Economics 581 Professor Hendrik Wolff

Econometrics II Winter 2008

Course Description and Outline

Subject Matter:

This course centers on the use of regression analysis in economics. We will focus on the use of regression and how to avoid its misuse. To oversimplify, we will examine models of the form **y=Xb+e**. We will learn how to estimate the coefficient vector **b**; how to test hypotheses; and how to forecast future values of y based on known values of X. You can get a pretty detailed idea of some of the course material by looking at the tentative outline below.

The course is largely theoretical, though it includes extensive hands-on computer work. The aim of the course is to develop careful, applied, econometricians.

Prerequisites:
This is an advanced course intended to serve as a first econometrics course for economics graduate students. Preparation in probability and statistics at the level of Economics 580 (Statistics 481) is assumed. You should also be comfortable with basic matrix algebra and calculus.
Economics 581 is half of a two quarter sequence which concludes in the Spring quarter with Economics 582. Economics 581 does not attempt to survey econometrics and students who take 581 should under normal circumstances take 582 as well.

Course Requirements:
The required text for the course is:
Econometric Analysis, *6th* edition, by William H. Greene, Prentice-Hall.

Optional, but highly recommended, text:
Introductory Econometrics, 3rd edition ,by Jeffrey M. Wooldridge, Thomson-Southwestern.
Optional, *EViews Illustrated*, by Richard Startz, Quantitative Micro Software.
Peter Kennedy: A Guide to Econometrics, The MIT Press; 5th edition (September 1, 2003)

Software:
Economics 581 (and 582) make use of Matlab and STATA®. Both are available in the graduate computing lab and at CSSCR. Those interested can buy full copies at student prices. Matlab® can be purchased directly from Mathworks at http://www.mathworks.com/products/education/student_version/sc/index.shtml or from the computers and software branch of the U Bookstore. (Note that Matlab use will likely also require the extra cost Statistics Toolbox and Optimization Toolbox.)

Grades:
The course grade will consist of about 4 components: a midterm and final, homework, and a seminar paper. (I reserve the right to retroactively change the grading scheme, in particular by taking class participation into account.) The midterm and final will determine 25% and 30% of your grade respectively while homework will determine 15%. The seminar paper (really a mini-papers) is worth 30%. Students are strongly encouraged to collaborate on the regular homework and computer exercises.

Grading benchmarks (also used in several other first year courses.)

1. A grade of 3.6 or higher indicates that based on this course the student is making good progress toward a PhD.

2. A grade of 3.0-3.5 indicates that based on this course the student is making good progress toward a Masters.

Misc.
In addition to the two weekly class meetings, there will be Friday sessions with the teaching assistant, Katie Lucia.

My office is Condon 422. My phone is 510-220-7961. My email address is hgwolff@u.washington.edu. Katie Lucia's email address is kelucia@u.washington.edu. My official office hours are Mondays 10-10:50, but as a practical matter also feel free to make appointment by email.

Tentative List of Topics Covered

Week	Topics	Readings
1	Introduction, multiple regression, Monte Carlo techniques	G 1-3, (review on your own appendices A-C)
2-4	Distribution of OLS estimates, multicollinearity, Gauss-Markov Theorem *t* and *F* tests, joint hypothesis tests, tests of linear restrictions, measures of fit,	G 4,5
5	Omitted variables, dummy variables, spurious correlation, specification tests Midterm	G 6, 7.1-7.2, 7.4-7.5
6	GLS, heteroskedasticity and autocorrelation	G 8, 19
7-8	Nonlinear regression	G 11
9-10	SUR, panel data, limited dependent variables	G 13, 14, 21

Tentative Goals

1. Multiple regression in the classical case

1.1. Interpreting coefficients as *ceteris paribus* marginal responses.

1.2. Least squares as data-fitting technique

1.3. Least squares parameters as statistical estimators

1.3.1. Derive mean and variance of coeficietn vector **b**.

1.3.2. Understand determinants of variance of **b**

1.3.2.1. 1 RHS variable regression

1.3.2.2. 2 RHS variable regression

1.3.2.3. Multicollinearity

1.3.3. Prove Gauss-Markov theorem

1.4. Hypothesis testing and confidence intervals

1.4.1. Wald, likelihood-ratio, and lagrange multiplier tests

1.4.2. *t*-tests

1.4.3. *F*-tests

1.4.3.1. likelihood-ratio version

1.4.3.2. Wald version

1.4.3.3. Chow test

1.4.4. Confidence intervals and regions

1.4.4.1. 1 RHS variable confidence interval

1.4.4.2. Joint confidence ellipse for 2-RHS variables

1.4.5. Type 1 versus Type 2 error

1.4.6. Size and Power

1.5. Data errors and outliers

1.6. Omitted variables bias

1.7. functional forms

1.7.1. logs and other nonlinear transformations

1.7.2. Dummy variables

1.7.2.1. Fixed effect estimator

2. Generalized least squares

2.1. Known form of heteroskedasticity

2.1.1. Correction of standard errors

2.1.2. GLS estimation

2.2. Serial correlation

2.2.1. testing

2.2.1.1.Durbin-Watson

2.2.1.2.Breusch-Godfrey

2.2.2. estimation

2.2.2.1. Cochrane-Orcutt

2.3. Heteroskedasticity

2.3.1. Models of heteroskedasticity

2.3.2. White correction

2.3.3. Newey-West correction

2.3.4. Cluster Analsyis

2.3.5. Bootstrapping

3. Extensions within the least squares framework

3.1. Seemingly Unrelated Regressions (SUR)

3.2. Panel Data

3.2.1. Fixed effects

4. Nonlinear regression

4.1. Estimation

4.2. Hypothesis tests

5. Maximum Likelihood Estimation (if time permits)

5.1. Estimation

5.2. Hypothesis testing

5.2.1. Likelihood ratio test

5.2.2. Wald test

5.2.3. Lagrange multiplier test

6. Limited Dependent Variable Models

6.1. Probit/Logit

6.2. Tobit

7. Writing skills

7.1. Write short, focused, professional style paper

7.2. Edit someone else's paper and rewrite in response to editing.

8. Computer skills

8.1. STATA

8.2. Matlab

9. Application Examples

9.1. Difference in Difference

9.2. Regression Discontinuity

9.3. Propensity Score/Matching