Econometrics III
Assignment Part I

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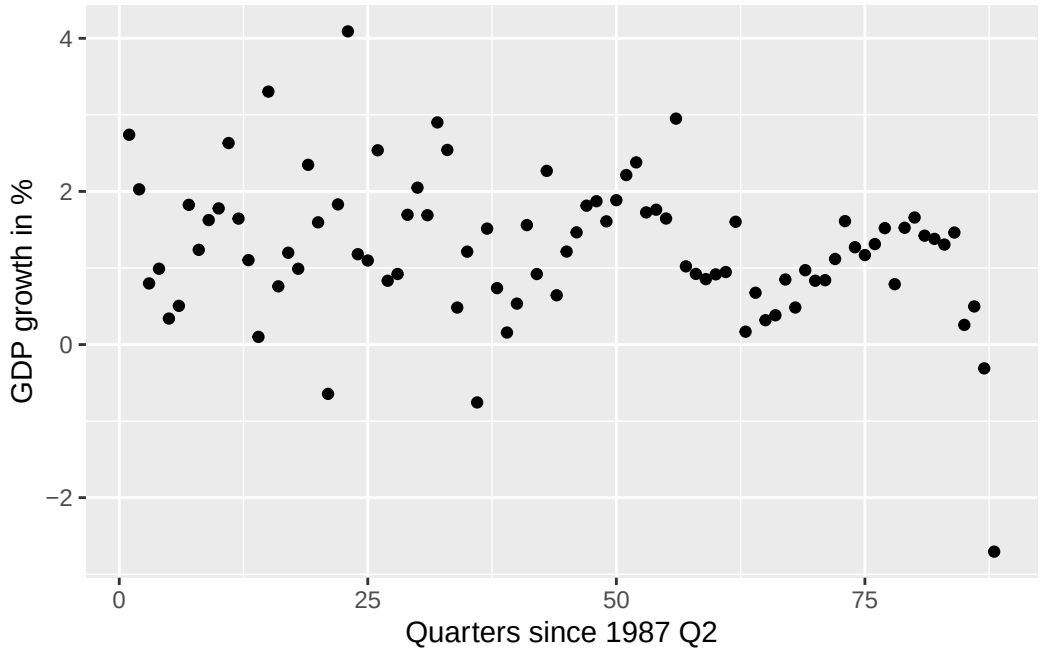
Contents

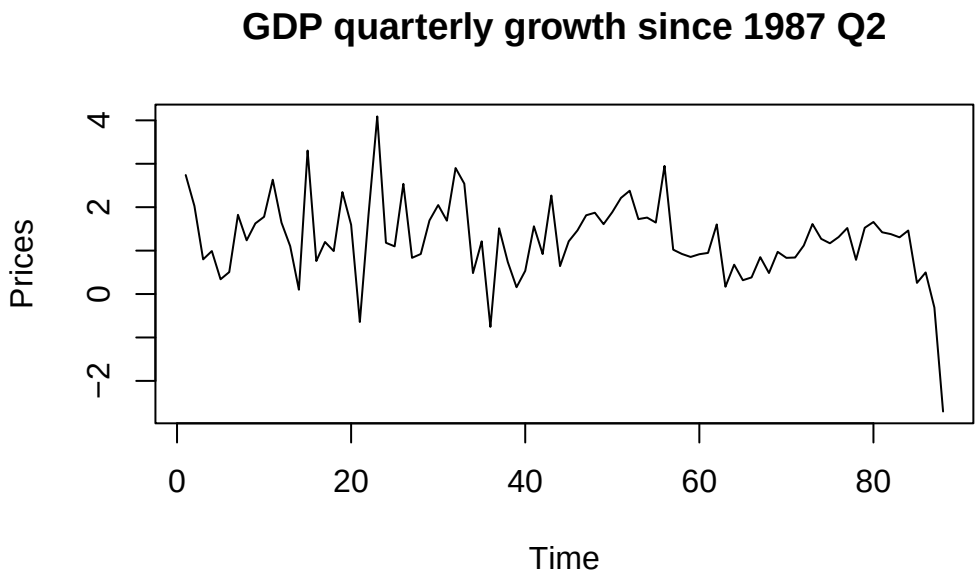
```r
# load packages
if(!require(pacman)){install.packages("pacman")}

p_load(devtools,tidyverse,dplyr,ggplot2,latex2exp,stargazer, fixest,
 ↪  modelsummary, knitr, readr, tseries, lmtest, forecast)

dfAssign_p1 <- as.data.frame(read_csv("data_assign_p1.csv"))

# Encode quarters
dfAssign_p1 <-
 ↪  cbind(dfAssign_p1,c(seq(1,nrow(dfAssign_p1),length.out=nrow(dfAssign_p1))))
colnames(dfAssign_p1) <- c("obs", "GDP_QGR", "ind")
```

1 Question 1

```r
ggplot(dfAssign_p1, aes(x = ind, y = GDP_QGR)) + geom_point() +
 ↪  ylab("GDP growth in %") + xlab("Quarters since 1987 Q2")
```



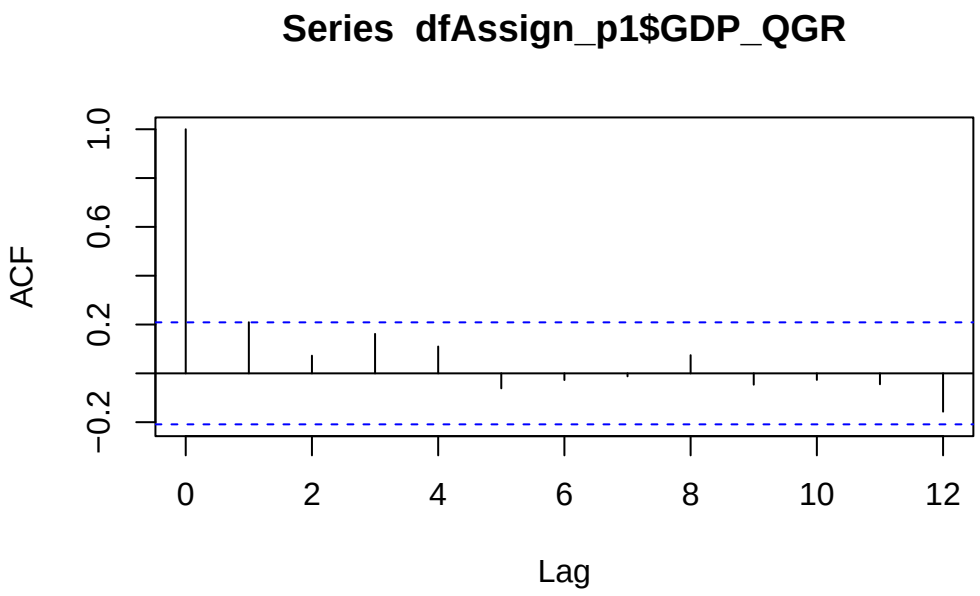
```r
plot.ts(dfAssign_p1$GDP_QGR, main="GDP quarterly growth since 1987 Q2",
↪  ylab="Prices")
```




```r
acf(dfAssign_p1$GDP_QGR,12,pl=F)
```

```
Autocorrelations of series 'dfAssign_p1$GDP_QGR', by lag

    0     1     2     3     4     5     6     7     8     9    10
1.000 0.209 0.072 0.162 0.110 -0.061 -0.027 -0.012 0.075 -0.046 -0.027
   11    12
-0.045 -0.157
```

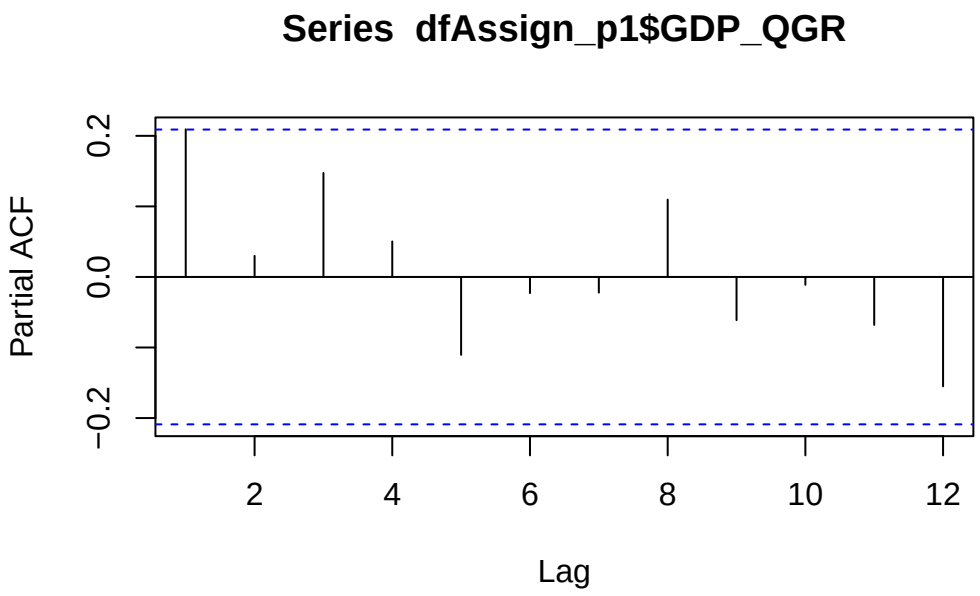
```r
acf(dfAssign_p1$GDP_QGR,12,pl=T)
```




```
pacf(dfAssign_p1$GDP_QGR,12,pl=F)
```

```
Partial autocorrelations of series 'dfAssign_p1$GDP_QGR', by lag

     1      2      3      4      5      6      7      8      9     10     11
 0.209  0.030  0.147  0.050 -0.110 -0.023 -0.022  0.110 -0.061 -0.011 -0.068
    12
-0.155
```

```
pacf(dfAssign_p1$GDP_QGR,12,pl=T)
```



2 Question 2

```r
ar4 <- arima(dfAssign_p1$GDP_QGR, order=c(4,0,0))
#coeftest(ar4)

ar3 <- arima(dfAssign_p1$GDP_QGR, order=c(3,0,0))
#coeftest(ar3)

ar2 <- arima(dfAssign_p1$GDP_QGR, order=c(2,0,0))
#coeftest(ar2)

ar1 <- arima(dfAssign_p1$GDP_QGR, order=c(1,0,0))
#coeftest(ar1)
```

```r
stargazer::stargazer(ar4,ar3,ar2,ar1, title="Estimating the AR(4) to
↪  AR(1) models on GDP data",  align=TRUE, label = "tab_ar4",
↪  table.placement="H", out = "tab_ar4.tex")
```

Table 1: Estimating the AR(4) to AR(1) models on GDP data

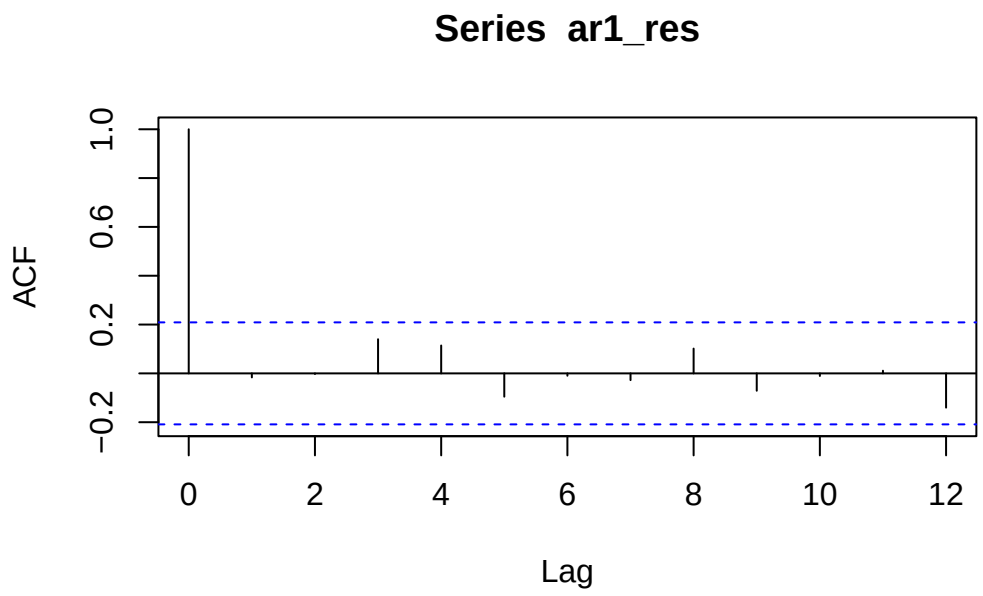
	Dependent variable:			
	(1)	(2)	(3)	(4)
ar1	0.242^{**}	0.256^{**}	0.263^{**}	0.272^{**}
	(0.118)	(0.117)	(0.119)	(0.118)
ar2	0.030	0.030	0.058	
	(0.120)	(0.120)	(0.121)	
ar3	0.189	0.200^{*}		
	(0.119)	(0.119)		
ar4	0.086			
	(0.120)			
intercept	1.214^{***}	1.228^{***}	1.249^{***}	1.253^{***}
	(0.204)	(0.180)	(0.140)	(0.130)
Observations	88	88	88	88
Log Likelihood	-113.211	-113.468	-114.849	-114.963
σ^2	0.765	0.770	0.796	0.798
Akaike Inf. Crit.	238.421	236.936	237.698	235.925
Note:				*p<0.1; **p<0.05; ***p<0.01

3 Question 3

```
ar1_res <- as.numeric(ar1[["residuals"]])
acf(ar1_res,12,pl=F)
```

```
Autocorrelations of series 'ar1_res', by lag

    0      1      2      3      4      5      6      7      8      9     10
1.000 -0.017 -0.003  0.140  0.114 -0.096 -0.010 -0.028  0.102 -0.071 -0.011
   11     12
0.011 -0.140
```

```r
acf(ar1_res,12,pl=T)
```



4 Question 4

```r
forecast8 <- as.data.frame(forecast(ar1, 8, level = c(95)))
predlbl <- c("2009Q2", "2009Q3", "2009Q4", "2010Q1", "2010Q2", "2010Q3",
 ↪  "2010Q4", "2011Q1")
forecast8 <- cbind(predlbl, forecast8)

kable(forecast8[,1:2], caption="The predicted quarterly GDP growth rates
 ↪  using ARIMA(1,0,0)", col.names = c("Quarter", "Predicted growth %"),
 ↪  digits = 3)
```

Table 2: The predicted quarterly GDP growth rates using ARIMA(1,0,0)

	Quarter	Predicted growth %
89	2009Q2	0.177
90	2009Q3	0.960

	Quarter	Predicted growth %
91	2009Q4	1.173
92	2010Q1	1.231
93	2010Q2	1.247
94	2010Q3	1.251
95	2010Q4	1.252
96	2011Q1	1.253

5 Question 5

6 Question 6

7 Question 7

8 Question 8