A Self-Exciting Threshold Jump-Diffusion Model for Option Valuation

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Abstract

A self-exciting threshold jump-diffusion model for option valuation is discussed. This model can incorporate two important stylized features of asset prices, namely jumps and regime switches, without introducing an additional factor process describing regime switches. Due to the presence of jumps, the market model is incomplete. A generalized version of the Esscher transform is used to select a pricing kernel. Both European and American contingent claims are considered. A piecewise linear partial differential-integral equation governing a price of a standard European contingent claim is derived. For an American contingent claim, a formula decomposing a price of the American claim into the sum of its European counterpart and the early exercise premium is provided. An approximate solution to the early exercise premium based on the quadratic approximation technique is given for a particular case where the jump component is absent.

Keywords

Option valuation; Self-exciting threshold jump-diffusion model; Generalized threshold Esscher transform; American Put Option; Decomposition Formula; Piecewise linear partial differential equation.