Midterm Review

EC 320: Introduction to Econometrics

Winter 2022

Prologue

Housekeeping

Midterm 1 on Wednesday

- No lab this week

Problem Set 1 solution posted

Grades

Exercises

Kyu is the person of contact

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- Zoom

Q: Why?

A: To ensure *consistency in grading*.

Problem sets and exams

I am the person of contact

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- PLC 420

Midterm I: High Concepts

Midterm Topics

Anything from the lectures, labs, or problem sets **is fair game!**

1. Probability Theory
2. Statistics
3. The Fundamental Problem of Econometrics
4. Randomized Control Trials
5. The Logic of Regression
6. Tidy Data and R (bonus points)

Midterm Topics

1. Probability Theory

Random variables

- Sketch out the probability distribution of a random variable.

Expected values

Population variance

Midterm Topics

2. Statistics

Estimators

- Population *v.s.* sample distinction.
- Sample mean, sample variance, sample covariance, sample correlation coefficient.
- Unbiasedness and efficiency.

Hypothesis testing

- Statistical significance.
- t-statistics.
- Two-sided t tests using rule of thumb discussed in class (*i.e.*, compare t to $t_{\text{crit}} = 2$).

Midterm Topics

3. The Fundamental Problem of Econometrics

Causal mechanisms *v.s.* confounding factors

Ideal data on potential outcomes

- Individual *v.s.* average treatment effects.
- Difference-in-means based on observable data.

Selection bias

Midterm Topics

4. Randomized Control Trials

How do RCTs eliminate selection bias?

- Can an RCT fail to eliminate selection bias? How?

Research questions

- Identify outcome variable and treatment variable.

Estimation using experimental data

- Difference-in-means.
- Linear regression.

Midterm Topics

5. The Logic of Regression

Regression models

- Identify outcome variable, treatment variable, and control variables.

Estimation using OLS

- How does OLS adjust treatment effect estimates for confounding factors?

Midterm Topics

5. The Logic of Regression (cont.)

Omitted variables

- When does omitting a variable cause omitted-variable bias?
- Illustrate assumptions with causal diagrams.

Regression tables

- Write down model.
- Calculate omitted-variable bias.

Midterm Topics

6. Tidy Data and R

For earning bonus points! [will be either multiple choice question or true/false question]

Identify R functions

- What does the function do?
- I will only ask you about functions you've seen in lab.
- **I will not ask you to write code.**

Which one of the following code produce below output?

- Example: Console output of `filter()` or `select()`.

Midterm Structure

Multiple Choice

- 5 questions
- 6 points per question (30 points total)

True or False

- 5 questions
- 6 points per question (30 points total)
- Brief explanations required for full credit

Free Response

- 5 multi-part questions with varying numbers of points (50 points total)
- Explanations required for full credit

Midterm Protocol

Materials

- Writing utensil
- 3-inch-by-5-inch note card
- Basic or scientific calculator (no graphing or programming capabilities)
- **Nothing else**

Procedure

- 80 minutes from *"you may begin"* to *"pencils down"*
- First 30 minutes: **quiet period** (no questions, no getting up)
- Last 50 minutes: ask lots of questions