COURSE DETAILS

Course Code: F71DP
Full Course Title: Derivative Pricing and Financial Modelling
SCQF Level: 11
SCAF Credits: 15
Available as Elective: No

DELIVERY LEVEL

Undergraduate: Yes  Postgraduate Taught: Yes  Postgraduate Research: No

COURSE AIMS

The aim of this course is to study the application of the Black-Scholes model to the range of derivative securities encountered in the market, and to the term structure of interest rates. The principle tool will be the equivalent martingale measure. Links between derivative price and PDEs will be indicated but solution of PDEs will be covered elsewhere. Discrepancies between the Black-Scholes model and market data will be described, and alternative models presented.

LEARNING OUTCOMES – SUBJECT MASTERY

On completion of this course the student should be able to:

- demonstrate an understanding of the theoretical frameworks for pricing derivatives, including the Black-Scholes model
- demonstrate an awareness of the differences between the real-world and the risk-neutral probability measures
- derive the underlying theory for pricing bonds and interest-rate derivatives

- critical understanding of the assumptions underlying common models of asset process and interest rates
- conceptual understanding of the processes in pricing derivative securities to enable the wider application of knowledge in different and new contexts

LEARNING OUTCOMES – PERSONAL ABILITIES

At the end of the course students should be able to:
F71DP Derivative Pricing and Financial Modelling

- use the Black-Scholes formula to tackle appropriate problems
- demonstrate how to price and hedge simple equity derivatives contracts
- demonstrate how the Greeks can be used to manage the risk in a portfolio of derivatives
- apply the main models for the term-structure of interest rates for pricing bonds and interest-rate.

- find problem solutions in groups
- plan and organize self-study and independent learning

- use of programming tools in the application of pricing methods
- communicate effectively problem solutions to peers

SYLLABUS

- The Cox-Ross-Rubinstein binomial model for derivative pricing: hedging; pricing under the risk-neutral measure
- The Black-Scholes model: the martingale approach to pricing; the PDE approach to pricing; Black-Scholes assumptions.
- Hedging and the Greeks.
- Extension of the Black-Scholes model to stocks paying dividends, foreign exchange and derivatives on futures; futures prices under Q; market price of risk.
- Term structure models: spot rates, forward rates and the yield curve
- Discrete-time binomial interest-rate model
- Continuous-time models: martingale approach to pricing; PDE approach to pricing; pricing interest-rate derivatives, forward-measure approach.

COURSE RELATIONSHIPS

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Level</th>
<th>Title</th>
<th>School</th>
<th>Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>F71DM</td>
<td>11</td>
<td>Derivatives Markets</td>
<td>School of Math and Comp Sci.</td>
<td>Linked</td>
</tr>
</tbody>
</table>

LOCATION AND ASSESSMENT METHODS

<table>
<thead>
<tr>
<th>Edi</th>
<th>SBC</th>
<th>Ork</th>
<th>Dub</th>
<th>Malay</th>
<th>IDL</th>
<th>COLL</th>
<th>ALP</th>
<th>OTH</th>
<th>Method</th>
<th>Weight</th>
<th>Exam Mins</th>
<th>Type</th>
<th>Diet</th>
<th>Synoptic Course</th>
</tr>
</thead>
<tbody>
<tr>
<td>Y</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Examination</td>
<td>67</td>
<td>180</td>
<td>Assessment</td>
<td>Semester 2</td>
<td>F71DM</td>
</tr>
<tr>
<td>Y</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Examination</td>
<td>100</td>
<td>180</td>
<td>Assessment</td>
<td>Semester 2</td>
<td></td>
</tr>
</tbody>
</table>