of participation immediately after the experiment if they take part in and complete all questions successfully. Then, they will be granted another 4 euro if their data are eligible for analysis – more specifically, if their inputted answers are exhibiting all same patterns or use less than 800 seconds to answer all questions, the input will be eliminated.

Each question is designed with a background text and three options:

Question XX/21: Your initial wealth is V **euro. Your job is to choose which of the hypothetical money amounts is most appealing to you. All choices are unrelated; please do not attempt to plan ahead. Just judge each amount based on what is most appealing to you. You may consider the following options, and you may choose one and continue. If you forget how to play this game, you may click the "Help" button below.**

Which choice appeals you the most?

- **Take the money and go away.**

- **Get** A **euro by yourself in** D **days.**

- **Take part in a lottery that will have a** p **probability to get** A **euro.**

In which the first option is an immediate payment; the second option is a delayed payment whereas the third option is a probable payment delivered via a lottery.

After the participant chooses one option, the system will respond and calculate different discounting rate preferences, which will be discussed in the next section.

When the participant completes all questions, he/she will finally be directed to an ending page, informing the completion of the experiment and reporting an average discounting rate, accompanying with an easy-understanding explanation of this rate.

This experiment also provides a data output function that provides the demographic information, answers to each question and the average discounting rate.

4 Measure

This experiment uses exponential formula to calculate the mental discounting rate:

$$
d_n = \begin{cases} 1, \text{if participant chooses option 1} \\ \{\arg k | V = Ae^{-kD}\}, \text{if participant chooses option 2} \\ \{\arg k | V = Ae^{-k\frac{1-p}{p}}\}, \text{if participant chooses option 3} \end{cases} \quad (n = 1, 2, ..., 21) \quad (1)
$$

In which, V, A, D, p are mentioned in the sample question. and k is the discounting rate. Specifically, $k = 1$ permits the situation of immediately payment as the participant is impatient to the future payment.

After the experiment, the participant's general performance is measured with the average of d_n.

5 Possible Improvement

This experiment still has space to improve, such as the measuring methods could be replaced with hyperbolic measuring, which is considered a better indicator; the time limits could be discussed more in detail of utilizing into the actual performance measurement.

Further, the intuition of this collection could also be investigated. It is not popular to investigate the comparison between delayed payment and probable payment under a same scenario. Hence with the change of the parameters of the experiment raw code and with an alternation of a possible penalty of choosing riskless option (as people tend to do so) would possible be helpful for the future development of the experiment.

References

[1] Warren K Bickel, DP Jarmolowicz, ET Mueller, CT Franck, C Carrin, and KM22644127 Gatchalian. Altruism in time: social temporal discounting differentiates smokers from problem drinkers. *Psychopharmacology*, 224:109–120, 2012.

[2] Warren K Bickel, A George Wilson, Christopher T Franck, E Terry Mueller, David P Jarmolowicz, Mikhail N Koffarnus, and Samantha J Fede. Using crowdsourcing to compare temporal, social temporal, and probability discounting among obese and non-obese individuals. *Appetite*, 75:82–89, 2014.

[3] Kris N Kirby and Nino N Maraković. Delay-discounting probabilistic rewards: Rates decrease as amounts increase. *Psychonomic bulletin & review*, 3:100–104, 1996.

[4] Todd L McKerchar and C Renee Renda. Delay and probability discounting in humans: An overview. *The Psychological Record*, 62:817–834, 2012.