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## fd\_fixedpoint

### Input parameters:

- TimeStepNumber  $N$
- SpaceStepNumber  $I$

### Output parameters:

- Price
- Delta

We use a finite difference method to solve the pricing of an American put. We use a finite difference Crank-Nicholson scheme coupled, within each timestep, with an iterative algorithm to locate the free boundary. This method is inspired from [1].

The main features of the algorithm we use are:

- we use a finite difference scheme in space,
- we use a Cranck-Nicholson time-stepping scheme,
- within each timestep, we move the boundary, according to the inequalities which must be verified by the solution,
- the linear system is tridiagonal and solved with Crout's method.

## References

- [1] Y. Achdou and O. Pironneau. A numerical procedure for the calibration of volatility with American options. *Applied Mathematical Finance*, to appear, 2005. 1