Time Series Analysis and Forecasting με R (62106)

Instructors: I.VRONTOS – A. LIVADA

Core Course, 2nd semester, 5 ECTS units

Course level: Graduate (MSc)

Language: Greek

Course Description

This course provides the theory and practice of time series analysis. It introduces the deterministic type of models and the decomposition of a given time series into its components: a trend, a seasonal and an irregular component. The course presents and describes different models for estimating trend and seasonal effects. It introduces linear filters and exponential smoothing techniques. It also introduces the basic theory of stationary processes (characteristics of stationary and non-stationary time series and unit root testing), it describes and presents analytically stochastic time series models, ARMA models in particular, and the Box-Jenkins methodology for ARIMA models. The course introduces the class of conditional heteroscedastic models (ARCH/GARCH), and presents practical time series forecasting techniques. Illustrative examples applying time series models/techniques to actual economic and financial data are also presented using R package and the econometric package Eviews. The empirical analysis consists of (a) unit root testing to exchange rate series and financial series, e.g. stocks and indices, and (b) modeling and forecasting economic/financial time series..

Prerequisites

Students should have basic knowledge of statistics and linear models.

Target Learning Outcomes

The aim of this course is to provide students with the learning of using appropriate time series models and techniques required for the analysis of time series data. After successfully completing the course, students will be able to:

- know deterministic time series modeling
- know the basic concepts of stationary processes
- have learned the ARMA stochastic time series models
- have learned about the time-varying ARCH/GARCH volatility models
- be able to apply the Box-Jenkins methodology in empirical applications

- be able to model and forecast time series data
- know how to implement time series analysis using R and Eviews

Recommended Bibliography

- Hamilton, James D. Time Series Analysis. Princeton, New Jersey: Princeton University Press, 1994.
- Enders, Walter. Applied Econometric Time Series. New York: Wiley, 2010.
- Cowpertwait, Paul S.P., and Metcalfe V. Andrew. Introductory Time Series with R. New York: Springer Texts in Statistics, 2009.
- Cryer, Jonathan D., and Chan Kung-Sik. Time Series Analysis with Applications in R. Springer Texts in Statistics, 2010.
- Gujarati, Damodar N. Basic Econometrics. New York: McGraw-Hill, 2008.
- Pindyck, R.S. and D.L. Rubenfeld. Econometric Models and Economic Forecasts. New York: McGraw-Hill, 1991.
- Shumway, Robert H. and David S. Stoffer. Time Series Analysis and Its Applications with R Examples. New York: Springer Texts in Statistics, 2011.
- Tsay, Ruey S. Analysis of Financial Time Series. New York: Wiley, 2010.
- Wooldridge, Jeffrey. Introductory Econometrics: A Modern Approach. South-Western College Publishing, 2009.
- Granger, C.W.J. and Paul Newbold. Forecasting Economic Time Series. San Diego, CA: Academic Press, 1986.

Teaching and Learning Activities

One three-hour lecture per week, study exercises, and programming exercises as homework (some to be submitted).

Assessment and Grading Methods

The final grade is the average of the final examination grade (weight 80%) and the grade of the study and programming exercises to be submitted (weight 20%), provided that the final examination grade is at least 5/10. Otherwise, the final grade equals the final examination grade.