Three Essays on Volatility Forecasting

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ABSTRACT

This study examines a number of issues related to forecasting financial market volatility. Using intraday executable quotes of index options and futures price data obtained from the Hong Kong Exchanges and Clearing Ltd, the study investigates both methodological and economic aspects of volatility forecasting.

The research explores the factors that affect the quality of volatility forecast. These factors include (1) the choice of sampling frequency during the trading sessions, (2) the inclusion (or exclusion) of non-trading time returns, (3) the choice of models of realized volatility, (4) the choice of time series models for forming expectation with historical data, (5) the choice of models for implied volatility, (6) the length of the forecasting horizon, and (7) whether the option horizon matches with the forecasting horizon. However, as realized volatility is an abstract concept, the research gauges the quality of a forecast by a test of its economic benefit.

The thesis first examines the distributional properties of realized volatility (RV) measures. Four realized volatility measures, namely, intraday volatility, total volatility, scaled total volatility and close-to-close volatility, are used, representing different treatments for non-trading time volatility. The results show that the three intraday RV measures are positively skewed and leptokurtic. The logarithmic transformation greatly reduces their non-normality. Moreover, the three RV measures possess long memory properties. The chapter also shows that the levels of intraday RV drop as maturity approaches. Most importantly, exclusion of non-trading time volatility lowers the level of the RV measures by 36 percent while the change in sampling frequency has little impact on both the level and variance of RV.

After revealing the distributive properties of the realized volatility measure, the thesis then examines the relative information content of model-free implied volatility (MFI), Black implied volatility (BIV) and time-series (TS) models against high-frequency futures and options data. The quality of prediction is significantly affected by the forecasting horizon and RV model, but is largely immune from the choice of sampling frequency. Consistent with prior research, BIV outperforms MFI and TS forecasts; however, the information content of historical volatility critically depends on the choice of RV measure.

Finally, the thesis explores the predictability of option implied volatility and tests the economic performance of different forecasting models with realistic (i.e., potentially executable) option price data. The results indicate that forecasts based on both historical and implied volatility outperform single model forecast for put options both in sample and out of sample. Moreover, the trading results are more sensitive to the estimated option spreads than to the choice of forecasting models. Finally, short option strategies are generally more profitable than long option strategies.
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