

CALCULUS AND FINANCIAL INSTRUMENTS

Degree in Finance

Code: 16226

Main Scientific Area: Finance

Lecturer: Paulo Alexandre da Rocha Armada de Campos Leite

Language of Instruction: Portuguese

Regime: S2

Contact Hours: 60h Total Workload: 108h

ECTS: 6,0

Objectives

As a main objective, the students should be able to understand some fundamental concepts related to the Mathematics of Finance, in particular, and, given the interactions with other curricular units, concepts related to the capitalization and discount processes, annuities, several kinds of loans and their respective amortization methods, as well as the identification and characterization of the main financial instruments.

Each chapter will begin with the adequate definitions and principles, combined with some other descriptive elements. On the other hand, the emphasis will be put in the formulation of the problems and the analysis of the results. Therefore, and considering that the topics which will be addressed are essentially practical, several cases will be given to the students, contemplating a necessarily wide range of practical situations.

Learning Outcomes

- Understand the basic concepts associated to the Mathematics of Finance, particularly those related to the capitalization and discount processes.
- Clearly distinguish the several types of interest rates: nominal and effective rates, equivalent and proportional rates; illiquid and liquid rates; current and real rates.
- Establish the equation of value using capitals due in different moments of time.
- Identify and classify an annuity and calculate its value.
- Identify and characterize the several types of loans and their respective amortization methods.
- Identify and characterize the main financial instruments.

Course Contents

Chapter 1: Introduction

1.1. Overview of financial mathematics

1.2. Basic concepts

1.3. The interest function

Chapter 2: Compounding

2.1. Simple interest

2.2. Compound interest

2.3. Simple interest versus compound interest

2.4. Simple interest and compound interest with variable interest rate

Chapter 3: Interest Rates

3.1. Disparity between the compounding period and the period of the interest rate

3.2. Proportional and equivalent interest rates

3.3. Nominal and effective interest rates

3.4. Illiquid and liquid interest rates

3.5. Current and real interest rates

Chapter 4: Discount

4.1. Definition

4.2. Simple interest

4.3. Compound interest

4.4. The effective cost of discount

Chapter 5: Capital Equivalence

5.1. Equation of value

5.2. Single capital and single maturity

5.3. Average maturity

Chapter 6: Annuities

6.1. Definition and classification

6.2. Temporary annuities

6.2.1 Temporary annuities with constant cash-flows

6.2.2 Temporary annuities with uneven cash-flows

6.3. Perpetuities with constant cash-flows

6.4. Leasing

Chapter 7: Debt Amortization

7.1. Definition and classification

7.2. Single amortization systems

7.3. Periodic amortization systems

Chapter 8: Financial Instruments

8.1. Concept and classification

8.2. Debt instruments: treasury bills; commercial paper; bonds

8.3. Equities

8.4. Derivatives

Recommended Bibliography

- MATIAS, Rogério (2018), "Cálculo Financeiro – Teoria e Prática", 6.^a edição, Escolar Editora.

- QUELHAS, Ana Paula; CORREIA, Fernando (2017), "Manual de Matemática Financeira", 4.^a Edição, Almedina.

Learning and Teaching Methods

Chapters 1 to 4 will allow students to understand the fundamentals of mathematical finance, namely those related with compounding and discount, as well as to distinguish and calculate: nominal and effective interest rates; proportional and equivalent interest rates; illiquid and liquid interest rates.

Chapter 5 will allow students to establish the equation of value using capitals in different moments of time.

Chapter 6 will allow students to identify and classify an annuity, as well as to calculate its value.

Chapter 7 will allow students to understand the main systems of debt amortization.

Finally, chapter 8 will allow students to identify and characterize the main financial instruments.

Assessment Methods

Degree in Business Administration

System of continuous evaluation: consists in two in-class tests. The final classification is the weighted average of the grades obtained in both tests (the 1st test weights 40%; the 2nd test weights 60%). The classification obtained in each test must be higher than 7 values (minimum grade).

There is no oral evaluation. The use of mobile phones / smartphones / smartwatches during tests / exams is not allowed.

Degree in Finance

The assessment methodology for the degree in Finance will be as follows:

1. To students enrolled in all the Curricular Units (CU) of the 1st year, for the first time:

Final Classification CU = 85% Assessment CU + 15% Project, in Continuous Assessment and 2nd semester Examination Period (the grade of the Project to be considered is that obtained in continuous assessment).

Final Classification CU = 100% Assessment CU, in the Special and Exceptional Period of Examination and Grade Improvement.

Validity of the Project: Continuous assessment and 2nd semester Examination Period of the academic year in which it was performed.

Assessment of CU (50h): 85% – The assessment includes two in-class tests, each one with the weight of 50% in the final classification. The classification obtained in the second test must be higher than 7,0 values (minimum grade).

Project (10h): 15% – The project is mandatory, as well as the attendance to Skills classes and the classes (from 27.05.2024 to 07.06.2024). Groups must be formed by 14.03.2024.

2. For Students who are not enrolled in all 1st year CU, for the first time, the Evaluation Methodology referred to in point 1 applies. However, instead of the project, these students must do substitute work. These students must communicate to the teacher of the CU, until 14.03.2024, that they will perform the substitute work, so the teacher can define the groups and the topic of the work. In the absence of communication, it is assumed that the student does not intend to do the substitute work, being automatically failed in the continuous assessment.

3. For students with student-worker status issued by the academic services the Evaluation Methodology referred to in point 1 applies. However, these students may choose to do the project or the substitute work. The option must be communicated by 14.03.2024 to the teacher of the CU. In the absence of communication, it is assumed that the student does not intend to do the project/substitute work, being automatically failed in the continuous assessment.

4. For students who do not do the project/substitute work, the following rules apply:

- Continuous Assessment: the student has missed an element of assessment and thus the Final Classification CU= Failed;

- 2nd semester Examination Period: zero is considered in the component of the evaluation concerning the project/substitute work, so Final Classification CU = 85% Assessment CU.