Mathematics for Finance (21187)

Matemàtiques Financeres (20644)

Degree/study: Grau ADE / ECO / IBE
Course: third/fourth
Term: first
Number of ECTS credits: 5 credits
Hours of student's dedication: 125 hours
Language or languages of instruction: English
Professor: Roland Umlauft

1. Presentation of the subject

This course is designed so that the student understands the two main concepts of financial mathematics, namely, discounting and accumulation, as well as various interest or time value mechanisms. The student obtains in-depth knowledge of calculation of the value of annuities and perpetuities with constant or varying payments. Finally, this knowledge is applied to the concepts of loans, debts and bonds as well as NPV, IRR and APR calculations.

2. Competences to be attained

Students obtain knowledge about discounting and accumulation using different interest rate regimes as well as calculation of the value of income streams. Throughout the course students make use of mathematical concepts such as progressions, logarithms and linear interpolation.

3. Contents

Block 1: Simple Interest and Simple Discount
(1.5hrs, Lecture 1)

1.1 Simple Interest
1.2 Discounted Value at Simple Interest
1.3 Equations of Value
1.4 Partial Payments
1.5 Simple Discount at a Discount Rate

Block 2: Compound Interest
(6hrs, Lectures 2-5)

2.1 Fundamental Compound Interest Formula
2.2 Equivalent Compound Interest Rates
2.3 Discounted Value at Compound Interest
2.4 Accumulated and Discounted Value for a Fractional Period of Time
2.5 Determining Rate and Time
2.6 Equations of Value
2.7 Continuous Compounding

Block 3: Annuities & Perpetuities
(7.5hrs, Lectures 6-10)

3.1 Definitions
3.2 Accumulated Value of an Ordinary Simple Annuity
3.3 Discounted Value of an Ordinary Simple Annuity
3.4 Other Simple Annuities
3.5 Determining the Term of an Annuity
3.6 Determining the Interest Rate
3.7 Perpetuities
3.8 Annuities with Varying Payments
3.8.1 Geometric Progression
3.8.2 Arithmetic Progression

Block 4: Repayment of Debt, Loans
(4.5hrs, Lectures 11-13)

4.1 Amortization of Debt
4.1.1 Interest-only Periods
4.1.2 Variable Interest Rate
4.2 Outstanding Balance

Block 5: Net Present Value (NPV), Internal Rate of Return (IRR) & Annual Percentage Rate (APR)
(4.5hrs, Lectures 14-16)

4.1.Net Present Value
4.2.Internal Rate of Return
4.3.IRR and APR

4. Assessment

This course consists of 24 hours of theory class (16 lectures of 1.5hrs) and 9 hours of practice classes (1.5hrs/wk during the last 6 weeks). At the end of the course there will be a final exam (70% of the grade). Additionally, students are graded on class participation, especially during the practice sessions (5%). Students have to hand in 2 homework sets, at the beginning of practice class in weeks 7 & 9. These homework sets account for 15% of the final grade. Practice sessions are used for student presentations. Each student has to present the solution to at least one exercise in one of the practice sessions. This presentation will also count for 10% of the final grade. The minimum final passing grade is 5.5 out of 10.

The grades for class participation, homework and exercise are preserved for the recuperation exam in the 2nd trimester.

Students are only allowed to attend the exam or recuperation exam if they were enrolled in the course during the first term of 2012-13.

5. Bibliography and teaching resources

5.1. Basic bibliography

Zima, Brown, Kopp, Mathematics of Finance, 7th Edition, McGraw Hill. 2011

5.2. Additional bibliography

MINER, J. Curso de Matemàtica financiera. McGraw Hill. Madrid, 2003.

BRUN, X., ELVIRA, O., PUIG, X. Matemàtica financiera y estadística bàsica. Ed.Profit. Barcelona, 2008.

BONILLA, M.; IVARS, A. Matemática de las operaciones financieras (teoría y práctica). Madrid: AC, 1994.

DELGADO, C.; PALOMERO, J. Matemática financiera. 6a. ed. Logronyo: Distribuciones Texto S.A., 1995.

GIL PELÁEZ, L. Matemática de las operaciones financieras. Madrid: AC, 1987.

MENEU, V.; JORDÁ, M. P.; BARREIRA, M. T. Operaciones financieras en el mercado español. Barcelona: Ariel, 1994.

RODRÍGUEZ, A. Matemáticas de la financiación. Barcelona: Ediciones S, 1994.

SANOU, L.; VILLAZÓN, C. Matemática financiera. Barcelona: Foro Científico, 1993.

TERCEÑO, A. i d'altres. Matemática financiera. Madrid: Pirámide, 1997.

VILLAZÓN, C.; SANOU, L. Matemática financiera. Barcelona: Foro Científico, 1993

ALEGRE, P.; BADÍA, C.; BORRELL, M.; SANCHO, T. Ejercicios resueltos de matemática de las operaciones financieras. Madrid: AC, 1989.

CABELLO, J. M.; GÓMEZ, T.; RUIZ, F.; RODRÍGUEZ, R.; TORRICO, A. Matemáticas financieras aplicadas (127 problemas resueltos). Madrid: AC, 1999.

GIL PELÁEZ, L.; BAQUERO, M. J.; GIL, M. A.; MAESTRO, M. L. Matemática de las operaciones financieras. Problemas resueltos. Madrid: AC, 1989.

6. Methodology

During the lecture portion of the course, the theoretical foundation of financial mathematics will be presented and each new concept is illustrated by at least one example that is being solved by the lecturer. During seminar class examples, the concepts previously studied in lectures are used by students to present solutions to practice problems.

7. Activities Planning

Students are recommended to attend lectures and classes and to prepare solutions to the seminar practice problems before attending seminar classes, even though the solutions do not have to be handed in. There are 2 homework sets to be handed in individually, at the practice class of weeks 7 and 9.