CRiSM Seminar

Wednesday, March 8

1pm – MB0.07

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Factor-adjusted network estimation and forecasting for high-dimensional time series

We propose and establish the asymptotic properties of FNETS, a methodology for network estimation and forecasting of high-dimensional time series exhibiting strong serial- and cross-sectional correlations. We operate under a factor-adjusted vector autoregressive (VAR) model where, after controlling for dynamic factors accounting for pervasive leading, lagging or contemporaneous co-movements of the variables, the remaining idiosyncratic dynamic dependence between the variables is modelled by a sparse VAR process. Network estimation of FNETS consists of three steps: (i) factor-adjustment via dynamic principal component analysis, (ii) estimation of the parameters of the latent VAR process by means of L1-regularised Yule-Walker estimators, and (iii) estimation of partial correlation and long-run partial correlation matrices. In doing so, we learn three networks underpinning the latent VAR process, namely a directed network representing the Granger causal linkages between the variables, an undirected one embedding their contemporaneous relationships and finally, an undirected network that summarises both lead-lag and contemporaneous linkages. In addition, FNETS provides a suite of methods for separately forecasting the factor-driven and the VAR processes. Under general conditions permitting heavy tails and weak factors, we derive the consistency of FNETS in both network estimation and forecasting as the dimension of the panel and the sample size diverge. Simulation studies and real data application confirm the good performance of FNETS.

This is joint work with Matteo Barigozzi (Bologna) and Dom Owens (Bristol).