Causality for CHARN models

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Abstract:
In this study, we consider Granger causality with a highly flexible nonlinear time series model, the conditional heteroscedastic autoregressive nonlinear (CHARN) model. We show that the causality of the CHARN models can be examined by a Portmanteau test, based on a constrained maximum likelihood estimator of the parameters, and the test statistic has an approximate asymptotic Chi-square distribution. We describe the Chi-square asymptotics of the Portmanteau test for a CHARN model, provide calculations of the test statistic and investigate the performance of the Portmanteau test using a simulation. This idea is also illustrated using a real data set.

Keywords: Asymptotic Chi-square distribution, CHARN model, Constrained maximum likelihood estimator, Nonlinear Granger causality, Portmanteau test