

Title: Doubly Constrained Factor Models: Estimation and Applications

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Abstract: Factor models have been widely used in recent years to improve the accuracy of forecasting when many explanatory variables are available. However, the models often encounter the difficulties of over-parameterization and factor interpretation. In this paper, we first consider constrained factor analysis to obtain a parsimonious factor model and propose likelihood ratio statistics to test the adequacy of factor constraints. Real and simulated examples are used to demonstrate the proposed analysis. In an application, we show that the constrained factor analysis can provide a deeper understanding of variations in monthly financial asset returns. We then extend the constrained models to the doubly constrained factor models by incorporating external information on both rows (e.g., subjects) and columns (e.g., variables) of a data matrix. Maximum likelihood estimates and likelihood ratio statistics of the proposed models are derived. Finally, we consider the applications of doubly constrained factor models in economics and finance. (This is a joint work with Ruey Tsay of the University of Chicago).