Mathematical Modelling in Finance

ECTS: 6 ECTS

COORDINATOR: Carlos Vázquez Cendón (carlosv@udc.es)

UNIVERSITY WHERE THE COORDINATOR IS: UDC

HAVE YOU GIVEN PERMISSION TO RECORD YOUR CLASSES? Yes

LECTURER 1: Carlos Moreno González (cmoreno@ccia.uned.es)

UNIVERSITY WHERE THE LECTURER 1 IS: UDC

HAVE YOU GIVEN PERMISSION TO RECORD YOUR CLASSES? Yes

LECTURER 2: María Rodríguez Nogueiras (mrnogueiras@gmail.com)

UNIVERSITY WHERE THE LECTURER 2 IS: UDC

HAVE YOU GIVEN PERMISSION TO RECORD YOUR CLASSES? Yes

SUBJECT CONTENTS

1. Fiinancial markets and financial derivatives
2. Present value of riskless financial products
3. Price models for risky assets
4. Dynamic hedging methodology and Black-Scholes models
5. Black-Scholes models for options and bonds with one stochastic factor

6. Black-Scholes models for options and bonds with two stochastic factors

7. Computation of financial risks: pricing and counterparty risk. Definitions, methodologies and applications

METHODOLOGY

Financial products and basic mathematical models will be presented in the lectures as well as the most common numerical methods for solving mathematical models will be described. The lectures will take place in 75% of the teaching time schedule, which will include examples and hours devoted to the examination. On the other hand, the remaining 25% hours will be devoted to practical classes, in which students solve different types of problems, under the supervision of the teacher. Exercises, patterns and numerical methods are also proposed which students must develop individually or in groups.

LANGUAGE USED IN CLASS: Spanish

IS IT COMPULSORY TO ATTEND CLASS? Students can attend via conference system

BIBLIOGRAPHY

1. D. Brigo, M. Morini, A.Pallavicini, Counterparty credit risk, collateral and funding, Wiley Financial Series, 2013.

2. K.Dowd, Measuring market risk, Wiley Financial Series, 2ªEdición, 2005.

3. J. Gregory, Counterparty credit risk: the new challenge for global financial markets, Wiley Financial Series, 2010.

4. J.C.Hull, Options, Futures and Other Derivatives, Prentice-Hall Inc., (New Jersey), 2000.

5. T.Mikosch, Elementary Stochastic Calculus with Finance in View, World Scientific, (Singapur), 1998.

6. A. Pascucci, PDE and martingale methods in option pricing, Bocconi University Press, Springer, 2011.

7. R.Seydel, Tools for Computational Finance, Universiteitext, Springer-Verlag, 2006.

8. C. Vázquez, An introduction to Black-Scholes modeling and numerical methods in derivatives pricing, MAT Serie A, (2010), p.1-47.

9. P.Wilmott, S.Howison, J.Dewynne, The mathematics of Financial Derivatives, A Student Introduction, Cambridge University Press (Cambridge), 1996.

10. P.Wilmott, S.Howison, J.Dewynne, Option Pricing: Mathematical Models and Computation, Oxford Financial Press (Oxford), 1996.

11. P.G.Zhang, Exotic Options, A guide to second generation options, World Scientific (Singapur), 1998.

SKILLS

Basic:

CG1: To have knowledge that provide a basis or opportunity for originality in developing and / or applying ideas, often within a research context, knowing how to translate industrial needs in terms of R & D in the field of mathematics Industrial.

CG2: To be able to apply the acquired knowledge and abilities to solve problems in new or unfamiliar environments within broader contexts, including the ability to integrate multidisciplinary R & D in the business environment.

CG4: To have the ability to communicate the findings to specialist and non-specialist audiences in a clear and unambiguous way.

CG5: To have the appropriate learning skills to enable them to continue studying in a way that will be largely self-directed or autonomous, and also to be able to successfully undertake doctoral studies.

Specific:

CE1: To acquire a basic knowledge in an area of Engineering / Applied Science, as a starting point for an adequate mathematical modelling, using well-established contexts or in new or unfamiliar environments within broader and multidisciplinary contexts.

CE2: To model specific ingredients and make appropriate simplifications in the model to facilitate their numerical treatment, maintaining the degree of accuracy, according to previous requirements.

CE5: To be able to validate and interpret the results, comparing them with visualizations, experimental measurements and functional requirements of the physical engineering system.

Modelling specialization:

CM1: To be able to extract, using different analytical techniques, both qualitative and quantitative models.

WILL YOU BE USING A VIRTUAL PLATFORM? No.

WILL YOU BE USING ANY SPECIFIC SOFTWARE? Yes. MATLAB

CRITERIA FOR THE 1ST ASSESSMENT OPPORTUNITY

The evaluation will be the result of the written examination (at least 50% of the qualification) together with the exercises and homework handed in by individuals or groups that will provide the rest of the mark.

CRITERIA FOR THE 2ND ASSESSMENT OPPORTUNITY

The same as in the 1st assessment opportunity.