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Modified residual CUSUM test for location-scale time series models with heteroscedasticity

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Abstract

This study considers the residual-based CUSUM test for location-scale time series models with heteroscedasticity. The estimates- and score vector-based CUSUM tests are widely used for detecting abrupt changes in time series models. However, their performance is often unsatisfactory with severe size distortions when the underlying model is complicated and the sample size is small. To circumvent this defect, the residual-based CUSUM test is suggested as an alternative. However, this test can only detect scale parameter changes and suffers severe power loss against location parameter changes. To remedy this, we introduce a modified residual-based CUSUM test and demonstrate its validity for both location and scale parameter changes. We conduct a simulation study and data analysis for illustration.

Keywords Location-scale time series models with heteroscedasticity · Parameter change test · CUSUM test · Residual-based test · Score vector-based test

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