

Principles of Financial Computing HW#2

Write a program to **price the European arithmetic average-rate knock-in put** on a non-dividend-paying stock; calculate its delta too. Note that the payoff is the same as the Asian call, and the knock-in barrier is triggered by the average price.

Inputs:

- (1) S (spot price)
- (2) X (strike price)
- (3) H (barrier price)
- (4) T (years)
- (5) r (risk-free interest rate)
- (6) s (annualized volatility)
- (7) n (number of periods)
- (8) k (number of buckets)

Output: (1) put price and (2) delta.

For example, assume $S = 100, X = 105, H = 95, T = 1, r = 0.05, s = 0.3, n = 160, k=160$. Then the put price is 7.746 and the delta is -0.5423.

$S = 100, X = 100, H = 100, T = 1, r = 0.05, s = 0.5, n = 50, k=100$.
put price is 9.929348 and the delta is -0.400970.

https://en.wikipedia.org/wiki/Binomial_options_pricing_model

Barrier Option

Their payoff depends on whether the underlying asset's price reaches a certain price level H throughout its life

- Knock out : Cease to exist if H is reached by underlying asset's price. 跌

Call knock out : Called a *down-and-out* option if $S > H$.

Put knock out : Called an *up-and-out* option when $S < H$.

- Knock in : Comes into existence if a certain barrier is reached. 漲

Call knock in : *Down and in* if $S > H$.

Put knock in : *Up and in* when $S < H$.