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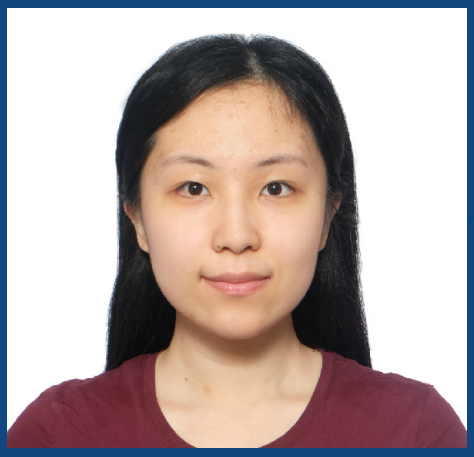

Finite Time Analysis of Vector Autoregressive Models under Linear Restrictions

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Monday, February 4, 2019
10:00am
311 Pearson Hall

We develop a unified finite-time theory for the OLS estimation of possibly unstable and even slightly explosive VAR models under linear restrictions, with the applicable region $\rho(A) \leq 1+c/T$, where $\rho(A)$ is the spectral radius of the transition matrix A in the VAR(1) representation, T is the time horizon and $c > 0$ is a universal constant. This linear restriction framework encompasses various existing models in the literature such as banded/network VAR models. We show that the restrictions reduce the error bounds through not only the reduced dimensionality but also a scale factor that resembles the asymptotic covariance matrix of the estimator in the fixed dimensional setup; as long as the model is correctly specified, this scale factor is decreasing in the number of restrictions. Our analysis reveals that the phase transition from slow to fast error rate regimes is determined by the smallest singular value of A, a measure of the least excitable mode of the system. The minimax lower bounds are also derived across different regimes. The developed finite- time theory not only bridges the theoretical gap between stable and unstable regimes but also precisely characterizes the effect of the restrictions and its interplay with other model parameters. Simulations support our theoretical results in both small and large samples.

Yao Zheng received the Ph.D. degree in statistics in 2017 and the B.S. degree (first class honors) in 2013 from the Department of Statistics and Actuarial Science, the University of Hong Kong. Since 2017, she has been a Postdoctoral Fellow and Visiting Assistant Professor in the Department of Statistics at Purdue University. Her current research interests are in the areas of time series analysis, high-dimensional statistics, econometrics, large-scale optimization and machine learning.