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ABSTRACT

A radial basis function generated finite difference (RBF-FD) method has been considered for solving PDEs arising in pricing of financial contracts. By being mesh-free while yielding a sparse differentiation matrix, this method aims to exploit the best properties from, both, finite difference (FD) methods and radial basis function (RBF) methods. Moreover, the RBF-FD method is shown to be advantageous for high-dimensional problems compared to: Monte Carlo (MC) methods which converge slowly, global RBF methods since they produce dense matrices, and FD methods because they require uniform grids. The introduced method successfully solves standard Black-Scholes equation for pricing European and American options with discrete or continuous dividends in 1D, and European call basket and spread, as well as American put basket options in 2D on adapted grids, and finally a European call basket option in 3D. Performance of the method and the error profiles have been studied with respect to discretization in space, size and form of stencils, RBF shape parameter and boundary conditions. The results highlight RBF-FD as a competitive, sparse method, capable of achieving high accuracy with a small number of nodes in space and suggest method's potential for solving even higher-dimensional problems.