

Partial Integro-Differential Equations and their Applications in Financial Modeling

Daniel Ševčovič

Comenius University in Bratislava, Slovakia
SEVCOVIC@FMPH.UNIBA.SK

Abstract

In this presentation, we analyze solutions of a non-local nonlinear partial integro-differential equation (PIDE) in multidimensional spaces. Such a class of PIDE often arises in financial modeling. We employ the theory of abstract semilinear parabolic equations in order to prove the existence and uniqueness of solutions on the scale of Bessel potential spaces. We consider a wide class of Lévy measures satisfying suitable growth conditions near the origin and infinity. The novelty of the paper is the generalization of already known results in the one-space dimension to the multidimensional case. We consider Black-Scholes models for option pricing on underlying assets following a Lévy stochastic process with jumps. As an application to option pricing in the one-dimensional space, we consider a general shift function arising from nonlinear option pricing models taking into account a large trader stock-trading strategy. We prove the existence and uniqueness of a solution to the nonlinear PIDE in which the shift function may depend on a prescribed large investor stock-trading strategy function. This is a joint work with J. Cruz and C.I. Udeani based on papers [1], [2], [3] and [4].

References

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