Introduction to Econometrics

Summer Term 2021-2

Instructor
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Course
LPS ECON-104-920
Location: Canvas - Zoom

Description
The main objective of the course is to make sure student thoroughly understands what econometrics is, what is it good for and what can we conclude using it. Other objectives of the course is to train the student in (i) handling economic data; (ii) quantitative analyses of simple economic models using computers; (iii) being able to comment on regression tables. The course covers linear regression models, simultaneous-equations models, discrete choice models and univariate time series models. Students are required to perform several econometric analyses of their own, using real-life data.

Logistics
Lectures will be asynchronous. However, to enhance the learning experience, I will do the following

- Hold extra office hours on multiple days of the week and by appointment. I will send out a survey to find out the optimal times.

- Have small group meetings (of 4 or 5) regularly to check in on how you're doing.

- Handwrite notes as I lecture instead of going through slides. I'll upload slides as supplementary material.

- Help you form study groups.

- Send out weekly anonymous surveys to receive feedback about the class.

I will also meet with you all through Zoom on the first day of class to answer questions about the class.

Prerequisite
ECON 101, ECON 103, MATH 104 and MATH 114 or MATH 115 or permission from instructor. In practice, students need to be comfortable with multivariate calculus including summations, differentiation, partial differentiation, and solving unconstrained optimization problems. Student should be comfortable with algebra and basic matrix algebra (linear algebra not required). Statistics knowledge should include random variables and probability distributions, point and interval estimation, hypothesis testing, and coding in R. You should refresh your memory on probability and statistics before the class starts, since we will use the same concepts extensively. I will post some preliminary statistics questions on the Canvas site, you should be **comfortable** solving them **before** the course starts.

ECON104 is arguably the most important class you will take during your major and it will be what separates you from all other "data scientists" in the job market. Don't treat this session as a filler for your summer hours. Your focus should be learning as much as possible.

Textbook
The textbook for this course is Stock and Watson's *Introduction to Econometrics, Updated 3rd edition*. I will frequently assign textbook readings and post my slides on Canvas.

Required Software

You will be required to use R extensively for problem sets. **IT IS YOUR RESPONSIBILITY TO READ UP ON R and LEARN HOW TO PERFORM THE REQUIRED ANALYSIS.** You should have a good understanding of R **BEFORE** you start the course. Students previously had difficulty catching up in the beginning of the course. R Studio is an open-source interface for using R. The most concise learning material would be `https://cran.r-project.org/doc/manuals/r-release/R-intro.pdf`. R Bloggers is a website dedicated to R related material. Also, MOOC sites like Coursera and edX usually have an active R lecture that you can follow. Lastly, R has millions of users worldwide. Whatever problem you are facing, someone faced it before you, posted on the internet (e.g. https://stackoverflow.com/) and found a solution. Google is your biggest helper learning R. I have posted some preliminary R questions on the Canvas site, you should be **comfortable** doing them **before** the course starts.

Course Policies

This course adheres to the Economics Department's undergraduate policies. Please see `http://economics.sas.upenn.edu/undergraduate-program/course-information/guidelines/policies` for full details.

- Academic Integrity: Any student found in violation of academic integrity will receive no credit for the assessment in question. It will enter as a "0" in the grade book.

- Exam Attendance: Attendance is mandatory for all exams. A missed exam will enter as a "0" in the grade book. Valid exceptions can be found on the department website.

Grading

The grade for this course will be allocated as follows (subject to change):
$$\text{Final Grade} = 50\% \text{ problem sets} + 20\% \text{ online quizzes} + 30\% \text{ final}$$

- *Problem sets:* Problem sets will be posted on the course site and due at **3 pm EST** on the posted date. There is **no** late submission policy; it is your responsibility to make multiple submissions before the deadline to ensure there are no issues. You are encouraged to work with others but must submit individual problem set.

- *Online quizzes:* I will post multiple-choice quizzes weekly on Canvas. They must be taken before the due date. They are timed (5 questions; 10 minutes): the timer starts whenever you start the quiz, and you can start anytime before the due date. Their purpose is to encourage you to study the notes.

- *Final:* There will be a 3 hour final on the last day of class. The final will be cumulative. I will adhere to the Department's guidelines.

Problem sets will contain questions that require R. I will not ask any questions about R on the quizzes or the final exam.

Regrade Requests

Regrade request must be typed and submitted in writing following the Department's guidelines *within two days* of receiving your mark. You must state the exact reason for a regrade either due to a miscalculation adding the points or an alternative but valid solution. "I think I deserve more points for this answer" is not an acceptable request and will not be considered.

Online Learning Challenges

We now live in environments that are not ideal for learning. If you have any issues that could inhibit your learning more than an average student, let me know as early as possible. Although I cannot guarantee that I will accommodate your requests, at least we can look for alternative solutions from the beginning.

Getting Started Module in Canvas is a first line for support for the issues you may face during the course. You should call for immediate tech support: 1-833-283-2987. For less urgent tech support issues, students can email: online-learning-help@sas.upenn.edu.

Additional Notes
The syllabus is a live document that I may update as we go along.

Course Topics

Linear regression with one regreessor

- Probabilistic modeling and regression

- Linear regression and OLS

- Large sample distribution of OLS estimation

- Hypothesis testing

- Prediction

- Heteroskedasticity

Regression with multiple regressors

- Multiple regression topics

- Variable selection

- Testing generalized hypotheses

Nonlinearities

- Polynomials and logarithmic transformations

- Binary regressors and interactions

- Linear probability models, logit, probit

Endogeneity

- Endogeneity bias and IV

- Simultaneous equations models

Panel data

- Panel data analysis

Time series analysis

- Introduction to time series

- AR(1) models

- ARMA models

- Vector autoregressive models