Modèles financiers II

Lecturer
Griselda DEELSTRA (Coordinator)

Course mnemonic
ACTU-F4002

ECTS credits
5 credits

Language(s) of instruction
French

Course period
Second term

Campus
Plaine

Course content

We will start this course with the introduction of concepts related to Brownian motion, stochastic integration, stochastic differential equations and a link with PDE's and the change of probability measures. In particular, we will study Ito's lemma, the theorem of Girsanov and the lemma of Feynman-Kac.

Next, we will concentrate upon the model of Black & Scholes (1973) and we will derive the famous formula of Black & Scholes by different methods. Using the technique of a change of measure, we will study different applications like the exchange option of Margrabe (1978) and exchange rates in the model of Garman-Kohlagen (1983).

A part of the course will be devoted to interest rate derivatives and stochastic interest rate models, in particular the models of Vasicek (1977), Hull & White (1990) and Cox-Ingersoll-Ross (1985).

Applications include exotic options and their applications in the financial and insurance world.

Several practical aspects like the calibration and numerical methods are mentioned.

Objectives (and/or specific learning outcomes)

The main goal of this course is that the students know how to obtain prices and hedging strategies for derivatives in different continuous-time models (without jumps).

Therefore, the course will start by providing the basic concepts of the theory of stochastic calculus.

Pre-requisits and co-requisits

Required knowledge and skills

Probability theory, stochastic processes, martingales, theory of pricing by absence of arbitrage opportunity (Modèles financiers I).

Teaching method and learning activities

Theoretical sessions, exercises and works; slides and black board explanations.

Contribution to the teaching profile

See the French version for more details.

A first goal is to define and analyze the properties of a "stochastic integral", that means an integral in which the integrand and the integrator are allowed to be stochastic processes. These results are essential in financial mathematics.

Indeed, the main goal of the course is to present probabilistic techniques used in financial models for pricing and hedging financial and insurance products in continuous-time models.

Different models for shares, interest rates and exchange rates are studied, as well as different derivatives and exotic options together with some applications in finance and insurance.

References, bibliography and recommended reading

BRIGO D. et F. MERCURIO (2006). *Interest Rate Models – Theory and Practice*, Springer.

DANA, R.-A. et M. JEANBLANC-PIQUE (1994). *Marchés Financiers en Temps Continu*. Economica.

HULL, J. (1989). *Options, Futures and Other Derivative Securities*. Prentice-Hall, Englewood Clifs, New Yersey.

LAMBERTON, D. et LAPEYRE, B. (1997) (2nd edition). *Introduction au Calcul Stochastique appliqué à la Finance*. Ellipses.

MUSIELA M. et M. RUTKOWSKI (1998). *Martingale Methods in Financial Modelling*, Springer.

STEELE J.M. (2001). *Stochastic Calculus and Financial Applications*, Springer-Verlag.

Course notes

Université virtuelle

Other information

Place(s) of teaching

Plaine

Contact(s)

Griselda Deelstra (9.NO.110)

Evaluation method(s)

written examination, Oral examination and Project

Evaluation method(s) (additional information)

The oral examination consists of theoretical questions and the written examination covers exercise questions. There is also a project to hand in and to defend (the date of the oral presentation will be fixed after discussion).

The assessment method could be adapted according to the sanitary situation.

Determination of the mark (including the weighting of partial marks)

20% on the project; 40% on the oral exam and 40% on the written exam.

Main language(s) of evaluation

French

Programmes

Programmes proposing this course at the faculty of Sciences

MA-ACTU | Master in Actuarial Science | finalité Professional/unit 1