Mathematics > Analysis of PDEs

C^{1,1} regularity for degenerate elliptic obstacle problems in mathematical finance

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The Heston stochastic volatility process is a degenerate diffusion process where the degeneracy in the diffusion coefficient is proportional to the square root of the distance to the boundary of the half-plane. The generator of this process with killing, called the elliptic Heston operator, is a second-order, degenerate-elliptic partial differential operator, where the degeneracy in the operator symbol is proportional to the distance to the boundary of the half-plane. In mathematical finance, solutions to obstacle problem for the elliptic Heston operator correspond to value functions for perpetual American-style options on the underlying asset. With the aid of weighted Sobolev spaces and weighted H\"older spaces, we establish the optimal C^{1,1} regularity (up to the boundary of the half-plane) for solutions to obstacle problems for the elliptic Heston operator when the obstacle functions are sufficiently smooth.

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