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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