

Automated outlier detection in Singular Spectrum Analysis

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Singular Spectrum Analysis (SSA) is a powerful non-parametric time series technique which is finding wide application in time series analysis. SSA is particularly powerful for time series that exhibit seasonal variation with/without trend components and find application in time series found in market research, economics, meteorology and oceanology, to name but a few. Outliers that might be present in time series can unduly influence model fitting and forecasting results. This paper compares automated outlier identification techniques in SSA by simulating time series from the broad spectrum of time series that SSA can handle. Specific attention is paid to modern robust principal component analysis techniques such as ROBPCA which employs projection pursuit combined with estimation of robust covariance matrices. The latter is employed to outlier maps, which essentially represents multivariate data in a two dimensional plot consisting of projected orthogonal distances plotted against score distances, in order to identify outliers. Promising results are obtained by robust principal component methods and also applying additional convex hull peeling methods to outlier maps. A well-known time series with an additive outlier present is used to illustrate the usefulness of the techniques.

Keywords: Convex hull peeling, outlier maps, projection pursuit, robust principal component analysis