

CH10. 계절형 ARMA모형

계절형 모형

- 계절형 시계열이 결정적이고 서로 독립적인 성분들로 구성된 경우
 - 삼각함수 또는 지시함수를 이용한 회귀모형 또는 지수평활법, 분해법 등
 - $Z_t = T_t + S_t + C_t + I_t$
- 계절형 시계열이 확률적이거나 서로 상관관계가 있는 경우
 - 확률적인 분석방법인 ARIMA모형을 이용한 분석을 시행
 - 예) 주기가 s 인 계절형 시계열 고려 : $Z_t = S_t + N_t$ (*)

N_t : 비계절적인 성분, S_t : 계절성분

계절형 모형

■ ARMA 오차를 갖는 회귀모형 적합

- 주기가 s 인 결정적인 계절성분
- $S_t = \beta_0 + \beta_1 \sin\left(\frac{2\pi t}{s}\right) + \beta_2 \cos\left(\frac{2\pi t}{s}\right)$
- N_t 기 정상 ARMA(p,q) 모형을 따른다고 하면 (*)는

$$Z_t = S_t + N_t = \beta_0 + \beta_1 \sin\left(\frac{2\pi t}{s}\right) + \beta_2 \cos\left(\frac{2\pi t}{s}\right) + N_t$$

$$\phi(B)N_t = \theta(B)\varepsilon_t$$

계절형 ARIMA 모형

■ 승법계절모형

$$\phi(B)\Phi(B^s)(1 - B^s)^D(1 - B)^d Z_t = \delta^* + \theta(B)\Theta(B^s)\varepsilon_t$$

- multiplicative seasonal ARIMA model
- $ARIMA(p, d, q)(P, D, Q)_s$
- $\Phi(B^s) = (1 - \Phi_1 B^s - \Phi_2 B^{2s} - \dots - \Phi_P B^{Ps})$
- $\Theta(B^s) = (1 - \Theta_1 B^s - \Theta_2 B^{2s} - \dots - \Theta_Q B^{Qs})$

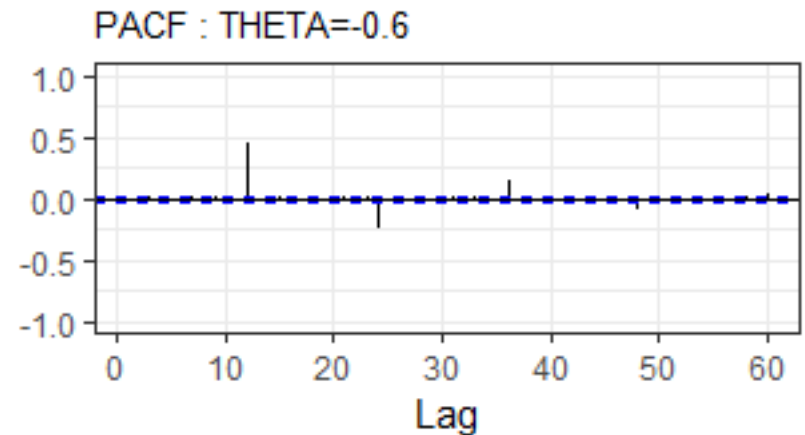
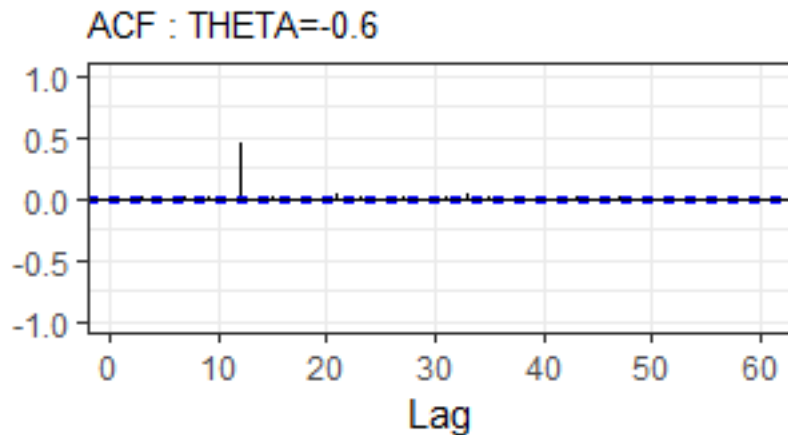
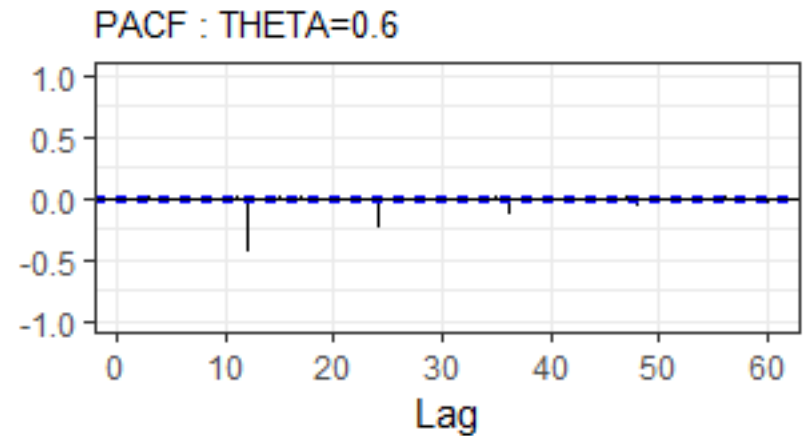
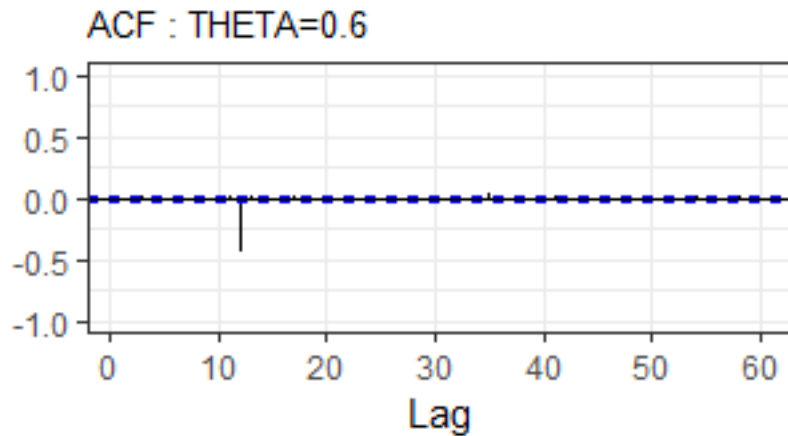
■ 비승법계절모형

$$\phi^*(B)(1 - B^s)^D(1 - B)^d Z_t = \delta^* + \theta^*(B)\varepsilon_t$$

- non multiplicative seasonal ARIMA model

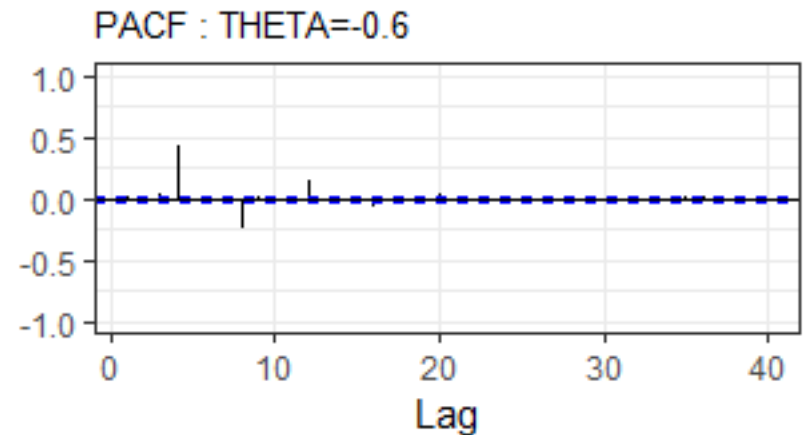
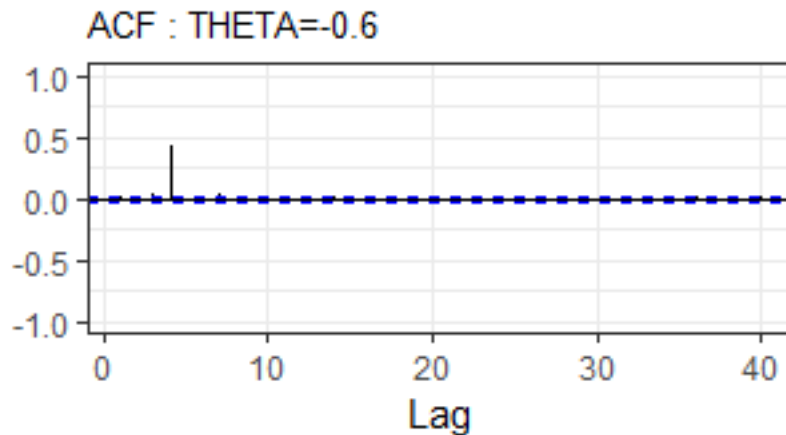
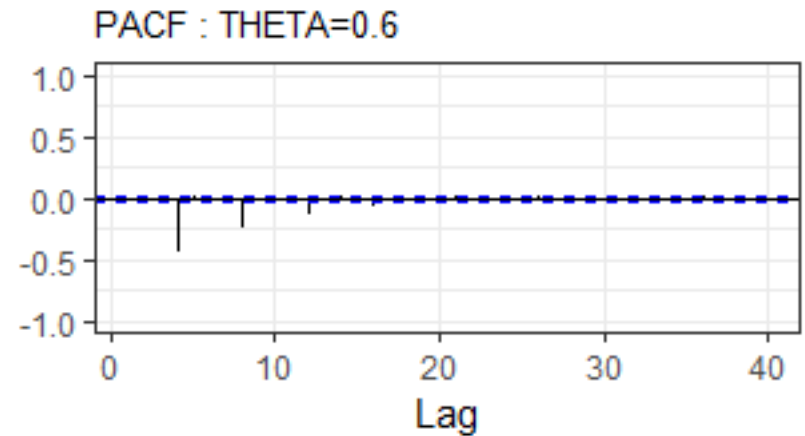
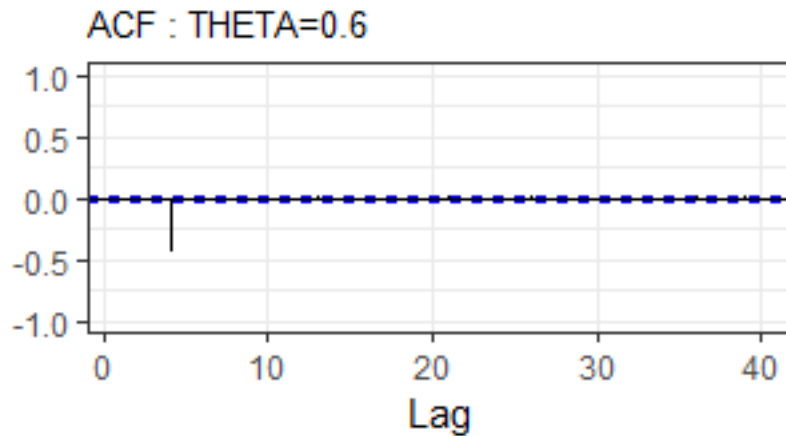
계절형 ARIMA 모형

- 상수항이 없는 $ARIMA(0, 0, 0)(0, 0, 1)_{12}$: SMA(1)



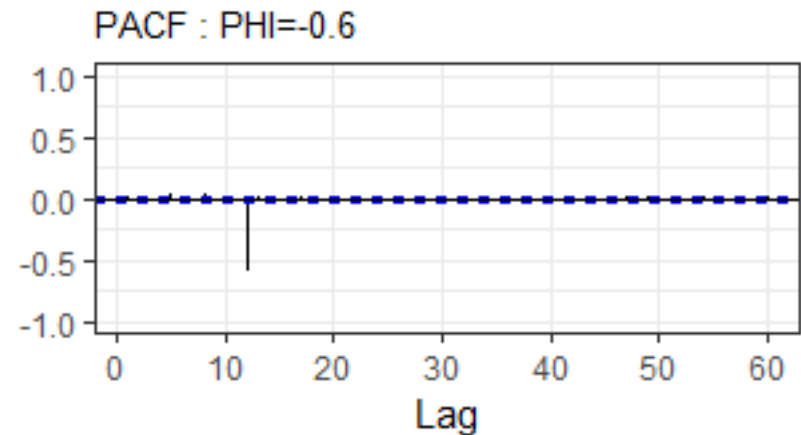
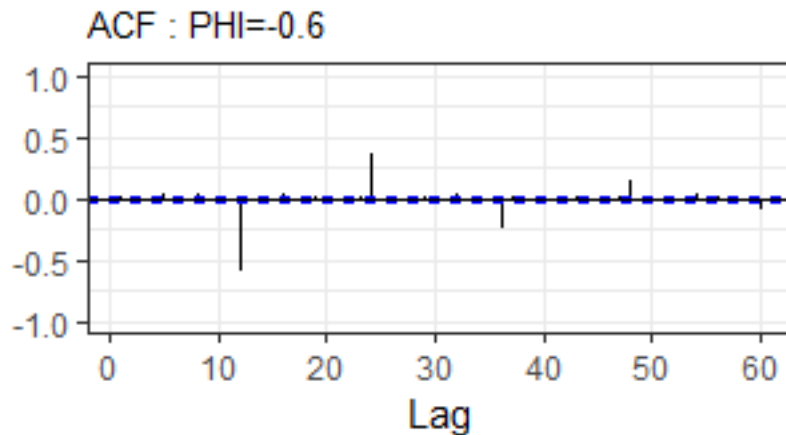
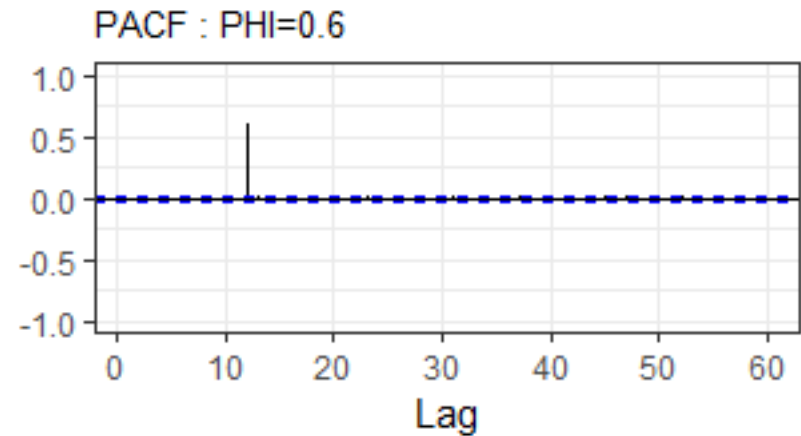
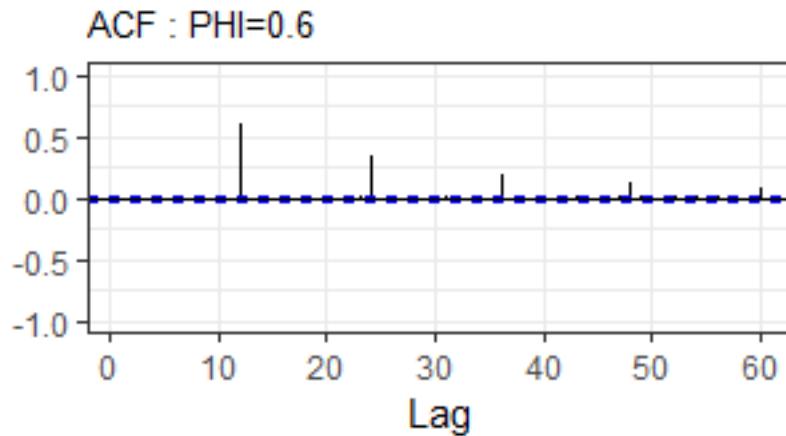
계절형 ARIMA 모형

- 상수항이 없는 $ARIMA(0, 0, 0)(0, 0, 1)_4$: SMA(1)



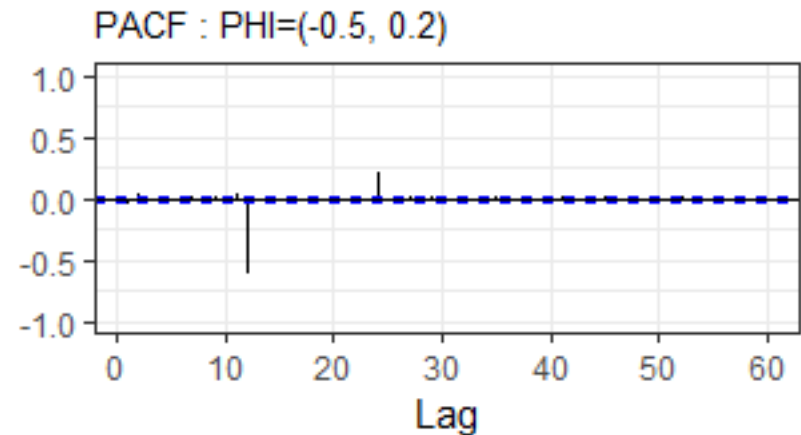
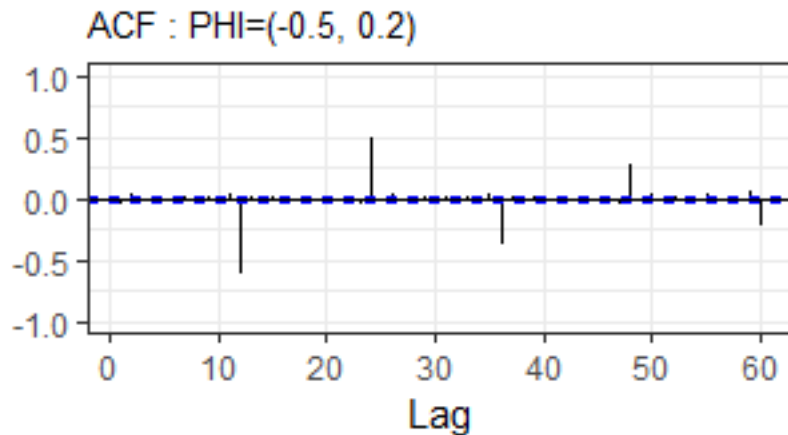
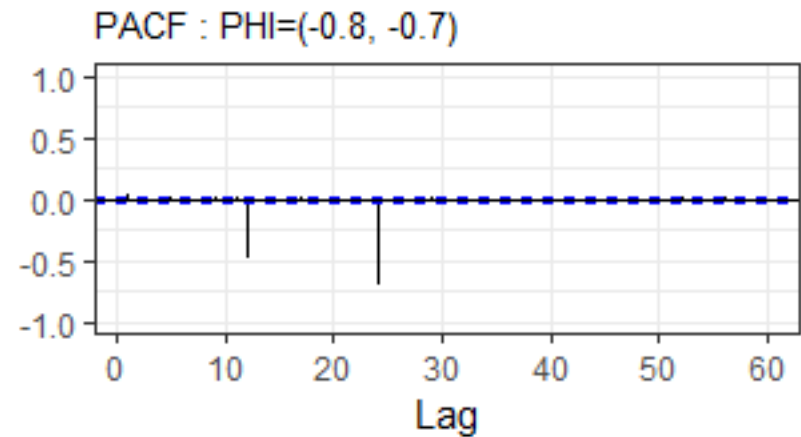
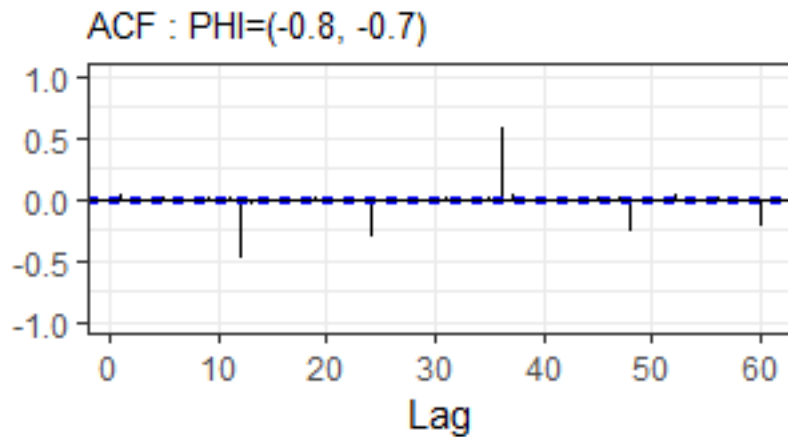
계절형 ARIMA 모형

- 상수항이 없는 $ARIMA(0, 0, 0)(1, 0, 0)_{12}$: SAR(1)



계절형 ARIMA 모형

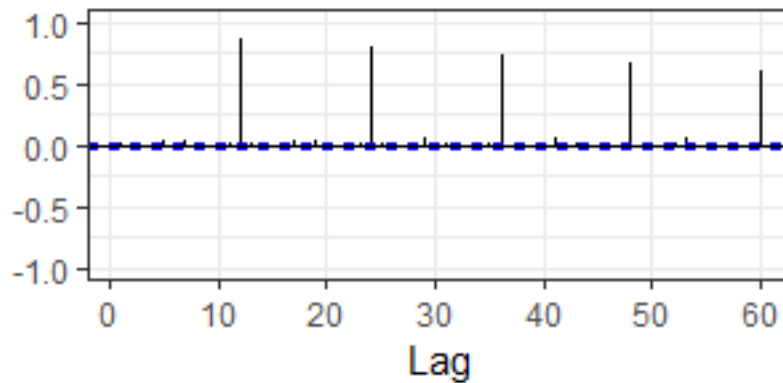
- 상수항이 없는 $ARIMA(0, 0, 0)(2, 0, 0)_{12}$: SAR(2)



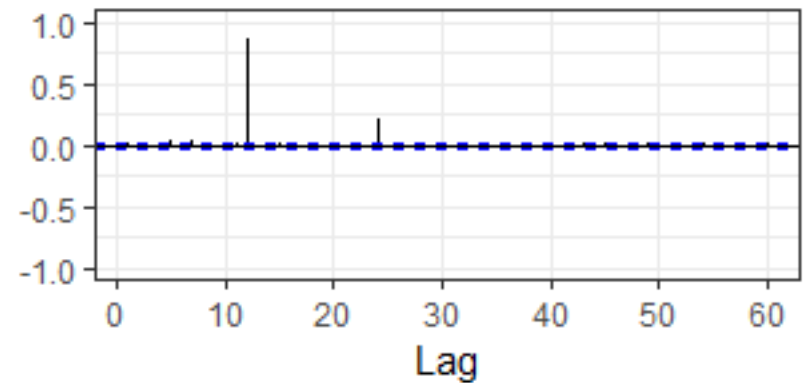
계절형 ARIMA 모형

- 상수항이 없는 $ARIMA(0, 0, 0)(2, 0, 0)_{12}$: SAR(2)

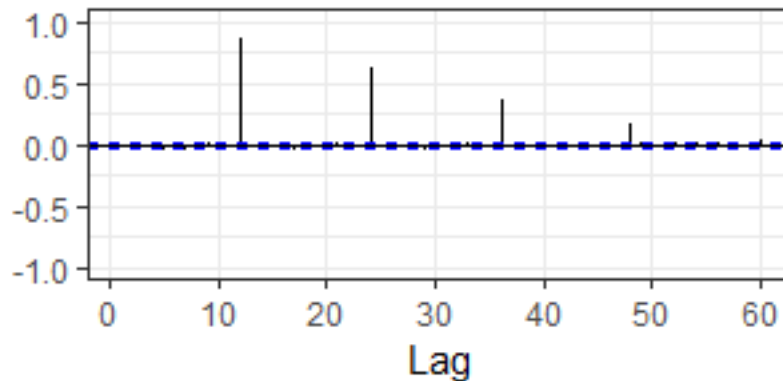
ACF : PHI=(0.7,0.2)



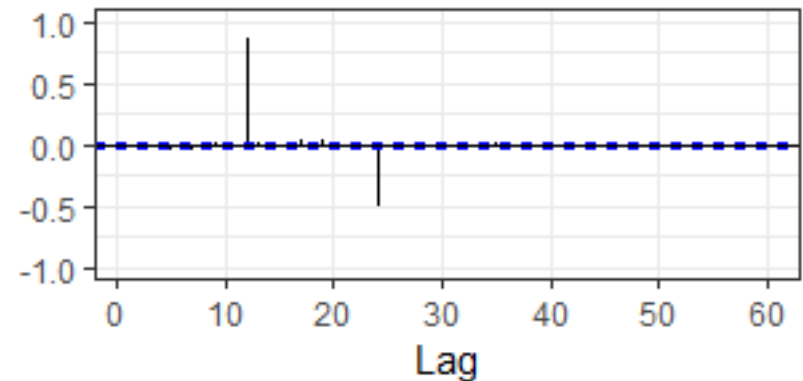
PACF : PHI=(0.7,0.2)



ACF : PHI=(1.3,-0.5)

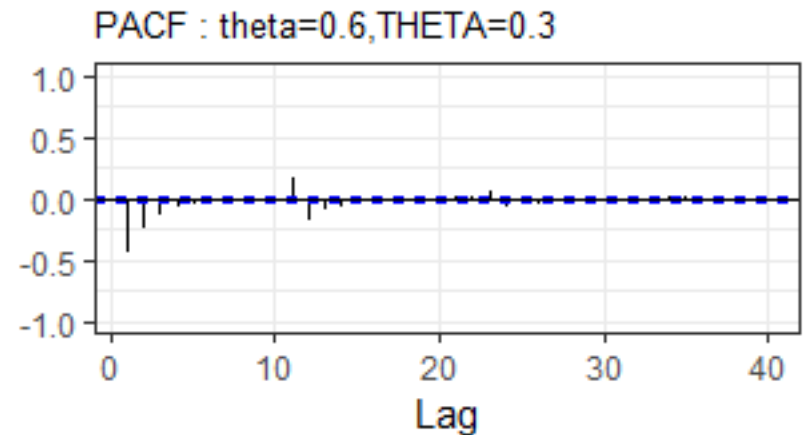
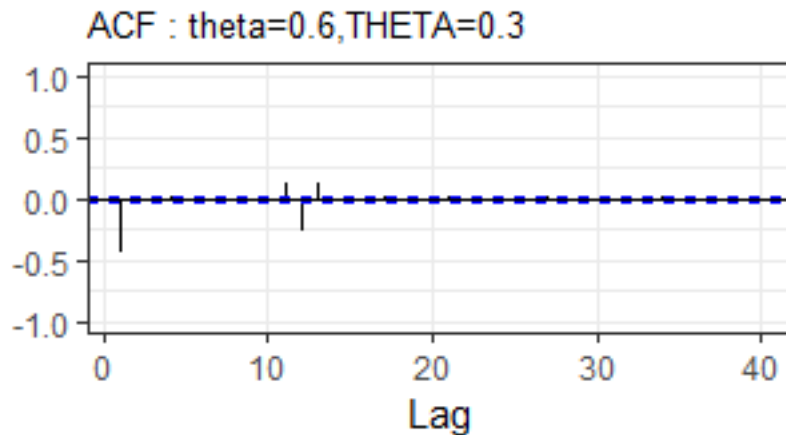
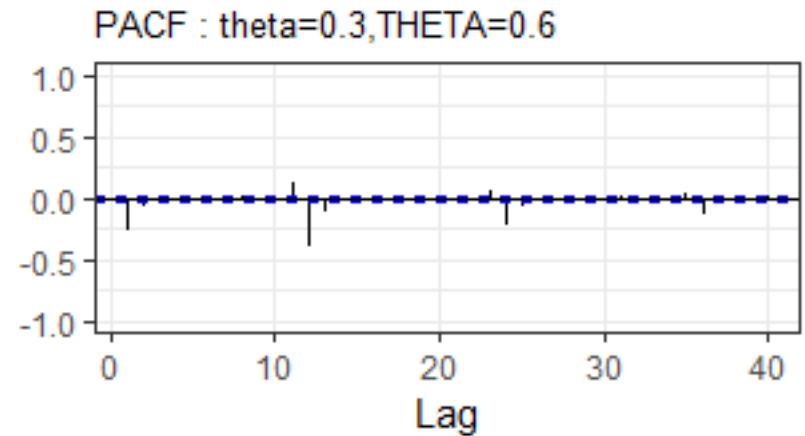
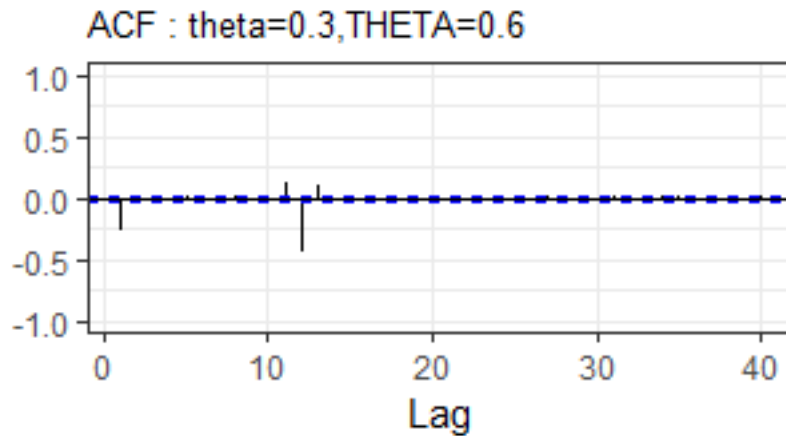


PACF : PHI=(1.3,-0.5)



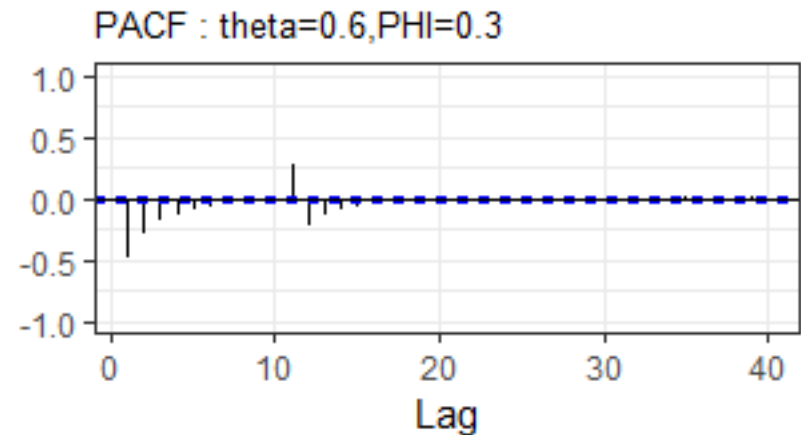
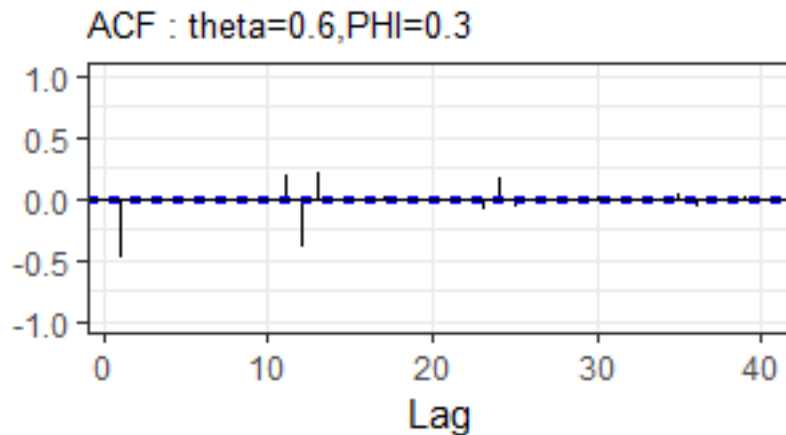
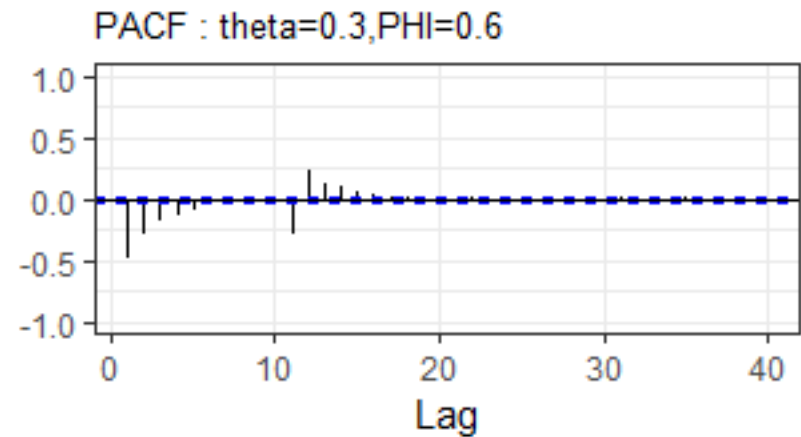
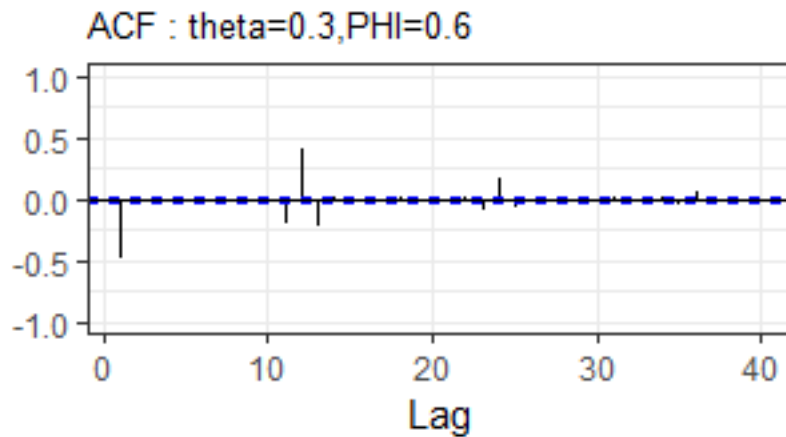
계절형 ARIMA 모형

- 상수항이 없는 $ARIMA(0, 0, 1)(0, 0, 1)_{12}$



계절형 ARIMA 모형

- 상수항이 없는 $ARIMA(0, 0, 1)(1, 0, 0)_{12}$



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