COURSE DATA

Data Subject

Code	43779
Name	Financial mathematics
Cycle	Master's degree
ECTS Credits	3.0
Academic year	2022 - 2023

Study (s)

Degree	Center	Acad. year	Period
2171 - Master's Degree in Actuarial and Financial Sciences	Faculty of Economics	1	Second term

Subject-matter

Degree	Subject-matter	Character
2171 - Master's Degree in Actuarial and Financial Sciences	3 - Finance and introduction to insurance	Obligatory

Coordination

Name	Department
GONZALEZ BAIXAULI, EUSEBIO CRISTOBAL	113 - Financial and Actuarial Economics

SUMMARY

The subject of "**Finance and Introduction to Insurance**" is located in the second semester of the first year and is studied after the study of two previous subjects. One of them, dedicated to lay the technical and methodological bases on which much of the later developments will be supported, and another devoted to place the student in the scenario in which his or her professional activity will be developed.

In this sense, once the mathematical and statistical foundations are reached, and the general context is known, one of the specific areas of the Master's Degree is able to be addressed in the second semester: Finance, in which the subject Financial Mathematics is included.

With the study of this subject it is intended that the students know the different operations and financial assets that are traded in the fixed income markets and acquire competences for the valuation of the interest rate risk.

The subject has continuity in the field of Risk Control and Solvency, especially in the subject of Fixed Income Models where knowledge is expanded and the valuation and management of interest rate risk is addressed as a continuous and integrated process in the set of risks of the company.

PREVIOUS KNOWLEDGE

Relationship to other subjects of the same degree

There are no specified enrollment restrictions with other subjects of the curriculum.

Other requirements

In order to carry out an adequate learning of the contents of this subject, students must know the typical contents of Financial Economics that are usually taught in social studies, as well as having basic skills in the use of the Excel © Worksheet.
No enrollment restrictions have been specified with other subjects of the curriculum.

COMPETENCES (RD 1393/2007) // LEARNING OUTCOMES (RD 822/2021)

2171 - Master's Degree in Actuarial and Financial Sciences

- Students should apply acquired knowledge to solve problems in unfamiliar contexts within their field of study, including multidisciplinary scenarios.

- Students should be able to integrate knowledge and address the complexity of making informed judgments based on incomplete or limited information, including reflections on the social and ethical responsibilities associated with the application of their knowledge and judgments.

- Students should demonstrate self-directed learning skills for continued academic growth.

- Saber tomar decisiones relacionadas con los riesgos evaluables económicamente.

- Alcanzar sólidos fundamentos de Matemática Financiera y ser capaces de utilizarlos para valorar operaciones, activos financieros y contratos derivados.

- Alcanzar sólidos fundamentos para la toma de decisiones financieras: asignación de recursos en el tiempo bajo incertidumbre, estructura y funcionamiento de los mercados financieros, valoración de activos y selección de carteras.

LEARNING OUTCOMES (RD 1393/2007) // NO CONTENT (RD 822/2021)

Capacity and / or competence to:

- Apply a valuation model to operations and financial assets.

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- Operate in the fixed income financial market based on the knowledge of the operation and valuation standards.

- Know the behavior and the explanatory theories of the term structure of interest rates (TSIR).

- Manage the interest rate risk of a fixed income portfolio.

DESCRIPTION OF CONTENTS

1. Fixed income assets and term structure of interest rates in an arbitrage-free valuation context

I.1.   Non-arbitrage as a fundamental hypothesis: basic concepts.
I.2.   Fixed income valuation in an arbitrage-free context. The IRR of fixed-income securities.
I.3.   Spot rates and term structure of interest rates (TSIR).
I.4.   Forward rates.
I.5.   Alternative theories about TSIR.

2. Interest rate risk

II.1.   Price risk.
II.2.   Macaulays duration.
II.3.   Durations limitations as a measure of market risk: convexity of a portfolio.
II.4.   Reinvestment risk.
II.5. Fixed income strategies: passive and active strategies. Contingent immunization.

3. Fixed income valuation under uncertainty

III.1. Wiener Processes.
III.2. Itôs Lemma.
III.3. Fixed income valuation under uncertainty.
III.4 Stochastic duration.

WORKLOAD

ACTIVITY	Hours	% To be attended
Theory classes	15,00	100
Classroom practices	15,00	100
Development of individual work	10,00	0
Study and independent work	25,00	0
Resolution of case studies	10,00	0
TOTAL	**75,00**	

TEACHING METHODOLOGY

During the term the contents of the program will be worked simultaneously with the theoretical and practical classes. In general, lectures will be used for the theoretical classes and the teacher will detail the fundamental aspects of each topic and guide the study through the relevant bibliography, to which the student must go to complete and deepen in the matter.

The practical classes will consist of solving questions and exercises and that have been previously raised in the theoretical classes. The student must participate actively in the development of the activity discussing the solution, and using the appropriate computer techniques for its resolution.

In addition to these activities, the student must carry out other activities oriented to autonomous learning, such as individual study or the performance of individual or group work. In this regard, tutoring, performed either individually or in groups, is a particularly important teaching resource since it allows the teacher to know the level of progress of the group, and the student a personalized orientation in its training program. Consequently, throughout the training period of the subject is recommended and encourages the use of this teaching resource.

The virtual classroom, http://pizarra.uv.es facilitates the development of these methodologies, since it includes all the teaching material.

EVALUATION

The evaluation will be based on:

- A written exam that will consist of theoretical questions as well as problems or exercises.
- Continuous assessment, based on class attendance and participation in training activities such as exercises, problems, cases, and individual and / or team work.

The written exam will represent 80% of the final grade and the continuous assessment will be 20% of the final grade.

To pass the subject the student will need to obtain a minimum score of 5 points out of 10 after the computation of the grade corresponding to the written exam and that corresponding to the continuous assessment. In order for the proposed activities and tasks to be evaluated, they must be submitted before the deadline stipulated for each of them.

In the second call, the same evaluation criteria will be used as in the first one.

REFERENCES

Basic

- Artículos:

Andrada, J.; Fernández, A. y Fernández, F. (2014): La estructura temporal de los tipos de interés: estrategias de negociación en renta fija. Cuadernos de Economía., 37, 141-149.

De la Peña, I. (1997): El Riesgo de Interés en Seguros y Pensiones: Una aproximación actuarial. Anales Instituto de Actuarios Españoles, vol.2, 49-172.

Donald J. Smith (2010) Bond portfolio duration, cash flow dispersion and convexity, Applied Economics Letters, 17:17, 1669-1672, DOI: 10.1080/13504850903251249

Iturricastillo, I. e I. De la Peña (2008): El problema del rebalanceo en las estrategias inmunizadoras. Análisis financiero, 108, 66-77

- Libros:

De La Grandville (2001): Bond Pricing and Portfolio Analysis. Ed MIT Press.

Marín, J. y G. Rubio (2001): Economía Financiera. Ed. Antoni Bosch.

Meneu,V., E. Navarro y M.T. Barreira. (1992): Análisis y Gestión del Riesgo de Interés. Ariel Economía.

Navarro, E. (2019): Matemáticas de las operaciones financieras. Ed. Pirámide.

Navarro, E. y J. Nave. (2001): Fundamentos de Matemáticas Financieras. Ed. Antoni Bosch.

- Páginas web:

AIAF: www.aiaf.es

CNMV: www.cnmv.es

Banco de España: www.bde.es

Bolsas y mercados españoles: www.bolsasymercados.es