TRAINING COURSE | ONLINE

DYNAMIC PANEL DATA ANALYSIS

16-17, 20-21, 23-24 May 2024

Dynamic Panel Data (DPD) are of interest in a wide range of economics, financial and social models. Consequently, DPD analysis has become increasingly popular due to its ability to take into account both short and long term effects and unobserved heterogeneity across economic agents in the estimation of the model parameters.

This course provides a rigorous overview of existing DPD techniques, thus offering students the opportunity to acquire the more advanced technical capabilities currently available for panel data analysis. Students are provided with a theoretical and applied overview of Instrumental Variable analysis (IV) and Generalized Methods of Moments (GMM), both of which being an important class of estimators for DPD models. The course then turns to address more recent issues in DPD analysis, such as weak instruments with persistent data; instrument proliferation; gaps in the data; estimation with serially correlated errors; robust inference with multiway clustering; maximum likelihood DPD models; sample selection, tests and corrections, and the Monte Carlo evaluation of the finite-sample performance of estimators and tests. The course concludes by addressing the issues of; i) non-stationarity in long panels, where the time series (as opposed to cross-sectional) characteristics of the data dominate; and ii) panel cointegration.

Lectures consist of theoretical sessions (in which the techniques and underlying principles are explained), supplemented by hands-on segments in *Stata*, during which participants have the opportunity to implement the techniques using real-world or simulated data and to replicate some of the results in published articles.

During the course, particular attention is paid (using a combination of both official *Stata* and community written dynamic panel data analysis commands) to: i) evaluating which specific econometric methodology/specification is the more appropriate for the analysis in hand; ii) the selection of appropriate instruments; iii) rigorous post-estimation diagnostic/specification testing; and iv) the problems of inference resulting from weak instrument bias, instrument-proliferation bias and small-sample bias. Special attention is also given to the interpretation and presentation of results.

In common with TStat's training philosophy, each session is composed of both a theoretical component (in which the techniques and underlying principles behind them are explained) and an applied (hands-on) segment, during which participants have the opportunity to implement the techniques using real data under the watchful eye of the course tutor. Throughout the course, theoretical sessions are reinforced using applied case studies, in which the course tutor discusses and highlights potential pitfalls and the advantages of individual techniques.

COURSE CODE

D-EF24-OL

DATE AND LOCATION

The 2024 edition of this training course will be offered online on a part-time basis on the 16th-17th, 20th-21st, 23rd-24th of May from 10:00 am to 1:30 pm Central European Summer Time (CEST).

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At the end of the course, it is expected that participants are able, with the aid of the *Stata* routines implemented during the sessions, to independently implement the methodologies and techniques acquired during the course in their own particular research needs.

TARGET AUDIENCE

Our DPD Analysis course is of particular interest to Ph.D. students, researchers in public and private research centres, and professionals working in the following fields: Agricultural Economics, Economics, Finance, Management, Public Health, and the Political and Social Sciences, wishing to acquire the necessary applied and theoretical skills in order to be able to independently conduct applied empirical research on DPD.

PREREQUISITES

It is assumed that delegates have an introductory knowledge of panel data analysis. More specifically, that they are familiar with:

- the arguments covered in our *Linear Panel Data in Stata* course;
- Instrumental Variables and General Method of Moments estimation techniques; and
- the statistical software *Stata*: including familiarity with *Stata* variable creation commands and *Stata do files*.

Those needing to refresh these concepts are referred to:

- Cameron, A. C. & Trivedi, P. K. (2022). *Microeconometrics Using Stata, Volume I: Cross-Sectional and Panel Regression Methods.* Second Edition. Chapters 1-9.

PROGRAM

SESSION I: PRELIMINARIES AND SIMPLE ESTIMATORS

1. The Dynamic Panel Data (DPD) Model
   - Assumptions
   - Inconsistency of basic panel data estimators
   - Monte Carlo evaluation of the bias
2. Consistent IV estimators
   - Anderson and Hsiao (AH) estimators
   - *Stata* implementation of AH using ***ivregress 2sls***

SESSION II: OPTIMAL DIFFERENCE GMM ESTIMATORS (ARELLANO AND BOND, 1991)

1. Arellano and Bond (AB) Difference GMM estimators
   - Moment conditions, GMM criterion function and specification tests
2. Three *Stata* commands for AB: ***xtabond, xtdpd, xtabond2*** (Roodman, 2009a)
   - The AR(1) model
   - Higher order AR models
   - Specifying exogenous covariates
   - Specifying predetermined covariates
   - Specifying predetermined covariates and their lags: weak and strict rules in *Stata*

- Specifying endogenous covariates
- One-step and two-step estimators
- The Windmeijer's correction of two-step standard errors

3. Specification tests:
   - AB autocorrelation tests
   - Hansen-Sargan overidentifying-restriction tests
   - Difference-in-Hansen tests for testing subsets of instruments
4. Replicating AB (1991) in *Stata*

SESSION III: OPTIMAL SYSTEM GMM ESTIMATORS (BLUNDELL AND BOND, 1998)

1. The Blundell and Bond (BB) System GMM estimator as a solution to weak instruments with highly persistent series
2. *Stata* implementation of the system estimator using ***xtdpdsys, xtdpd, xtabond2***
   - AR(1) and higher-order AR models with exogenous, predetermined and endogenous covariates
   - Specification tests
3. Replicating BB (1998) in *Stata*

SESSION IV: FURTHER TOPICS IN DPD

1. Reducing the instrument count
   - Instrument proliferation: detection and solutions with ***xtabond2*** (Roodman, 2009a and 2009b)
   - Autocorrelation of errors in the level equation
2. Forward orthogonal deviations as an alternative to first-differencing
3. Sample selection in DPD
   - Ignorability of selection (al Saldon, Jimenez Martin, Labeaga, 2019)
   - Testing and correcting for selection (Semykina and Wooldridge, 2013)
4. Bias corrected LSDV in DPD
   - Approximations of the LSDV bias (Kiviet, 1995; Bruno 2005a)
   - Application in *Stata* through ***xtlsdvc*** (Bruno 2005b)
5. Maximum likelihood DPD
   - ML DPD models through ***xtdpdml*** (Williams, Allison, Moral-Benito 2018)
   - The cross-lagged panel data model

SESSION V: NON-STATIONARY PANELS (BALTAGI 2013, PESARAN 2015)

1. Panel unit-root tests
   - First-generation unit-root tests (neglecting cross-sectional dependency)
   - Testing unit-root through DPD estimators
   - Testing cross-sectional dependence
   - Second-generation unit-root tests (accommodating cross-sectional dependence)
   - Applications in *Stata*
2. Panel cointegration
   - Cointegration tests
   - Estimation and inference in cointegrated models with heterogeneous panels
   - Applications in *Stata*

SUGGESTED READINGS

- Al Sadoon, M., Jiménez-Martín, S. & Labeaga, J. M. (2019). *Simple methods for consistent estimation of dynamic panel data sample selection models*. W. P. no 1631, Universitat Pompeu Fabra, Department of Economics and Business.
- Arellano, M. & Bond, S. (1991). *Some tests of specification for panel data: Monte Carlo evidence and an application to employment equations*. Review of Economic Studies, 58:277–297.
- Baltagi, B. H. (2013). *Econometric Analysis of Panel Data*. New York: Wiley.
- Blundell, R. & Bond, S. (1998). *Initial conditions and moment restrictions in dynamic panel data models*. Journal of Econometrics, 87:115–143.
- Bruno, G. S. F. (2005a). *Approximating the bias of the lsdv estimator for dynamic unbalanced panel data models*. Economics Letters, 87:361–366.
- Bruno, G. S. F. (2005b). *Estimation and inference in dynamic unbalanced panel data models with a small number of individuals*. The Stata Journal, 5:473–00.
- Kiviet, J. F. (1995). *On bias, inconsistency and efficiency of various estimators in dynamic panel data models*. Journal of Econometrics, 68:53–78.
- Pesaran, M. H. (2015). *Time Series and Panel Data Econometrics*. Oxford: Oxford University Press.
- Roodman, D. M. (2009a). *How to do **xtabond2**: An introduction to difference and system gmm in Stata*. The Stata Journal, 9(1):86–136.
- Roodman, D. M. (2009b). *A note on the theme of too many instruments*. Oxford Bulletin of Economics and Statistics, 71(1):135–157.
- Semykina, A. & Wooldridge, J. M. (2013). *Estimation of dynamic panel data models with sample selection*. Journal of Applied Econometrics, 28:47–61.
- Williams, R. Allison, P. D. & Moral-Benito, E. (2018). *Linear dynamic panel-data estimation using maximum likelihood and structural equation modeling*. The Stata Journal, 18:293-326.
- Windmeijer, F. (2005). *A finite sample correction for the variance of linear efficient two-step gmm estimators*. Journal of Econometrics, 126:25–51.
- Cameron, A. C. & Trivedi, P. K. (2022). *Microeconometrics Using Stata, Volume I: Cross-Sectional and Panel Regression Methods*. Second Edition. Stata Press.
- Cameron, A. C. & Trivedi, P. K. (2022). *Microeconometrics Using Stata, Volume II: Nonlinear Models and Causal Inference Methods.* Second Edition. Stata Press.

REGISTRATION FEES

Full-Time Students*: € 1170.00
Ph.D. Students: € 1500.00
Academic: € 1735.00
Commercial: € 2330.00

*To be eligible for student prices, participants must provide proof of their **full-time** student status for the current academic year. Our standard policy is to provide all **full-time students**, be they Undergraduates or Masters students, access to student participation rates. Part-time master and doctoral students who are also currently employed will, however, be allocated academic status.

Fees are subject to VAT (applied at the current Italian rate of 22%). Under current EU fiscal regulations, VAT will not however be applied to companies, Institutions or Universities providing a valid tax registration number.

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The number of participants is limited to 8. Places will be allocated on a first come, first serve basis. The course will be officially confirmed when at least 5 individuals are enrolled.

Course fees cover: i) teaching materials - copies of lecture slides, databases and Stata programs specifically developed for the course; ii) a temporary licence of *Stata* valid for 30 days from the day before the course commences.

Individuals interested in attending the training course should contact TStat Training to ask for a registration form. The completed application should then be returned to TStat by the 7th of May 2024.

Further details regarding our registration procedures, including our commercial terms and conditions, can be found at https://www.tstattraining.eu/training/dynamic-panel-data-analysis-ol/.

CONTACTS

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