Numerical Methods

Week 8 code

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```
function [V, variance] = mc_euro_call(S, E, T, r, sigma, N)
% MC_EURO_CALL2 - Pricing of European call option by the Monte Carlo method
% S         - The underlying price
% E         - Strike price
% T         - Time to expiration
% r         - The interest rate
% sigma     - The volatility
% N         - Number of MC samples
% V         - The corresponding option price

x = randn(N,1);
ST = S*exp((r-0.5*sigma^2)*T+sigma*sqrt(T)*x);
payoff = exp(-r*T)*max(0.,ST-E);
V = mean(payoff);
variance = var(payoff);
```

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```
function [V, variance] = mc_euro_call2(S, E, T, r, sigma, N)
% MC_EURO_CALL2 - Pricing of European call option by the Monte Carlo method
% S         - The underlying price
% E         - Strike price
% T         - Time to expiration
% r         - The interest rate
% sigma     - The volatility
% N         - Number of MC samples
% V         - The corresponding option price

V  = 0.;
V2 = 0.;
for k = 1:N
    x = randn(1,1);
    ST = S*exp((r-0.5*sigma^2)*T+sigma*sqrt(T)*x);
    payoff = exp(-r*T)*max(0.,ST-E);
    V  = V +payoff;
    V2 = V2+payoff^2;
end
V = V/N;
variance = V2/N - V^2;
```

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```
function [V, variance] = mc_euro_call_a(S, E, T, r, sigma, N)
% MC_EURO_CALL2 - Pricing of European call option by the Monte Carlo method
% S         - The underlying price
% E         - Strike price
% T         - Time to expiration
% r         - The interest rate
% sigma     - The volatility
% N         - Number of MC samples
% V         - The corresponding option price

x = randn(N,1);
ST1 = S*exp((r-0.5*sigma^2)*T+sigma*sqrt(T)*x);
payoff1 = exp(-r*T)*max(0.,ST1-E);
ST2 = S*exp((r-0.5*sigma^2)*T-sigma*sqrt(T)*x);
payoff2 = exp(-r*T)*max(0.,ST2-E);
payoff = 0.5*(payoff1+payoff2);
V = mean(payoff);
variance = var(payoff);
```

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