

Assignment3_6104640427.R

user

2021-03-01

```
setwd("/Users/user/Desktop/Arm/EE435 R")
library(fBasics)

## Loading required package: timeDate

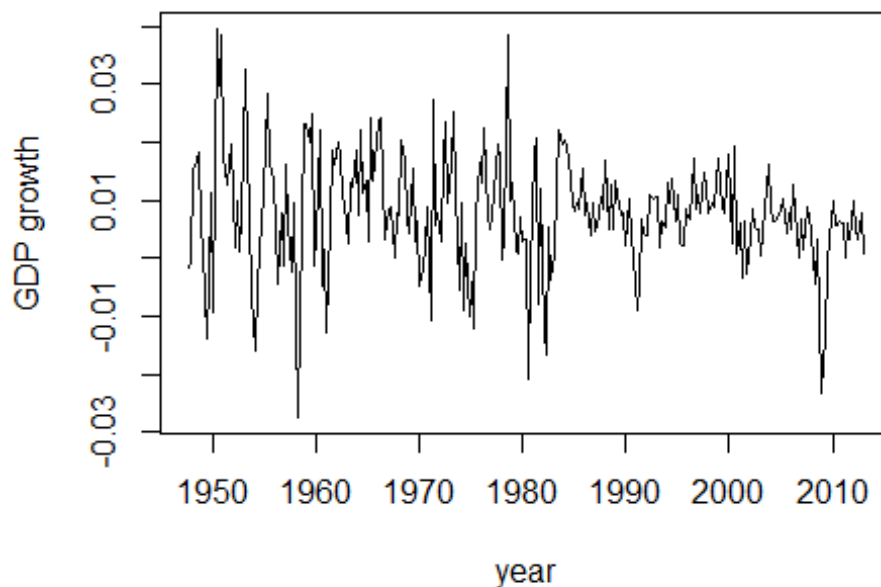
## Loading required package: timeSeries

cat(rep("\n",50))

da = read.table("q-gdpmc1.txt" , header = TRUE)
return_GDP = da[,4]
par(mfcol=c(1,1))
length(return_GDP)

## [1] 264

xa = c(2:264)/4+1947
logreturnG=diff(log(return_GDP))
# 1a.
plot(xa,logreturnG,xlab='year',ylab='GDP growth',type="l")
```



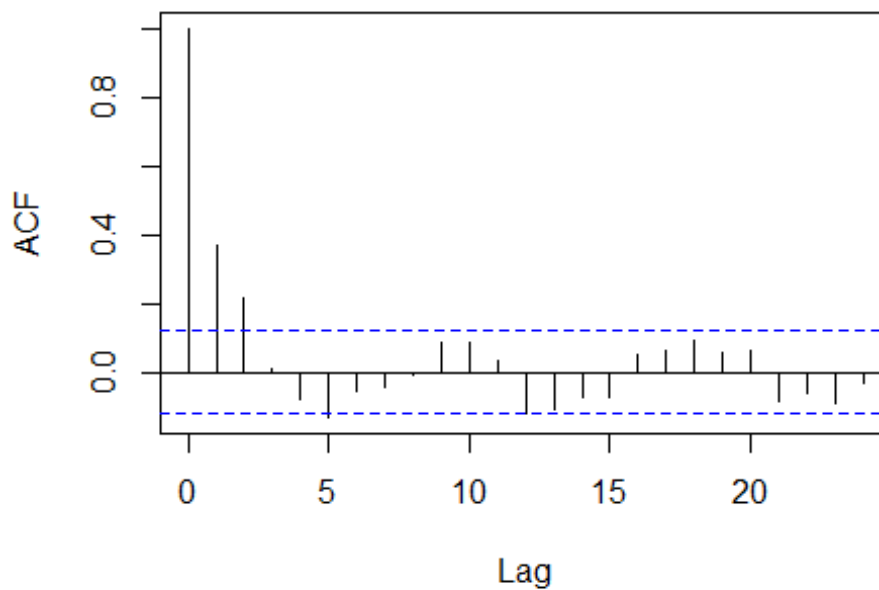
#1b

```
basicStats(logreturnG)
```

```
##          logreturnG
## nobs      263.000000
## NAs        0.000000
## Minimum   -0.027445
## Maximum    0.039624
## 1. Quartile 0.002772
## 3. Quartile 0.013047
## Mean       0.007770
## Median     0.007601
## Sum        2.043500
## SE Mean    0.000608
## LCL Mean   0.006573
## UCL Mean   0.008967
## Variance   0.000097
## Stdev      0.009855
## Skewness   -0.096390
## Kurtosis   1.365072
```

```
m1 = acf(logreturnG)
```

Series logreturnG



```
names(m1)
```

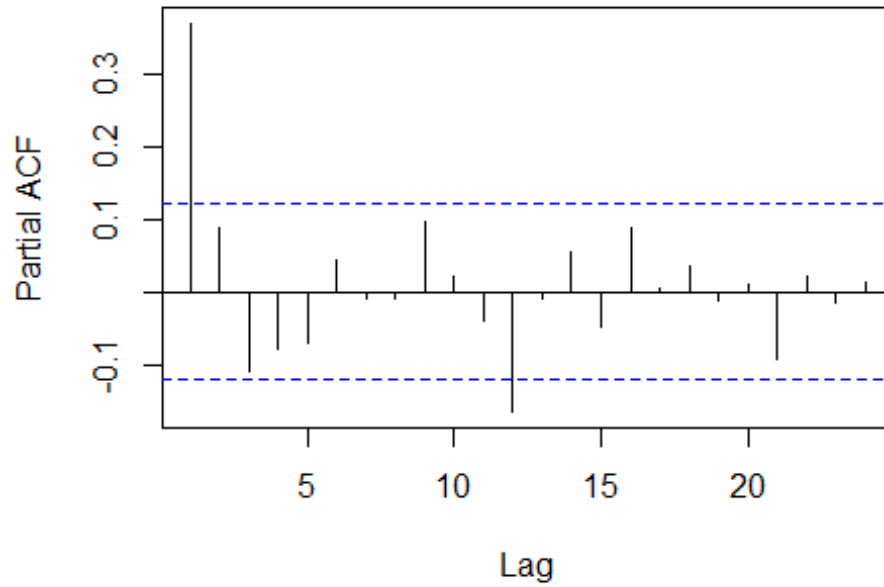
```
## [1] "acf"      "type"     "n.used"   "lag"      "series"   "snames"
```

```
m1$acf
```

```
## , , 1
##
##          [,1]
## [1,] 1.000000000
## [2,] 0.370000013
## [3,] 0.214242174
## [4,] 0.010736359
## [5,] -0.075552257
## [6,] -0.129944597
## [7,] -0.053754640
## [8,] -0.039425441
## [9,] -0.008702604
## [10,] 0.086105943
## [11,] 0.084571233
## [12,] 0.035641140
## [13,] -0.118107413
## [14,] -0.106798234
## [15,] -0.070360606
## [16,] -0.073192373
## [17,] 0.053870122
## [18,] 0.061631517
## [19,] 0.091689878
## [20,] 0.060492740
## [21,] 0.062664761
## [22,] -0.081733930
## [23,] -0.061613172
## [24,] -0.087952226
## [25,] -0.030142752
```

```
m2=pacf(logreturnG)
```

Series logreturnG



```
names(m2)
```

```
## [1] "acf"      "type"      "n.used"    "lag"       "series"    "snames"
```

```
m2$acf
```

```
## , , 1
```

```
##
```

```
##           [,1]
```

```
## [1,] 0.37000013
```

```
## [2,] 0.089609739
```

```
## [3,] -0.110475248
```

```
## [4,] -0.077531516
```

```
## [5,] -0.070501467
```

```
## [6,] 0.045120094
```

```
## [7,] -0.008544500
```

```
## [8,] -0.009978968
```

```
## [9,] 0.096272533
```

```
## [10,] 0.022309063
```

```
## [11,] -0.038433563
```

```
## [12,] -0.164654544
```

```
## [13,] -0.008450158
```

```
## [14,] 0.055471293
```

```
## [15,] -0.048915560
```

```
## [16,] 0.089535534
```

```
## [17,] 0.006160997
```

```
## [18,] 0.034434562
```

```
## [19,] -0.011673680
## [20,]  0.009413300
## [21,] -0.092256962
## [22,]  0.020948782
## [23,] -0.015177445
## [24,]  0.014385511
```

```
Box.test(logreturnG,lag=12,type = "Ljung")
```

```
##
## Box-Ljung test
##
## data:  logreturnG
## X-squared = 64.259, df = 12, p-value = 3.737e-09
```

As p-value is less than 0.05 significant level, we reject H0 and says that previous return has some correlation with today return

```
#1c
```

```
t.test(logreturnG)
```

```
##
## One Sample t-test
##
## data:  logreturnG
## t = 12.786, df = 262, p-value < 2.2e-16
## alternative hypothesis: true mean is not equal to 0
## 95 percent confidence interval:
##  0.006573382 0.008966545
## sample estimates:
##  mean of x
## 0.007769964d
```

As p-value is less than 0.05 significant level, we reject H0 and says that mean of U.S. gdp growth rates is not equal to zero

```
#2
```

```
da1 = read.table("d-amzn3dx.txt" , header = TRUE)
```

```
#2a Amazon, VW, EW, and SP
```

```
simplerA= da1[,2]
```

```
basicStats(simplerA)
```

```
##              simplerA
## nobs          1259.000000
## NAs            0.000000
## Minimum       -0.127820
## Maximum        0.267951
## 1. Quartile    -0.013195
## 3. Quartile     0.014571
```

```
## Mean          0.001207
## Median        -0.000451
## Sum           1.519912
## SE Mean       0.000820
## LCL Mean      -0.000401
## UCL Mean      0.002816
## Variance      0.000846
## Stdev         0.029087
## Skewness      1.031884
## Kurtosis      9.360219
```

```
simplerV= da1[,3]
basicStats(simplerV)
```

```
##              simplerV
## nobs          1259.000000
## NAs           0.000000
## Minimum       -0.089763
## Maximum        0.114895
## 1. Quartile   -0.006328
## 3. Quartile    0.007376
## Mean          0.000210
## Median        0.000818
## Sum           0.264749
## SE Mean       0.000469
## LCL Mean      -0.000710
## UCL Mean      0.001130
## Variance      0.000277
## Stdev         0.016641
## Skewness      -0.113083
## Kurtosis      6.298940
```

```
simplerE= da1[,4]
basicStats(simplerE)
```

```
##              simplerE
## nobs          1259.000000
## NAs           0.000000
## Minimum       -0.078240
## Maximum        0.107422
## 1. Quartile   -0.006365
## 3. Quartile    0.007780
## Mean          0.000517
## Median        0.001210
## Sum           0.651089
## SE Mean       0.000434
## LCL Mean      -0.000334
## UCL Mean      0.001368
## Variance      0.000237
## Stdev         0.015395
```

```
## Skewness      -0.168185
## Kurtosis      5.275824
```

```
simplerSP= da1[,5]
basicStats(simplerSP)
```

```
##          simplerSP
## nobs      1259.000000
## NAs        0.000000
## Minimum    -0.090350
## Maximum     0.115800
## 1. Quartile -0.006301
## 3. Quartile  0.006978
## Mean        0.000114
## Median      0.000685
## Sum         0.143876
## SE Mean     0.000467
## LCL Mean    -0.000802
## UCL Mean     0.001031
## Variance    0.000275
## Stdev       0.016573
## Skewness    -0.018307
## Kurtosis    7.154386
```

```
#2b
```

```
logrA <- log(simplerA+1)
logrA
```

```
## [1] 3.822791e-02 -1.086380e-02 -6.981106e-02 3.379429e-04 -1.063940e-02
## [6] -3.073657e-02 -1.132893e-02 -3.847059e-02 2.183683e-02 -3.225153e-02
## [11] 1.370061e-03 -2.866103e-03 -4.503124e-03 -1.617816e-02 -5.918435e-02
## [16] 4.880921e-02 -9.014061e-04 -2.320517e-02 -2.497325e-02 3.509833e-03
## [21] 4.595663e-02 -4.031275e-02 -9.153768e-03 -2.547372e-02 -5.122803e-02
## [26] 3.472408e-02 3.587377e-02 2.273264e-02 -9.890753e-03 4.311409e-02
## [31] -2.514346e-02 -3.818693e-02 -1.213432e-02 2.141212e-02 -5.212311e-02
## [36] 3.071057e-02 1.637421e-02 -2.179990e-02 -1.150392e-02 -4.354758e-02
## [41] -5.109963e-02 -3.215446e-02 4.555828e-02 -5.369389e-03 -3.523554e-02
## [46] 2.128878e-02 -9.721097e-03 5.636143e-02 -9.576711e-03 2.685028e-02
## [51] -1.465073e-03 -2.508501e-02 7.483749e-02 -2.156997e-02 4.213761e-02
## [56] 3.701636e-02 -1.032310e-02 -1.839312e-02 -4.149931e-02 -1.479795e-02
```

02
[61] 2.183585e-02 7.300508e-02 8.697071e-03 -3.191181e-02 2.542795e-02
02
[66] 3.899240e-04 5.188516e-03 -3.837291e-02 5.897575e-03 -3.869197e-02
02
[71] 8.575128e-03 -1.516149e-03 2.842029e-02 -7.401322e-03 7.867069e-02
02
[76] 9.985013e-04 -7.260292e-03 1.743512e-02 -4.172240e-02 3.999253e-02
02
[81] 1.363364e-02 -1.511973e-02 -2.648053e-02 9.241169e-03 -2.617151e-02
02
[86] -1.814360e-02 -2.769832e-03 -3.398811e-02 -5.343250e-03 -5.233672e-03
03
[91] 2.885759e-02 4.029188e-04 -4.839692e-03 2.554688e-02 4.457053e-03
03
[96] 7.348185e-02 -1.926335e-02 -3.043859e-02 1.218644e-02 -1.154742e-02
02
[101] 2.856122e-02 -6.720532e-03 3.366328e-03 1.568239e-02 -1.717668e-02
02
[106] -1.497120e-03 1.720219e-02 3.626732e-02 -4.699937e-02 -1.499486e-02
02
[111] 2.389144e-03 -2.983054e-02 -1.472996e-02 3.889277e-02 3.145700e-02
02
[116] 1.542541e-02 -5.438763e-03 2.086677e-02 -3.822433e-02 -5.192458e-03
03
[121] -1.297380e-02 1.086476e-02 -5.370884e-02 -2.172836e-02 -1.797458e-02
02
[126] 3.947200e-03 -3.005929e-02 7.808435e-03 6.782944e-03 3.457243e-02
02
[131] -6.084933e-02 2.829600e-04 -3.003765e-02 -3.352886e-02 1.125245e-02
02
[136] 6.930122e-02 3.750956e-03 -4.234816e-02 -9.302131e-03 -7.474867e-03
03
[141] 3.711369e-02 1.097177e-01 -5.221609e-03 -3.020460e-02 2.892754e-02
02
[146] 0.000000e+00 -2.420048e-02 -7.759024e-03 -5.281394e-04 4.392884e-02
02
[151] -1.297684e-02 -1.470661e-02 4.522572e-02 8.997781e-02 -9.581759e-03
03
[156] -6.438684e-03 1.533876e-02 -1.868957e-02 -3.882295e-02 -2.214234e-02
02
[161] 1.027998e-02 1.366520e-02 2.373703e-02 -2.867420e-02 -1.324331e-02
02
[166] -3.670674e-04 2.046711e-02 -3.178689e-02 7.397570e-03 -7.893068e-03
03
[171] -3.451174e-02 1.475658e-02 2.457261e-02 -2.646821e-02 -2.953077e-02
02
[176] 3.545980e-02 -1.533498e-02 -1.233679e-02 1.781340e-02 -9.576778e-02
02
[181] 6.703415e-02 5.715886e-02 -7.789452e-02 -4.322697e-02 -2.540397e-02

02
[186] 2.985293e-02 -1.933064e-02 -1.097702e-01 1.384916e-01 -4.468884e-02
02
[191] -3.242609e-02 -5.358330e-03 -2.677323e-02 -1.085512e-01 4.183268e-02
02
[196] -8.584987e-02 4.454066e-03 9.765107e-02 -1.046086e-01 -1.367595e-01
01
[201] 3.171667e-02 7.132503e-03 4.478692e-02 -5.311284e-02 -4.789451e-03
03
[206] 6.579309e-03 -2.739895e-02 1.258349e-02 1.224778e-01 1.505412e-02
02
[211] -3.169016e-03 9.302596e-03 -2.601651e-02 4.693607e-02 -1.173128e-01
01
[216] -9.604185e-02 4.127917e-02 -1.535834e-02 -4.559692e-02 -1.080040e-01
01
[221] 7.796794e-02 -7.340653e-02 -5.059985e-02 -3.200060e-02 -7.003413e-02
02
[226] -2.285929e-02 7.795407e-02 1.153445e-01 -7.320731e-03 4.109684e-02
02
[231] -2.908078e-02 -5.363815e-02 1.763459e-02 9.312324e-02 4.561465e-02
02
[236] 1.967027e-02 6.322923e-02 -3.116852e-03 -3.071079e-02 -2.960905e-02
02
[241] 6.031963e-02 -4.796096e-02 7.453217e-02 1.039578e-02 -2.090091e-02
02
[246] -1.003518e-02 -3.392810e-02 2.457553e-02 7.023279e-03 6.588250e-03
03
[251] -4.705387e-02 2.715786e-02 1.019189e-02 5.832740e-02 -5.534286e-03
03
[256] 5.925239e-02 -2.043028e-02 1.693774e-02 -2.929082e-02 -6.685908e-02
02
[261] -9.093218e-03 -5.925331e-02 5.905822e-02 2.911757e-03 -6.300157e-02
02
[266] 4.243957e-02 -1.194303e-02 1.372242e-02 -1.994866e-02 -2.426913e-02
02
[271] 3.887161e-02 -7.174677e-03 1.624589e-01 3.884757e-02 3.912648e-02
02
[276] -4.059910e-02 3.413086e-02 5.196607e-02 2.401115e-03 -5.231171e-02
02
[281] 1.635552e-02 -6.140816e-03 -1.100433e-02 -2.545525e-02 1.096566e-02
02
[286] -6.435665e-03 3.036527e-02 -3.424678e-02 6.112991e-02 -2.923418e-02
02
[291] -2.173858e-02 3.854837e-02 -4.417866e-02 -4.688976e-03 4.917580e-02
02
[296] -6.171904e-04 -4.872082e-02 -1.964368e-02 8.277282e-02 4.216637e-02
02
[301] 1.506003e-02 -1.374706e-02 -2.433573e-02 6.320294e-02 -1.402984e-03
03
[306] -1.627167e-02 -1.998997e-03 7.726840e-02 -3.733849e-02 -5.646914e-02

03
[311] 1.766112e-02 -4.397070e-02 1.296163e-02 2.761128e-02 8.166664e-04
[316] 3.791120e-02 2.368918e-02 -2.305656e-03 -3.231557e-02 1.928092e-02
[321] 3.560167e-02 -1.045951e-02 -2.202989e-02 -3.304502e-02 3.343284e-02
[326] 1.030274e-02 -6.168989e-03 1.497038e-02 5.825002e-03 1.764638e-02
[331] 4.665551e-02 -1.599220e-02 -8.699733e-03 -3.218750e-02 9.107401e-03
[336] -1.956414e-02 1.020574e-02 2.635172e-02 1.098397e-03 -3.361159e-02
[341] -1.691831e-02 8.431356e-03 -8.687628e-03 -4.918184e-02 1.232474e-02
[346] -2.030884e-02 3.142987e-02 2.496575e-02 1.283176e-03 -2.611710e-02
[351] -4.221900e-03 3.571071e-02 -1.659290e-02 7.108673e-03 4.369440e-03
[356] 6.286212e-02 2.238459e-02 8.792235e-03 -1.868745e-03 2.357394e-02
[361] -1.379978e-02 8.302439e-03 -5.642891e-03 -1.044839e-02 -1.896776e-02
[366] -1.076170e-02 -1.246031e-02 6.067555e-03 -1.284717e-02 1.659061e-02
[371] -4.701404e-02 -1.874663e-02 2.026233e-02 3.629528e-02 2.023195e-02
[376] -1.018570e-02 7.559356e-03 -2.493224e-02 -2.833878e-02 -1.550051e-02
[381] -3.213690e-02 2.261729e-02 9.520536e-03 -6.036181e-03 4.828051e-02
[386] 5.874710e-03 3.123410e-02 1.828285e-02 -3.023566e-03 2.734568e-02
[391] 8.802147e-03 -2.475060e-03 5.563715e-02 -8.188165e-02 -2.635938e-02
[396] 8.745645e-03 -7.559501e-03 2.053667e-02 -3.840365e-03 1.940059e-02
[401] -1.893412e-02 -1.775570e-02 2.132724e-03 1.001271e-02 -1.036756e-02
[406] -1.047669e-02 2.831726e-02 -1.594749e-02 -1.213028e-02 -3.061489e-02
[411] 1.299223e-02 1.065899e-02 1.304652e-02 1.076386e-02 -5.899367e-03
[416] -3.675747e-03 -2.259551e-03 3.683209e-03 -1.855509e-02 -1.915326e-02
[421] -2.532088e-02 -1.296873e-02 4.086638e-03 5.212392e-03 2.541333e-02
[426] 1.642831e-02 1.938784e-02 8.195326e-03 -8.076528e-03 -3.703851e-03
[431] 8.211164e-02 -2.871118e-03 -1.770567e-03 3.096202e-03 3.461879e-

02
[436] -1.472082e-02 -2.927280e-03 -1.741273e-02 1.849785e-02 -5.328170e-03
[441] 1.772203e-02 -2.516397e-02 -1.315718e-02 -1.322000e-02 2.494819e-02
[446] 3.310590e-02 1.321431e-02 5.132805e-03 -2.229264e-02 1.305541e-02
[451] 2.735638e-02 -1.498979e-02 -7.212951e-03 -6.736640e-03 3.163989e-03
[456] -1.656139e-02 3.209485e-04 2.374022e-01 5.059995e-02 -2.083454e-02
[461] -3.529220e-03 7.673483e-03 -3.121413e-02 2.519683e-04 -3.962842e-03
[466] -1.078697e-02 2.953356e-02 4.530601e-02 3.717083e-03 2.710239e-02
[471] -1.845702e-03 4.760650e-03 1.852043e-02 -1.043223e-02 -2.587344e-03
[476] 3.049535e-04 -1.767326e-02 5.180558e-03 2.543380e-02 -4.511017e-04
[481] 8.165571e-03 -1.723365e-02 3.116237e-02 1.887769e-02 2.671593e-02
[486] -7.620966e-03 -2.575893e-02 -2.479999e-02 -7.452777e-04 -2.109903e-02
[491] 3.052436e-02 -9.127529e-03 -2.086415e-02 -8.791533e-03 -1.446309e-02
[496] -1.136028e-02 1.229510e-02 3.299561e-02 7.203989e-03 3.807005e-02
[501] -3.388735e-03 6.047676e-03 7.177424e-04 -2.116746e-02 -1.453817e-02
[506] -4.619654e-03 5.882663e-03 -1.828210e-02 -1.715938e-02 2.671690e-02
[511] -2.435007e-02 -2.296161e-02 1.372537e-02 -1.372577e-02 -1.650361e-03
[516] 3.690183e-03 -1.444483e-02 6.655801e-03 -4.185273e-02 -9.265795e-03
[521] -6.922908e-03 2.700117e-02 2.637023e-02 -4.931138e-03 -5.355796e-02
[526] -6.328986e-03 8.262769e-03 -2.689033e-02 1.242845e-02 -4.781413e-03
[531] 1.021861e-02 -5.693175e-03 2.299556e-02 -3.587427e-03 -1.796033e-02
[536] -1.043425e-02 1.510337e-02 -4.754284e-03 4.161330e-03 -6.546381e-03
[541] 2.093238e-02 -1.277728e-02 1.690570e-03 5.055812e-02 7.917573e-03
[546] 2.863895e-03 2.075414e-02 2.952637e-03 9.265938e-03 -9.964481e-03
[551] 1.303369e-02 2.325060e-02 -1.326357e-02 -5.247745e-03 5.020377e-03
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[786] 1.619416e-02 6.162970e-03 -7.326775e-03 -1.283097e-02 6.090416e-03
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02
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02
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[1136] 9.155807e-04 -1.081932e-02 -8.891412e-03 0.000000e+00 -2.497018e-02
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[1141] -5.161297e-03 -1.387988e-02 1.397095e-02 -1.095782e-02 4.249956e-03
03
[1146] 2.485908e-03 3.922648e-02 9.329346e-03 -1.003720e-02 -1.322811e-02
02
[1151] -2.722321e-02 1.354485e-02 7.573622e-02 -5.196478e-03 -1.188738e-02
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[1156] -5.199494e-03 -5.530264e-03 1.786251e-02 -4.179723e-03 1.092312e-02
02
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03
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03
[1181] 2.074042e-02 3.040311e-02 -7.942458e-03 -5.538308e-03 -1.560122e-

```

04
## [1186]  1.787332e-02  3.950188e-03 -1.259498e-02  2.902783e-03  1.126036e-
02
## [1191] -3.330540e-03 -1.288870e-02 -1.040494e-02 -9.245609e-03 -1.111252e-
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## [1196]  2.733984e-02 -8.886367e-03 -9.124502e-03 -5.610711e-03  2.100680e-
02
## [1201]  1.762280e-02 -7.553456e-03  2.125739e-03 -3.176625e-02 -2.407653e-
02
## [1206] -3.147950e-03 -7.645150e-03  7.480948e-03 -9.834835e-04  1.444812e-
02
## [1211] -1.072430e-02 -2.000681e-02 -2.625876e-02  2.264434e-03 -2.515269e-
02
## [1216] -2.467904e-02  6.646541e-02 -2.269868e-02 -3.239241e-03  1.215261e-
03
## [1221]  8.174498e-03  1.368986e-02 -2.342115e-02 -2.050888e-02 -4.584493e-
03
## [1226]  7.067502e-04  5.738353e-04 -1.623914e-02 -1.060099e-02  2.077568e-
02
## [1231]  1.969576e-02  1.756287e-02  1.801574e-02  7.741954e-03  1.547071e-
02
## [1236] -8.964016e-04  1.512011e-02  1.669486e-02  3.099193e-03 -6.851417e-
03
## [1241]  8.588017e-03  5.813071e-03 -2.325702e-03 -4.020808e-04 -2.194811e-
02
## [1246]  1.171610e-02  4.258918e-03 -2.028055e-03 -8.232797e-03  1.856755e-
02
## [1251]  2.543575e-02 -9.298094e-03  1.351328e-02 -1.766918e-02  6.595204e-
03
## [1256] -3.938865e-02 -1.293837e-03 -1.268512e-02  2.294181e-02

```

```
basicStats(logrA)
```

```

##          logrA
## nobs      1259.000000
## NAs        0.000000
## Minimum   -0.136759
## Maximum    0.237402
## 1. Quartile -0.013283
## 3. Quartile  0.014466
## Mean       0.000791
## Median     -0.000451
## Sum        0.996211
## SE Mean    0.000810
## LCL Mean   -0.000798
## UCL Mean    0.002380
## Variance   0.000826
## Stdev      0.028736
## Skewness   0.627148
## Kurtosis   7.249289

```

```
logrV <- log(simplerV+1)
logrV
```

```
## [1] -1.186916e-02 -9.514525e-04 -2.598367e-02 2.019796e-04 -1.716752e-02
## [6] 9.958252e-03 8.363925e-03 -1.400359e-02 1.040666e-02 -2.504297e-02
## [11] -6.691337e-03 -2.809911e-02 -5.583559e-03 -9.464649e-03 1.959182e-02
## [16] 1.247091e-02 -1.308119e-02 1.702328e-02 6.362715e-03 -5.376427e-03
## [21] 1.483836e-02 1.585760e-02 -9.018545e-03 -3.132969e-02 -8.027131e-03
## [26] 7.696307e-03 -2.063127e-03 5.787222e-03 6.253407e-03 1.426872e-02
## [31] -1.329803e-02 -4.531026e-04 6.098140e-04 8.823954e-03 -1.190863e-02
## [36] 6.763079e-03 1.497137e-02 8.196318e-03 -7.522829e-04 -7.736852e-03
## [41] -2.648875e-02 -4.210886e-04 -4.797490e-03 6.912057e-03 -2.226299e-02
## [46] -8.781444e-03 -1.837173e-02 3.514994e-02 -7.033678e-03 7.271498e-03
## [51] -2.020373e-02 -1.504663e-02 3.881582e-02 -2.642611e-02 2.097645e-02
## [56] 1.744397e-02 5.716629e-03 -6.434658e-03 -1.018368e-02 -7.998906e-03
## [61] 5.288989e-03 3.162463e-02 3.729305e-04 2.674421e-03 1.959080e-03
## [66] 1.720519e-03 -3.183061e-03 -9.023590e-03 5.598300e-03 -1.973853e-02
## [71] -2.555262e-03 5.066145e-03 2.387862e-02 -1.210733e-03 1.642339e-02
## [76] -5.481502e-04 -9.313234e-03 1.117376e-03 5.051221e-03 6.901132e-03
## [81] 2.559672e-04 -5.688147e-03 -1.535178e-03 1.443334e-02 3.248717e-03
## [86] -2.635470e-03 8.397641e-03 -1.602370e-02 4.607370e-03 -4.586502e-03
## [91] 1.093895e-02 7.727014e-04 3.044361e-03 1.108830e-02 2.435033e-03
## [96] -2.000200e-04 -5.991916e-03 -1.546091e-02 2.908765e-03 -1.161418e-02
## [101] 4.888034e-03 5.696743e-03 4.367449e-03 3.249714e-03 -9.040745e-03
## [106] -4.863809e-03 -8.933990e-04 2.004279e-02 -2.705367e-02 -5.781671e-04
## [111] -4.999477e-03 -1.530452e-02 1.443957e-03 1.459103e-02 3.266659e-03
## [116] -3.940755e-03 -8.308420e-03 2.406103e-03 -1.763560e-02 -8.473589e-03
```

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## [1251] 1.104083e-02 -4.654817e-03 4.871117e-03 -8.525237e-03 -2.208437e-
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## [1256] -4.969327e-03 -6.732266e-04 -9.319290e-03 1.628763e-02
```

```
basicStats(logrV)
```

```
##          logrV
## nobs      1259.000000
## NAs        0.000000
## Minimum   -0.094050
## Maximum    0.108760
## 1. Quartile -0.006348
## 3. Quartile 0.007348
## Mean       0.000072
## Median     0.000818
## Sum        0.090160
## SE Mean    0.000470
## LCL Mean   -0.000850
## UCL Mean    0.000993
## Variance   0.000278
## Stdev      0.016673
## Skewness   -0.317276
## Kurtosis    6.194861
```

```
logrE <- log(simplerE+1)
```

```
logrE
```

```
## [1] -6.616843e-03 -4.554355e-03 -2.267208e-02 -1.855721e-03 -1.413239e-
02
## [6] -4.340942e-04 9.652267e-03 -1.135927e-02 7.766760e-03 -1.859889e-
02
## [11] -8.800387e-05 -2.183261e-02 -7.343901e-03 -1.038979e-02 1.805208e-
02
## [16] 1.101214e-02 -1.541187e-03 1.341758e-02 7.653636e-03 -2.548244e-
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## [21] 1.504033e-02 1.562824e-02 -3.030588e-03 -2.179990e-02 -7.260292e-
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## [26] 5.176578e-03 -2.754791e-03 2.810048e-03 4.105561e-03 1.308403e-
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## [31] -1.373084e-02 -4.066256e-03 2.550744e-03 5.094998e-03 -9.716048e-
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## [41] -2.036190e-02 -5.186426e-03 -6.735634e-03 3.276626e-03 -2.164763e-
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## [46] -7.679411e-03 -2.103775e-02 2.672859e-02 -4.194786e-03 7.444223e-
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## [1221]  3.171964e-03  6.015868e-03 -1.806622e-02 -9.635270e-03 -5.261384e-
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## [1241] -1.109615e-03 -1.900018e-05  7.567136e-04  1.167318e-03  2.702345e-
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## [1246]  7.294332e-03 -2.990447e-04 -4.088346e-03  8.626278e-04  6.495856e-
03
## [1251]  9.480914e-03  9.135826e-04  4.193196e-03 -5.645908e-03 -2.536213e-
03
## [1256] -3.264322e-03 -1.789600e-03 -4.140560e-03  1.485807e-02

```

```
basicStats(logrE)
```

```

##          logrE
## nobs      1259.000000
## NAs        0.000000
## Minimum   -0.081470
## Maximum    0.102035
## 1. Quartile -0.006385
## 3. Quartile  0.007749
## Mean       0.000398
## Median     0.001209
## Sum        0.501599
## SE Mean    0.000435
## LCL Mean   -0.000454
## UCL Mean    0.001251
## Variance   0.000238
## Stdev      0.015420

```

```
## Skewness      -0.333442
## Kurtosis      5.193084
```

```
logrSP <- log(simplerSP+1)
logrSP
```

```
## [1] -1.454324e-02  0.000000e+00 -2.485843e-02  3.217817e-03 -1.852249e-02
## [6]  1.353203e-02  7.916581e-03 -1.368826e-02  1.081234e-02 -2.524089e-02
## [11] -5.627806e-03 -2.952459e-02 -6.063345e-03 -1.114690e-02  2.121535e-02
## [16]  1.001271e-02 -1.599931e-02  1.740367e-02  6.133154e-03 -4.775384e-03
## [21]  1.663290e-02  1.216372e-02 -1.051812e-02 -3.251803e-02 -7.653211e-03
## [26]  7.855068e-03 -4.212862e-03  5.871728e-03  7.239730e-03  1.351230e-02
## [31] -1.351188e-02  8.376491e-04 -8.964016e-04  8.306406e-03 -1.295050e-02
## [36]  7.850107e-03  1.371847e-02  6.894180e-03 -9.194225e-04 -8.982220e-03
## [41] -2.746370e-02  5.338575e-04 -3.453958e-03  5.224329e-03 -2.225992e-02
## [46] -8.445564e-03 -1.558380e-02  3.645728e-02 -9.036708e-03  5.113902e-03
## [51] -2.100201e-02 -8.999373e-03  4.153534e-02 -2.458679e-02  2.366184e-02
## [56]  1.520482e-02  2.301350e-03 -8.804647e-03 -1.152617e-02 -7.981770e-03
## [61]  5.670890e-03  3.526675e-02 -1.935873e-03  1.301153e-03  7.956834e-04
## [66]  1.560781e-03 -5.113049e-03 -8.124918e-03  4.464021e-03 -2.058441e-02
## [71] -3.389739e-03  4.589452e-03  2.243739e-02  6.228060e-04  1.797645e-02
## [76] -1.555209e-03 -8.849037e-03  2.895803e-03  6.421339e-03  6.473998e-03
## [81] -1.052554e-03 -3.896582e-03 -3.853415e-03  1.699575e-02  3.230775e-03
## [86] -4.544310e-03  7.622872e-03 -1.828007e-02  3.662286e-03 -6.747715e-03
## [91]  1.096071e-02 -3.850741e-04  3.997997e-03  1.052937e-02  1.249219e-03
## [96]  8.975970e-04 -9.317271e-03 -1.618325e-02  2.613582e-03 -1.329803e-02
## [101]  6.822673e-03  3.955168e-03  5.320819e-03  1.514852e-03 -1.055956e-02
## [106] -5.804815e-03 -3.270535e-04  1.930839e-02 -3.137612e-02  7.936849e-04
```

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[1006] 7.899688e-05 -1.255650e-02 1.065009e-02 -4.300233e-03 1.535550e-02
[1011] 1.879823e-04 2.939675e-03 -2.540224e-03 2.259446e-03 8.846752e-03
[1016] 3.099520e-04 2.334273e-03 -4.960282e-03 3.546703e-03 1.104676e-02
[1021] 4.926843e-03 6.687763e-04 4.708891e-04 -1.026527e-03 8.634614e-03
[1026] -5.762572e-03 -1.594270e-03 -2.525186e-03 -4.571045e-04 8.860628e-03
[1031] 1.094401e-03 1.449937e-02 -4.240899e-04 2.020956e-03 2.157671e-03
[1036] 1.472915e-03 -6.909818e-03 6.776984e-03 -9.404421e-04 -5.397541e-03
[1041] 1.096566e-02 2.346245e-03 7.197409e-04 -3.345590e-03 4.262901e-03
[1046] 1.670604e-03 1.354083e-03 3.350381e-03 -4.748255e-03 6.139117e-03
[1051] -3.251280e-03 -3.877508e-03 -1.548934e-02 6.877297e-03 9.770117e-03
[1056] 3.624424e-03 1.599872e-04 1.796958e-02 -1.196716e-03 5.949268e-03
[1061] 1.118374e-03 3.966125e-03 -3.005512e-03 -1.872753e-03 -7.233096e-03
[1066] 3.104177e-03 1.379047e-02 -2.820975e-03 -4.954252e-03 -1.609294e-03
[1071] 3.691179e-03 7.476978e-03 -3.996977e-03 -1.025440e-02 -6.291979e-04
[1076] -1.142299e-02 -1.722856e-02 7.421393e-03 1.368493e-02 -1.255347e-02
[1081] -5.041271e-04 1.536830e-02 -4.063244e-03 -5.951676e-03 1.168317e-03
[1086] -8.443547e-03 3.673245e-03 1.355275e-02 6.657788e-03 2.411091e-03
[1091] -3.891562e-03 5.642054e-03 -2.500123e-03 -7.688481e-03 -1.627878e-02
[1096] 3.509384e-04 -4.288181e-03 -6.724559e-03 2.513838e-03 -3.392749e-03
[1101] -1.117521e-02 -5.762572e-03 -4.413726e-03 -1.516542e-02 -7.415426e-03
[1106] 1.590878e-02 4.858819e-04 1.692567e-03 1.379049e-03 -2.168349e-03

[1111] 1.101808e-02 -1.443874e-02 -2.279596e-03 -2.495172e-02 1.099940e-04
[1116] 5.710663e-03 2.278738e-02 -1.060056e-04 8.081258e-03 -1.270031e-02
[1121] 1.158365e-02 -7.047777e-03 1.075694e-02 1.028493e-02 1.443957e-03
[1126] 9.768136e-03 -1.687423e-03 -2.251354e-02 7.149382e-03 -1.608365e-02
[1131] 4.761645e-03 8.944875e-03 -2.112229e-03 2.461456e-02 2.455982e-03
[1136] 6.212661e-03 -4.698018e-03 -9.477773e-03 -1.640345e-03 -8.159196e-03
[1141] -1.500011e-05 -4.999477e-03 1.636240e-02 -2.316681e-03 7.382681e-03
[1146] 6.658781e-03 2.713316e-03 -1.011296e-02 -8.948922e-03 -9.082118e-03
[1151] -3.140493e-04 1.640569e-02 1.890124e-02 -4.831167e-04 -4.326345e-03
[1156] -3.034600e-03 -7.401322e-03 1.886101e-02 2.326292e-03 5.094004e-03
[1161] 6.208073e-04 4.139143e-04 2.185610e-03 -1.252784e-03 -1.280082e-04
[1166] 1.139351e-03 7.075907e-03 1.870250e-03 -2.100022e-05 -3.504132e-03
[1171] 2.259745e-04 -8.104755e-03 6.434256e-03 -4.891196e-04 -8.083266e-04
[1176] 8.436440e-04 -7.836626e-03 5.060176e-03 -1.166680e-03 -1.068571e-03
[1181] 2.022999e-02 4.041821e-03 -6.166977e-03 3.130096e-03 2.090813e-03
[1186] 1.617842e-02 3.951184e-03 -3.129893e-03 -1.280820e-03 1.184298e-03
[1191] -5.411464e-04 -7.500281e-05 -2.235497e-03 -1.055754e-02 -5.753520e-03
[1196] 9.602746e-03 -4.488056e-03 2.648490e-03 8.716200e-04 3.617449e-03
[1201] 7.148389e-03 -3.220519e-04 -3.462989e-03 -9.940241e-03 -6.207225e-03
[1206] 1.949810e-04 -2.970407e-03 8.045548e-03 1.021762e-02 4.108548e-03
[1211] -2.446991e-03 -1.670983e-02 4.399032e-04 -1.454933e-02 -3.089768e-03
[1216] 2.991521e-03 -7.292658e-04 1.559878e-04 1.086773e-02 -9.423260e-03
[1221] 2.161662e-03 7.822326e-03 -2.399048e-02 -1.228009e-02 1.697558e-03
[1226] 1.299916e-04 -3.992961e-03 -1.394883e-02 -1.595272e-03 4.828325e-03
[1231] 1.966732e-02 6.627803e-04 2.317313e-03 1.294189e-02 -2.032063e-03

```
## [1236] -5.240709e-03  7.825302e-03  4.260909e-03  1.619869e-04 -4.756293e-03
## [1241] -1.711464e-03  1.583745e-03  3.301544e-03  2.916742e-03  3.379429e-04
## [1246]  6.527648e-03  4.478997e-04 -6.341062e-03 -4.143573e-03  1.180109e-02
## [1251]  1.142153e-02 -7.617943e-03  5.472996e-03 -9.423260e-03 -2.442982e-03
## [1256] -4.798494e-03 -1.218742e-03 -1.111150e-02  1.680008e-02
```

```
basicStats(logrSP)
```

```
##                logrSP
## nobs            1259.000000
## NAs              0.000000
## Minimum         -0.094695
## Maximum          0.109572
## 1. Quartile     -0.006320
## 3. Quartile      0.006954
## Mean            -0.000023
## Median           0.000685
## Sum             -0.029133
## SE Mean          0.000468
## LCL Mean        -0.000941
## UCL Mean         0.000894
## Variance         0.000275
## Stdev            0.016594
## Skewness        -0.242090
## Kurtosis         6.952089
```

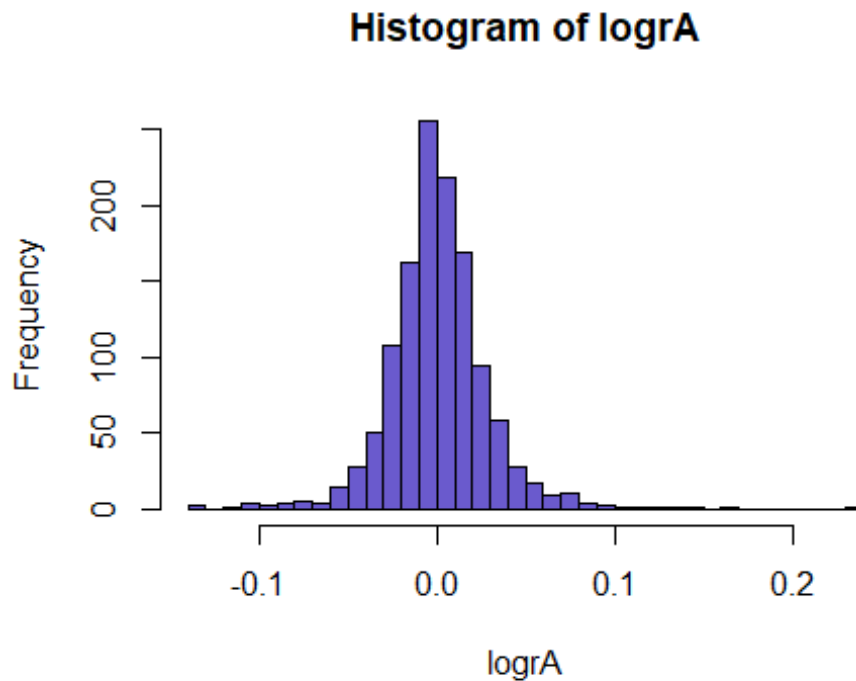
```
#2c
```

```
t.test(logrA)
```

```
##
## One Sample t-test
##
## data:  logrA
## 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
```

As p-value is higher than 0.05 significant level, we cannot reject H0 and says that mean of log return of AMZN is zero.

```
#2d
hist(logrA, breaks=40 , col='slateblue')
```



```
#3
da2 = read.table("m-abt3dx.txt" , header = TRUE)
```

```
simplerABT= da2[,2]
basicStats(simplerABT)
```

```
##          simplerABT
## nobs      492.000000
## NAs        0.000000
## Minimum   -0.234146
## Maximum    0.382326
## 1. Quartile -0.024230
## 3. Quartile  0.055840
## Mean       0.014073
## Median     0.014083
## Sum        6.923863
## SE Mean    0.002921
## LCL Mean   0.008333
## UCL Mean   0.019812
## Variance   0.004198
## Stdev      0.064795
## Skewness   0.097058
## Kurtosis   2.469971
```

```
simplerVW= da2[,3]
basicStats(simplerVW)

##          simplerVW
## nobs          492.000000
## NAs            0.000000
## Minimum       -0.225363
## Maximum        0.165585
## 1. Quartile   -0.017196
## 3. Quartile    0.039484
## Mean           0.009020
## Median         0.012626
## Sum            4.437612
## SE Mean        0.002089
## LCL Mean       0.004915
## UCL Mean       0.013124
## Variance       0.002147
## Stdev          0.046341
## Skewness       -0.555341
## Kurtosis       2.073657
```

```
simplerEW= da2[,4]
basicStats(simplerEW)

##          simplerEW
## nobs          492.000000
## NAs            0.000000
## Minimum       -0.272248
## Maximum        0.299260
## 1. Quartile   -0.020694
## 3. Quartile    0.044462
## Mean           0.011583
## Median         0.014379
## Sum            5.699074
## SE Mean        0.002583
## LCL Mean       0.006508
## UCL Mean       0.016659
## Variance       0.003283
## Stdev          0.057299
## Skewness       -0.200025
## Kurtosis       3.288104
```

```
simplerSP1= da2[,5]
basicStats(simplerSP1)

##          simplerSP1
## nobs          492.000000
## NAs            0.000000
## Minimum       -0.217630
## Maximum        0.163047
## 1. Quartile   -0.018948
```

```
## 3. Quartile    0.035349
## Mean           0.006386
## Median         0.009091
## Sum            3.142113
## SE Mean        0.002019
## LCL Mean       0.002419
## UCL Mean       0.010354
## Variance       0.002006
## Stdev          0.044788
## Skewness       -0.444303
## Kurtosis       1.889777
```

```
logrABT <- log(simplerABT+1)
logrABT
```

```
## [1] 0.0384001843 0.0739741775 -0.0300108544 0.0216284105
0.0531397387
## [6] 0.0376781779 0.0428008353 -0.0187211523 -0.0583634926
0.0069875302
## [11] -0.0338443119 -0.0368144106 0.0508290366 -0.0034128170
0.0467528522
## [16] -0.0755396118 -0.0619509385 -0.0075474102 0.0859694177 -
0.0817893989
## [21] -0.0210530688 0.0534763099 -0.1680589530 -0.1400888458
0.0426848982
## [26] 0.0448720221 -0.0046297005 0.0356450975 0.0178575997 -
0.0223724064
## [31] -0.0687339764 -0.2667637279 -0.1964334630 0.3237675875
0.0655976476
## [36] 0.0714588950 0.0998679591 0.1122870716 0.1099587277
0.0402557542
## [41] 0.0239733296 0.0316430365 -0.0117406525 -0.0134226825 -
0.0735884148
## [46] 0.1249492966 0.0564417682 0.0060794824 0.0461896429 -
0.0692000358
## [51] 0.1229616037 -0.0061901193 -0.0083921155 -0.0056338403
0.0676063107
## [56] 0.0716422920 0.0291995144 0.0207893952 -0.0938964795
0.0179725223
## [61] -0.0766553679 -0.0055403193 -0.0339012068 -0.0380716136 -
0.0555697940
## [66] 0.1195450380 0.0532070620 0.0549161240 0.0423475503 -
0.0261940892
## [71] 0.0751872467 0.0545592055 -0.0916888448 0.0024360305
0.0727168622
## [76] 0.0863850142 0.0508756072 0.0273991904 0.1450860052 -
0.0376115286
## [81] -0.0282708820 -0.0872848689 0.0000000000 0.0610875735 -
0.0011857027
## [86] -0.1145234788 0.0956901076 -0.0114725589 -0.0275068689
```

0.0840184861
[91] 0.0359750671 0.0553779408 0.0331155762 -0.0032623156
0.0481633011
[96] 0.0308666845 -0.0530548450 -0.0394791465 -0.0169213621
0.0987170969
[101] 0.0604410756 -0.0117993392 0.1393749110 -0.0052085409
0.0729883456
[106] -0.0285589523 0.0726712978 0.0545592055 -0.0214677929
0.0849255365
[111] 0.0020858232 -0.0320067961 -0.0352459032 0.1222574549 -
0.1202857899
[116] -0.0603435988 -0.0047964848 0.0849420708 0.0519594225 -
0.0927821779
[121] 0.0776469170 -0.0086583758 0.0086584076 0.0572929603 -
0.0547508438
[126] -0.0086956982 0.0580217078 0.1499929054 -0.0035773912
0.0715035837
[131] 0.0264919684 0.0129872988 0.0462679384 -0.0062112499
0.0692004499
[136] 0.0836138620 -0.0695687516 0.1039184764 0.0154638165 -
0.0339901763
[141] 0.0288352396 0.0503888855 -0.1205644001 0.0083222736 -
0.0308582562
[146] -0.0320264143 -0.0269879198 0.0799962451 -0.1135551109
0.0993293648
[151] 0.0040029774 0.0826918111 -0.1267521381 -0.0048165811
0.0030353885
[156] 0.0120481289 0.1300822010 0.0131412740 0.1016988198 -
0.0316268993
[161] 0.0594710155 0.0583123034 -0.0269396353 0.0419026904 -
0.0196294023
[166] 0.0320789250 0.0664148847 0.0938491130 0.0105471824
0.0269077184
[171] 0.1998659172 0.0048581799 0.0699588048 0.1502820635 -
0.0631624018
[176] -0.0125159994 -0.1698054115 0.0313833503 0.0916033179 -
0.0323475873
[181] 0.1793036742 0.1025981037 0.0000000000 -0.0041576310
0.0062563879
[186] 0.0367387896 0.0139305182 -0.0039758934 -0.0616211807 -
0.1655139985
[191] -0.1429077854 0.1122933281 0.0154244295 0.0645388336 -
0.1037595756
[196] -0.0204751934 0.0163043586 -0.0300984478 0.0093996842
0.0327004640
[201] 0.0342593876 0.0010354637 -0.0425599622 0.0451607286
0.0241226941
[206] 0.0424529837 0.0685040854 0.0154057201 0.0698972624 -
0.0213227221
[211] 0.1307255850 -0.0387647371 0.0078739192 0.0286068930

0.0594973985
[216] -0.0182159068 -0.0397506936 -0.0135534342 0.0250252402
0.0213670892
[221] 0.1148658961 0.0908995582 0.0640052540 -0.0838817340 -
0.0221178053
[226] 0.0519195482 0.0620579471 0.0310324731 -0.0290859241
0.0639996260
[231] 0.0344400733 0.0581707901 0.0147063299 0.0072724912
0.0448720221
[236] 0.0069368841 -0.0069359985 0.0929874844 -0.0214596193
0.1783369622
[241] -0.0714594825 -0.0039216797 -0.0421322275 0.0833158068
0.0094254406
[246] -0.1131037506 0.0257983425 0.0041065565 -0.0766326950
0.0313610607
[251] 0.0585943269 -0.0122699691 -0.0939942460 -0.0512932944 -
0.0144580152
[256] 0.0853755397 -0.0272745930 -0.0568878622 -0.0179155290
0.0392207132
[261] 0.0515340154 0.0418518640 0.0303710936 0.0127395068
0.0015178475
[266] -0.0656687596 -0.0368704372 0.0703317082 0.0515131202 -
0.0297264863
[271] -0.0239044483 0.0645388336 0.0448136971 -0.0059134500
0.0278349872
[276] 0.0232564599 0.0862831953 0.0035277701 0.0070173209
0.1019002358
[281] 0.0157483413 0.0124225200 -0.0071857558 -0.0317486983
0.0953101798
[286] -0.0645619881 0.0217742119 0.0243169323 0.0257320722 -
0.0178045648
[291] -0.0242435135 0.0028180256 0.0597187999 0.0086584076
0.0140389906
[296] 0.0253177830 0.0902464718 0.0347202165 0.0917210192 -
0.0917206300
[301] 0.0756833734 0.0316052505 -0.0022244723 0.0877086338
0.0322609733
[306] 0.0578197507 -0.0157412459 -0.0877935010 0.0646035190 -
0.0375284658
[311] 0.0603243414 0.0057414861 0.0817910246 0.0549492532
0.0066607678
[316] -0.0253813997 0.0144254511 0.1001231244 0.0187255769 -
0.0780426258
[321] 0.1206651007 0.0820112304 0.0210538050 0.0206189607 -
0.0504883553
[326] -0.0026956299 0.0107381393 0.0363406081 -0.0681621452
0.0041404166
[331] -0.0512638211 0.0101374421 -0.1674475257 0.0999765481 -
0.0606251218
[336] -0.0454242353 -0.1037939656 0.0133465374 0.0641834581

0.0932735619
[341] 0.0568877661 0.0909716912 -0.0636375938 0.0497906159
0.0835531542
[346] 0.1082946070 0.0417214299 -0.1281948005 -0.0725008028
0.0880694837
[351] -0.0374339903 -0.0127965274 0.1139909660 -0.0796581150
0.1140721589
[356] -0.0753573677 0.0423504259 0.0255156884 0.0374190912
0.0135438664
[361] 0.0380122910 -0.0201323016 -0.0724094155 0.0296879201 -
0.1273278175
[366] -0.2323962256 0.1008484516 -0.0338929310 0.0092005449
0.0413367420
[371] 0.0446071418 -0.0902978625 -0.0419945567 -0.0678314034
0.0543631775
[376] 0.0832486401 0.0921050489 -0.0178921135 -0.1025455924
0.0264004217
[381] 0.0543281346 0.0073757323 0.0364013579 0.0528760911 -
0.0728707378
[386] -0.0065212170 -0.0405303704 0.0745247424 -0.0040270979 -
0.0109800608
[391] -0.0286196634 0.0577650076 0.0159432286 0.0124343718 -
0.0158418217
[396] 0.1059560383 -0.0298078733 0.0213171661 0.0136060169
0.0586292206
[401] -0.0188913227 0.0158359469 -0.0438996423 -0.0326967605 -
0.0623989450
[406] 0.0215814364 -0.1324371344 0.0446014035 0.0965085524
0.0235895654
[411] -0.0394739452 0.0132162790 -0.0009364383 0.0210870961
0.0972673542
[416] 0.0192809226 -0.0028791408 -0.0156701378 -0.0180529788
0.0429972270
[421] 0.0899586130 0.0301081659 0.0213739412 0.0203123013 -
0.0047804080
[426] -0.0509659795 -0.0484961574 0.0237829307 0.0324110414
0.0244106216
[431] 0.0515587092 -0.0239321019 0.0063021000 -0.0479452212
0.0294413196
[436] -0.0376914830 0.0660180511 -0.0618562550 0.0680482922
0.0191622262
[441] 0.0026085947 -0.0366121185 -0.0513406639 0.0185331945
0.0445248903
[446] -0.1579458725 0.0075762278 -0.1213273092 0.0739035941
0.0430029745
[451] -0.0357069736 0.0053198246 0.0896057587 0.0298704042
0.0746583921
[456] -0.0092183588 -0.0121120557 0.0249969565 -0.0299201775 -
0.0207140625
[461] -0.0729653944 -0.0165359686 0.0569208301 0.0052830202

```

0.0571135239
## [466] -0.0092304700 -0.0984135904 0.0296568557 -0.0494161100
0.0630705692
## [471] 0.0195584798 0.0683537339 0.0040268812 0.0070560474 -
0.0157056912
## [476] 0.0229232433 -0.0264363821 0.0608777662 0.0125439941
0.0303322894
## [481] -0.0288676911 0.0444273275 0.0794311361 0.0206689186 -
0.0043604931
## [486] 0.0424587343 0.0358023773 -0.0116799458 0.0450488886 -
0.0379033413
## [491] -0.0076632881 0.0076625674

```

```
basicStats(logrABT)
```

```

##          logrABT
## nobs      492.000000
## NAs        0.000000
## Minimum   -0.266764
## Maximum    0.323768
## 1. Quartile -0.024528
## 3. Quartile 0.054337
## Mean       0.011924
## Median     0.013985
## Sum        5.866748
## SE Mean    0.002898
## LCL Mean   0.006230
## UCL Mean   0.017619
## Variance   0.004133
## Stdev      0.064287
## Skewness   -0.297125
## Kurtosis   2.005416

```

```
logrVW <- log(simplerVW+1)
```

```
logrVW
```

```

## [1] 2.798767e-02 3.086765e-02 8.684183e-03 5.489903e-03 1.624238e-
02
## [6] -2.111741e-02 -4.263074e-03 3.533432e-02 -7.700573e-03 8.638580e-
03
## [11] 4.856538e-02 1.118027e-02 -2.783893e-02 -4.538238e-02 -7.881981e-
03
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03
## [416]  2.475310e-02  1.923776e-02  3.645246e-02  2.342840e-02  1.077474e-
02
## [421]  1.924169e-02 -1.405531e-02  1.286588e-02  3.904858e-02  3.819326e-
02
## [426] -1.486595e-02 -3.227116e-02  1.159255e-02  4.004729e-02  2.550692e-
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## [431] -5.047468e-02 -4.428793e-03 -6.416632e-02 -2.189087e-02 -1.047467e-
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## [436]  4.984199e-02  2.356319e-02 -8.168088e-02 -1.341964e-02  1.050859e-
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## [441] -1.031463e-01 -2.040802e-01 -8.840944e-02  2.190727e-02 -8.048581e-
02
## [446] -1.055650e-01  8.313914e-02  1.037824e-01  6.559016e-02 -3.102809e-
03
## [451]  7.855052e-02  3.097430e-02  4.424174e-02 -2.839742e-02  5.552836e-
02
## [456]  2.802267e-02 -3.780364e-02  3.418401e-02  6.166408e-02  1.981341e-
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## [461] -8.244835e-02 -5.205253e-02  6.793244e-02 -4.376173e-02  8.756939e-
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## [466]  3.780914e-02  5.151707e-03  6.499342e-02  1.897778e-02  3.745377e-
02
## [471]  3.368321e-03  2.828420e-02 -1.504562e-02 -1.856629e-02 -2.272630e-
02
## [476] -5.918965e-02 -8.869243e-02  1.079428e-01 -6.245462e-03  3.695164e-
03
## [481]  5.266550e-02  4.036045e-02  2.370969e-02 -6.824232e-03 -6.777576e-
02
## [486]  3.744606e-02  1.021366e-02  2.592600e-02  2.619295e-02 -1.420035e-
02
## [491]  6.171914e-03  1.245610e-02

```

```
basicStats(logrVW)
```

```

##          logrVW
## nobs          492.000000
## NAs            0.000000
## Minimum       -0.255361
## Maximum        0.153223
## 1. Quartile   -0.017345
## 3. Quartile    0.038724
## Mean           0.007903
## Median         0.012547
## Sum            3.888033
## SE Mean        0.002107
## LCL Mean       0.003762
## UCL Mean       0.012043
## Variance       0.002185
## Stdev          0.046745

```

```
## Skewness      -0.839542
## Kurtosis      3.003331
```

```
logrEW<- log(simplerEW+1)
logrEW
```

```
## [1] 0.0988421170 0.0409586252 -0.0009514525 0.0012302429 -
0.0182871961
## [6] -0.0343585526 -0.0299315117 0.0121775517 -0.0312069096 -
0.0138626440
## [11] 0.0498334293 -0.0200731239 -0.0264805350 -0.0756248143 -
0.0294092434
## [16] -0.0732375818 -0.0872826865 -0.0384757907 0.1006793762 -
0.0454336536
## [21] 0.0704538038 0.0003029541 -0.1926773939 -0.0426611848
0.1243163139
## [26] 0.0085860343 0.0083440910 -0.0571387670 -0.0753110032 -
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## [31] -0.0533111183 -0.0896927869 -0.0823223875 0.0851468899 -
0.0527627946
## [36] -0.0841906318 0.2617948716 0.0525146482 0.0783461925
0.0306194047
## [41] 0.0703428931 0.0693320140 -0.0090003822 -0.0493142015 -
0.0396424821
## [46] 0.0146127124 0.0166565070 -0.0005991795 0.1739843991
0.1010129788
## [51] 0.0179469851 -0.0038172765 -0.0198762300 0.0261646993
0.0022335039
## [56] -0.0168135590 0.0168472842 -0.0228449705 0.0263361393
0.0974986924
## [61] 0.0362383858 0.0043903483 0.0105976461 0.0167892682
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## [66] 0.0502205692 0.0122862144 -0.0012337608 0.0148570849 -
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## [71] 0.0684732699 0.0208618700 -0.0112146498 0.0256755440
0.0656369801
## [76] 0.0763284337 0.0654318720 0.0102393980 0.0510675689
0.0894247126
## [81] 0.0061808591 -0.1951393549 0.0374932604 0.0142440698
0.0895307840
## [86] -0.0164027933 0.0808119502 0.0284066825 -0.0068685345
0.0532212846
## [91] 0.0211409470 0.0728935207 -0.0011726873 -0.1030465283
0.0632517561
## [96] 0.0653054145 0.0999620702 -0.0063209351 -0.1803750525
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## [101] 0.0688252574 0.0451416115 0.0855160095 0.0620203532
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## [106] 0.0464302389 0.0669153817 -0.0329530361 0.0055992947
0.0021476921
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[411] 0.0363107140 0.0097433787 -0.0453436602 -0.0085151512 -
0.0229595652
[416] 0.0247033442 0.0089656878 0.0451750661 0.0306921404
0.0146915487
[421] 0.0220383615 0.0021077771 0.0065236745 0.0266847733
0.0228597143
[426] -0.0079374181 -0.0445131735 -0.0118064223 0.0250466962
0.0172562508
[431] -0.0797014326 -0.0110498251 -0.0461298061 -0.0216333220 -
0.0256358073
[436] 0.0314085467 0.0312806200 -0.0906098437 -0.0012968405
0.0129389298
[441] -0.1279526968 -0.2296924486 -0.1396299511 0.0412926038 -
0.0243357263
[446] -0.1139158977 0.1020519484 0.1762707878 0.0974261214
0.0236354686
[451] 0.0817799670 0.0553060326 0.0688140555 -0.0519377125
0.0280469804
[456] 0.0535199136 -0.0114533398 0.0330507565 0.0669537272
0.0562262573
[461] -0.0800989593 -0.0583369904 0.0582292847 -0.0487617646
0.0919892170
[466] 0.0398753066 0.0106045722 0.0664878699 0.0143091343
0.0363666442
[471] 0.0085443925 0.0190189870 -0.0187242090 -0.0244023297 -
0.0220544207
[476] -0.0787348133 -0.1064099550 0.1022830852 -0.0208610873 -
0.0035954559
[481] 0.0818951447 0.0358438642 0.0174154666 -0.0091477130 -
0.0709000461

```
## [486] 0.0336001396 -0.0032863943 0.0245169874 0.0343009386 -  
0.0135787757  
## [491] 0.0027861152 0.0216049238
```

```
basicStats(logrEW)
```

```
##           logrEW  
## nobs      492.000000  
## NAs       0.000000  
## Minimum   -0.317795  
## Maximum    0.261795  
## 1. Quartile -0.020911  
## 3. Quartile 0.043501  
## Mean       0.009887  
## Median     0.014277  
## Sum        4.864341  
## SE Mean    0.002592  
## LCL Mean   0.004794  
## UCL Mean   0.014979  
## Variance   0.003305  
## Stdev      0.057491  
## Skewness   -0.662276  
## Kurtosis   3.976081
```

```
logrSP1 <- log(simplerSP1+1)
```

```
logrSP1
```

```
## [1] 1.795877e-02 2.498818e-02 5.894593e-03 4.374418e-03 1.712748e-  
02  
## [6] -2.206260e-02 2.330283e-03 3.387375e-02 -4.872853e-03 9.273864e-  
03  
## [11] 4.460714e-02 1.175860e-02 -1.725908e-02 -3.821082e-02 -1.434028e-  
03  
## [16] -4.165568e-02 -1.906458e-02 -6.596711e-03 3.727844e-02 -3.737482e-  
02  
## [21] 3.931302e-02 -1.291834e-03 -1.208815e-01 1.643323e-02 -1.009680e-  
02  
## [26] -3.630583e-03 -2.355526e-02 -3.983394e-02 -3.412675e-02 -1.477359e-  
02  
## [31] -8.098340e-02 -9.461732e-02 -1.270780e-01 1.510433e-01 -5.464628e-  
02  
## [36] -2.035680e-02 1.158363e-01 5.816136e-02 2.146203e-02 4.618200e-  
02  
## [41] 4.315623e-02 4.336883e-02 -7.005129e-02 -2.129514e-02 -3.525937e-  
02  
## [46] 5.981771e-02 2.440769e-02 -1.157473e-02 1.118150e-01 -1.146750e-  
02  
## [51] 3.022751e-02 -1.105589e-02 -1.446816e-02 4.011070e-02 -8.087617e-  
03  
## [56] -5.137173e-03 2.238850e-02 -2.248592e-02 -7.805383e-03 5.116639e-  
02
```

```
## [61] -5.185134e-02 -2.189802e-02 -1.412428e-02 2.029794e-04 -2.385017e-02
## [66] 4.436132e-02 -1.635502e-02 -2.126654e-02 -2.483080e-03 -4.437622e-02
## [71] 2.660882e-02 2.842955e-03 -6.348734e-02 -2.507374e-02 2.462529e-02
## [76] 8.196332e-02 4.225062e-03 -1.774145e-02 5.250706e-02 2.559367e-02
## [81] -7.287489e-03 -9.604185e-02 1.650307e-02 1.477925e-02 3.897645e-02
## [86] -3.720978e-02 5.368483e-02 1.671602e-03 -2.668900e-02 3.792757e-02
## [91] 8.707975e-03 5.171730e-02 0.000000e+00 -7.107289e-02 4.174061e-02
## [96] 1.662799e-02 5.602583e-02 -4.389620e-03 -1.073570e-01 4.031627e-02
## [101] 4.551911e-02 2.661175e-02 6.301142e-02 5.818042e-03 2.485650e-02
## [106] 1.589402e-02 9.746876e-02 -3.446102e-02 -4.682120e-02 1.318963e-02
## [111] 3.539900e-02 -2.373547e-02 -1.658374e-03 -1.046254e-02 -2.212446e-03
## [116] -6.411088e-02 -5.533514e-02 4.797841e-02 3.593648e-02 -3.053653e-02
## [121] -1.769972e-02 -6.245855e-02 -1.021904e-02 3.923417e-02 -3.994946e-02
## [126] -2.049867e-02 -2.325942e-02 1.097303e-01 7.585160e-03 1.046879e-01
## [131] 3.548586e-02 1.504427e-02 3.259690e-02 1.881685e-02 3.255915e-02
## [136] 7.224810e-02 -1.242284e-02 3.461783e-02 -3.357126e-02 1.125542e-02
## [141] 1.010675e-02 -1.529030e-02 1.727591e-02 -8.873251e-03 -9.258730e-03
## [146] -3.963416e-02 1.340771e-02 5.451116e-03 -6.119053e-02 1.731817e-02
## [151] -1.658782e-02 1.010500e-01 -3.486069e-03 -6.000180e-05 -1.522735e-02
## [156] 2.212737e-02 7.146914e-02 8.647502e-03 -2.929286e-03 -4.604585e-03
## [161] 5.264084e-02 1.206097e-02 -4.859790e-03 -1.206752e-02 -3.534121e-02
## [166] 4.163031e-02 6.303301e-02 4.407526e-02 2.364203e-03 6.904927e-02
## [171] 5.144758e-02 -1.424904e-02 4.900824e-02 1.401138e-02 -6.047532e-02
## [176] 6.877298e-02 -8.931111e-02 5.328386e-02 2.124962e-02 -2.869581e-02
## [181] 1.237801e-01 3.625864e-02 2.604779e-02 -1.151606e-02 6.015868e-03
```

[186] 4.680248e-02 4.709730e-02 3.436181e-02 -2.446279e-02 -2.454275e-01
[191] -8.921271e-02 7.032891e-02 3.963601e-02 4.096630e-02 -3.391155e-02
[196] 9.380862e-03 3.170967e-03 4.234659e-02 -5.425692e-03 -3.936472e-02
[201] 3.896010e-02 2.563266e-02 -1.907171e-02 1.458118e-02 6.870016e-02
[206] -2.937114e-02 2.059251e-02 4.887587e-02 3.453475e-02 -7.956570e-03
[211] 8.468116e-02 1.539784e-02 -6.565506e-03 -2.549731e-02 1.640569e-02
[216] 2.119088e-02 -7.129946e-02 8.502749e-03 2.396552e-02 -2.725507e-02
[221] 8.800080e-02 -8.925716e-03 -5.236688e-03 -9.906261e-02 -5.254039e-02
[226] -6.720532e-03 5.820664e-02 2.452479e-02 4.067926e-02 6.511429e-02
[231] 2.196010e-02 3.459402e-04 3.785151e-02 -4.907786e-02 4.388195e-02
[236] 1.945845e-02 -1.932962e-02 1.179022e-02 -4.492205e-02 1.057896e-01
[241] -2.010067e-02 9.519545e-03 -2.207384e-02 2.751108e-02 9.635357e-04
[246] -1.751143e-02 3.861861e-02 -2.429064e-02 9.064790e-03 2.103785e-03
[251] 2.981314e-02 1.005726e-02 7.021293e-03 1.042942e-02 1.852436e-02
[256] -2.574559e-02 2.246281e-02 7.547151e-04 -5.341239e-03 3.385248e-02
[261] -1.003821e-02 1.920735e-02 -1.299507e-02 1.004043e-02 3.198401e-02
[266] -3.050560e-02 -4.682540e-02 1.146502e-02 1.234252e-02 -2.717800e-02
[271] 3.098206e-02 3.695179e-02 -2.726637e-02 2.061994e-02 -4.030650e-02
[276] 1.222398e-02 2.398797e-02 3.543857e-02 2.696223e-02 2.757626e-02
[281] 3.566826e-02 2.105576e-02 3.128159e-02 -3.200512e-04 3.931494e-02
[286] -4.991437e-03 4.022886e-02 1.729360e-02 3.209636e-02 6.910070e-03
[291] 7.885825e-03 1.334160e-02 2.259578e-02 2.254457e-03 -4.682749e-02
[296] 1.863921e-02 5.275657e-02 2.579542e-02 7.080882e-02 -2.173960e-02
[301] 5.951059e-02 5.910499e-03 -4.354863e-02 5.676400e-02 5.692555e-02
[306] 4.253541e-02 7.522157e-02 -5.916207e-02 5.178947e-02 -3.508639e-02

[311] 4.362159e-02 1.560953e-02 1.009883e-02 6.807819e-02 4.873873e-02
[316] 9.035061e-03 -1.900547e-02 3.868018e-02 -1.168298e-02 -1.575864e-01
[321] 6.052673e-02 7.723323e-02 5.744404e-02 5.484324e-02 4.019044e-02
[326] -3.281559e-02 3.806042e-02 3.724183e-02 -2.528704e-02 5.300792e-02
[331] -3.257071e-02 -6.273638e-03 -2.896754e-02 6.066133e-02 1.888260e-02
[336] 5.623287e-02 -5.224533e-02 -2.031292e-02 9.232391e-02 -3.128016e-02
[341] -2.215870e-02 2.365207e-02 -1.647599e-02 5.892812e-02 -5.496635e-02
[346] -4.961287e-03 -8.345661e-02 4.044809e-03 3.405064e-02 -9.683144e-02
[351] -6.635884e-02 7.400668e-02 5.077090e-03 -2.532191e-02 -1.083044e-02
[356] -6.625519e-02 -8.525619e-02 1.793716e-02 7.248437e-02 7.545461e-03
[361] -1.569655e-02 -2.098465e-02 3.608021e-02 -6.338505e-02 -9.122484e-03
[366] -7.522475e-02 -8.228981e-02 4.869127e-03 -1.165484e-01 8.290261e-02
[371] 5.550093e-02 -6.222972e-02 -2.779780e-02 -1.715023e-02 8.323265e-03
[376] 7.792724e-02 4.964599e-02 1.125839e-02 1.609380e-02 1.771516e-02
[381] -1.201590e-02 5.350475e-02 7.103709e-03 4.951847e-02 1.712847e-02
[386] 1.213507e-02 -1.649429e-02 -1.693357e-02 1.201058e-02 1.782911e-02
[391] -3.489273e-02 2.284389e-03 9.320430e-03 1.391671e-02 3.786884e-02
[396] 3.194237e-02 -2.561529e-02 1.872656e-02 -1.930311e-02 -2.031394e-02
[401] 2.951220e-02 -1.430102e-04 3.533626e-02 -1.128544e-02 6.924967e-03
[406] -1.790026e-02 3.458112e-02 -9.524534e-04 2.514812e-02 4.528974e-04
[411] 1.100423e-02 1.211334e-02 -3.140502e-02 8.699622e-05 5.073110e-03
[416] 2.105087e-02 2.426911e-02 3.102181e-02 1.633289e-02 1.253708e-02
[421] 1.396109e-02 -2.208816e-02 9.930529e-03 4.238014e-02 3.203050e-02
[426] -1.797662e-02 -3.250460e-02 1.278196e-02 3.516828e-02 1.471323e-02
[431] -4.504235e-02 -8.665437e-03 -6.311340e-02 -3.537954e-02 -5.977832e-03

```

## [436]  4.645124e-02  1.061744e-02 -8.988313e-02 -9.907922e-03  1.211729e-
02
## [441] -9.518029e-02 -1.856370e-01 -7.779831e-02  7.791567e-03 -8.954950e-
02
## [446] -1.164563e-01  8.195319e-02  8.977215e-02  5.172015e-02  1.959808e-
04
## [451]  7.152220e-02  3.300915e-02  3.509973e-02 -1.995988e-02  5.577902e-
02
## [456]  1.761494e-02 -3.767487e-02  2.811504e-02  5.713241e-02  1.465115e-
02
## [461] -8.553174e-02 -5.538798e-02  6.651594e-02 -4.861163e-02  8.392838e-
02
## [466]  3.619306e-02 -2.292626e-03  6.325645e-02  2.239339e-02  3.145700e-
02
## [471] -1.047548e-03  2.809657e-02 -1.359297e-02 -1.842673e-02 -2.170792e-
02
## [476] -5.846739e-02 -7.446711e-02  1.023066e-01 -5.071840e-03  8.496800e-
03
## [481]  4.265998e-02  3.978690e-02  3.085117e-02 -7.525244e-03 -6.469960e-
02
## [486]  3.879274e-02  1.251931e-02  1.957025e-02  2.394697e-02 -1.998742e-
02
## [491]  2.842955e-03  7.043139e-03

```

```
basicStats(logrSP1)
```

```

##          logrSP1
## nobs          492.000000
## NAs            0.000000
## Minimum       -0.245428
## Maximum        0.151043
## 1. Quartile   -0.019130
## 3. Quartile    0.034738
## Mean           0.005360
## Median         0.009050
## Sum            2.636920
## SE Mean        0.002035
## LCL Mean       0.001361
## UCL Mean       0.009359
## Variance       0.002038
## Stdev          0.045145
## Skewness       -0.711215
## Kurtosis       2.659018

```

```
t.test(logrABT)
```

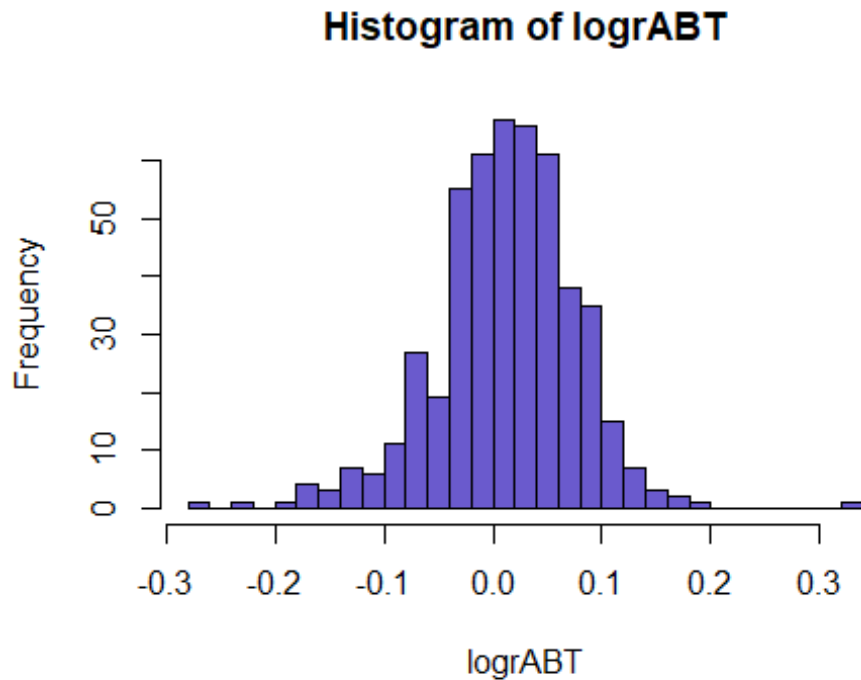
```

##
## One Sample t-test
##
## data:  logrABT
## t = 4.1143, df = 491, p-value = 4.555e-05

```

```
## alternative hypothesis: true mean is not equal to 0
## 95 percent confidence interval:
## 0.006229721 0.017618849
## sample estimates:
## mean of x
## 0.01192429

hist(logrABT, breaks=40 , col='slateblue')
```



```
#4
#4a

t.test(logrVW)

##
## One Sample t-test
##
## data:  logrVW
## t = 3.7499, df = 491, p-value = 0.000198
## alternative hypothesis: true mean is not equal to 0
## 95 percent confidence interval:
## 0.003761858 0.012043156
## sample estimates:
## mean of x
## 0.007902507
```

As p-value is less than 0.05 significant level, we reject H0 and says that mean of value-weighted index return is no equal to zero.

#4b

```
T=length(logrVW)
T
## [1] 492

m3VW = skewness(logrVW)
tst = m3VW/sqrt(6/T)
tst

## [1] -7.602379
## attr(,"method")
## [1] "moment"

pv = 2*pnorm(tst)
pv

## [1] 2.907355e-14
## attr(,"method")
## [1] "moment"
```

As p-value is less than 0.05 significant level, we reject H0 and says that the return of VW is not symmetry or skewness is not equal to zero.

#4c

```
k =kurtosis(logrVW)
k

## [1] 3.003331
## attr(,"method")
## [1] "excess"

tstk = k/sqrt(24/T)
tstk

## [1] 13.59816
## attr(,"method")
## [1] "excess"

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

## [1] 0
## attr(,"method")
## [1] "excess"
```

As p-value is less than 0.05 significant level, we reject H0 and says that excess kurtosis of VW log return is not equal to zero.

```
#5
```

```
#5a
```

```
#i
```

```
T1=length(logrA)
```

```
T1
```

```
## [1] 1259
```

```
m3A = skewness(logrA)
```

```
tst = m3A/sqrt(6/T1)
```

```
tst
```

```
## [1] 9.084625
```

```
## attr(,"method")
```

```
## [1] "moment"
```

```
pv = 2*(1-pnorm(tst))
```

```
pv
```

```
## [1] 0
```

```
## attr(,"method")
```

```
## [1] "moment"
```

As p-value is less than 0.05 significant level, we reject H0 and says that log return of AMZN is asymmetric.

```
#i
```

```
k1 =kurtosis(logrA)
```

```
k1
```

```
## [1] 7.249289
```

```
## attr(,"method")
```

```
## [1] "excess"
```

```
tstk1 = k/sqrt(24/T1)
```

```
tstk1
```

```
## [1] 21.75256
```

```
## attr(,"method")
```

```
## [1] "excess"
```

```
pv = 2*(1-pnorm(tstk1))
```

```
pv
```

```
## [1] 0
## attr(,"method")
## [1] "excess"
```

As p-value is less than 0.05 significant level, we reject H0 and says that excess kurtosis of log return of AMZN is not equal to zero.

```
#iii
```

```
t.test(logrA)
```

```
##
```

```
## One Sample t-test
```

```
##
```

```
## data: logrA
```

```
## 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
```

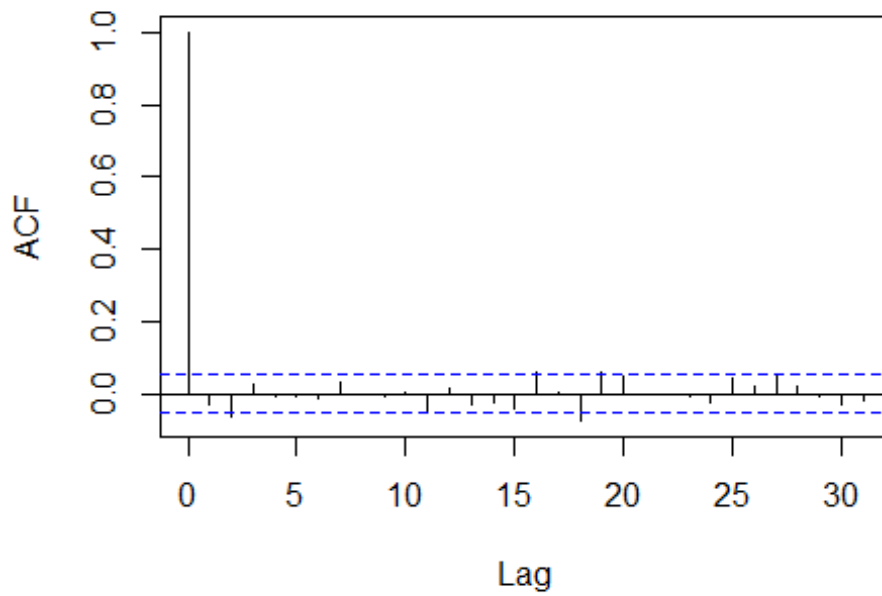
```
## 0.000791272
```

```
#95 percent confidence interval: -0.0007975567 0.0023801007
```

```
#b
```

```
m3 = acf(logrA)
```

Series logrA



```
names(m3)
```

```
## [1] "acf"      "type"      "n.used"    "lag"       "series"    "snames"
```

```
m3$acf
```

```
## , , 1
```

```
##
```

```
##           [,1]
```

```
## [1,] 1.0000000000
```

```
## [2,] -0.0316614625
```

```
## [3,] -0.0657963636
```

```
## [4,] 0.0254218662
```

```
## [5,] -0.0078449975
```

```
## [6,] -0.0106049170
```

```
## [7,] -0.0148006161
```

```
## [8,] 0.0323683041
```

```
## [9,] -0.0036167194
```

```
## [10,] -0.0071029841
```

```
## [11,] 0.0036460656
```

```
## [12,] -0.0470650529
```

```
## [13,] 0.0124225728
```

```
## [14,] -0.0292344042
```

```
## [15,] -0.0243312999
```

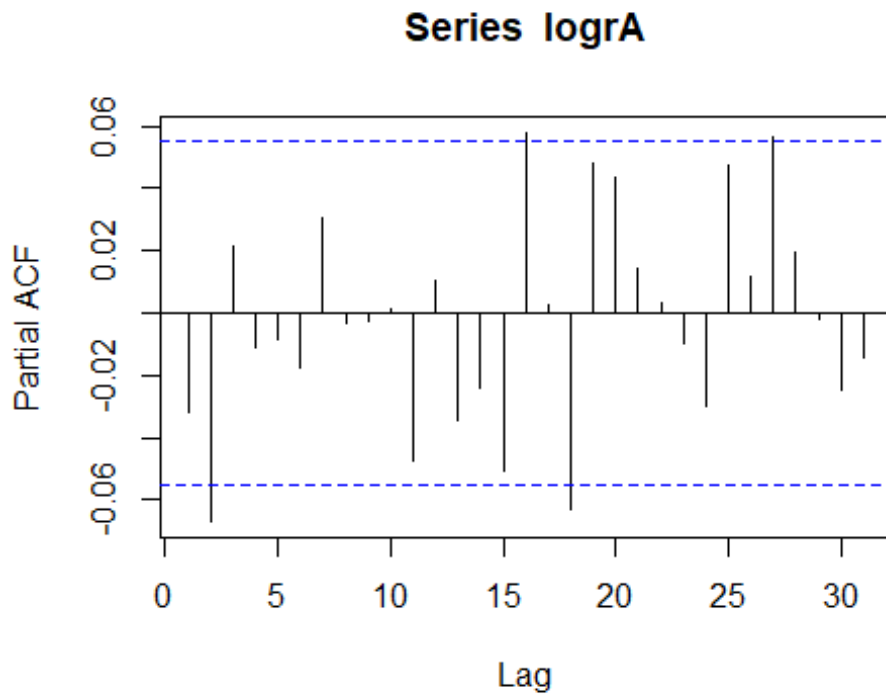
```
## [16,] -0.0427496969
```

```
## [17,] 0.0620802986
```

```
## [18,] 0.0061473042
```

```
## [19,] -0.0744147656
## [20,]  0.0568749860
## [21,]  0.0471836320
## [22,]  0.0003109035
## [23,] -0.0006986516
## [24,] -0.0062326764
## [25,] -0.0244831099
## [26,]  0.0430134379
## [27,]  0.0192213377
## [28,]  0.0464068477
## [29,]  0.0197592080
## [30,] -0.0055967072
## [31,] -0.0317808897
## [32,] -0.0189335815
```

```
m4=pacf(logrA)
```



```
names(m4)
```

```
## [1] "acf"      "type"     "n.used"   "lag"      "series"   "snames"
```

```
m4$acf
```

```
## , , 1
```

```
##
```

```
##           [,1]
```

```
## [1,] -0.031661462
```

```
## [2,] -0.066865841
```

```

## [3,] 0.021198224
## [4,] -0.010767266
## [5,] -0.008175617
## [6,] -0.017271554
## [7,] 0.030726846
## [8,] -0.003403192
## [9,] -0.002629988
## [10,] 0.001032256
## [11,] -0.047363651
## [12,] 0.010284023
## [13,] -0.034370971
## [14,] -0.024008840
## [15,] -0.050490587
## [16,] 0.057915450
## [17,] 0.002614565
## [18,] -0.062793034
## [19,] 0.048259706
## [20,] 0.043316077
## [21,] 0.014313942
## [22,] 0.003269419
## [23,] -0.009825781
## [24,] -0.029795895
## [25,] 0.047586551
## [26,] 0.012023445
## [27,] 0.056509305
## [28,] 0.019236094
## [29,] -0.002035994
## [30,] -0.024437113
## [31,] -0.014212519

Box.test(logrA,lag=12,type = "Ljung")

##
## Box-Ljung test
##
## data: logrA
## X-squared = 12.488, df = 12, p-value = 0.4073

# as compared to 95% cf, p-value is more than 0.05 of significant level, we
cannot reject H0 and conclude that there is no correlation of today return
with previous return.

#6a
daex = read.table("d-exuseu.txt" , header = TRUE)
returnex = daex[,4]
logrex = diff(log(returnex))
logrex

## [1] -4.412021e-03 -1.060020e-02 3.089071e-03 -1.016111e-02 -1.732502e-
03
## [6] 1.213067e-03 1.290563e-02 -7.696584e-04 -8.419294e-03 1.637861e-

```

03
[11] -3.019196e-03 1.727713e-04 4.317976e-04 -1.382409e-03 9.506115e-04
04
[16] -8.326876e-03 -7.518832e-03 -2.108408e-03 -5.998077e-03 2.209360e-03
03
[21] 9.705740e-04 -2.914553e-03 -2.036390e-03 1.151513e-03 3.540450e-04
04
[26] 2.739607e-03 -2.474155e-03 -1.859642e-03 -8.277382e-03 3.657616e-03
03
[31] -6.235247e-04 -1.327493e-02 -3.437051e-03 -3.994558e-03 -1.912134e-03
03
[36] 8.711489e-03 -6.617438e-03 -9.503864e-03 3.666029e-03 -3.941524e-03
03
[41] -5.895374e-03 1.753820e-03 5.151331e-03 -2.388390e-03 8.060866e-03
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[46] -2.649250e-03 3.658314e-04 -5.487972e-04 -1.373312e-03 9.119990e-03
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[3331] 5.188177e-03 -6.751941e-04 9.001576e-04 -1.594713e-02 -4.734640e-03
03
[3336] 1.911827e-03 -1.528117e-04 -1.452877e-03 2.751033e-03 5.099916e-03
03
[3341] -6.780203e-03 -1.147272e-03 4.276448e-03 -7.620499e-05 7.617887e-04
04
[3346] 6.073508e-03 -6.301984e-03 5.923468e-03 2.271265e-04 1.664020e-03
03
[3351] 1.208459e-03 -1.435208e-03 -2.268002e-04 -5.458694e-03 -5.322992e-04
04
[3356] -4.268625e-03 -2.983592e-03 -2.838840e-03 -4.697918e-03 3.859067e-04
04
[3361] -1.699105e-03 -6.981102e-03 -6.089963e-03 -3.058946e-03 -1.651009e-03
03
[3366] 9.437673e-04 3.766187e-03 -2.666250e-03 -1.312064e-02 1.113232e-03
03
[3371] -5.179088e-03 -2.399425e-03 -6.668566e-03 -3.310593e-03 4.519052e-03
03
[3376] 6.020488e-03 -4.652664e-03 7.848831e-03 2.629169e-03 -6.866294e-03
03
[3381] 1.760987e-03 -2.161644e-03 9.492354e-03 9.522299e-04 1.980905e-

03
[3386] -4.363182e-03 9.022618e-03 8.663123e-04 -9.253101e-03 -3.262905e-03
03
[3391] -5.194817e-03 -7.214140e-04 -1.123235e-03 -1.928486e-03 1.872490e-02
02
[3396] -6.652963e-03 2.856691e-03 -1.887754e-02 -8.189124e-03 1.301766e-03
03
[3401] -3.583941e-03 -8.979959e-04 -3.682040e-03 2.701487e-03 2.857261e-03
03
[3406] -2.693769e-03 2.204532e-03 -3.262909e-04 -6.630401e-03 -4.114893e-03
03
[3411] -5.291893e-03 5.786575e-03 1.212533e-02 7.302264e-03 -9.748249e-03
03
[3416] 5.292095e-03 -1.300073e-03 -1.227110e-02 1.964283e-02 2.579398e-03
03
[3421] 0.000000e+00 -4.680070e-03 -6.979981e-03 1.627605e-03 3.328330e-03
03
[3426] -8.107670e-04 -3.331034e-03 5.518599e-03 -3.323743e-03 2.271069e-03
03
[3431] 1.039703e-02 0.000000e+00 8.860565e-03 -3.981531e-03 -1.517148e-03
03
[3436] 3.987564e-03 -2.071549e-03 -3.275417e-03 6.460641e-03 -9.545021e-04
04
[3441] 2.940127e-03 1.823299e-03 1.337444e-02 -7.815248e-05 4.911716e-03
03
[3446] 2.795901e-03 1.395025e-03 1.765610e-02 -1.294400e-03 -5.654049e-03
03
[3451] 1.072140e-03 -8.995563e-03 3.238495e-03 -6.255088e-03 2.784871e-03
03
[3456] -7.210172e-03 1.710332e-03 -1.399145e-03 3.416683e-03 3.945694e-03
03
[3461] -3.248263e-03 7.101535e-03 4.451274e-03 -1.411244e-02 9.315324e-04
04
[3466] 3.098856e-03 1.391358e-03 3.089280e-04 6.618973e-03 7.413386e-03
03
[3471] -2.058006e-03 -6.429906e-03 3.143572e-03 -7.067710e-03 -1.929236e-03
03
[3476] 9.264979e-04 -1.544640e-03 -2.476398e-03 5.640347e-03 -1.619309e-03
03
[3481] -1.621935e-03 -6.903266e-03 -4.524542e-03 2.186817e-03 -4.613528e-03
03
[3486] -1.490255e-03 -1.964251e-03 7.864417e-05 1.885607e-03 3.369513e-03
03
[3491] -5.333764e-03 7.131412e-03 6.245121e-04 1.560671e-04 1.109614e-02
02
[3496] 5.400193e-04 -2.007258e-03 -1.314620e-03 2.318752e-03 4.390871e-03
03
[3501] 4.295144e-03 1.147359e-03 -3.058338e-04 -8.370177e-03 -2.006948e-03
03
[3506] -9.276439e-04 4.783591e-03 3.534387e-03 2.986791e-03 4.349326e-

```
03
## [3511]  2.661295e-03  4.167778e-03  2.718624e-03 -2.718624e-03 -4.395611e-
03
## [3516]  9.869046e-04  3.711141e-03  0.000000e+00 -6.049607e-04 -2.575174e-
03
## [3521]  6.823093e-04 -6.462672e-03 -4.817075e-03  3.977669e-03 -2.369398e-
03
## [3526]  7.649354e-04  1.079941e-02  1.001024e-02  1.197515e-03 -2.021640e-
03
## [3531] -2.777050e-03  3.825818e-03 -3.976148e-03  7.516819e-05  3.006163e-
04
## [3536]  5.246209e-03  5.813537e-03  2.229240e-04  1.855770e-03  5.915427e-
03
## [3541]  1.473405e-03  7.919091e-03 -1.212403e-02  3.100091e-03 -3.026168e-
03
## [3546] -1.085109e-02 -1.196351e-03  3.584769e-03  2.680168e-03 -1.487099e-
04
## [3551] -8.513232e-03  2.097693e-03  1.869229e-03 -2.767702e-03 -1.099657e-
02
## [3556] -2.882065e-03  4.556155e-04 -8.998764e-03  3.822927e-03 -1.909637e-
03
## [3561] -6.982036e-03  6.157636e-04  1.768211e-03 -2.229998e-03  8.279716e-
03
## [3566] -8.125763e-03
```

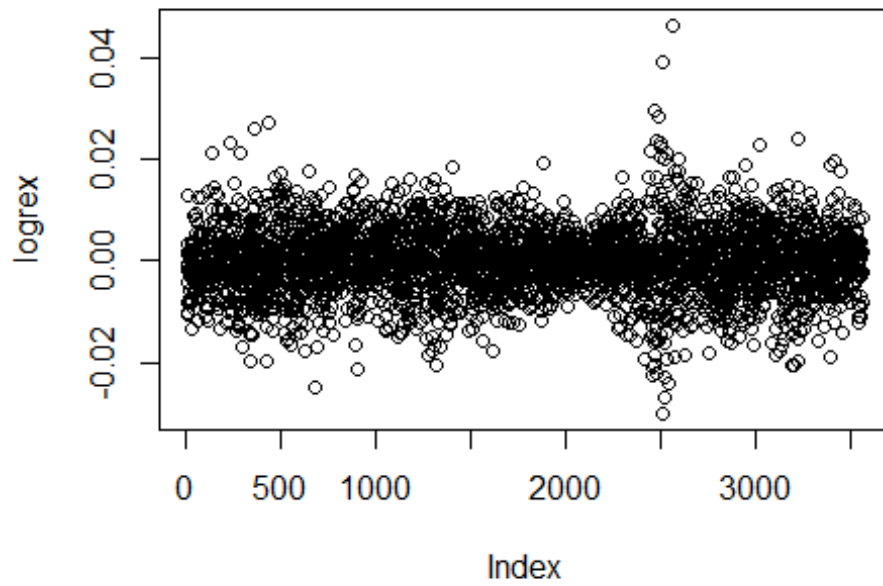
#6b

```
basicStats(logrex)
```

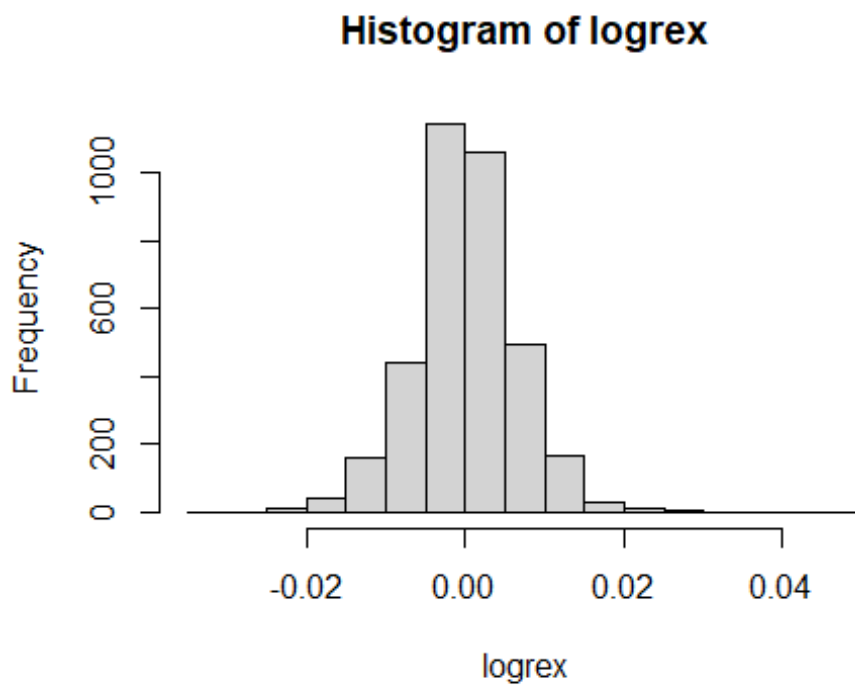
```
##                logrex
## nobs            3566.000000
## NAs              0.000000
## Minimum         -0.030031
## Maximum          0.046208
## 1. Quartile     -0.003585
## 3. Quartile      0.003767
## Mean            0.000027
## Median           0.000000
## Sum              0.095218
## SE Mean         0.000109
## LCL Mean        -0.000187
## UCL Mean         0.000240
## Variance         0.000042
## Stdev            0.006511
## Skewness         0.116750
## Kurtosis         2.058184
```

#6c

```
plot(logrex)
```



```
hist(logrex)
```



#6d

```
t.test(logrex)
```

```
##
```

```
## One Sample t-test
```

```
##
```

```
## data: logrex
```

```
## t = 0.24489, df = 3565, p-value = 0.8066
```

```
## 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
```

As p-value is higher than 0.05 significant level, we cannot reject H_0 and thus says that the mean of the daily log return of exchange rate is equal to zero.