

# Bayesian Analysis of Dynamic Factor Models: An Ex-Post Approach towards the Rotation Problem

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## Abstract

Due to their indeterminacies, dynamic factor models require identifying assumptions to guarantee uniqueness of the parameter estimates. These identifying assumptions refer to the invariance of the likelihood under location, scale and orthogonal transformations of factors and loadings, respectively. The indeterminacy with respect to orthogonal transformations is referred to as the rotation problem. The typical strategy in Bayesian factor analysis to achieve identification via ex-ante constraints on certain model parameters may, however, result in posterior distributions whose shapes depend on the ordering of cross-sections in the data set. We propose an alternative approach, which relies on a sampler without the usual identifying constraints and fixes the rotation issue. Identification is reached ex-post based on a Procrustes transformation. The resulting order invariance of posterior estimates are illustrated by means of simulation and an empirical application. Favorable properties of ex-post identification with respect to convergence, statistical as well as numerical accuracy are revealed.

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