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The Non-Uniqueness of Partial Differential Equations Options Price Valuation Formula for Heston Stochastic Volatility Model

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Abstract : An option is defined as a financial contract that provides the holder the right but not the obligation to buy or sell a specified quantity of an underlying asset in the future at a fixed price (called a strike price) on or before the expiration date of the option. This paper examined two approaches for derivation of Partial Differential Equation (PDE) options price valuation formula for the Heston stochastic volatility model. We obtained various PDE option price valuation formulas using the riskless portfolio method and the application of Feynman-Kac theorem respectively. From the results obtained, we see that the two derived PDEs for Heston model are distinct and non-unique. This establishes the fact of incompleteness in the model for option price valuation.

Keywords : Black-Scholes partial differential equations, Ito process, option price valuation, partial differential equations
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