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tr_thirdmoment

Input parameters:

- StepNumber N

Output parameters:

- Price
- Delta

This tree is taken from [1]. This is a binomial tree with the matching of the first three moments. It is not a flat tree (ie $u*d=1$ does not hold), therefore for american options the intrinsic value has to be recomputed at each node of the tree.
The calculations are described there.

/*Price array*/

/*Up and Down factors*/
Here $u=\frac{e^{(r-divid)h}Q}{2}\left[1+Q+\sqrt{Q^2+2Q-3}\right]$,
$d=\frac{e^{(r-divid)h}Q}{2}\left[1+Q-\sqrt{Q^2+2Q-3}\right]$,

/*Discounted Risk-Neutral Probability*/
This is the exact Risk-Neutral probability within the tree. `p` is for the upper node, `q` for the lower.

/*Terminal values*/

/*Backward Resolution*/
Notice that the indexing of the price array P is relative to the lower of the underlying values at a fixed time.

/*Delta*/
We keep the formula of the generalized CRR delta. This is the perfect hedging ratio within the tree. The convergence can be proved in the same manner as for the CRR delta (cf there)

/*First Time Step*/

/*Price*/

/*Memory desallocation*/

References

[1] Y.W.KWOK. *Mathematical models of financial derivatives.* Springer Finance, 1998. 1