

Title

Dynamic Nonlinear Quantile estimation with the Asymmetric Laplace Distribution

Abstract:

Value-at-Risk (VaR) forecasting is recommended for financial institutions via the Basel II Capital Accord. The VaR is simply proportional to a quantile in the relevant forecast distribution. Engle and Manganelli (2004) proposed to use quantile regression to model the VaR directly, introducing the Conditional Autoregressive Value at Risk (CAViaR) model. Recent work shows that such dynamic quantile estimation is a special case of maximising the asymmetric or skewed Laplace distribution likelihood. The question then arises as to the feasibility of extending this result to likelihood and Bayesian inference; a question which has been partially answered in cross-sectional regression models by Yu and Moyeed (2001) and Geraci and Bottai (2007). We extend this work by designing an adaptive MCMC sampling scheme, combining random walk and independent Metropolis-Hastings methods, to provide and assess parameter estimates and inference for CAViaR-type models, exploiting the skewed Laplace

pseudo-likelihood framework. Further, we extend the CAViaR framework to include more flexible nonlinear models, e.g. to better capture asymmetry in financial markets. A simulation study shows favourable results compared to numerical minimisation of the usual quantile criterion function. We apply our method to a set of 10 international stock market indices and provide a thorough comparison with modern symmetric and nonlinear GARCH-type models, as well as the popular RiskMetrics method, in terms of forecasting the VaR, and quantiles in general, dynamically. Again the results marginally favour CAViaR models.