Homework Description

Each folder contains a readme pdf file, a source file, and an exe file.

Folder Name	Description
Hw1 Plain Vanilla	Use Black-Scholes formulas, Monte Carlo simulation, and the binomial tree model to calculate European call and put prices, respectively. American call and put prices are also required in the case of the binomial tree model.
Hw2 Martingale	A derivative has a payoff structure which is shown in Figure 1. Use the martingale pricing method to derive its Black-Scholes formula first, and then calculate its price with the formula and Monte Carlo simulation, respectively.
Hw3 Implied Volatility	Use the bisection method and Newton's method to calculate European call and put's implied volatilities, respectively. Each method should be based on both Black-Scholes formulas and the binomial tree model. In addition, American call and put's implied volatilities are required in the case of the binomial tree model.
Hw4 Rainbow	Use Monte Carlo simulation to calculate the rainbow option's price. (Hint: Use Cholesky decomposition to generate a set of random variables which follows a specified multivariate normal distribution.)
Hw5 Lookback	Use the Black-Scholes formula, Monte Carlo simulation, and the binomial tree model to calculate the European lookback put price, respectively. The American lookback put price is also required in the case of the binomial tree model.
Hw6 Arithmetic Average	Use Monte Carlo simulation and the binomial tree model to calculate the European arithmetic average option prices, respectively. The American arithmetic average option prices are also required in the case of the binomial tree model.
Bonus1 Finite Difference	Use the implicit and explicit finite difference methods to calculate European and American plain vanilla option prices, respectively.
Bonus2 NGARCH	Under the assumption of the NGARCH model, use Monte Carlo simulation and the multinomial tree model to calculate the European call and put prices, respectively. The American call and put prices are also required in the case of the multinomial tree model.

Figure 1