UNIVERSITÀ
DEGLI STUDI DI MILANO-BICOCCA

SYLLABUS DEL CORSO

Risk Management

2627-2-F8206B026-F8206B026-1

Learning objectives

The course aims to provide students with the conceptual, mathematical, and computational tools necessary to analyze and interpret financial risk models and the metrics developed to assess it. At the end of the course, students will be able to:

1. Know in detail the variance-based approach to risk measurement, including the properties of the efficient frontier and the role of the Sharpe ratio;
2. Construct and compute advanced risk metrics (VaR, CVaR, and EVaR) for complex portfolios of financial assets;
3. Evaluate the performance of risk measures through backtesting procedures;
4. Use the copula approach to construct joint distributions useful for evaluating portfolios of securities;
5. Implement and validate risk models using the R programming language

Contents

Introduction to risk and uncertainty; the efficient frontier; risk measures; backtests; copulas.

Detailed program

1. Risk and return: general introduction and different definitions of the rate of return;
2. The mean-variance model: the construction of effficient portfolios with two risky assets and general properties;
3. Efficient frontier and the CAPM: costruction of the effiicet frontier in the general case; properties of the market portfolio and market line;

4. Efficient frontier with portfolio constraints: short-selling constraints and other trading restrictions; their ipact on the efficient frontier;
5. Definitions of risk measures: coherent properties of risk measures and their interpretation;
6. Main risk measures: Value-at-Risk, Expected Shortfall and EVaR; spectral measures; main properties of each measure;
7. Numerical implementation: how to write functions to compute risk measures;
8. Backtests: how to run a test on the performance of the risk measures; conditional tests;
9. Copulas: the role of covariances and the method of copulas.

Prerequisites

In order to attend this course, students must have received adequate training in the following areas:

1. Programming (preferably in R, but Python or MATLAB are also acceptable). Excel or VBA are not sufficient;
2. Financial theory: a solid understanding of the main financial instruments;
3. Statistics: a strong knowledge of the main parametric families of distributions, as well as the properties of mean, variance, and covariance.

Teaching methods

Traditional computer aided lectures (36 hours) and classes (6 hours). Due to scarcity of rooms and labs, some oof the lesssons may take place on-line.

Assessment methods

Numerical exercises with PC. The student is presented a list of 5/6 problems covering all topics of the course and which require to answer with numerical elaborations at the PC. You will be provided with a dataset to work on and a library of functions in R. The student may be required to write an ad hoc new function in R in order to solve some of the problems.

Textbooks and Reading Materials

Lectures will mainly follow the material prepared and availble on-line. Other useful sources are

1. Hull, J. C., Risk Management and Financial Institutions, Wiley;
2. McNeil, A. J., Frey, R., & Embrechts, P., Quantitative Risk Management: Concepts, Techniques and Tools, Princeton University Press.

Semester

First semester

Teaching language

Italian (English)

Sustainable Development Goals

QUALITY EDUCATION