Bonus1 Finite Difference

Description:

Use the implicit and explicit finite difference methods to calculate European and American plain vanilla option prices, respectively.

User Manual:

Double click "Bonus1 Finite Difference.exe"

→Click "Input" at the upper left corner of the window

→Input the following parameters in the dialogue box:

S: Current stock price

multiple: Smax = multiple * S, where Smax is the specified maximum stock price

K: Strike price

r: One-year risk-free interest rate (e.g., 10% => r = 0.1)

T: Expiration date (e.g., 6 months => T = 0.5)

Sigma: One-year volatility (e.g., 30% => Sigma = 0.3)

q: One-year dividend yield (e.g., 2% => q = 0.02)

m: delta S = Smax / m

n: delta t = T / n

Method: Use the implicit finite difference method (Implicit) or the explicit finite difference method (Explicit). The implicit solution will always converge, but it takes a great deal of time. The explicit solution usually diverges, and if it happens, the window will show "The explicit solution will diverge! Error code: 1 (or 2)". If the error code is "1", it means that ΔS and Δt do not satisfy the following condition: $\alpha^2 \frac{\Delta t}{(\Delta S)^2} \le \frac{1}{2}$, where $\alpha^2 = \frac{1}{2}\sigma^2 S^2$. If the error code is "2", it means that although the prior condition is satisfied, the call price may be more than $S_{\max}$ or the put price may be more than K at some node of the grid. The case of negative prices has been eliminated by requiring prices at each node to be nonnegative.

→Click "OK" at the lower right corner of the dialogue box (or "Cancel" if you would like to exit the dialogue box)

→Calculation result will be shown on the display area of the window

→If you would like to perform another calculation, click "Input" at the upper left corner and repeat the process above. (The dialogue box will save the parameters you input last time.) Or you can click "X" at the upper right corner of the window to exit the program.