

Hybrid Equity Warrants Pricing Formulation under Stochastic Dynamics

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Abstract : A warrant is a financial contract that confers the right but not the obligation, to buy or sell a security at a certain price before expiration. The standard procedure to value equity warrants using call option pricing models such as the Black-Scholes model had been proven to contain many flaws, such as the assumption of constant interest rate and constant volatility. In fact, existing alternative models were found focusing more on demonstrating techniques for pricing, rather than empirical testing. Therefore, a mathematical model for pricing and analyzing equity warrants which comprises stochastic interest rate and stochastic volatility is essential to incorporate the dynamic relationships between the identified variables and illustrate the real market. Here, the aim is to develop dynamic pricing formulations for hybrid equity warrants by incorporating stochastic interest rates from the Cox-Ingersoll-Ross (CIR) model, along with stochastic volatility from the Heston model. The development of the model involves the derivations of stochastic differential equations that govern the model dynamics. The resulting equations which involve Cauchy problem and heat equations are then solved using partial differential equation approaches. The analytical pricing formulas obtained in this study comply with the form of analytical expressions embedded in the Black-Scholes model and other existing pricing models for equity warrants. This facilitates the practicality of this proposed formula for comparison purposes and further empirical study.

Keywords : Cox-Ingersoll-Ross model, equity warrants, Heston model, hybrid models, stochastic

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