UNIVERSITÀ
DEGLI STUDI DI MILANO-BICOCCA

COURSE SYLLABUS

Portfolio Theory

2526-1-F1602M001

Learning area

Learning objectives

The students will learn the portfolio optimization models proposed in the literature together with the necessary mathematical instruments. Particular attention will focus on the practical implementation of the proposed theoretical models.

Knowledge and understanding
Students will develop a thorough understanding of the fundamental portfolio selection models as established in the academic literature, alongside the mathematical foundations required for their rigorous analysis.

Applying knowledge and understanding
Students will be able to apply theoretical models to the construction and management of financial portfolios, with a strong emphasis on their practical implementation through quantitative and computational tools.

Making judgements
Students will cultivate the ability to critically evaluate the assumptions and limitations underlying portfolio selection methodologies, and to autonomously identify appropriate approaches in varying financial contexts.

Communication skills
Students will be capable of clearly and effectively presenting the outcomes of portfolio analyses, employing precise technical language suitable for both academic discourse and professional practice.

Learning skills
Students will acquire the methodological and analytical competencies necessary to pursue further study in advanced portfolio theory and to engage with developments in modern financial research.

Contents

Mathematical tools. Portfolio optimization models.

Detailed program

Mathematical instruments: functions of several variables, matrix algebra, quadratic forms, sign of a quadratic form, eigenvalues and eigenvectors, diagonalization.
Mean-variance model (Markowitz model): assumptions, theoretical derivation in the case of n risky assets and in the case of n risky assets and one riskless asset, efficient frontier, two funds separation theorem.
Limits of Markowitz model.
Alternative asset allocation models: risk parity, maximum diversified portfolio, optimal allocations that minimize alternative risk measures.

Prerequisites

Foundations of differential calculus and of matrix algebra

Teaching methods

Teaching activities consist of traditional lectures covering theoretical content and practical sessions focused on applied aspects. During the practical sessions, the theoretical models introduced in class will be implemented using real financial data through the MatLab software.

Teaching will be delivered exclusively in person. However, when logistically convenient, the MatLab-based sessions may be conducted remotely.

Approximately 70% of the course will follow a traditional lecture-based format, while the remaining 30% will be delivered in an interactive manner. This will include ongoing assessments of students' understanding, application of the studied models to real data, and the use of Bloomberg terminals.

Assessment methods

The examination is written with exercises and theoretical questions (open questions and exercises). The oral exam (on the topics presented during the lectures and the applications with MatLab) is mandatory.

Textbooks and Reading Materials

Lectures notes. Further referring texts will be suggested during the lessons.

Sustainable Development Goals

QUALITY EDUCATION