



Generalized latent VARMAX models and dynamic structural equations, with application to the study of the effect of pollution on health

Dani Gamerman*

Universidade Federal do Rio de Janeiro, Rio de Janeiro, Brazil - dani@im.ufrj.br

Luigi Ippoliti

Universita G. d'Annunzio, Pescara, Italia - ippoliti@unich.it

Pasquale Valentini

Universita G. d'Annunzio, Pescara, Italia - ippoliti@unich.it

Abstract

VARMAX models handle temporal relation between multivariate response time series with multivariate explanatory time series. They usually assume additivity and Gaussianity for the errors. Dynamic structural equation models (DSEM) perform a similar task but at a latent level, purposefully designed to reduce the dimensionality and render more easily interpretable description of the phenomenon under study. DSEM also assume additivity and Gaussianity of the input error terms. Both these structures can be generalized for the context of non-Gaussian time series. This talk discusses possible uses of generalizations. The approach is based on casting these models into a general state space formulation. Application to the study of the effect of pollution on health provide an important motivating illustration. Building up from previous applications of transfer response and spatial factor models, it shows the relevance of this approach to reduce dimensionality in the spatio-temporal context. In passing, it also provides a simple solution to the problem of spatial misalignment.

Keywords: factor analysis; spatio-temporal; state-space; transfer response function.