PSC 405
Linear Models

Curt Signorino  
Harkness 303  
Office Hours: By Appointment  
curt.signorino@rochester.edu

TA: Anna Walsdorff  
Harkness 302  
Office Hours: TBA  
anna.walsdorff@rochester.edu

PREREQUISITES

The prerequisites for this course include a mathematical statistics course at the level of PSC 404 and mathematical modeling at the level of PSC 407.

OVERVIEW

In this course, we examine the linear model, variations of it, and various pathologies one encounters in practice. The linear model has a long history in statistics, econometrics, and political methodology. Understanding the linear model is important for further research in nonlinear and likelihood-based models (e.g., PSC 505). Its simplicity also makes understanding the theory behind it and the pathologies more tractable than when dealing with more complicated, nonlinear models. This course has two goals: (1) provide students with the statistical theory of linear models and (2) provides students with the skills for applied data analysis using the linear model.

COURSE REQUIREMENTS

The requirements consist of problem sets, a midterm, and a final. The problem sets will be divided between analytic and empirical exercises, and all empirical exercises will be performed in R. Students are expected to work alone on homeworks. Students are also responsible for the additional readings. The course grade will be calculated as follows: problem sets 30%, midterm 30%, final 40%.

COURSE WEBPAGE

Dropbox directory to be provided.

TEXTS

The required texts for this course are:
  The accompanying source code and data, are free on the web here: http://cran.r-project.org/web/packages/faraway/index.html

If you want a slightly different version of the section material, take a look at

The following texts are not required but may be helpful for simpler overviews:

**COURSE SCHEDULE**

1. Linear Algebra

2. The Linear Regression Model
   - Conditional expectation
   - Ordinary least squares (OLS)
   - OLS: Finite sample properties
   - OLS: Asymptotic properties

3. Specification and Misspecification
   - Omitted variable bias
   - Measurement error
   - Inclusion of irrelevant variables

4. Hypothesis Testing
5. Regression extensions
   - Nonlinearity
   - Heteroskedasticity and generalized least squares

6. Generalized Method of Moments

7. Endogeneity and Instrumental Variables

8. Bayesian Methods

9. Univariate Time Series Models

10. Panel Data Models

11. Nonparametric and Semiparametric Methods

Additional reading


NOTE: Instructor reserves the right to modify this syllabus at any time.