Alternative Granger Causality Tests Based on Vector Autoregressive Model

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Abstract

Granger causality is a classical tool for measuring predictability from one group of time series to another by incorporating information of variables described by a vector autoregressive (VAR) model. Traditional methods for validating Granger causality are based on the Wald type tests, which may encounter a problem with (i) tuning parameter selection or (ii) test-statistic inflation when the estimated covariance matrix is singular or near-singular. In this work, we propose an alternative procedure for testing Granger causality based on non-pivotal statistics. The proposed hypothesis testing method is valuable in the sense that (i) it does not require any calibration of tuning parameters (thus saving huge computational cost); and (ii) it yields very competitive power values in comparison with the Wald type tests. Finally, a number of simulation examples and a real data set are used to illustrated and evaluated the proposed method.

Keywords: Granger causality, Vector autoregression, Modified Wald test, Nonpivotal test