EKT 814 Panel Data Econometrics
Department of Economics
2021

Feb 3, 2021

1 Introduction

This is a postgraduate course in econometrics which draws on the knowledge acquired in previous time-series and cross-section econometric courses that you have done. It also requires a reasonably good knowledge of matrix algebra.

2 Lecture time

This module will be offered through a blended approach. We are scheduled to meet on campus (in Tukkiewerf 1-37) on Wednesday afternoons at 16:30. The possibility exists, however, that we will initially start online with virtual classes facilitated through Blackboard Collaborate sessions. Whether we will meet on campus or online, reading and narrated lecture materials will be made available weekly, and class time/online sessions will mostly be used for practical application of theory and discussion of problems. **Please follow announcements on ClickUP to stay informed on course activities.**

3 Instructors

Prof. Reneé van Eyden, Tukkiewerf 1-11, renee.vaneyden@up.ac.za; online consultation by appointment.
Dr. Matthew Clance, Tukkiewerf 2-09, matthew.clance@up.ac.za; online consultation by appointment.

4 Description of course

In this course "panel data" refers to the pooling of observations on a cross-section of countries, households, firms, individuals, etc. over a number of time periods. Panel data often allows for more informative results, more variability, more degrees of freedom and more efficiency. The course covers techniques applicable to both stationary and non-stationary panel data sets and static and dynamic model specifications.

We begin the discussion with the static linear model in a panel data setting. We start with the fixed effects (FE) model and pay attention to the least squares dummy variable (LSDV) estimator and the within transformation (within estimator). As an alternative way to eliminate the individual effects, we look at the first-difference (FD) estimator and the difference-in-difference estimator. We distinguish between one-way and two-way error component models. Relevant hypothesis testing includes testing for the validity of fixed effects, i.e. pooling of slope and intercept coefficients vs only pooling the slopes (Baltagi, Chapters 1, 2).

We continue the discussion by assuming a case where individual effects can be considered random factors, independently and identically distributed over cross-sections, i.e. the random effects (RE or EGLS)

estimator (Baltagi, Chapters 2, 3). We also discuss choosing between FE and RE. Relevant hypothesis testing includes testing the validity of random effects and the Hausman specification (endogeneity) test (Baltagi, Chapter 4). We also consider tests for heteroscedasticity and serial correlation in panel data models; testing for it and the correction thereof (Baltagi, Chapter 5).

The next topic is simultaneous equations with error components: we consider endogeneity of regressors; Instrumental variable (IV) estimation (Within 2SLS, Between 2SLS, Error component 2SLS, Generalized 2SLS); Endogeneity occurring through the unobserved individual effects; and Hausman and Taylor estimator (Wooldridge, Chapters 4, 5, 8, 9).

Next, we focus on limited dependent variable (LDV) models, a selection of the most used estimators from this class of models will be highlighted (Wooldridge, Ch 13, 15, 16, 17, 18).

The above is followed by dynamic panel data models (Baltagi, Chapter 8). We cover dynamic relationships and sources of persistence; Nickell (1981) bias and corrections; Arellano and Bond (1991) DIF-GMM estimator; Arellano and Bover (1995) estimator; Blundell and Bond (1998) SYS-GMM estimator; and Keane and Runkle (1992) estimator.

We next revisit panel heterogeneity, also paying attention to cross-sectional dependence (Lecture Notes). We consider models that extend heterogeneity in intercept coefficients to heterogeneity in slope coefficients, including the Mean Group (MG) estimator of Pesaran and Smith (1995); Pooled Mean Group (PMG) estimator of Persaran and Smith (1997, 1999); Swamy's (1970) Random Coefficient (RC) estimator; and Zellner's (1962) Seemingly Unrelated Regression (SUR) estimator. We also consider cross-section (between-group) dependence: SUR and Pesaran's (2006) Common Correlated Effects (CCE) estimator.

We conclude the course with a discussion on non-stationarity in panels (Baltagi, Ch 12), focussing on panel unit root tests assuming cross-section independence and panel unit root tests assuming cross-sectional dependence. We also discuss the concept of spurious regressions in panel data and panel cointegration tests. We conclude this section with a discussion on estimation and inference in panel cointegration models.

5 Assessment

Assessment is done via assignments, a semester test on 21 April, and the final exam. Assessment components will contribute to the final mark according to weight structure below:

1. Practical assignments (0.25)
2. Semester test, 21 April (0.25)
3. Exam during June, date to be confirmed (0.50)

6 Software

The software of choice is Stata, with Stata 16 the latest version available in the computer labs on campus. Arrangements for remote access to software will be communicated. Using R for practical assignments is also acceptable.

7 Topic overview of the course

Stationary Panel Data

1. Introduction
2. One-way error component models
3. Two-way error component models
4. Hypothesis testing

IV and Dynamic Panel Data

1. Instrumental variables
2. Dynamic panel data models

LDV models

1. Limited dependent variable models

Panel Heterogeneity revisited

1. Heterogeneity in slope coefficients
2. Cross-sectional dependence

Non-Stationary Panel Data

1. Overview of the issues
2. Unit root tests
3. Estimation with non-stationary time series
4. Cointegration tests

8 References

1. Arellano, M. *Panel Data Econometrics,* Oxford; Oxford University Press, 2003.
2. Baltagi, B.H. *Econometric Analysis of Panel Data.* 5th Edition. Chichester: John Wiley and Sons, 2013.
3. Hsiao, C. *Analysis of Panel Data.* Cambridge: Cambridge University Press, 2003.
4. Wooldridge, J.M. *Econometric Analysis of Cross Section and Panel Data.* Cambridge, MA: MIT Press, 2002.
5. Wooldridge, J.M. *Introductory Econometrics. A Modern Approach.* 2nd Edition. Thomas Learning, 2009.
6. Selected journal articles (Refer to references in course material).
7. Lecture notes.

The Baltagi and Wooldridge texts will be our principal references. Each unit in the lecture notes contains references to applied work in academic journals. A reading list also accompanies practical assignments.

9 Lecture schedule

	Date*	Scope and principal textbook source
1	3 March	Introduction, One-way error component models (Baltagi, Ch 1,2)
2	10 March	One-way error component models (cont.); two-way error-component models (Baltagi, Ch 2,3)
3	17 March	Two-way error component models (cont.) (Baltagi, Ch 3)
4	24 March	Article discussion; Practical Application
5	31 March	Hypothesis testing: Poolability, endogeneity (Baltagi, Ch 4)
6	7 April	Instrumental variables (Wooldridge, Ch 4, 5, 8, 9)
7	14 April	Limited dependent variable models (Wooldridge, Ch 13, 15, 16, 17, 18)
	21 April	**Semester test (Scope and format to be announced)**
8	5 May	Dynamic panel techniques (Baltagi Ch 8)
	12 May	*Recess*
9	19 May	Panel heterogeneity revisited; Cross-sectional dependence
10	26 May	Hypothesis testing: Serial Correlation and Heteroscedasticity (Baltagi, Ch 5)
11	2 June	Panel Time Series: unit root tests (Baltagi, Ch 12)
12	9 June	Panel cointegration (Baltagi, Ch 12)

* Dr. Clance: 7, 14 April; Prof. Van Eyden: other dates.

On Wednesday, 28 April, we follow a Monday timetable, so no EKT 814 class.