

# Computational Methods in Finance

## Computational Project - Part 2

Option trading reached a volume of billions of dollars every year and, consequently, option pricing now plays a central role in modern finance. Fast and accurate methods for option pricing became of paramount importance, especially in the case of basket options (higher space dimensions).

This small computational project has the objective of implementing and comparing two classical methods for option pricing: i. The numerical solution of the Black-Scholes partial differential equation and ii. The binomial methods.

1. Implement the numerical solution of the Black-Scholes equations, for one asset, in the case of European and American call and put options, using two time stepping schemes: i. The explicit forward Euler method and ii. The Crank-Nicolson method.
2. Implement the binomial method for both European and American call and put options, using at least two different parameter choices (for instance  $p = \frac{1}{2}$  or  $u = \frac{1}{d}$ ).
3. Choose a base parameter set (risk-free interest rate, volatility, Strike price, spot price and maturity) and i. using the Black-Scholes equations, price the option with an accuracy of three decimal places; ii. obtain comparable results using the binomial method.
4. Conduct the tests you see fit, in order to compare the methods in terms of computational complexity for a fixed accuracy.
5. Any additional analysis and consideration are welcome but, remember, the great is an enemy of the good!