Advanced Techniques in Applied Economics

2021-2022 Academic Year
Master of Research in Economics, Finance and Management

1. Description of the subject

- Advanced Techniques in Applied Economics
- Total credits: 3 ECTS

Code: 32364
Workload: 75 hours
Term: 3rd

- Type of subject: Elective
- Department of Economics and Business
- Teaching team: Christian Brownlees

2. Teaching guide

Introduction

Modeling increasingly complex datasets in applied economics requires a broad range of tools from statistics and machine learning that go beyond regression analysis. This course focuses on network models, one of the most prominent class of models used to study large dimensional panels of time series that has gained popularity in recent years.

The aim of this course is to give a concise introduction to network models for the analysis of large dimensional panels of time series. The course will be kept relatively high-level and will be based on work-out examples in R. Selected aspects of the theory will be presented to improve the overall statistical maturity of the students.

Teaching methodology

Each of the main concepts presented in the lecture will be illustrated with an applied problem. Worked out examples in R will be provided.

Contents

The course is divided into five parts that roughly correspond to the five weeks of the course's duration.

1. Basic concepts:
   main concepts: graphs, random graphs, conditional independence
2. Lasso estimation:
   main concepts: sparse estimation, high-dimensional estimation
3. Contemporaneous Networks:
   main concepts: Gaussian graphical models, partial correlation networks
4. Dynamic Networks:
   main concepts: Granger causality network, Connectedness Table
5. Nonparametric Networks:
   main concepts: SKEPTIC

Assessment and Grading System

The final grade is based on the project submitted at the end of the course.

Literature

Acemoglu, D., Carvalho, V., Ozdaglar, A., & Tahbaz-Salehi, A. (2012). The network origins of aggregate fluctuations. Econometrica, 80, 1977–2016.

Billio, M., Getmansky, M., Lo, A., & Pellizzon, L. (2012). Econometric measures of connectedness and systemic risk in the finance and insurance sectors. Journal of Financial Economics, 104, 535–559.

Dahlhaus, R. (2000). Graphical interaction models for multivariate time series. Metrika, 51, 157–172.

Davis, R. A., Zang, P., & Zheng, T. (2016). Sparse vector autoregressive modeling. Journal of Computational and Graphical Statistics, 25, 1077–1096.

Dempster, A. P. (1972). Covariance selection. Biometrics, 28, 157–175.

Diebold, F. X., & Yılmaz, K. (2014). On the network topology of variance decompositions: Measuring the connectedness of financial firms. Journal of Econometrics, 182, 119–134.

Friedman, J., Hastie, T., & Tibshirani, R. (2008). Sparse inverse covariance estimation with the graphical lasso. Biostatistics, 9, 432–441.

Fu, W. J. (1998). Penalized regression: The bridge versus the lasso. Journal of Computational and Graphical Statistics, 7, 397–416.

Kock, A. B. (2016). Consistent and conservative model selection with the adaptive lasso in stationary and nonstationary autoregressions. Econometric Theory, 32, 243–259.

Meinshausen, N., & Bühlmann, P. (2006). High dimensional graphs and variable selection with the lasso. Annals of Statistics, 34, 1436–1462.

Lauritzen, S. L. (1996). Graphical models. Oxford, UK: Clarendon Press.