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Framing in choice task

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Framing in choice task

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Abstract

The direction of speed-up – delay effect is reversed in elicitation with choice task in MPL format. The model of intertemporal choice with reference point cannot explain this reversal. I claim that this reversal is due to the structure of elicitation task.

Introduction

Delay –speed up effect, is well-established evidence in experimental research in time preference. Loewenstein (1988) proposed intertemporal choice model with reference point to explain the differences between discount rates elicited in delay and speed up frames. Delay-speed up effect is usually elicited with matching task. Subjects are given immediate/postponed payoff (reward or loss) and are asked to state the amount that makes them indifferent between receiving the outcome on a given date or postpone/anticipate the outcome.

Another elicitation procedure is choice task. Choice task asks subjects to choose between two options available at different points of time. The choice on a single choice question provides only information whether individual discount rate is higher or smaller compared to the interest rate associated with the choice options. To get more precise estimate of the individual discount rate a series of choice questions are asked to subjects. In these choice questions the payoff associated with sooner smaller (SS) or later larger (LL) options is fixed and the payoffs of the corresponding LL or SS option is varied. This series of choice questions is called choice task in multiple price list format (MPL). Normally, individuals choose SS option for some corresponding values of LL option and then switch to choosing LL option. The position at which this switch happens gives information about the discount rate. Choice task in MPL

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format gained popularity over recent years as it is a straightforward task for subjects to complete and it is easily enforceable with real incentives.

There are two ways in which choice task in MPL format is constructed in existing literature. One way is to set the LL amount, x, while the amount of SS option is the LL minus some fraction of it, $x - \Delta$. The value of Δ varies from 0 to the amount of LL option. If this elicitation is done over several elicitation periods the monetary values corresponding to option A and option B remain the same for all elicitation periods considered in the elicitation (Tanaka et al 2010, Slonim et al. 2007). I will refer to this elicitation structure as choice task in MPL format with monetary structure ($-MPL).

Another way of presenting choice task in MPL format is to fix the SS amount, x, and let the LL amount be $x + \Delta$, where Δ is the increase over elicitation amount that would happen if this amount is invested for the elicitation period at a given interest rate (Harrison et al, 2002, Anderson et al, 2008). In this case the researcher chooses the list of interest rates that will define the LL options. I will refer to this elicitation structure as choice task in MPL format with interest rate structure (%-MPL).

Elicitation with choice task in $-MPL format is normally performed in speed up scenario, while elicitation with choice task in %-MPL format is done in delay scenario. Present experiment is the first experiment that directly compares elicitation with choice task in %-MPL and $-MPL formats. In particular, I study speed-up - delay effect in discount rates elicited with choice task in MPL format. I show that elicitation with choice task in $-MPL and %-MPL formats in their traditionally used scenario's reverses the sign of the speed up-delay effect, this evidence persists in within-subjects elicitation of speed-up - delay effect.

Experiment 1.

Experimental procedures of the present experiment closely followed experimental procedures adopted in Harrison et al (2002). The experiment was conducted with pen and pencil and provided real payoffs: one person in each treatment was randomly selected to receive the payment corresponding to the choice in a randomly chosen choice question. Subjects selected for the payment received their payment at the end of the experiment and were asked to put this amount in the envelope. They received the envelope on the due date. All subjects were paid participation fee of 8 euro on the date of the experiment. The experiment was conducted with front-end-delay of 2 months and elicitation was performed

over 5 elicitation periods: 1, 3, 6, 9 and 12 months. All subjects participated in a trial session in which experimental procedures were explained on the example with candies.

At each elicitation period the choice was between option A and option B in 20 choice questions. In speed-up frame subjects were choosing between 400 euro later and 400-x euro in 2 months, where x was multiplier of 20 (thus option B corresponded to 380, 360, …, 20, 10). In delay frame subjects were to choose between 400 in 2 months and 400+x euro later, where x corresponded to the increment of 2.5%, 5%, …, 50% on 400 euro calculated over elicitation period.

Experiment compared between and within-subjects design. In between subjects design subjects were faced with only speed-up or delay frame, in within-subjects design subjects were faced with both frames inversing the order of presentation of the frame for half of the subjects. 80 subjects participated in the experiment with 20 persons involved in each treatment. The experiment was conducted at CEEL, University of Trento.

Table 1 reports median individual discount rates observed in the experiment. Discount rates in speed-up scenario, elicited with \$-MPL, decrease with the increase of elicitation interval and present rather hyperbolic pattern. Discount rates elicited in delay scenario, corresponding to elicitation with choice task in %-MPL format, are comparatively stable with respect to the length of elicitation interval.

Discount rates elicited in delay scenario result to be significantly lower compared to discount rates elicited in speed-up scenario in between-subject elicitation (Mann-Whitney test significance levels are above 0.02). Subjects were ready to pay higher premium to anticipate reward available in the future compared to the premium they attached to postponing to the future the reward available sooner. Elicitation with choice task in MPL format reverses the direction of the speed up-delay effect according to which postponing receipt of a reward to the future is more painful compared to anticipating the reward available in the future.

Scenario	1 month	3 months	6 months	9 months	12 months
Between subjects					
Delay (%-MPL)	31	20	29	30	32
Speed up (\$-MPL)	300	122	73	59	61
Mann-Whitney, unidirectional test	z=3.59 p=0.000	z=4.00 p=0.000	z=3.75 p=0.000	z=3.22 p=0.001	z=2.38 p=0.02
Within subjects					
%-MPL first					
Delay (%-MPL)	21	15	26	22	24

Speed up ($-MPL)	445	179	110	89	91
Wilcoxon, unidirectional test	Z=2.46 P=0.013	Z=2.66 P=0.007	Z=3.46 P=0.000	Z=3.62 P=0.000	Z=3.41 P=0.000
	$-MPL first				
Delay (%-MPL)	35	29	28	29	29
Speed up ($-MPL)	234	119	76	61	52
Wilcoxon, unidirectional test	Z=3.07 P=0.002	Z=3.40 P=0.000	Z=3.73 P=0.000	Z=3.02 P=0.003	Z=1.71 P=0.09

Table 1: Experiment I results: Median discount rates and tests.

Speed up-delay effect is normally observed in within-subjects design (Benzion et al 1989). Elicitation of discount rates with choice task in MPL format within subjects does not change the situation. The reverse of the effect persists also in within-subjects elicitation.

Discussion

Loewenstein (1988) incorporates the notion of reference point into a model of intertemporal choice to explain speed-up – delay effect. According to this model individuals adjust their reference point to the receiving payoff on a given date. When receipt of the payoff is postponed or anticipated in the adjustment to the new reference point she will experience loss from losing the original reference point and gain from the newly adjusted reference point. The treatment of this model is based on the Prospect theory (Kahneman and Tversky, 1979). Suppose that individuals value the payoff according to a linear value function $v(.)$ and that both gain and loss portions of this function are linear, but the loss slope b is steeper, than the gain slope a (i.e. $b > a > 0$). If subjects have this kind of preferences they will ask for higher premium when faced with postponing of the receipt of the reward compared to the cost of speeding up they will be willing to pay to anticipate the receipt of a future reward.

According to this model, subjects faced with choice task in %-MPL format and choosing option A will perceive a gain of 400 euro in 2 months, but a loss of option B, $400 + \Delta$ in the future:

$$\delta(t_0)v(400) + \delta(t_n) \cdot v(-400 - \Delta) = \delta(t_0) \cdot a \cdot 400 - \delta(t_n) \cdot b \cdot (400 + \Delta) \quad (1),$$

where Δ_s is the difference between option A and option B on choice question s.

If the subjects consider choosing option B his value function will be:

$$\delta(t_0) * v(-400) + \delta(t_n) * v(400 + \Delta_s) = -\delta(t_0) \cdot b \cdot 400 + \delta(t_n) \cdot a \cdot (400 + \Delta_s). \quad (2)$$

Subjects will choose option A for (1)>(2), or $\Delta_{delay} < \frac{400 \cdot [\delta(t_n) - \delta(t_0)]}{\delta(t_n)}$, where Δ_{delay} is delay premium.

In the case of choice task in $-MPL format if subject chooses option A she values it as a gain of the payoff relative to option A but a loss of the payoff relative to the option B:

$$\delta(t_0) \cdot v(400 - \Delta) + \delta(t_n) \cdot v(-400 - \Delta) = \delta(t_0) \cdot a \cdot (400 - \Delta) - \delta(t_n) \cdot b \cdot (400). \quad (3)$$

While she will attach the following value to the choice of option B:

$$\delta(t_0) \cdot v(-400 - \Delta) + \delta(t_n) \cdot v(400 + \Delta) = -\delta(t_0) \cdot b \cdot (400 - \Delta) + \delta(t_n) \cdot a \cdot 400. \quad (4)$$

Subjects will choose option A if (3)>(4), or $\Delta_{speed\ up} < \frac{400 \cdot [\delta(t_n) - \delta(t_0)]}{\delta(t_0)}$.

From here, the delay premium, Δ_{delay}, is higher than the speed up cost, $\Delta_{speed\ up}$.

In the present experiment subjects present the opposite behavior: they are ready to pay higher cost to anticipate the receipt of a reward compared to the premium they require to postpone it. Elicitation of speed-up – delay effect in the present experiment was done with choice task in MPL format with two different structures. The present model assumes procedural invariance, which implies that strategically equivalent elicitation methods should lead to the same result.

Kahneman (2003) points out that when individuals are sequentially presented with stimulus that changes only on one dimension their attention will be attracted to this dimension and decision process will be based upon this dimension. The striking difference between choice task in $-MPL and %-MPL formats is the relative difference between option A and option B in the two elicitation structures as figure 1 shows. In the case of choice task with $-MPL structure the difference between option A and option B ranges from 20 to 390, these values are the same for all elicitation intervals. In choice task with %-MPL the difference between option A and option B depends on the length of elicitation interval. It goes from 1 to 17 for 1-month elicitation period, reaching the range 10-250 for 1-year elicitation period. Experimental subjects can perceive the difference between option A and option B as the "right" ranges in which the "correct" values for their choice should be included as experimenter demand effect would suggest (Zizzo, 2010).
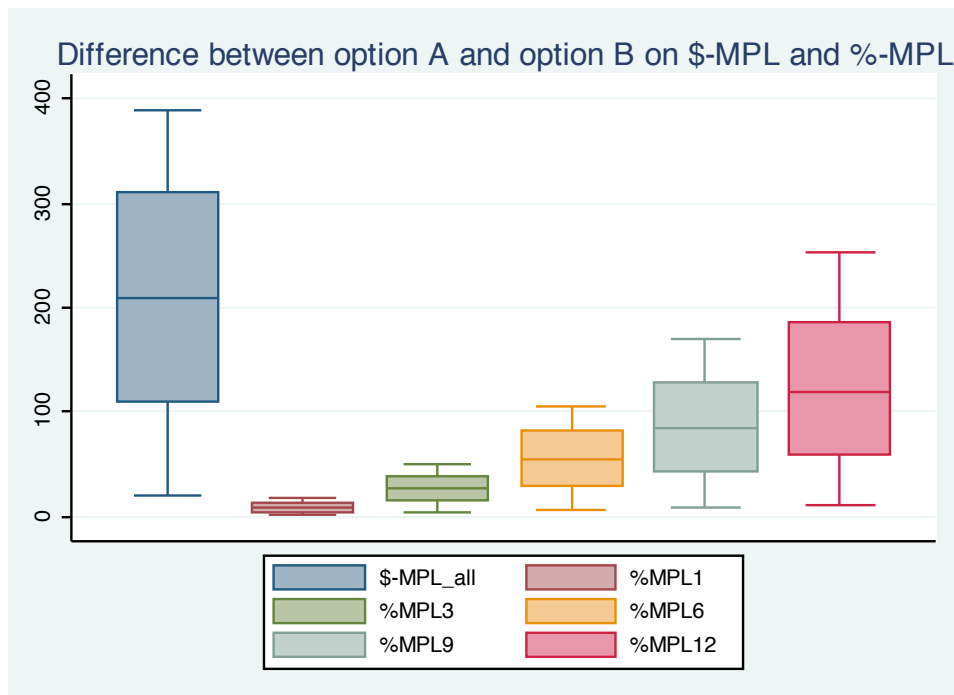
Figure 1. Difference between option A and option B on elicitation tasks.

There is wide evidence in Psychophysics that when subjects are requested to report values on a scale they tend to adjust their answers to the response scale (Poulton, 1989). In particular, individuals rarely choose the extreme values of the scale and tend to concentrate their responses too close to the center of the scale – response contraction bias. Moreover, in sequential reporting of value using the scale the current response is used as an anchor for the next value to report – sequential contraction bias.

According to this research the scale on which preferences are reported may influence subjects in the present experiment. From this point of view subjects do not perceive the values linearly, as the model suggests. They may rather see the payoffs rescaled. If this were the truth subject faced with the task presented in the same scale will present the traditional sign of speed-up – delay effect. I conduct an additional experiment to test this hypothesis.

Experiment 2

Experiment 2 faces subjects with choice task in %-MPL format in speed-up and delay frames[2].

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[2] Due to the restrictions on the budget for the experiment it was not possible to extend this Experiment with choice task in $-MPL format as it introduces possibility of very large payments in delay frame

Scenario	1 month	3 months	6 months	9 months	12 months
%-MPL					
Delay	22	18	19	20	21
Speed up	22	14	14	17	17
Wilcoxon matched-pairs signed-rank test	Z=0.68 P=0.49	Z=1.76 P=0.08	Z=1.54 P=0.12	Z=1.11 P=0.27	Z=1.65 P=0.10

Table 2: Experiment II results: Median discount rates and tests.

Discount rates elicited with choice task in %-MPL result to be higher in delay frame compared to speed-up frame (Table 2), except for discount rates observe in elicitation period of 1 month. These differences are not significant as stated by Wilcoxon test. This test is not significant because the differences are very small if measured in terms of discount rates. However, if measured in absolute value delay premium results significantly higher compared to speed-up premium. These results present the same evidence as the one observed in elicitation with matching task. This evidence provides support to the intuition that the scale of elicitation task influences subjects' decisions.

Conclusions

The results of the present experiment warn the comparison of discount rates elicited in different studies. Elicitation tasks and, in particular, the structures of these tasks are hardly comparable between studies. As present study demonstrates discount rates may by heavily dependent upon the chosen structure of the elicitation task.

The present study is of explorative nature. More investigation needs to be done to understand the difference in elicitation results and behavioral pattern of elicited discount rates.

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