# Statistical Methods for Finance and Insurance

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***COURSE AIMS AND INTENDED LEARNING OUTCOMES***

It is widely acknowledged that quantitative analysis in finance is increasingly drawing on the use of statistics. Financial intermediaries nowadays not only need solid training about the markets and their operation, but also a good knowledge of mathematical, statistical and IT tools that enable decision making that is often specific to the environment in which the intermediaries operate.

At the end of the course students will be able to:

1. perform exploratory data analysis for returns on a financial product and/or portfolio;
2. to use financial simulation and sampling techniques;
3. to make inferences about the parameters of models to describe financial phenomena with particular regard to the use of regression models;
4. estimate the parameters of a geometric Brownian motion;
5. measure the volatility of financial markets and estimate the VaR of a financial product and a portfolio.

***COURSE CONTENT***

First module

A preliminary exploratory analysis of the historical financial series (data will be made available on *Blackboard*) and the study of the temporal dynamics of prices and returns, are the instrumental elaborations for each statistical investigation. There will be references to probability models typical of finance and insurance, and the basic methods used to identify and estimate distribution parameters. Bond portfolios and the estimate of the corresponding parameters will be created.

Second module

After completing these steps, students should be able to apply the statistical tools that allow them:

– to describe and explain the basic features of the dynamics that occur in a historical financial series, by also using procedures of simulation and resampling from historical series. In this context, Excel © will be used for the generation of random numbers;

– to study the dynamics of the unpredictability and correlation, and to estimate VaR of a portfolio;

– use the *Solver* for optimization procedures;

– to calculate the beta of a financial asset and of a portfolio.

***READING LIST***

Recommended reading

D. Zappa-M. Nai Ruscone-R. Bramante, *Appunti di metodi statistici per la finanza e le assicurazioni,* EDUCatt, 2022.

 Supplementing reading:

S. Benninga-C. Zazzara, *Modelli finanziari: la finanza con Excel*, McGraw-Hill, 2010.

D. Ruppert; D.S. Matteson, *Statistics and Data Analysis for financial engineering: with R examples*, Springer, 2015.

C. Sengupta, *Financial Analysis and Modeling Using Excel and VBA*, 2nd edition, Wiley, 2009.

***TEACHING METHOD***

Lectures will be held in the IT Lab and will examine the processing of historical series of financial data, using Excel.

***ASSESSMENT METHOD AND CRITERIA***

The final assessment will take place in the computer room and consists of a test - using Excel © - aimed at assessing the full conceptual and operational knowledge of the topics presented. The assessment does not include an oral exam.

***NOTES AND PREREQUISITES***

Before attending the course, students are expected to know the elements of mathematics and statistics provided in the three-year degree courses as well as the main probabilistic models (in particular, the Gaussian model). Basic knowledge of the behaviour of financial markets, of the main financial products and, given the significant use of IT tools, some familiarity with the use of personal computer and, especially of Excel©, will be useful elements for an easier interpretation of the results.

Further information can be found on the lecturer's webpage at http://docenti.unicatt.it/web/searchByName.do?language=ENG or on the Faculty notice board.