

## Extra Bonus 1 (5%)

Calculate the implied volatility with

$$\left\{ \begin{array}{l} \text{Black-Scholes model} \\ \text{Binomial tree model} \end{array} \right\} \left\{ \begin{array}{l} \text{European calls} \\ \text{European puts} \\ \text{European calls} \\ \text{European puts} \\ \text{American calls} \\ \text{American puts} \end{array} \right\} + \left\{ \begin{array}{l} \text{Bisection method} \\ \text{Newton's method} \end{array} \right\}$$

(Inputs:  $S_0$ ,  $K$ ,  $r$ ,  $q$ ,  $T$ , market price of the option,  $n$ , convergence criterion. Outputs: Implied volatility.)