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Nonlinear integro-differential evolution problems arising in option pricing: a viscosity solutions approach. (English) Zbl 1052.35083

Differ. Integral Equ. 16, No. 7, 787-811 (2003).

The class of nonlinear integro-differential Cauchy problems

$$\partial_t u + F(x,t,u,l\mathcal{I},Du,D^2u) = 0, \quad (x,t) \in \mathbb{R}^n \times (0,T],$$
$$u(x,0) = u_0(x), \quad x \in \mathbb{R}^N,$$

where the integral term $\mathcal{I}u$ is given by

$$\mathcal{I}u(x,t) = \int_{\mathbb{R}^N} M(u(x+z,t),u(x,t))\, d\mu_{x,t}(z)$$

is studied by means of the viscosity solutions approach. In view of financial applications, the author is interested in continuous initial data with exponential growth at infinity. Existence and uniqueness of solution is obtained through Perron's method, via a comparison principle; besides, a first-order regularity result is given. The extension of the standard theory of viscosity solutions allows to price derivatives in jump-diffusion markets with correlated assets, even in the presence of a large investor, by means of the PDEs approach. In particular, derivatives may be perfectly hedged in a completed market.

Reviewer: Vasile Iftode (Bucureşti)

MSC:

35K55	Nonlinear parabolic equations
35B30	Dependence of solutions to PDEs on initial and/or boundary data and/or on parameters of PDEs
35R10	Partial functional-differential equations
60J75	Jump processes (MSC2010)
91G80	Financial applications of other theories
45K05	Integro-partial differential equations
35K15	Initial value problems for second-order parabolic equations

Keywords:

Perron's method; comparison principle