TStat

PARAMETRIC AND NONPARAMETRIC PRODUCTION FRONTIER MODELS IN STATA

16-17 and 23-24 November 2023

Production frontier models have over the years become an indispensable tool of analysis for both scholars and practitioners interested in the measurement of performances through efficiency scores, in academia, business and government. This course provides participants with both the knowledge and requisite applied toolset for applying frontier methods to cross-section and panel data in Stata.

The course begins by focusing on stochastic frontier models - parametric models implemented in Stata using the **frontier** and **xtfrontier** commands for cross section and panel data respectively. Participants are also introduced to the user-written commands **sfkk** (Karakaplan, 2017), **sfcross** and **sfpanel** (Belotti et al., 2013).

The remaining sessions focus on the non-parametric approach to frontier models, referred to in the literature as *data envelopment analysis (DEA)*. Session 2 centers on radial and non-radial efficiency measures, along with the derived concepts of scale efficiency and the Malmquist productivity index (Färe et al., 1994), using the user written commands **teradial** and **tenonradial** (Badunenko and Mozharovskyi, 2016). Session 3 illustrates the concept of bootstrap inference for radial measures as developed by Simar and Wilson (1998) and (2000), along with bootstrap tests of independence (Wilson 2003) and returns to scale (Simar and Wilson, 2002). These procedures are implemented in Stata by **nptestind**, **nptestrts** and **teradialbc** (Badunenko and Mozharovskyi, 2016). The course closes with a discussion of the user written command **simarwilson**, a procedure which implements the Simar and Wilson (2007) approach to identify the impact of external factors on DEA efficiency scores (Badunenko and Tauchmann, 2019).

In common with TStat's training philosophy, each individual session is composed of both a theoretical component (in which the techniques and underlying principles behind them are explained), and an extensive 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 by case study 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.

At the end of the course, participants are expected to be able to: i) autonomously implement (with the help of the Stata routine templates specifically developed for the course) the appropriate methodology, given both the nature of their data and the analysis in hand, and ii) to have mastered the concepts of: stochastic, parametric and non-parametric frontier model analysis.

COURSE CODE

D-EF45-OL

TARGET AUDIENCE

Researchers and professionals working in business, government, economics, banking, finance, social and political sciences needing to acquire the necessary analytical tool set to evaluate performance through production efficiency scores.

https://www.tstattraining.eu/training/parametric-nonparametric-frontier-models-stata-ol/

PREREQUISITES

Course participants are required to have a good working knowledge of:

- topics covered in TStat Training's micro data analysis course;
- Truncated regression method;
- Censored regressions;
- the statistical software Stata: including familiarity with Stata variable creation commands and Stata *do files*.

PROGRAM

SESSION I:
STOCHASTIC FRONTIER
MODELS

1. Cross-section models: **frontier**
2. Panel-data models: **xtfrontier**
3. Models with endogenous variables: **sfkk**
4. Cross-section and panel data extensions: **sfcross, sfpanel**

SESSION II:
DEA IN STATA - EFFICIENCY
MEASURES

1. Radial (**teradial**) and non-radial (**tenonradial**) measures of technical efficiency
2. Scale efficiency
3. Computing the Malmquist productivity index through **teradial**

SESSION III:
DEA IN STATA - BOOTSTRAP
INFERENCE

1. Testing independence: **nptestind**
2. Testing scale returns: **nptestrts**
3. Bias-corrected radial efficiency measures: estimation and inference through **teradialbc**

SESSION IV:
DEA IN STATA - THE SIMAR-
WILSON APPROACH TO THE
DETERMINANTS OF EFFICIENCY

1. Single and double bootstrap algorithms
2. Implementing the bootstrap algorithms through the command **simarwilson**

SUGGESTED READINGS

- Badunenko, O. & Mozharovskyi P. (2016). *Nonparametric frontier analysis using Stata*. Stata Journal 16: 550–589.
- Badunenko, O. & Tauchmann H. (2019). *Simar and Wilson two-stage efficiency analysis for Stata*. Stata Journal 19: 950–988.
- Belotti, F., Daidone S. & Ilardi G. (2013). *Stochastic frontier analysis using Stata*. Stata Journal 13: 719–758.
- Färe, R., Grosskopf S. & Knox Lovell C.A. (1994). *Production Frontiers*. Cambridge University Press.
- Karakaplan, M. U. (2017). *Fitting endogenous stochastic frontier models in Stata*. Stata Journal 17: 39–55.
- Simar, L. & Wilson P. W. (1998). *Sensitivity analysis of efficiency scores: How to bootstrap in nonparametric frontier models*. Management Science 44: 49–61.
- Simar, L. & Wilson P. W. (2000). *A general methodology for bootstrapping in nonparametric frontier models*. Journal of Applied Statistics 27: 779–802.
- Simar, L. & Wilson P. W. (2002). *Non-parametric tests of returns to scale*. European Journal of Operational Research 139: 115–132.

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PARAMETRIC AND NONPARAMETRIC PRODUCTION FRONTIER...

- Simar, L. & Wilson P. W. (2007). *Estimation and inference in two-stage, semi-parametric models of production processes*. Journal of Econometrics 136: 31–64.
- Wilson, P. W. (2003). *Testing independence in models of productive efficiency*. Journal of Productivity Analysis 20: 361–390.

DATE AND LOCATION

The 2023 edition of this training course will be offered online on a part-time basis on the 16th-17th and 23rd-24th of November from 10 am to 1.30 pm Central European Time (CET).

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.

Individuals interested in attending this course must return their completed registration forms by email (training@tstat.eu) to TStat by the 6th November 2023.

Further details regarding our registration procedures, including our commercial terms and conditions, can be found at **https://www.tstattraining.eu/training/parametric-nonparametric-frontier-models-stata-ol/.**

CONTACTS

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