DATA SCIENCE AND ARTIFICIAL INTELLIGENCE

a.y. 24/25

Data Science for Insurance:
Introduction to the course

March 17, 2025

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Lecturers

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Check the personal page for office hours

Course material

- Slides and additional material presented in class or useful for the study will be made available through the Moodle page of the course
  $\rightarrow$ register using the key `DSFI24`
- Lecture recordings will be available via Teams
- Details on the R packages used can be found at web CRAN page https://cran.r-project.org/
- Further readings
  - J. McNeil, R. Frey, and P. Embrechts (2015) *Quantitative Risk Management: Concepts, Techniques and Tools*, Revised Edition, Princeton Series in Finance

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Course Structure

The course is structured in two parts:

Module A (24 h, R. Pappadà) will focus on

- statistical issues in risk management and risk measures
- multivariate modelling in finance and insurance
- Copulas and related applications
- Analysis of time series of risk-factor changes and volatility estimation methods

Overview (cont.)

Module B (24 h, G. Millo) will focus on

- Addressing the target market: the use of spatial linear regression models for setting budgets for insurance agents.
- Planning operations: dynamic models for the prediction of market premiums within a three-year plan horizon.
- Short-term forecasting for budgeting with automatic time series modeling algorithms.

Overview (cont.)

The course consists of frontal lectures and R practical sessions

- Home assignments will be scheduled during the course and evaluated
- Labs will focus on the use of the R statistical software
- R source files and lecture notes will be available via Moodle

Overview (cont.)

Practical sessions with R include

Module A

- *Modelling dependent risks*: estimation of risk measures for dependent risk processes
- *Fitting Copula models*: Parametric and non-parametric estimation of copula model via the copula R package

Module B

- *Claim reserving tools in R*: automatic calculation of claims reserving through the ChainLadder package
- *Demographic projections in R*: automating the Lee-Carter model of mortality and survival.

Main objectives of the course

By the end of this course you will be able to

- Discuss main statistical issues in the financial and insurance context related to risk management
- Exploit copula models for addressing various statistical problems related to stochastic dependence
- understand the use of spatial linear regression models in insurance
- Use appropriate statistical models for estimation of claims reserves in insurance and forecasting issues

Final exam

The final exam consists of two steps:

I A written test with problems and general questions pertaining to the topics covered in class

II a project to be developed with R presenting the statistical analysis of a dataset and the implementation of some of the techniques discussed in class

The final grade will be the average of the evaluation resulting from Part I and Part II.