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Joint Modelling and Estimation of Global and Local Cross-Sectional Dependence in Large Panels

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We propose a new unified approach to identifying and estimating spatio-temporal dependence structures in large panels. The model accommodates global cross-sectional dependence due to global dynamic factors as well as local cross-sectional dependence, which may arise from local network structures. Model selection, filtering of the dynamic factors, and estimation are carried out iteratively using a new algorithm that combines the Expectation-Maximization algorithm with proximal minimization, allowing us to efficiently maximize an ℓ_1- and ℓ_2-penalized state space likelihood function. A Monte Carlo simulation study illustrates the good per- formance of the algorithm in terms of determining the presence and magnitude of common factors and local spillover effects. In an empirical application, we investigate monthly US interest rate data on 12 maturities over almost 35 years. We find that besides a changing number of global dynamic factors, there are heterogeneous local spillover effects among neighboring maturities. Taking this heterogeneity into account substantially improves out-of-sample forecasting performance.

[1] S. J. Koopman, J. Schaumburg, and Q. Wiersma, "Joint modelling and estimation of global and local cross-sectional dependence in large panels," *Tinbergen Institute Discussion Paper 2021-008/III*, 2021.