Numerical Solution for the Jump-Diffusion Models by the Local Differential Quadrature Method

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In this paper the local differential quadrature (LDQ) method is provided to solve the option-pricing problems based on jump-diffusion models. The main advantages of the LDQ method include the arbitrary order for the numerical approach and the convenience to deal with non-uniform grids. For option-pricing works, jump-diffusion processes are widely used to simulate the variation of asset prices. Generally speaking, the pricing equation is a partial integro-differential equation (PIDE) in jump-diffusion models. Thus, how to solve the PIDE efficiently is an essential topic for financial engineers. For this purpose, the LDQ method dealing with non-uniform grids is adopted. Moreover, an alternative integral method appropriate for non-uniform grids is also suggested. Numerical analyses for European, American and barrier options are demonstrated in this work. As a result, the LDQ method combined with the alternative integral method provides good performance for solving the jump-diffusion models. It also indicates that the option-pricing works can be progressed more efficiently by the present method.

Keywords: option-pricing; jump-diffusion models; LDQ; PIDE; European option; American option; barrier option.