Assignment 8

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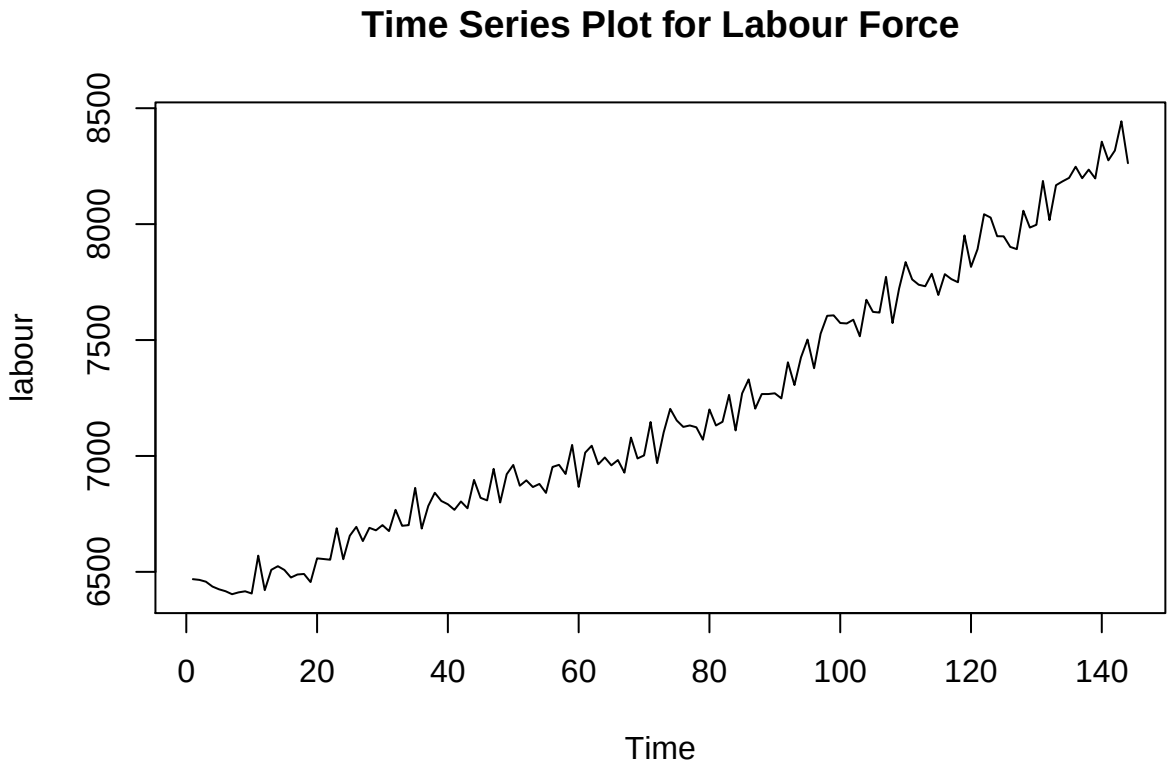
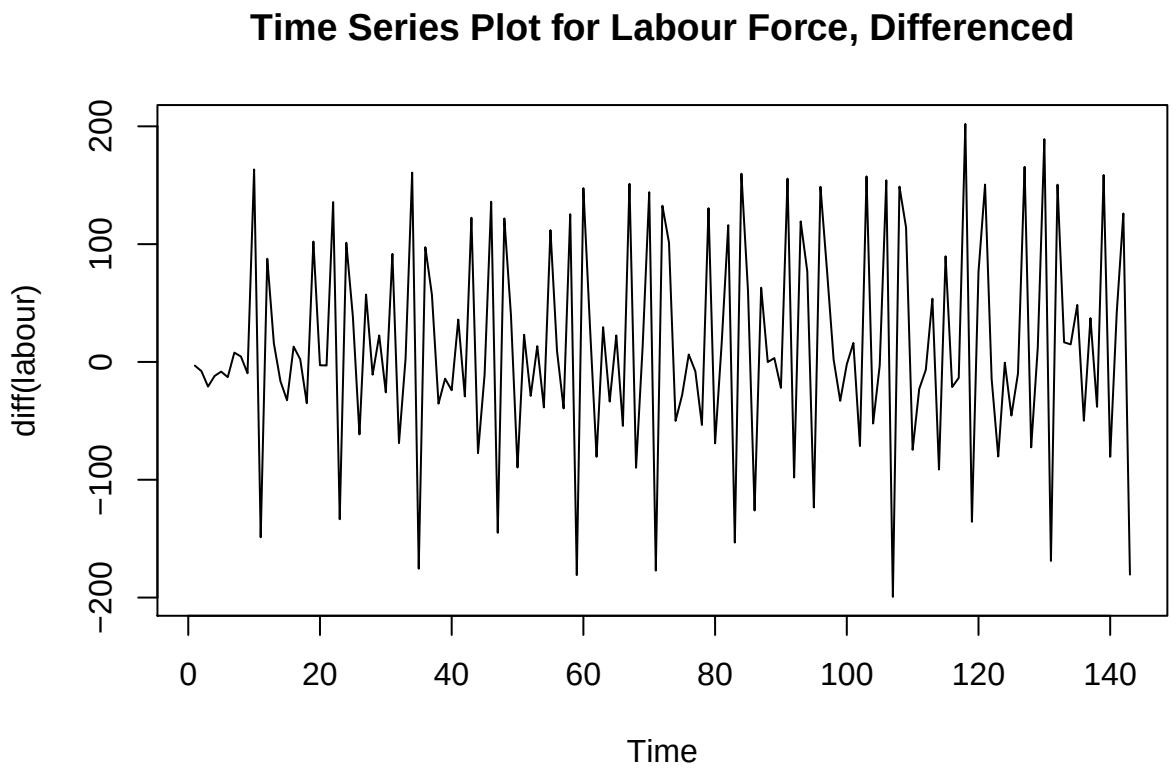
2.

```
data <- read.table("labour.dat")
labour <- data[1:144,]

plot.ts(labour, main="Time Series Plot for Labour Force")
```

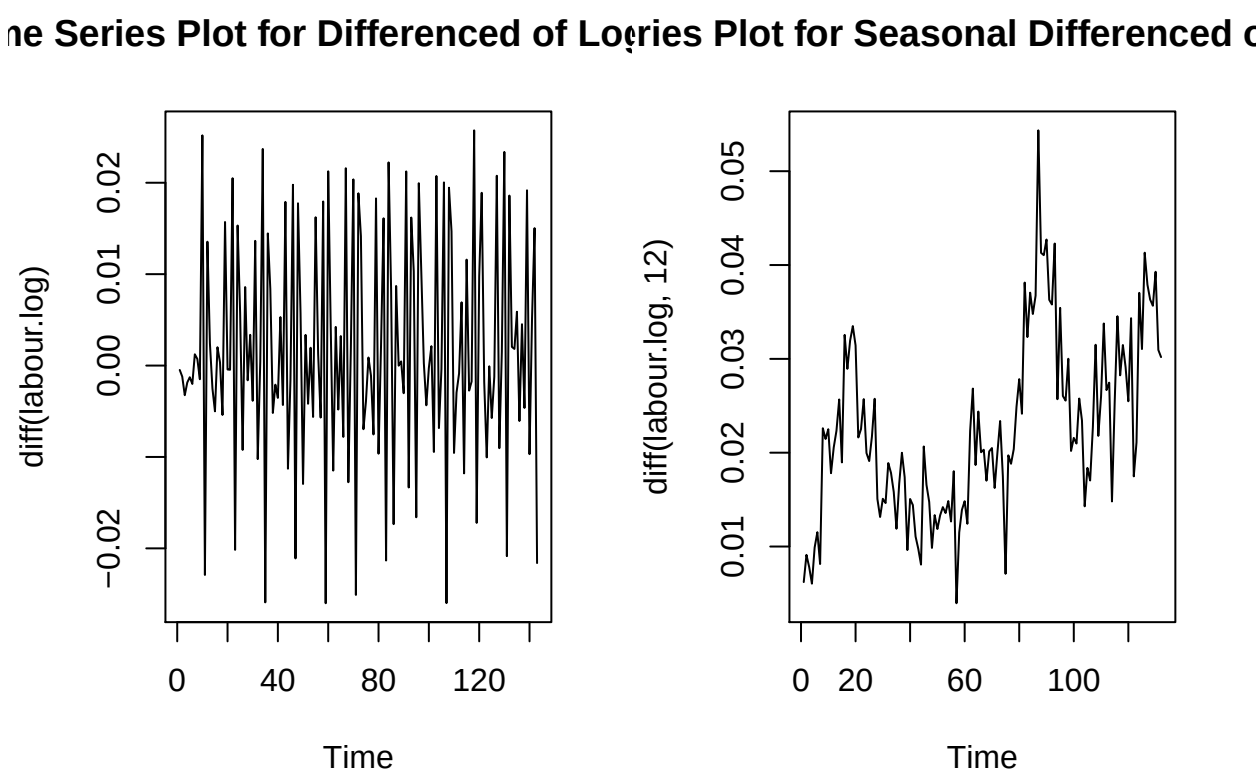


```r
plot.ts(diff(labour), main="Time Series Plot for Labour Force, Differenced")
```

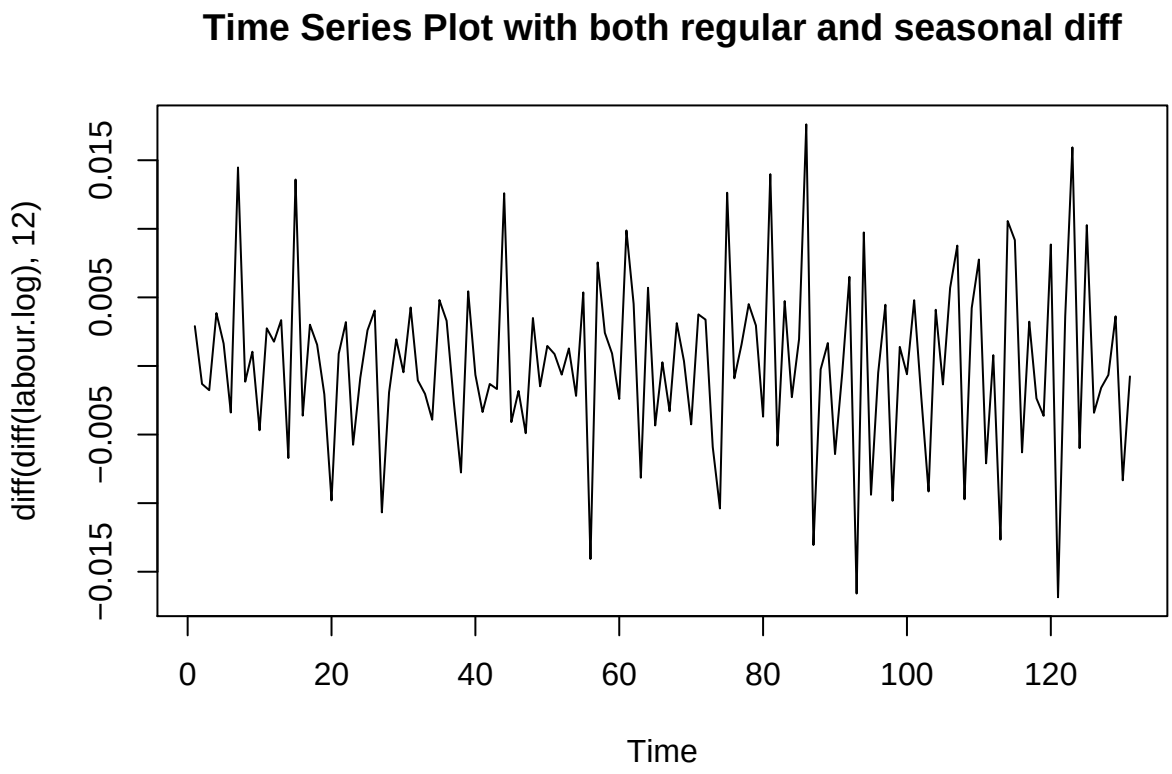



```r
labour.log <- log(labour)

plot.new()
par(mfrow=c(1,2))
plot.ts(diff(labour.log), main="Time Series Plot for Differenced of Logarithm")
plot.ts(diff(labour.log,12), main="Time Series Plot for Seasonal Differenced of Logarithm")
```

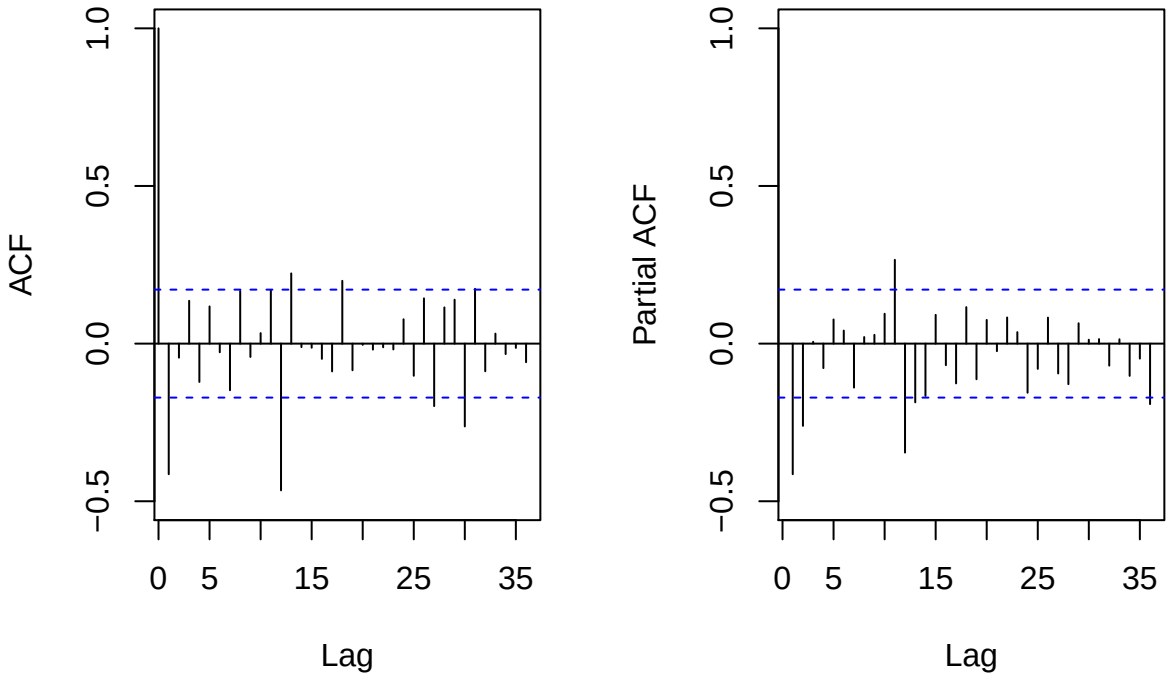



```
par(mfrow=c(1,1))
plot.ts(diff(diff(labour.log),12), main="Time Series Plot with both regular and seasonal diff")
```



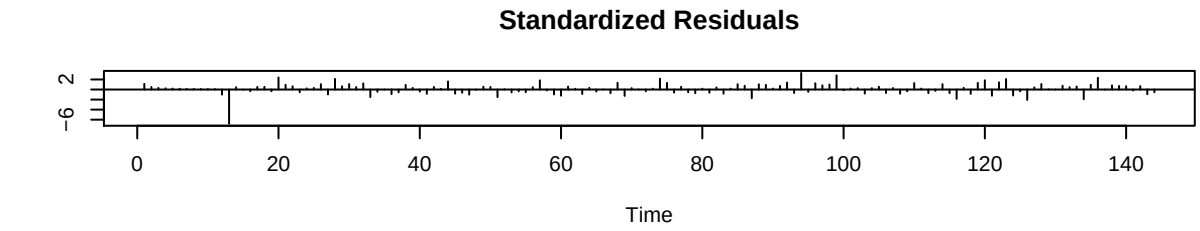

```
par(mfrow=c(1,2))
acf(diff(diff(labour.log),12),36, xlim=c(1,36), ylim=c(-0.5,1), main="ACF with both regular and seasonal
pacf(diff(diff(labour.log),12),36, ylim=c(-0.5,1), main="PACF with both regular and seasonal differenci
```

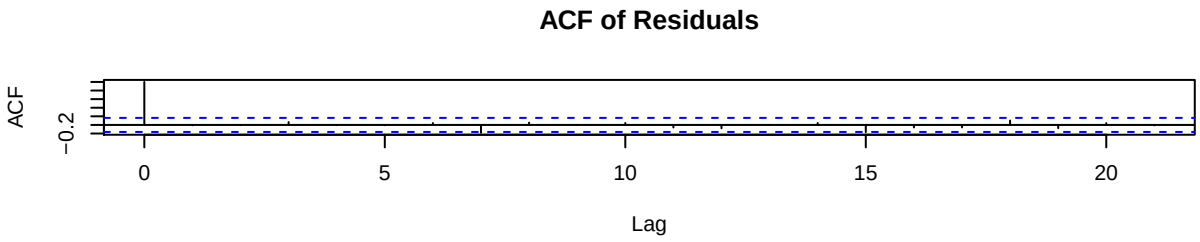
with both regular and seasonal diff **with both regular and seasonal dif**

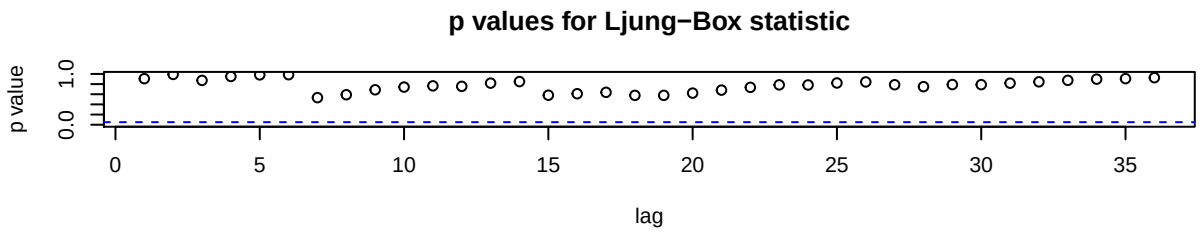



```
source("sarima.R")

# fit1<-sarima(labour.log,1,1,1,1,1,1,12)
# fit2<-sarima(labour.log,1,1,2,1,1,2,12)
# fit3<-sarima(labour.log,2,1,2,2,1,2,12)
# fit4<-sarima(labour.log,2,1,1,2,1,1,12)
# fit5<-sarima(labour.log,1,1,1,1,1,2,12)
# fit6<-sarima(labour.log,0,1,2,0,1,2,12)
fit7<-sarima(labour.log,0,1,1,0,1,1,12)
```








```
# f1.cri<-c(fit1$AIC,fit1$AICc,fit1$BIC)
# f2.cri<-c(fit2$AIC,fit2$AICc,fit2$BIC)
# f3.cri<-c(fit3$AIC,fit3$AICc,fit3$BIC)
# f4.cri<-c(fit4$AIC,fit4$AICc,fit4$BIC)
# f5.cri<-c(fit5$AIC,fit5$AICc,fit5$BIC)
# f6.cri<-c(fit6$AIC,fit6$AICc,fit6$BIC)
f7.cri<-c(fit7$AIC,fit7$AICc,fit7$BIC)

fit7 # best AIC & BIC
```

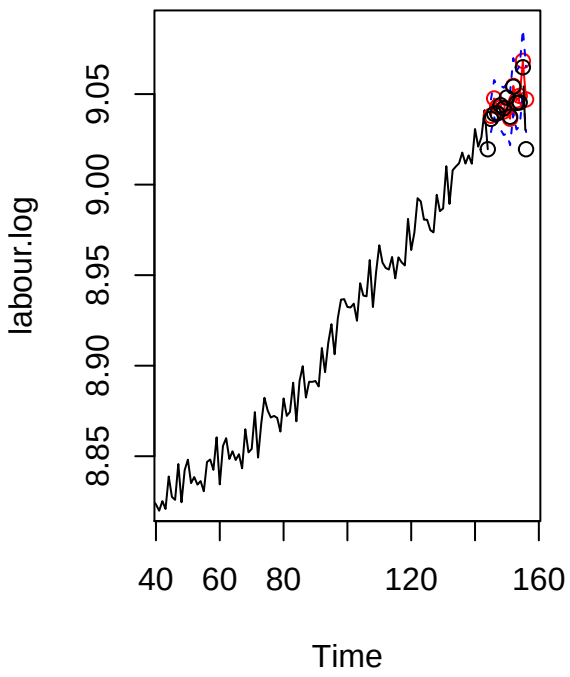
```
## $fit
##
## Call:
## arima(x = data, order = c(p, d, q), seasonal = list(order = c(P, D, Q), period = S))
##
## Coefficients:
##           ma1     sma1
##       -0.4778  -0.7523
## s.e.   0.0698   0.0919
##
## sigma^2 estimated as 2.03e-05:  log likelihood = 516.7,  aic = -1027.39
##
## $AIC
## [1] -9.776904
##
## $AICc
```

```
## [1] -9.761825
##
## $BIC
## [1] -10.73566
```

```
sarima.for(labour.log,12,0,1,1,0,1,1,12)
```

```
## $pred
## Time Series:
## Start = 145
## End = 156
## Frequency = 1
##  [1] 9.038024 9.047586 9.043101 9.042565 9.040433 9.042093 9.036401
##  [8] 9.054509 9.046518 9.049025 9.068349 9.047050
##
## $se
## Time Series:
## Start = 145
## End = 156
## Frequency = 1
##  [1] 0.004507703 0.005085080 0.005603276 0.006077446 0.006517209
##  [6] 0.006929117 0.007317877 0.007687001 0.008039194 0.008376592
## [11] 0.008700917 0.009013579
```

```
all_labour<-data$V1
lines(144:156, log(all_labour[144:156]), type="b")
```



The ACF and PACF suggested that AR and MA could be 0, 1, or 2. All models checked seemed to pass the diagnostic plots so I moved to AIC and BIC coefficients. The best model was $(0, 1, 1)(0, 1, 1)_{12}$. After checking that this model was less than 1.96 z-score I went to forecasting. In forecasting the data all, but a single point fall within the prediction intervals. With a 95% prediction interval we would expect some points to fall outside the interval.