

Title: A Comparative Analysis of the Methods of Index Construction in Time Series Data

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Abstract:

Principal Component Analysis is a convenient tool used in aggregating the indicators of sustainable development and providing indices where different weights are assigned to the various indicators. There are, however, problems on the meaning of indices especially if time series data is used. The study explores the feasibility of applying recent approach in principal component analysis of time series using Philippine data. We present here the comparative advantages of SPCA (Sparse Principal Component ANALYSIS) relative to averaging of adequacy/inadequacy index and principal component analysis in index construction from various indicators of sustainable development in the Philippines in terms of usefulness and validity of indices being developed.

The empirical results reveal that SPCA can attain sparse and non-overlapping loadings without losing a large amount of variance explained compared to PCA. Computational complexity of SPCA compared to PCA and averaging of adequacy/inadequacy index can be easily compensated in cases where data is indexed over time and exhibit non-stationarity. Because of the non-overlapping of variables in SPCA components, for the purpose of index construction, indices developed can have clear and mutually exclusive meanings. Even with a more complicated algorithm, reduced dimensions and simpler interpretations of indices justify the advantages of SPCA over PCA index construction.

Keywords: Sparse Principal Component Analysis (SPCA), Principal Component Analysis (PCA), Sustainable Development Indicators, Index Construction