EC 513 Problem Set 4

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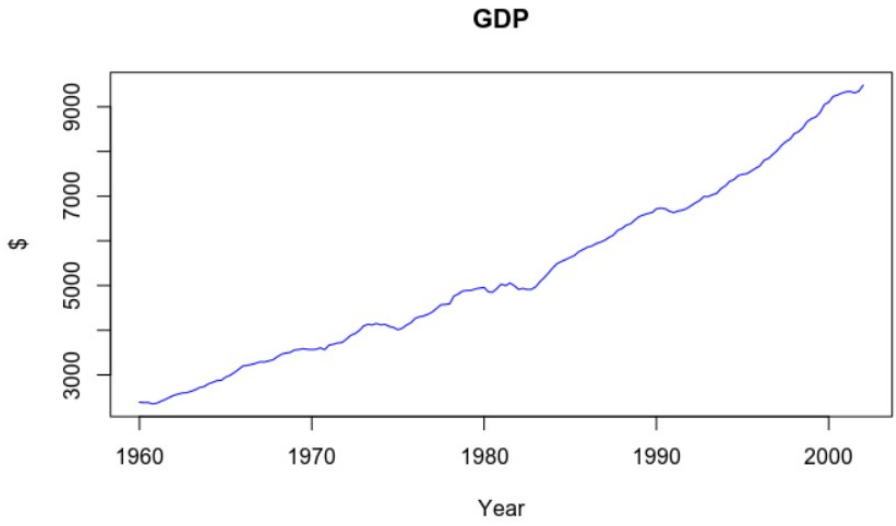
1a. Not stationary



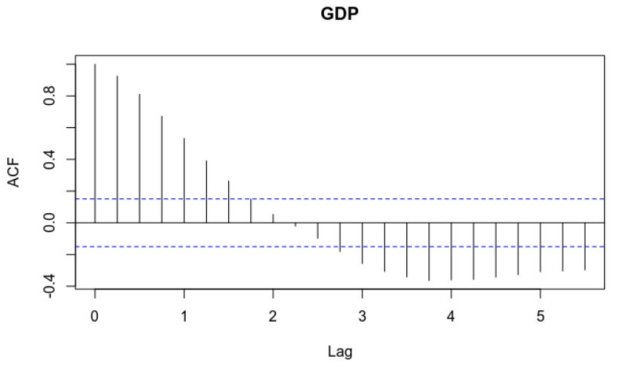
b.

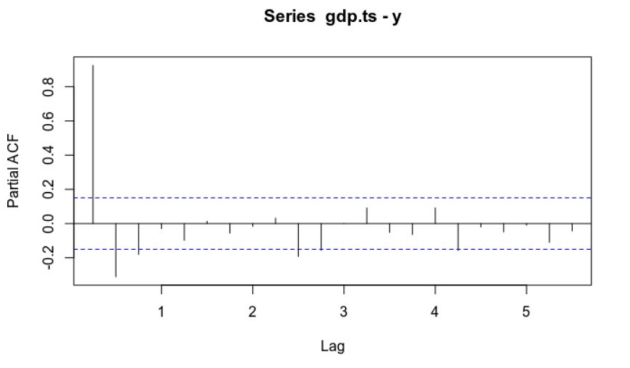
```
> partb

Call:
lm(formula = gdp.ts ~ t + I(t^2) + I(t^3))

Coefficients:
(Intercept)            t       I(t^2)       I(t^3)
  2.224e+03    3.851e+01   -1.705e-01    1.185e-03
```

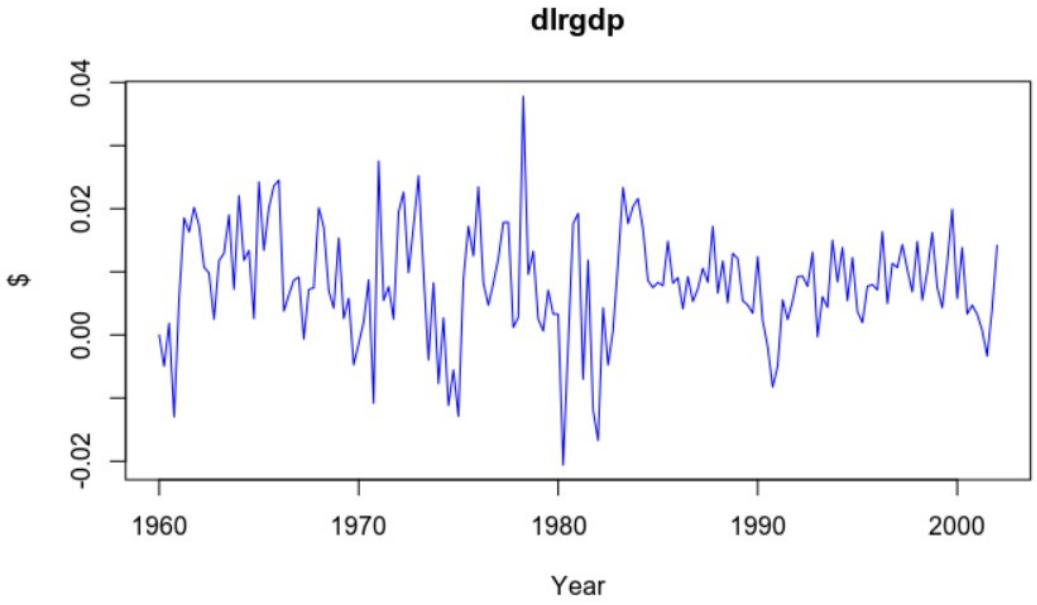
c. We need a better model.





d. The Dickey-Fuller test on GDP returns a p value of greater than 0.99. Thus the null is rejected and the series is not stationary.

e. Appears stationary.



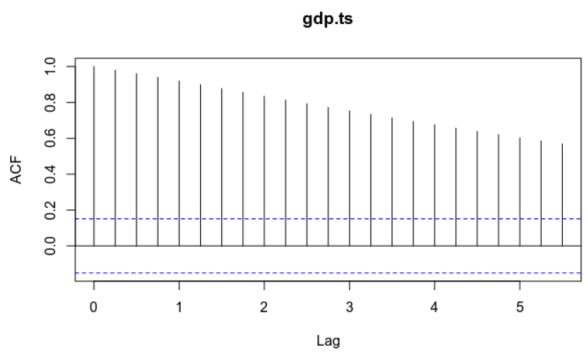
f.

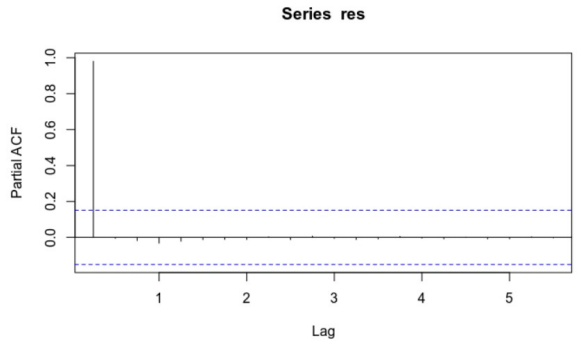
```
> dlrgdpAR2
Series: dlrgdp.ts
ARIMA(2,0,0) with non-zero mean

Coefficients:
         ar1     ar2    mean
      0.2580  0.1502  0.0084
s.e.  0.0758  0.0757  0.0011

sigma^2 estimated as 6.886e-05:  part log likelihood=570.51
```

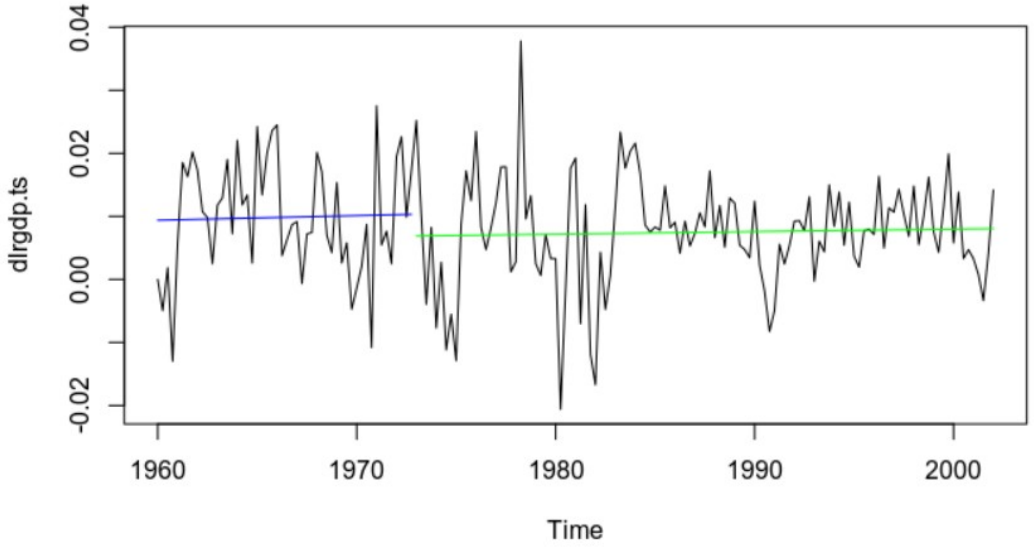
g. The residuals appear to be white noise. Our model is good.





h. Dickey-Fuller statistic returned -6.04 with a p value less than 0.01; the series is stationary.

i. The F-statistic of a Chow test gives a p value of about 0.35. Thus we conclude that there is not a break point.



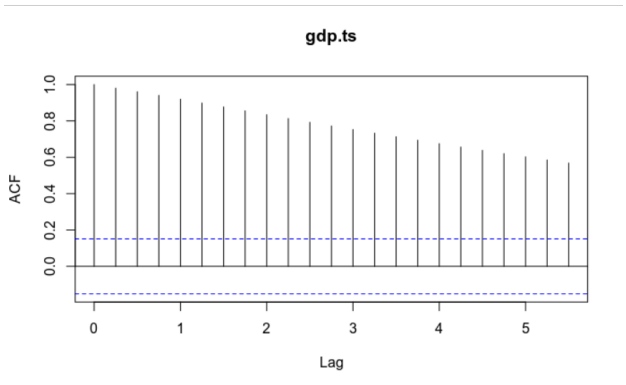
j.

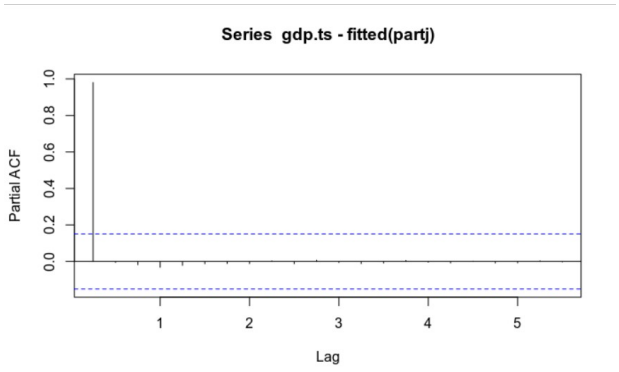
```
> partj
Series: dlrgdp.ts
Regression with ARIMA(2,0,0) errors

Coefficients:
         ar1     ar2  intercept     xreg
      0.2456  0.1392     0.0104  -0.0028
s.e.  0.0759  0.0756     0.0019   0.0022

sigma^2 estimated as 6.864e-05:  part log likelihood=571.29
```

k. The residuals appear to be white noise, so our model is acceptable. However, the dummy variable seems unecessary, as part g was also white noise residual and a simpler model.





```
data.df <- read.csv("~/Downloads/1605.csv",header=TRUE, sep=",")
gdp.ts <- ts(data=data.df[c("GDP")], frequency=4, start=c(1960,1), end=c(2002,1))
#a
plot(gdp.ts, col="blue", ylab="$", main="GDP", xlab="Year")
#b
t<-1
for (i in 2:169)
  t[i]<-i
partb <- lm(gdp.ts ~ t + I(t^2) + I(t^3))
partb
#c
y <- fitted(partb)
acf(gdp.ts-y)
pacf(gdp.ts-y)
#d
adf.test(gdp.ts)
#e
dlrgdp <- 0
for (i in 2:169)
  dlrgdp[i] <- log(gdp.ts[i]/gdp.ts[i-1])
dlrgdp.ts <- ts(dlrgdp, frequency=4, start=c(1960,1), end=c(2002,1))
plot(dlrgdp.ts, col="blue", ylab="$", main="dlrgdp", xlab="Year")
#f
dlrgdpAR2 <- Arima(dlrgdp.ts, order=c(2,0,0), method = "CSS")
dlrgdpAR2
#g
y<- fitted(dlrgdpAR2)
res <- gdp.ts-y
acf(res)
pacf(res)
#h
adf.test(dlrgdp.ts, k =2)
#i
total <- lm(dlrgdp.ts ~ t)
half1 <- lm(dlrgdp.ts[1:52] ~ ts(t[1:52]))
half2 <- lm(dlrgdp.ts[52:169] ~ ts(t[52:169]))
RSSt <- sum((dlrgdp.ts-fitted(total))^2)
RSS1 <- sum((dlrgdp.ts[1:52]-fitted(half1))^2)
RSS2 <- sum((dlrgdp.ts[52:169]-fitted(half2))^2)
F <- 165*(RSSt-(RSS1+RSS2))/((RSS1+RSS2)*2)
F > qf(.36, 2, 165)
F#j
dummy<-0
for (i in 2:52)
  dummy[i]<-0
for (i in 53:169)
  dummy[i]<-1
partj <- Arima(dlrgdp.ts, xreg=dummy, order=c(2,0,0), method = "CSS")
```

```
partj
#k
acf(gdp.ts-fitted(partj))
pacf(gdp.ts-fitted(partj))
```