F71DV Derivatives Markets and Pricing

**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

**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
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derivative pricing
  • Show an appreciation of the role of derivative markets in finance

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 pricings by no-arbitrage (non-dividend and dividend-paying stock, foreign currency, consumption commodity)
• Cost of carry, convenience yield

Single Period Derivative Pricing
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- 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

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