

An Adaptive Threshold INGARCH Model for Evolving Regimes in Crime Count Time Series

Cathy W. S. Chen

Department of Statistics, Feng Chia University, Taiwan

Abstract

Integer-valued time series arise in many applications where the variable of interest is the number of events occurring over time. Such count series may exhibit changes in their level and serial dependence, making a single fixed threshold inadequate for separating regimes throughout the sample. This study proposes a locally adaptive threshold integer-valued GARCH (INGARCH) model for count time series with evolving regime behavior. Unlike conventional threshold INGARCH models, the proposed model determines the regime boundary from recent observations through a local order statistic, allowing the threshold to adjust to changes in the behavior of the process over time. All model parameters, including the memory length and threshold position, are estimated within a Bayesian framework, with Markov chain Monte Carlo methods used for inference. Simulation studies examine the finite-sample performance of the proposed approach. Applications to monthly crime count data illustrate its ability to capture changing regime patterns and provide flexible modeling of count time series with evolving dynamics.