A new and fast block bootstrap based prediction intervals for GARCH processes with application to exchange rates

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Measuring volatility and construction of valid predictions for future returns and volatilities have an important role in assessing risk and uncertainty in the financial market. To this end, the generalized autoregressive conditionally heteroscedastic (GARCH) model is one of the most commonly used technique for modeling volatility and obtaining dynamic prediction intervals for returns as well as volatilities. Technically, construction of prediction intervals requires some distributional assumptions which are generally unknown in practice. Moreover, the constructed prediction intervals along with the estimated parameter values can be affected due to any departure from the assumptions and may lead us to unreliable results. One of the remedy to construct prediction intervals without considering distributional assumptions is to use the well known resampling methods, e.g., the bootstrap.

In this study, we propose a new bootstrap algorithm to obtain prediction intervals for GARCH processes which can be applied to construct prediction intervals for future returns and volatilities of conditionally heteroskedastic time series models. The advantages of the proposed method are two-fold: (a) it often exhibits improved performance and, (b) is computationally more efficient compared to other available resampling methods. Also, it is more robust to model disturbances than the existing resampling methods. The superiority of this method over the other resampling method based prediction intervals is explained with Spearman's rank correlation coefficient. The finite sample properties of the proposed method are also illustrated by an extensive simulation study.