

DETECTING CO-MOVEMENTS IN NONCAUSAL TIME SERIES

Gianluca Cubadda* Alain Hecq[†] Sean Telg[‡]

June 4, 2018

Abstract

This paper introduces the notion of common noncausal features and proposes tools to detect them in multivariate time series models. We argue that the existence of co-movements might not be detected using the conventional stationary vector autoregressive (VAR) model as the common dynamics are present in the noncausal (i.e. forward-looking) component of the series. In particular, we show that the presence of a reduced rank structure allows to identify purely causal and noncausal VAR processes of order two and higher even in the Gaussian likelihood framework. Hence, usual test statistics and canonical correlation analysis can still be applied, where both lags and leads are used as instruments to determine whether the common features are present in either the backward- or forward-looking dynamics of the series. The proposed definitions of co-movements also valid for the mixed causal-noncausal VAR, with the exception that an approximate non-Gaussian maximum likelihood estimator is necessary for these cases. This means however that one loses the benefits of the simple tools proposed in this paper. An empirical analysis on European Brent and U.S. West Texas Intermediate oil prices illustrates the main findings. Whereas we fail to find any short run co-movements in a conventional causal VAR, they are detected in the growth rates of the series when considering a purely noncausal VAR.

Keywords: causal and noncausal process, common features, vector autoregressive models, oil prices.

*Universita' di Roma "Tor Vergata", Dipartimento di Economia e Finanza. Email: gianluca.cubadda@uniroma2.it.

[†]Maastricht University, School of Business and Economics, Department of Quantitative Economics, P.O.Box 616, 6200 MD Maastricht, The Netherlands. Email: a.hecq@maastrichtuniversity.nl.

[‡]Maastricht University, School of Business and Economics, Department of Quantitative Economics. Email: j.telg@maastrichtuniversity.nl