Quantitative Methods in Economics
Economics 1126
Spring Semester 2015 – Tues, Thurs. 1130-100, Sever Hall 214

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Office Hours: Th 2:00 – 330

Course Description:
We analyze the linear model as a tool for describing relationships in economic data. In particular, we will focus on best linear predictors under square loss and analyze this prediction problem in details using cross sectional data. We discuss nonlinear models and their approximations using linear models. We will also discuss omitted variables, and derive formulas that account for the bias these variables create. We will also extend our methods to cover panel data and illustrate how these data allow us to mitigate the problem of omitted variables.

The course will then develop instrumental variable models and the role random assignment plays. Applications include models of demand and supply, and evaluation of treatment effects. For this part, we will focus closely on the maintained assumptions and how they shape the conclusions that can be obtained. This part of the course will focus on generic models of missing data.

Lecture Notes and Textbook:
We will not follow a particular textbook. Instead, I will provide lecture notes¹ on the class website and try and make them available in advance of their treatment in class.

http://isites.harvard.edu/k108494

I will also provide backup material on the class website. It is useful to have a probability text at the Statistics 110 level as a reference; for example, M. DeGroot and M. Schervish, Probability and Statistics, 2002, Addison-Wesley. The early chapters of A Course in Econometrics by Arthur S. Goldberger, 1991, Harvard University Press, have a nice development of basic probability concepts used in regression analysis. In addition, I will provide various background readings and materials. Those will be posted on the class websites.

¹ Some materials in these notes are based on lecture notes written by G. Chamberlain.
Prerequisites
Students must have successfully completed Statistics 199 or preferably Statistics 110 and Mathematics 20 or equivalent.

Organization
Class meets twice a week for lecture and once a week for a section to be arranged. Sections are conducted by Silvia Robles (robes.silvia@gmail.com).

Grading
Grades will be based on a problem sets (20%), a midterm (30%) and a final examination (50%). The midterm exam is on Thursday March 12th. You are encouraged to work on homework jointly, but each student should submit their own copies of the homework.

Tentative Schedule (please check the class website often as I will update this section of the syllabus to reflect progress, timing, etc) Also, references for materials in the Lecture Notes will be given there.

Linear Models.
• Prediction Problems: mechanics, relation to conditional expectation, omitted variable bias, functional forms.
  Readings:
  o Lecture Notes
  o Supplementary Readings:
    ▪ G (chp:1, 4 and 13)
• Inference: finite sample inference in the classical regression model, large sample inference based on frequentist random sampling.
  Readings:
  o Lecture Notes
  o Supplementary Readings:
    ▪ G (chp: 9 and 19)
• Panel Data Models: Linear fixed and Random effects.
  Readings:
  o Lecture Notes

Instrumental Variable Models.
• Counterfactuals and treatment effects, Exclusion restrictions on the instrumental variables lead to orthogonality conditions that provide moment conditions for inference. Two- stage least squares estimator. Potential outcome function, treatment effects, selection bias, and random assignment
  Readings:
  o Lecture Notes
  o Supplementary Readings:
    ▪ G (chp: 32, 33)