

Summary on basic time series studies

tensor data analysis with different data types

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1 α -PCA method

1.1 Overall Summary

This article considers the estimation and inference of the **low rank** components in high-dimensional matrix-variate models (tensor), and we propose an estimation method called α -PCA and it has some benefits with the high dimensions data favorably compared with other methods (Original PCA, etc) based on the performance in the simulation.

1.2 Main model

The model is shown as the following:

$$\mathbf{Y}_t = \mathbf{R}\mathbf{F}_t\mathbf{C}^T + \mathbf{E}_t$$

$\mathbf{Y}_t : \mathbf{Y}_t \in \mathbb{R}^{p \times q}$, $1 \leq t \leq T$, observations

$\mathbf{F}_t : \mathbf{F}_t \in \mathbb{R}^{k \times r}$, where $k \ll p$ and $r \ll q$ (**low rank**), latent matrix

$\mathbf{E}_t : \mathbf{E}_t \in \mathbb{R}^{p \times q}$, noise matrix

1.3 Main Statistics

$$\hat{\mathbf{M}}_R \triangleq \frac{1}{pq} \left((1 + \alpha) \cdot \right)$$

$$\hat{\mathbf{M}}_C \triangleq \frac{1}{pq} \left((1 + \alpha) \cdot \right)$$

$\alpha : \alpha \in [-1, +\infty)$, a hyperparameter

$$\bar{\mathbf{Y}} = \frac{1}{T} \sum_{t=1}^T \mathbf{Y}_t$$

1.4 Theoretical Properties

1.5 Simulation

1.6 Application