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Analysis of Artificial Boundary Conditions for Black-Scholes Equations

We consider the partial differential equations approach for valuing European-style options. In order to solve the equations numerically by finite difference or finite elements methods it is necessary to introduce an artificial boundary in order to make the computational domain bounded. We derive pointwise bounds for the error caused by introduction of the far boundary in variable coefficient case for various boundary conditions imposed on the artificial boundary. The error estimates can be used to determine a priori a suitable placement for the far boundary in terms of a user's error tolerance in a specified region of initial stock prices.