Hi-Di NET

Econometric Analysis of High Dimensional Network Structures in Macroeconomics and Finance

Second Intermediate Workshop (virtual)

Thursday 20th January 2022

11.00 Project update and administrative questions, Monica Billio (Ca' Foscari University)

11.15 **Bootstrap Diagnostics in Proxy-SVARS with Weak Proxies**, Giovanni Angelini, **Giuseppe Cavaliere**, Luca Fanelli (University of Bologna)

Bootstrap methods are debated and routinely applied in Structural Vector Autoregressions (SVARs) identified and estimated by external in struments (proxies), in the so-called proxy-SVAR/SVAR-IV approach. In this paper we link the bootstrap to the identification issues that arise in proxy-SVARs where proxies are .weak.in the sense that their correlation with instrumented structural shocks satisfy a local-to-zero embedding. We show that the bootstrap can be constructively used to build a computationally straightforward diagnostic test for strong against weak proxies. The test is particularly useful for practitioners: it amounts to a normality test, does not require novel asymptotic distributions and novel critical values, and is robust to VAR innovations and proxies being characterized by conditional heteroskedasticity. The empirical size and power properties of the suggested diagnostic test is analyzed through a set of Monte Carlo experiments which show that infinite samples, empirical size and power performance is comparable to that of first-stage F-statistics borrowed from the literature on instrumental variable regressions. On the empirical side, the test is applied to a fiscal proxy-SVAR estimated on US quarterly data to infer the tax multiplier by using a narrative fiscal proxy for the tax shock.

11.45 **A Multivariate Dependence Analysis for Electricity Prices, Demand and Renewable Energy Sources**, Fabrizio Durante, Angelica Gianfreda, **Francesco Ravazzolo** and Luca Rossini (Free University of Bozen)

This paper examines the dependence between electricity prices, demand, and renewable energy sources by means of a multivariate copula model while studying Germany, the widest studied market in Europe. The inter-dependencies are investigated in-depth and monitored over time, with particular emphasis on the tail behavior. To this end, suitable tail dependence measures are introduced to take into account a multivariate extreme scenario appropriately identified through the Kendall's distribution function. The empirical evidence demonstrates a strong association between electricity prices, renewable energy sources, and demand within a day and over the studied years. Hence, this analysis provides guidance for further and different incentives for promoting green energy generation while considering the time-varying dependencies of the involved variables.

12.15 **Tail Forecasting with Multivariate Bayesian Additive Regression Trees**, Todd E. Clark, Florian Huber, Gary Koop, **Massimiliano Marcellino**, and Michael Pfarrhofer (Bocconi University)

We develop novel multivariate time series models using Bayesian additive regression trees that posit nonlinear relationships among macroeconomic variables, their lags, and possibly the lags of the errors. The variance of the errors can be stable, driven by stochastic volatility (SV), or follow a novel nonparametric specification. Estimation is carried out using Markov chain Monte Carlo estimation algorithms that easily scale up to permit the use of large models. We evaluate the real-time density and tail forecasting performance of the various models for a set of US macroeconomic and financial indicators. Our results suggest that using nonpara-metric models generally leads to improved forecast accuracy. In particular, when interest centers on the tails of the posterior predictive, flexible models improve upon standard VAR models with SV. Another key finding is that if we allow for nonlinearities in the conditional mean, allowing for heteroskedasticity becomes less important. A scenario analysis reveals highly nonlinear relations between the predictive distribution and financial conditions.

12.45 **Bayesian Dynamic Tensor Regression**, Monica Billio, **Roberto Casarin**, Matteo Iacopini, Sylvia Kaufmann (Ca' Foscari University)

High- and multi-dimensional array data are becoming increasingly available. They admit a natural representation as tensors and call for appropriate statistical tools. We propose a new linear autoregressive tensor process (ART) for tensor-valued data, that encompasses some well-known time series models as special cases. We study its properties and derive the associated impulse response function. We exploit the PARAFAC low-rank decomposition for providing a parsimonious parametrization and develop a Bayesian inference allowing for shrinking effects. We apply the ART model to time series of multilayer networks and study the propagation of shocks across nodes, layers and time.

13.15 Discussion and conclusions