



TRAINING COURSE | ONLINE

## ESTIMATING LINEAR REGRESSION MODELS WITH EXOGENOUS AND ENDOGENOUS VARIABLES IN STATA

5-6 and 12-13 June 2023

This applied course offer a rigorous overview of the more advanced technical capabilities currently available in Stata for linear regression analysis. Thus providing participants with a unique hands-on opportunity to acquire the necessary theoretical and applied skills to independently apply advanced linear regression techniques in Stata.

In the opening session, the application of Ordinary Least Squares (OLS) techniques for both estimation and inference in linear models in the presence of exogenous regressors is discussed. In the second session, participants address the problems which arise when trying to estimate linear models containing endogenous regressors. Instrumental Variable and Generalized Methods of Moments (GMM) techniques for both estimation and inference, together with a discussion of the available tests for both weak identification and inference procedures under weak identification, therefore form the core of this closing session.

### COURSE STRUCTURE

Individual sessions are composed of both a theoretical component (in which the techniques and underlying principles behind them are explained), and an applied (hands-on) segment using Stata, during which participants implement the techniques using real data under the watchful eye of the course tutor. Throughout the course, theoretical sessions are reinforced by applied examples, in which the course tutor discusses and highlights potential pitfalls and the advantages of individual techniques. The intuition behind the choice and implementation of a specific technique is of the utmost importance. In this manner, the course leader is able to bridge the “often difficult” gap between abstract theoretical methodologies, and the practical issues one encounters when dealing with real data.

### COURSE OUTCOME

At the end of the course, participants are expected to be able to autonomously implement the theories and methodologies discussed during the course.

### COURSE CODE

D-EF48-OL

# ESTIMATING LINEAR REGRESSION MODELS WITH EXOGENOUS...

## TARGET AUDIENCE

This course is particular interest to researchers in public and private research centres, Master and Ph.D. Students working in the following fields: Agricultural Economics, Economics, Finance, Management, Public Health, and the Political and Social Sciences seeking to acquire the applied and theoretical toolset to enable them to independently apply linear regression techniques in their empirical research.

## PREREQUISITES

It is assumed that course participants have:

- at some point followed a basic course in econometrics or statistics;
- a knowledge of Stata or other statistical software, SPSS, SAS.

## PROGRAM

### SESSION I: LINEAR REGRESSION WITH ALL EXOGENOUS REGRESSORS

1. The OLS estimator: *regress*
2. Categorical variables, dummies, interactions and marginal effects: *margins*
3. Testing hypotheses on model coefficients: *test*, *testparm*, *lincom*, *nlcom*
4. OLS predicted values: *predict*, *margins*
5. Testing heteroskedasticity: *estat imtest*, *estat hettest*
6. Testing autocorrelation: *estat dwatson*, *estat durbinalt*, *estat bgodfrey*, *actest*, *abar*
7. Consistent variance-covariance estimators under:
  - heteroskedasticity: the *regress* options *vce(robust)*, *vce(hc2)*, *vce(hc3)*
  - cluster correlation: the *regress* option *vce(cluster clustvar)*
  - autocorrelation: *newey*

### SESSION II: LINEAR REGRESSION WITH POSSIBLE ENDOGENOUS REGRESSORS

1. Optimal estimation and inference under i.i.d. errors with the Two-Stage-Least-Square estimator: *ivregress 2sls*, *ivreg2*
2. Optimal estimation and inference under non-i.i.d. errors with overidentified GMM estimators: *ivregress gmm*, *ivreg2*
3. Consistent variance-covariance estimators under:
  - heteroskedasticity: *ivregress...*, *vce(robust)*, *ivreg2...*, *robust*
  - cluster correlation: *ivregress...*, *vce(cluster clustvar)*, *ivreg2...*, *cluster(clustvar)*
  - twoway cluster correlation: *ivreg2...*, *cluster(varlist)*
  - autocorrelation: *ivregress...*, *vce(hac kernel)*, *ivreg2...*, *bw(#)*
4. Specification tests:
  - Testing heteroskedasticity: *ivhettest*
  - Testing autocorrelation: *actest*, *abar*
  - Testing overidentifying restrictions: *estat overid*



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- Testing subsets of overidentifying restrictions: **ivreg2...**, **orthog(varlist\_inst)**
  - Testing subsets of regressors for endogeneity: **estat endogenous**, **ivreg2...**, **orthog(varlist\_regr)**
  - Tests for weak instruments: **ivregress...**, **first**, **ivreg2...**, **first**
  - A robust test for weak instruments with one endogenous variable: **weakivtest**
5. Inference with weak instruments: **ivreg2...**, **first**, **condivreg**, **weakiv**
  6. Estimation and inference using heteroskedasticity without instruments: **ivreg2h**

## SUGGESTED READINGS

- Baum, C. F. (2006). *An Introduction to Modern Econometrics using Stata*. Stata Press.
- Baum, C. F., Schaffer, M. E. & Stillman, S. (2003). *Instrumental variables and GMM: Estimation and testing*. The Stata Journal, 3: 1–31.
- Baum, C. F., Schaffer, M. E. & Stillman, S. (2007). *Enhanced routines for instrumental variables/generalized method of moments estimation and testing*. The Stata Journal 7: 465–506.
- Baum, C. F. & Schaffer, M. E. (2012). **ivreg2h**: *Stata module to perform instrumental variables estimation using heteroskedasticity-based instruments*.
- Baum, C. F., Schaffer, M. E. (2013). **actest**: *Stata module to perform Cummy-Huizinga general test for autocorrelation in time series*.
- Cameron, A. C. & Trivedi, P. K. (2022). *Microeconometrics Using Stata, Volume I: Cross-Sectional and Panel Regression Methods*. 2nd Edition. Stata Press.
- Chernozhukov, V. & Hansen, C. (2008). The Reduced Form: A Simple Approach to Inference with Weak Instruments. *Economics Letters*, 100: 68–71.
- Finlay, K. & Magnusson, L. M. (2009). Implementing weak-instrument robust tests for a general class of instrumental-variables models. *The Stata Journal*, 9: 398–421.
- Finlay, K., Magnusson, L. M. & Schaffer, M. E. (2013). **weakiv**: *Weak-instrument-robust tests and confidence intervals for instrumental-variable (IV) estimation of linear, probit and tobit models*.
- Lewbel, A. (2012). Using Heteroscedasticity to Identify and Estimate Mismeasured and Endogenous Regressor Models. *Journal of Business and Economic Statistics*, 30: 67–80.
- Mikusheva, A. & Poi, B. (2006). *Tests and confidence sets with correct size when instruments are potentially weak*. The Stata Journal, 6: 335–347.
- Olea J. L. M. & Pfluger C. (2013). *A robust test for weak instruments*. *Journal of Business and Economic Statistics*, 31: 358–368.
- Pflueger, C. E. & Wang S. (2015). *A robust test for weak instruments in Stata*. The Stata Journal, 15: 216–225.
- Roodman, D. M. (2009). How to do **xtabond2**: *An introduction to difference and system GMM in Stata*. The Stata Journal, 9: 86–136.



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## DATE AND LOCATION

The 2023 edition of this training course will be offered online on a part-time basis on the 5th-6th and the 12th-13th of June, from 10:00 am to 1:30 pm Central European Summer Time (CEST).

## REGISTRATION FEES

Full-Time Students\*: € 710.00

Ph.D. Students: € 910.00

Academic: € 1060.00

Commercial: € 1420.00

\*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 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: 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.

## CONTACTS

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Individuals interested in attending this training course, must return their completed registration forms by email ([training@tstat.eu](mailto:training@tstat.eu)) to TStat by the 25th May 2023.

Further details regarding our registration procedures, including our commercial terms and conditions, can be found at <https://www.tstattraining.eu/training/estimating-linear-regression-ol/>.

