

In the existing financial literature research covering stock exchanges usually focuses on the prices, returns and on the modelling and forecasting of asset return volatility. Therefore, much less attention has been paid to modelling the trading volume observed on stock markets. Consequently, our knowledge of trading volume is definitely much narrower. However, the trading volume plays a significant role in the trading process, and is one of the key liquidity measures on stock markets.

Trading volume has often been analysed in the context of dependencies between trade size and other financial variables, such as price, returns or returns' volatility. Forecasting of trading volume in stock markets definitely has not been a central point of financial econometrics for years. However, nowadays, the situation appears to take a new shape, especially in recent years as so-called algorithmic trading is becoming increasingly dominant on the stock exchanges. Many trading algorithms require intraday volume forecasts as essential inputs, and further performance improvement of those strategies strongly depends on the accuracy of intraday volume predictions. Therefore, the ability to produce accurate intraday volume forecasts can facilitate and improve trading algorithms, many of which, indeed, depend on the quantity considered. As a result, there is growing interest among researchers and practitioners in well-established econometric tools for modelling and forecasting of the intraday trading volume.

The main objective of this project is to apply Bayesian nonlinear autoregressive conditional volume (ACV) models to analysis of the dynamics of and forecasting intraday trading volume. Another objective of this project is to propose and develop new specifications of Bayesian nonlinear ACV models, especially with time-varying variance distributions for innovation terms. Additionally, one of research objectives is also to empirically investigate the predictive abilities of alternative Bayesian ACV models via point (level), density, and interval forecasts of the trading volume and evaluate the quality of these forecasts. These issues have not been discussed in the literature so far.

Our research is comprised of four stages. In the first stage, we will propose and develop new specifications of nonlinear ACV models, and develop Bayesian methodology to their estimation. The second stage provides application of a set of nonlinear ACV models (with proposed new specifications) to modelling the intraday trading volume dynamics. The third stage comes to forecasting issue. At this stage, we will compare alternative Bayesian ACV models via point, density and interval forecasts of trading volume. Moreover, we will evaluate the quality of obtained forecasts by employing many popular statistical measures and tests. Finally, in the fourth step, we will evaluate the accuracy of intraday trading volume point forecasts obtained from alternative Bayesian ACV models in terms of VWAP trading strategy based on volume predictions. At this stage, we will also compare Bayesian nonlinear ACV models to benchmark models in the literature.

The implementation of this project appears to be justified by the following arguments.

Firstly, this research contributes to the literature and theory of financial econometrics by proposing and developing new models to analysis of the intraday trading volume dynamics – novel specifications of nonlinear ACV models, and developing Bayesian methodology to estimation of parameters of new models. These models have not been discussed in the literature so far. They can be viewed as interesting alternatives for other ACV models and benchmark models in the literature. Secondly, the project also covers the existing gap in the literature on modelling and forecasting of intraday trading volume on financial markets with the use of nonlinear ACV models. Thirdly, from practical point of view an effective model of intraday volume can potentially improve trading algorithms based on volume predictions. It should be noted that identifying the better model can be of high relevance to practitioners because any increase in forecasting accuracy can be directly converted to monetary gains through the avoided price effect. Fourthly, more affective model of intraday volume used as a building block in other structures may contribute to creating a better model for analysis of crucial financial variables and market activities later on.