

Final Exam Study Guide

ECON 340: Economic Research Methods

Instructor: Div Bhagia

Here is some general information about the final exam.

- This will be a closed-book exam.
- You will be allowed to use a calculator. No phones or computers are allowed.
- It is really important that you review all the material uploaded on the Course Website under the modules *Linear Regression Model* and *Additional Topics*.
- You do not need to know any proofs for the exam.
- While writing the exam, make sure to show your work to get full credit. This also helps you get partial credit in case you make a small error.

What do you need to know?

1. How does the Ordinary Least Squares (OLS) method estimate the coefficients of a regression model?
2. OLS line passes through sample means.
3. Given the estimated model,

$$\hat{Y}_i = \hat{\beta}_0 + \hat{\beta}_1 X_i$$

If I tell you the value of X_j and Y_j for observation j , you should be able to calculate the prediction (\hat{Y}_j) and the error term (\hat{u}_j) for this observation. (Also, be able to do so for the multiple regression model).

4. Understand the formula for R^2 and how to interpret it. When is $R^2 = 1$ or $R^2 = 0$?
5. Four assumptions for the simple linear regression model.
6. Difference between causal and predictive analysis.

7. Multiple regression: interpretation, adjusted- R^2
8. Be able to interpret the output from the following regression models:
 - Linear
 - Quadratic
 - Log-Log (elasticity), Log-Level, Level-Log
 - Dummy variable
 - Interaction terms

For example, if I give you the following model:

$$\log Y = \beta_0 + \beta_1 X$$

You should be able to take the derivative and show:

$$\frac{1}{Y} \cdot \frac{dY}{dX} = \beta_1 \rightarrow 100\beta_1 = \frac{100 \times dY/Y}{dX}$$

So we can interpret $100\beta_1$ as the percentage change in Y in response to a one unit change in X .

9. Given the coefficient estimate and its standard error, be able to set up a hypothesis test to check statistical significance. Calculate and interpret p -values for regression coefficients. Construct confidence intervals.
10. Be able to identify the direction of omitted variable bias.
11. What are randomized control trials? What are some tools economists use to emulate experimental variation?
12. What are the differences between Machine Learning (ML) and Econometrics? Are ML methods geared more towards predictive or causal inference?