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Convertible bond pricing with partial integro-differential equation model

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Abstract

In this paper, we introduce the concept of Exponential Variance Gamma (EVG) model to the valuation of convertible bond (CB). Rather than evaluating derivatives with standard Black-Scholes approach, we describe the dynamic underlying asset log price with VG process, which is one of classical Lévy process with non-normal distribution but skewness and leptokurtosis. For numerical purpose, we develop a discrete scheme with stability and convergence, which combines so-called multi-stage compound-option model (MCO) and explicit-implicit difference method (EXIM) to discretize the partial integro-differential equation (PIDE). By comparing our results with Black-Scholes approach, we can show that because of the ability to capture skewness and leptokurtosis features, the new approach does provide a lower price for the valuation of CB.

Keywords:
Convertible bond; Exponential Variance Gamma model; Geometric Brownian Motion; Partial integro-differential equation

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