A nonstandard numerical scheme for a nonlinear option pricing model in illiquid markets

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Abstract

It is the aim of this work to obtain numerical solutions for a nonlinear option pricing model in illiquid markets, using a numerical method where numerical solutions preserves the positivity as well as stability and consistence. An exact difference scheme is applied to a part of the equation to produce a semi-discrete approximation with zero local truncation error with respect to time. In addtidion, spatial derivative is approximated using nonstandard finite difference methods. This scheme leads to qualitative improvements in the behavior of the numerical solution. Numerical experiments show that the proposed scheme has the ability to model this kind of nonlinear Black-Scholes equations. In order to illustrate the accuracy of the method, the obtained results are compared with classical methods, and the results show that the solutions preserves the properties of the continuous model.

Key words: Nonlinear option pricing, Semi-discrete, Nonstandard finite difference methods, Numerical solution.

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