Written Exam at the Department of Economics summer 2019

Foundations of Behavioral Economics

Final Exam

June 17, 2019

(3-hour open/closed book exam)

Note: The following illustrations are a sketch of how to solve the exam questions, rather than a full-fledged "solution manual". Some derivations of results are omitted for brevity and some responses only exemplify possible solutions to the questions (in both cases, further details can be found in the lecture notes of the respective sections).

Question 1: (weight: 30%)

a) During the course, we discussed the model of inequality aversion by Fehr and Schmidt. Please define and discuss their model of social preferences. Furthermore consider the following ultimatum game and formally derive the equilibrium predictions that this model generates assuming that players are motivated by Fehr and Schmidt inequity aversion.

Ultimatum game: Assume there is a "player 1" (proposer) and a "player 2" (responder). Player 1 has to propose an allocation of 100 DKK to the responder which the responder can either accept or reject. That means, player 1 can propose an amount $0 \leq c \leq 100$ to the responder (which implies she keeps $100 - c$ to herself). In case player 2 rejects the proposal by "player 1" both get nothing. In case "player 2" accepts the allocation, the proposal is implemented.

Lastly, briefly discuss the kind of real world scenarios the ultimatum game tries to capture.

Points to include: The answer should in detail explain what the model of inequality aversion is about. It might help to present it in the formal way so that it is clear what is meant. As a guideline for the answer to the formal part of this question (ultimatum game) see the paper Fehr and Schmidt (1999) pages 825-828

Fehr, E., & Schmidt, K. M. (1999). A theory of fairness, competition, and cooperation. Quarterly Journal of Economics, 817-868.

b) We also discussed the model of belief-dependent sequential reciprocity by Dufwenberg and Kirchsteiger. Please formally define and explain their notion of kindness and perceived kindness. How do they formalize the emotion of 'reciprocity' using these two concepts?

c) Consider the following *two-player sequential prisoner's dilemma* (the upper payoff refers to player 1 and the lower to player 2)
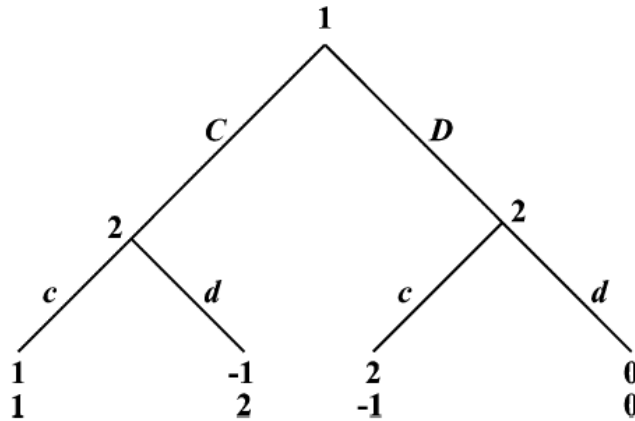

Fig. 2. Game Γ_2—the sequential prisoners' dilemma.

How sensitive to reciprocity does "player 2" have to be in order to play cooperate (c) after observing cooperation (C) by "player 1" in equilibrium. What about player 1? How sensitive to reciprocity does he have to be to play cooperate C in equilibrium given that player 2 is sufficiently motivated by reciprocity. Please derive the answers to these questions formally.

Question 2 (weight = 20%):

Consider a decision maker with initial wealth level W = 50,000 DKK who chooses Lottery B when having to choose between the following two lotteries, A and B:

Lottery A: win 75,000 DKK with prob. p=0.20 win 0 kr., p=0.80	*vs.*	*Lottery B:* + 10,000 DKK with prob. p=1

Assume that the same decision maker now has a wealth level of W' = 125,000 DKK and chooses Lottery D when having to choose between the following lotteries, C and D:

Lottery C: - 65,000 DKK with prob. p=1	*vs.*	*Lottery D:* +/- 0 DKK with prob. p=0.20 - 75,000 DKK with prob. p=0.80

a)   Show formally that this choice pattern is inconsistent with Expected Utility Theory.

Choice B over A implies
u(60000) > 0.2 u(125000) + 0.8 u(50000)

Choice D over C implies
*u(60000) < 0.2 u(125000) + 0.8 u(50000) → a contradiction*

b)   Are the decision maker's choices consistent with one of the "behavioral" models that we
     discussed during the course? Please explain, in particular, the specific elements of the model
     that can account for / "rationalize" the observed choice pattern.

Choices are consistent with prospect theory by Kahneman / Tversky (1979). Core elements of PT
that can account for the observed choice pattern:
- *Cancellation: People disregard components that are shared by different prospects and focus*
  only on those components where they differ
- *People evaluate changes in wealth rather than absolute consumption / wealth levels. Here:*
  evaluate the lotteries in isolation and don't integrate them with their initial wealth.
- *Loss aversion: Losses relative to the reference point are evaluated more negatively than the*
  positive value attached to equally sized gains
- *Diminishing sensitivity: the marginal change in perceived well-being is greater for changes that*
  are close to one's reference level than for changes that are further away.
- *(Probability weighting)*

Question 3 (weight = 25%):

The following graph is taken from the study "Are Risk Aversion and Impatience Related to Cognitive Ability?" by Dohmen, Falk, Huffman and Sunde (*American Economic Review* 2010).
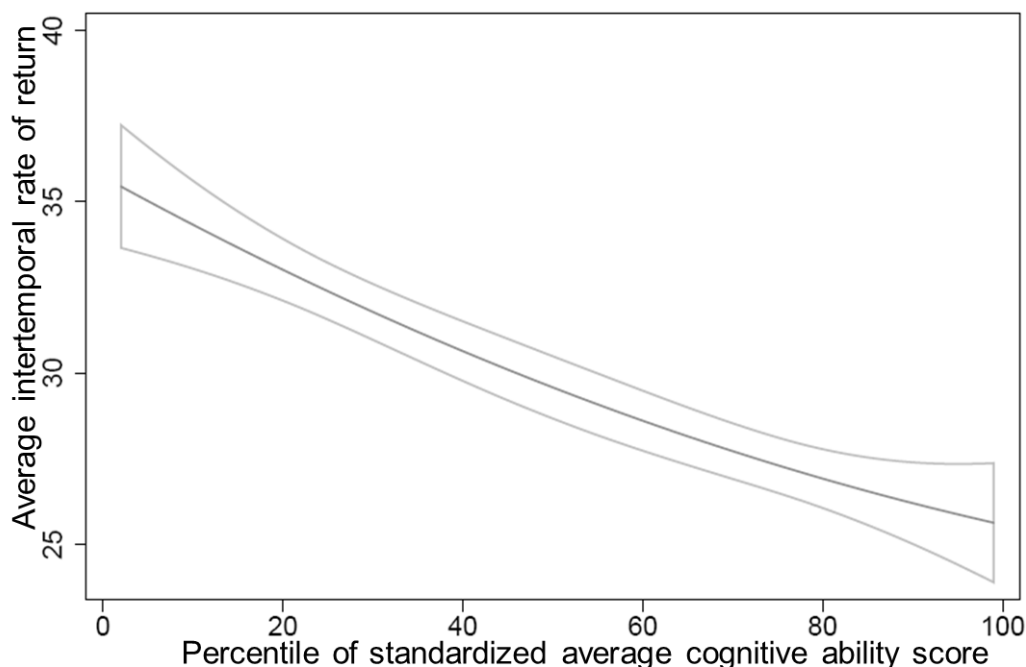
a) How did the authors measure individuals' patience/impatience (the measure underlying the values depicted on the y-axis)?

- *Dohmen et al. use "multiple price-list" procedure based on choice tables where people choose between sooner smaller vs. later larger reward*
- *20 choices between "100 Euro today" vs. "100 + X Euro in 1 year" where X increases across 20 choices*
- *One choice randomly selected and implemented (each subject is selected for payment with prob. 1/7. If selected, subject is paid according to the choice in the randomly selected row)*
- *Row in which subject switches from "today" to deferred payment allows to calculate minimum rate of return at which subject is willing to wait one year → indicates subjects' level of impatience (later switch = greater impatience)*

b) What are the two main concerns regarding the robustness of the depicted finding that we discussed in class? Explain.

The depicted relationship between impatience and cognitive ability could be spurious for two main reasons:
- *Positive association between cognitive ability and income → association depicted in the graph could be driven by income effect / liquidity constraints (people with lower c.a. have stronger liquidity constraints and therefore appear less patient)*
- *People with higher cognitive ability might be more likely to realize that many of the offered "later larger" represent arbitrage opportunities relative to market interest rates → high c.a.*

c) How did Dohmen et al. address these concerns and what did they find?

Addressing the concerns:
- *Income effects / cash constraints: Dohmen et al. elicit household income and additional variable measuring individuals' borrowing possibilities. Control for these variables in some of the patience – cog. ability regressions.*
- *Arbitrage opportunities: Dohmen et al. ask participants whether they "thought about market interest rates" during the experiment. Control for this variable in some of the patience – cog. Ability regressions.*

Findings:
- *All of the mentioned control variables are significantly associated with measured impatience. But even after controlling for these additional variables, the significant negative association btw cognitive ability and impatience remains robust (though the estimated coefficient for cognitive ability gets smaller in some specifications with controls)*

d) Consider again the measurement of (im)patience discussed in part a). Describe how you could adapt the procedure employed by Dohmen et al. to measure whether individuals are present-biased.

Shift the time frame of the multiple-prize list procedure, such that options do/do not involve immediate payoffs (e.g., elicit discount rates for (i) today vs. one year and (ii) one year vs. two years)

e) A newspaper summarizes the study's main results as follows: "The findings by Dohmen et al. show that less intelligent people are more likely to violate rational, standard-economic behavior." Do you agree with this statement? Explain.

Disagree with the statement:
- *Findings by Dohmen et al. are not in conflict with standard EUT: paper does not refer to time-inconsistent present bias, but to general impatience (captured in EUT through exponential discounting). High general impatience is consistent with EUT (as long as one abstracts from the excess returns/arbitrage issues discussed in c/d).*
- *Similarly for Dohmen et al.'s findings on risk attitudes.*

Question 4 (weight = 25%):

Consider the paper "Reference Points and Effort Provision" by Abeler, Falk, Goette, and Huffman (*American Economic Review* 2011).
Recall: the paper studies an experiment in which participants work on a tedious real-effort task (counting 0s in tables depicted on their computer screen).

a) What is the research question of the paper? Please also explain why it is difficult to study this question with field data.

- *Research Question: do belief-dependent reference points affect labor supply / effort provision?*
- *Difficult to study in the field: (i) beliefs typically unobserved and (ii) hard to find credible exogenous variation in beliefs in the field.*

b) Briefly discuss the critical features of Abeler et al.'s experimental design and explain how these features allow the authors to study their research question (i.e., describe their identification strategy).

Key idea of Abeler et al.'s identification strategy: exogenously vary rational earnings expectations across two treatment conditions (HI/LO). Test whether this affects subjects' effort provision in line with predictions of expectation-based reference dependence (a la Koszegi/Rabin).

See lecture notes from "Part 3_02" for description of two main treatments and further critical design features.

c) What do Abeler et al. find in their main experiment, and how do they interpret these findings?

Findings:
- *On average, subjects work more in HI treatment than in LO treatment*
- *Many subjects stop exactly when accumulated piece-rate earnings w*e are equal to the fixed payment f in the corresponding treatment (7 in HI, 3 in LO)*

Interpretation:
- *Both findings are in line with the predictions of expectation based RDP a la Koszegi Rabin (where reference point is 50/50 lottery between w*e and f)*
- *In contrast, findings are in conflict with hypotheses based on EUT and RDP involving status-quo as reference point*

d) Besides their main treatments (denoted as HI and LO), Abeler et al. also conducted a control treatment called NOSAL, to rule out salience as an alternative explanation for the treatment differences observed between the HI and LO treatment. First, describe briefly the alternative explanation. Second, describe the NOSAL treatment and discuss how it addresses the alternative explanation. Third, state the findings of the control treatment.

- *Alternative explanation: subjects stop at we=f because "3 (7) euros" is mentioned frequently in instructions and on the screens of the LO (HI) treatment*
- *NOSAL treatment: participants' payoffs are*
  - *8 euros fix w. 50% probability vs.*
  - *5 euros+acquired piece rate earnings w. 50% probability*
- *NOSAL idea: take away saliency of "€3", but maintain loss-aversion motive to stop at acquired earnings of w*e=3.*
- *Findings: efforts in NOSAL similar to LO treatment. Indicates that salience is not driving the differences between HI and LO*

e) Imagine a variation of the Abeler et al. design with a fixed payment of €0 (instead of €3 and €7 as in the LO and HI treatment, respectively). Consider a comparison of this new ZERO

treatment with the HI and LO treatments of the original experiment. Based on the main finding of Abeler et al., what is your prediction regarding the average behavior of subjects in the ZERO treatment, compared to both the HI and LO treatments?

Rational earnings expectations in ZERO treatment are lower than in LO and HI. Hence,
- *average efforts should be lower than in LO treatment*
- *some subjects should not start working at all if expectation-based loss aversion is very strong (spike at we=0)*