RECENT ADVANCES IN SPARSE BAYESIAN FACTOR ANALYSIS

SYLVIA FRÜHWIRTH-SCHNATTER
Vienna University of Business and Economics, Vienna, Austria
e-mail: sfruehwi@wu.ac.at

HEDIBERT FREITAS LOPES
Insper Institute of Education and Research, São Paulo, Brazil
e-mail: hedibertfl@insper.edu.br

Factor analysis is a popular method to obtain a sparse representation of the covariance matrix of multivariate observations. This is particularly relevant for analyzing the correlation among high-dimensional data. The present talk reviews some recent research in the area of sparse Bayesian factor analysis that tries to achieve additional sparsity in a factor model through the use of point mass mixture priors.

However, despite the popularity of sparse factor models in many applied areas such as genetics, economics, and finance, little attention has been given to formally address identifiability of these models beyond standard rotation-based identification such as the positive lower triangular constraint. In particular, identifiability issues that arise from introducing zeros in the factor loading matrix are largely ignored. In a recent paper [1] we tried to fill this gap.

Identifiability issues that arise from introducing zeros in the factor loading matrix are discussed in detail. We provide a counting rule on the number of nonzero factor loadings that is sufficient for achieving uniqueness of the variance decomposition in the factor representation. Furthermore, we introduce the generalized lower triangular representation to resolve rotational invariance and show that within this model class the unknown number of common factors can be recovered in an overfitting sparse factor model. By combining point-mass mixture priors with a highly efficient and customized MCMC scheme, we obtain posterior summaries regarding the number of common factors, as well as the factor loadings via post-processing. The methodology is illustrated for monthly exchange rates of 22 currencies with respect to the euro over a period of eight years and for monthly log-returns of 73 firms from the NYSE100 over a period of 20 years.

References