# Assignment3-R.R

jharit

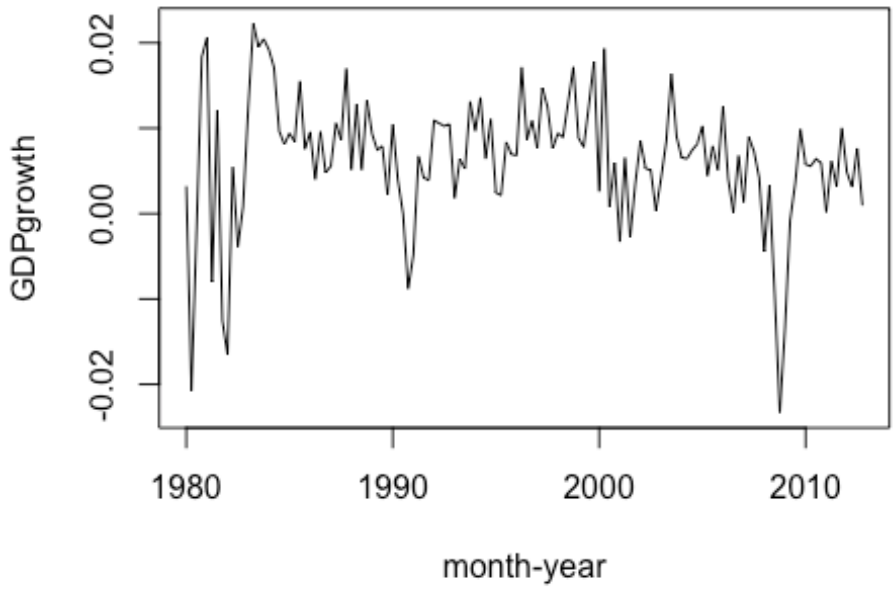
2021-03-01

```
# EE435 Assigment 3 ID:6104640112
setwd("/Users/jharit/Desktop/Assignment3")
cat(rep("\n",50))  #clear R Console

library(quantmod)

## Warning: package 'quantmod' was built under R version 3.6.2

## Loading required package: xts

## Warning: package 'xts' was built under R version 3.6.2

## Loading required package: zoo

## Warning: package 'zoo' was built under R version 3.6.2

##
## Attaching package: 'zoo'

## The following objects are masked from 'package:base':
##
##     as.Date, as.Date.numeric

## Loading required package: TTR

## Warning: package 'TTR' was built under R version 3.6.2

## Registered S3 method overwritten by 'quantmod':
##   method            from
##   as.zoo.data.frame zoo

library(fBasics)

## Loading required package: timeDate

## Loading required package: timeSeries

##
## Attaching package: 'timeSeries'

## The following object is masked from 'package:zoo':
##
##     time<-
```

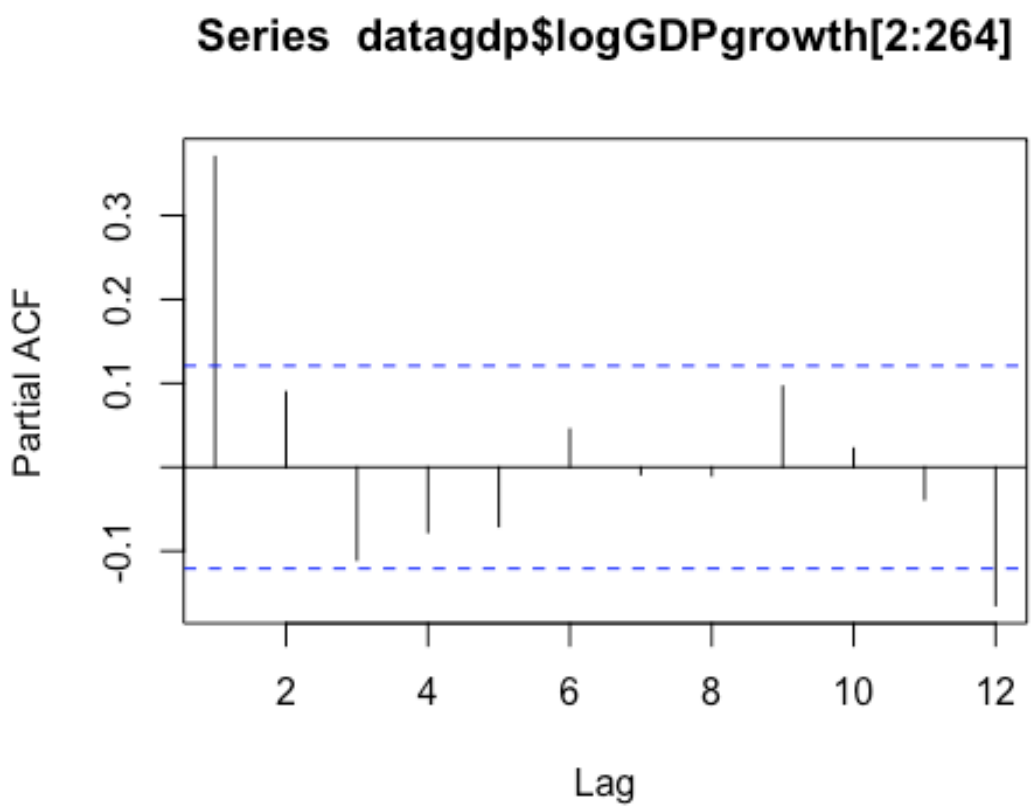
```
##
## Attaching package: 'fBasics'

## The following object is masked from 'package:TTR':
##
##     volatility

library(sn)

## Warning: package 'sn' was built under R version 3.6.2

## Loading required package: stats4

##
## Attaching package: 'sn'

## The following object is masked from 'package:fBasics':
##
##     vech

## The following object is masked from 'package:stats':
##
##     sd

library(PerformanceAnalytics)

##
## Attaching package: 'PerformanceAnalytics'

## The following objects are masked from 'package:timeDate':
##
##     kurtosis, skewness

## The following object is masked from 'package:graphics':
##
##     legend

library(car)

## Warning: package 'car' was built under R version 3.6.2

## Loading required package: carData

## Warning: package 'carData' was built under R version 3.6.2

##
## Attaching package: 'car'

## The following object is masked from 'package:fBasics':
##
##     densityPlot

library(tseries)
```

```
## Warning: package 'tseries' was built under R version 3.6.2

library(forecast)

## Warning: package 'forecast' was built under R version 3.6.2

library(data.table)

## Warning: package 'data.table' was built under R version 3.6.2

##
## Attaching package: 'data.table'

## The following objects are masked from 'package:xts':
##
##     first, last

library(dplyr)

## Warning: package 'dplyr' was built under R version 3.6.2

##
## Attaching package: 'dplyr'

## The following objects are masked from 'package:data.table':
##
##     between, first, last

## The following object is masked from 'package:car':
##
##     recode

## The following objects are masked from 'package:timeSeries':
##
##     filter, lag

## The following objects are masked from 'package:xts':
##
##     first, last

## The following objects are masked from 'package:stats':
##
##     filter, lag

## The following objects are masked from 'package:base':
##
##     intersect, setdiff, setequal, union
```

```
#Question 1
datagdp = read.table(file="q-gdpmc1.txt", header =T) #import the data
datagdp$Date = as.yearmon(paste(datagdp$year, datagdp$month), "%Y %m") #new c
olumn with mounths-year
datagdp$logGDP <- log(datagdp$gdp) #log gdp column
datagdp = mutate(datagdp,logGDPgrowth = logGDP - lag(logGDP)) #growth column


#Question 1a
#plotting starting from 1980
par(mfcol=c(1,1))
plot(datagdp$Date[133:264],datagdp$logGDPgrowth[133:264],xlab='month-year',yl
ab='GDPgrowth',type='l')
```




```
#Question 1b
#perform the test for Autocorrelation H0: p1=p2=p3=...=p12 = 0
Box.test(datagdp$logGDPgrowth[2:264],lag=12,type="Ljung") #L-jung box test

##
##  Box-Ljung test
##
## data:  datagdp$logGDPgrowth[2:264]
## X-squared = 64.259, df = 12, p-value = 3.737e-09 ##reject H0

pacf(datagdp$logGDPgrowth[2:264], lag.max=12) #PACF graph
```




```r
#Question 1c
t.test(datagdp$logGDPgrowth[2:264])

##
##  One Sample t-test
##
## data:  datagdp$logGDPgrowth[2:264]
## t = 12.786, df = 262, p-value < 2.2e-16 #reject H0
## alternative hypothesis: true mean is not equal to 0
## 95 percent confidence interval:
##  0.006573382 0.008966545
## sample estimates:
##   mean of x
## 0.007769964

#Question 2
dataAMZ = read.table(file="d-amzn3dx.txt", header =T) #import the data
```

```
#Question 2a
table.Stats(dataAMZ$amzn) #compute mean sd ,skewness , kurtosis .. of AMZN

##
## Observations    1259.0000
## NAs                0.0000
## Minimum           -0.1278
## Quartile 1        -0.0132
## Median            -0.0005
## Arithmetic Mean    0.0012
## Geometric Mean     0.0008
## Quartile 3         0.0146
## Maximum            0.2680
## SE Mean            0.0008
## LCL Mean (0.95)   -0.0004
## UCL Mean (0.95)    0.0028
## Variance           0.0008
## Stdev              0.0291
## Skewness           1.0331
## Kurtosis           9.3799 (this is an excess kurtosis)

table.Stats(dataAMZ$vwrtn) #compute mean sd ,skewness , kurtosis .. of VW

##
## Observations    1259.0000
## NAs                0.0000
## Minimum           -0.0898
## Quartile 1        -0.0063
## Median             0.0008
## Arithmetic Mean    0.0002
## Geometric Mean     0.0001
## Quartile 3         0.0074
## Maximum            0.1149
## SE Mean            0.0005
## LCL Mean (0.95)   -0.0007
## UCL Mean (0.95)    0.0011
## Variance           0.0003
## Stdev              0.0166
## Skewness          -0.1132
## Kurtosis           6.3137 (this is an excess kurtosis)

table.Stats(dataAMZ$ewrtn) #compute mean sd ,skewness , kurtosis .. of EW

##
## Observations    1259.0000
## NAs                0.0000
## Minimum           -0.0782
## Quartile 1        -0.0064
## Median             0.0012
## Arithmetic Mean    0.0005
```

```
## Geometric Mean      0.0004
## Quartile 3          0.0078
## Maximum             0.1074
## SE Mean             0.0004
## LCL Mean (0.95)    -0.0003
## UCL Mean (0.95)     0.0014
## Variance            0.0002
## Stdev               0.0154
## Skewness           -0.1684
## Kurtosis            5.2890 (this is an excess kurtosis)

table.Stats(dataAMZ$sprtn) #compute mean sd ,skewness , kurtosis .. of SP

##
## Observations    1259.0000
## NAs                0.0000
## Minimum           -0.0904
## Quartile 1        -0.0063
## Median             0.0007
## Arithmetic Mean    0.0001
## Geometric Mean     0.0000
## Quartile 3         0.0070
## Maximum            0.1158
## SE Mean            0.0005
## LCL Mean (0.95)   -0.0008
## UCL Mean (0.95)    0.0010
## Variance           0.0003
## Stdev              0.0166
## Skewness          -0.0183
## Kurtosis           7.1705(this is an excess kurtosis)

#Question 2b
#create log return column for each of them
dataAMZ$logAMZN <- log(1+dataAMZ$amzn)
dataAMZ$logVW <- log(1+dataAMZ$vwrtn)
dataAMZ$logEW <- log(1+dataAMZ$ewrtn)
dataAMZ$logSP <- log(1+dataAMZ$sprtn)

#compute each mean sd ,skewness , kurtosis ..
table.Stats(dataAMZ$logAMZN)

##
## Observations    1259.0000
## NAs                0.0000
## Minimum           -0.1368
## Quartile 1        -0.0133
## Median            -0.0005
## Arithmetic Mean    0.0008
## Geometric Mean     0.0004
## Quartile 3         0.0145
## Maximum            0.2374
```

```
## SE Mean            0.0008
## LCL Mean (0.95)   -0.0008
## UCL Mean (0.95)    0.0024
## Variance           0.0008
## Stdev              0.0287
## Skewness           0.6279
## Kurtosis           7.2656 (this is an excess kurtosis)
```

```
table.Stats(dataAMZ$logVW)
```

```
##
## Observations    1259.0000
## NAs                0.0000
## Minimum           -0.0941
## Quartile 1        -0.0063
## Median             0.0008
## Arithmetic Mean    0.0001
## Geometric Mean    -0.0001
## Quartile 3         0.0073
## Maximum            0.1088
## SE Mean            0.0005
## LCL Mean (0.95)   -0.0009
## UCL Mean (0.95)    0.0010
## Variance           0.0003
## Stdev              0.0167
## Skewness          -0.3177
## Kurtosis           6.2095 (this is an excess kurtosis)
```

```
table.Stats(dataAMZ$logEW)
```

```
##
## Observations    1259.0000
## NAs                0.0000
## Minimum           -0.0815
## Quartile 1        -0.0064
## Median             0.0012
## Arithmetic Mean    0.0004
## Geometric Mean     0.0003
## Quartile 3         0.0077
## Maximum            0.1020
## SE Mean            0.0004
## LCL Mean (0.95)   -0.0005
## UCL Mean (0.95)    0.0013
## Variance           0.0002
## Stdev              0.0154
## Skewness          -0.3338
## Kurtosis           5.2061 (this is an excess kurtosis)
```

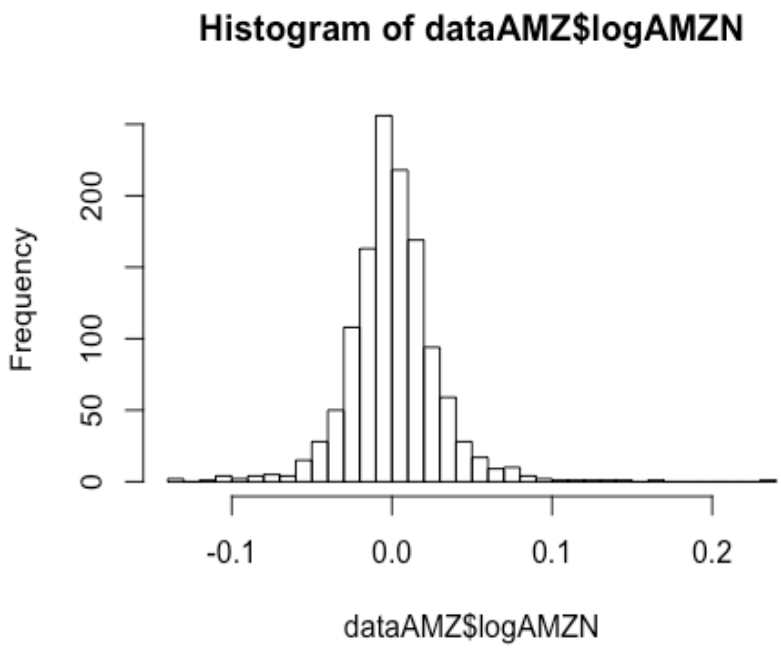
```
table.Stats(dataAMZ$logSP)
```

```
##
## Observations    1259.0000
## NAs                0.0000
## Minimum           -0.0947
## Quartile 1        -0.0063
## Median             0.0007
## Arithmetic Mean    0.0000
## Geometric Mean    -0.0002
## Quartile 3         0.0070
## Maximum            0.1096
## SE Mean            0.0005
## LCL Mean (0.95)   -0.0009
## UCL Mean (0.95)    0.0009
## Variance           0.0003
## Stdev              0.0166
## Skewness          -0.2424
## Kurtosis           6.9679 (this is an excess kurtosis)
```

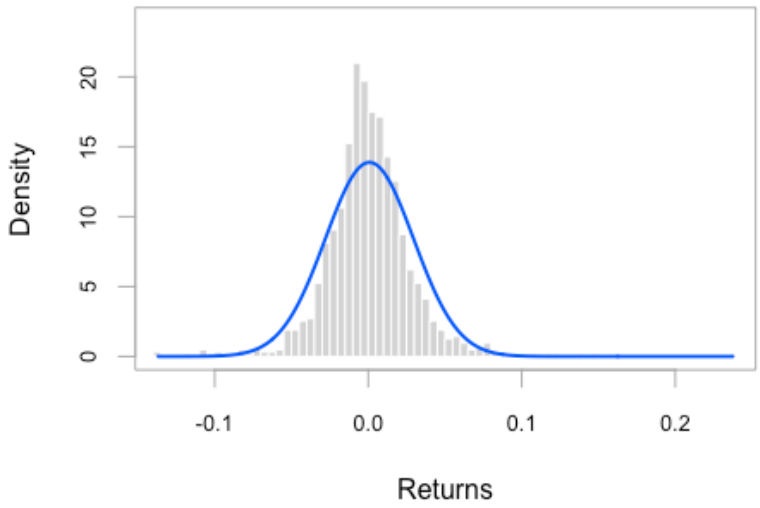
```
#Question 2c
t.test(dataAMZ$logAMZN)
```

```
##
##  One Sample t-test
##
## data:  dataAMZ$logAMZN
## t = 0.97705, df = 1258, p-value = 0.3287 ##FTR H0
## alternative hypothesis: true mean is not equal to 0
## 95 percent confidence interval:
##  -0.0007975567  0.0023801007
## sample estimates:
##   mean of x
## 0.000791272
```

```r
#Question 2d
hist(dataAMZ$logAMZN,nclass=40)
```




```r
chart.Histogram(dataAMZ$logAMZN,methods = c("add.normal"))
```



```r
#Question 3
dataABT = read.table(file="m-abt3dx.txt", header =T) #import the data

#Question 3a
table.Stats(dataABT$RET) #compute mean sd ,skewness , kurtosis ..

##
## Observations    492.0000
## NAs               0.0000
## Minimum          -0.2341
## Quartile 1       -0.0242
## Median            0.0141
## Arithmetic Mean   0.0141
## Geometric Mean    0.0120
## Quartile 3        0.0558
## Maximum           0.3823
## SE Mean           0.0029
## LCL Mean (0.95)   0.0083
## UCL Mean (0.95)   0.0198
## Variance          0.0042
## Stdev             0.0648
## Skewness          0.0974
## Kurtosis          2.4923 (this is an excess kurtosis)

table.Stats(dataABT$vwretd) #compute mean sd ,skewness , kurtosis ..

##
## Observations    492.0000
## NAs               0.0000
## Minimum          -0.2254
## Quartile 1       -0.0172
## Median            0.0126
## Arithmetic Mean   0.0090
## Geometric Mean    0.0079
## Quartile 3        0.0395
## Maximum           0.1656
## SE Mean           0.0021
## LCL Mean (0.95)   0.0049
## UCL Mean (0.95)   0.0131
## Variance          0.0021
## Stdev             0.0463
## Skewness         -0.5570
## Kurtosis          2.0943

table.Stats(dataABT$ewretd) #compute mean sd ,skewness , kurtosis ..

##
## Observations    492.0000
## NAs               0.0000
## Minimum          -0.2722
## Quartile 1       -0.0207
```

```
## Median             0.0144
## Arithmetic Mean    0.0116
## Geometric Mean     0.0099
## Quartile 3         0.0445
## Maximum            0.2993
## SE Mean            0.0026
## LCL Mean (0.95)    0.0065
## UCL Mean (0.95)    0.0167
## Variance           0.0033
## Stdev              0.0573
## Skewness          -0.2006
## Kurtosis           3.3137
```

```
table.Stats(dataABT$sprtrn) #compute mean sd ,skewness , kurtosis .. of SP
```

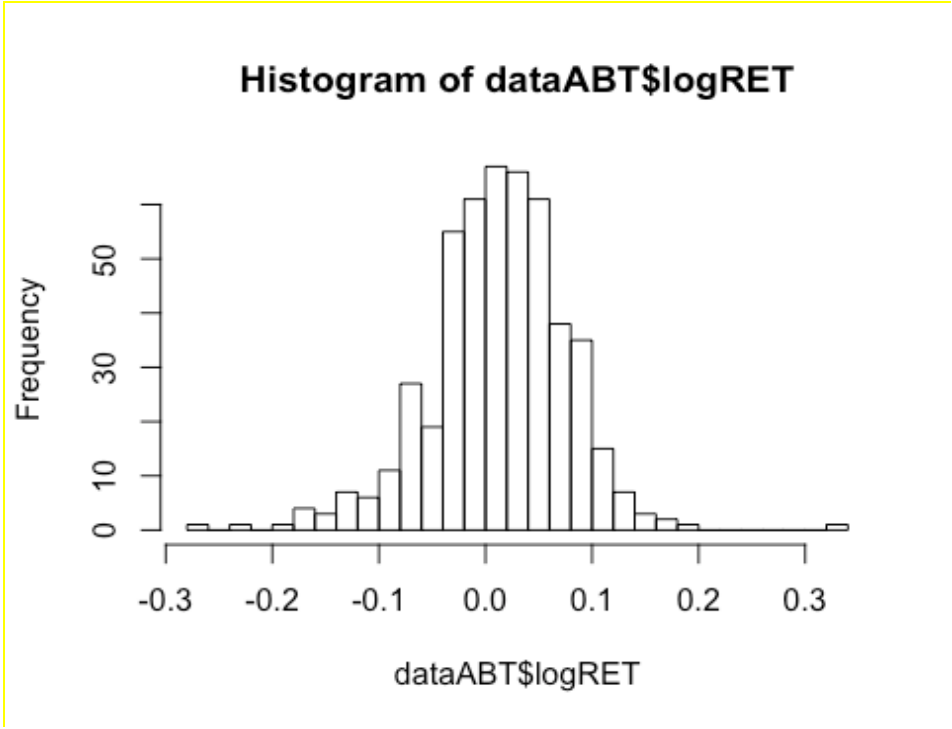
```
##
## Observations    492.0000
## NAs               0.0000
## Minimum          -0.2176
## Quartile 1       -0.0189
## Median            0.0091
## Arithmetic Mean   0.0064
## Geometric Mean    0.0054
## Quartile 3        0.0353
## Maximum           0.1630
## SE Mean           0.0020
## LCL Mean (0.95)   0.0024
## UCL Mean (0.95)   0.0104
## Variance          0.0020
## Stdev             0.0448
## Skewness         -0.4457
## Kurtosis          1.9097
```

```
#Question 3b
#create log return column for each of them
dataABT$logRET <- log(1+dataABT$RET)
dataABT$logVW <- log(1+dataABT$vwretd)
dataABT$logEW <- log(1+dataABT$ewretd)
dataABT$logSP <- log(1+dataABT$sprtrn)

#compute each mean sd ,skewness , kurtosis ..
table.Stats(dataABT$logRET)
```

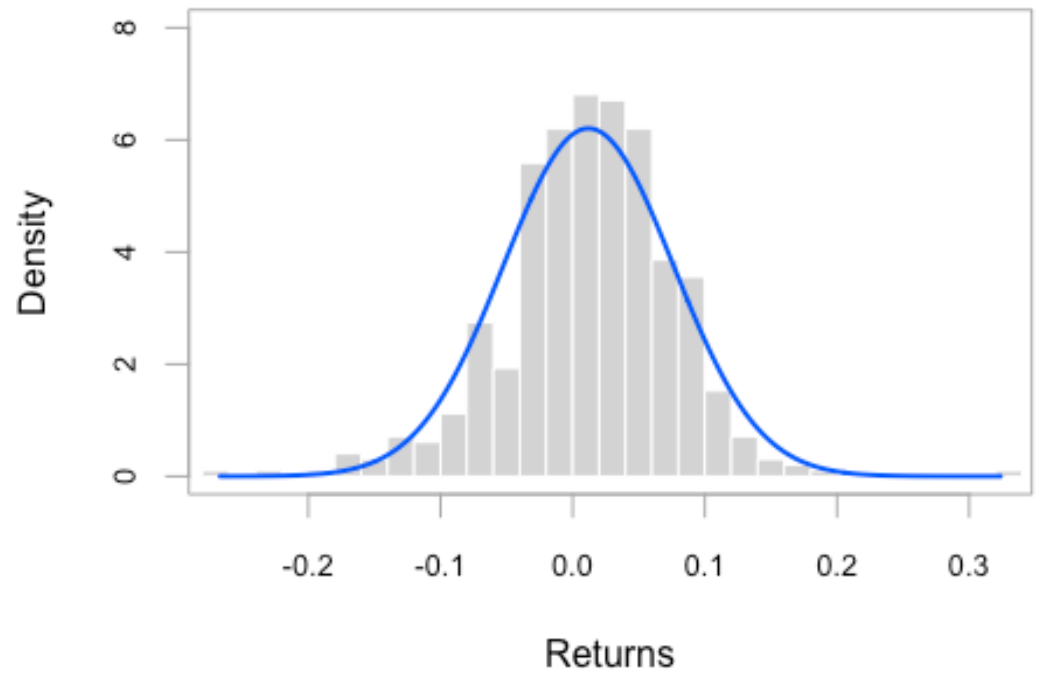
```
##
## Observations    492.0000
## NAs               0.0000
## Minimum          -0.2668
## Quartile 1       -0.0245
## Median            0.0140
## Arithmetic Mean   0.0119
## Geometric Mean    0.0098
```

```
## Quartile 3        0.0543
## Maximum           0.3238
## SE Mean           0.0029
## LCL Mean (0.95)   0.0062
## UCL Mean (0.95)   0.0176
## Variance          0.0041
## Stdev             0.0643
## Skewness         -0.2980
## Kurtosis          2.0258

table.Stats(dataABT$logVW)

##
## Observations    492.0000
## NAs               0.0000
## Minimum          -0.2554
## Quartile 1       -0.0173
## Median            0.0125
## Arithmetic Mean   0.0079
## Geometric Mean    0.0068
## Quartile 3        0.0387
## Maximum           0.1532
## SE Mean           0.0021
## LCL Mean (0.95)   0.0038
## UCL Mean (0.95)   0.0120
## Variance          0.0022
## Stdev             0.0467
## Skewness         -0.8421
## Kurtosis          3.0278

table.Stats(dataABT$logEW)

##
## Observations    492.0000
## NAs               0.0000
## Minimum          -0.3178
## Quartile 1       -0.0209
## Median            0.0143
## Arithmetic Mean   0.0099
## Geometric Mean    0.0082
## Quartile 3        0.0435
## Maximum           0.2618
## SE Mean           0.0026
## LCL Mean (0.95)   0.0048
## UCL Mean (0.95)   0.0150
## Variance          0.0033
## Stdev             0.0575
## Skewness         -0.6643
## Kurtosis          4.0045

table.Stats(dataABT$logSP)
```

```
##
## Observations    492.0000
## NAs               0.0000
## Minimum          -0.2454
## Quartile 1       -0.0191
## Median            0.0090
## Arithmetic Mean   0.0054
## Geometric Mean    0.0043
## Quartile 3        0.0347
## Maximum           0.1510
## SE Mean           0.0020
## LCL Mean (0.95)   0.0014
## UCL Mean (0.95)   0.0094
## Variance          0.0020
## Stdev             0.0451
## Skewness         -0.7134
## Kurtosis          2.6821

#Question 3c
t.test(dataABT$logRET)

##
##  One Sample t-test
##
## data:  dataABT$logRET
## t = 4.1143, df = 491, p-value = 4.555e-05 ## reject H0
## alternative hypothesis: true mean is not equal to 0
## 95 percent confidence interval:
##  0.006229721 0.017618849
## sample estimates:
##  mean of x
## 0.01192429

#Question 3d
hist(dataABT$logRET,nclass=40)
```




```
chart.Histogram(dataABT$logRET,methods = c("add.normal"))
```



```r
#Question 4
#data for question4 dataABT$vwretd

#Question 4a
#H0: mean = 0
t.test(dataABT$vwretd)

##
##  One Sample t-test
##
## data:  dataABT$vwretd
## t = 4.3172, df = 491, p-value = 1.912e-05 ##reject H0
## alternative hypothesis: true mean is not equal to 0
## 95 percent confidence interval:
##  0.004914667 0.013124406
## sample estimates:
##   mean of x
## 0.009019537

#Question 4b
#test skewness = 0
T = length(dataABT$vwretd)
s = skewness(dataABT$vwretd)
s

## [1] -0.5570388

tst = s/sqrt(6/T)
tst

## [1] -5.044201

pv = 2*pnorm(tst)
pv

## [1] 4.55421e-07 ##reject H0

#Question 4c
#test excess kurtosis = 0
k = kurtosis(dataABT$vwretd)
k

## [1] 2.094344

tstk = k/sqrt(24/T)
tstk

## [1] 9.482548

pvk = 2*(1-pnorm(tstk))
pvk

## [1] 0  ##reject H0
```

```r
#Question 5
#data for question5  dataAMZ$logAMZN

#Question 5a
#Question 5a(1)
#symetric test ( skewness = 0)
T2 = length(dataAMZ$logAMZN)
s2 = skewness(dataAMZ$logAMZN)
s2
```

```
## [1] 0.6278955
```

```r
tst2 = s2/sqrt(6/T2)
tst2
```

```
## [1] 9.095459
```

```r
pv2 = 2*(1-pnorm(tst2))
pv2
```

```
## [1] 0 ##reject H0
```

```r
#Question 5a(2)
#test excess kurtosis = 0

k2 = kurtosis(dataAMZ$logAMZN)
k2
```

```
## [1] 7.26559
```

```r
tstk2 = k2/sqrt(24/T2)
tstk2
```

```
## [1] 52.62331
```

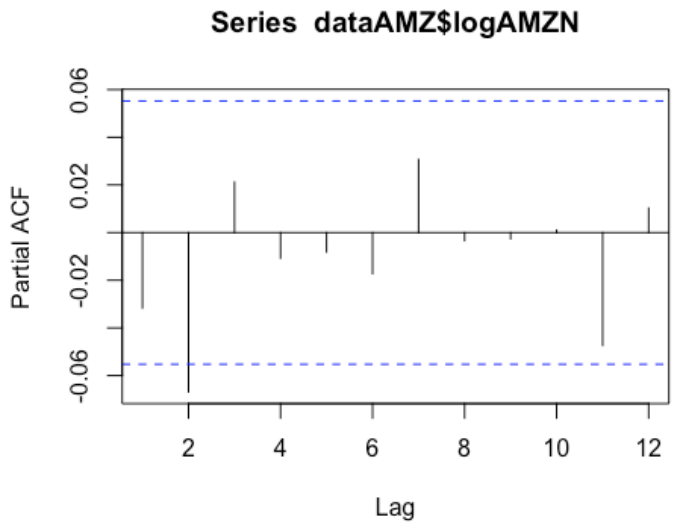
```r
pvk2 = 2*(1-pnorm(tstk2))
pvk2
```

```
## [1] 0 ##reject H0
```

```r
#Question 5a(3)
#using t.test to get CI 95%
t.test(dataAMZ$logAMZN)##
##  One Sample t-test
##
## data:  dataAMZ$logAMZN
## t = 0.97705, df = 1258, p-value = 0.3287
## alternative hypothesis: true mean is not equal to 0
## 95 percent confidence interval:
##  -0.0007975567  0.0023801007
```

```
## sample estimates:
##   mean of x
## 0.000791272

#Question 5b
#perform the test for Autocorrelation H0: p1=p2=p3=...=p12 = 0  with acf,pacf
acf(dataAMZ$logAMZN, lag=12)
```

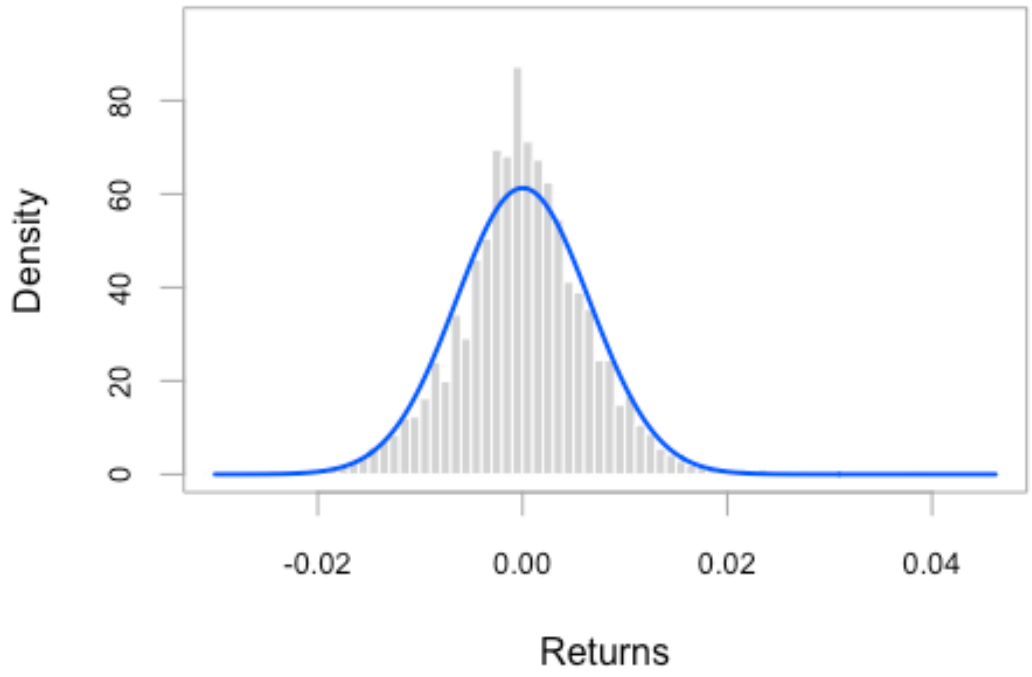

```
pacf(dataAMZ$logAMZN, lag.max=12) #PACF graph
```




##reject H0

```r
#Question 6
dataforex = read.table(file="d-exuseu.txt", header =T) #import the data

#Question 6a
#compute daily log return
dataforex$logValue <- log(dataforex$VALUE) #log Value column
dataforex = mutate(dataforex,logReturn = logValue - lag(logValue)) #Daily log
return

#Question 6b
table.Stats(dataforex$logReturn) #compute mean sd ,skewness , kurtosis .. of
logReturn

##
## Observations    3566.0000
## NAs                1.0000
## Minimum           -0.0300
## Quartile 1        -0.0036
## Median             0.0000
## Arithmetic Mean    0.0000
## Geometric Mean     0.0000
## Quartile 3         0.0038
## Maximum            0.0462
## SE Mean            0.0001
## LCL Mean (0.95)   -0.0002
## UCL Mean (0.95)    0.0002
## Variance           0.0000
## Stdev              0.0065
## Skewness           0.1168
## Kurtosis           2.0610

#Question 6c
hist(dataforex$logReturn)
```


```
chart.Histogram(dataforex$logReturn,methods = c("add.normal"))
```




```
#Question 6d
#H0: mean = 0
t.test(dataforex$logReturn)

##
##  One Sample t-test
##
## data:  dataforex$logReturn
## t = 0.24489, df = 3565, p-value = 0.8066 ## FTR HO
## alternative hypothesis: true mean is not equal to 0
## 95 percent confidence interval:
##  -0.0001870737  0.0002404769
## sample estimates:
##    mean of x
## 2.670158e-05
```