Instructor:

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Time:

Tuesday and Thursday 12:30-2:00, Room 445, 110 Fifth Avenue [Lecture]
Friday 12:30-2:30, Room 445, 110 Fifth Avenue [Lab]

Office Hours:

Thursday 2:30-4 or by appointment.

Text (Required):


Supplementary material will be available on-line.

Course Objectives:

We will begin by briefly reviewing probability and distribution theory, and then proceed to consider the estimation of linear models. Throughout the course our focus will almost exclusively be on parametric estimation problems. Starting with a behavioral model, we derive decision rules (or equilibrium conditions) that can be expressed in terms of functions $y = g(x, ε; θ)$, where $y$ is an endogenous variable, $g$ is a function known up to some $k$ dimensional vector $θ$, $x$ is a vector of observed “covariates” or “state variables,” and $ε$ is an unobservable (to the econometrician) disturbance term. Given the decision rule $g$, access to sample information on $y$ and $x$, and assumptions regarding the joint distribution of the $x$ and $ε$, our goal is to obtain “good” estimates of $θ$. Estimation theory addresses both the question of what information is needed to obtain some estimate of $θ$, and, given identification (within some class of estimators), how to construct an “optimal” estimator. Given an estimator, assumptions regarding the distribution of the disturbance terms, and data, we then derive the sampling distributions of our estimators. Knowledge of these distributions is necessary for us to enter the somewhat metaphysical world of hypothesis testing.
We will then consider modifications of the classical linear regression model, extensions which will make the econometrics slightly more challenging and the model more appropriate for use in real world empirical applications. We first consider heteroskedasticity, which simply means that the conditional variance function is nonconstant. We then make a brief foray into the estimation of systems of linear regression equations that are linked through nonindependent disturbance terms and/or cross-equation restrictions on the regression parameters.

The final few lectures introduce nonlinear estimation, first by allowing a nonlinear conditional expectation function and then in the context of maximum likelihood estimation. Besides describing some of the basic theory and computational approaches to these problems, we will illustrate their applicability through the use of some examples from the areas of discrete choice and duration analysis.

We will distribute weekly problem sets, many of which will include computational exercises. For the most part these exercises will involve the use of real data sets, and students will be expected to program in GAUSS, a matrix programming language, or MATLAB, if they prefer. Instruction in the use of GAUSS will be provided in some of the early lab sessions.

**Course Requirements and Grading:**

Students are expected to complete all of the weekly problem sets. These problem sets will be distributed at the end of the Tuesday lecture and collected at the beginning of the lecture on the following Tuesday. Each problem set will be graded and discussed in the lab session of the same week in which the problem set was collected. The average homework grade will be a component of the student’s final grade. The average grade will be computed after dropping the two lowest homework scores received over the course of the (entire) semester. No late homework assignments will be accepted under any circumstances. Students will also take a midterm exam [during a class period] and a final [during finals week].

The final grade for the course (the Flinn section and the Stoya section) will be determined using the following weights:

- Homework Average .20
- Midterm (Flinn) .40
- Final (Stoya) .40

**Course Information:**

I will be posting course information, including the syllabus, assignments, data sets, and old examinations, on my home page.
Lecture Schedule:

1. **Review of Probability and Basic Statistical Theory**
   
   (a) Text 1.1-1.4  
   (b) M  
   (c) MGB 1-5 (for those needing a review)

2. **Linear Regression Model**
   
   (a) Text 1.5, 3

3. **Linear Regression Model (cont’d) and Applications**
   
   (a) P 4.1-4.2

4. **Hypothesis Testing in the LRM**
   
   (a) Text 4.1-4.4

5. **Simulation-Based Tests**
   
   (a) Text 4.5-4.8

6. **Heteroskedasticity and GLS Estimation, Part I**
   
   (a) Text 7

7. **Heteroskedasticity (cont’d) and Applications**
   
   (a) H

8. **Estimating Systems of Linear Regression Equations**
   
   (a) Text 7

9. **Demand System Estimation**
   
   (a) P 4.3
   (b) DMu 3
10. *Nonlinear Regression Functions*

   (a) Text 8

11. *Application: Censored and Truncated Regression Model*

   (a) DMu 4

12. *Maximum Likelihood Estimation of Nonlinear Models*

   (a) Text 10

13. *Application: Discrete Choice Analysis*

   (a) DMc 3,4

14. **Examination**

where:


