Written Exam at the Department of Economics summer 2020

Foundations of Behavioral Economics

Final Exam

June 11, 2020

(3-hour open book exam)

Note: The following illustrations are a sketch of how to solve the exam questions, rather than a fullfledged "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

Consider a consumer who is characterized by a Koszegi/Rabin utility function with the following properties

- *u(c|r) = m(c) + μ(c|r)*
- with material utility *m(c)=c*
- and two-piece linear gain-loss utility $\mu(\cdot) = \begin{cases} (c_i - r_i) & \text{if} \quad c_i \geq r_i \\ \lambda(c_i - r_i) & \text{if} \quad c_i < r_i \end{cases}$

  where λ > 1

The consumer faces a situation in which he will lose $ 100 with probability 50%. Alternatively, he can buy an insurance policy that fully insures him against the potential loss (choice *"I"*). The cost of the insurance policy is $ 55.

a) How is the consumer's reference point *r* determined according to the Koszegi/Rabin model?
   - Explain the assumptions of what determines the reference point in the Koszegi/Rabin model.
   - Discuss how they differ from other (earlier) approaches to model reference-dependent preferences and loss aversion.
   - Illustrate the difference using the insurance example from above.

   Koszegi / Rabin assume that an individual's reference point is determined by her (recently held) rational expectations*. In the example:*
   - *if the individual expects not to buy the insurance policy, her reference point is determined by the risky gamble of facing the probabilistic loss. That is, her reference point r is the lottery NI={0.5, -100$; 0.5, 0$}.*

- *If the consumer expects to buy the insurance policy, her reference point is r=-55*

Note that, according to KR, the reference point is the "entire lottery", rather than just the expected value of the lottery.

Differences to other models of RDP:
- *Earlier models often use the status quo as reference point (and hence implicitly assume that expectations don't matter for reference points). In the insurance example, a status-quo based model would thus use r=0 rather than r=NI or r=-55 as noted above*
- *Other models do allow for belief-dependent reference points, but differ in how exactly expectations matter for r (e.g., they assume that the reference point depends on expected values rather than "entire lotteries" as in KR).*

b) What is the consumer's expected utility if he buys the insurance (choice "*I*") and also expected to buy it? I.e., what is *EU(I|I)?*

$EU(I|I) = -55 + [-55+55] = -55$

c) Under which conditions is "buying the insurance" (and expecting to buy it) a personal equilibrium?
- *Hint: build on your result from Part b) and check under which conditions EU(I|I)≥ EU(NI|I)*

$EU(NI|I) = -50 + 0.5\lambda\,[-100+55] + 0.5[0+55]$
$= -22.5 - 22.5\lambda$

$EU(I|I) \geq EU(NI|I)$ *if*
$-55 \geq -22.5 - 22.5\lambda$
$\lambda \geq (32.5 / 22.5) \approx 1.44$

No incentive to deviate to NI if $\lambda \geq 1.44$ *(i.e., if the decision maker is sufficiently loss averse.)*

d) Under which conditions is "not buying" the insurance (choice "*NI*") and expecting not to buy a personal equilibrium?

$EU(NI|NI)$
$= -50 + 0.5[0.5(-100+100) + 0.5\,\lambda(-100-0)] + 0.5[0.5(0 + 100) + 0.5(0-0)]$
$= -50 - 25\lambda + 25$
$= -25 - 25\lambda$

$EU(I|NI)$
$= -55 + 0.5(-55+100) + 0.5\,\lambda(-55-0)$
$= -32.5 - 27.5\lambda$

$EU(NI|NI) \geq EU(I|NI)$ *if*

$-25 - 25\lambda \geq -32.5 - 27.5\lambda$
$\lambda \geq -3$
Since this is always fulfilled ($\lambda \geq 1$ *by assumption), "not buying" is always a PE*

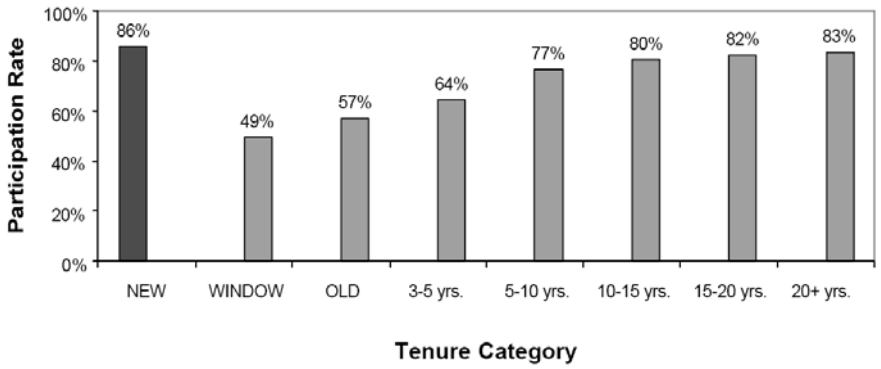
e) What is the preferred personal equilibrium?

Compare $EU(I|I)$ and $EU(NI|NI)$:
$EU(I|I) > EU(NI|NI) = -25-25\lambda$ if
$-55 > -25-25\lambda$
$\lambda > 30/25 = 1.2$

We know from Part c) that the "buying insurance" PE only exists if $\lambda > 1.44$. Hence, buying the insurance is the PPE whenever the "buying insurance" PE exists at all.

Question 2:

a) Consider the following figure taken from Madrian and Shea (2001). What is depicted in the graph? Explain, in particular, the key difference between the "NEW" and "OLD" group.



- *The figure depicts differences in participation rates in 401(k) retirement savings plans (y-axis) at the firm studied in Madrian/Shea for groups of employees with different levels of tenure (x-axis).*
- *Main difference between NEW and OLD cohort: NEW cohort and OLD cohort differ in the default applied to newly hired employees:*
  - *Employees in OLD cohort have to actively enroll in the savings plan ("opt-in" policy).*
  - *Employees in NEW cohort are automatically enrolled in the plan, but can opt out if they do not want to use the 401(k) plan to save for retirement "opt-out" policy.*
- *Additional differences: old cohort can enroll only after 1 year of tenure, new cohort can enroll immediately after being hired*
- *Although the costs of opting in / out of the plan are very low in both regimes (employees simply have to inform payroll office), differences in defaults result in strong differences in plan enrollment rates.*

b) Is the behavior depicted in the figure consistent with exponential discounting? Explain which details of the empirical findings and the decision environment make you confident that exponential discounting cannot account for the findings.

Observed differences in enrollment rates are hard to reconcile with exponential discounting

a. *employees in both the OLD and NEW group are free to opt in / opt out at any time*
b. *transaction costs should be negligible compared to the importance of the decision (differences in life-time wealth can be very high)*

→ exponential discounters in both groups should enroll immediately or never, but one wouldn't except such strong differences in enrollment rates

c) Provide another example in which default specifications have been shown to systematically affect people's decisions. How was the influence of defaults empirically tested in your example?

Various examples:

- *Differences in organ-donor registration rates*
- *Charitable giving on online donation platforms*
- *Subscription to green energy contracts*
- *…*

Empirical strategy: depending on example (e.g., cross-country comparisons, randomized controlled trials, etc.)

d) What could be potential "behavioral" explanations for the default effects in your example from Part c) and in the example depicted in the figure above? Explain.

Depending on example:

- *Present bias (of naive and/or sophisticated types)*
- *limitations in memory and attention*
- *defaults perceived as implicit recommendation*
- *loss aversion relative to the default option*
- *…*

Question 3:

Research in Behavioral Economics has frequently documented systematic differences in individuals' preferences or behavior.

a) Give an example in which systematic heterogeneity in preferences or behavior has been observed. Please also discuss the most relevant factors / individual characteristics that are associated with the described behavioral differences in your example.

Possible examples (see lecture notes for detailed description of examples):

- *time preferences and cognitive ability (Dohmen et al.),*
- *daily labor supply and experience (Camerer et al.),*
- *response to information brochure depending on risk of long-term unemployment (Altmann et al.),*
- *etc.*

b) What are the key challenges in understanding heterogeneity in behavior? Discuss, in particular, which difficulties commonly arise in measuring and interpreting empirical relationships between people's behavior and potential sources of heterogeneity in behavior.

Points to include:

- *One needs individual-level measures of, both, the outcome of interest and possible determinants. Both can be difficult to obtain (e.g., how to measure loss aversion on individual level?, how to get measures of all characteristics that are potentially interesting?, etc.).*
- *Ideally, one needs large, representative sample in which there is enough variation in outcomes and in potential determinants (e.g., studying age effects in student subject pools not very meaningful).*
- *Most of the mentioned associations are only correlations. Potential issues due to omitted variables, reverse causality, etc.*
- *See lecture notes for the different studies for more extensive discussion of the studies' specific challenges.*

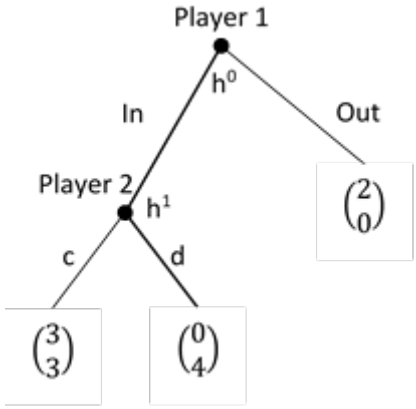
c) Why is it important to document heterogeneity in behavior or preferences? Reply by describing a theoretical or empirical insight that can only be obtained if one acknowledges heterogeneity across individuals or groups.

Possible examples:

- *Heterogeneity in fairness preferences: interesting implications for principal-agent interactions (e.g., use of upfront wages vs. bonuses, sorting into jobs)*
- *Interaction effects with experience (e.g., cab driver and card-dealer studies) can be important for model formation: e.g., how to model reference-point formation and -updating?*
- *Importance for public policy: do targeted policy interventions for specific subgroups make sense (e.g.. at-risk group in job-search study)?*
- *Naiveté vs. sophistication: is there demand for commitment products?*
- *…*

Question 4:

Consider the two-player game below. Both players have two actions. The numbers connected with the terminal histories are monetary payoffs. The upper number in the bracket is the material payoff of player 1, the lower number is the payoff of player 2.



a) *Inequity Aversion:* Assume players are motivated by Fehr & Schmidt (1999) inequity aversion. For which α and β for both players is (In,c) an equilibrium? Explain the intuition for these results in words as well.

Tentative Answer: Use backward induction, i.e., start with player 2.

- *The utility from choosing c is 3 and the utility from choosing d is 4-beta_2[4-2].*
- *That is, player 2 chooses c over d if 3>4-beta_2[4-2]. This is the case if beta_2>1/4.*
- *Given this, Player 1 is better off from choosing In and does not suffer from any disutility from inequality.*
- *That is, Player 1 chooses In independent of alpha_1 and beta_1.*
- *Intuition for this condition should also be given in words!*

b) *Guilt aversion:* Assume now that player 2 is motivated by belief-dependent guilt aversion. Under which condition does player 2 choose c instead of d? Explain the intuition in words as well.

Tentative Answer:

- *Player 2's guilt utility from choosing c in h1 is 3.*
- *Player 2's utility from choosing d in h1 is 4 – gamma_2 [3 p''+(1-p'') 0].*
- *Hence, Player 2 chooses c if gamma_2 >1/[3 p''].*
- *Intuition for this condition should also be given in words! In particular the answer should discuss the relation between player 2's second order belief p'' and their sensitivity to feel guilt gamma_2.*

c) *Reciprocity:* Assume that players 1 and 2 are motivated by Dufwenberg and Kirchsteiger (2004)'s belief-dependent reciprocity.

c.1) Define player 2's belief about the kindness of player 1 towards player 2 in history h^1. Explain the intuition in words as well.

Tentative Answer: Denote player 2's belief about player 1's belief about the likelihood with which player 2 chooses c by p''. Given this lambda_212 is defined as lambda_212=p''3 + (1-p'')4 + ½ [0+ p''3 + (1-p'')4] = 2 - (½) p''. Intuition for this condition should also be given in words!

c.2) For which sensitivities of reciprocity Y_1, Y_2 is (In,c) a sequential reciprocity equilibrium? Explain the intuition in words as well.

Tentative Answer:

- *Player 2's utility from choosing c in h^1 is: $3+Y_2[3- ½ (3+0)][2 -(½) p'']$.*
- *Player 2's utility from choosing d in h^1 is: $4+Y_2[0- ½ (3+0)][2 -(½) p'']$.*
- *Hence, Player 2 chooses c in equilibrium if: $3+Y_2[1.5][1.5]> 4+Y_2[-1.5][1.5]$. This reduces to: $Y_2 > 1/(4.5)$.*
- *If Player 2 is sufficiently motivated by reciprocity, then Player 2 chooses c in equilibrium in order to respond kind to the kindness perceived by Player 1.*

d) Beside Dufwenberg and Kirchsteiger (2004)'s concept of belief-dependent sequential reciprocity we have also talked about another mechanism triggering reciprocal reactions. Explain the key difference between Dufwenberg and Kirchsteiger (2004)'s reciprocal mechanism and the second reciprocal mechanism we have discussed in the course. Furthermore, please explain the experimental set-up Sebald and Walzl (2014) used to identify this additional reciprocal mechanism. How did they identify this mechanism?

Tentative Answer: the answer should discuss the fact that people seem to react reciprocally in reaction to ego-threatening information as such - irrespective of the associated material payoff. The experimental set-up that we discussed involved a principal agent situation with subjective performance evaluations. We used a clicking task to create a situation with subjective information. Two treatments are important for the answer to this question: the flat and the incentive treatment. In the incentive treatment, agent's payoffs are connected to the feedback that they receive whereas their payoffs are unrelated to the feedback in the flat treatment. Agents react in the flat as well as

the incentive treatment to the feedback they receive by costly punishing / giving to the principal. From this it can be inferred that people react to the ego (i.e. subjective performance) information as such and not only the underlying payoffs associated with the treatment.

The above points just outline the main line of the argument. Complete answers should describe / discuss the details around the experiment and the results.