Written Exam for the M.Sc. in Economics summer school 2018

Behavioral and Experimental Economics

SOLUTIONS for Final Exam

August 28, 2018

(2-hour closed book exam)

Please note that answers must be provided in English.

All 5 questions have to be answered for obtaining the top grade.

The exam has 4 pages in total (including cover page)

Question 1: Framing and nudging

a) Provide a definition of a "framing effect".

A: A framing effect prevails if different representations of the objectively same situation elicit systematically different behavioral responses. Framing effects arise because of perception, e.g. one aspect of the situation is more salient when presented one way than the other. Framing violates the basic assumption of "description invariance"

b) Behavioral economists sometimes refer to a "System 1" and "System 2" in decision making (with reference to, e.g., Kahneman's book "Thinking, fast and slow"). Explain what is meant by these systems. How may such thinking be related to money illusion?

A: System 1: Intuitive mind (fast, automatic, effortless): Can often lead to wise decisions, but sometimes leads systematically to irrational, poor decisions. Cognitive biases in decision making arise because we use simple heuristics that are often useful but sometimes lead us astray. System 2: Reflective mind (slow, conscious, effortful): Can lead to more thoughtful, rational decisions. Using system 2 is tedious and people like to avoid the effort. Money illusion is a tendency think in nominal terms about economic transactions, i.e., to adopt the natural framing of economic transactions, which might lead to biased choices. However, use of system 2 thinking (in the guise of deflationing) can prevent such biases.

c) Explain what is meant by a "nudge" (Thaler and Sunstein 2008).

A: "Nudges" are "soft" measures (i.e. are liberty-preserving, in contrast to regulation or economic incentive) that are supposed to guide behavior, especially to improve the welfare of decision maker. Nudges often operate through the deliberate design of the "choice architecture", i.e. how choices are presented to decision makers. Nudges can shape our choices while we use System 1.

d) Thaler and Benartzi's (JPE 2004) "Save more tomorrow" (SMarT) scheme has increased savings in defined-contributions plans. Explain which behavioral aspects make it successful.

A: In SMarT, employees commit to save part of future wage increase (uses loss aversion: you still get a raise, but it is lower than it could have been whereas workers see it as a loss if they have to contribute of current income). The scheme works best (i.e., has most acceptance) when this is made the default option. That is, employers offer SMarT as a default which is implemented if employees take no particular action but employees can "opt out" of the scheme if they like. (Using defaults is a standard example of nudging)

Question 2: Oligopoly

Consider an oligopoly with n firms with a structure similar to the one used in the experiment of Gächter, Thöni, Tyran (JEE 2006): firms simultaneously choose q_i with cost $c = 80q_i$ and $P = 200 - Q$, where Q is total production in the market.

a) What is the prediction of standard economics for $n = 2$? Calculate prices, quantities and profits in equilibrium for the duopoly case.

   A: $p_1(q_1, q_2) = [200 - (q_1 + q_2)]q_1 - 80q_1 = 200\ q_1 - q_1{}^2 - q_1\ q_2 - 80q_1$

   $\pi' = 200 - 2\ q_1 - q_2 - 80 = 0$. Solve for q_1 → $q_1(q_2) = 60 - 0.5\ q_2$

   $q_1{}^*(q_2{}^*) = 60 - 0.5\ (60 - 0.5\ q_1{}^*) = 30 + 0.25\ q_1{}^*$

   $P^* = 120$, $q_1{}^* = q_2{}^* = 40$, $\pi_1{}^* = \pi_2{}^* = 1600$

b) How are prices, quantities and profits predicted to change when $n = 4$? That is, provide a *qualitative* comparison of these values for duopoly and quadropoly in equilibrium (i.e., no need to calculate the exact values for $n = 4$).

   A: With $n = 4$, P^* is lower, $q_i{}^*$ lower (total output higher), $\pi_i{}^*$ lower than with $n = 2$.

c) Huck, Normann and Oechssler (JEBO 2004) investigate the ability of firms to engage in tacit collusion. What do they find with respect to the success of tacit collusion in oligopoly markets with 2 vs. 4 firms?

   A: There is some collusion with 2 firms and markets are therefore less competitive than predicted (quantities are lower and profits higher than predicted in equilibrium) but markets are more competitive than predicted with four firms (quantities are above, and profits below the prediction). Hence the title of the paper: 2 are few, 4 are many.

Question 3: Biases in probability estimates

a) Consider the following scenario: For a woman at age 45 who participates in routine mammography screening, the probability of breast cancer is 0.01. The test accuracy is 90%. That is, if a woman has breast cancer, the probability is 0.9 that she will have a positive mammogram (and conversely, the probability that the test will show she has no cancer if she in fact has no cancer is also 90%). If a woman does not have breast cancer, the probability is 0.1 that she will still have a positive mammogram. Now imagine a randomly drawn woman from this age group with a positive mammogram. What is the probability that she actually has breast cancer? (*Hint*: use Bayes' rule)

   A: prob (cancer | test positive) = (0.9 * 0.01) / (0.9 * 0.01 + 0.1 * 0.99) = about 8% (0.0833, to be exact)

b) What probability would a person prone to the Base-rate fallacy estimate for the woman in the example above? (explain why).

   A: The "base rate" in the example above is 0.01. It shows how often breast cancer occurs in the sample. The base-rate fallacy claims that people tend to ignore the base rate. Typically, they would think it is 90% (i.e., the reliability of the test).

c) "Probability weighting" is one of the assumptions of prospect theory (Kahneman and Tversky, ECMA 1979). Describe the assumption (*Hint*: draw a diagram).

   A: "Probability weighting" assumes that people do not proportionally perceive differences in probabilities («weight») but think in terms of «does not happen», «may happen», «will

happen» (people tend to overreact to small probability events but under-react to medium and large probabilities. Overweighting when weighting function is above 45 degree line).
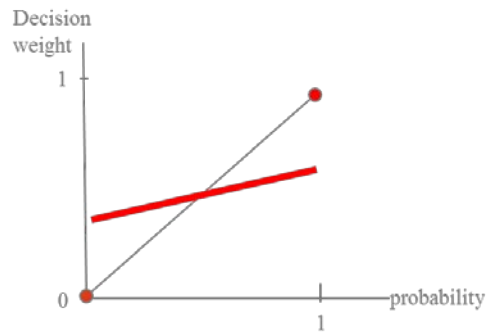
d) Explain what "Myopic loss aversion" implies for the tendency to accept single vs. multiple bets (*Hint*: refer to Gneezy and Potters QJE 1997).

A: People with Myopic Loss Aversion (MLA) shy away from (on average profitable) bets because these can result in losses (e.g., 2/3 probability to lose 1$ and a probability of 1/3 to win $2.50). However, when the same such lottery is offered to be played several times in a row, the probability of a loss falls (e.g., when played 3 times in a row, from 0.67 to $(0.67)^3 = 0.3$). Hence, MLA implies that people invest more (and on average earn more) with infrequent feedback and longer investment horizon than with frequent feedback and shorter horizon. Gneezy and Potters (1997) find evidence supporting this claim.

e) Fellner and Sutter (EJ 2012) replicate the finding of Gneezy and Potters (QJE 1997) concerning myopic loss aversion. To test the robustness of this finding, Fellner and Sutter run a treatment inspired by the story of Ulysses and the Sirens. Describe the treatment and the findings.

A: The idea was that subjects may fall prey to MLA when exogenously exposed to it but subjects may be smart enough to avoid the situation that harms them altogether (i.e., subjects would anticipate that they would otherwise make silly choices), if given the opportunity. If given a choice between getting feedback every 3 periods rather than every period, they would choose the infrequent feedback. Choosing infrequent feedback is a commitment device to prevent oneself from making silly choices, just as Ulysses asked his crew to tie him to the mast such that he will not risk his life by jumping over board when hearing the song of the sirens. However, the manipulation did not work: the subjects mostly (80%) choose the frequent feedback.

Question 4: Social preferences

a) Sometimes, beginning students ask: "Can it be rational to have prosocial preferences?" Comment on this question with reference to the definition of rationality, and by distinguishing prosocial acts and preferences.

A: (Camerer and Fehr Science 2006: 47): "The rationality assumption consists of two components: first, individuals are assumed to form, on average, correct beliefs about events in their environment and about other people's behavior; second, given their beliefs, individuals choose those actions that best satisfy their preferences." Thus, a person is rational if a person has beliefs and chooses actions as described above, independent of whether the person is self-interested, prosocial or antisocial.
A rational person with prosocial preferences may therefore very well act in a prosocial way. Yet, rational people who do not have prosocial preferences may act in prosocial ways when the incentives are set accordingly (e.g. reputational incentives).
However, the quote by the student above points to a confusion. It suggests that people can choose their preferences. This is not a standard assumption is economics or even behavioral economics (even though it might be the case to some extent). Standard economics takes preferences as given.

b) Franzen and Pointner (ExEc 2012) use the "misdirected letter technique" to study the "generalizability" of findings in the dictator game. What do they find?

A: They find a significant correlation between dictator giving in the lab and the tendency to return a misdirected letter containing money (in the latter case, they did not know that they were participating in an experiment).

c) The figure below is taken from (Cappelen et al. Ecs Letters 2013). Explain the design, including treatments Give and Take. How do the authors interpret the main result with respect to "generosity"?
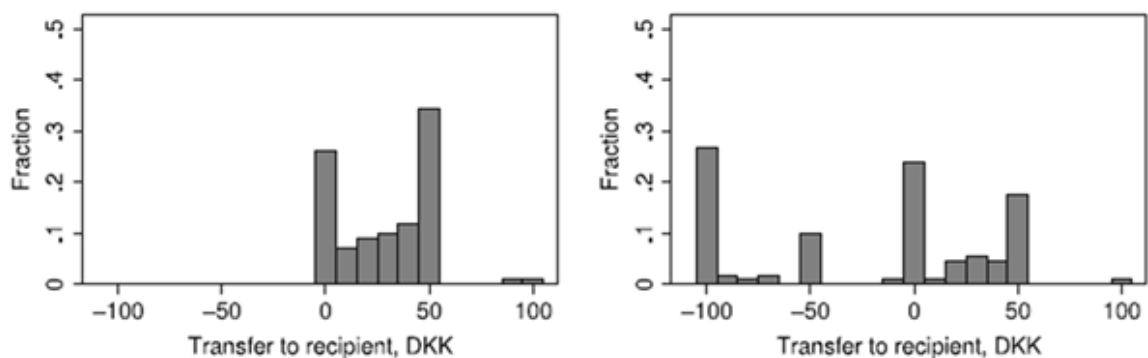
A: The player in the role of dictator (A) is tentatively allocated 200 kr., the other player (B) 100 kr. In GIVE (left panel): Player A can send from 0 to 100 to other player. In TAKE: as in Give but A can also take from 0 to 100 from B. Result: the share of positive giving falls about by half (from 74% in GIVE to 34% TAKE), and the median transfer falls to 0 (from 30% in GIVE). Almost 30% take everything from other, but there is still some giving (34%). Interpretation: «manners» are to some extent determined by contextual cues.

d) Prasnikar and Roth (QJE 1992) study the multi-proposer Ultimatum game. Describe the game and its equilibria, and the main finding.

A: Design: 9 proposers simultaneously submit offers from 0$ to 10$ to a single responder. The responder may exclusively accept the best offer s_h. If he rejects, all 10

players get a payoff of 0. If he accepts, the responder gets s_h, the one proposer who submitted the best (accepted) offer gets 10 - s_h. All others get 0.

Equilibrium: $9.95 and $10 are equilibrium offers which are accepted by the responder.

Results: Highly unequal outcomes prevail immediately and near-perfect equilibration prevails after a few periods, as predicted by standard game theory (proposers engage in intense competition and the entire rent goes to the responder).

Question 5: Public goods and voting

a) The standard linear public goods game (PGG) is a workhorse to study cooperation. Describe the standard PGG and explain the "free rider incentive".

A: Subjects are in groups of n players. Each player has an endowment and can allocate points to a "Private account" or "Public account". All points allocated to the public account are multiplied by a factor (marginal per capita return) of $0 < a < 1$ with $an > 1$. Hence, contributing is efficient but not individually rational for a self-interested player which means that there is a free-rider incentive.

b) Tyran and Feld (SJE, 2006) study the effect of voting on formal sanctions on cooperation. In their treatment MildEnd, groups vote on whether or not to implement mild sanctions.

b1. What is the prediction for MildEnd if all players are fully rational and self-interested?

A: In MildEnd, before subjects make decisions in the PG game, a majority vote is held on a sanction meted out to everyone who contributes less than fully to the public account. But the sanction is too weak (4 points) to deter free riding by rational and self-interested players. The standard prediction therefore is that nobody contributes. Hence, the mild sanction will be rejected.

b2. How do observed contributions in MildEnd compare to MildEx (when mild sanctions are imposed)? How do the authors explain these observations?

A: The sanction is often (60% of the cases) accepted in MildEnd, and contributions to the public account are about twice as high with the sanction in MildEnd than in MildEx. The authors interpret this effect as a "dividend of democracy" because efficiency is higher when a given (mild) sanction is accepted in a vote than when it is imposed to voters.

c) Mechtenberg and Tyran (WP 2016) study costly voting in a common interest situation. How is voting in this situation related to the provision of public goods?

A: Casting a vote is privately costly but has a benefit (positive externality) on everyone else because casting a vote increases the quality of democratic choice (i.e. the probability to pick the best policy choice) which is a public good.