Estimating approximate factor models with jumps via the shrinkage method

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Abstract

Approximate factor models and their extensions are widely used in forecasting and economic analysis due to their ability to extract useful information from a large number of relevant variables (e.g. Stock and Watson, 2002; Bernanke *et al.*, 2005; Ludvigson and Ng, 2009). In this paper, we consider estimating an approximate factor model in which the multi-dimensional time series of candidate predictors contain a jump component in addition to the usual common factors. The jump component is assumed to be sparse, i.e., most of the observations in the jump factors are zero. Variables of interest are to be forecasted by the factors together with some other exogenous variables. The setting is similar as the dynamic factor model considered in Stock and Watson (2002) except the additional jump term, which can be viewed as a vector for idiosyncratic large uncommon jumps or outliers for the predictor variables. Estimation of the model is carried out by solving the penalized l_1 norm optimization problem. This is similar to the approach of the shrinkage method used in dealing with sparse data. Preliminary empirical analyses and simulation results indicate that our new methodology performs significantly sharper parameter estimates and more accurate out-of-sample forecasts comparing with the traditional model without jumps.