ECO-10516 Applied Microeconometrics

Summer 2024

1 Administrative Details

Professor: Erick F Molina
Schedule: Monday to Thursday 8:30 - 11:00 AM
Classroom: RH 102
Office hours: Monday and Wednesday 11:00 AM - 12:30 PM

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2 Course Description

This course focuses on providing the theoretical and practical tools necessary to conduct an empirical analysis of the relationship between two or more variables. Since most empirical analysis is related to questions with direct policy implications, the course focuses on methods for estimating causal effects. Therefore, both the theoretical foundations and practical applications of different methods will be explored, using real data and statistical analysis programs such as R and Stata. By the end of the course, students will be able to test various hypotheses, answer questions, and evaluate the effectiveness of different methods.

3 Grading

Problem Sets	15 %
Project	25 %
Midterm Exam	30 %
Final Exam	30 %
Total	100 %

Problem sets: There will be 3 of them. The due dates are June 24, July 8, and July 15. You can solve them in teams, but submission must be individual, so each person must write their own answers.

Project: In the second week of the course, teams will be created and each team will be assigned a project with a dataset. At the end of the course, there will be presentations to showcase the project results. Guidelines for developing and presenting the project will be provided during the course.

Midterm Exam: The midterm exam will take place on Thursday, July 4, during class time. It will be a guided practical exam, meaning there will be precise instructions on what to do.

Final Exam: The final exam will take place on Monday, July 22, during class time. The exam will consist of both a theoretical part and a practical part. Both parts will be submitted in a single document, with attached code. According to article 27 of ITAM's regulations, it is necessary to **pass the final exam** in order to pass the course.

3.1 Academic Integrity

All students are expected to commit to ITAM's honor code. Any violation will immediately result in failing the course. Violations of the code include: plagiarism, copying, falsifying information, buying/selling course materials, among others. It is easy to detect when someone submits work that is not their own.

4 Software Use

The course will have a practical component, so you are expected to install R and Stata on your devices. These programs will be very useful in your careers in the long term. Solutions to assignments, projects, and exams will be posted for both programs.

5   Syllabus

1. Review of Probability and Statistical Inference

   (a) Distribution functions (CDF and PDF)

   (b) Expected value, variance, and moments

   (c) Sampling

   (d) Asymptotic properties of estimators

   (e) Hypothesis testing

2. Introduction to Statistical Software: R and Stata

   (a) Introduction to R and Stata

   (b) Data manipulation in R and Stata

   (c) Creating tables and graphs

   (d) Best practices

3. Review of Econometrics

   (a) The linear regression model

   (b) The identification problem

   (c) Ordinary Least Squares (OLS)

   (d) Interpretation of coefficients

4. Model Validity

   (a) External validity

   (b) Omitted variable bias

   (c) Measurement error

5. Models with Binary or Categorical Dependent Variables

   (a) Linear Probability Model

   (b) Probit & Logit

   (c) Multivariate probit and logit

6. Panel Data

   (a) Balanced and unbalanced panels

   (b) First differences estimator

   (c) Random effects, fixed effects, and "between" estimators

   (d) Dynamic panel models

7. The Causal Problem

   (a) The Rubin causal model

   (b) The experimental ideal

   (c) Selection bias

8. Randomized Control Trials (RCTs)

   (a) The importance of randomization

   (b) Attrition and other implementation issues

   (c) Natural experiments

   (d) Power and sample size

9. Instrumental Variables

   (a) The endogeneity problem

   (b) Weak instruments

   (c) Two-Stage Least Squares (2SLS)

   (d) Local Average Treatment Effect (LATE)

10. Difference-in-Differences

    (a) Parallel trends assumption

    (b) Identification, estimation, and inference

    (c) Common problems in diff-in-diff

11. Regression Discontinuity

    (a) Sharp Regression Discontinuity

    (b) Identification, estimation, and inference

    (c) Bandwidth selection

    (d) Fuzzy Regression Discontinuity

6 References

6.1 Main Textbooks

- Angrist, J. and J.S. Pischke (2009). "Mostly Harmless Econometrics," Princeton University Press.

- Angrist, J. and J.S. Pischke (2014). "Mastering Metrics: The Path from Cause to Effect," 1st ed., Princeton University Press.

- Cunningham, S. "Causal Inference: The Mixtape," Available here.

- Hansen, B. (2022). "Econometrics" Princeton University Press.

- Stock, J. and Mark Watson (2011). "Introduction to Econometrics," 3rd ed., Addison Wesley.

- Wooldridge, J. (2012). "Introductory Econometrics: A Modern Approach," 5th ed., Southwestern Cengage Learning.

6.2 Additional Resources

- Baltagi, B. (2005). "Econometric Analysis of Panel Data," Springer.

- Cameron, A. and P. Trivedi (2005). "Microeconometrics: Methods and Applications," Cambridge University Press.

- Cattaneo, M., N. Idrobo, and R. Titiunik (2018). "A Practical Introduction to Regression Discontinuity Designs. Volume I and II." Cambridge University Press.

- Duflo, E., R. Glennerster, and M. Kremer (2007). "Using Randomization in Development Economics Research: A Toolkit." CEPR Discussion Paper No. 6059.

- Huntington-Klein, N., "The Effect: An Introduction to Research Design and Causality", Available here.