

## **Sparse Vector Autoregressive Modeling**

Richard A. Davis\*

Columbia University, New York, USA [rdavis@stat.columbia.edu](mailto:rdavis@stat.columbia.edu)

Pengfei Zang

Columbia University, New York, USA [pengfei@stat.columbia.edu](mailto:pengfei@stat.columbia.edu)

Tian Zheng

Columbia University, New York, USA [tzheng@stat.columbia.edu](mailto:tzheng@stat.columbia.edu)

The vector autoregressive (VAR) model has been widely used for modeling temporal dependence in a multivariate time series. For large (and even moderate) dimensions, the number of VAR parameters can be prohibitively large resulting in noisy estimates and difficult-to-interpret temporal dependence. As a remedy, we propose a methodology for fitting sparse VAR models (sVAR) in which most of the autoregressive coefficients are set equal to zero. The first step in selecting the nonzero coefficients is based on an estimate of the partial squared coherency (PSC) together with the use of BIC. The PSC is useful for quantifying conditional relationships between marginal series in a multivariate time series. A refinement step is then applied to further reduce the number of parameters. The performance of this 2-step procedure is illustrated with both simulated data and several real examples, one of which includes financial data.

Key Words: sparsity, partial spectral coherence, model selection, LASSO