Final Review Questions

ECON 480 • Econometrics • Fall 2020

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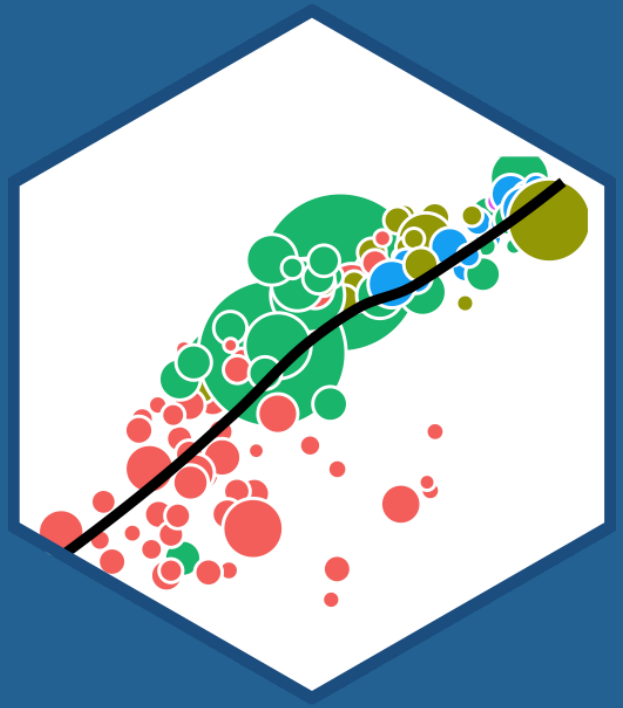
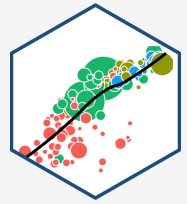
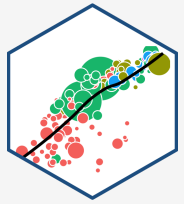


Major Models and Extensions



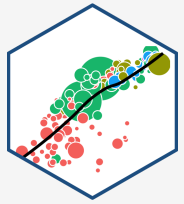
- Causality
  - Fundamental problem of causal inference
  - DAGs, controlling
- Multivariate OLS
  - Omitted Variable Bias
  - Variance/Multicollinearity
- Categorical data
  - Using categorical variables as dummies
  - dummy variable trap
  - interaction effects

Major Models and Extensions



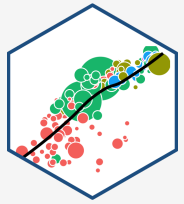
- Nonlinear Models
  - quadratic model, polynomial models, logarithmic models
- Panel Data
  - pooled model
  - fixed effects
  - difference-in-difference models

Question 1



What are the two conditions for a variable Z to cause omitted variable bias if it is left out of the regression?

Question 2

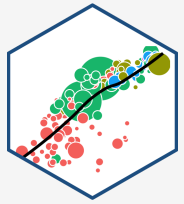


$$\widehat{Wages}_i = \beta_0 + \beta_1 \, Education_i + \beta_2 \, Age_i + \beta_3 \, Experience_i + \epsilon_i$$

Suppose $Education_i$ and Age_i are highly correlated

- Does this **bias** $\hat{\beta}_1$ and $\hat{\beta}_2$?
- What will happen to the **variance** of $\hat{\beta}_2$ and $\hat{\beta}_2$? How can we measure this?

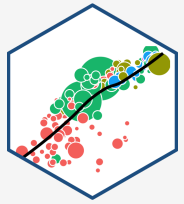
Question 3



$$\widehat{Cholesterol}_i = \beta_0 + \beta_1 \, Treated_i + u_i$$

- $Treated_i$ is a dummy variable $\begin{cases} = 1 & \text{if person received treatment} \\ = 0 & \text{if person did not receive treatment} \end{cases}$
- What is $\hat{\beta}_0$?
- What is $\hat{\beta}_1$?
- What is the average cholesterol level for someone who recieved treatment?

Question 4

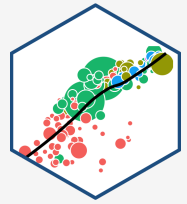


$$\widehat{Y}_i = \beta_0 + \beta_1 \, Red_i + \beta_2 \, Orange_i + \beta_3 \, Yellow_i + \beta_4 \, Green_i + \beta_5 \, Blue_i$$

Suppose observation i can be either { Red, Orange, Yellow, Green, Blue, Purple }

- What is $\hat{\beta}_0$?
- What is $\hat{\beta}_1$?
- What is the average value of Y_i for $Green$ shapes?
- Why can't we add $\beta_6 \, Purple_i$?

Question 5

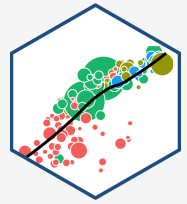


$$\widehat{Utility}_i = \beta_0 + \beta_1\, Eggs_i + \beta_2\, Breakfast_i + \beta_3 (Eggs_i \times Breakfast_i)$$

$Breakfast_i$ is a dummy variable $\begin{cases} = 1 & \text{if meal i is breakfast} \\ = 0 & \text{if meal i is not breakfast} \end{cases}$

- What is $\hat{\beta}_1$?
- What is $\hat{\beta}_2$?
- What is $\hat{\beta}_3$?
- We have two regressions (one for Breakfast; one for Not Breakfast)
    - how can we determine if the intercepts are different?
    - how can we determine if the slopes are different?

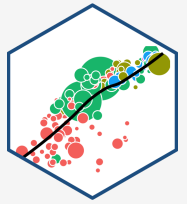
Question 6



$$\widehat{Utility} = 2 + 4 \text{ Ice Cream Cones}_i - 1 \text{ Ice Cream Cones}_i^2$$

- What is the marginal effect of eating 1 more Ice Cream Cone?
- What if we *start* with 1 Ice Cream Cone?
- What if we *start* with 4 Ice Cream Cones?
- What amount of ice cream cones will *maximize* utility?
- How would we know if we should add $\text{Ice Cream Cones}_i^3$?

Question 7



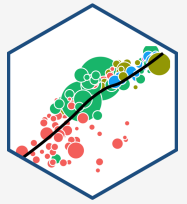
$$ln(GDP_i) = 10 + 2 \text{ population (in billions)}_i$$

- Interpret $\hat{\beta}_1$ in context.

$$ln(GDP_i) = 10 + 0.1\ ln(\text{population}_i)$$

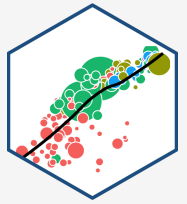
- Interpret $\hat{\beta}_1$ in context.

Question 8



- Explain what an F-test is used for
- Explain *how* an F-statistic is generated

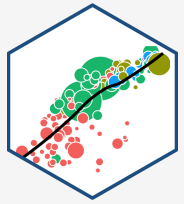
Question 9



$$\widehat{\text{Divorce Rate}}_{it} = \beta_0 + \beta_1 \text{Divorce Law}_{it} + \alpha_i + \theta_t + \epsilon_{it}$$

- Why do we need α_i and θ_t?
- What sorts of things are in α_i?
- What sorts of things are in θ_t?

Question 10



$$\widehat{\text{Crime Rate}}_{it} = \beta_0 + \beta_1 \text{Maryland}_i + \beta_2 \text{After}_t + \beta_3 (\text{Maryland}_i \times \text{After}_t)$$

- Suppose Maryland passes a law (and other States do not) that affects crime rates
- What must we assume about Maryland over time?
- What is the average crime rate for other states before the law?
- What is the average crime rate for Maryland after the law?
- What is the *causal effect* of passing the law?