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fd_adi

Input parameters:

- TimeStepNumber M
- SpaceStepNumber N

Output parameters:

- Price
- Delta1
- Delta2

Alternate Direction Implicit methods were proposed by Peachman Rachford ([2]. At each time step, one can integrate "in each direction" (cf.there). In the american case to solve the inequality one combines the projection by the splitting scheme with A.D.I. finite difference method.The idea of this scheme ([1])is to split the American problem in twosteps(cf.there).
/*Memory Allocation*/
/*Covariance Matrix*/
/*Space localisation/*
Define the integration domain $D = [-l, l]^2$ using probabilistic estimation.
/*Space Step/*
Define the space step $h = \frac{2l}{M}$.
/*Time Step*/
/*Rhs Factor of first step*/
The right-hand side factor of the first step of ADI scheme.
/*Rhs Factor of second step*/
The right-hand side factor of the second step of ADI scheme.
/*Terminal Values/*

Put the value of the payoff into a vector P
/*Homegenous Dirichlet Conditions/*
/*Finite difference Cycle/*
At any time step, described by the loop in the variable *TimeIndex*, we have to solve the system (cf. there)

/*First step*/
First step of ADI scheme.

/*Init Rhs*/
Compute the right-hand side.

/*Gauss Algorithm*/
Resolution of linear system with Gauss method. (cf. there)

/*Second step*/
First step of ADI scheme.

/*Init Rhs*/
Compute the right-hand side.

/*Gauss Algorithm*/
Resolution of linear system with Gauss method. (cf. there)

/*Splitting for American case*/
For American options, we compare at each time step the solution in P with the payoff function saved in *iv*. We save the result in P

/*Price*/

/*Delta*/
cf.there.

/*Memory Desallocation*/

References

[1] S.VILLENEUVE A.ZANETTE. Parabolic A.D.I. methods for pricing american option on two stocks. *Mathematics of Operations Research*, pages 121–151, Feb 2002. 1

[2] D.W.PEACEMAN-H.H.RACHFORD Jr. The numerical solution of parabolic and elliptic differential equations. *J.of Siam*, 3:28–42, 1955. 1