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
Total	51 hours

Assessment:

Assignments	10%
Midterm Examination	30%
Final Examination	60%
Total	100%

Syllabus

Introduction to 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.

Basic Options Theory

- Option pricing in discrete time: the binomial tree (Cox-Ross-Rubinstein) model.
- Option pricing in continuous time: geometric Brownian motion and the Black-Scholes formula.
- Elementary stochastic calculus, Itô's lemma.
- Associated numerical methods.

Outline

Outline

- Introduction to financial market
- Interest rate
- Derivative options
- Discrete time market
- Continuous time market

Notice This is a course in mathematics rather than a course in finance.

Reference

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

John Hull, *Options, Futures, and Other Derivatives*, Prentice Hall, 2009

http://www-2.rotman.utoronto.ca/~hull/index2.htm