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The Variance of Standard Option Returns

Adi Ben-Meir, Jeremy Schiff

(Submitted on 16 Apr 2012)

The vast majority of works on option pricing operate on the assumption of risk neutral valuation, and consequently focus on the expected value of option returns, and do not consider risk parameters, such as variance. We show that it is possible to give explicit formulae for the variance of European option returns (vanilla calls and puts, as well as barrier options), and that for American options the variance can be computed using a PDE approach, involving a modified Black-Scholes PDE. We show how the need to consider risk parameters, such as the variance, and also the probability of expiring worthless (PEW), arises naturally for individual investors in options. Furthermore, we show that a volatility smile arises in a simple model of risk-seeking option pricing.

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