COURSE DETAILS
Course Code: F71DV
Full Course Title: Derivatives Markets and Pricing
SCQF Level: 11
SCAF Credits: 15
Available as Elective: No

DELIVERY LEVEL
Undergraduate: Yes  Postgraduate Taught: Yes  Postgraduate Research: No

Additional Information:

COURSE AIMS
The aims of this course are:

- To provide a thorough grounding in the operation of derivative markets
- To provide an introduction to the methods of hedging using option and forward contracts, with particular emphasis on bond (interest rate) markets
- To provide students with a good understanding of the principles of no-arbitrage pricing
- To introduce mathematical concepts related to stochastic processes
- To teach students the CRR (discrete time binomial) model for derivative pricing
- To introduce the Wiener process and the BSM option pricing model

LEARNING OUTCOMES – SUBJECT MASTERY
On completion of this course the student should be able to:

- Show an awareness of the basic characteristics of the derivatives markets.
- Demonstrate a knowledge of forward and future prices
- Show an awareness of the role of futures in hedging
- Define and describe the interest rates markets and interest-rate derivatives and the relationship between swap quotes and LIBOR zero rates
- Describe how different factors affect option prices
- Demonstrate a knowledge and understanding of the mathematics underpinning the pricing and hedging of derivative instruments.
- Demonstrate a knowledge and understanding of the theory underpinning the calculation of derivative prices and their hedging strategies using the binomial model
- Demonstrate a basic knowledge and understanding of the Black-Scholes-Merton model and be able to derive the Black-Scholes-Merton partial differential equation.

LEARNING OUTCOMES – PERSONAL ABILITIES

- Show an appreciation of the interface between academic theory and industrial practice
- Demonstrate the ability to learn independently and as part of a group
- Manage time, work to deadlines and prioritise workloads
- Present results in a way that demonstrates that they have understood the technical and broader issues of
### SYLLABUS

#### Introduction and Forward Contracts
- Basic characteristics of the derivatives markets and the basic instruments (forwards, options and swaps).
- Uses and differences of forwards and futures

#### Options
- Uses and differences of puts/calls of European/American type, different types of options (stock, currency, index options, warrants, convertibles, property)
- Model independent properties of option prices
- Basic option structures (spreads, straddles, butterflies etc.)

#### Hedging with Futures and Options
- Minimum variance hedging and changing portfolio betas using forwards
- Basis risk
- Use of options in hedging

#### Interest Rate Derivatives and Swaps
- Interest rates, and interest-rate derivatives (Treasury, LIBOR, Zero, Forward Rates; FRAs, Gilt STRIPS; Interest Rate and Bond Futures, Caps and Floors)
- Construct and value swaps
- The relationship between swap rates and LIBOR zero rates

#### No-Arbitrage Pricing of Forwards
- Forward and future priceings by no-arbitrage (non-dividend and dividend-paying stock, foreign currency, consumption commodity)
- Cost of carry, convenience yield

#### Single Period Derivative Pricing
• Derivation of delta and prices
• Equivalent measures and risk neutral expectations
• Factors affecting derivative prices (stock, strike price, term to expiry, volatility, risk-free rate, dividends)
• Incomplete markets

Mathematical Foundations of Multi-Period Derivative Pricing

• Random variables, sigma-algebras, sample paths, filtrations, adapted and previsible process, conditional expectations, discrete time martingales

The Binomial Model

• The Binomial Representation Theorem, self-financing portfolio strategies and replicating strategies
• CRR model for American and European style derivatives
• Introduction to the Greeks

Continuous Time Models

• Limit of the CRR model
• The Wiener process

Derivation of the BSM equation for a GBM asset, the BSM pricing formula and link to CRR formula

LOCATION AND ASSESSMENT METHODS

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