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Solution sketch for Final exam for MA course "Behavioral and Experimental Economics"

Retake exam (2 hours, closed book)

Question 1: Experimental methods

a) Explain the following expressions

"replication": repeating a treatment under identical conditions

"ceteris paribus variation": repeating a treatment while varying only one aspect of the treatment, allows to isolate causal factors

"session": Sequence of periods / decision situations with the same subjects on the same day

"treatment": Specific combination of economic agents, environment, institution

b) Explain the sufficient conditions to "induce" experimental subjects' preferences (Smith, AER, 1982).

(A: Medium of payment: money m = (m_0 + Δm), where: m_0 : 'outside money', Δm : Money earned during the experiment. An experimental subject has unobservable preferences: $V(m_0 + \Delta m, z)$, where z : represents all other motives.
Three crucial assumptions (sufficient for inducement):
Monotonicity: V_m exists and is positive for each combination of (m, z) ; Salience: the payment Δm depends on the actions of the subject. (Show up-fee is not salient); Dominance: The changes in utilities of a subject during the experiment depend importantly on Δm. The influence of z can be neglected. Interpretations of z: 'transactional effort', boredom, experimenter demand effects etc.)

c) Can experiments which fail to induce preferences nevertheless be interesting? Illustrate by referring to one experimental study discussed during the course.

(A: Control in the sense of inducing preferences is important for some experiments (e.g. for those wanting to test the capacity of DA vs. PO markets to equilibrate) but may be less important for other experiments. Sometimes, we would like to measure social preferences rather than to induce preferences. Example: In the dictator game, we measure altruistic preference (when the experiment is run in double blind format), in the ultimatum game (or the cooperation game with punishment stage) we measure to some extent the willingness to punish unfair behavior etc.)

Question 2: Voting and Provision of Public Goods

a) Describe the design by Tyran and Feld (SJE, 2006)

Hint:

	No law	**Mild law**	**Severe law**
Exogenous	NoEx	MildEx	SevereEx
Endogenous	NoEnd	MildEnd	SevereEnd

(A: A linear public goods game with E = 20, n = 3 and a = 0.5 is studied in 6 treatments. A sanction or "fine" is to be paid by those who do not contribute efficiently, i.e. E = 20 points, to the public good. The fine has three levels: 0, 4, 14 points. The fine is either imposed by the experimenter or subjects can vote on the sanction (in this case, it is a two-stage game with voting in the first stage and contributions in the second stage. Subjects have to indicate their expectations, this is a one-shot game).

b) What is the prediction for SevereEnd if all players are fully rational and egoistic?

(A: Sanction is accepted in first stage, full contribution in the second stage)

c) What is the prediction for MildEnd if all players are fully rational and egoistic?

(A: Sanction is rejected in first stage, zero contribution in the second stage)

d) What do the authors observe in treatment MildEnd? How do contributions compare to MildEx?

(A: 60% of voters accept the mild sanction of 4, and contributions in MildEnd are significantly higher than without sanction and higher than MildEx)

Question 3: Anchoring

Table 1 below shows the results from "experiment 1" reported in Ariely et al. (QJE 2003).

TABLE I

AVERAGE STATED WILLINGNESS-TO-PAY SORTED BY QUINTILE OF THE SAMPLE'S SOCIAL SECURITY NUMBER DISTRIBUTION

Quintile of SS# distribution	Cordless trackball	Cordless keyboard	Average wine	Rare wine	Design book	Belgian chocolates
1	\$ 8.64	\$16.09	\$ 8.64	\$11.73	\$12.82	\$ 9.55
2	\$11.82	\$26.82	\$14.45	\$22.45	\$16.18	\$10.64
3	\$13.45	\$29.27	\$12.55	\$18.09	\$15.82	\$12.45
4	\$21.18	\$34.55	\$15.45	\$24.55	\$19.27	\$13.27
5	\$26.18	\$55.64	\$27.91	\$37.55	\$30.00	\$20.64
Correlations	.415	.516	0.328	.328	0.319	.419
	p = .0015	p < .0001	p = .014	p = .0153	p = .0172	p = .0013

The last row indicates the correlations between Social Security numbers and WTP (and their significance levels).

a) Describe "experiment 1" and explain the hypothesis that motivated this experiment.

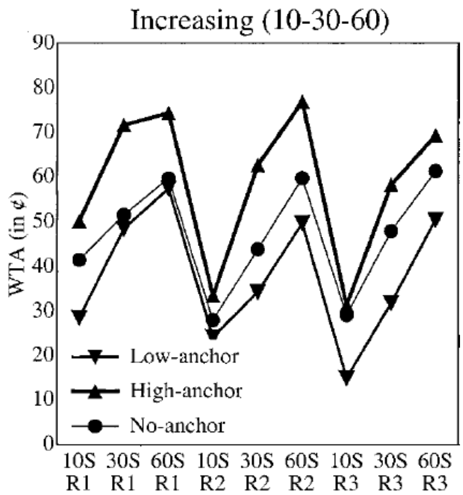
(A: "Anchoring" refers to a tendency to make judgments from some starting point and then adjust from there. In experiment 1, Students (*n* = 55, Sloan School, MBAs) are shown 6 products (with description). Questions: A) "would you buy the product for a dollar figure equal to the last 2 digits of your social security number?" Yes/No; B) "What is your max WTP?". A Becker-DeGroot-Marschak (BDM) mechanism determines whether the student got the product (had to pay). (In this mechanism, a random number is drawn from some interval. If the number is lower than the bid, the trader gets the product and pays the price he bid. If it is higher, he does not get the product and does not pay. It is a weakly dominant strategy to bid your true value in the BDM)

b) What is the main conclusion from the table above?

(A: Random anchors can systematically affect WTP: Those with high social security numbers tend to state higher willingness to pay for all goods)

c) The figure below shows the results of "experiment 2" reported in Ariely et al. (QJE 2003). Describe this experiment.

(A: Subjects (*n* = 132, MIT) first listened to some aversive sound ("high-pitched scream" of 3000 Hz) over headphones for 30''. Subjects were asked whether they would listen to this scream for another 30'' for \$0.10 (low anchor), \$0.50 (high anchor), No anchor (Yes/No). Subjects had to indicate willingness to accept (WTA). [BDM: If the random number (from \$0.05 to \$1.00) was higher than WTA, they hear the noise and get paid the random draw. They are told that it is the best strategy to state true, minimal WTA]. They have to indicate WTA for noise durations of 10'', 30'', 60''. 3 repetitions
6 treatments in total: High vs. low anchor vs. no, increasing (10'', 30, 60'') vs. decreasing sequence (60, 30, 10). Across-subjects design (i.e. about 20 obs. each), 3 repetitions each



Question 4: Money Illusion

a) Explain the basic design of Fehr and Tyran (Games and Economic Behavior, 2006). (Hint: see table below for treatments)

(A: Participants simultaneously choose prices from 1 to 30. Payoffs depend on the relative price (average price of others). The game has multiple pareto-rankable equilibria. The idea is to create a tension between real payoff-dominance (which has been used a selection criterion in game theory) and nominal payoff-dominance (which has not). Equilibrium A > C in real terms, but C > A in nominal terms. Payoffs are represented in a payoff table. There are 4 treatments (2 by 2-design): Participants are shown a real payoff table or a nominal payoff table (in this case they know that they have to "deflate", i.e. divide the nominal payoffs in the table by the price level). Participants either play in groups of 5 or 6 or against computers (in this case they know that the computers always play a best reply against them).

b) The table below shows percentages of subjects choosing equilibrium A or C respectively in the last period of Fehr and Tyran (Games and Economic Behavior, 2006).

	NH	RH	NC	RC
Equilibrium A	0.00	0.98	0.82	0.83
Equilibrium C	0.84	0.00	0.18	0.09

Comment on and interpret the results in the table along the following dimensions:

1) NH vs. RH: shows that money illusion has a massive effect on equilibrium selection. Essentially all groups coordinate on equilibrium A when payoffs are shown in real terms but on C when shown in nominal terms.

2) NC vs. RC: shows that the individual-level (direct) effect of money illusion is small. In particular, participants learn to overcome the direct effect of money illusion (learn to see through the veil of money) when the game is transformed into an individual optimization task

3) NH vs. NC: shows strategic interaction determines whether the nominal representation coordinates behavior on the inferior equilibrium

Question 5: Voting and redistribution

Consider agents with the following utility functions (Fehr and Schmidt, QJE 1999):

$$u_i(\mathrm{x}) = x_i - \frac{1}{n-1}\left[\alpha_i \sum_{j \neq i} \max(x_j - x_i, 0) + \beta_i \sum_{j \neq i} \max(x_i - x_j, 0)\right]$$

where x = (x_1, ... , x_n), $1 \geq \beta_i \geq 0$, $i = 1, 2, ..., n$.

Tyran and Sausgruber (EER, 2004) adapt the model by Fehr and Schmidt (1999) to analyze voting on redistribution. They derive the following:

$$y(R_{rp}) = \lambda n_r + \frac{1+\mu}{2} n_m + n_p.$$

a) Name three simplifying assumptions Tyran and Sausgruber (EER, 2004) use to deduce the formula above.
(A: The authors assume three income classes, and that all members within an income class have the same income: rich (with income x_r), middle (x_m), poor (x_p). They consider

non-revolutionary redistribution, i.e. the ordering of income classes remains the same after redistribution, and redistribution only takes place across income classes but not within income classes, Proposal R_{rp}: Each rich voter pays t_r and each poor voter receives b_p. The relative „size" (number of people) of income classes is captured by the weigth w;Voters are assumed to be rational utility maximizers, opportunity costs of voting is zero, voters cast their votes as if they were pivotal (voting is compulsory; an indifferent voter casts votes randomly)

b) Explain the meaning of α_i and β_i in Fehr and Schmidt (QJE, 1999). How does λ relate to α_i and β_i? How does μ relate to α_i and β_i?
(Hint: You may write down the formula or provide intuitions for these relations)
(A: α_i and β_i are parameters capturing inequality aversion. Inequality-aversion is self-centered in the sense that individual *i* compares each other individual with himself, but comparisons among others are irrelevant for *i*. Unfavorable inequality aversion is captured by α_i, and favorable by β_i.
λ is the share of rich voters voting against material self-interest, i.e. they vote for redistribution. The reason is that some voters in this income class have a β_i that is "high enough" to make it optimal for those to for redistribution. Their β_i is high enough if it exceeds a threshold value $\overline{\beta}$ which in turn is determined by the parameters of the redistribution proposal: In general, λ falls with $\overline{\beta}$)

$$\beta_i > \frac{t_r}{w_{rm}t_r + w_{rp}(t_r + b_p)} \equiv \overline{\beta}(R_{rp}).$$

μ is the share of middle-class voters voting for the proposal. As redistribution is from rich to poor, the middle class is in principle indifferent (if all voters were strictly self-interested, 1/2 n_m would vote for the proposal.) Minimal inequality aversion induces these voters to vote for redistribution. In particular, any voter with $\alpha_i > 0$ or $\beta_i > 0$ will vote for redistribution.)

c) How do Tyran and Sausgruber (EER, 2004) test the theory experimentally? (A: Subjects are in groups of 5 voters. Decision is by majority vote. There are 2 rich (A), 2 middle-class voters (B), and 1 poor voter. Redistribution is from rich to poor. Participants are endowed with money: A: 250, B: 185, C: 60. The proposal is to tax each of the two rich with 50 to give 100 to the poor. In addition, the two voters in role B must pay 5 points.

d) What are the predictions (Null and alternative hypothesis) in the design by Tyran and Sausgruber (EER, 2004)?
(Hint: explain how the alternative hypothesis is "calibrated")
(A: H Null: No redistribution. The poor (1/5) approve, all others are against it as they lose in money terms. The alternative hypothesis is derived by taking the empirical distributions of α_i and β_i in the population that have been found in other (non-voting) games (for example, in the ultimatum game) and published in Fehr and Schmidt (1999). The predictions are that 40% of the rich, 70% of the middle, and 100% of the poor should approve. Given the weights of income classes in the population, 64% of the voters should approve.)

e) What are the main results?
(A: The main finding is that the model by Fehr and Schmidt predicts much better than the standard theory. The respective percentages are 34, 69, 96, or a total of 61%.)

f) Suggest one experimental treatment variation in which you expect to observe less fair-minded behavior.
(A: Subjects were endowed with the money. If they first have to earn the money in a real effort task, they are likely to be less generous.)

Question 6: Guessing game

Consider the standard guessing game with factor $p < 1$. Suppose a share s of the $n > 2$ players is irrational. These players choose a no matter what and a share $1\text{-}s$ is rational (i.e. have rational expectations) and choose a best reply r to what everybody else does.

a) Derive the Nash equilibrium in this game as a function of p, s and a
b) Derive the equilibrium average number M^* and decompose the total effect into a direct and the indirect effect of a change in s.
c) Derive the value of μ (the multiplier) in the expression $\partial M^*/\partial s = \mu\,(a - r)$
d) How does μ depend on the degree of strategic complementarity and the share of irrationals?
e) Calculate (i) the total effect, (ii) the direct effect and (iii) the indirect effect for the values $p = 0.8$, $a = 50$ is s changes from $s_1 = 0.1$, to $s_1 = 0.2$.