Midterm Review

EC 320: Introduction to Econometrics

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Prologue

Housekeeping

Problem Set 4

- Due tonight by 23:59 on Canvas

Midterm 2 on Wednesday

- **You still have lab this week!**
- Maps!

Extended office hours

- Tomorrow 15:00 to 17:00
- Room TBA

Midterm II: The Weeds

Midterm Topics

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

1. Simple Linear Regression: Estimation I & II
2. Classical Assumptions
3. Simple Linear Regression: Inference
4. Multiple Linear Regression: Estimation
5. Multiple Linear Regression: Inference
6. Regressions in R

Midterm Topics

1. Simple Linear Regression: Estimation

OLS mechanics

- How does OLS pick parameter estimates?
- What properties are a direct consequence of OLS?
- Residuals *v.s.* errors

Coefficient interpretation (literal)

Midterm Topics

1. Simple Linear Regression: Estimation (cont.)

Goodness of fit

- R^2 interpretation (literal)
- Understand R^2 derivation
- Use and misuse of R^2

OLS by hand

- Estimate coefficients and calculate R^2.
- Don't have to calculate standard errors by hand.

Midterm Topics

2. Classical Assumptions

Six assumptions

1. Linearity
2. Sample variation/no perfect collinearity
3. Random sampling
4. Exogeneity
5. Homoskedasticity
6. Normality

What do they buy?

When are they satisfied? When are they violated?

Midterm Topics

2. Classical Assumptions (cont.)

So what?

- Coefficient interpretation (substantive)
- Hypothesis test validity.

Midterm Topics

3. Simple Linear Regression: Inference

Making inferences about population parameters

- Population *v.s.* sample
- What do we mean by "statistical significance?"

Hypothesis testing (*e.g.*, *t* tests)

- Null hypotheses *v.s.* alternative hypotheses
- Left-tailed, right-tailed, and two-tailed
- Type I *v.s.* Type II error

Confidence intervals

Midterm Topics

4. Multiple Linear Regression: Estimation

OLS mechanics and properties

Goodness of fit

- R^2 interpretation (literal)
- Know the behavior of R^2 as the number of explanatory variables increases.

Make predictions for certain values of the explanatory values (*e.g.*, hedonic modeling)

Midterm Topics

4. Multiple Linear Regression: Estimation (cont.)

Coefficient interpretation (literal and substantive)

Omitted-variable bias

- Know when omitting a variable causes bias.
- Sign the bias.
- Back out correlations between explanatory variables.

Midterm Topics

5. Multiple Linear Regression: Inference

Confidence intervals and *t* tests

- Other than degrees of freedom, same as before.

Multicollinearity

- Standard errors depend on the overlapping variation between the explanatory variable.
- More overlap $\implies$ bigger standard errors $\implies$ less likely to reject null hypothesis.

Irrelevant variables

No *F* tests on the midterm! Stay tuned for the final.

Midterm Topics

6. Regressions in R

Write the code that generates regression output

- I provide the console or R Markdown output and the name of the data file.
- You provide the code that loads the necessary packages, imports the data, runs regressions, and generates a table.
- Write the code as if it's in a `.R` script.

Midterm Structure

Fill in the Blank

- 10 blanks
- 3 points per blank (30 points total)

True or False

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

Free Response

- 4 multi-part questions with varying numbers of points (140 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

- **Randomized** seating chart (penalty for non-compliance)
- 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

Practice

Regression Table

Example: Final Grades

Data on 680 students in an introductory microeconomics class.

Outcome: Final Exam Score (%)

Explanatory variable	**1**	**2**	**3**
Intercept	22.7	21.8	**-8.69**
	(0.877)	(0.973)	**(1.49)**
Classes Attended (%)	0.039	0.027	**0.041**
	(0.011)	(0.014)	**(0.013)**
HW Turned In (%)		0.022	**0.023**
		(0.012)	**(0.011)**
ACT Score			**0.528**
			(0.048)