

# PANEL DATA ECONOMETRICS

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## Outline

Panel data are omnipresent in economics. They come with many advantages: the resulting larger data sets enable more precise inference, observing individuals/firms/countries at multiple points in time allows to model and estimate dynamic responses to changes in variables of interest over time, and they can overcome some endogeneity concerns and hence contribute to a convincing identification strategy.

Naturally, adding time as a second dimension to the data does not come without challenges. The aim of the course is to both make the advantages of panel data clear and equip students with the tools and technical understanding to make use of their potential. Starting from the linear one- and two-way error component models, we will venture into different advanced challenges in panel econometrics, including dynamic, unbalanced, and non-linear panel models. In accompanying computer sessions, we will implement and use some of the estimators ourselves in the statistical software R.

The main accompanying textbook is "Econometric Analysis of Panel Data" (5th edition) by Badi Baltagi. Additional references will be provided in the lecture.

The course will be held online via Zoom on Thursdays from 10 to 12. The Zoom link will be shared with all participants before the first lecture, which will take place on April 15th, 2021.

## Target Groups

The course is offered for both master students of “Economics Policy and Quantitative Methods” at the University of Potsdam and for PhD students at the Berlin School of Economics. The content will be distinguished into components for all participants and additional, more advanced, components for PhD students only. Other interested students with sufficient previous econometric knowledge are also welcome in the course.

## Prerequisites

Previous knowledge at the level of a master’s course in advanced econometrics is expected.

## Structure

The course will cover the following topics. Items printed in italics are components of the course that are specifically offered for PhD students and are not part of the exam taken by the master students.

1. The One-Way Error Component Regression Model

- 1.1. Fixed Effects (FE)

- 1.2. Random Effects

Computer: Implement the Fixed and Random Effects Estimators

2. The Two-Way Error Component Regression Model

- 2.1. Fixed Effects

2.2. *Pseudo-Panels, Multi-Way and High-Dimensional Fixed Effects*

Computer: Implement the Two-Way FE Estimator

*Computer: Estimate a High-Dimensional FE specification*

3. Heteroskedasticity and Serial Correlation in the Error Component Model

3.1. Heteroskedasticity

3.2. Serial Correlation

Computer: Implement Robust Variance Estimators

4. *Unbalanced Panel Data Models*

*Computer: Implement Unbalanced Fixed Effects Estimator*

5. Dynamic Panel Models

5.1. The Anderson/Hsiao IV Estimator

5.2. Dynamic Panel GMM Estimators

5.3. *Bias-Corrected Estimators*

5.3.1. *Split-Panel Corrections*

5.3.2. *Analytical Corrections*

Computer: Implement Anderson/Hsiao Estimator

*Computer: Estimate Difference and System GMM specifications*

*Computer: Estimate Dynamic Specifications Using Bias Corrections*

6. Limited Dependent Variables and Panel Data

6.1. Fixed and Random Effects Logit and Probit Models

6.2. Poisson Models for Panel Data

6.3. *Dynamic Panel Data Limited Dependent Variable Models*

6.4. *Non-Linear High-Dimensional Fixed Effects Models (HDFE)*

Computer: Estimate Panel Binary Choice Specifications

*Computer: Estimate Dynamic Binary Choice Models with HDFE*

## **Coursework**

The course will be assessed based on a 90 minute exam which will contain both a theory and a computer part. There will be the additional opportunity to gain bonus points for the exam by completing optional computer exercises during the term. For PhD students, there will be an additional take-home exam component assessing the parts of the course that are additionally offered for the PhD level.

## **Registration**

Master students at the University of Potsdam have to register for the course via PULS. PhD students from the BSE can register by writing an email to [joschka.wanner@uni-potsdam.de](mailto:joschka.wanner@uni-potsdam.de) before April 12th, 2021.