Discovering the Network Granger Causality in Large Vector Autoregressive Models

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Abstract

In this paper we propose novel inferential procedures for network Granger causality in high-dimensional vector autoregressive (VAR) models. In particular, we propose two procedures which are designed to control the false discovery rate (FDR). The first procedure for multiple testing with controlled FDR is based on the limiting normal distributions of the t-statistics constructed by the debiased lasso estimators. The second procedure is based on the bootstrap distributions of the t-statistics, constructed by imposing the null hypotheses. The theoretical properties of these proposed procedures, including FDR control and power guarantees, are investigated. The finite sample evidence suggests that both procedures can successfully control the FDR while maintaining high power. The proposed methods are applied to discover network Granger causality in a large number of macroeconomic variables and in regional house prices in the UK.

Keywords. Multiple testing, FDR and power, Debiased lasso, Bootstrap, FRED-MD, House price.

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