Dynamic Factor Analysis by Maximum Likelihood

Abstract:
A new approach to dynamic factor analysis by imposing smoothness restrictions on the factor loadings is proposed. A statistical procedure based on Wald tests that can be used to find a suitable set of such restrictions is presented. These developments are presented in the context of maximum likelihood estimation. The empirical illustration concerns term structure models but the methodology is also applicable in other settings. An empirical study using a data set of unsmoothed Fama-Bliss zero yields for US treasuries of different maturities is performed. The general dynamic factor model with and without smooth loadings is considered in this study together with models that are associated with Nelson-Siegel and arbitrage-free frameworks. These existing models can be regarded as special cases of the dynamic factor model with restrictions on the model parameters. Statistical hypothesis tests are performed in order to verify whether the restrictions imposed by the models are supported by the data. The main conclusion is that smoothness restrictions can be imposed on the loadings of dynamic factor models for the term structure of US interest rates.