Lancaster University Management School

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statistics | econometrics | forecasting

DEPARTMENT OF ECONOMICS

Econ 603: Microeconometrics and Panel Data Econometrics

COURSE AIMS & OBJECTIVES, KEY SKILLS AND LEARNING OUTCOMES

Course Aims & Objectives: The purpose of this course is to provide students with an in-depth understanding of panel data econometrics, presented from a microeconometric perspective. The course will cover linear panel data models with unobserved heterogeneity, including discussions of the strengths and weakness of the various estimation methods. In addition to the basic methods, more advance models – such as those with heterogeneous trends – will be covered. In addition, we will study how to use panel data to evaluate interventions, including difference-in-difference and staggered designs. The powerful method of combining instrumental variables and panel data will be covered in some detail, including applications to dynamic models and other situations where strict exogeneity fails.

Key Skills: By the end of this course, students should have some knowledge and understanding of:

- Static panel models, random effects, fixed effects, first differencing estimators
- Instrumental variables estimation of models without strictly exogenous explanatory variables
- Dynamic panel models, Arellano Bond and Arellano Blundell Bond estimators
- Estimation of linear models with heterogeneous trends and heterogeneous slopes
- Unbalanced panels, how to test for sample selection and attrition bias.

Desired Outcomes: By the end of this course, students should be able to:

- Engage in abstract thinking by extracting the essential features of complex systems to facilitate problem solving and decision-making
- Communicate and present complex arguments in oral and written form with clarity and succinctness
- Present, interpret and analyse information in numerical form
- Utilise effectively statistical and other packages
- Apply basic statistical techniques to analyse economic and financial datasets
- Work effectively both individually and within a team environment.

COURSE STRUCTURE

Econ 603 is a core 20-credit course, and therefore students are expected to input approximately 200 hours of study into the course. The total number of contact hours on Econ 603 is 25 hours. This leaves 175 hours for private study. Course Delivery comes in the form of lectures (five days consisting of two-hour lectures twice a

day), a one-hour tutorial (one each week for five weeks). There will be optional clinics on the last day of the course.

During your private study you should strike a balance between reading the course material (which is the primary source of information) and the recommended textbooks, thinking critically about how these fit in to the body of knowledge on the subject and about how our level of knowledge can be improved, performing exercises, completing coursework and revising for examinations. You can expect to perform well on this course only if you work consistently through the year.

LECTURES

Two two-hour lectures per day once a week, plus a weekly one-hour tutorial.

COURSE CONVENOR

Professor Jeff Wooldridge

LECTURER AND TUTOR CONTACT INFORMATION

Email: wooldri1@msu.edu

Available by appointment (please email to arrange a convenient time)

ADMINISTRATIVE SUPPORT STAFF

Emma Fitchett email: e.fitchett@lancaster.ac.uk Tel: 01524 594228

The Administrative Staff are your primary point of contact for all administrative matters concerning Economics courses. Most matters can be resolved with a single face-to-face meeting. You may also contact the Economics Department Office via email.

Office Hours: Mon-Fri, 9:30-11:30 and 14:00-16:00, room MS B34

Please email the Administrative Support Staff if you are unable to attend during office hours to arrange an appointment.

Please note: The course website on MOODLE is the primary means of communication with students. Also any emails will be sent to your Lancaster email account which you should check regularly.

MOODLE INFORMATION

Course website via MOODLE: https://mle.lancs.ac.uk/course. Login using your regular Lancaster University access details. This opens a page headed MLE: My home.

ATTENDANCE AND LECTURE INFORMATION

Attendance is monitored by class register at all compulsory classes i.e. tutorials, lecture seminars, computer laboratory sessions and workshops. Absences are recorded electronically against an individual's record. It is the responsibility of each student to ensure that their attendances are correctly recorded both in class and electronically. Students must report all absences (illness or otherwise) using the online self certification system http://mylusi.lancs.ac.uk/StudentInfo/ then click on absence notification). In cases where illness is causing you to miss a coursework element or for an illness causing you to miss a continued number of classes, you are required to provide medical confirmation after consultation with a doctor/GP whilst ensuring that you still

maintain your attendance record in the self certification system. Equally, we may feel it necessary to request that you provide additional documentation to support the reasons you have entered on the self certification system for your absence(s). Students who are absent without explanation will be recorded as an unauthorised absence and this will be reported to the appropriate Director of Studies, who decides whether disciplinary measures need to be taken. Persistent failure to attend without explanation will lead to referral to the Standing Academic Committee and the risk of permanent exclusion from the University. Please note that the University teaching day runs until 20:00 hours. If you have any event timetabled up to and including this you should not make any travel arrangements that involve you leaving Lancaster before this time, in particular on the last day of term.

TIMETABLE INFORMATION

For timetable information for this module please refer to http://timetabling.lancaster.ac.uk/AcademicTimetable/Default.aspx , using your Lancaster University username and password to login, then follow the link 'Timetables 2021/22': Students'. We advise that you check the online timetable regularly as timings and venues for lectures, tutorials, seminars, workshops, clinics, tests etc. can be changed at short notice from time to time. Please note that the University teaching day runs until 20:00 hours. If you have any event timetabled up to and including this you should not make any travel arrangements that involve you leaving Lancaster before this time, in particular on the last day of term.

COURSEWORK ASSESSMENT

The CWA mark will be calculated as 100% coursework. The coursework will be assigned at the beginning of the module.

Term 2: The coursework will be delivered to students at the end of week 6 of each term and is due for submission at the end of week 10, allowing students 4 weeks for completion.

For the times and venues of the test please consult your timetable. It is advised to check this regularly especially prior to the test in case there are any changes.

What should I do if I am too ill to attend a coursework test?

If you find that you are too ill to take a test, you must follow the procedures below:

• inform the Undergraduate Secretary (ex 94226) that you will not be attending the test.

• see a doctor at the Health Centre (not the nurses' unit) either before or on the day of the test to obtain medical evidence to support your absence. Please note you will be required to pay a charge of £16. Medical evidence dated after the test cannot be accepted.

• if the department is not informed of the reasons for any failure to produce coursework, a mark of zero is awarded.

COURSEWORK RETURN INFORMATION

The coursework will be marked and returned to students within 4 weeks of the submission deadline.

MARKING CRITERIA AND PENALTIES

Marking criteria can be found on pages 20-21 of the Economics Undergraduate Handbook. An electronic copy of this can be found on the Econ Part 1 and Econ Part 2 Moodle pages.

FINAL MARKING INFORMATION

This course is assessed by means of coursework, and the final mark for the course is assigned as the coursework mark.

RESEARCH ETHICS

In the event that your coursework involves collecting information from or conducting interviews with individuals you should be aware of the following LUMS research ethics code of conduct. You will need to sign on the coursework submission form that you have followed these guidelines

CODE OF CONDUCT

These are the principles of the LUMS Code of Conduct:

1. Students will agree to conduct empirical research involving human participants in line with the University ethical research guidelines: http://www.lancs.ac.uk/depts/research/lancaster/ethics.html.

2. Students will normally ensure that participation in their research activities is based on informed consent.

3. Students will be honest in all their relationships with research participants.

4. Students will be transparent as to the context and purpose of data collection.

5. Students will respect the confidentiality of information collected in their research activities.

6. Students shall respect the rights and well-being of all individuals and organisations affected by their research.

7. Students will ensure that respondents are not harmed or adversely affected by their research activities.

8. Students will respect the needs of participating individuals and/or organisations and the requirements of the University in meeting their academic requirements.

9. Students will discuss the research, design, and its operationalisation with their supervisors/module tutors, prior to conducting the research, to ensure that the above principles are adequately considered.

STUDENT FEEDBACK

At the end of the course students will be given the opportunity to provide feedback on the course. This is done through an online questionnaire using the Questionmark Perception software. Students will be notified via email during the course as to when the questionnaires will be available. This feedback is extremely valuable to the University as it enables us to identify areas of strength and weakness so that we can improve the course in the future. You are strongly advised to complete this questionnaire for every course that you take at Lancaster University.

COURSE TEXT AND RECOMMENDED READING

Main Texts

- Jeffrey M. Wooldridge (2010). Econometric Analysis of Cross Section and Panel Data, 2nd Edition. The MIT Press

Students should purchase a copy of this book. For the computer labs you will also need:

W E Griffiths, R C Hill and G C Lim, *Using Stata for Principles of Econometrics*, Wiley. 5th Edition. This supplementary book presents the Stata (www.stata.com) software commands required for the examples in Principles of Econometrics, 5th Edition in a clear and concise way. It contains many illustrations that are student friendly. It is useful not only for students and instructors who will be using this software as part of their econometrics course, but also for those who wish to learn how to use Stata.

The two books are available in the campus bookshop and also on the library online resources.

https://www-dawsonera-com.ezproxy.lancs.ac.uk/abstract/9781119463245

Students may also find the following useful as further reading. The first is a treatment of some of the material at a lower level. The second is a survey of many of the panel data methods that will discussed in the class.

- J.M. Wooldridge (2019) *Introductory Econometrics: A Modern Approach*, CENGAGE Learning Custom Publishing; 7th edition.
- J.M. Wooldridge (2011), "Econometrics: Panel Data Methods," in *Complex Systems in Finance and Econometrics.* Roberts Meyers (ed.), 215-237. Heidelberg, Germany: Springer.

Note Copies of the lecture slides will be made available on the course web pages. You **MUST** print off the notes for each lecture **prior to** attending. Solutions to exercises, and some additional material associated with these lectures and course announcements will also be placed on this website.

COURSE OUTLINE/LECTURE SCHEDULE

Each two-hour lecture will include a 15-minute break at about the one hour mark, and then another 15-minute break before the next lecture begins.

Day 1: Background and Review

Lecture 1: Overview of Ordinary Least Squares with Cross-Sectional Data (2 hours)

- Motivation for OLS: Applications of Conditional Means
- Approximating Properties of the Linear Projection
- Asymptotic Properties of OLS. Inference
- Practical Issues in Using OLS: Functional Form, Goodness-of-Fit

Lecture 2: Overview of Instrumental Variables with Cross-Sectional Data (2 hours)

- Motivation for Instrumental Variables
- Asymptotic Properties of Two Stage Least Squares (2SLS)
- Specification Tests. Control Function Methods
- Weak Instruments
- Optimal Instruments
- Models Nonlinear in Endogenous Explanatory Variables

Day 2: Linear Panel Data Models with Strictly Exogenous Explanatory Variables

Lecture 3: The Unobserved Effects Model and Basic Estimators (2 hours)

- The Unobserved Effects Linear Model
- Assumptions for the Linear Model
- Estimation Methods: Pooled OLS, Random Effects, Fixed Effects, First Differencing

Lecture 4: Specification Tests and Choosing among Estimators (2 hours)

- POLS versus RE and FE
- Comparing RE and FE. Correlated Random Effects
- Comparing FE and FD

Day 3: Heterogeneous Trends; Intervention Analysis; Unbalanced Panels; Large-T Panels

Lecture 5: Heterogeneous Trends. Difference-in-Differences and Staggered Designs (2 hours)

- Heterogeneous Trend Models
- Basic Difference-in-Differences
- Adding Pre-Treatment Periods
- Many Time Periods
- Staggered Interventions

Lecture 6: Unbalanced Panels. Large-T Panels. Cross-Sectional Dependence (2 hours)

- The Nature of Unbalanced Panels
- Properties of Basic Estimators with Unbalanced Panels
- Tests of Selection Bias with Unbalanced Panels
- Inference with Large-T Panels and Cross-Sectional Correlation
- Spatial Correlation

Day 4: Instrumental Variables Methods with Panel Data

Lecture 7: Pooled 2SLS, RE 2SLS, and FE 2SLS (2 hours)

- Idiosyncratic Endogeneity versus Heterogeneity Exogeneity
- Definition and Properties of the Estimators
- Specification Tests: Endogeneity and Overidentification

Lecture 8: First-Differencing IV Approaches (2 hours)

- The General FDIV Approach
- Estimation in Models Under Sequential Exogeneity: The Arellano-Bond Approach
- Adding Extra Moment Conditions: Arellano-Bover/ Blundell–Bond
- Estimating Dynamic Models

Day 5: Nonlinear Panel Data Models

Lecture 9: Nonlinear Models under Strict Exogeneity (2 hours)

- Linear versus Nonlinear Models
- Including Heterogeneity in Nonlinear Models and Estimation Approaches

- Quantities of Interest: Average Partial Effects
- Binary Response Models
- Fractional Response Models
- Exponential Models for Panel Data
- Random Effects Poisson Estimation
- Fixed Effects Poisson Estimation

Lecture 10: Nonlinear Models under Endogenous Explanatory Variables (2 hours)

- Endogeneity in Nonlinear Models
- Combining the CRE and Control Functional Approaches
- A Probit Response Function: Binary and Fractional Outcomes
- An Exponential Response Function