



# DYNAMIC PANEL DATA ANALYSIS

ONLINE, 19th-21st and 25th-27th JANUARY 2021

## COURSE CODE

D-EF24-OL

## DATE AND LOCATION

Due to the current COVID-19 situation, the 2021 edition of this Training Course will also be offered ONLINE.

To facilitate the transition to an online format, the course programme has been transformed into 6 sessions running from 10.00 am to 1.30 pm Central European Time (CET) on the 19th-21st and the 25th-27th of January 2021. Please note that the session on the 26th January will however, take place from 2.00 pm to 5.30 pm (CET)

A 45 minutes informal evening Study Group session will also be scheduled, during which participants are encouraged to discuss further issues arising from either the arguments addressed or practical sessions undertaken. The course leader will also be available during this session to offer feedback and guidance on how to deal with specific research issues.

Dynamic panel data analysis has become increasingly popular in a wide range of fields, due to its ability to take into account both: i) short and long term effects and; ii) unobserved heterogeneity between economic agents in the estimation of the parameter estimates.

This course offers a rigorous overview of existing dynamic panel data analysis techniques, thus providing participants with the opportunity to acquire the more advanced technical capabilities currently available for panel data analysis. In the opening session, participants are given, through a series of illustrative examples, 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 the estimation of dynamic linear panel data models. The course then turns to address more recent issues in dynamic panel data analysis, such as weak instruments with persistent data; instrument proliferation; gaps in the data; estimation with serially correlated errors; robust inference with multiway clustering and the finite-sample performance of estimators and tests. The concluding session addresses issues of: i) non-stationarity in long panels, where the time series (as opposed to cross-sectional) characteristic of the data dominates; and ii) cointegration.

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 will also be given to the interpretation and presentation of results. At the end of the course, participants are expected to be able, with the aid of the Stata routines implemented during the sessions, to correctly implement independently the methodologies and techniques acquired during the course.

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. Moreover, 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.

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## TARGET AUDIENCE

Our Dynamic Panel Data 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, Political Sciences and the Social Sciences, wishing to acquire the necessary applied and theoretical skills in order to be able independently conduct applied empirical research on dynamic panel data.

## PREREQUISITES

It is assumed that delegates have an introductory knowledge of panel data analysis (familiarity with the arguments covered in our introductory panel data analysis course), IV and GMM estimation techniques, together with previous experience in using Stata.

## PROGRAM

### SESSION I: PRELIMINARIES AND SIMPLE ESTIMATORS

1. The Dynamic Panel Data (DPD) Model
  - Assumptions
  - Inconsistency of basic panel data estimators (computed by *xtreg*)
  - Monte Carlo evaluation of the bias in *xtreg* procedures (*xtarsim*)
2. Consistent IV estimators
  - Anderson and Hsiao (AH) estimators
  - Stata implementation of AH: *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
  - Specifying endogenous covariates
  - One-step and two-step estimators
  - The Windmeijer's correction of two-step standard errors
3. Specification tests:
  - AB autocorrelation tests (*estat abond*, *xtanond2*)
  - Hansen-Sargan tests (*estat sargan*, *xtabond2*)
  - Difference-in-Hansen tests for testing subsets of instruments (*xtabond2*)
4. Replicating AB (1991)

### SESSION III: OPTIMAL DIFFERENCE GMM ESTIMATORS (ARELLANO AND BOND, 1998)

1. Blundell and Bond (BB) System GMM estimators
  - The issue of weak instruments with highly persistent series
  - More moment conditions from Mean stationarity: the System estimator as solution to weak instruments
2. Three Stata commands for the System estimator: *xtdpdsys*, *xtdpd*, *xtabond2*
  - Applying the system estimator to AR(p) models with exogenous, predetermined and endogenous covariates
3. Replicating BB (1998)

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### 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. A transformation alternative to first-differencing: Forward orthogonal deviations
  - Sample selection in DPD
  - Ignorability of selection (al Saldon, Jimenez Martin, Labeaga, 2019)
  - Testing and correcting for selection (Semykina and Wooldridge, 2013)
  - Bias corrected LSDV in DPD
  - Approximations of the LSDV bias (Kiviet, 1995; Bruno 2005a)
  - Application through *xtlsdvc* (Bruno 2005b)

### SESSION V: NON-STATIONERY PANELS BALTAGI 2013

1. Panel unit-root tests
  - The *xtunitroot* command for first-generation unit-root tests (neglecting cross-sectional dependency)
  - Testing unit-root through DPD estimators
  - Testing cross-sectional dependency (*xtcd*)
  - Second-generation unit-root tests (accommodating cross-sectional dependency: *pescadf*, *multiport*)
2. Panel cointegration in Stata
  - Cointegration tests (*xtcointtest*, *xtwest*, *xtpedroni*)
  - Estimation and inference in cointegrated models (*xtpmg*, *xtpedroni*)

## COURSE REFERENCES

M. al Sadoon, S. Jiménez-Martín, and J. M. Labeaga. Simple methods for consistent estimation of dynamic panel data sample selection models. W. P. no 1631, Universitat Pompeu Fabra, Department of Economics and Business, 2019.

M. Arellano and S. Bond. Some tests of specification for panel data: Monte carlo evidence and an application to employment equations. *Review of Economic Studies*, 58:277–297, 1991.

B. H. Baltagi. *Econometric Analysis of Panel Data*. New York: Wiley, 2013.

R. Blundell and S. Bond. Initial conditions and moment restrictions in dynamic panel data models. *Journal of Econometrics*, 87:115–143, 1998

G. S. F. Bruno. Approximating the bias of the lsdv estimator for dynamic unbalanced panel data models. *Economics Letters*, 87:361–366, 2005a.

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J. F. Kiviet. On bias, inconsistency and efficiency of various estimators in dynamic panel data models. *Journal of Econometrics*, 68:53–78, 1995.

D. M. Roodman. How to do *xtabond2*: An introduction to difference and system gmm in stata. *The Stata Journal*, 9(1):86–136, 2009a.

D. M. Roodman. A note on the theme of too many instruments. *Oxford Bulletin of Economics and Statistics*, 71(1):135–157, 2009b.

A. Semykina and J. M. Wooldridge. Estimation of dynamic panel data models with sample selection. *Journal of Applied Econometrics*, 28:47–61, 2013.

F. Windmeijer. A finite sample correction for the variance of linear efficient two-step gmm estimators. *Journal of Econometrics*, 126:25–51, 2005

*Microeconometrics using Stata, Revised Edition*, (2010) di A. C. Cameron e P. K. Trivedi, Stata Press

*Econometric Analysis of Cross Section and Panel Data* (2010) di J. Wooldridge, MIT Press

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# DYNAMIC PANEL DATA ANALYSIS

## REGISTRATION FEES

Students\*: € 1065.00

Academic: € 1515.00

Commercial: € 2020.00

\*To be eligible for student prices, participants must provide proof of their **full-time** student status for the current academic year.

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

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: course materials (handouts, Stata *do files* and datasets to be used during the course), a temporary licence of Stata valid for 30 days from the beginning of the course.

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 **9th January 2021**.

## CONTACTS

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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/>

