Assignment 7

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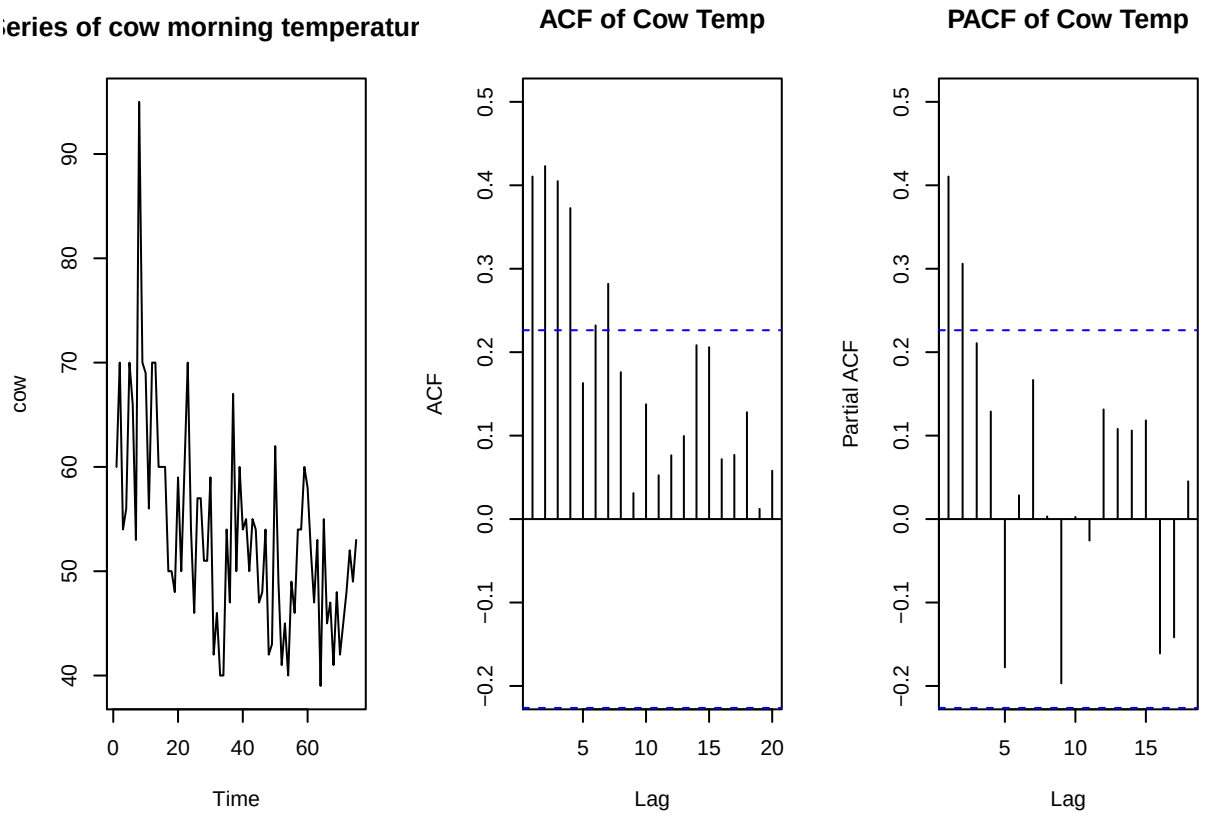
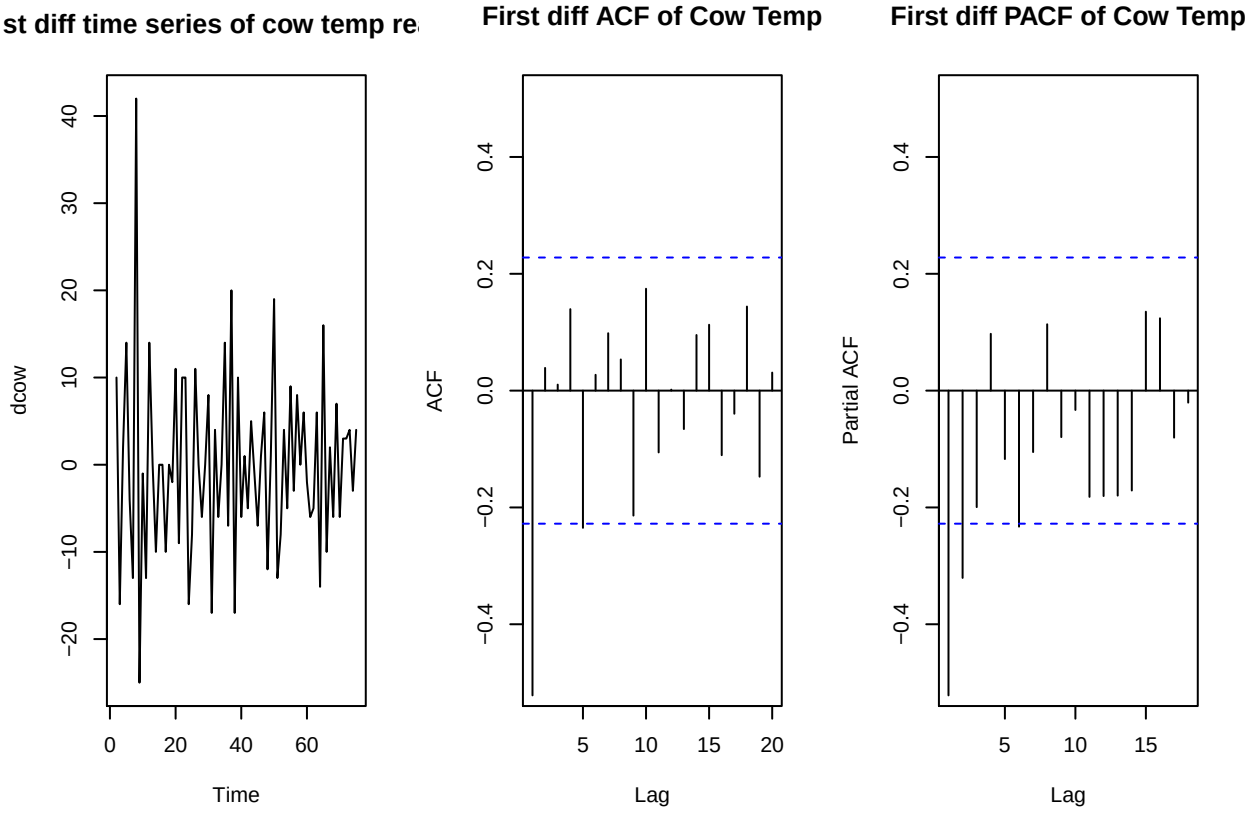
2.

a.

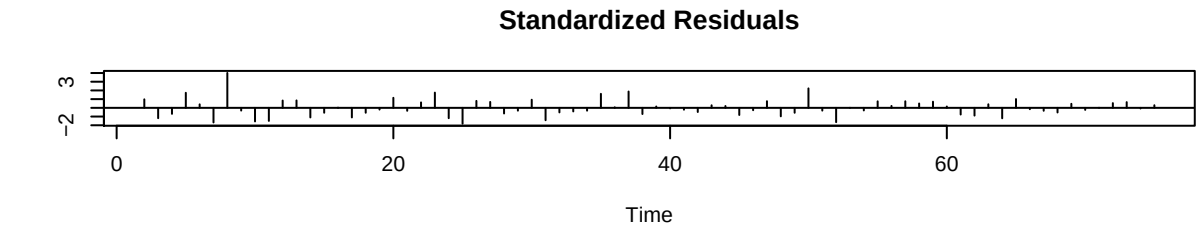
```
source('sarima.R')

cow_temp <- scan("cow.dat")
cow <- ts(cow_temp)

par(mfrow=c(1,3))
plot(cow, main="Time Series of cow morning temperature readings")
acf(cow, 20, xlim=c(1,20), ylim=c(-0.2,0.5),  main="ACF of Cow Temp")
pacf(cow, ylim=c(-0.2,0.5), main="PACF of Cow Temp")
```

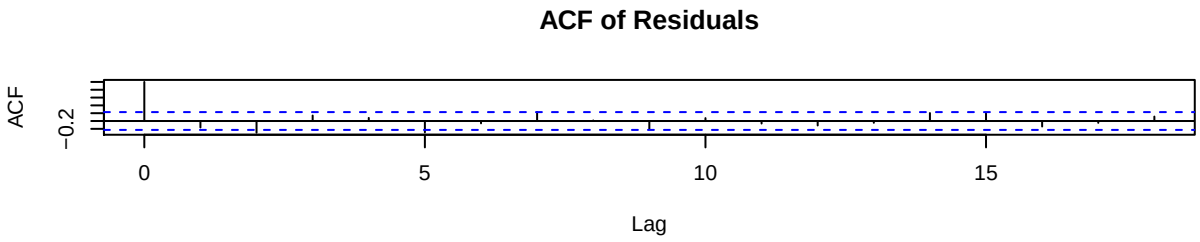


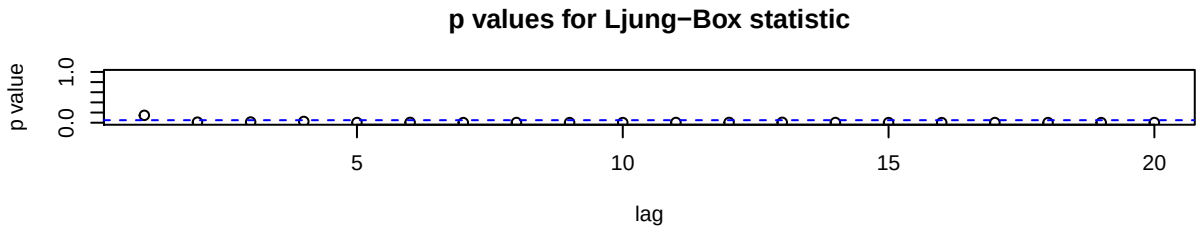
```
dcow <- diff(cow)
par(mfrow=c(1,3))
plot(dcow, main="First diff time series of cow temp readings")
acf(dcow, 20, xlim=c(1,20), ylim=c(-0.5,0.5),  main="First diff ACF of Cow Temp")
pacf(dcow, ylim=c(-0.5,0.5), main="First diff PACF of Cow Temp")
```



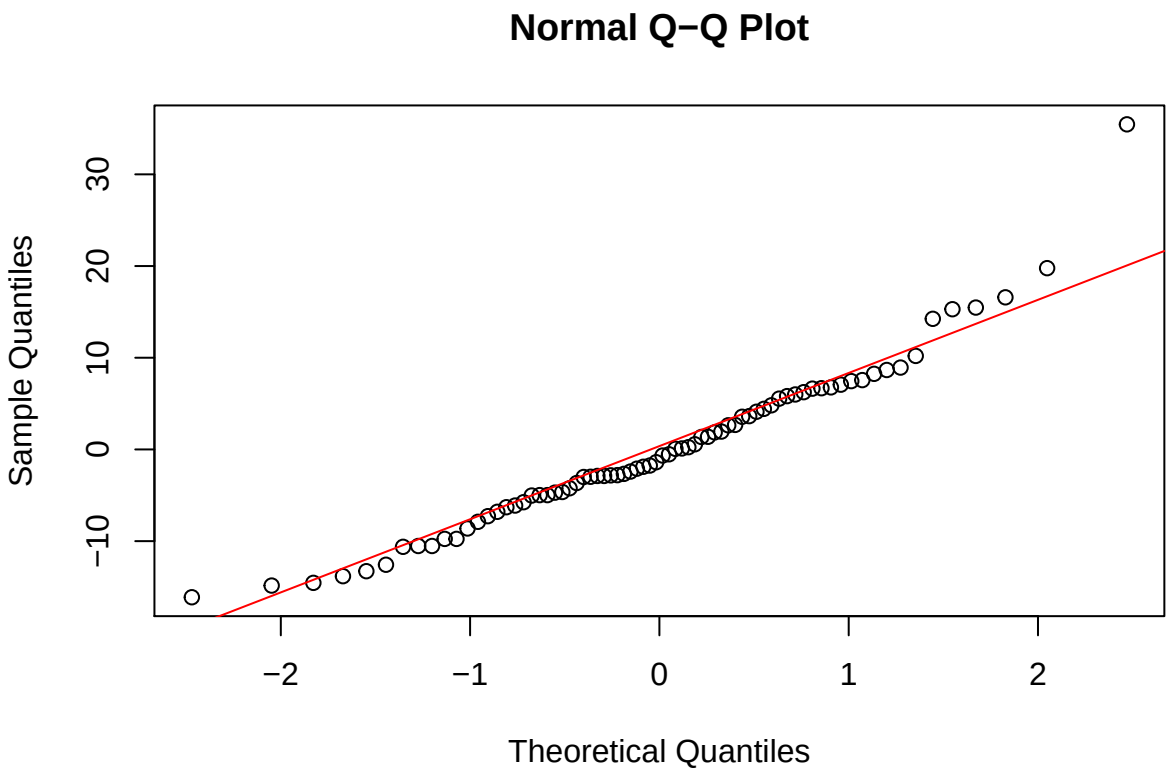

```
fit1<-sarima(dcow, 1,0,0)
```








```
par(mfrow=c(1,1))
qqnorm((fit1$fit)$resid)
qqline((fit1$fit)$resid, col="red")
```

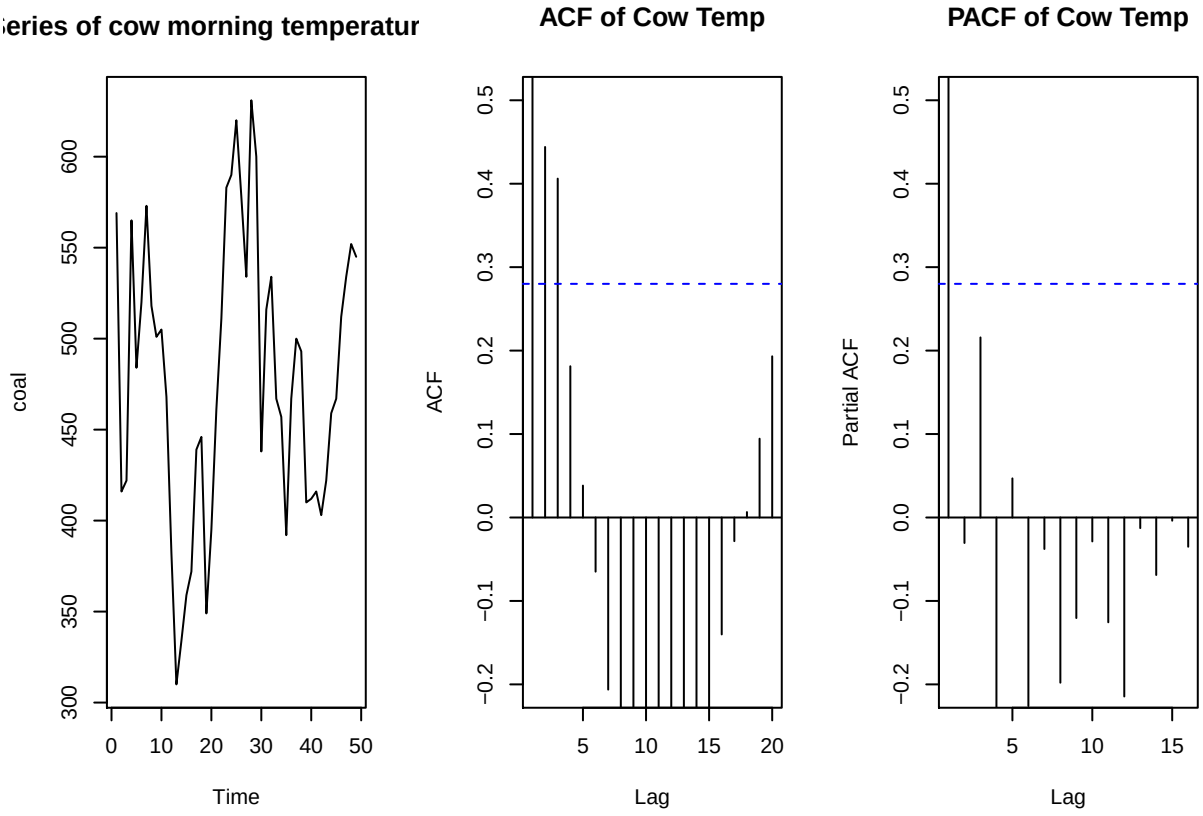


The time series was not stationary from the start, but a differenced plot looks close to stationary. An AR(1) models seem to fit this data well. The p-values are constant, and no longer show a pattern. The Q-Q plot also seems mostly normal aside from one outlier. In the other models the tails were curved.

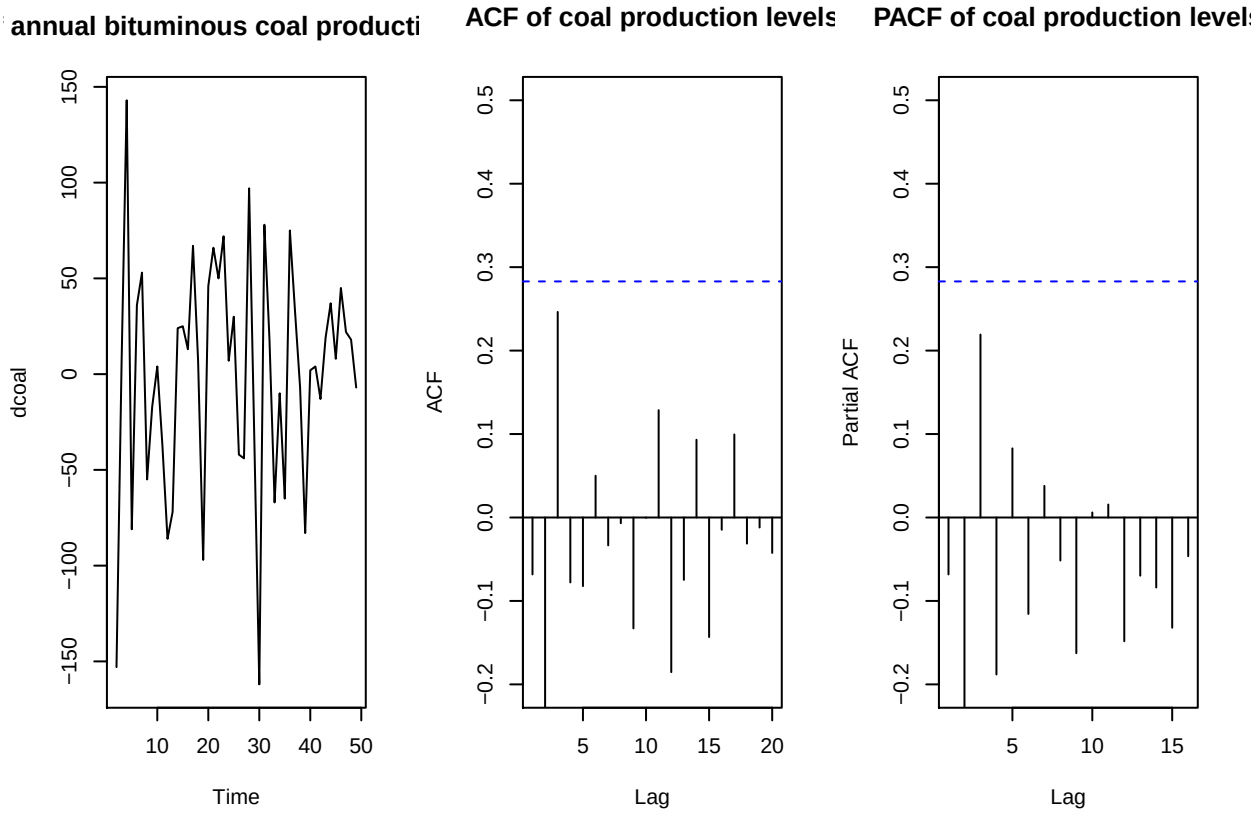
2.

b.

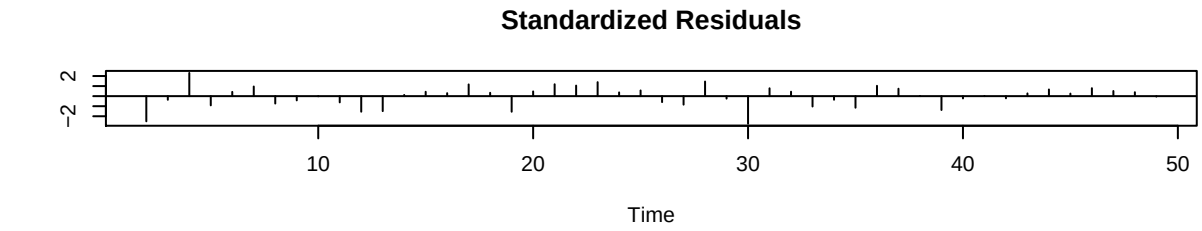
```
bicoal <- scan("bicoal.dat")
coal <- ts(bicoal)

par(mfrow=c(1,3))
plot(coal, main="Time Series of cow morning temperature readings")
acf(coal, 20, xlim=c(1,20), ylim=c(-0.2,0.5),  main="ACF of Cow Temp")
pacf(coal, ylim=c(-0.2,0.5), main="PACF of Cow Temp")
```

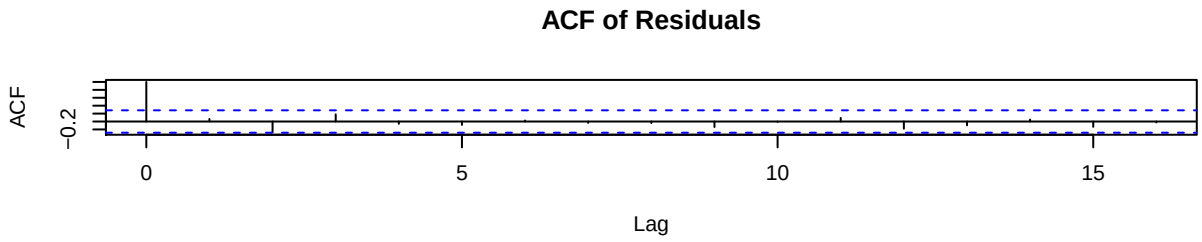


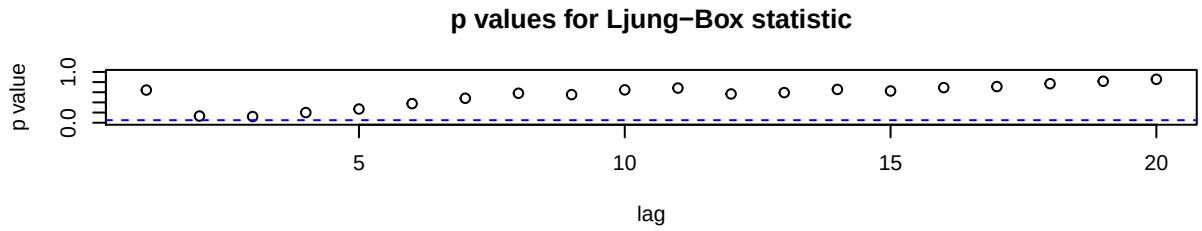

```
dcoal <- diff(coal)
par(mfrow=c(1,3))
plot(dcoal, main="TS of annual bituminous coal production levels")
acf(dcoal, 20, xlim=c(1,20), ylim=c(-0.2,0.5),  main="ACF of coal production levels")
pacf(dcoal, ylim=c(-0.2,0.5), main="PACF of coal production levels")
```



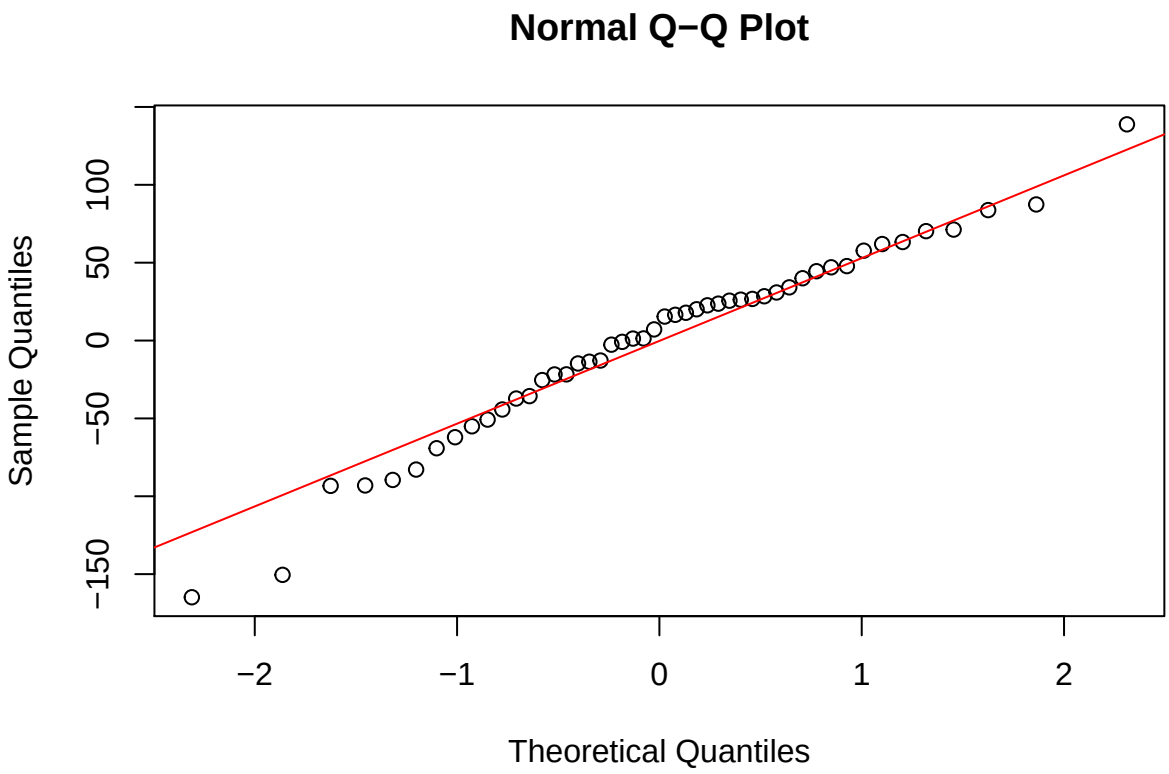

```
fit2<-sarima(dcoal, 0,0,1)
```








```
par(mfrow=c(1,1))
qqnorm((fit2$fit)$resid)
qqline((fit2$fit)$resid, col="red")
```



An MA(1) model was the best I could find, though none of the models I tried fit this data well. There is still a trend in the data, but the Q-Q plot is mostly normal. The data was differenced again since the initial time series was not stationary. It may be needed to take a second difference of this data.