

MATH 4210 - Financial Mathematics

Subject Description

Objectives: To learn the basic theory and mathematical techniques for pricing financial derivative options.

Learning Outcome: Upon satisfactory completion of the subject, students should be able to:

- understand the basic principles and assumptions for mathematical modelling of the derivative options in financial market
- solve elementary stochastic differential equations
- apply the theory of options to consider the pricing of financial derivatives
- apply the associated numerical methods
- synthesize the knowledge and techniques required in solving real-life problems

Subject Description

Learning Approach:

Lecture	39 hours
Tutorial	12 hours
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Total	51 hours

Assessment:

Assignments and Quiz	20%
Midterm Examination	20%
Final Examination	60%
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Total	100%

Mathematical modelling of the financial market

- Discrete time: the binomial tree (Cox-Ross-Rubinstein) model.
- Continuous time: Brownian motion and the Black-Scholes formula.
- Elementary stochastic calculus, Itô's lemma.
- Associated numerical methods.

General properties of Options and Derivatives

- Options, forwards, futures, and other derivative securities.
- Interest rate.
- Principle of no arbitrage, self-financing strategies, fundamental theorem of asset pricing, risk-neutral valuation.
- Properties of option prices, relationship between put and call options.

Outline

- Introduction to financial market
- Probability theory review
- Discrete time market
- Continuous time market
- General properties of the derivative options
- Interest rate

Notice This is a course in mathematics rather than a course in finance. There are also some related courses at CUHK, e.g. ESTR3509 (Investment Science), SEEM3590 (Investment Science), RMSC4005 (Stochastic calculus for finance and risk), FINA4150 (Quantitative Methods for Financial Derivatives),

RAYMOND H. CHAN, YVES ZY. GUO, SPIKE T. LEE AND XUN LI,
Financial Mathematics, Derivatives and Structured Products, Springer,
2019

<https://www.springer.com/gp/book/9789811336959>

LECTURE NOTES FROM UNIVERSITY OF MÜNSTER, *Advanced
Financial Mathematics*,

[https://www.uni-muenster.de/imperia/md/content/Stochastik/
financial_mathematics.pdf](https://www.uni-muenster.de/imperia/md/content/Stochastik/financial_mathematics.pdf)