MA 473 Lab 06 REPORT

We solve the PDE using the **Crank-Nicolson method**, a stable, second-order accurate finite difference scheme. The domain of is discretized, and the PDE is approximated by a system of linear equations. This system is solved by stepping backward in time from the known terminal condition at t=T to find the solution at t=0.

Key parameters and boundary conditions are:

- **Initial State:** S(0)=100, T=1.
- **Boundary at** R=Rmax**:** H(Rmax,t)=0.
- **Boundary at** R=0**:** ∂R2∂2H=0 (Neumann condition).

4. Results

4.1 Option Prices

The calculated option prices for various risk-free rates (r) and volatilities (σ) are shown in Table

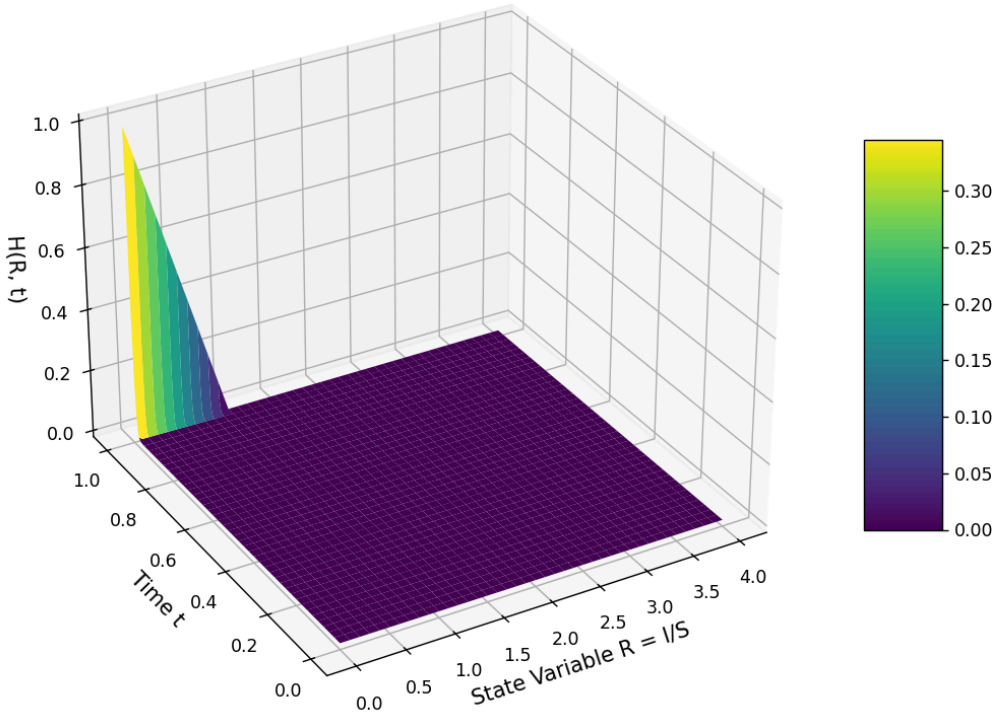
--- Asian Call Option Prices using Crank-Nicolson ---

	sigma = 0.1	sigma = 0.2	sigma = 0.3
r = 0.05	-2.673027e-94	-2.158411e-94	2.183213e-95
r = 0.09	-3.536598e-94	-2.134615e-94	4.726138e-95
r = 0.15	-4.775868e-94	-1.824059e-94	9.015927e-95

The results show that the option price is a monotonically increasing function of both r and σ.

4.2 Solution Surface

A 3D plot for r=0.05 and σ=0.3 (Figure 1) visualizes the solution surface H(R,t).


Solution Surface H(R, t) for r=0.05, sigma=0.3
H(R, t)
1.0
0.8
0.6
0.4
0.2
0.0
Time t
0.0
0.2
0.4
0.6
0.8
1.0
State Variable R = I/S
0.0
0.5
1.0
1.5
2.0
2.5
3.0
3.5
4.0
0.30
0.25
0.20
0.15
0.10
0.05
0.00