$\gamma(h) = \operatorname{cov}(X_t, X_{t+h})$, $\{X_t\}_{t \in \mathbb{Z}}$

$\rho(h) = \dfrac{\gamma(h)}{\gamma(0)}$, ACF

PACF

$\{X_1, X_2, \ldots, X_n\}$ muestra

$\hat{\rho}(h) = \dfrac{\hat{\gamma}(h)}{\hat{\gamma}(0)}$ — version empirica

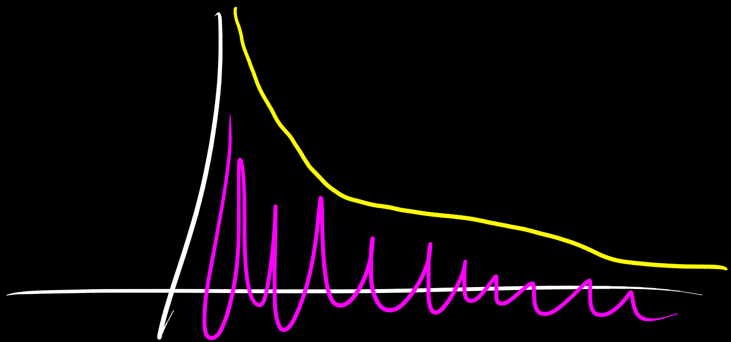
- Corroborar de manera grafica si un ST es estacionaria
-

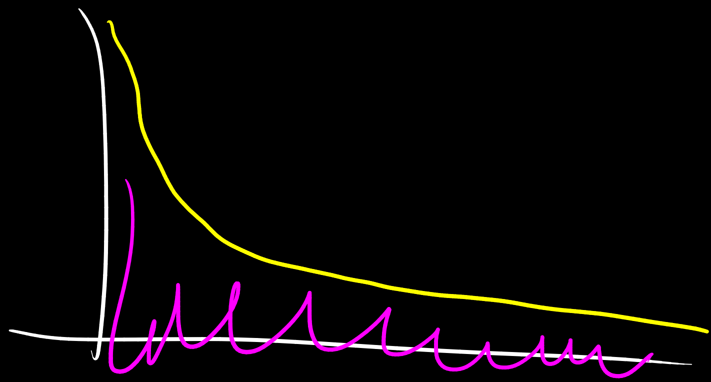
$\{X_t\}_{t \in \mathbb{Z}}$, $\boxed{X_t = \xi_t}$, $\xi_t \sim WN(0,1)$

- Normal
- T

White Noise

ACF (Para ST Estacionarias) PACF





$ARIMA(p, d, q)$

AR(p): Autoregressive
Autoregresivos

I(d): Integrated (Integrado)

MA(q): - Moving Average
- Medias Moviles

AR(P)

, $\{Z_t\}$, $t \in \mathbb{Z}$, $\varepsilon_t \sim NW(0,1)$

$$Z_t = a_1 Z_{t-1} + a_2 Z_{t-2} + \cdots\cdots + a_p Z_{t-p} + \varepsilon_t$$

$$= \sum_{i=1}^{p} a_i Z_{t-i} + \varepsilon_t$$

$|\phi| < 1$

$$Z_t = \phi Z_{t-1} + \varepsilon_t$$

AR(1)

$\phi = 1$

Caminante aleatorio

MA(q)

,

$$Z_t = b_1 \varepsilon_{t-1} + b_2 \varepsilon_{t-2} + \cdots\cdots + b_q \varepsilon_{t-q} + \varepsilon_t$$

$$= \sum_{i=1}^{q} b_i \varepsilon_{t-i} + \varepsilon_t$$

Usando el operador Lag ($\underline{L}$), $\{x_t\}_{t\in\mathbb{Z}}$

$$L x_t = x_{t-1},$$

$$L^2 x_t = L(L x_t) = L x_{t-1} = x_{t-2}$$

$$\vdots$$

$$L^j x_t = x_{t-j}$$

$$\underline{L(\mathcal{H})}$$

(Analisis Funcional)

$$AR(p): \quad Z_t = \sum_{i=1}^{p} a_i L^i Z_t + \varepsilon_t$$

$$MA(q): \quad Z_t = \sum_{i=1}^{q} b_i L^i \varepsilon_t + \varepsilon_t$$

$$AR(P): \quad Z_t - \sum_{i=1}^{p} a_i L^i Z_t = \underbrace{\left(1 - \sum_{i=1}^{p} a_i L^i\right)}_{P(L)} (Z_t) = \varepsilon_t$$

$$P(L) Z_t = \varepsilon_t$$

$$MA(P): \quad Z_t = \sum_{i=1}^{q} b_i L^i \varepsilon_t + \varepsilon_t = \underbrace{\left(\sum_{i=1}^{q} b_i L^i + 1\right)}_{Q(L)} \varepsilon_t$$

$$Z_t = Q(L) \varepsilon_t$$

$$P(x) = \left(1 - \sum_{i=1}^{p} a_i x^i\right), \quad P(L)$$

$$Q(x) = \left(\sum_{i=1}^{q} b_i x^i + 1\right), \quad Q(L)$$

$\left.\begin{matrix} P(L) \\ Q(L) \end{matrix}\right\}$ Polinomios caracteristicos de los Modelos

$$ARMA(p,q): \quad P(L)Z_t = Q(L)\xi_t$$

$$ARIMA(p,d,q): \quad (1-L)Z_t = w_t$$

$$Z_t = Z_{t-1} + w_t$$

Caminante aleatorio

(Cantidad de Raices Unitarias)

$$\underbrace{P(L)}_{AR(p)}\underbrace{(1-L)^d}_{\text{Integrada}(d)} Z_t = \underbrace{Q(L)}_{MA(q)}\xi_t$$

{Movimiento Browniano

Proceso de Wiener}

Proceso	ACF	PACF
AR(p)	Decae exp.	Se corta después de h=p
MA(q)	Se corta en h=q	Decae exp.
ARMA(p,q)	Decae exp	Deca exp.
ARIMA		

"Decae exp" — Esta oculto un proces AR(∞) o MA(∞)

- OLS
- ML

SARIMAX