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Samir kumar bhowmik* (bhowmiksk@gmail.com), Department of Mathematics, Al Imam Mohammad Ibn Saud Islamic University, Riyadh, Saudi Arabia. *Fast and Efficient Numerical Methods for an Extended Black-Scholes Model*. Preliminary report.

An efficient linear solver plays an important role while solving partial differential equations (PDEs) and partial integro-differential equations (PIDEs) type mathematical models. In most cases, the efficiency depends on the stability and accuracy of the numerical scheme considered. In this article we consider a PIDE that arises in option pricing theory (financial problems) as well as in various scientific modeling and deal with two different topics. In the first part of the article, we study several iterative techniques (preconditioned) for the PIDE model. A wavelet basis and a Fourier sine basis have been used to design various preconditioners to improve the convergence criteria of iterative solvers. We implement a multigrid (MG) iterative method. In fact, we approximate the problem using a finite difference scheme, then implement a few preconditioned Krylov subspace methods as well as a MG method to speed up the computation. Then, in the second part in this study, we analyze the stability and the accuracy of two different one step schemes to approximate the model. (Received September 04, 2014)