

Transformation and trend–seasonal decomposition

Peter Thomson
Statistics Research Associates Ltd
New Zealand

Abstract

Many time series, particularly monthly economic and official time series, are both non-linear and seasonal. In practice simple power transformations are often used to transform such series to additive linear models and standard seasonal-trend decomposition procedures are then applied for various purposes including seasonal adjustment, trend extraction and forecasting.

This paper considers the effects of seasonal-trend decomposition on transformed time series which are then transformed back to provide seasonal and trend components in the original scale of the data. It is shown that this approach leads to ambiguities in the resulting decomposition which result in systematic biases to these components. These effects are particularly evident when there is significant variation about the trend, due to either or both of the seasonal and irregular components.

A new trend-seasonal decomposition is proposed which is largely free of these biases. Results are illustrated by simulation and with reference to NZ official time series.

This work is joint with Professor Tohru Ozaki, Institute of Statistical Mathematics, Tokyo, Japan.