"Dynamic Sparse Factor Analysis"

Abstract

Its conceptual appeal and effectiveness has made latent factor modeling an indispensable tool for multivariate analysis. Despite its popularity across many fields, there are outstanding methodological challenges that have hampered practical deployments. One major challenge is the selection of the number of factors, which is exacerbated for dynamic factor models, where factors can disappear, emerge, and/or reoccur over time. Existing tools that assume a fixed number of factors may provide a misguided representation of the data mechanism, especially when the number of factors is crudely misspecified. Another challenge is the interpretability of the factor structure, which is often regarded as an unattainable objective due to the lack of identifiability. Motivated by a topical macroeconomic application, we develop a flexible Bayesian method for dynamic factor analysis (DFA) that can simultaneously accommodate a time-varying number of factors and enhance interpretability without strict identifiability constraints. To this end, we turn to dynamic sparsity by employing Dynamic Spike-and-Slab (DSS) priors within DFA. Scalable Bayesian EM estimation is proposed for fast posterior mode identification via rotations to sparsity, enabling Bayesian data analysis at scales that would have been previously time-consuming. We study a large-scale balanced panel of macroeconomic variables covering multiple facets of the US economy, with a focus on the Great Recession, to highlight the efficacy and usefulness of our proposed method.