Homework 4

Deadline: 19 October 2025, 23:30.
All solutions must be in a single PDF file and uploaded to the LMS portal.

1. (0.25 point) Derive the expression for $\frac{\partial V}{\partial r}$ within the Black-Scholes-Merton model.
2. (0.25 point) Derive the expression for $\frac{\partial^2 V}{\partial S \partial \sigma}$ within the Black-Scholes-Merton model.
3. (0.25 point) Derive the expression for $\frac{\partial^2 V}{\partial \sigma^2}$ within the Black-Scholes-Merton model.
4. (0.25 point) Derive the expression for $\frac{\partial V}{\partial t}$ within the Black-Scholes-Merton model.
5. (0.5 point) Consider two Brownian motions W_t^1 and W_t^2 such that $[W^1, W^2]_t = \rho t$. Show that $cov(W_t^1, W_t^2) = \rho t$.
6. (0.5 point) Let Y_t follow a Geometric brownian motion, and define $Z_t = \frac{1}{Y_t}$. Find the quadratic covariation $[Y, Z]_t$.