MATH0094 Market Risk and Portfolio Theory

Year:	2023-2024
Code:	MATH0094
Value:	15 UCL credits (= 7.5 ECTS)
Term:	1
Structure:	**On Campus**
Assessment:	In-class test with programming component (20%) and a final examination (80%). To pass the course, students must obtain an overall weighted mark of 50%.
Pre-requisites:	None
Lecturers:	Dr C Garcia Trillos

Course description and objectives

Risk is an intrinsic element in financial markets. Its quantitative modelling and understanding is a cornerstone of modern financial theory, as it is essential to many activities like choosing investment strategies, calculating capital requirements and creating new financial products.

This module aims to study quantitatively (by using several mathematical tools from probability, optimisation, linear algebra,...) the effects of market risk under some modelling assumptions. We will pay particular attention to the effects associated to decision making for investors and regulators. Important aspects related to the implementation of these concepts will be highlighted.

Recommended texts

K. Back, *Asset pricing and portfolio choice theory.* Oxford University Press, 2010.
H. Föllmer and A. Schied, *Stochastic finance: an introduction in discrete time.* Walter de Gruyter, 2011.
A. J. McNeil, R. Frey, and P. Embrechts, *Quantitative risk management: Concepts, techniques and tools.* Princeton university press, 2015.

Detailed syllabus

1. Mathematical modelling of financial markets in discrete time. Main assumptions and properties.

2. Utility functions: properties, absolute and relative risk aversion, examples, related concepts.

3. Portfolio choice: Consumption-investment problems. Performance measurement (RORAC) and efficient frontiers.

4. Risk, risk management and risk treatment. Risk measures. Notable examples: value at risk, expected shortfall. Properties: coherent and convex risk measures.

5. Practical aspects: Factor models, risk measure estimation, backtesting. Implementation in Python.

September, 2023