Course Outline: EC504 Quantitative and Econometric Analysis

Course Lecturer: Jonathan Wadsworth (Autumn Term)
Office: H215A
Office Hours: Wed. 12.30-1.30 Thrs. 4.30-5.30

Aims: This is a course intended to familiarise students with the principal methods of econometric analysis. The emphasis of the course is on applied econometrics and will try to ensure that you are comfortable when reading and evaluating the econometric work of others and that you can also produce good quality applied econometric work of your own.

The first half of the course is designed to ensure a sound understanding of the basics, assuming that you have already completed a core undergraduate course in econometrics. You will be introduced to the principles and assumptions underlying ordinary least squares, the consequences of any departure from these assumptions, how to test for this and what to do about it.

Learning Outcomes: On completion of the Autumn Term students should:

- be able to formulate, estimate, test and interpret suitable models for the empirical study of economic phenomena;
- have acquired the ability to evaluate the performance of alternative econometric models through the appropriate use of tests.
- Be able to demonstrate an ability to apply regression techniques through the use of econometric software.
- Feel confident about reading and interpreting applied economic articles in journals.

Course Delivery: The course will be delivered through two lecture hours and one class hour each week. The lectures will develop the main econometric tools and theoretical arguments.

There will be a weekly problem set that comprises both theoretical and computer based problems. Classes will be devoted to the study of problem sets. Students should try to attempt all problems before their solutions are discussed in class. In order to have any realistic hope of doing well in the examinations, students should attempt to do these problem sets every week.

Knowledge of basic undergraduate econometrics is assumed, as is elementary knowledge of calculus, statistics and matrix algebra.

Assessment: Progress and learning outcomes will be evaluated by:

- a 3-hour unseen examination, taken in the Summer term, which contributes 60% of the final mark. The final exam will comprise 2 compulsory questions (1 from each half of the course) and a choice of 2 from 4 subsequent questions.

- Three one hour tests each comprising 10% of the final course mark. The first test will be toward the end of the first term covering material from the first part of the term. The 2nd test, covering material from the latter half of the Autumn Semester, will be toward the beginning of the Spring term.

- Four computer based assessed pieces of work (in addition to the regular computer based problems in the problem sets), each comprising 2.5% of the final mark. The 1st of these tests is expected to be handed in by the 8th week of the 1st term and the 2nd at the start of the Spring term.

- **Reading:** The primary course textbook, is

  Johnston, Jack and John DiNardo, *Econometric Methods*, 4th Edition, McGraw-Hill, 1997. (JD) **(Library code: 330.0182 JOH)**

It is recommended that students buy a copy of this text which will act as a reference for the entire course (autumn and spring terms).
The alternative, more comprehensive texts

Greene, William, *Econometric Analysis*, 5th Edition, Prentice Hall, 2002. (G)
(Library code: 330.01 GRE)

Wooldridge, J., *Econometric Analysis of Cross Section and Panel Data*, MIT Press, 2001.
(Library code: 330.01 WOO)

Cameron, C. and P. Trivedi, *Microeconometrics*, Cambridge University Press, 2005
(Library code: 330.01 CAM)

Davidson, R. and MacKinnon, J., *Econometric Theory and Methods*, Oxford University Press, 2004
(Library code: 330.01 DAV)

cover more ground in more detail and are useful, (though more technical) alternatives.

Two other good books which contain plenty of empirical examples and which provide lots of worthwhile underlying intuition, (though pitched below the level of this course), are

G. Maddala, *An Introduction to Econometrics*, 3rd Edition, John Wiley 2001

J. Wooldridge, *Introductory Econometrics*, South Western College Press, 2000 **(Library code: 330.01 WOO)**

There is also an edition of the *Journal of Economic Perspectives*, Fall 2001, which is given to a discussion of several practical econometric issues and deals with them in a non-technical way.

Autumn Timetable:

Week 1. Ordinary Least Squares
Learning Objectives: By the end of this week you should be familiar with: Matrix formulation of the regression model; the derivation of OLS estimates; algebra of least squares

Reading: JD ch. 3.1-3.3; G ch. 6.1-6.5, W. Ch. 1, 2. CT ch. 4, DM ch. 1, 2

Week 2. Gauss Markov Theorem and Properties of OLS Estimators
Learning Objectives: By the end of this week you should be familiar with: Properties of least squares estimates;

Reading: JD ch. 3.4; G ch. 6.6, DM ch. 3

Week 3. Hypothesis Testing
Learning Objectives: By the end of this week you should be familiar with: test statistics for model evaluation; Prediction using OLS; statistical properties of estimates

Reading: JD ch. 3,5; G ch. 7.1-7.5 , DM ch. 4

Week 4. Generalised Least Squares
Learning Objectives: By the end of this week you should be familiar with: Consequence of non-spherical residual terms. Alternative estimation strategies

Reading: JD ch. 5.4, 6.1; G ch. 11.1-11.4, 12.1-12.2, DM ch. 7

Week 5. Heteroskedasticty
Learning Objectives: By the end of this week you should be familiar with: Non-constant variance in residuals. Tests for presence. What to do about it. Feasible GLS

Reading: JD ch. 6.2-6.3; G ch. 12.3-12.5

Week 6. Measurement Error and Endogeneity Learning Objectives: By the end of this week you should be familiar with: Causes and consequences of endogeneity Testing for it. What to do about it. Consequences of badly measured right and left hand side variables Endogeneity caused by interdependence between left and right hand side variables. Instruments and Identification.

Reading: JD ch. 5.5, 9.4; G ch. 9.5, 16; Wooldridge Ch. 5, 6, 8 & 9.; CT ch. 6; JEP pp. 57-67

Week 7. Two Stage Least Squares Estimation
Learning Objectives: By the end of this week you should be familiar with the two stage least squares as a solution to the problem of endogeneity.

Reading: JD ch. 5.6, 9.5; G ch. 9.5, 16; Wooldridge Ch. 5, 6, 8 & 9. CT ch. 4.8, 4.9; JEP pp. 57-67, DM ch. 8

Week 8. Combining Cross-Section and Time Series Data (Panel Data)
Learning Objectives: By the end of this week you should be familiar with: How to estimate when there are repeated observations on the same agents over time. Fixed v random effects; Hausman test

Reading: JD ch. 12; G ch. 14, Wooldridge Ch. 10

Week 9. Discrete Dependent Variables
Key Concepts: Estimation when the dependent variable is binary or categorical. Probit, Logit, Poisson estimation

Reading: JD ch. 13; G ch. 21; Wooldridge Ch. 15, CT ch. 14, DM ch. 11

Week 10. Sample Selection Problem Models
Key Concepts: Sample selection Problem. Heckman two step correction. Tobit Model

Reading: JD ch. 13; G ch. 21; Wooldridge Ch. 17, CT ch. 16. , DM ch. 11.7