Dauphine | PSL ★
UNIVERSITÉ PARIS

0IBUSY28 – Applied Mathematics for Finance (The time value of money: interest rates, loans, and investment valuation)

Lecturer: Jean-Philippe CORREIA
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Department: International affairs
Semester: 2

Course level: L3 Undergraduate
Domain: Business, Finance
Teaching language: English
Number of in-class hours: 18
Number of course sessions: 10 + Exam
ECTS: 3

Course description and objectives

The aim of the course is to introduce students to the fundamental math tools used in corporate finance. It is intended for L3 students wishing to pursue a degree in corporate finance or accounting. The course covers the concepts of interest rates (simple/compounded interest; periodic and continuous compounding; discounted and earned value); calculation of amortisation and annuities on undivided loans (loan amortisation table ; actuarial cost, total effective rate); bonds and interest rate markets (zero-coupon ; yield curve; bond valuation; actuarial rate; duration); investment choices (net present value, IRR, profitability index), equity valuation (yield; valuation by multiples; Gordon-Shapiro model). It is based on the presentation of theoretical concepts and the corresponding vocabulary and makes extensive use of exercises to put the techniques studied into practice.

Prerequisites

A minimum grounding in mathematics (power functions, derivative functions) is recommended, although a refresher is provided at the beginning of the course.

Learning outcomes

At the end of the course students will be familiar with the vocabulary and concepts of the time value of money. They will know how to use the fundamental tools studied in an appropriate context for decision making in corporate finance.

Assignments and grading

- A written assignment (70%) and a participation mark (30%) make up the continuous assessment mark.
- Final exam and continuous assessment 50/50.

Attendance is compulsory. After two absences, the attendance mark is reduced to zero. Basic calculators are allowed in examinations.

The numerical grade distribution will dictate the final grade. The passing grade for a course is 10/20.

Class participation: Active class participation – this is what makes classes lively and instructive. Come on time and prepared. Class participation is based on quality of comments, not quantity.
Exam policy: In the exam, students will not be allowed to bring any document (except if allowed by the lecturer). Unexcused absences from exams or failure to submit cases will result in zero grades in the calculation of numerical averages. Exams are collected at the end of examination periods.

Course structure

Session	Topic
1	Refresher: affine equations, power functions, logarithms, usual derivative functions Chapter 1: Interest rates Simple and periodic compounding; continuous compounding; present value and future value; discounting
2	Exercises chapter 1
3	Chapter 2: annuities Definition; arithmetic and geometric series; time line; different types of annuities: regular, progressive, advance or arrear annuities, perpetuity; effective interest rate; EIR through trial error and interpolation
4	Exercises chapter 2
5	Chapter 3: loans Characteristics; usual amortization and redemption; advance repayment; loan effective interest rate
6	Exercises chapter 3
7	Written assignment
8	Chapter 4: bonds Definition; yield curve; zero-coupon bonds; theoretical bond price; forward rate; duration
9	Exercises chapter 4
10	Chapter 5: investments Net present value; profitability index; internal rate of return; indifference rate; Gordon-Shapiro model
11	Exercises chapter 5
12	**Final Exam**

Bibliography

- Garett, An introduction to the mathematics of finance, a deterministic approach, Butterworth-Heinemann second edition
- Drake & Fabozzi, Foundations and applications of the time value of money, Wiley 2009
- Luderer, Classical financial mathematics : basic ideas, central formulas and terms at a glance, Springer 2021
- Devolder & Fox, Mathématiques financières, Pearson 2015 (in French)

Lecturer's biography

Jean-Philippe Correia teaches accounting, finance and applied mathematics. He joined UPD after a career in investment banking (corporate banking and derivative markets) in major European banking groups, both in France and in Europe.
He is a graduate from EM Lyon business school and Ecole Normale Supérieure de Cachan (Paris-Saclay).

Academic integrity

Be aware of the rules in Université Paris Dauphine about plagiarism and cheating during exams. All work turned in for this course must be your own work, or that of your own group. Working as part of a group implies that you are an active participant and fully contributed to the output produced by that group.