Data Science and Scientific Computing
Spring Semester 21/22

Data Science for Insurance: Introduction to the course

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(DEAMS)

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2 Course Overview

Structure

The course is structured in two parts:

Part I Lecturer: R. Pappadà (DEAMS)
contact: rpappada@units.it
N. hours: 24
Expected n. weeks: 10

Part II Lecturer: to be announced soon
N. hours: 24
(Other info in the next weeks)

Lessons timetable and location

	Thursday	Friday
Part I	4 - 6 pm	2 - 4 pm
	Aula Disegno	Aula Disegno
	(Ed. C5)	(Ed. C5)

For the first two weeks lessons will be only on Thursday (2h)

Office hours:
Office: room 2.18, 2nd floor, Via Valerio 4/1

Tuesday, 15:00 - 16:30
Wednesday, 11:30 - 13:00
(Via Teams by appointment)
Check also for possible changes posted on www.deams.units.it

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Main objectives

This course (PART I) will be held with frontal lectures and `R` practical sessions.
The course aims at

- illustrating some statistical tools for dealing with quantitative modeling issues arising in the financial framework
- discussing risk in the context of finance and insurance and introduce common risk measures
- introducing recent statistical methods for handling risk aggregation concepts

Main objectives / 2

By the end of this module 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 dependence (we use the statistical software R)

Content

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- we focus on the joint and marginal distributions of risk-factor changes (or so-called returns)

We will consider different approaches to the statistical analysis of the loss distribution, according to whether or not we neglect the modeling of dynamics:

- if we assume risk-factor changes are *iid* we study the *unconditional* loss distribution
- otherwise, we need models for (multivariate) time series (we consider modeling financial time series and predicting volatility, particularly using GARCH models)

Content / 2

Assumption of multivariate normality may seriously underestimate the *tail* of the loss distribution. Another problem is also *radial symmetry*..

- Are there alternatives to the multivariate normal distribution (or multivariate-t) for modeling random vectors of risk-factor changes?

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We will introduce copula models that allow a more realistic description of joint extreme risk factor changes

- the goal is to measure dependence in the joint tails of bivariate distributions
- how estimation of risk measures changes?

Short summary

I. Financial risk and randomness

- Risk factors and loss distributions, Risk measures
- Unconditional or conditional analysis
- Time series of risk-factor changes and volatility estimation methods.

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- Risk aggregation in quantitative risk management;
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III. Dependence and Copulas

- Copulas (definition and properties)
- Some families of copulas, dependence measures
- Fitting copulas to data

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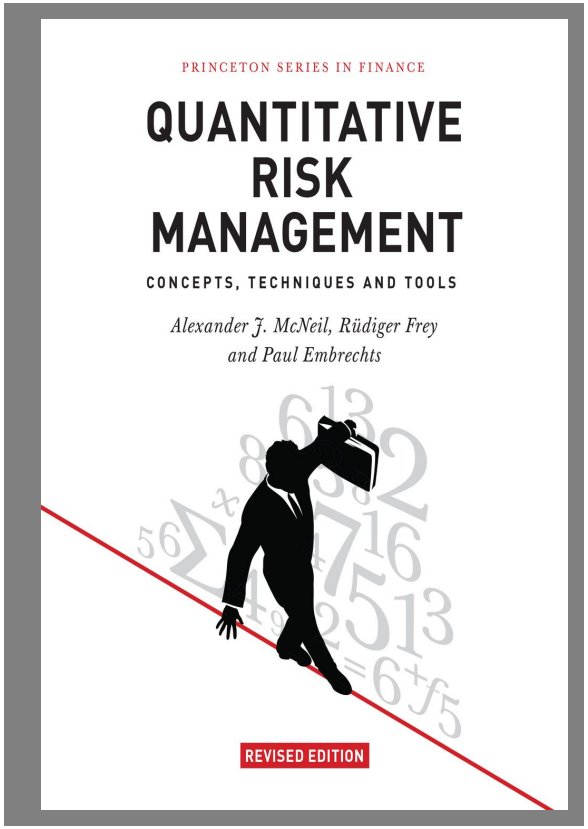
Textbooks and other resources

J. McNeil, R. Frey, and P. Embrechts (2015) *Quantitative Risk Management: Concepts, Techniques and Tools*, Revised Edition, Princeton Series in Finance

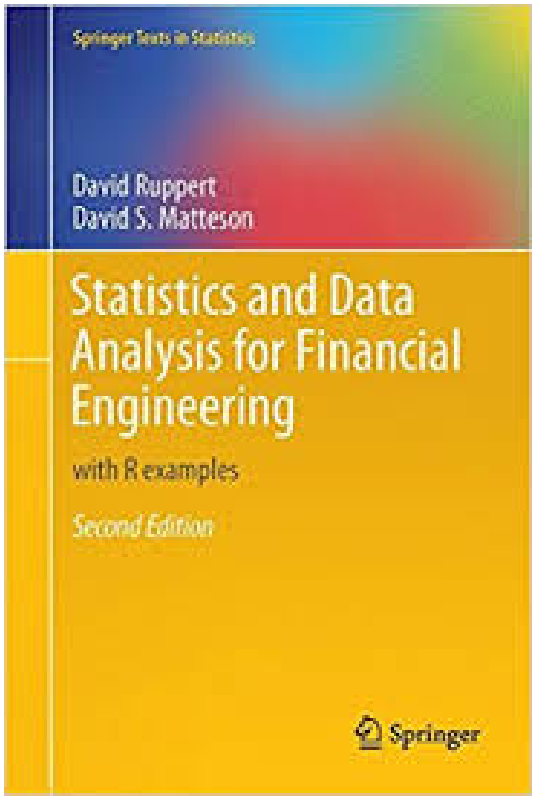


Textbooks and other resources / 2

D. Ruppert, D.S. Matteson (2015)

Statistics and Data Analysis for Financial Engineering with R examples

Second edition, Springer Texts in Statistics



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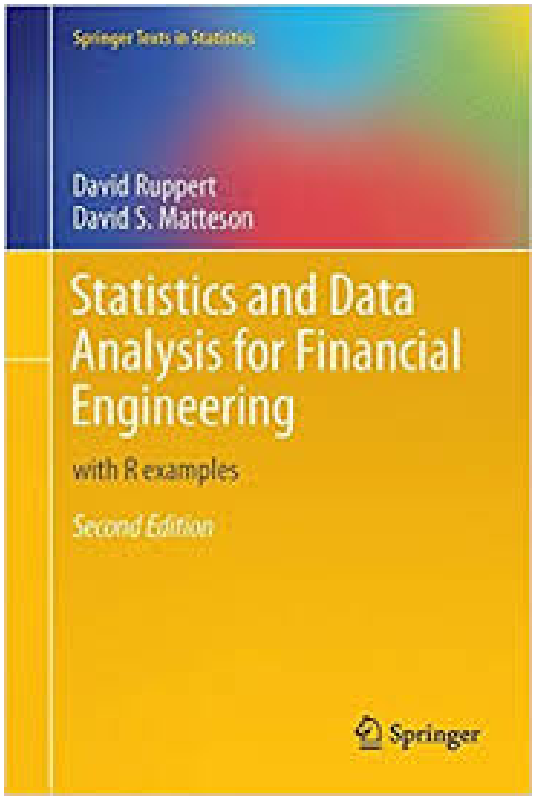

→ R code, exercises, slides and further readings will be available at the Moodle page of the course