Financial Engineering (COMP0048)

Description

Aims:
This module introduces the applied mathematical and computational aspects of Quantitative Finance;

Learning outcomes:
On successful completion of the module, a student will be able to successfully apply the necessary probability and differential equation based approach to the pricing of financial derivatives; using both quantitative and numerical techniques;

Content:
Financial Products and Markets:

Stochastic Calculus:
- Brownian motion and properties, Itô’s lemma and Itô integral. Stochastic Differential Equations – drift and diffusion; Geometric Brownian Motion and Vasicek model. Forward and Backward Kolmogorov equations for the transition density; Black-Scholes Model:
- Assumptions, PDE and pricing formulae for European calls and puts. Extending to dividends, FX and commodities. The Greeks and risk management
  - theta, delta, gamma, vega and rho and their role in hedging. Two factor models and multi-asset options;
  Mathematics of early exercise:
  - Perpetual American calls and puts; optimal exercise strategy and the smooth pasting condition; Computational Finance:

Fixed income world:
– Zero coupon bonds and coupon bearing bonds; yield curves, duration and convexity. Bond Pricing Equation

Key information

Year 2019/20
Credit value 15 (150 study hours)
Delivery PGT L7, Campus-based
Reading List View on UCL website
Tutor Dr Riaz Ahmad
Term Term 1
Timetable View on UCL website

Assessment

- Written examination (main exam period): 80%
- Written examination (departmentally managed): 20%

Find out more

For more information about the department, programmes, relevant open days and to browse other modules, visit ucl.ac.uk

Disclaimer: All information correct as of August 2019. Please note that aspects of the module may be subject to change. UCL will make best efforts to inform applicants of major changes.
Popular models for the spot rate:
Stochastic interest rate models:
- Vasicek, CIR, Ho and Lee, and Hull and White.

Solutions of the BPE;
Introduction to Exotics:
- Basic features and classification of exotic options.
Simple exotics – Binaries, one-touch, power options, compound and exchange options. Weak and strong path dependency
- barriers, Asians and Lookbacks. Sampling
- continuous and discrete. Pricing using the PDE framework;

Requisites:
In order to be eligible to select this module, a student must be registered on a programme for which it is a formally-approved option or elective choice AND must have a good understanding of basic probability and differential equations.