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New hybrid methodology for stock volatility prediction

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Modeling and forecasting stock market volatility have been always very crucial issues in the academic and research communities for finance and economy. As we can see, the evidence for predictability has led to various approaches, some of which are theoretically motivated, while others are simply empirical approaches. However, some major related research compared the ability of various members of the GARCH (Generalized Autoregressive Conditional Heteroskedasticity) family to forecast market volatility in different stock markets, found that the asymmetric GARCH models could not outperform the standard GARCH model, and concluded that asymmetry plays only a modest role in forecasting volatility.

For those empirical results, this study excluded the asymmetric GARCH models and concentrates on studying whether the integrated model, Grey-GARCH, enhances the one-step ahead variance forecasts as compared to the GARCH model. Consequently, based on the rule of using a minimal amount of recent information, this study employs the forecasting property of Grey forecasting model to continually modify the squared error terms sequence, and combines this model the traditional symmetric GARCH model for predicting the conditional volatility.

For the performance evaluation, we show that the proposed Grey-GARCH model, which combines the Grey forecasting model with the GARCH model as a means of enhancing the one-period-ahead volatility demonstrates better forecasting ability of the well-known GARCH model. International stock indices are used as empirical research subjects, and the out-of-sample periods are divided into all data, up-trending and down-trending periods. Since the error term always displays ‘‘noise” in an econometric model, the error term sequence characterized by unpredictable random and nonlinear phenomenon was random and nonlinear. Therefore, this investigation adjusts the error term sequence to solve the stochastic and nonlinear problems based on the Grey prediction model. Figures 1 and 2 demonstrate that Grey-GARCH(1,1) provides higher volatility than GARCH(1,1) does for these indices. In conclusion, we present an integrated model to improve the variance forecasting ability in variance as compared to the traditional GARCH. Overall, the results show that the new integrated model can enhance the volatility forecasting ability of the traditional GARCH.

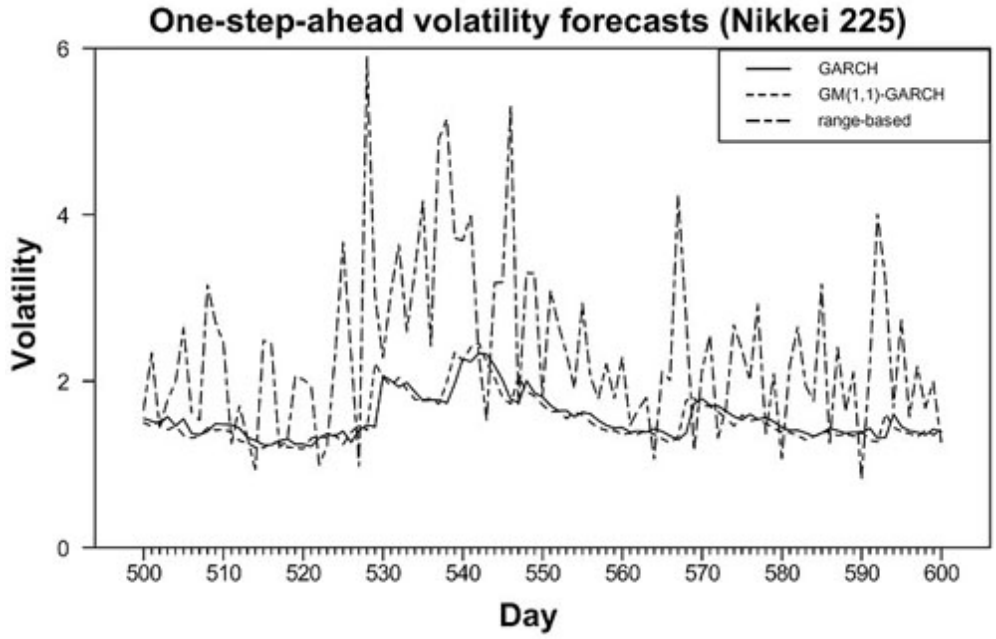

Figure 1. Comparison of Nikkei 225 stock volatility forecasts for different GARCH models.

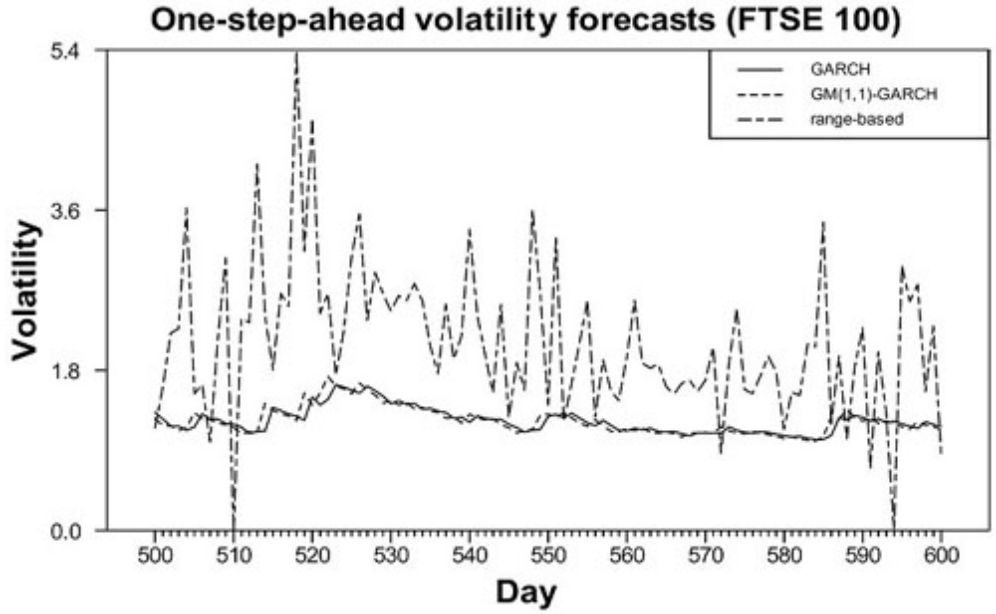

Figure 2. Comparison of FTSE 100 stock volatility forecasts for different GARCH models.