

Sussex Research

Procedures for eliciting time preferences

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Appendices

A Instructions

The translation of the original instructions (in Italian) follows below (we omit the comprehension test for space reasons - it showed three screens, one for each time horizon, as filled by an hypothetical participants. On each screen two simple questions asked about what payment would the hypothetical participant received if drawn or not drawn. Links to screenshots and our experimental software is available [here](#).

A.1 Sheet 1 (common to all treatments)

This experiment studies choice over time. Please read carefully the instructions that follow while an assistant also reads them aloud. You will be given a fixed participation fee at the end of the experiment. Moreover you may be able to receive an additional sum on top of the participation fee. This additional amount will depend on your choices and on a random draw. More precisely, you will have one chance in two to be drawn to receive the additional payment.

At the end of the experiment we will ask you to complete a questionnaire. The information collected will be used solely for research purposes. The information collected will be kept completely anonymously.

Click ‘NEXT’ to continue.

A.2 Sheet 2

A.2.1 MPL

TAKING PART IN THE EXPERIMENT

By participating in this experiment you have one chance in two of being drawn to receive a monetary amount. We will ask you shortly to make some choices between monetary rewards payable at different points in time. All the choices, presented in a table, are between two options: option “A” or option “B”. Each option consists of an amount of money which you could receive, and each row in the table corresponds to a different pair A and B. For each row you will have to choose between a smaller amount payable tomorrow (option A) or a larger amount payable later (option B). Option B is the same in all rows, and corresponds to the receipt of €20, payable with some weeks delay.

Option A instead is different on all rows, and varies between a minimum of €0.50 and a maximum of €20. Careful! You must make a choice in each row. To do so you will have to use the cursor in the middle of the screen: you can scroll it using the mouse to select the option that you prefer in each row. You will see three tables in total, differing from one another only for the delay with which the €20 of option B are payable.

Three random draws will take place at the end of the experiment. The first will draw one of the three screens, the second will draw one of the forty rows from that screen, and the third will draw the participants which will receive the additional payment, corresponding to the choice made in the row drawn. This means that if you are drawn to receive a payment, the amount of money you will receive will be that corresponding to the option (A or B) that you chose in the row drawn. This means that each choice you will make in each of the three tables may be rewarded.

Click 'NEXT' to continue

A.2.2 BDM

TAKING PART IN THE EXPERIMENT

By participating in this experiment you have one chance in two of being drawn to receive €20, which will be payable with a delay of some weeks. However you will have the opportunity to anticipate receipt to tomorrow. In this case you will have to give up part of the total amount. Very shortly you will see a screen where you will be able to declare the minimum amount you are prepared to receive in place of the full €20 to receive your payment tomorrow, entering a value between €0.50 and €20 in €0.50 steps. After your choice a number between €0.50 and €20 in €0.50 increments will be drawn at random. Every value between €0.50 and €20 in €0.50 increments has the same probability of being drawn

How much is the early payment?

If you are drawn for payment:

1) if your declared value smaller or equal to the one drawn, you will be entitled to receive tomorrow an amount of money equal to the number drawn.

2) if your declared value is larger than the one drawn, you will be entitled to the full €20 but with delay.

How much to declare?

If you think about it, you will see that the best option for you is to declare the amount that makes you indifferent between receiving such amount tomorrow or the whole €20 with delay. Consider for instance the two extreme values, namely €0.50 and €20. If you

declare €0.50, you will be sure that, if drawn for payment, you will receive your payment tomorrow, but you could earn as little as €0.50 in case the number drawn is €0.50. If you declare €20 you will be sure that, if drawn for payment, you will receive the whole €20 albeit with delay: the exception is if €20 is drawn, in which you would receive €20 tomorrow. Yet even in this case if the declaration which makes you indifferent is less than €20, by declaring such value you would receive €20 tomorrow anyway.

You will be shown three screens in total, which differ only for the delay with which the full €20 are payable.

Three random draws will take place at the end of the experiment. The first will draw one of the three screens, the second will draw a number between €0.50 and €20 in €0.50 increments, and the third will draw the participants who will receive a payment corresponding to the choices made. This means that if you are drawn to receive a payment, the amount of money you will receive will be based on the choice you made in the screen drawn. This means that each choice you will make in each of the three screens may be rewarded.

Click 'NEXT' to continue

A.2.3 SPA

TAKING PART IN THE EXPERIMENT

By participating in this experiment you have one chance in two of being drawn to receive €20, which will be payable with a delay of some weeks. However you will have the opportunity to anticipate receipt to tomorrow. In this case you will have to give up part of the total amount. Very shortly you will see a screen where you will be able to take part in an auction to anticipate the payment to tomorrow. As the other participants, you will have to declare the minimum amount you are prepared to receive in place of the full €20 to receive your payment tomorrow, entering a value between €0.50 and €20 in €0.50 steps. The participant declaring the lowest value will acquire the right to receive the payment earlier. If two or more participants have inserted the same minimum value, all of these participants will acquire the right to receive the payment earlier.

How much is the early payment?

If you are drawn for payment:

1) if your declared value is the smallest, you will be entitled to receive tomorrow an amount of money equal to the lowest of all the other declarations excluding yours. Thus in case of a draw with one or more participants, such lowest value will be the same as the one you declared.

2) if your declared value is not the smallest, you will be entitled to the full €20 but with delay.

Suppose for instance that there are only two participants, Jane who declares € x and John who declares € y , and suppose that they are both drawn to receive payment. If € x is smaller than € y , Jane gets the right to early payment, and will receive € y tomorrow, while John will receive €20 with delay; if € x is larger than € y , Jane will receive €20 with delay while John gets the right to early payment, and will receive € x tomorrow; if € x and € y are the same, then both Jane and John will receive € x =€ y tomorrow.

How much to declare?

If you think about it, you will see that the best option for you is to declare the amount that makes you indifferent between receiving such amount tomorrow or the whole €20 with delay. Consider for instance the two extreme values, namely €0.50 and €20. If you declare €0.50, you will be sure that, if drawn for payment, you will receive your payment tomorrow, but you could earn as little as €0.50 in case another participant has also declared €0.50. If you declare €20 you will be sure that, if drawn, you will receive the whole €20 albeit with delay: the exception is if everybody else has also declared €20, in which case everybody will have the right to early payment. Yet even in this case if the declaration which makes you indifferent is less than €20, by declaring such value you would be the only participant to get the right for early payment, and would receive €20 tomorrow anyway.

You will be shown three screens in total, which differ only for the delay with which the full €20 are payable.

Two random draws will take place at the end of the experiment. The first will draw one of the three screens, the second will draw the participants who will receive a payment corresponding to the choices made. This means that if you are drawn to receive a payment, the amount of money you will receive will be based on the choice you made in the screen drawn. This means that each choice you will make in each of the three screens may be rewarded.

Click 'NEXT' to continue

A.3 Sheet 4

A.3.1 MPL

INTEREST RATE PHASE

In the next screen you will have the possibility, if drawn, to earn additional money.

In each of the previous screens your choices have determined the last line (counting from the top) in which you have chosen option A over option B. On that row of course the value of option A would have been between €20 (if you chose option A only on the first line, the one at the top) and €0.50 (if you chose option A always, down to the bottom line). In the next screen we will ask you to enter the simple annual interest rate corresponding to the choice you made in the last line where you chose option A, in each of the three tables.

If drawn, your earnings will be determined as follows:

1. if the simple annual interest rate you entered for the table drawn is within $\pm 5\%$ of the simple annual interest rate corresponding to your choice, you will earn €2;
2. if the simple annual interest rate you entered for the table drawn differs more than $\pm 5\%$ but not more than $\pm 10\%$ from the simple annual interest rate corresponding to your choice, you will earn €1;
3. for larger differences, or if you do not enter any value, you will earn nothing.

Click on 'NEXT' to continue

A.3.2 BDM and SPA

INTEREST RATE PHASE

In the next screen you will have the possibility, if drawn, to earn additional money.

We will ask you to enter the three simple annual interest rates corresponding to the choices you made in the three preceding screens.

If drawn, your earnings will be determined as follows:

1. if the simple annual interest rate you entered for the version drawn is within $\pm 5\%$ of the simple annual interest rate corresponding to your choice, you will earn €2;
2. if the simple annual interest rate you entered for the version drawn differs more than $\pm 5\%$ but not more than $\pm 10\%$ from the simple annual interest rate corresponding to your choice, you will earn €1;
3. for larger differences, or if you do not enter any value, you will earn nothing.

Click on 'NEXT' to continue

A.4 Sample graphic interface

A.4.1 Interface to select between time horizons (common to all treatments)

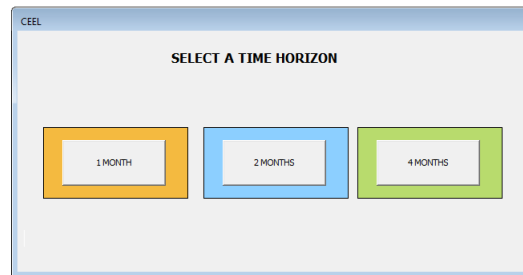


Figure 1: Selecting a version

A.4.2 Sample choice problem - MPL

[illegible]

Figure 2: Sample Screenshot for MPL elicitation method

A.4.3 Sample choice problem - BDM

One month

I prefer to receive € (enter a value between 0.50 and 20)

in order to obtain the payment tomorrow, rather than receive the whole amount (20€) in one month

Reminder: if this version is drawn:

1) number drawn $<$ your declaration
⇒ you will receive €20 in one month

2) number drawn \geq your declaration
⇒ you will receive €(number drawn in cents) tomorrow

Figure 3: Sample screenshot for the BDM elicitation method, two month version

A.4.4 Sample choice problem - SPA

4 Months

I prefer to receive € (enter a value between 0.50 and 20)

in order to obtain the payment tomorrow, rather than receive the whole amount (20€) in four months

Figure 4: Sample screenshot with the elicitation question for the auction method

B Predictions of Discount Rates Implied by Choices

In the last phase of the experiment, we verified (in an incentivized way) subjects' perceptions of the interest rates implied by their choices, as was indicated to subjects in the instructions. The elicitation method seems to have no effect on subject prediction errors. In Table 1, we show the distribution of prediction errors by time horizon.

		Number of subjects
One month	Don't know	34
	Error >10%	125
	$5\% < \text{Error} \leq 10\%$	2
	Error $\leq 5\%$	31
Two months	Don't know	37
	Error >10%	132
	$5\% < \text{Error} \leq 10\%$	3
	Error $\leq 5\%$	20
Four months	Don't know	33
	Error >10%	140
	$5\% < \text{Error} \leq 10\%$	2
	Error $\leq 5\%$	17

Table 1: Frequency of prediction errors, by time horizon

	124	142	214	241	412	421
MPL	31	1	17	4	5	6
BDM	44	4	5	3	1	7
SPA	45	0	10	5	2	2

Table 2: Screen order

		124	142	214	241	412	421
One month	MPL	14.87	20	14.53	13.62	14.8	14.83
	BDM	16.66	16.75	18.6	18.67	15	16.14
	SPA	17.11	n/a	12.45	17.3	17.5	16.5

		124	142	214	241	412	421
Two months	MPL	13.73	20	14.71	14.38	13.3	14.58
	BDM	16.11	17.25	18.3	18.67	8.5	15.64
	SPA	15.52	n/a	13.85	13.9	17.5	16.5

		124	142	214	241	412	421
Four months	MPL	12.68	20	14.79	10	13.9	15.83
	BDM	14.99	16.25	17.8	14	10	13.79
	SPA	13.86	n/a	12.55	11.7	17.5	20

Table 3: Mean response by treatment and order with different time horizons

C Order effects

One novel aspect of our design is that we allow each subject to select her preferred order of the three tasks. The instructions are the same across treatment with the exception of the description of the procedure in question; also, the selection screen was constant across treatments. Table 2 shows the number of subjects by treatment and the order they selected. In all treatments, by far the most common order of horizons was 1 month, 2 month, then 4 month, though this order is slightly less predominant in the MPL treatment compared to the BDM and MPL.

A Fisher’s exact test finds significant association between treatment and order ($p = 0.015$).

One might next ask whether order appears to mediate the differences in monetary discount rates across treatments. To investigate whether this is the case, we display the conditional mean of responses by order and treatment in Table 3.

Ignoring cells in Table 3 with only a single observation, we can see that, conditional on the order, the average response in the MPL treatment always lies below that in the BDM treatment, with the single exception being the comparison in the four month horizon between subjects who responded in order 4,2,1 a comparison involving a total of 13 subjects between the MPL and BDM treatments that appears consistent with sampling variation. Moreover, in the BDM and MPL treatments the conditional means by order appear to be consistent with the hypothesis of no order effects, again given reasonable sampling variation. Thus we conclude that, even if order effects are present, they cannot explain the difference we find between responses in the MPL and BDM on the one and two month horizons.

In the SPA treatment, the 15 subjects who respond to the 2 month horizon first exhibit higher discount rates on all horizons compared to other subjects in the SPA treatment. However, when comparing these subjects to the remaining subjects in the SPA, these differences are only statistically significant in a t-test for the 1 month horizon ($p = 0.04, 0.24, 0.20$ for the 1, 2, and 4 month horizons, respectively). Since we fail to see a consistent direction of effect across treatments, this seems best attributable to sampling variation.

	One month	Two months	Four months
MPL	15	11	15
BDM	21	21	19
SPA	19	13	11

Table 4: Number of €20 bids by treatment and horizon

D The uncertainty effect

Gneezy et al. (2006) find evidence that, in some cases, people will value a risky lottery less than its worst possible outcome. They term this phenomenon the “uncertainty effect”. A related concern to our discussion of incentive-based hypotheses in Section ?? is that if subjects are particularly risk averse as in the uncertainty effect of Gneezy et al. (2006), they may seek to eliminate risk to the extent possible and violate Eventwise Monotonicity doing so. In the MPL always selecting the later option guarantees that, conditional on a given screen being selected to determine a subject’s payment, the subject does not face further risk in the amount of their payment; in the BDM, a bid of €20 does similarly, as in the SPA. If subjects have a particular dislike of uncertainty generated by others’ behavior (as compared to risk with objectively-given probabilities), then we ought to expect such €20 bids to be more likely in the SPA treatment.

We report the number of €20 bids in each treatment and horizon in Table 4. Across all treatments and horizons, 25% of responses are at €20. While, in each horizon, there are more €20 bids in the BDM treatment than in any other treatment, on no horizon are these differences statistically significant at the 5% level using Fisher’s exact test of proportions.

E The HEXACO personality inventory

The conventional ‘Big Five’ personality traits (CANOE: Conscientiousness, Agreeableness, Neuroticism, Openness, Extraversion) have been found to be unsatisfactory when used to assess personality traits in non anglophone populations (see e.g. Lee and Ahston (2008)). For this reason we have instead relied on the HEXACO personality inventory, which concentrates on six personality traits: Honest, Emotionality, eXtraversion, Agreeableness, Conscientiousness and Openness to experience. Each trait has five subtraits. Subjects were asked a total of 60 personality questions, with each group of 10 assessing a different trait. Given that we ‘only’ have 192 subjects overall, we do not have enough data for a proper analysis using these traits as regressors. For this reason, we do not discuss personality measures in the body of the paper.

We report below some summary statistics to show that the subjects in each treatment were fairly homogeneous in terms of personality traits. We present these summary statistics both by treatment in Table 5.

		Mean	Median	Mode	Maximum	Minimum	St. Dev.
Honesty	Auctions	3.48	3.40	3.40	5.00	2.00	.65
	BDM	3.41	3.25	3.20	4.70	1.90	.61
	MPL	3.47	3.50	3.30	4.80	1.50	.70
Emotionality	Auctions	3.01	3.00	2.80	4.70	1.70	.56
	BDM	3.19	3.20	2.90	4.50	1.90	.59
	MPL	3.10	3.20	3.30	4.30	1.80	.59
Extraversion	Auctions	3.50	3.55	3.70	4.40	1.90	.54
	BDM	3.46	3.45	3.30	4.50	2.50	.49
	MPL	3.50	3.55	3.60	4.90	2.30	.52
Agreeableness	Auctions	3.08	3.00	2.80	5.00	1.90	.65
	BDM	2.88	2.90	2.70	3.90	1.40	.57
	MPL	2.98	3.00	3.00	4.30	1.80	.58
Conscientiousness	Auctions	3.55	3.70	3.70	4.90	1.00	.75
	BDM	3.63	3.80	3.80	5.00	1.90	.70
	MPL	3.61	3.60	3.60	4.90	2.10	.61
Openness	Auctions	3.50	3.60	4.00	5.00	2.00	.64
	BDM	3.43	3.55	3.70	4.70	2.10	.66
	MPL	3.59	3.60	4.00	4.80	2.30	.65

Table 5: HEXACO personality traits - summary statistics by treatment

To evaluate whether any of the differences across treatments are statistically significant, we regress the measure of each trait above on treatment dummies. None of our tests for equality of treatment dummy coefficients reject the null hypothesis of equality in that personality trait in each treatment at the 5% significance level.

E.1 HEXACO questions

The HEXACO personality inventory questions in the English version follow below (from Lee and Ashton, 2008).

DIRECTIONS

On the following pages you will find a series of statements about you. Please read each statement and decide how much you agree or disagree with that statement. Then write your response in the space next to the statement using the following scale: 5 = strongly agree 4 = agree 3 = neutral (neither agree nor disagree) 2 = disagree 1 = strongly disagree

Please answer every statement, even if you are not completely sure of your response.

Please provide the following information about yourself.

Sex (circle): Female Male

Age: ----- years

(we also added indication of the discipline to which student participants belonged)

1. I would be quite bored by a visit to an art gallery.
2. I plan ahead and organize things, to avoid scrambling at the last minute.
3. I rarely hold a grudge, even against people who have badly wronged me.
4. I feel reasonably satisfied with myself overall.
5. I would feel afraid if I had to travel in bad weather conditions.
6. I wouldn't use flattery to get a raise or promotion at work, even if I thought it would succeed.
7. I'm interested in learning about the history and politics of other countries.
8. I often push myself very hard when trying to achieve a goal.
9. People sometimes tell me that I am too critical of others.
10. I rarely express my opinions in group meetings.

11. I sometimes can't help worrying about little things.
12. If I knew that I could never get caught, I would be willing to steal a million dollars.
13. I would enjoy creating a work of art, such as a novel, a song, or a painting.
14. When working on something, I don't pay much attention to small details.
15. People sometimes tell me that I'm too stubborn.
16. I prefer jobs that involve active social interaction to those that involve working alone.
17. When I suffer from a painful experience, I need someone to make me feel comfortable.
18. Having a lot of money is not especially important to me.
19. I think that paying attention to radical ideas is a waste of time.
20. I make decisions based on the feeling of the moment rather than on careful thought.
21. People think of me as someone who has a quick temper.
22. On most days, I feel cheerful and optimistic.
23. I feel like crying when I see other people crying.
24. I think that I am entitled to more respect than the average person is.
25. If I had the opportunity, I would like to attend a classical music concert.
26. When working, I sometimes have difficulties due to being disorganized.
27. My attitude toward people who have treated me badly is "forgive and forget".
28. I feel that I am an unpopular person.
29. When it comes to physical danger, I am very fearful.
30. If I want something from someone, I will laugh at that person's worst jokes.
31. I've never really enjoyed looking through an encyclopedia.
32. I do only the minimum amount of work needed to get by.
33. I tend to be lenient in judging other people.

34. In social situations, I'm usually the one who makes the first move.
35. I worry a lot less than most people do.
36. I would never accept a bribe, even if it were very large.
37. People have often told me that I have a good imagination.
38. I always try to be accurate in my work, even at the expense of time.
39. I am usually quite flexible in my opinions when people disagree with me.
40. The first thing that I always do in a new place is to make friends.
41. I can handle difficult situations without needing emotional support from anyone else.
42. I would get a lot of pleasure from owning expensive luxury goods.
43. I like people who have unconventional views.
44. I make a lot of mistakes because I don't think before I act.
45. Most people tend to get angry more quickly than I do.
46. Most people are more upbeat and dynamic than I generally am.
47. I feel strong emotions when someone close to me is going away for a long time.
48. I want people to know that I am an important person of high status.
49. I don't think of myself as the artistic or creative type.
50. People often call me a perfectionist.
51. Even when people make a lot of mistakes, I rarely say anything negative.
52. I sometimes feel that I am a worthless person.
53. Even in an emergency I wouldn't feel like panicking.
54. I wouldn't pretend to like someone just to get that person to do favors for me.
55. I find it boring to discuss philosophy.
56. I prefer to do whatever comes to mind, rather than stick to a plan.

- 57. When people tell me that I'm wrong, my first reaction is to argue with them.
- 58. When I'm in a group of people, I'm often the one who speaks on behalf of the group.
- 59. I remain unemotional even in situations where most people get very sentimental.
- 60. I'd be tempted to use counterfeit money, if I were sure I could get away with it.

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