Stochastic Rough Volatility Model with Jump Dynamics

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March 22, 2023

Abstract:

Motivated by previous work on stochastic rough volatility models, we propose a novel model where the volatility is driven by two correlated Hawkes processes to depict the microstructure of rough Heston model. Compared to the current literature, this construction has three conspicuous advantages. First, it allows us to show that this process itself instead of its integrated form will converge to rough Heston model under proper scaling. The intricate structure of the model makes the proof of C-tightness challenging, and our work fills this gap. On the other hand, such construction generalizes the volatility model to a jump dynamics setting, where the so-called jump is actually a sharp rise of volatility composed of a series of self-exciting increases. Moreover, by seeking for the exponential characteristic functional of the volatility, we show that the converge mentioned earlier is unique.

Key words:

stochastic volatility model, Hawkes process, rough Heston model with jumps