Written Exam Economics summer 2016

Foundations of Behavioural Economics

August 22, 2016

(3-hour closed book exam)

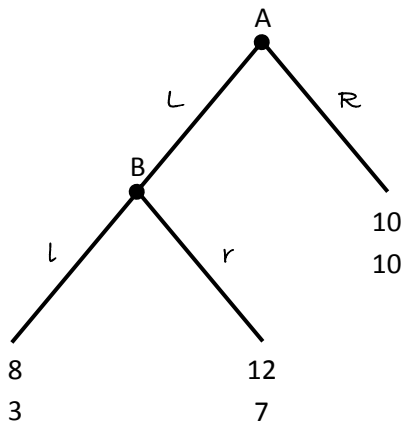
Sketch for solution

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:

During the course we talked about different types of social preferences. One of the theories we talked about was the theory of sequential reciprocity by Dufwenberg and Kirchsteiger (2004).

a) Consider the following strategic situation:



Assume that player B and A are motivated by belief-dependent reciprocity (Dufwenberg and Kirchsteiger 2004). For which values of the sensitivity to reciprocity Y_A and Y_B is (R, l) a sequential reciprocity equilibrium? Give an intuition for your result! What would be the standard sequential equilibrium prediction without reciprocity and any other social preference in this context?

Points to include:

- Let's start with player B and denote the conditional second-order belief of player B p''.
- Player B's perception about the kindness of player A in the history following L is:

$$\lambda_{BAB}(L) = p''3 + (1-p'')7 - \frac{1}{2}[10 + p''3 + (1-p'')7]$$

- Important observation: this is negative independent of p''.
- In equilibrium the second order belief must be correct, i.e. p''=1
- Player B's kindness towards player A on the other hand is:

$$\kappa_{BA}(l|L) = 8 - \frac{1}{2}[12+8] = -2$$

$$\kappa_{BA}(r|L) = 12 - \frac{1}{2}[12+8] = 2$$

- Given these elements it is clear that player B chooses l over r in equilibrium if:

$$U_B(l|L) \geq U_B(r|L)$$

$$3 + \mathrm{Y}_B(-2)(-3.5) \geq 7 + \mathrm{Y}_B(2)(-3.5)$$

$$\mathrm{Y}_B \geq 4/14$$

- In words: if the above condition holds than player B chooses l following L can be part of an equilibrium

  What about player A? In equilibrium, i.e. p''=1, it has to hold that

$$\kappa_{AB}(L|l) = 3 - \frac{1}{2}[10+3] = -3.5$$

$$\kappa_{AB}(R|l) = 10 - \frac{1}{2}[10+3] = 3.5$$

- On the other hand player A's perception of player B's strategy is:

$$\lambda_{ABA}(l) = 8 - \frac{1}{2}[12+8] = -2$$

- Given these elements player A chooses R over L if

$$U_A(R|l) \geq U_A(L|l)$$

$$10 + \mathrm{Y}_A(3.5)(-2) \geq 8 + \mathrm{Y}_A(-3.5)(-2)$$

$$2/14 \geq \mathrm{Y}_A$$

- In words: If player A is not affected too much and player B is affected sufficiently by reciprocity then the joint strategy profile (R,l) is an equilibrium

b) Please describe an example of a real-world situation that mimics the strategic setting described above. Also describe how the equilibrium prediction that you have established in a) translates to this real-world example.

Points to include:

- The game is essentially a mini ultimatum game in which player A can propose a split 10,10 which cannot be rejected and a split 12,7 which can be rejected by player B at a cost.
- Essentially any real world example which fits this strategic situation can be described here.

c) Dufwenberg and Kirchsteiger (2004) assume that the players' perceptions about the other players' kindness is determined by some 'equitable payoff'. Please define what the equitable payoff is and what

role it plays in their model. Furthermore, discuss the realism of this particular definition of the equitable payoff.

Points to include:

- Dufwenberg and Kirchsteiger (2004) (DK) propose an equitable payoff which determines whether a strategy is (perceived) as kind or not
- This equitable payoff describes in a way what a player feels entitled to or feels others are entitled to
- In DK the equitable payoff is determined by the average between the maximum / minimum that e.g. a player can give to somebody else by choosing any of the possible efficient strategies
- As also acknowledged by DK this definition is adhoc and mostly serves theoretical simplicity
- In many real-world situations this feeling of entitlement might however be influenced by psychological biases like the self-serving bias
- This could mean for example that self-serving players place a higher weight on the maximum payoff. I.e. they demand more than the average.

Question 2:

A movie lover who does not own any money has received a cinema voucher as a birthday present. He can use the voucher to go to the cinema on one of the next three Saturdays. In the upcoming three weeks, the movie program consists of...

- an average movie (utility $u_1 = 60$) on the first Saturday (t = 1)
- good movie ($u_2 = 125$) on the second Saturday (t = 2)
- and an excellent movie ($u_3 = 250$) on the third Saturday (t = T = 3)

The agent maximizes an intertemporal utility function of the following form

$$U_t = u_t + \beta \sum_{\tau=1}^{T-t} \delta^\tau u_{t+\tau}$$

e.g, in period t=1:

$$U_1 = u_1 + \beta(\delta u_2 + \delta^2 u_3)$$

a) When does the agent go to the cinema if his discounting parameters are β = 1, δ=0.8?

Let $\hat{t}$ denote the date at which the agent plans to go to the movies.
Since

$$U_1(\hat{t} = 3) = 0 + 0 + \delta^2 250 > U_1(\hat{t} = 2) = 0 + \delta 125 + 0 > U_1(\hat{t} = 1) = 60 + 0 + 0,$$

the agent plans to go to the cinema in t= 3.

As the agent is time consistent (β=1), he also follows through on this plan in period 2:

$$U_2(\hat{t}=3)=\delta \;\; 250 > \; U_2(\hat{t}=2)=125$$

b) When does the agent plan to go to the cinema if he is present-biased and naive?
   - Assume that his discounting parameters are β=0.5 , δ=0.8, and the agent's period-t "self" beliefs that all future selves will not be present-biased (i.e., $\hat{\beta}=1$).
   - Does the agent actually stick to his consumption plan from period t = 1? Explain.

With β=0.5 , δ=0.8 and naïve beliefs, his initial plan is to go to the cinema in t=3:

$$U_1(\hat{t}=3)=\beta\delta^2 250 > \; U_1(\hat{t}=1)=60 > U_1(\hat{t}=2)=\beta\delta 125$$

In t= 2,

$$U_2(\hat{t}=3)=\beta\delta \;\; 250 < U_2(\hat{t}=2)=125,$$

so he breaks his original plan an goes to the cinema in t=2. This is because from t=1's perspective, both t=2 and t=3 lie in the future and are therefore discounted with the additional factor β. In t=2, however, going to the cinema immediately gets an additional weight due to the agent's present bias, whereas β affects only consumption in t=3. In t=1, he is thus overly optimistic regarding his future willingness to wait another period.

c) When does the agent actually go to the movies if he is present biased but fully sophisticated?
   - Assume that the agent's discounting parameters are again β=0.5 , δ=0.8, but that in contrast to part b) the agent is fully aware of his future self-control problems (i.e., $\hat{\beta}=0.5$).
   - How does the agent's consumption plan in period t = 1 differ from the one of the naive agent from part b)? What it the intuition behind this result?

The sophisticated agent foresees that $U_2(\hat{t}=3)=\beta\delta \;\; 250 < U_2(\hat{t}=2)=125$ and that, in t=2, he thus prefers going to the cinema to waiting another period.

In t=1, he is thus realistically pessimistic about his future self-control problem (in contrast to the agent from part b). He therefore only compares the alternative $\hat{t}=2$ vs. $\hat{t}=1$. Since

$$U_1(\hat{t}=1)=60 > \; U_1(\hat{t}=2)=\beta\delta 125,$$

he goes to the cinema immediately in t=1.

d) Now assume that the cinema introduces a new deposit service for the voucher: on the first Saturday, the cinema offers to keep the voucher until week t=3 (i.e., the voucher is stored by the cinema and can

only be picked up on the third Saturday). The fee for the deposit service is DKK 12 (to be paid in t = 1). Does any of the agents from parts a), b) or c) make use of this service? Substantiate your answers.

- Assume for part d) that the agent has received the required DKK 12 as an additional birthday gift (i.e., he can now in principle afford the deposit service). The additional DKK 12 are, however, not enough to go to the movies a second time. Alternatively, the agent can use the 12 DKK for buying popcorn when watching the selected movie (which gives him additional utility of $u_t(12) = 12$).

Agent from part a) does not buy the service: buying the service would yield (lifetime) utility $U_1(\hat{t} = 3) = \beta\delta^2 250$*, not buying yields* $U_1(\hat{t} = 3) = \beta\delta^2(250 + 12)$ *which is higher.*

Agent from part b) also does not buy the service: in t=1, he beliefs that he will be willing to wait until t=3, yielding expected utility $U_1(\hat{t} = 3) = \beta\delta^2(250 + 12)$ *without the service and* $U_1(\hat{t} = 3) = \beta\delta^2(250)$ *with the service → he thus thinks that the service would be a waste of money (although we know from part b) above that he would benefit from buying it).*

Agent from part c) does buy the service: with the service, he can guarantee himself $U_1(\hat{t} = 3) = \beta\delta^2(250) = 80$*. This is higher than the alternative of going to the cinema and eating popcorn immediately in t=1,* $U_1(\hat{t} = 1) = 60 + 12$*.*

Question 3:

a) The table on the next page is taken from the paper by Chetty, Looney, and Kroft (AER 2009). The table depicts average sales of different product categories in two time periods for various grocery stores. What was the treatment intervention by Chetty et al. (i.e., what is the difference between "treated" and "control categories" and between "treatment" and "control stores")?

Intervention: make sales tax more salient by posting price tags with tax-inclusive prices for subset of products in a subset of the grocery stores under consideration during treatment period (08-10 / 2006)

b) Summarize the findings depicted in the table.
   - ↖ What is the most important result of the experiment?
   - ↖ Interpret the coefficients DD_{TS}, DD_{CS} and DDD. Give an example of a situation in which DD_{TS} would be biased / would not uncover the causal treatment effect of interest.
   - ↖ How do Chetty et al. interpret their findings?

Sales of treated products go down, relative to sales of control goods (DD_{TS}) and relative to the comparable change in sales of the same product groups in other stores (DDD), in which no change in (relative) demand for treatment and control products is observed during the intervention period (DD_{CS}). Example where DD_{TS} would be biased: demand shock for treatment / control products coinciding with intervention period (e.g., due to seasonal fluctuations in demand).

According to Chetty et al, findings suggest importance of limited attention (regarding less salient taxes).

c) What is the alternative empirical approach used by Chetty et al. to demonstrate the effect? What are advantages and potential problems of the two different empirical approaches?
   - ↖ You can substantiate your arguments by discussing the identification assumptions of the two approaches.

   Alternative approach: exploit state-level changes in more / less salient taxes for alcohol over time (sales tax not included, alcohol tax included in price tag).

   Advantages and potential problems of both approaches: see discussion in part b) and in paper (e.g. Hawthorne effects, modified common trends assumption for DDD, absence of correlated, state-specific shocks in alcohol data).

d) Could the underlying mechanism be used by market actors to "exploit" customers? What are potential policy implications of Chetty et al.'s result? Explain.

   Exploitation possible, for example, through "shrouded attributes" and hidden costs (e.g., extended warranties, follow-up costs for maintenance, shipping-and-handling costs on amazon, ebay,…).

   Possible policy implications: requirement to post "all-inclusive" prices (e.g., airline fares), regulation of information disclosure (e.g., for financial products), etc.

Question 4:

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

a) Describe (at least) two cases where such heterogeneity in preferences or behavior has been observed. Please also discuss the most relevant factors / individual characteristics that are associated with the described differences in the respective variables of interest in your examples.

   Possible examples (see lecture notes for detailed description of examples):
   - ↖ *loss aversion and age, education, income (Gächter et al.),*
   - ↖ *time preferences and cognitive ability (Dohmen et al.),*
   - ↖ *daily labor supply and experience (Camerer et al.),*
   - ↖ *response to info treatment depending on risk of long-term unemployment (Altmann et al.),*
   - ↖ *etc.*

b) What are the key challenges in explaining heterogeneity in behavior, in terms of measuring, estimating, and interpreting empirical relationships between outcome variables and explanatory factors?

   - *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 on 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 and / or empirical example of an economic insight that can (only) be obtained if one acknowledges individual-level heterogeneity.

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?*
- *…*