UNIVERSITÀ
DEGLI STUDI DI MILANO-BICOCCA

SYLLABUS DEL CORSO

Statistica dei Mercati Finanziari

2526-2-F1601M061-F1601M070M

Learning area

Statistical Methods in Finance

Learning objectives

The course aims to deepen the knowledge of the statistical tools learned during the basic courses of statistical inference and probability in order to improve the student's ability in analyzing financial time series. To this end, interval estimation and hypothesis testing techniques will be extended to the time series context and they will be applied in order to study the features of financial returns.

Copulas will be used to deepen the knowledge of the CreditMetrics and CreditRisk+ model by considering the possible dependence among the elements of the credit portfolio.

Several lessons will be held in the computer lab so that the theoretical insights can actually lead to an increase of the student's practical ability.

Expected learning outcomes (Dublin Descriptors):

Knowledge and understanding
Students will have a solid knowledge and understanding of the main topics covered during the course, with particular reference to the modeling of dependence with copulas and making statistical tests/interval estimates on characteristics of weakly dependent processes (alpha-mixing processes)

Applying knowledge and understanding
Students will be able to effectively apply the knowledge acquired during the course to concrete problems related to the study of financial phenomena.

Making judgements
Students will develop good autonomy of judgment and the ability to identify the methodologically correct techniques/tools to model financial phenomena and solve complex problems related to them.

Communication skills
Students will acquire clear and rigorous financial and statistical language and be able to effectively communicate their acquired knowledge.

Learning Skills
Students will develop an independent study method that will be useful in their future work or in case of more advanced studies.

Contents

Statistical inference for time series and inference for risk and performance measures of financial assets. Introduction to Copulas and their use in CreditMetrics and CreditRisk+.

Detailed program

Preliminaries. Review on probability theory

The multivariate Normal distribution

The delta method and its applications

Normality tests and goodness of fit tests
Kernel Density Estimation

Definition of stochastic process in discrete time

Laws of large numbers and central limit theorems for dependent data and their applications in finance
Descriptive and Inferential analysis of the returns of financial assets: inference on the expected return, standard deviation, VaR, and Sharpe Ratio.
Copulas and their applications in the CreditMetrics and CreditRisk+model.

Prerequisites

Basic notions of mathematical analysis, probability theory, statistical inference, and informatics.

Teaching methods

The theoretical and methodological arguments will be treated during lessons. Several lessons will be held in the computer lab in order to increase the student’s practical ability.

In all lessons a "mixed" approach is adopted: classical teaching will alternate with interactive teaching in proportions that vary from lesson to lesson. Typically the "interactive component" will be greater during exercises. Having to quantify, approximately 30% of the course will be delivered in interactive mode.

Assessment methods

Statistica dei mercati finanziari:

The exam is divided in two parts:

1. theoretical examination: the student is required to answer in writing to some open-ended questions.
2. practical examination: the student is required to apply the theoretical tools studied during the course in a practical test on a pc (using the R software).

The final evaluation will be given by the average of the evaluations in the theoretical and practical tests.

Textbooks and Reading Materials

Nelsen, R. B., An Introduction to Copulas, Springer, 2006.

Karlin S. and Taylor, H.M., A First Course in Stochastic Processes. Academic Press, 1975.

Classroom materials provided during the lessons

Sustainable Development Goals