Summary
A first course in statistical time series analysis and applications, including practical work.

Content
- Motivation; basic ideas; stochastic processes; stationarity; trend and seasonality.
- Autocorrelation and related functions.
- Stationary linear processes: theory and applications.
- ARIMA, SARIMA models and their use in modelling.
- Prediction of stationary processes.
- Spectral representation of a stationary process: theory and applications.
- Financial time series: ARCH, GARCH models.
- State-space models: dynamic linear models, Kalman filter.
- Other topics as time permits.

Learning Prerequisites

Required courses
Probability and Statistics

Recommended courses
Probability and Statistics for mathematicians. A course in linear models would be valuable but is not an essential prerequisite.

Important concepts to start the course
The material from first courses in probability and statistics.

Learning Outcomes
By the end of the course, the student must be able to:
- Recognize when a time series model is appropriate to model dependence
- Manipulate basic mathematical objects associated to time series
- Estimate parameters of basic time series models from data
- Critique the fit of a time series model and propose alternatives
• Formulate time series models appropriate for empirical data
• Distinguish a range of time series models and understand their properties
• Analyze empirical data using time series models

Teaching methods
Ex cathedra lectures, exercises and computer practicals in the R language in the classroom and at home. Mini-project based on data chosen by the student.

Assessment methods
Mini-project, final exam.
Seconde tentative: Dans le cas de l’art. 3 al. 5 du Règlement de section, l’enseignant décide de la forme de l’examen qu’il communique aux étudiants concernés.

Supervision
Office hours No
Assistants Yes
Forum Yes

Resources
Virtual desktop infrastructure (VDI)
No

Bibliography
A polycopié of the course notes will be available.

Ressources en bibliothèque
• Dynamic Linear Models with R / Petris, Petrone & Campagnoli
• Analysis of Financial Time Series / Tsay
• Introduction to Time Series and Forecasting / Brockwell & Davis
• (electronic version)
• Time Series Analysis and its Applications, with R Examples / Shumway & Stoffer
• (electronic version)
• (electronic version)
• (electronic version)

Notes/Handbook