# QDA 2023 03 30

## ARIMA models – AR(p)

$$X_t = \xi + \phi_1 X_{t-1} + \phi_2 X_{t-2} + \dots + \phi_p X_{t-p} + \varepsilon_t$$

$$\varepsilon_t \overset{iid}{\sim} N(0, \sigma_\varepsilon^2)$$

STATIONARITY (weak) .... moments up to d order are constant with time

↳ $E(X_t) = \mu_t = \mu$ $\quad E(\xi) = \xi$ $\quad E(\varepsilon_t) = 0$

$$\mu = E(X_t) = E(\xi + \phi_1 X_{t-1} + \dots + \varepsilon_t) = \xi + \phi_1 \mu + \dots + \phi_p \mu$$

$$\mu - \phi_1 \mu - \dots - \phi_p \mu = \xi$$

$$\Rightarrow \xi = \mu\left(1 - \sum_{i=1}^{p} \phi_i\right) \rightsquigarrow \mu = \xi / \left[\mu\left(1 - \sum \phi_i\right)\right]$$