Density forecasts with quantile autoregression with an application to option pricing

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Abstract

This paper presents a method for estimating the conditional and joint probability densities of multiple random variables using quantile regression, established by Koenker and Bassett (1978), for which the statistical inference has been extended to the field of time series analysis by Koenker and Xiao (2006). We provide a simple and robust framework for estimating autoregressive, conditional densities, allowing for inference not only on the conditional density itself but also on functions of the modeled random variables, such as option prices. In our application, we demonstrate theoretically, via a simulation study and in out-of-the-sample density forecasts the effectiveness of our approach in estimating option prices with confidence bounds implied by the estimation method. Our findings suggest that quantile autoregression is effective in forecasting conditional densities and can be used for option pricing. The flexibility of our method in incorporating conditioning information, such as past returns or volatility, has the potential to further improve forecasting accuracy.

Keywords: Quantile Regression, Conditional Density Forecasts, Option Pricing

References

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