Introduction to Econometrics
Summer Term 2017

Instructor
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Course
LPS ECON-104-920
Time: TR 1:15-5:05
Location: McNeil 167-8
CourseURL:TBA

Description
The main objective of the course is to make sure student thoroughly understands what econometrics is, what is it good for and what we can conclude using it. Other objectives of the course is to train the student in (i) handling economic data; (ii) quantitative analyses of economic models with probabilistic tools; (iii) econometric techniques, their application as well as their statistical and practical interpretation; (iv) implementing these techniques on a computer. 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 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, simple linear regression, and some coding in \texttt{R}.

Recommended Readings
The recommended textbook for this course is Watson’s \textit{Introduction to Econometrics, 3rd edition}. I will not assign any textbook readings, however this course loosely follow Watson, \textit{Econometrics By Example} by Gujarati and \textit{Econometrics} by Diebold. This text is available online at \url{http://www.ssc.upenn.edu/~fdiebold/Textbooks.html} I will post lecture notes on the course website above.

Required Software
This course will require use of a software package with statistical capabilities. You will be required to use \texttt{R}. \texttt{R} Studio is an interface for using \texttt{R}. It is downloadable, open source, free, and Professor DiTraglia has useful tutorials available \url{http://www.ditraglia.com/econ103/}. Learning \texttt{R} will teach you how to code from basics. You will be required to submit your accompanying code. It is your responsibility to read up on \texttt{R} and learn how to perform the required analysis. \texttt{R} Bloggers is a website dedicated to \texttt{R} related material. Also, MOOC sites like Coursera and edX usually have an active \texttt{R} lecture that you can follow.

Course Policies
This course adheres to the Economics Department’s undergraduate policies. Please see \url{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 gradebook.
- Exam Attendance: Attendance is mandatory for all exams. A missed exam will enter as a ‘0’ in the gradebook. 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 = 40% Problem Sets + 30% Midterm + 30% Final

- Problem Sets: Problem sets will be posted on the course site and due at the start of class on the posted date.
- Midterm: There will be a 1.5 hour midterm in class on July 13.
- Final: There will be a 2 hour midterm on the last day of class on August 4. The final will be cumulative but heavily favoured towards post-midterm material. I will adhere to the Department’s guidelines.

Additional Notes
Any substantial administrative issues should be addressed via e-mail or office hours. During or after class is not an appropriate time. The syllabus is a live document that I may update as we go along. I will post notes and exercises on Canvas. Lastly, 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

Class 1: Syllabus, What is Econometrics
Non-Quantitative Review of What’s to Come

Class 2: Statistics Review, Matrix Algebra
Random Variables, Sampling Distributions, Matrix Algebra

Class 3: Estimation, Intro to Bayesian Econometrics and Shrinkage Estimators
Loss Functions, Estimators, Bias-Variance Trade-off

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

Class 5: Midterm

Class 6: Large Sample Theory and Maximum Likelihood Estimation
Asymptotic Properties of OLS, Properties of MLE

Class 7: Multicollinearity, Trinity of Classical Testing, Heteroskedasticity and Autocorrelation
Weighted Least Squares, Generalized Least Squares, Robust Standard Errors

Class 8: Stochastic Regressors and Endogeneity
Omitted Variable Bias, Measurement Error, Outliers and Leverage, Simultaneity

Class 9: Dummy/Limited Dependent Variable Regressions
Logit, Probit, Censored, Truncated

Class 10: Selected Topics in Time Series and Panel Data
ARMA Processes, Unit Roots, Fixed vs. Random Effects
Class 11: **Final Exam**

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