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tr_boyleevninegibbs

Input parameters:

- StepNumber N

Output parameters:

- Price
- Delta1
- Delta2

This is taken from [2]. It is a 4-node tree which is a particular case ($\lambda = 1$) of a 5-node tree designed later by Kamrad and Ritchken in [1] implemented in [Routine tr_kamradritchken_bs2d.c](#).

/*Memory Allocation*/

/*Up and Down factors*/

Here $u1 = e^{\sigma1\sqrt{h}}$, $d1 = e^{-\sigma1\sqrt{h}}$, $u2 = e^{\sigma2\sqrt{h}}$, $d2 = e^{-\sigma2\sqrt{h}}$: in each direction the grid is that of a standard CRR tree.

/*Risk-Neutral Probabilities*/

These are computed from the two first-moments matching condition, cf [Routine tr_kamradritchken_bs2d.c](#).

/*Terminal Values*/

Nothing surprising here: at each *stock2* level (variable i) we initialize the intrinsic values and then the price values in the *stock1* direction (variable j). The indexing starts from below for *stock1*, above for *stock2* (why not?).

Since this is a flat tree (cf [Introduction to Tree methods in finance](#)), we store the intrinsic values in an array to avoid to recompute them at each node just like in

[Routine tr_coxrossrubinstein_c](#).

```
/*Backward Cycle*/
```

```
/*Deltas*/
```

We call a function which computes the two deltas in a finite-difference manner in [bs2d_std2d.h](#).

```
/*First Time Step*/
```

```
/*Price*/
```

```
/*Memory desallocation*/
```

References

- [1] B.KAMRAD P.RITCHKEN. Multinomial approximating models for options with k state variables. *Management Science*, 37:1640–1652, 1991. 1
- [2] P.BOYLE J.EVNINE S.GIBBS. Numerical evaluation of multivariate contingent claims. *Review of Financial Studies*, 2:241–250, 1989. 1