



Test for conditional quantile change in general conditional heteroscedastic time series models

Sangyeol Lee¹ · Chang Kyeom Kim¹

Received: 8 June 2023 / Revised: 19 October 2023 / Accepted: 24 October 2023 /
Published online: 15 December 2023
© The Institute of Statistical Mathematics, Tokyo 2023

Abstract

This study aims to test for detecting a change point in the conditional quantile of general location-scale time series models. This issue is quite important in risk management because the conditional quantile is utilized to measure the value-at-risk or expected shortfall of financial assets. In this paper, we design two types of cumulative sum tests based on the conditional quantiles. Their limiting null distributions are derived under regularity conditions, together with consistency of the proposed tests under the alternative. Monte Carlo simulations demonstrate the good performance of the proposed tests in terms of both stability and power for various time series settings. A real data analysis using the daily returns of the Brent Oil futures also confirms the validity of the tests in real-world applications.

Keywords Change point detection · Conditional heteroscedastic time series models · CUSUM test · Quantile regression · Risk management

✉ Sangyeol Lee
sylee@stats.snu.ac.kr

¹ Department of Statistics, Seoul National University, Seoul 08826, Korea