PSTAT 174 Lab Assignment 7

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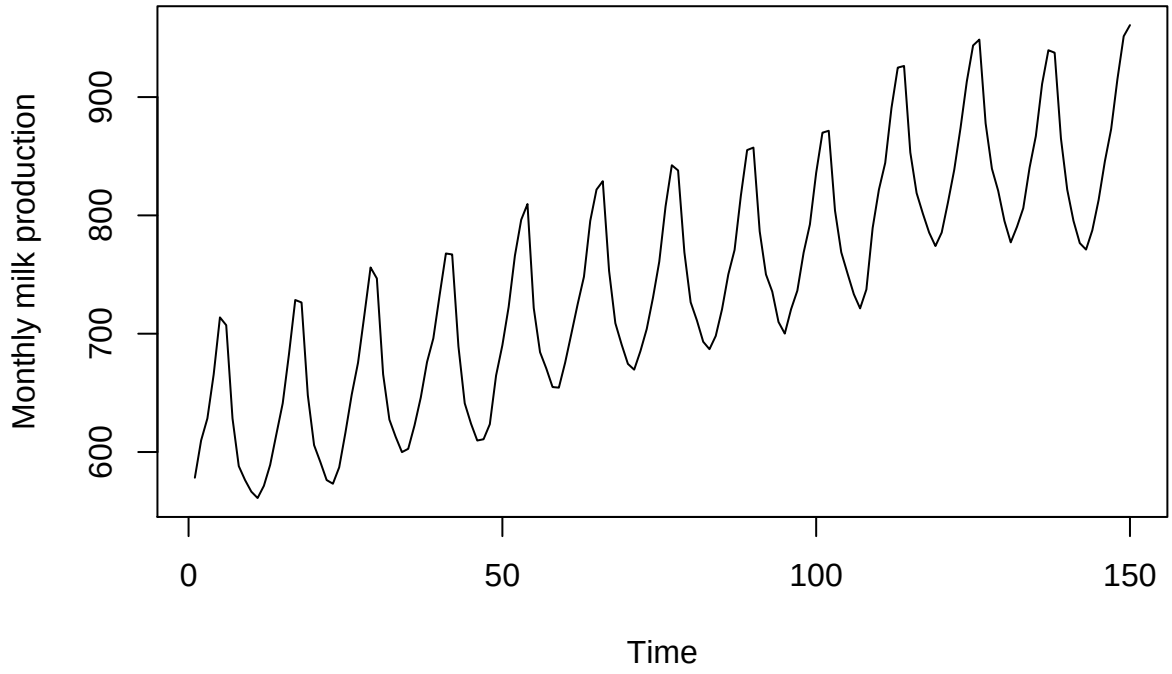
```
library(tsdl)
milk <- subset(tsdl, 12, "Agriculture")[[3]]
# training set: model building, testing set: prediction verification/Comparison
train <- milk[1:150]
test <- milk[151:156]
ts.plot(train, ylab = "Monthly milk production")
```

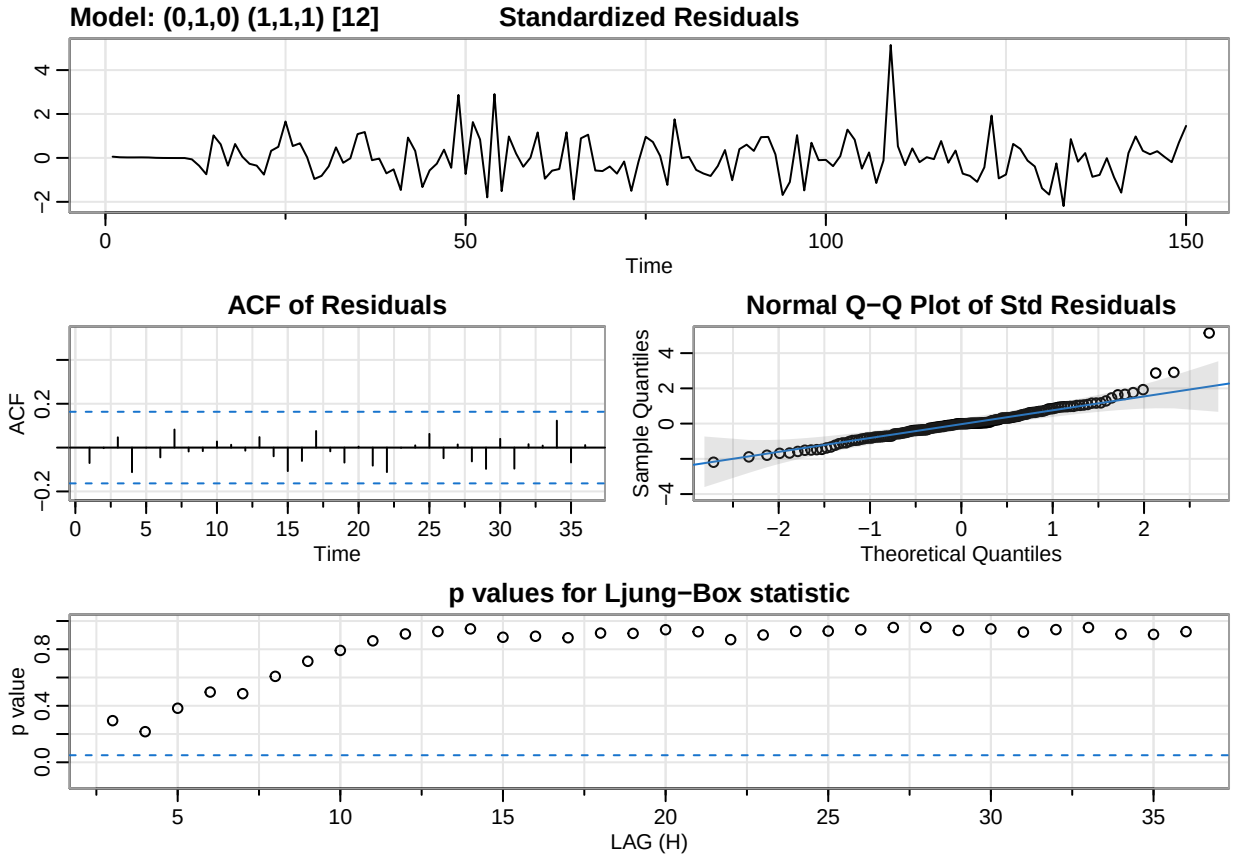



```
#Make stationary:
#Diff at 12 to remove sesonality
dmilk <- diff(train, 12)
#Diff at 1 to remove upward trend
ddmilk <- diff(dmilk, 1)

#SARIMA (0, 1, 0) × (1, 1, 1)12
library(astsa)
fit.i <- sarima(xdata=train, p=0, d=1, q=0, P=1, D=1, Q=1, S=12)
```

```
## initial  value 1.989465
## iter   2 value 1.850408
## iter   3 value 1.824156
## iter   4 value 1.800049
## iter   5 value 1.791131
## iter   6 value 1.789958
## iter   7 value 1.789636
## iter   8 value 1.789235
## iter   9 value 1.789186
## iter  10 value 1.789182
## iter  10 value 1.789182
## iter  10 value 1.789182
```

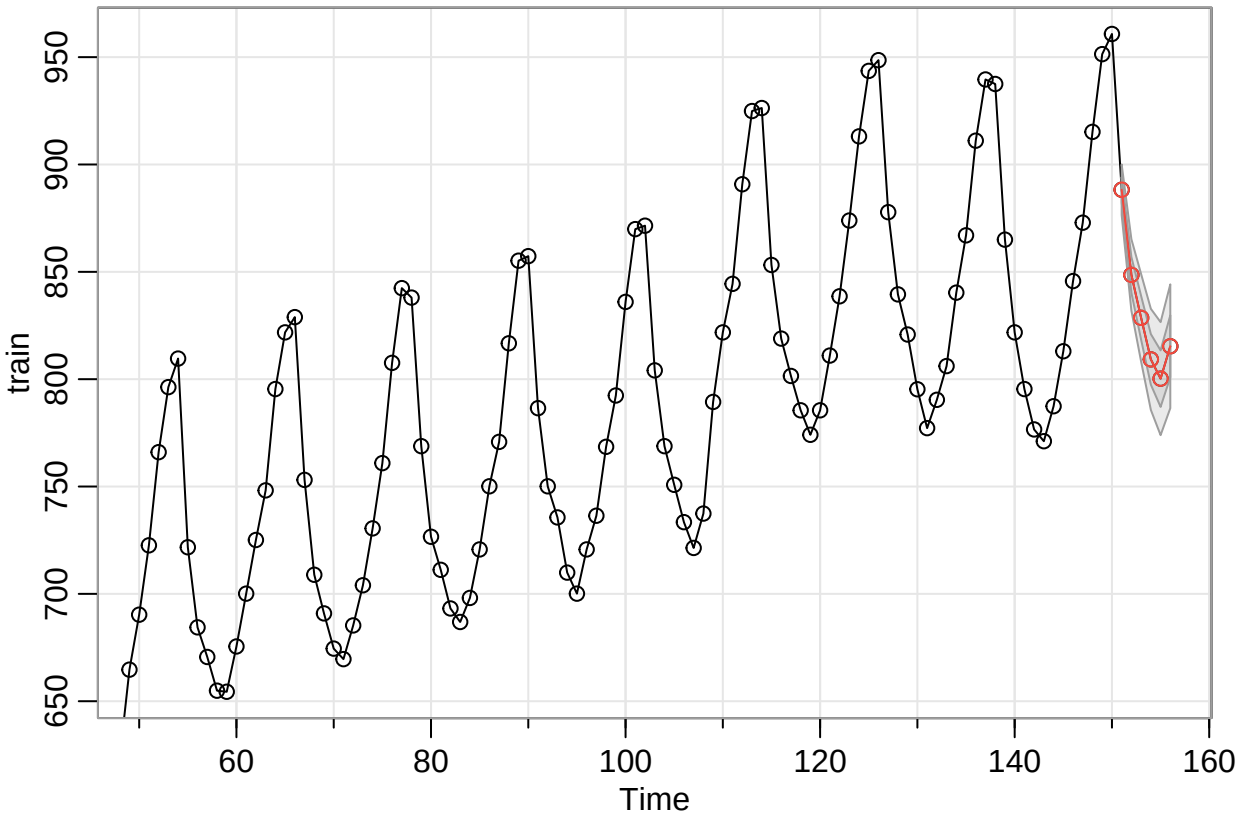
```
## final  value 1.789182
## converged
## initial  value 1.803940
## iter   2 value 1.803675
## iter   3 value 1.803165
## iter   4 value 1.803164
## iter   5 value 1.803163
## iter   6 value 1.803163
## iter   6 value 1.803163
## final  value 1.803163
## converged
```



1 (a) Perform diagnostics on the chosen model fit. Do the residuals appear to be white noise? Are they normally distributed? You should conduct hypothesis testing and plot some graphs to answer these questions. (You can think about why we want to check normality of the residuals.) We first check the residuals plot, it should resemble WN meaning it has no trend, no seasonality, no change of variance, etc. Which the plot for the SARIMA model does resemble WN. Next, we check if the ACF/PACF of the residuals lie within the confidence interval. In this case, they do. We can next test for the independence of residuals using the Box-Ljung test. Here, the lags have a p-value > 0.05, if the p-value was less than 0.05 it would not be WN. Lastly, we can test for normality of the residuals using the Q-Q plot. Here, the theoretical quantities are aligned with the sample quantities, since the points form a roughly straight line, it indicates normality. Therefore, this model is a White Noise.

(b) Forecast the next 6 observations using sarima.for(), and plot your predictions. And you should also add true milk prodcution points in test.

```
#Forecast the next 6 observations
sarima.for(xdata=train,n.ahead=6,p=0, d=1, q=0, P=1, D=1, Q=1, S=12)
```




```
## $pred
## Time Series:
## Start = 151
## End = 156
## Frequency = 1
## [1] 888.2461 848.5753 828.5640 809.2242 800.2488 815.3330
##
## $se
## Time Series:
## Start = 151
## End = 156
## Frequency = 1
## [1]  5.887425  8.326076 10.197319 11.774849 13.164682 14.421186
```