tr_hullwhite

Input parameters:

- StepNumber N

Output parameters:

- Price
- Delta

This is taken from [1]. Let $k = \frac{T}{N}$, $a = e^{(r-\delta)k}$, $b^2 = a^2(e^{\sigma^2 k} - 1)$
$tmp = a^2 + b^2 + 1$,$u = \frac{(tmp+\sqrt{tmp^2-4a^2})}{2a}$,$d = \frac{1}{u}$
Let

$$p = \frac{a-d}{u-d}$$

the probability satisfying the local consistency condition.

/*Memory Allocation: Price, Intrinsic Value arrays*/

/*Up and Down factors*/

/*Risk-Neutral Probability*/
This is Hull-White binomial probability for which the local consistency condition is easily checked (cf. [1])

/*Intrinsic Value computation*/
Storage of the $2N + 1$ possible values of the intrinsic value.

/*Backward Resolution*/
Note that we don't re-compute the intrinsic value.

/*Delta*/
The delta here is the right hedging delta in the binomial model (cf The Generalized CRR model). There may be a more clever way to approximate the continuous-time Black&Scholes delta.

/*First time step*/

/*Price*/

/*Desallocation*/

References

[1] J.HULL A.WHITE. The use of the control variate technique in option pricing. *J.Of Finance and Quantitative Analysis*, 23:237–251, 1988. 1