Psychology and Economics

14.13 Mid-term Review

Frank Schilbach & Will Rafey

MIT

Midterm: Overview

- Remember: the class is pass/fail. Try your best but do NOT stress about or lose sleep over this exam.
- You will do fine and pass as long as you answer all questions and get at least some of the questions almost right.
- Exam will be posted on on Monday (April 6) at 8:00 am EST.
  - You administer the exam online yourself.
  - You pick your own two-hour window to complete the exam.

What resources are you allowed to use while taking the exam?

- You can use slides and notes from lectures, recitations, psets, etc.
- You CANNOT consult or receive help from others while taking the exam (online, in person, or any other way).
- You CANNOT find try to answers to your the questions online other than the Learning Modules website (e.g. ask you CANNOT ask question on Piazza or try to google questions or answers).
- You CANNOT watch lecture videos during the exam.
- Support animals are fine!
- Honor code: we trust you to stick to those rules.

Midterm: Three types of questions

(I) True/false/uncertain

- State true, false, or uncertain
- Always explain answer carefully
- Need to provide intuition.
- Using math might be helpful but you always need to provide a verbal explanation.

(II) Multiple choice

- Pick correct answers, no further explanation needed

(III) Pset-style questions

- Similar to problem set questions
- Some algebra involved
- Always explain your answers carefully.

Midterm: How to best prepare?

- What materials are you responsible for?
  - Lectures up to and including lecture 12 (March 11) [up to slide 67 of lectures 11 to 13]
  - Recitations 1 to 5 [recitations 6 and 7 are just reviews that might be helpful for some of you]
  - Psets 1 to 3
  - Readings (starred or non-starred) cited in class are only relevant to the extent that they appear in lectures and/or recitation.

- How to get ready?
  - Study lecture and recitation slides carefully
  - Psets and solutions: make sure you understand and are able to solve psets on your own.
  - Great resource to practice: previous psets and exams
  - Readings (starred or non-starred) may help you deepen your understanding of the material but we won't ask about details of those readings that beyond what was covered in class.

Time preferences: Exponential discounting model

- What is the exponential discounting model?
- What is δ? What does it measure? How can we estimate it?
- What are the main assumptions of this model?
- What evidence do we have against those assumptions?

Time preferences: Quasi-hyperbolic discounting model

- What is the quasi-hyperbolic discounting model? How is it different from the exponential discounting model?
- What empirical evidence can the quasi-hyperbolic model explain better than the exponential discounting model? Why?
- Sophistication and (partial) naivete
  - What does β measure? What does $\hat{\beta}$ measure?
  - Full sophistication, full naivete, partial naivete
  - Does sophistication make people always better off? Why (not)?
- Demand for commitment
  - What is demand for commitment? Who demands commitment, who doesn't?
  - What kinds of people do (not) demand commitment?
  - Can people be worse off from being offered a commitment device? Why (not)?

Time preferences: Empirical applications and solving problems

- Empirical applications
  - Be familiar with the empirical applications from lectures 5 and 6
  - Understand why the quasi-hyperbolic model can explain (some of) the empirical evidence better than the exponential discounting model.

- You need to be able to solve problems:
  - for exponential discounters
  - for quasi-hyperbolic discounters
  - for fully naive, fully sophisticated, and partially naive agents

- How does one solve such problems?
  - Solving problems forward and backward (depending on the case)
  - See slide 62 of lectures 3 & 4, and slide 37 of lectures 5 & 6
  - Plenty of pset and mid-term examples to practice with

Time preferences: Example of True/False/Uncertain Question 1

Statement: *Consider individuals with "β, δ" preferences, who only differ by their present bias, $\beta \in [0, 1]$. Suppose there is a commitment savings device available. Willingness to pay for this commitment device strictly decreases in β.*

False. Why?

- Individuals may be naive
- Commitment device may not be effective
- Even if individuals are fully sophisticated and the device is effective, willingness to pay may not be strictly decreasing.
  - Individuals would be willing to pay 0 for $\beta = 0$ and for $\beta = 1$, but willing to pay a positive amount for $\beta \in (0, 1)$.

Time preferences: Example of True/False/Uncertain Question 2

Statement: *Fully sophisticated individuals can experience large welfare losses from their present bias.*

True. Why?

- Awareness of present bias (i.e. sophistication) does *not* remove present bias
- Sophisticates that lack commitment devices may still make suboptimal decisions

Time preferences: Example of True/False/Uncertain Question 3

Statement: *Present-biased individuals always have positive demand for commitment devices.*

False. Why?

- Three conditions must be met for positive demand for commitment
  i. Individuals must be present-biased.
  ii. Individuals must be aware of their present-bias (i.e. they can't be fully naive).
  iii. Individuals must perceive the commitment device as effective in helping overcome the self-control problem.
- When only the first is met, we cannot be sure there will be positive demand for commitment.

Risk preferences: expected utility

- What is the expected utility model?
  - What is risk aversion? Why are people risk averse?
  - How is risk aversion modeled in the expected utility model?
  - What is the expected monetary value?

- How can we measure risk aversion within the expected utility model?
  - Certainty equivalents
  - Choices from gambles
  - Insurance choices

- What is problematic about the estimates of risk aversion in the expected utility model?
  - Substantial small-scale risk aversion (high γ)
  - Relatively low large-scale risk aversion (low γ)
  - Expected utility model only has one parameter, can thus not explain both of those features.
  - See Rabin (2000), Rabin & Thaler (2001), and recitation 4

Kahneman and Tversky (1979): Prospect Theory

- What evidence in Kahneman and Tversky (1979) is inconsistent with expected utility?
  - Risk aversion in the gain domain, risk loving in the loss domain
- What are the most important points in Kahneman and Tversky's Prospect Theory (slide 3 of 51 of lecture 9):
  (1) Changes rather than levels
  (2) Loss aversion
  (3) Diminishing sensitivity
- What does the proposed alternative utility (value) function look like? How does it incorporate the three above features?
- How is the reference point determined? What are some candidate reference points? See discussion in recitation 5.

Risk preferences: reference-dependent preferences

- What empirical evidence of loss aversion do we have?
  - Small-scale gambles
  - Endowment effect
  - Applications (lecture 9)

- Applications
  - Labor supply, housing market, stocks, marathon running, golf
  - Be familiar with the empirical applications from lecture 9
  - Understand why reference-dependent preferences can explain (some of) the empirical evidence better than the expected utility model
  - NOT relevant: ~~Deal or No Deal; Pierce et al. (2020)~~ (we did not cover this)

- Solving problems with reference-dependent preferences
  - See pset 3
  - Additional pset and exam questions to practice with

Reference-dependent preferences: Example of Multiple Choice Question 1

Question: *Maddie is writing a problem set for 14.13. She gets utility $u(q)$ from the number of questions she writes. She has reference-dependent preferences around her goal of writing 10 questions (her reference point). Normalize $u(10) = 0$. Which of the following would be consistent with loss aversion?*

(a) $u(8) = -2, u(12) = 1$
(b) $u(8) = -2, u(12) = 2$
(c) $u(8) = -1, u(12) = 2$

Answer: (a). Why?

- Loss aversion means losses hurt more than gains help
- With preferences in (a), Maddie would have a utility cost of 2 from falling short of her goal by 2 questions, but only gain 1 util from exceeding her goal by 2 questions.

Reference-dependent preferences: Example of Multiple Choice Question 2

Question: *Maddie is walking home and passes a bakery. Unexpectedly, she decides to buy a pastry. Prior to purchasing the pastry, her maximum willingness to pay for the pastry was p_0. She then runs into Allan who asks to buy the pastry from her. She offers him the lowest price she is willing to accept, p_1. Which of the following comparisons between p_0 and p_1 is consistent with an endowment effect?*

(a) $p_0 > p_1$
(b) $p_0 = p_1$
(c) $p_0 < p_1$

Answer: (c). Why?

- Consistent with an endowment effect, $p_0 < p_1$ implies Maddie values the pastry more after she has bought it than prior to buying it.

Social preferences

- What are social preferences?
- How can we measure social preferences?
  - Dictator Game
  - Ultimatum Game
  - Trust Game
- What evidence do we typically find in dictator and ultimatum games?
- Are people genuinely nice to others (because of pure altruism)? Why not?
  - Costly exit in dictator games
  - Hiding behind the computer
  - Moral wiggle room
- We will NOT ask you about models that estimate social preferences (this will be in pset 4).

Social preferences: Example of True/False/Uncertain Question

Statement: *if a person gives 0 in a dictator game, this is evidence that this person is selfish.*

Uncertain. Why?

- The person might give 0 to the other person in the dictator game and then donate the money to someone in greater need.
- The person might be very poor (relative to the other person in the game), so her marginal utility is very high.

Time preferences: Example of Long Question: Laptop Policies

- Assume 14.13 students are present biased with $\beta < 1$ and $\delta = 1$. All students have the same $\beta < 1$ and $\delta = 1$ but differ in the value they derive from using laptops in class, L.
- L is constant for each student from class to class but uniformly distributed across students on the interval [0,1].
- Each lecture generates no immediate utility, but does give a future benefit V. Using a laptop reduces the long-run benefit by D. Both V and D are the same for all students.
- In summary, a student that uses a laptop in class gets immediate utility L and future (undiscounted) utility $V - D$. A student that does not use a laptop gets immediate utility 0 and future (undiscounted) utility V.

- The social planner is not present biased and seeks to maximize the utility of 14.13 students.

Long Question: Part 1

Show that students are just indifferent between using and not using their laptop in the current class if $L = \beta D$. Explain why students with lower values of L (i.e. $L < \beta D$) don't use laptops in class, while students with higher values of L (i.e. $L > \beta D$) do use laptops in class.

Long Question: Solution, Part 1

- Utilities from the two choices are:

$$\begin{aligned} U(\text{laptop}) &= L + \beta(V - D) \\ U(\text{no laptop}) &= 0 + \beta V \end{aligned}$$

- For students that are indifferent, $U(\text{laptop}) = U(\text{no laptop})$. This gives:

$$\begin{aligned} L + \beta(V - D) &= 0 + \beta V \\ L &= \beta D \end{aligned}$$

- Students that choose not to use laptops will have low valuations, L, of using laptops, while students that choose to use laptops will have higher L. Given the indifference condition:
  - Students that do not use laptops: $L < \beta D$
  - Students that use laptops: $L > \beta D$

Long Question: Part 2

Now consider the policy that allows students to use laptops only if they sign up in advance to sit in a laptop section. Why is $L \geq D$, not $L \geq \beta D$, the threshold for opting into the laptop section?

Long Question: Solution, Part 2

- Students now compare:

$$\begin{aligned} U(\text{laptop}) &= 0 + \beta(L + V - D) \\ U(\text{no laptop}) &= 0 + \beta V \end{aligned}$$

- The threshold for opting in is defined by $U(\text{laptop}) \geq U(\text{no laptop})$. This gives:

$$\begin{aligned} 0 + \beta(L + V - D) &\geq 0 + \beta V \\ L &\geq D \end{aligned}$$

- The threshold changes from βD to D because when laptop use can only happen in the future, all benefits and costs are discounted at the same rate, β.[23]

Long Question: Part 3

Assume there is no laptop policy. Show that if $\beta D < L < D$, the student engages in preference reversals: she prefers not to use the laptop in future classes, but changes her mind when she's actually sitting in those future classes.

Long Question: Solution, Part 3

- When thinking about future laptop use, the student's problem is identical to the problem in part (2). Why?
  - Because she discounts time both one and two periods in advance by β
- We know from part (2) that if $L < D$, she would like to not use the laptop
- But from part (1), we know that if $\beta D < L$, she will end up using the laptop when she's actually sitting in the future class
- This implies a preference reversal: she prefers not to use the laptop in future classes, but switches her mind when she's actually sitting in those future classes.

Long Question: Part 4

Explain why fraction $1 - \beta D$ of the class uses a laptop in part 1, but fraction $1 - D$ of the class uses a laptop in part 2. Why does a smaller share of the class use their laptops in part 2?

Long Question: Solution, Part 4

- In part 1, a student uses a laptop if $L > \beta D$. Define $F(.)$ as the CDF of L.
- Given the uniform distribution:

$$\begin{aligned} P(L > \beta D) &= 1 - F(\beta D) \\ &= 1 - \beta D \end{aligned}$$

- Likewise, in part 2, a student uses a laptop if $L > D$. We have:

$$\begin{aligned} P(L > D) &= 1 - F(D) \\ &= 1 - D \end{aligned}$$

- A smaller share will use laptops in part 2 because the benefit of using a laptop is delayed and hence discounted by β

Long Question: Part 5

Why would the social planner prefer the opt-in policy to both the policy of allowing students to choose whether to use their laptops and to banning lap tops altogether?

Long Question: Solution, Part 5

- The planner is not present biased so would want only students with $L > D$ to use laptops; the opt-in policy achieves this.
- Under the free choice policy, students with $\beta D < L < D$ will sub-optimally use their laptops.
- On the other hand, banning laptops altogether is suboptimal because welfare is gained by allowing the students with the highest valuations, $L > D$, to use laptops

The End

- Don't worry too much about the exam – try your best and you'll do great!
- And even if you don't do great, you'll be fine!

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