SYLLABUS DEL CORSO

Computational Finance and Financial Econometrics

2021-2-F8204B036-F8204B037M

Learning objectives

Providing the students with the largest possible knowledges about the statistical properties of financial data with a strong emphasis on numerical applications using the software package R. In particular, the students will learn how to solve typical real-world financial problems such as portfolio management and derivative pricing using statistical and computational methods.

Contents

Working with financial data and assessing their empirical properties.

Uni- and multivariate GARCH models for portfolio management and derivative pricing.

Monte Carlo simulation for derivative pricing

Detailed program

- Definition of the main financial assets and contracts
- Stylized facts of financial prices and returns
- Univariate GARCH models
- Multivariate GARCH models
- Monte Carlo and bootstrap
- Simulation of univariate (geometric) Brownian motions
- Simulation of multivariate (geometric) Brownian motions
- Using fundamental theorem of asset pricing for approximating the value of derivative contracts
- Possible extensions (GARCH asset pricing, jump diffusion, yield curve)

Prerequisites

A working knowledge of R, descriptive, inferential and multivariate statistics and time series analysis.

Teaching methods

All lessons take place in computer labs. Theory is immediatly illustrated through practical exercises using R.

Under Covid-19 restrictions, the lessons will be streamed through Google Meet and the recordings will be available on the elearning pages. Students should have R and RStudio intalled on their computers.

Assessment methods

Writing an R script to solve a real financial problem provided by the lecturer. The exam session takes place in a computer lab and lasts one hour.

Textbooks and Reading Materials

- Lecturer's notes available in the e-learning platform.

- Wickham (2015) *Advanced R*. CRC Press. First 7 chapters. Available also on-line: http://adv-r.had.co.nz/
- Iacus (2008) *Simulation and Inference for Stochastic Differential Equations: With R Examples*. Springer. Only the first chapter. The volume can be downloaded under unimib network (or unimib vpn) at https://link.springer.com/

Semester

2nd term (November - January). Notice that we adopt a four terms organization of the academic year.

Teaching language

English