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Properties of matrices arising from Black-Scholes equations

The Black-Scholes equation and various versions of it are used for modelling many financial problems. While the Black-Scholes equation is a parabolic Partial Differential Equation (PDE) and it is often discretized by typical centered finite differences in space and Crank-Nicolson timestepping, it is not as “typical” parabolic PDE, as many would think. In this talk, we discuss some of the peculiarities these parabolic PDE problems exhibit, including positive and negative interest rates, unusual boundary conditions, special nonuniform grids, vanishing coefficients, etc, and the effect these have on the arising matrices. We also discuss the performance of certain solvers and preconditioners for the arising discrete equations.