OPTIONS AND MATHEMATICS (7.5 hec)
(**CTH**$[mve095]$, **GU**$[MMA700]$)
http://www.math.chalmers.se/Math/Grundutb/CTH/mve095/
http://www.math.chalmers.se/Math/Grundutb/GU/MMA700/

Period 4, spring 2009

The lecture Thursday 13^{15}-15 (Euler), week 19, is moved forward to Thursday 8-9^{45}(Euler), week 19.

REMARK : Students who wish examination according to the course Options and Mathematics (3p) (CTH$[tma155]$&GU$[mam690]$) must inform the office at the department of mathematics at the latest one week before the examination.

Lectures (50 hours) Week 12 (first week in the study period 4): Tuesday 10-11^{45} (Euler), Thursday 8-9^{45}, 13^{15}-15 (Euler), Friday 13^{15}-15 (FB)
    For the remaining schedule, see the web.

Teacher and examiner: Christer Borell, e-mail: borell@chalmers.se, phone: 772 35 53

Textbook: Christer Borell, Introduction to the Black-Scholes Theory (can be purchased at the DC, Maskingränd, Chalmers)

CONTENTS

Week 12

Financial derivatives of European and American types. Forward contracts. The Dominance principle. Put-call parity. Convexity properties of European call and put prices. Introduction to the binomial model.

Week 13

More on the binomial model: Arbitrage portfolio, replicating and self-financing strategies. Some basic concepts in probability: event, random variable, Markov's inequality, characteristic function, Gaussian random variables, independence.

Week 14

More on basic concepts in probability: Random walk, Law of Large Numbers, Monte Carlo simulation. Brownian motion. The geometric Brownian motion model of a stock price. Some remarks on portfolio theory.

Week 17

Heat conduction, simple random walk, and Brownian motion. Probabilistic representations of solutions to the heat equation and some other parabolic differential equations. Simple random walk and the heat equation. The Black-Scholes model and differential equation. Black-Scholes model.

Week 18

More on the Black-Scholes model: call prices, European and American put prices, simple currency derivatives.

Week 19

More on the Black-Scholes model: options on futures contracts, Greeks and sensitivity analysis. The Black-Scholes prices of path-dependent options. Implied volatility.

The assignments must be handed in at the latest Friday 15^{00}.

Week 20

Bivariate Brownian motion. Change of numéraire. The option to exchange one asset for another. The option on the maximum of two asset prices.

Week 21

Calls and puts written on dividend-paying underlying assets.

EXAMINATION

Assignments handed in to the examiner

A number of exercises solved and handed in by the student at the latest Friday May 8 at 15^{00} will result in a maximum of 1 point at the final examination in May 2009.

The courses CTH[$tma155$] and GU[$mam690$] have no assignments.

Written final examination (4 hours)

May 25, 2009, morning, m

August 29, 2009, morning, v

January ?, 2010, ?, ?

Aid not permitted.

The test comprises 15 points (in May 2009 plus the credit from the assignments) and to pass at least 6 points are required (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).

At least 6 points are of theoretic nature and at least 3 of these are chosen from the following list:

Theorem 1.1.2; Theorem 1.1.3; Theorem 1.1.4; Theorem 2.1.1; Theorem 2.2.1; Theorem 3.3.1; Theorem 4.1.1; Theorem 4.2.1; Theorem 4.3.1; Theorem 4.3.2; Theorem 5.1.1; Theorem 5.2.1; Theorem 5.3.1 (only the formula for delta); Theorem 6.1.1; Example 6.1.1.

<div style="text-align:center">

Göteborg May 4, 2009

Christer Borell

</div>