Student Research Group 'Stochastic Volatility Models', Project 'Heston – 2'

Methods of Simulation of the Heston Model: A Review

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January 21, 2023

Heston Model Definition

Assume that the spot asset at time t follows the diffusion

$$dS(t) = \mu S(t)dt + \sqrt{v(t)}S(t)dZ_1(t), \tag{1}$$

$$dv(t) = \left(\delta^2 - 2\beta v(t)\right)dt + \sigma\sqrt{v(t)}dZ_2(t), \tag{2}$$

where Z_1, Z_2 are the correlated Wiener processes with $dZ_1 dZ_2 = \rho dt$.

Outline

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Conclusion

We introduced the three most common simulation methods for dynamics of the two-factor Gaussian diffusion model:

1. Euler-Maruyama scheme (classical and modified);
2. Broadie-Kaya scheme;
3. Andersen schemes (TG and QE. Only for stochastic variance).

To-dos

1. How do we approximate the log-prices?
2. Martingale correction in the Andersen schemes
3. Numerical stability of implied volatility calculations