Option Pricing Using Realized Volatility and ARCH Type Models

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Abstract

This article analyzes whether daily realized volatility, which is the sum of squared intraday returnsover a day, is useful for option pricing. Different realized volatilities are calculated with or without taking account of microstructure noise and with or without using overnight and lunch-time returns. The both ARFIMA and ARFIMAX models are employed to specify the dynamics of realized volatility. The former can capture the long-memory property and the latter can also capture the asymmetry in volatility depending on the sign of previous day's returns. Option prices are derived under the assumption of risk-neutrality. For comparison, GARCH, EGARCH and FIEGARCH models with daily returns are estimated, where option prices are derived by assuming the risk-neutrality and by using the Duan (1995) method in which the assumption of risk-neutrality is relaxed. Main results using the Nikkei 225 stock index and its put options prices are: (1) the ARFIMAX model with daily realized volatility performs best, (2) applying the Bartlett adjustment to the calculation of realized volatiliy to take account of microstructure noise does not improve the performance while the Hansen and Lunde (2005a) adjustment without using overnight and lunch-time returns improves the performance, and (3) the Duan (1995) method does not improve the performance of the GARCH option pricing compared with assuming the risk neutrality.