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Daily value-at-risk modeling and forecast evaluation: the realized volatility approach

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Abstract

One of the main applications of conditional volatility modeling and forecasting of financial assets is the value-at-risk (VaR) estimation that is used by financial institutions for reporting the daily capital in risk. It remains a question on whether realized volatility (RV) models that incorporate the use of intraday data produce better VaR forecasts compared to methodologies that are based solely on daily returns. This study provides extensive comparison of out-of-sample volatility and VaR forecast performance on three equity market indices: S&P500, FTSE100, and DAX30 using 13 risk models that consist of 5 GARCH specifications, 4 ARFIMAX specifications and 4 HARX specifications. The out-of-sample volatility forecasts are evaluated by various loss functions and simple scoring procedures in order to identify the model that produces the overall best volatility forecasts. For VaR forecasts, the models are evaluated using a two-stage backtesting procedure where the models undergo unconditional and conditional coverage tests to eliminate underperforming models and the qualified models are then evaluated using the quadratic probability score (QPS) function that is computed based on various VaR loss functions. The results showed that RV models outperform GARCH models for volatility forecasts, but a simple EGARCH model outperforms the rest models for most of the VaR forecasts. The results also indicated that capturing the asymmetric behavior of volatility dynamics is essential for accurate volatility and VaR forecasts. The findings of this study provide useful information for market risk regulation, financial risk management and further investigations such as extension to derivative markets and options pricing.

Keywords: Realized volatility, volatility forecasting, value-at-risk, GARCH, ARFIMA, HAR.

JEL Classifications: C22, C52, C53, C58, G32.

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