Numerical Pricing of Financial Options under Irrational Exercise Times and Regime-Switching Models

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Abstract : In this paper, we studied the pricing problem of American options under a regime-switching model with the possibility of a non-optimal exercise policy (early or late exercise time) which is called an irrational strategy. For this, we consider a Markovmodulated model for the dynamic of the underlying asset as an alternative model to the classical Balck-Scholes-Merton model (BSM) and an intensity-based model for the irrational strategy, to provide more realistic results for American option prices under the irrational behavior in real financial markets. Applying a partial differential equation (PDE) approach, the pricing problem of American options under regime-switching models can be formulated as coupled PDEs. To solve the resulting systems of PDEs in this model, we apply a finite element method as the numerical solving procedure to the resulting variational inequality. Under some appropriate assumptions, we establish the stability of the method and compare its accuracy to some recent works to illustrate the suitability of the proposed model and the accuracy of the applied numerical method for the pricing problem of American options under the regime-switching model with irrational behaviors.

Keywords : irrational exercise strategy, rationality parameter, regime-switching model, American option, finite element method, variational inequality

Conference Title : ICMMS 2023 : International Conference on Mathematics and Mathematical Statistics

Conference Location : Sydney, Australia

Conference Dates : January 30-31, 2023