Generalized linear dynamic factor models

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We consider generalized linear dynamic factor models. These models have been developed recently and they are used for forecasting and analysis of high dimensional time series in order to overcome the curse of dimensionality plaguing traditional multivariate time series analysis.

We consider a stationary framework; the observations are represented as the sum of two uncorrelated component processes: The so called latent process, which is obtained from a dynamic linear transformation of a low dimensional factor process and which shows strong dependence of its components, and the noise process, which shows weak dependence of the components. The latent process is assumed to have a singular rational spectral density. For the analysis, the cross sectional dimension n, i.e. the number of single time series, as well as the sample size are going to infinity; the decomposition of the observations into these two components is unique only for n tending to infinity.

We present a structure theory giving a state space or ARMA realization for the latent process, commencing from the second moments of the observations. The emphasis is on the zeroless case, which is generic in the setting considered. Accordingly the latent variables are modeled as a possibly singular autoregressive process and (generalized) Yule-Walker equations are used for parameter estimation. The Yule-Walker equations do not necessarily have a unique solution in the singular case, and the resulting complexities are examined with a view to find a stable and coprime system.

Finally we present some preliminary results for the mixed frequency case, where the time series components are sampled at different rates. We consider identifiability and estimation from mixed frequency data based on extended Yule-Walker equations.