Model-based quantification of the volatility of options at transaction level with extended count regression models

Czado, C. and Kolbe, A.

Abstract:
In this paper we elaborate how Poisson regression models of different complexity can be used in order to model absolute transaction price changes of an exchange-traded security. When combined with an adequate autoregressive conditional duration model, our modelling approach can be used to construct a complete modelling framework for a security’s absolute returns at transaction level and thus for a model-based quantification of intraday volatility and risk. We apply our approach to absolute price changes of an option on the XETRA DAX index based on quote-by-quote data from the EUREX exchange and find that within our Bayesian framework a Poisson Generalized Linear Model (GLM) with a latent AR(1) process in the mean is the best model for our data according to the deviance information criterion (DIC). While, according to our modelling results, the price development of the underlying, the intrinsic value of the option at the time of the trade, the number of new quotations between two price changes, the time between two price changes and the Bid-Ask spread have significant effects on the size of the price changes, this is not the case for the remaining time to maturity of the option.