UAB
Universitat Autònoma de Barcelona

Advanced Financial Engineering

Code: 104876
ECTS Credits: 6

2024/2025

Degree	Type	Year
2503852 Applied Statistics	OT	4

Contact

Name: Albert Ferreiro Castilla

Email: albert.ferreiro@uab.cat

Teaching groups languages

You can view this information at the end of this document.

Prerequisites

The subject is a natural continuation of the curse Introduction to Financial Engineering and thus it is recomended but not required that the student has acquired the basic knowledge of that subject. It si required that the student has acquired the basic theoretical knowledge of calculus, calculus of probabilities and numerical methods.

Objectives and Contextualisation

The objective of this course is to introduce the student to a very active area, both scientifically and professionally, such as financial mathematics. The main educational goal is to deepen in the description of the different financial assets and to show the mathematical and statistical tools used for their management and valuation, focusing on their proper use and interpretation of the results.

It is for this reason that it is required that the student has acquired the basic theoretical and practical knowledge of the subject Introduction to Financial Engineering as well as the basic theoretical knowledge of calculus, calculus of probabilities and numerical methods.

Thus, the subject is considered as a first course in financial derivatives, focusing on the description of the most relevant assets in the market, its use and its valuation. For more than 40 years, financial derivatives have played a very important role in mitigating risks, speculating or arbitraging markets and have been a fundamental part in the transfer of risk among economic agents. It is for this reason that financial derivatives have also been at the center of different financial crises.

It is also a goal that the student does a job that requires the use of the computer, and this will lead to completing the theory classes with classes of problems and case sets where the computer is present.

Learning Outcomes

1. CM14 (Competence) Propose the statistical model needed to analyse data sets belonging to real studies.
2. KM17 (Knowledge) Recognise the statistical models for the analysis of data with different structures and complexities that frequently appear in different fields of application.

3. KM18 (Knowledge) Recognise the language of applications of economics and finances, biomedical science and engineering, provided by research and innovation in the field of statistics.
4. KM18 (Knowledge) Recognise the language of applications of economics and finances, biomedical science and engineering, provided by research and innovation in the field of statistics.
5. SM16 (Skill) Select appropriate sources of information for the statistical work.
6. SM17 (Skill) Discuss scientific articles in which the analysis of a study of the different areas of application is considered.
7. SM19 (Skill) Analyse complex data, whether this is due to their characteristics or their size.

Content

- Introduction
  - Introduction to financial markets
  - Fair value and finance
  - Academia vs Industry: Disclaimer
- Time value of money: Interest rates
  - Type of interest rates
  - Discount factors
  - Spot & forward curves
  - Bootstrapping method
  - Description of fixed income assets and valuation
- Valuation of Forwards and Futures
  - Description of forward and future instruments
  - Forward price and expected value
  - Currency forward price
- Interest rate derivatives
  - Market conventions
  - Description of an interest rate swap and valuation
  - Mechanics of swap markets
  - Options on bonds, caps and floors
- Mechanics of the options market
  - Vanilla options on equities
- Exotic Options & Securitizations

Unless the requirements enforced by the health authorities demand a prioritization or reduction of these contents.

Activities and Methodology

Title	Hours	ECTS	Learning Outcomes
Type: Directed			
Case Studies	20	0.8	CM14, KM17, SM17, SM19, CM14
Lectures	30	1.2	CM14, KM17, KM18, SM17, CM14
Type: Supervised			
Tutorials	25	1	CM14, KM17, KM18, SM16, SM17, SM19, CM14
Type: Autonomous			
Study + Problem & Case Sets	67.5	2.7	KM17, SM16, SM19, KM17

The student acquires the scientific-technical knowledge of the subject by attending to lectures and completing it with a personal study of the topics covered. The theory classes are activities in which less interactive activity is required from the student: they are conceived as a fundamentally unidirectional method of transmitting knowledge from teacher to student.

Problems and case sets are sessions with a small number of students with a double goal. On the one hand they work the scientific-technical knowledge showed in lectures to complete their understanding and to deepen in them through a variety of activities, from the typical resolution of problems to the discussion of practitioner cases. On the other hand, the problem set activities are the natural forum in which to discuss in common the development of practitioner cases work, providing the necessary knowledge to carry it out, or indicating where and how they can be acquired. The case problem sets of this subject is proposed as a way to guide the student in a statistical fieldwork in each of its stages.

This approach is aimed at promoting active learning and developing critical reasoning and the ability to analyze and sumarize.

The proposed teaching methodology may experience some modifications depending on the restrictions to face-to-face activities enforced by health authorities.

Annotation: Within the schedule set by the centre or degree programme, 15 minutes of one class will be reserved for students to evaluate their lecturers and their courses or modules through questionnaires.

Assessment

Continous Assessment Activities

Title	Weighting	Hours	ECTS	Learning Outcomes
Case Problem Sets	35%	2.5	0.1	CM14, KM17, KM18, SM16, SM17
Exam	30%	2.5	0.1	CM14, KM17, KM18
Problem Sets	35%	2.5	0.1	KM17, SM19

To pass the subject it is necessary that the average of the case and problem sets is greater than or equal to 4 and the exam mark should be greater than or equal to 3. If the student attends the recovery exam, the final grade will be the maximum between the course grade and the weighted average of it (30 %) and the grade of the recovery exam (70%). It is not allowed to attend the recovery exam to increase final marks.

In the event that a student applies for Single Assessment, consisting of an Exam (50%) and an Applied Essay (50%), the student would need to obtain a minimum of 5 in both activities to pass the subject.

Student's assessment may experience some modifications depending on the restrictions to face-to-face activities enforced by health authorities.

Bibliography

Hull, J. (2008) Options, Futures, and Other Derivatives, Prentice Hall.

Software

Excel

Language list

Name	Group	Language	Semester	Turn
(SEM) Seminars	1	Catalan	second semester	afternoon
(TE) Theory	1	Catalan	second semester	afternoon