Estimation of a Model for Multiple Time Series

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Abstract

We propose a model for multiple time series data, and a procedure to estimate the parameters of this model. We assume pairwise independence of the time series and postulate additivity. We also assume the time series share common autoregressive patterns which suggests a common time series component can be extracted.

Thus we propose to estimate the autoregressive component and the individual random effects by integrating maximum likelihood estimation and best linear unbiased predictions in a backfitting algorithm. We use a simulation study to evaluate the backfitting estimator, and assess its performance by analyzing its convergence properties, its predictive ability, and its bias. We compare these results to the Arellano-Bond GMM estimator, the most commonly used GMM estimator for dynamic panel data models.

We conclude that the backfitting estimator provides an alternative to the Arellano-Bond GMM Estimator when $T > N$, when Arellano-Bond generally diverges in these cases. We find that the backfitting estimator has high predictive ability, and is robust to N, and improves as T increases. For cases when $T <= N$, the backfitting estimator is comparable to Arellano-Bond, and provides high predictive performance and low bias for certain parameter settings.

Keywords: multiple time series, panel data, additive models, Arellano-Bond estimator, backfitting, mixed model