On-line course materials

MATH39032 - Mathematical Modelling in Finance

Year: 3 - **Semester:** 2 - **Credit Rating:** 10

Aims

Students should gain an insight into both the development and solution of the mathematical models used to describe the value of financial derivatives. As a result they should be able to find the value of basic derivatives.

Brief Description

This course unit is primarily concerned with the valuation of financial instruments known as derivatives. To achieve this, a mathematical model is developed and then solved for different types of problems. No previous background in finance is necessary. It is shown that mathematical methods can be powerful tools in solving financial problems once suitable models have been devised.

Learning Outcomes

On successful completion of the course, students will be able to: apply basic ideas from classical applied mathematics to solve derivative valuation problems arising from financial modelling. Emphasis will be placed on the analogies between the financial models and physical systems.

Future topics requiring this course unit

None.

Syllabus

1.Introduction to options, futures and the no arbitrage principle - using this to calculate fair delivery prices for futures. [4 lectures]

2.Model for the movements of stock prices, efficient markets, Brownian motion and geometric Brownian motion. Stochastic and deterministic processes. [2]

3.Basics of stochastic calculus and Ito's lemma. [2]

4.The Black-Scholes analysis. Derivation of the Black-Scholes partial differential equation, the assumptions behind it. Formulating the mathematical problem, determining boundary conditions for option pricing problems. [5]

5.Solving the Black-Scholes equation. Connection with the heat conduction equation, solution of the heat conduction equation - similarity solutions and the Dirac delta function. Derivation of the price of European options. [6]

6.Extension to consider options on assets paying dividends and American options; free boundary problems. [5]

Teaching & Learning Process (Hours Allocated To)

Lectures	Tutorials/ Example Classes	Practical Work/ Laboratory	Private Study	Total
22	11	0	67	100

Assessment and Feedback

End of semester examination: two hours weighting 100%

Further Reading

- Wilmott, O., Howison, S., Dewynne, J., The Mathematics of Financial Derivatives, Cambridge University Press 1995. ISBN 0521497892

Staff Involved

Prof Peter Duck - Lecturer

Data source is EPS system
Back To Top