FINANCIAL DERIVATIVES AND STOCHASTIC ANALYSIS (5p)
(CTH[$TMA285$]**&GU**[$MAM695$]**)**

Period 2, autumn 2006
http://www.math.chalmers.se/Math/Grundutb/CTH/tma285/
http://www.math.chalmers.se/Math/Grundutb/GU/MAM695/

Lectures (56 hours): Weeks 44-50: Monday 13^{15}-15 (MVL14), Wednesday 10-12 (MVF21) and 13^{15}-15 (MVF21), and Friday $13^{15} - 15$ (MVH11). (Friday November 17 is cancelled; new lecture time November 27, 10-11^{45} (MVL14))

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Textbook: S. Shreve, Stochastic Calculus for Finance II. Continuous-Time Models, Springer 2004.

CONTENTS

Week 44

Chapters 1 and 2, Probability Theory: Random variable; Expectation; Change of Measure; σ-algebra; Conditional Expectation. **Exercises:** 1.7, 1.8, 1.10, 1.11, 1.14

Week 45

Chapter 3, Brownian Motion: Symmetric random walk; Brownian Motion; Martingale; Quadratic Variation; Markov Property; First Passage Time Distribution. **Exercises:** 2.3, 2.4, 2.7, 2.8

Week 46

Chapter 4, Stochastic Calculus: Itô integral; Itô-Doeblin formula; Black-Scholes-Merton equation; Option Value; Greeks; Put-Call Parity. **Exercises:** 3.1, 3.2, 3.4, 3.5, 3.6; **Exercise:** 4.4

Week 47

Chapter 4, Stochastic Calculus: Multivariable Stochastic Calculus; Gaussian Processes.

Exercises: 4.2, 4.6, 4.7, 4.11

Chapter 5, Risk-Neutral Pricing: Risk-Neutral Measure; Girsanov's Theorem.

Week 48

Chapter 5, Risk-Neutral Pricing: Martingale Representation. Fundamental Theorems of Asset Pricing; Forwards and Futures.

Exercises: 4.13, 4.15, 4.19, 5.2, 5.3, 5.9

Week 49

Chapter 6, Connections with Partial Differential Equations: Feynman-Kac Theorem; Interest Rate Models.

Chapter 7, Exotic Options: Barrier Options. Asian Options.

Exercises: 6.1, 6.2, 6.3, 6.6

Week 50

Chapter 9, Change of Numéraire: Foreign and Domestic Risk-Neutral Measures. Forward Measures.

Exercises: 6.7, 6.8, 6.9; Examination September 1, 2006: 1, 2, 5, 6, 7; Examination December 16, 2004: 1, 2, 3, 5

EXAMINATION

Written examinations (4 hours):

December 16, 2006, morning, v

April 13, 2007, morning, v
August 28, 2007, morning, v
Aid not permitted.

The test comprises 15 points; to pass requires at least 6 points (at GU 11 points or more is graded VG; at Chalmers a result greater than or equal to 9 points and smaller than 12 points is graded 4 and a result greater than or equal to 12 points is graded 5).

Assignments

A number of exercises solved and handed in by the student at the latest Friday, November 24 at 14^{45} will result in a maximum of 1 point at the final examination.

The written examination thus comprises 15 points, where at least 6 points are of theoretic nature. At least 3 points from the theoretic part are collected from the following list:

(a) Theorem 3.3.4 (b) Theorem 3.4.3 (c) Theorem 3.5.1

(d) Theorem 3.6.1 (e) Theorem 3.6.2 (f) Theorem 3.7.1

(g) Theorem 3.7.3. (h) Theorem 4.2.1 (i) Theorem 4.2.2

(j) Theorem 4.2.3 (k) Theorem 4.4.1 (l) Lemma 4.4.4

(m) Theorem 4.4.9 (n) Lemma 5.2.1 (o) Lemma 5.2.2

(p) Theorem 5.2.3 (q) Theorem 5.4.7 (r) Theorem 6.4.1

(s) Theorem 6.4.3 (t) Theorem 7.2.1 (u) Corollary 7.2.2

(v) Theorem 9.2.1 (w) Theorem 9.2.2

Göteborg February 12, 2007
Christer Borell