Valuation of financial assets and arbitrage

ECTS : 6

Volume horaire : 30

Description du contenu de l'enseignement :

Course outline:

I. Discrete time modelling

I.1. Financial assets

I.2. The No arbitrage condition and martingale measures (FTAP)

I.3. Pricing and hedging of European options; market completeness and 2nd FTAP

I.4. Pricing and hedging of American options (in a complete market)

II. Continuous time modelling

II.1. Financial assets as Itô processes : general theory

II.2. Markovian models : PDE pricing, delta-hedging (European options, barrier options, American options)

II.3. Local volatility models and Dupire's formula

II.4. Stochastic volatility models : how to deal with market incompleteness; (semi-)static hedging; specific models and their properties

Compétence à acquérir :

The lecture starts with discrete time models which can be viewed as a proxy for continuous settings, and for which we present in detail the theory of arbitrage pricing. We then develop on the theory of continuous time models. We start with a general Itô-type framework and then specialize to different situations: Markovian models, local and stochastic volatility models. For each of them, we discuss the valuation and the hedging of different types of options : plain Vanilla and barrier options, American options, options on realized variance, etc. Finally, we present several specific volatility models (Heston, CEV, SABR,...) and discuss their specificities.

Bibliographie, lectures recommandées :

Bouchard B. et Chassagneux J.F., Fundamentals and advanced Techniques in derivatives hedging, Springer, 2016.
Lamberton D. et B. Lapeyre, Introduction au calcul stochastique appliqué à la finance, Ellipses, Paris, 1999.