PDE Problems in Finance: Degenerate Parabolic Equations, Free Boundary Problems, and Inverse Problems

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Abstract

In this talk, I will introduce three topics on PDEs in FINANCE: Degenerate Parabolic Partial Differential Equations, Free Boundary Problems, and Inverse Problems. A random variable, such as stock price, should stay in a finite interval even though it can move randomly, which leads to that the PDEs for derivative securities are degenerate and their final value problems have unique solutions. American style derivative securities can be exercised at any time, which results in appearance of free boundaries. Thus many problems in Finance are free-boundary problems. Sometimes some functions in coefficients of PDEs, which are called market prices of some risks, are unknown. Therefore before pricing some derivative securities, we first need to solve inverse problems. In order to price derivative securities efficiently, new numerical methods need to be developed. Consequently, by the way I will also briefly describe some results related to numerical methods for these problems.