Estimation and testing for multivariate time series models: a measure transportation approach

Abstract. Measure transportation theory is a growing field of mathematics and it is popular in many other disciplines. For instance, optimal transportation mappings, as related to the results of Monge (1781) and Kantorovich (1942), are widely-applied in bioengineering (e.g. for image analysis), in economics (e.g. for resources allocation), in physics (e.g. for fluids dynamics analysis), in machine learning (e.g. for classification and network analysis), just to name a few; see e.g. Santambrogio (2015). In this talk, I focus on statistics and I explain how one can hinge on the solution to the Kantorovich primal problem to devise novel inference procedures (estimation and testing) for multivariate time series models. The talk contains two parts. (i) I present the results available in Hallin et al. (2020b), where we provide, for the first time in the literature, an application of measure transportation ideas to semiparametric VARMA models. The proposed *R-estimators* build on novel concepts of centered-outward ranks and signs (see Chernozhukov et al. (2017) and Hallin et al. (2020a)), which allow to overcome the classical problem of lack of canonical order in $\mathbb{R}^d$, $d \geq 2$. (ii) I present the results available in Hallin et al. (2020c). I explain how centered-outward ranks and signs can be applied to define a novel class of *tests* for semiparametric VAR models. Numerical results (Monte Carlo simulations and real data analysis of macroeconomic time series) illustrate the theoretical findings of the two parts of the talk.

References

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