Course Outline: Quantitative Methods II (Ec2203) - Econometrics

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Aims
Much of the economics you have seen so far and will continue to study this year consists of theoretical models. Economics, however, is more than that. Many economists look at the real world and analyse data to learn how the world works. The first half of the course is intended to provide you with a solid understanding and practical experience of the essentials of empirical research techniques (ie econometrics) used by applied economists.

Learning Outcomes
By the end of this term, students should be able to:

- use, understand and distinguish between standard econometric techniques
- be able to do formal statistical tests of economic hypotheses
- manipulate and analyse data sets and conduct their own econometric investigations, both written and using computer software.

Course Delivery
There will be two, hourly lectures and a one hour class each week.

The lectures will combine discussion of econometric theory along with demonstrative use of the econometrics package Stata to enable students to understand the practical art of econometrics as well as the basic theory.

There will be a handout to accompany each lecture which will cover the basic materials. Students are expected to take notes to supplement these handouts during lectures and after (by consulting the relevant pages in the course texts).

The course is very much an 'applied hands-on' econometrics full of real world data and practical examples. Students who do not attend lectures or classes and who do not attempt problem sets will find this course very difficult.

Problem Sets
One problem set will be given out and discussed each week which will involve both written questions and computer-based exercises. To have any hope of doing well in the end of year examination and the dissertation all these problem sets should be attempted. Students should bring written answers to the class to be discussed by the class teacher. Students will be allowed to retain their work so that they can add comments and rectify errors during the discussion. There will not be time to discuss all the answers to every question in the problems sets. Students will be expected to work through the answers to those questions not covered in classes in their own time.
To facilitate this, answers to the problems sets – along with lecture handouts and data sets - will be posted (with a lag) on the course Moodle page http://moodle.rhul.ac.uk/ and on the course website http://personal.rhul.ac.uk/uhte/006/ec2203/index2.html

**Computer Exercises**

To really understand econometrics and empirical work, you need to have experience of doing it yourself. Most of the problem sets assigned during term will include questions requiring use of real world data sets and use of the Stata regression package. Detailed instructions for using the package will be included in a separate handout and in the problem sets. The seminars will take place in the computer labs. So you will have plenty of opportunity for practice.

**Assessment**

70% of the course grade will come from an examination taken during the summer term. The exam will test your knowledge of and understanding of the material covered in both parts of the course and your ability to manipulate and solve related problems.

Assessment comprises an Econometrics project (based on material covered in the Autumn term) to be handed in early in the Spring term. Students will have to devise their own econometric project, find data and present estimation results - to be completed by the beginning of the Spring term. More details about the project will also be given in a separate handout in the Autumn term.

The project carries a weight of 20%.

There will also be one assessed online test each term. Each online test carries a weight of 5%.

You will receive standardised feedback on your project and test.

Test and project hand-in dates can be found in the student handbook and reminders will be provided in Moodle.

**Reading**

The course text, which you should probably buy (though there are several copies in the library) is


The lecture will not follow the text page by page, but the book is a useful companion to the lecture notes you will be provided with.

Other useful texts are


(the last two are probably pitched just above the overall level of this course, they are more comprehensive and contain lots of useful intuition and worked examples).

The lectures and associated classes will not cover basic statistical issues like expected values, covariances, the normal distribution, hypothesis testing or confidence intervals. It is assumed that you have a good knowledge of these topics from last year. If you need to revise them,


is a good source.

Time permitting, the course will go over the following areas.

**Weeks 1-2. Simple Regression Analysis**
Simple regression model; derivation of linear regression equation; goodness of fit.

Aims: know the formulae for the regression coefficients and understand the principle underlying how they are derived; know the definition of $R^2$ and how it is related to the residual sum of squares

**Weeks 3-4: Properties of Regression coefficients**
Gauss-Markov conditions and unbiasedness of the regression coefficients; precision of the regression coefficients; Gauss-Markov theorem; t test of a hypothesis relating to a regression coefficient; Type I error and Type II error; confidence intervals; F test of goodness of fit.

Aims: How to interpret a regression coefficient; how to investigate whether or not estimators are biased;

**Week 5. Multiple Regression Analysis**
Regression with 2 explanatory variables; properties of multiple regression; Hypothesis testing

Aims: To be able to perform F tests, Chow tests, give economic interpretation of estimated coefficients.
**Week 6. Specification of Regression Equations**
Functional form; F tests in multiple regression model; transformation of variables elasticities; dummy variables; omitted variable bias.

Aims: know tests for omitted variables, functional form

**Week 7. Endogeneity**
Definition and consequences of endogeneity; simultaneous equation systems; measurement error; tests for endogeneity; instrumental variable estimation as a solution to problem

Aims: Demonstrate consistency of IV estimation and perform relevant tests.

**Week 8. Autocorrelation**
Definition and consequences; tests for AR(1) autocorrelation; autocorrelation with lagged dependent variable

Aims: to be able to perform tests and be aware of possible solutions to autocorrelation.

**Week 9. Models using Time Series Data and Non-Stationary Processes**
Dynamic models; short and long-run coefficients; partial adjustment predictions; stationary and non-stationary processes; cointegration

Aims: to analyse short and long-run implications of dynamic models; to determine whether a time series is stationary; to understand the principles behind the unit root test

**Week 10 Heteroskedasticity**
Meaning and consequences of heteroskedasticity. Tests for heteroskedasticity

Aims: How to undertake tests for heteroskedasticity.

**Week 10. Panel Data**
The idea of panel data. Fixed Effects and Random effects.
Aims: To have a simple appreciation of panel models.