Universitat Pompeu Fabra Barcelona

Academic Year: 2025/26

21896 - Forecasting Techniques

Teaching Guide Information

Academic Course: 2025/26

Academic Center: 304 - Faculty of Law and Economics
332 - Faculty of Economic and Business Sciences

Study: 3041 - Double bachelor's degree programme in Law and Business Management and Administration / Economics
3324 - Bachelor's degree in Business Management and Administration

Subject: 21896 - Forecasting Techniques

Credits: 5.0

Course: 418 - Bachelor's degree in Economics: 4
412 - Bachelor's degree in Business Sciences: 4
418 - Bachelor's degree in Economics: 3
412 - Bachelor's degree in Business Sciences: 3
417 - Bachelor's degree in Business Management and Administration: 3
417 - Bachelor's degree in Business Management and Administration: 4
523 - Double bachelor's degree programme in Law and Business Management and Administration / Economics: 6

Teaching languages:

Theory:	Group 1: English
Seminar:	Group 101: Pending
	Group 102: Pending

Teachers: Chiara Amorino

Teaching Period: Second term

Presentation

The course focuses on time series analysis with view towards model-based prediction. Basic skills in statistics and computing with R is a prerequisite, a previous course in econometric analysis of linear time series is desirable although by no means necessary (additionally, such material can be learnt parallel to this course). The modelling and computational methodology developed in the course applies to a wide range of scientific fields, including engineering, environmental sciences, biochemistry, natural language processing, but in this course we concentrate on applications to economics and finance, such as the extraction of stochastic business cycles and volatility prediction using daily and intraday high-frequency data. The aim of the course is to train the skills and the understanding of building, fitting, checking, and predicting with sophisticated linear and non-linear time series models. Additionally, to study the structure and the empirical characteristics of certain financial time series.

Associated skills | General learning outcomes

The student should comfortably carry out time series analysis with the following classes of models: the ARMA family, Markov chains, and GARCH. The student will be able to understand the underlying mathematical and statistical framework for their estimation (e.g. maximum likelihood), their properties in terms of prediction (step-ahead forecast distributions and moments thereof), and the appropriateness of the different models for different type of data. The student also acquires a working knowledge of the choice among competing models. An important aspect of the course is the empirical analysis of time series with the view towards identifying important structures and signals that lead to the choice of the appropriate model. Another important aspect of the course is the development of the skills required for carrying out such analyses in the computer using the R language.

Learning outcomes | Specific learning outcomes

G4. The ability to satisfactorily use the English language for academic purposes (read, write and speak using a medium-high register).
G5. Proficiency in the use of computing tools and their main applications in ordinary academic work.
G9. Consolidated habits as regards self-discipline, personal standards and thoroughness in academic work and in organization and fulfilment of timescales.
G10. A proactive attitude to ascertaining the unknown, essential in all training processes and in all prestigious professional activities.
G11. The ability to apply the knowledge acquired and to adapt it to new situations flexibly and creatively.
G12. The ability to make progress autonomously and continuously in training and learning processes.
G16. Use of the right information in formulating proposals and problem-solving.
G19. Identification of the key factors in a problem.

Contents

Intro to Times Series

Time Series in Economics and Finance
Time Series as Stochastic Processess
Time Series Properties

Linear Time Series
Linear Time Series: Models
Linear Time Series: Prediction
Linear Time Series: Estimation
Linear Time Series: Practice

Volatility Modeling

Volatility Modeling: ARCH and GARCH
Volatility Modeling: Asymmetric Effects
Volatility Modeling: Prediction and Evalution
Volatility Modeling: Stochastic Volatility
Volatility Modeling: High Frequency Data Based Volatility Modelling

Evaluation and grading system

The final grade of the course is based on a number of items:

Problemsets. Students will be required to complete a series of personalized problemsets. The problemsets typically require carrying out time series analysis in R using a simulated data or a real time series. There is approximately one problemset for each topic of the course.

Time Series Analysis Project. The time series analysis project consists of analysing an economic or financial time series of your choice using the tools introduced in class, presenting results of the analysis during seminars
and writing a short report describing the findings of your analysis.

Forecasting Competition. The forecast competition consists of developing a forecasting algorithm in R to predict the future realizations of a time series.
The time series used in the competition is simulated according to a secret model. Students have to organize themselves in teams (of no more than four members). The teams have access to a training sample of data and have to develop a prediction algorithm for the future realizations of the series.
The grade of the competition is based on the out--of--sample performance of the algorithm.

Final Exam. The final exam is made up of a set of open questions covering the content of the course. 10% Problem sets

Final Grade: 35% Time Series Project + 5% Forecast Competion + 50% Final Exam

A minimum of 4 in the final exam and in the final grade is required to pass the course.

Students that fail the course have to do a recuperation exam. The recuperation exam is made up of a set of open questions covering the content of the course. The final grade of the course for students that do the recuperation exam is entirely based on the recuperation exam. (Again, a minimum of 4 is required to pass the course). The recuperation exam is only for those students that attended the course (at least 80% of the lectures).