

# 國立中山大學應用數學系

## 學術演講

講者：蔡瑞胸院士 (Booth School of Business, University of Chicago)  
講題：Screening Predictors in High-Dimensional Time-Series Analysis  
時間：2024/02/29 (Thursday) 14:10~15:00  
地點：理 SC 4009-1 教室  
茶會：13:45

### Abstract

This paper proposes a sparse vector autoregressive (VAR) model for high dimensional time series in which both the dimension  $d$  and the AR order  $p$  diverge to  $\infty$  when the sample size goes to  $\infty$ , but the model only includes  $s$  dynamically dependent variables with  $p_0$ -lag dependence, where both  $s$  and  $p_0$  are finite. We call the model a  $sp_0$ -sparse VAR model and derive the convergence rate of the least squares estimators (LSE) of model parameters. Based on LSE, we consider a two-step adaptive group lasso estimation procedure and show that the procedure can screen out dynamically uncorrelated variables and determine the lag  $p_0$  of the remaining dependent variables with probability approaching 1. The estimated parameters of the resulting VAR model, consisting of the  $s$  dependent variables, can achieve the “oracle” properties, i.e., as efficient as the LSE when both  $s$  and  $p_0$  are known. We further extend the procedure to high-dimensional factor AR models and show that it can determine  $s$ , the number of factors, with probability approaching 1. We conduct a simulation study to assess the performance of the proposed procedure in finite samples. Two real examples demonstrate applications of the proposed approach and showcase that the models built via our approach fare better than the five-factor model in one-step-ahead out-sample forecasting.

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