Final Review

EC 320: Introduction to Econometrics

Winter 2022

Prologue

Housekeeping

Final Exam

Friday, March 18 at 10:15am in Tykeson 140.

Lab

Additional review session.

Office hours

Next week: Tuesday and Thursday over Zoom

Final Exam

Final Exam Topics

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

1. Midterm Topics
2. Multiple Linear Regression: Inference
3. Categorical Variables
4. Interactive Relationships
5. Nonlinear Relationships

Final Exam Topics

1. Midterm Topics

Making predictions using fitted regression model

- *e.g.*, using a Hedonic model

Goodness of fit

Hypothesis testing

Omitted-variable bias

- Know when omitting a variable causes bias
- Sign the bias
- Back out correlations between explanatory variables
- Provide examples of problematic omitted variables

Final Exam Topics

2. Multiple Linear Regression: Inference

F tests (multiple parameters)

- State null hypothesis
- Identify restricted and unrestricted models
- Calculate *F* statistic
- Use table to find F_{crit}
- $F > F_{crit}$?
- State conclusion of the test

t tests (single parameter)

Q: Which test should you choose?

A: Depends on the null hypothesis!

Final Exam Topics

2. Multiple Linear Regression: Inference

Confidence intervals

- Formula, interpretation, and comparison of different intervals for the same coefficient

Proof: Show that the F statistic formula containing RSS implies the F statistic formula containing R^2

- For practice, you can also prove that the second formula implies the first

Final Exam Topics

3. Categorical Variables

How do you interpret coefficients on binary variables?

- **Note:** Depends on the presence of interaction terms and whether the outcome variable is transformed

Dummy variable trap

What is the reference category?

- How do you back out group-specific averages from a dummy variable regression?
- How do coefficient estimates change when you change the reference category?

Final Exam Topics

4. Interactive Relationships

How do you interpret interaction coefficients?

- Binary $\times$ binary
- Binary $\times$ continuous
- Continuous $\times$ continuous

How does an interaction term change how you interpret the effect of the variable of interest on the outcome variable?

- Marginal effects (partial derivative)

Final Exam Topics

5. Nonlinear Relationships

Identify nonlinear models

- OLS can handle nonlinear variables, but not nonlinear parameters

Transform nonlinear models

- Give OLS a chance

Final Exam Topics

5. Nonlinear Relationships

How do you interpret coefficients in the presence of logarithmic transformations?

- Level Y, level X
- Level Y, log X
- Log Y, level X
- Log Y, log X

Quadratic models: interacting X with itself

- Calculate marginal effects to understand how X affects Y

Final Exam Structure

Mix of fill-in-the blanks, multiple choice questions, T/F questions (60 points)

- Total of 20 questions (3 points each)

Long answer questions (40 points)

- Four questions

Final Exam Protocol

Materials

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

Procedure

- 120 minutes from *"you may begin"* to *"pencils down"*
- First 30 minutes: **quiet period** (no questions, no getting up)
- Last 90 minutes: ask lots of questions

Practice

gapminder Package

Data on population, GDP per capita, and life expectancy

Unit of observation: country-year

- All countries, every 5th year between 1957 and 2007

```
p_load(gapminder)
data ← get('gapminder')
head(data)
```

```
#> # A tibble: 6 × 6
#>   country     continent  year lifeExp      pop gdpPercap
#>   <fct>       <fct>     <int>   <dbl>    <int>     <dbl>
#> 1 Afghanistan Asia       1952    28.8  8425333      779.
#> 2 Afghanistan Asia       1957    30.3  9240934      821.
#> 3 Afghanistan Asia       1962    32.0 10267083      853.
#> 4 Afghanistan Asia       1967    34.0 11537966      836.
#> 5 Afghanistan Asia       1972    36.1 13079460      740.
#> 6 Afghanistan Asia       1977    38.4 14880372      786.
```

Association of GDP per Capita with Life Expectancy

	Life Expectancy	Life Expectancy	log(Life Expectancy)	log(Life Expectancy)
log(GDP/Capita)	**6.42**	5.69	0.112	0.111
	(0.183)	(0.325)	(0.004)	(0.006)
log(GDP/Capita) ? Americas		4.03		0.047
		(0.674)		(0.013)
log(GDP/Capita) ? Asia		0.561		-0.002
		(0.421)		(0.008)
log(GDP/Capita) ? Europe		0.614		-0.019
		(0.597)		(0.012)
log(GDP/Capita) ? Oceania		5.2		0.035
		(4.36)		(0.084)
Continent Dummies?	**Yes**	Yes	Yes	Yes
Observations	**1704**	1704	1704	1704
R-Squared	**0.704**	0.71	0.665	0.669

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