Introduction to Econometrics

Summer Term 2020-1

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Course
LPS ECON-104-920
Live Meetings: 6pm-9pm EST Mon-Thur
Location: Online
Github URL: https://github.com/gorkembostanci/ECON104_2020_1

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.

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 have posted 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 shouldn't be getting a good grade or getting rid of one more obligation to graduate. It should be learning as much as possible. If your access to the course and learning will be restricted due to limited internet access, time-zone differentials etc., consider taking this class later, when you won't face these issues.

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.

Main Logistics
I will use both Canvas and the course website on github (above) to post material related to the course. Make sure to check both regularly. Any announcement on the Canvas page functions as an addendum to the syllabus, make sure to read previous announcements if you arrive 'late' to the class. I expect you to log on to Canvas at least once a day during our session and make sure you did not miss any announcements. I strongly recommend adjusting your Canvas settings so that you get immediate email notifications with each announcement.

I will use Zoom to conduct any synchronous meetings and post any relevant Zoom links on Canvas. I will record all the synchronous meetings and upload the videos to Canvas, however, I still expect you to

download the Zoom app, attend the live sessions and have your webcam on during them with a virtual background. If you are going to miss a live session, you should send me a Course Absence Report[1] in advance. Otherwise, this will hurt your participation score.

It is hard to design a course that will satisfy everyone with such diverse needs. I will try to accommodate the course to your particular situation, but I cannot give any guarantees. Unlike the fall semester, the assumption will be that you had sufficient time to prepare necessary technology and opted-in to take this class during the summer.

I will also post some pre-recorded videos and you should make sure you watch those. The LPS page had declared this class as asynchronous before I came on board. To reiterate, this class **will** have synchronous parts.

If you want to ask something that might be of general interest, please use the discussion board in Canvas. Emails should only be used for the remaining issues. You should expect me to respond to emails in 24 hours. You can and should nudge me if I don't. All the date and times I post will refer to the Eastern Standard Time unless noted otherwise.

Required Software
You will be required to use *R* extensively for problem sets and the final exam. **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.

Assessment and Marks
The mark for this course will be allocated as follows (subject to change):

Final Grade = 50% Problem Sets + 15% In-Class Presentation + 30% Final + 5% Participation

- *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 may ask questions to each other but each of you has to submit individual problem sets. I will use Turnitin to evaluate submissions. This course has a heavy load of homework due to the relatively short schedule. I **do not** recommend it for students who are employed or taking multiple classes during the summer.
- *In-Class Presentation:* You will be tasked to explain how to solve a problem-set question to the rest of the class in a pre-recorded session and to answer any questions that show up on the discussion board specific to your video. The grading will be based on (1) how well the economic concepts are

[1] `https://www.college.upenn.edu/course-absence-report`

explained, (2) how well the statistical framework is analyzed, (3) how accurate and efficient the R code is, and (4) how well the audience questions are answered.

- *Final:* There will be a 3 hour final on the last day of class on **June 30**. The final will be cumulative. I will adhere to the Department's guidelines.
- *Participation:* The participation score will depend on attendance and activity in live lectures, in-class exercises and activity in the discussion board. ECON104 is a difficult class squeezed into 5 weeks of teaching. This is to ensure you are engaged to the class consistently throughout the semester.

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
The quarantine is forcing most of us to 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. If you are in need of any equipment, check the emergency funding availability from the school. Otherwise, I will assume everyone has good internet connection and a private room to attend the lectures.

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. Given the online nature of the class, we may have to make frequent changes. I expect all students to be present in the first lecture, to which I will frequently refer as we go along the course.

Course Topics

Each class roughly corresponds to one synchronous meeting. You should expect two live meetings per week, approximately 3 hours each. We will finalize the schedule of the rest of the live meetings during our first meeting. **I need all of you to attend the first live meeting.**

Class 1 - 05/28: Syllabus, What is Econometrics, Statistics Review
Non-Quantitative Review of What's to Come, Random Variables, Basic Calculations

Class 2 - 06/01: Estimation, Intro to Bayesian Econometrics and Shrinkage Estimators
Loss Functions, Estimators, Bias-Variance Trade-off

Class 3 - 06/04: The Classical Linear Regression Model - Single Regressor
OLS, Finite Sample Properties of OLS, Gauss-Markov Theorem, Test of Linear Restrictions

Class 4 - 06/08: The Classical Linear Regression Model - Multiple Regressors
OLS, Finite Sample Properties of OLS, Gauss-Markov Theorem, Test of Linear Restrictions

Class 5 - 06/11: Nonlinear Regressions with OLS
Also External-Internal Validity

Class 6 - 06/15: Dummy/Limited Dependent Variable Regressions and Panel Data
Logit, Probit, Censored, Truncated

Class 7 - 06/18: Endogeneity
Instruments, Diff-and-diff Estimation

Class 8 - 06/22: Experiments and Selected Topics in Time Series
Natural Experiments, RCTs, ARMA Processes, Unit Roots, Financial Econometrics

Class 9 - 06/25: TBD

Class 10 - 06/30: **Final Exam**