

**TIME DISCOUNTING FOR PRIMARY AND
MONETARY REWARDS**

SUPPLEMENTARY MATERIAL

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ABSTRACT

This document contains the supplementary material for the paper titled "Time Discounting for Primary and Monetary Rewards" published in *Economics Letters*. Section 1 explains in detail the experimental design. Section 2 describes the experimental procedures. Section 3 contains an example of the experiment's instructions.

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1. Experimental design

In order to elicit their short-run discount rate, we give subjects a set of nine simple decisions. Each decision consists of choosing between an amount x today and a larger amount $(1 + r)x$ in one week. In the experiment, subjects answer a set of questions where x is a check for \$50 and another set where x corresponds to 5 small chocolates. At the end of the experiment, in each set of decisions, one decision is randomly chosen and implemented.

If, for a given r and x , a subject prefers the amount x today, we can conclude that the subject is willing to forgo an amount rx in order to get the money/good today instead of in a week. Hence, by gradually increasing the interest rate r over the nine decisions, we can observe the r at which a subject switches from x today to $(1 + r)x$ in one week. Therefore, this switching point serves as a measure of the subject's discount rate. We use this method because it is incentive compatible and easily understood.¹

For the set of decisions where x is a \$50 check, we use the following values of r : 0.00, 0.01, 0.03, 0.05, 0.07, 0.09, 0.10, 0.15, and 0.20. Consequently, at the highest interest rate, subjects can earn an additional \$10 by waiting a week. Furthermore, note that an r of 1% already implies an annual interest rate of 67.76%, which we expect to be higher than the borrowing rate of our subjects. In other words, in the absence of other considerations, an exponential discounter ought to switch to the delayed payment already at this point.² For the set where x equals 5 chocolates, we use the following values of r : 0.00, 0.05, 0.10, 0.15, 0.20, 0.40, 0.60, 0.80, and 1.00. Hence, at the highest

¹ Encouraging in this sense is the fact that all subjects either never switched or switched only once from early to late delivery. In other words, even though we did not restrict their choices, none switched more than once or in the “wrong” direction (from late to early delivery).

² There might be reasons for exponential discounters to prefer an early delivery even if $r > 1\%$. For example, uncertainty with respect to transaction costs in cashing the check can induce even a patient subjects to ask for immediate delivery (Reuben et al., 2009).

interest rate, waiting is rewarded with 5 additional chocolates. Furthermore, an exponential discounter ought to switch at $r = 0.05$.

The set of rates for chocolate differ from the one we offered for money for technical constraint. Offering a 5% return over 5 pieces of chocolate requires delivering one fourth of a chocolate, and we could not reliably cut the chocolate in smaller parts. An alternative approach would have been to reduce the divisibility problem by increasing the amount of chocolate delivered, but we fear this would cause a satiation problem.

2. Experimental procedures

The experiment was conducted in a single session on the 13th of October 2007 with MBA students from the Kellogg School of Management. Upon arrival subjects were randomly assigned to a seat by picking a USB drive with seat labels from a box. Once all subjects were seated, the experimenter reminded them not to communicate with one another and that their interaction with others will remain anonymous. Thereafter, they were asked to sign a consent form. The experiment was run from the subjects own laptop computers by double-clicking on a file located in the USB drive they just received. The experiment was programmed and run with zTree (Fischbacher, 2007). It lasted one and a half hours. Furthermore, as a prerequisite for participation in the experiment, subjects filled an online survey a few days before.

For taking part in the study, subjects were informed they would receive a participation fee of \$50 (in addition to their experimental earnings which averaged \$51.87).³ These are the \$50 that were used to elicit their discount rate. Specifically, as their first choice in the experiment, subjects answered the set of nine questions

³ In addition to the two sets of decisions to elicit discount rates, subjects played in a series of lotteries, a beauty-contest game, and few trust games. Subjects participated in all these games in the same sequence and in order to prevent spillovers; they received no feedback in-between choices.

designed to elicit discount rates with money (described above). They were informed at the end of the experiment which decision would be used to determine their payment.

In order to make the delivery times as similar as possible, we decided to pay subjects with a check. Checks were delivered to the subjects' university mailboxes a couple of hours after the experiment or at the same time one week later. We chose this procedure to keep constant the uncertainty of receiving the check (in neither case did the subjects receive the check right away). Furthermore, since payment was done in days in which subjects have to be present at the university, we do not expect the transaction costs to vary between delivery times.

Later on, subjects were informed that as additional compensation for participating, they were entitled to at least 5 Leonidas Napolitain Belgian chocolate squares (a picture was provided on the screen). Then they were given the set of nine decisions designed to elicit discount rates with the primary reward. In addition, in the next screen subjects were asked to self-report with seven-point Likert scale their fondness for chocolate and how hungry they felt at that moment; the precise questions were: (i) how much do you like chocolate? (ii) how hungry are you right now? Again, subjects were informed until the end of the experiment which decision would be randomly picked and implemented.

We used this type of chocolate as they are a well-regarded brand that is not easily available. In this way, subjects who choose the later delivery must forgo the consumption of this type chocolate on the day of the experiment. Furthermore, the relatively small size of each chocolate—around 6 grams per square—makes it less likely that subjects reach a satiation point where they would not want more chocolate. Subjects that received the chocolate the day of the experiment did so once the experiment had finished. Subjects who received the chocolate one week later did after a

class scheduled at the same time as the experiment.⁴ The instructions for these two set of questions are available in the appendix.

3. Instructions

The instructions used to elicit discount rates are below. The instructions of the other games in the experiment (not reported in this paper) are available from the authors.

Instructions to elicit discount rate for money

For completing the LEAD survey, you get \$50. Now we ask you to determine when you will receive this amount.

For each row below, choose to be paid \$50 *today* or a higher amount *in one week*. If paid *today*, a check will be delivered to your mailfolder during the afternoon on the *13th of August*. If paid *in one week*, the check will be delivered during the afternoon on the *20th of August*. One of these rows will be randomly selected by the computer and implemented.

1. Receive \$50.00 *now* or receive \$50.00 *in one week*.
2. Receive \$50.00 *now* or receive \$50.50 *in one week*.
3. Receive \$50.00 *now* or receive \$51.50 *in one week*.
4. Receive \$50.00 *now* or receive \$52.50 *in one week*.
5. Receive \$50.00 *now* or receive \$53.00 *in one week*.
6. Receive \$50.00 *now* or receive \$54.50 *in one week*.
7. Receive \$50.00 *now* or receive \$55.00 *in one week*.
8. Receive \$50.00 *now* or receive \$57.50 *in one week*.
9. Receive \$50.00 *now* or receive \$60.00 *in one week*.

⁴ In the case of chocolate we opted for immediate delivery as unlike with the check, subjects can consume the good as soon as it is received.

Instructions to elicit discount rate for chocolate

As part of your compensation for participating in the LEAD game, you get 5 Leonidas Napolitain Belgian chocolates (see picture). Moreover, you can get a higher number of chocolates if you delay their delivery.

For each row below, choose *5 chocolates today* or a higher number *in one week*. If delivered today the *13th of August*, they will be given to you as soon as the LEAD game finishes. If delivered in one week, they will be given to you on Monday the *20th of August* after the feedback class. One of these rows will be randomly selected by the computer and implemented.

1. Receive 5 chocolates *today* or receive 5 *in one week*.
2. Receive 5 chocolates *today* or receive $5\frac{1}{4}$ *in one week*.
3. Receive 5 chocolates *today* or receive $5\frac{1}{2}$ *in one week*.
4. Receive 5 chocolates *today* or receive $5\frac{3}{4}$ *in one week*.
5. Receive 5 chocolates *today* or receive 6 *in one week*.
6. Receive 5 chocolates *today* or receive 7 *in one week*.
7. Receive 5 chocolates *today* or receive 8 *in one week*.
8. Receive 5 chocolates *today* or receive 9 *in one week*.
9. Receive 5 chocolates *today* or receive 10 *in one week*.

Please answer the following questions:

1. How much do you like chocolate? [7-point scale ranging from: 1 = "Not at all" to 7 = "My favorite food"]
2. How hungry are you *right now*? [7-point scale ranging from: 1 = "Not at all" to 7 = "Extremely hungry"]

References

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