STOCKHOLMS UNIVERSITET,
MATEMATISKA INSTITUTIONEN,
Avd. Matematisk statistik

Exam: Introduction to Finance Mathematics (MT5009), 2026-08-14

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Allowed aid: Calculator (provided by the department).

Return of exam: To be announced via the course webpage or the course forum.

The exam consists of five problems. Each problem gives a maximum of 10 points.

- The reasoning should be clear and concise.
- Answers should be motivated (unless otherwise stated).
- Any assumptions should be clearly stated and motivated.
- Start every problem on a new sheet of paper.
- Clearly number each sheet with problem number and sheet order.
- Write your code number (but no name) on each sheet.

Preliminary grading:

A	B	C	D	E
46	41	36	30	25

Good luck!

Problem 1

(A) Explain shortly (using only, or mainly, words) what is meant by a **put option**. Also explain the difference between a European put option and an American put option.

(B) Explain shortly (using only, or mainly, words) how the value of a **call option** changes as the strike price increases.

Hint: in this exercise it is enough that you provide intuitive arguments, i.e., no mathematical derivation is required.

(10p)

Problem 2

At time $t = 0$, the market interest rate is continuously compounded at $r = 3\%$.

(A) A bond pays 1 unit of currency at maturity and makes no intermediate payments (no coupons). The bond expires in 5 years. Find its current value ($t = 0$). In addition, calculate the time t at which the bond price equals 0.95.

(B) An investor is considering purchasing a coupon bond with a maturity of 2 years. The bond has a face value of $F = 100$ and pays a coupon of $C = 8$ every six months. Determine the current value of the bond ($t = 0$).

(10p)

Problem 3

Consider a Black-Scholes financial market for a financial asset with price process $S(t), t \geq 0$. Let

$$r = 0.04, \qquad \mu = 0.12, \qquad \sigma = 0.25, \qquad S(0) = 20.$$

Find the Value at Risk (VaR) with a 95% confidence level and a one-year horizon for a position consisting of 5 shares.

Hint: $N^{-1}(0.05) \approx -1.645$.

(10p)

Problem 4

Consider a two-period binomial model for a financial market with $t = 0, 1, 2$ and

$$S(0) = 100, \qquad U = 0.10, \qquad D = -0.10, \qquad R = 0.$$

The stock pays a **cash dividend of 5 SEK at time** $t = 1$. The dividend is paid immediately after the stock price at $t = 1$ is reached (i.e., after the first multiplication by either $1 + U$ or $1 + D$). When the dividend is paid, the stock price is reduced by 5 before the next binomial step takes place (i.e., before the second multiplication by $1 + U$ or $1 + D$ takes place).

Find the current value $C_E(0)$ of a European call option

with strike price $X = 100$, and maturity at time $t = 2$.

(10p)

Problem 5

The following questions should be answered using the Capital Asset Pricing Model (CAPM) assuming that the risk-free rate is $R = 2\%$ and the expected return of the market portfolio is $\mu_M = 5\%$.

(A) The shares of a company have a beta of 1.2. Find the expected return of the shares.

(B) The shares of company A have a beta of $\beta_A = 1.2$ and the shares of company B have a beta of $\beta_B = 1.1$. The current share prices are $S_A(0) = 1$ and $S_B(0) = 1$ (i.e., the share prices are the same). An investor holds a portfolio V consisting of 100 shares of company A and 50 shares of company B.

Compute the beta of the portfolio (i.e., β_V), and determine the expected return of the portfolio.

(10p)