

Q7

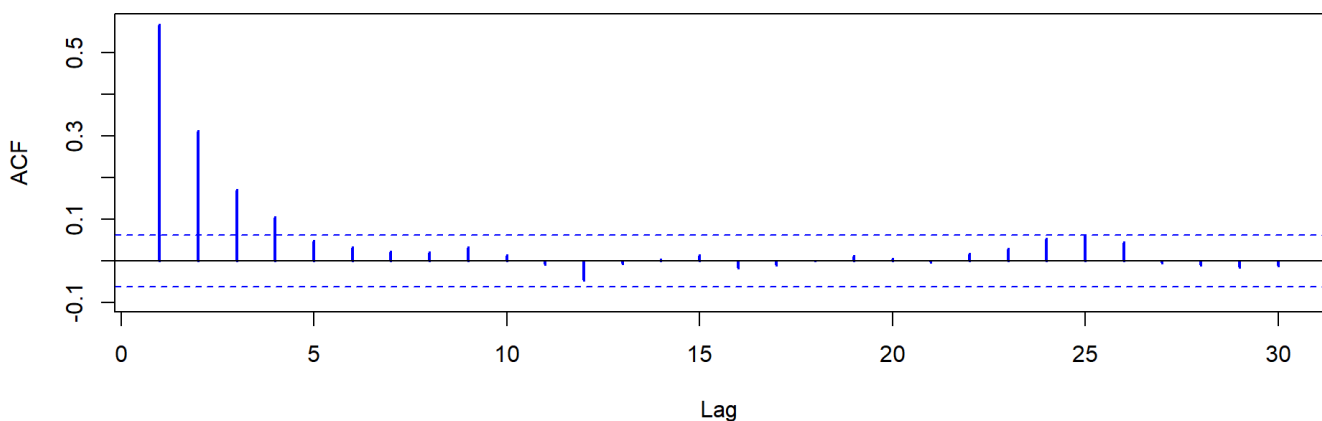
ACF/PACF for AR(1), MA(1), and ARMA(1,1)

```
p <- 0.6
t <- 0.9
n <- 1000
set.seed(123)
d1 <- arima.sim(model=list(ar=p), n=n)
d2 <- arima.sim(model=list(ma=t), n=n)
d3 <- arima.sim(model=list(ar=p, ma=t), n=n)
```

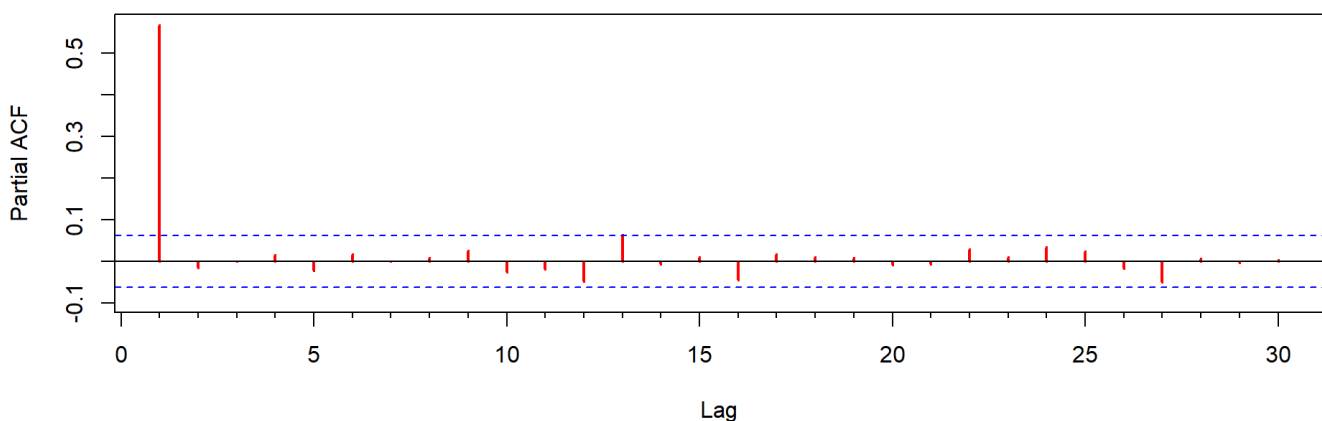
ACF and PACF for AR(1) Model

```
par(mfrow=c(2, 1))
Acf(d1, main="ACF for AR(1)", col='blue', lwd=2)
Pacf(d1, main="PACF for AR(1)", col='red', lwd=2)
```

ACF for AR(1)



PACF for AR(1)



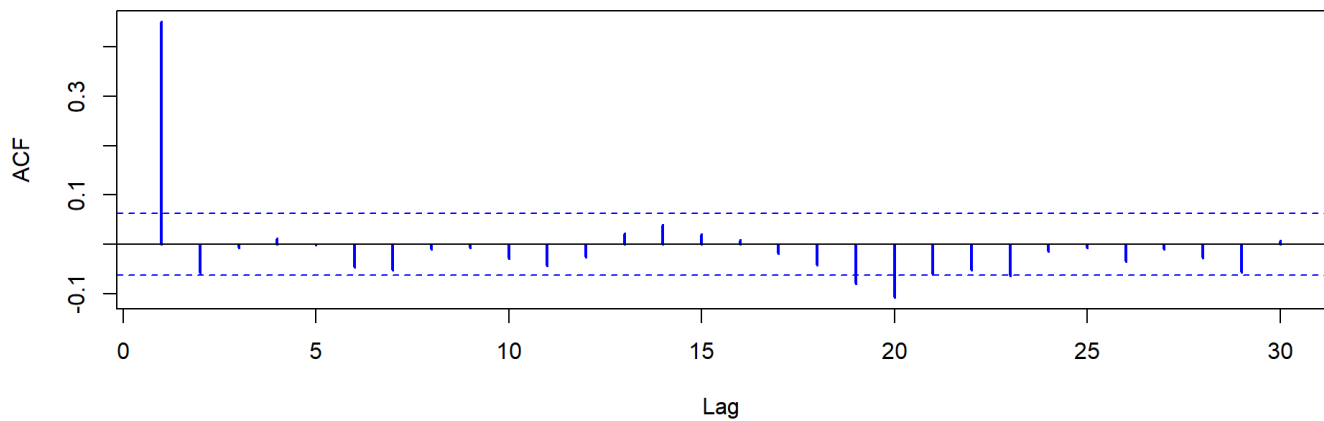
AR(1) Model: - ACF: gradual decay: $h_0(k) = \phi^k$ ($\phi = 0.6$). implies current value depend on past values.

- PACF: spike at lag 1: $\phi(k) = 1$ if $k = 1$; $\phi(k) = 0$ if $k > 1$. this shows first lag has strong impact.

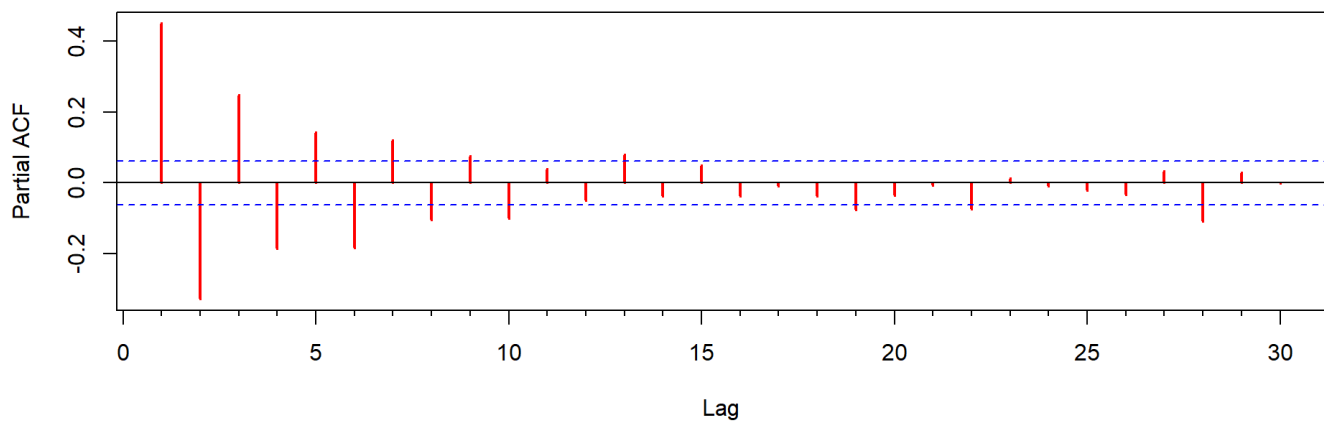
ACF and PACF for MA(1) Model

```
par(mfrow=c(2, 1))
Acf(d2, main="ACF for MA(1)", col='blue', lwd=2)
Pacf(d2, main="PACF for MA(1)", col='red', lwd=2)
```

ACF for MA(1)



PACF for MA(1)



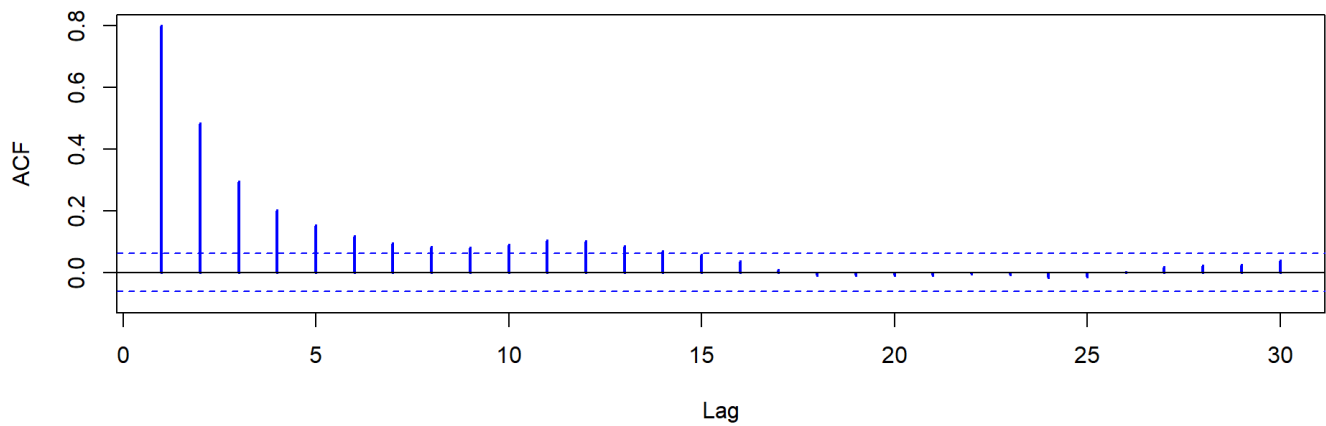
MA(1) Model: - ACF: Sharp spike at lag 1: $\rho(k) = \theta$ if $k = 1$; $\rho(k) = 0$ if $k > 1$. strong short term dependence.

- PACF: Gradual decay implies multiple past errors influence current values.

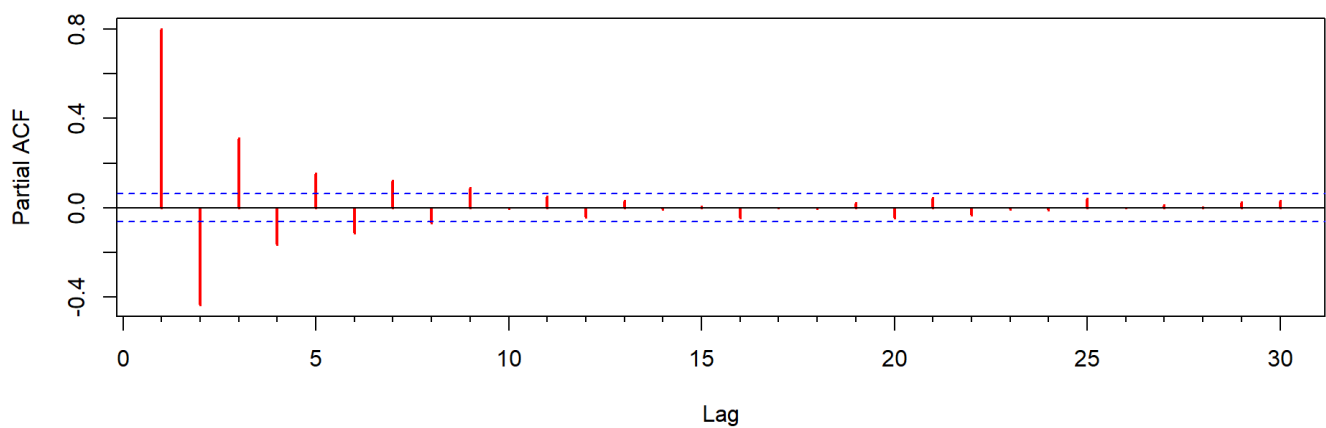
ACF and PACF for ARMA(1,1) Model

```
par(mfrow=c(2, 1))
Acf(d3, main="ACF for ARMA(1,1)", col='blue', lwd=2)
Pacf(d3, main="PACF for ARMA(1,1)", col='red', lwd=2)
```

ACF for ARMA(1,1)



PACF for ARMA(1,1)



ARMA(1,1) Model: - ACF: Mixed behavior, may show a decay pattern from both AR and MA components.

- PACF: Significant spike at lag 1 with gradual decay: $\phi(k) = 1$ if $k = 1$; else decay for $k > 1$. implies both AR and MA have impact.

Observations

- Cut-off Patterns: Sharp cut-offs in PACF suggests AR; cut-offs in ACF suggests MA.
- Decay Patterns: Gradual decay in ACF suggests AR; similar decay in PACF suggests MA.