UNIVERSITY OF CALGARY

FACULTY OF SCIENCE

Department of Mathematics and Statistics

Actuarial Science 515 Models For Financial Economics

(see Course Descriptions for the applicable academic year: http://www.ucalgary.ca/pubs/calendar/)

Main reference Text: Derivative Markets (Third Edition) by Robert L. McDonald

Syllabus

Topics

Chapter1: Introduction to Derivatives

Chapter 2 An Introduction to Forwards and Options

Chapter 3 Insurance, Collars, and Other Strategies

Chapter 4 Introduction to Risk Management

Chapter 5 Financial Forwards and Futures

Chapter 8 Swaps

Chapter 9 Parity and Other Option Relationships

Chapter 10 Binomial Option Pricing: Basic Concepts

Chapter 11 Binomial Option Pricing: Selected Topics

Chapter 12 The Black-Scholes Formula

Chapter 13 Market-Making and Delta-Hedging

Chapter 14 Exotic Options: I

Chapter 18 The Lognormal Distribution

Chapter 19 Monte Carlo Valuation

Chapter 20 Brownian Motion and It ˆ o's Lemma (sections 20.1-20.6)

Chapter 21 The Black-Scholes-Merton Equation (sections 21.1-21.3)

Chapter 25: Interest Rate and Bond Derivatives (sections 25.1-25.3) (similar material will be drawn from advanced texts)

It is intended that this course should cover most of the topics in financial economics (FE) tested in the Society of Actuaries (SOA) preliminary exams. At present Financial economics consists of 20-35% SOA exam FM and SOA exam MFE. This course syllabus should be updated as needed, with FE contents in SOA preliminary exams.

Course Outcomes:

By the end of this course, students will be able to:

1. Describe what is meant by a long (or short) position in an asset.

2. Give the definitions of various derivative securities such as options (American and European), forwards, futures and swaps, and more complex option positions such as bull/bear spreads, butterflies, condors, naked/covered calls and puts, and describe how they are used in hedging and investment strategies.

3. Use put-call parity to determine the relationship between prices of European put and call options.

4. Identify arbitrage opportunities when derivatives are mispriced and describe how to exploit them.

5. Write down the the Black-Scholes option pricing formula, and describe the meaning of the various terms that arise in the formula and the modelling assumptions that lie behind the formula.

6. Calculate values of option positions using numerical methods such as Monte Carlo simulation and binomial trees, and describe sources of error in such computations and how errors can be controlled.

7. Explain the characteristics of exotic options such as Asian, barrier and compound options, etc.

8. Describe and interpret option Greeks and their use in risk management contexts.

9. Describe the properties of the diffusion process (i.e. simple Brownian motion), and use Itô's Lemma to transform and solve some stochastic differential equations

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