Option pricing: from BS to BNS

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Abstract

In this talk, we discuss model construction in continuous-time option pricing from the perspective of consistency with empirical studies and the feasibility of numerical analysis. We begin by introducing the Black-Scholes (BS) model. Note that the BS model is inconsistent with the following two empirical findings: (1) Fat tails of the increment of the log-price. (2) Appearance of volatility smile. To address (1), we discuss exponential Lévy models in the second part of this talk and introduce the Carr-Madan method, based on the Fast Fourier Transform, which is effective for computing option prices. Finally, taking (2) into consideration, we study the Barndorff-Nielsen and Shephard (BNS) model, a representative framework for jump-type stochastic volatility models. Since the Carr-Madan method is no longer available for the BNS model, we introduce the Monte Carlo method developed by Arai and Imai [1].

References

[1] Arai, T. & Imai, Y. (2024). Monte Carlo simulation for Barndorff-Nielsen and Shephard model under change of measure, Mathematics and Computers in Simulation, 218, pp.223-234.