# 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 Being aware of these requirements the course provides some basic to intermediate tools to fulfil them using the Excel © software. At the end of the course the students will be able to:

1. perform an exploratory analysis for returns on a financial product;
2. calculate the optimal mean-variance portfolio;
3. detect trends in an asset following an inference procedure;
4. assess the performance of trading systems based on an inference procedure;
5. evaluate breaks into the volatility structure of a financial asset;
6. pick the best variables for a regression model through a *stepwise* procedure.

***COURSE CONTENT***

* A preliminary analysis of financial series: tools for the graphical and the rolling description of prices and returns. Checking assumptions of *gaussian* distribution by means of the *Jarque–Bera* test or the *QQ* and the *PP* plots.
* Construction of the *variance–covariance* matrix among the returns and the calculation of the optimal portfolios with a minimum variance.
* Detection of trends into financial series by using the *t–test* statistics. Building up a *predictive trading system* on a bond derivative market and its assessment from a statistical inference point of view.
* Tools for a longitudinal data analysis of financial time series: the *Auto Correlation Function* and the *GARCH models*. Evaluation of the breaks in the volatility of financial time series by means of the *Likelihood Ratio Test*: application to the *Brexit* case.
* *Stepwise* procedures for variable selection in multivariate linear or logistic regression: the *Holthausen-Larcker* model case.

***READING LIST***

D. Ruppert, *Statistics and Data Analysis for financial engineering*, Springer, 2012.

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

***TEACHING METHOD***

Lectures are held in a IT Lab and will be processing the financial time series using the widespread software MS Excel ©.

***ASSESSMENT METHOD AND CRITERIA***

The final assessment will take place exclusively in the computer room and consists of a test - using Excel © - aimed at assessing the operational knowledge of the topics presented. The candidates will be assigned a case study with a series of questions related to the topics covered in class. The worth of the questions will depend on their difficulty. The time allowed for the test is 90 minutes. The assessment does not include an oral exam.

***NOTES AND PREREQUISITES***

Before attending the course, students are expected to know the fundamentals of descriptive and inference statistics with regards to: the main *descriptive statistics*, the *multivariate linear regression* model, the *likelihood* function; the *t–test* procedures for two populations as well as the *Gaussian* distribution and its related sampling distribution (*Chi square*, *t–student* and *Snedecor’s* *F*). Basic knowledge of the behaviour of financial markets and some familiarity with MS Excel© will be useful to follow the lessons.

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.