

### Problem 1 (10%)

During an epidemic, the authorities wish to present information about a diagnostic test in a way that helps as many people as possible understand its implications.

It is estimated that **20% of the population is infected**, but who is infected is unknown, so people must be tested.

If a person *is infected*, the test will correctly show a positive result in **75%** of cases, but in **25%** it will incorrectly show negative.

If a person *is not infected*, the test will correctly show a negative result in **75%** of cases, but in **25%** it will incorrectly show positive.

In this situation, a positive test means there is a **3/7 probability** that the person is actually infected.

However, people tend to commit a fallacy and ignore an important part of the information when judging the information above.

- a) (Counts 5%) What information tends to be ignored? What is the fallacy called? How does ignoring this information typically affect peoples intuitive estimate of the probability of being infected given a positive test?
- b) (Counts 5%) The information above can be presented as *natural frequencies* as described in Hoffrage et al (2002). Explain what we mean by presenting the information as natural frequencies and discuss to what extent this may help more people understand the implications of the test.

### Problem 2 (20%)

In a well-known experiment in Kahneman et al. (1991), some participants are given a small object—such as a mug, a chocolate bar, or a Kinder Egg—while others receive nothing. Those who did not receive the object are asked to state their *willingness to pay (WTP)* for it, while those who received it are asked for their *willingness to accept (WTA)*, i.e. the required compensation to give it up.

- a) (Counts 8%) In the context of this experiment, explain the *endowment effect* and describe how it manifests in the observed values of WTP and WTA.

A central question in Plott and Zeiler (2005) was to what extent elicitation of WTP and WTA is *incentive compatible*.

- b) (Counts 6%) What do we mean when we say that an elicitation procedure is incentive compatible?

A study (Isoni et al. 2011, cited in Ericson and Fuster 2014) have shown that the presence or absence of a *show-up fee* – a payment participants receive for showing up to the experiment – significantly affects the observed difference between WTP and WTA.

- c) (Counts 6%) How can we explain why the show-up fee has such a strong effect?

## References (from curriculum)

Hoffrage, U., Gigerenzer, G., Krauss, S., & Martignon, L. (2002). Representation facilitates reasoning: what natural frequencies are and what they are not. *Cognition*, 84(3), 343–352.

Vallée-Tourangeau, G., Abadie, M., & Vallée-Tourangeau, F. (2015). Interactivity Fosters Bayesian Reasoning Without Instruction. *Journal of Experimental Psychology: General*, 144(3), 581–603.

Kahneman, D., Knetsch, J. L., & Thaler, R. H. (1991). Anomalies: The Endowment Effect, Loss Aversion, and Status Quo Bias. *Journal of Economic Perspectives*, 5(1), 193–206.

Plott, C., & Zeiler, K. (2005). The willingness to pay–willingness to accept gap, the «endowment effect,» subject misconceptions, and experimental procedures for eliciting valuations. *American Economic Review*, 95(3), 530–545.

Marzilli Ericson, K. M., & Fuster, A. (2014). *The Endowment Effect*. 6(1), 555–579.

Isoni A, Loomes G, Sugden R. 2011. The willingness to pay–willingness to accept gap, the “endowment effect,” subject misconceptions, and experimental procedures for eliciting valuations. *Comment Am. Econ. Rev.* 101:991–1011

**Problem 3 – time preferences (30%)**

- a) (Counts 5%) Paul Samuelson's Discounted Utility (DU) model with a constant exponential discount rate is a standard discounting model. Briefly explain what the  $\beta$ - $\delta$  model captures that exponential discounting does not. Feel free to explain through examples of typical behaviour that is inconsistent with the DU model, but consistent with the  $\beta$ - $\delta$  model.

The table below shows the evaluated outcomes of completing a costly task once by an individual with  $\beta$ ,  $\delta$  preferences. The task must be completed in one of the periods 1-4.  $t$  is the time period the outcome is evaluated at.  $\tau$  is the time period the task is considered completed.

	$\tau=1$	$\tau=2$	$\tau=3$	$\tau=4$
$t=0$	-2	-3	-4.5	-8
$t=1$	-4	-3	-4.5	-8
$t=2$		-6	-4.5	-8
$t=3$			-9	-8
$t=4$				-16

- b) (Counts 2.5%) Assume  $\delta = 1$ . Based on the outcomes in the table, what is  $\beta$ ? Briefly explain how you found the answer.
- c) (Counts 7.5%) Given the evaluated outcomes in the table above, when will a person with **naïve** behaviour complete the task and when will a person with **sophisticated** behaviour complete the task? Explain your reasoning.
- d) (Counts 5%) At  $t=0$ , how much would the sophisticated be willing to pay for a commitment device making it certain that the task will be done at a certain period? When would (s)he then complete the task? Explain your reasoning.
- e) (Counts 10%) Consider that the task is pleasurable instead of costly, meaning that the signs in front of the outcomes in the table above are positive rather than negative. Does this change when the sophisticated and the naïve will complete the task? Explain your reasoning.

**Problem 4** (counts 40%)

Consider a two-person, one-shot, fully anonymous ultimatum game with stakes of 100 EUR. This particular game has one feature usually not present in ultimatum games: before the Proposer (P) makes her decision, the Responder (R) is given the option to send the Proposer a short, anonymous message.

The Responder sends the following message to the Proposer:

“I will reject any offer of 30 EUR or less.”

- a) (Counts 5%) If you know that the Responder is self-interested, can you then know for sure whether the Responder’s threat is credible or not? Why/why not?

Assume now instead that the Responder has preferences according to the Fehr-Schmidt model. That is, you know that the Responder’s utility  $U_R$  is given by

$$(1) \quad U_R = x_R - \alpha_R \max\{x_P - x_R, 0\} - \beta_R \max\{x_R - x_P, 0\}$$

where  $x_i$  is  $i$ ’s monetary payoff, and  $\beta_R \leq \alpha_R$  and  $0 \leq \beta_R < 1$ .

However, you do not know the actual values of  $\alpha_R$  and  $\beta_R$ , only that  $\alpha_R > 0$  and  $\beta_R > 0$ .

- b) (Counts 7.5%) Can you now know for sure whether the Responder’s threat is credible or not? Why/why not? (A verbal explanation is sufficient.)
- c) (Counts 5 %.) Would it matter for your answer in b) if you knew the value of  $\beta_R$ ? Why/why not?

Assume now that instead of the message cited above, the Responder sends the following message:

“I will reject any offer of 75 EUR or less.”

You can still assume that the Responder has preferences according to the Fehr-Schmidt model, as explained above.

- d) (Counts 7.5%) Can you now know for sure whether the Responder’s threat is credible or not? Why/why not? (A verbal explanation is sufficient.)

Finally, assume now that in fact,  $\alpha_R = 0.5$ , while  $\beta_R = 0.2$ .

- e) (Counts 10%.) Was the Responder’s first message (“I will reject any offer of 30 EUR or less”) in fact credible? Why/why not? Please explain.
- f) (Counts 5 %.) Explain briefly what is meant by *reciprocal preferences*. If the Responder’s preferences were, in fact, reciprocal, could his first message (“I will reject any offer of 30 EUR or less”) then possibly be a credible one? Why/why not? (An informal explanation is sufficient.)