Applied Time Series

ECTS : 3

Description du contenu de l'enseignement :

The objective of the course is to study the theory, modeling, programming, and interpretation of the major time series models. Some applications to finance will be undertaken using Python. At the end of this class, students should be able to :

- Develop knowledge of basic univariate time series models appropriate for economic and financial data.
- Learn how to specify and estimate a time series model on these data.
- Be able to use such models for forecasting and to evaluate their performance.
- Familiarize with common volatility modelling approaches.

Course outline:

1/ Time series building blocks

- Stationarity
- Autocorrelation and white noise
- Testing autocorrelation
- Non-stationarity
- Python exercices

2/ ARMA Framework

- Moving average process
- Auto regressive process
- ARMA models and the Box-Jenkins method
- Maximum-Likelihood estimation
- Simulation and model selection with Python

3/ Specific topics and applications

- Unit-roots
- Trends
- Seasonnality
- Python application to the Earnings-Per-Share

4/ Volatility models

- GARCH
- Value-at-Risk
- Expected Shortfall
- Yahoo-Finance API and ARCH/GARCH modelisation with Python

5/ Principal Component Analysis

- Normed vs. Non-normed PCA
- Contribution and quality of representation of observations and variables on principal components
- Computation of the Absorption Ratio with Python

Compétence à acquérir :

Master the econometrics (dynamic) tools used in empirical finance

Mode de contrôle des connaissances :

Assignment (30%) + Final Exam (70%)

Bibliographie, lectures recommandées :

Brooks C (2008), Introductory econometrics for Finance, Cambridge Univ Pr. Brockwell, P.J. and Davis, R.A. (2002), Introduction to time series and forecasting, Springer Verlag. Campbell J., Lo A., McKinley, A. (1997), The Econometrics of Financial Markets. NJ: Princeton University Press. Francq C, Zakoïan J.M. (2010), Garch models: Structure, statistical inference and financial applications, Wiley. Hamilton J. D. (1994), Time Series Analysis, Princeton University Press.