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Robust Heston Calibration in Regimes of Extreme Volatility: Overcoming Feller Condition Violations in Bitcoin Modeling

Communication Info

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Abstract

This paper introduces a method for estimating Heston model parameters using Euler-based Maximum Likelihood Estimation (EMLE). We developed direct formulas (closed-form estimators) for mean-reversion and the volatility-of-volatility. By applying Martingale theory and the Strong Law of Large Numbers, we prove that these estimators are strongly consistent. To test how well this works in the real world, we applied the method to Bitcoin data (BTC-USD, 2020–2024).

The results show that the model handles extreme volatility well, even though crypto markets frequently break the theoretical Feller condition.

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