OUTLIER DETECTION IN TIMESERIES

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INTRODUCTION

THEORETICAL RESULTS

Types of outlier in ARIMA model

We say that x_t folows an ARIMA (p,d,q) model if x_t has the form

$$\phi(B)(1-B)^d X_t = \theta(B) Z_t \tag{1}$$

Where B is backshift operator, Z_t is white noise process, $\phi(B) = 1 - \alpha_1 B - \alpha_2 B^2 ... - \alpha_p B^p$ $\theta(B) = 1 + \beta_1 B + \beta_2 B^2 + ... + \beta_p B^p$, and d is the number of differenced times. It is further assumed the root of $\phi(B)$ and $\theta(B)$ are assumed to be outside unit circle and have no common roots.

Additive outliers (AO)

An additive outlier (AO) correspond to an exogenous change of a single observation of the time series. It is associated with inciden like measurement errors or impulse effect due to external effect. A time series $y_1....y_T$ affected by AO at t=k is given by

$$y_t = x_t + \omega I_t^k \tag{2}$$