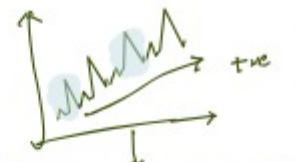
Time series

Data

① trend
② Seasonality } → not stationary



ADF ← non-stationary

KPSS ↓

Stationary

→ seasonal.

p < 0.05 → stationary.

p > 0.05 → non-stationary.

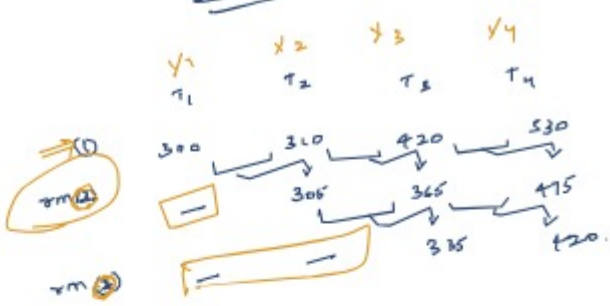
Time series. signal + noise → error/irregularity

signal → trend etc.

① Remove trend

$y(t) = y(t) - y(t-1)$

moving average / Rolling mean.



$\frac{300 + 310}{2}$ =

month → 30 days
year → 12 mm
we → 7 days

Shift(1)

AR model. → auto regressive model

MA model → moving average model.

ARMA model → auto regressive moving avg model.

ARIMA model → auto regressive integrated moving avg

AR model

$y_t = \beta_0 + \beta_1 y_{t-1} + \beta_2 y_{t-2} \cdots + \beta_p y_{t-p} + \varepsilon_t$

β_0 ↑ constant. past value. ε_t ↓ error.

MA model

$y_t = \theta_0 + \theta_1 \varepsilon_{t-1} + \cdots + \theta_q \varepsilon_{t-q}$

θ_0 → constant. ε_{t-1} ↓ error

ARMA

$y_t = \beta_0 + \beta_1 y_{t-1} \cdots \beta_p y_{t-p} + \varepsilon_t + \theta \varepsilon_{t-1} \cdots + \theta_q \varepsilon_{t-q}$

ARMA(data, order = (0,1))

AR 0 | MA 1

ARIMA p d q

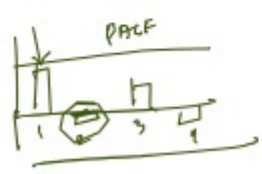
d = 0 → ARMA

d = 1 → ARI

MA = 1/2

ACF → MA

PACF → AR



AR = 1