An empirical analysis of the Nikkei 225 put options using realized GARCH models *

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Abstract

This paper analyses whether the realized generalized autoregressive conditional heteroscedasticity (GARCH) model suggested by Hansen et al. [2011] is useful for pricing Nikkei 225 put options. One advantage of this particular model over classic autoregressive conditional heteroscedasticity (ARCH)-type models is that it enables us to estimate simultaneously the dynamics of stock returns using both realized volatility and daily return data. Another advantage is that this model adjusts for the bias in realized volatility caused by the presence of market microstructure noise and non-trading hours, and therefore, it can be apply to any realized measure. The analysis also examines whether realized GARCH models using the realized kernels proposed by Bardorff-Nielsen et al. [2008] improve the performance of option pricing by comparing the results with those obtained using realized volatility as the simple sum of the squares of the intra-day returns. Comparing the estimation results based on the root mean square error indicates that the realized GARCH models perform better than either the exponential GARCH (EGARCH) or the Black–Scholes models in terms of put option pricing. Moreover, the realized GARCH models with the realized kernels without non-trading hour returns perform better than those with realized volatility alone.

Key words: put option pricing; realized GARCH; non-trading hours; microstructure noise; Nikkei 225 stock index

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