Gazdasági és pénzügyi modellek vizsga

Dátum: 2023.06.07. 10:00

Név: Hengsperger Márk

Neptun-kód: DCHCAS

Feladat 0:
R kód lefuttatása neptun-kód alapján, értékek generálása:

```
> x="dchcas";#neptun kód
> z=charToRaw(iconv(x, "latin1", "UTF-8"))
> for (i in 1:6) v=paste("0x",z,sep="")
> e=strtoi(v)
> ax=e[1];ay=e[2];az=e[3];av=e[4];ss=sum(strtoi(v))+24
> cat("ax=",ax,"\n")
ax= 100
> cat("ay=",ay,"\n")
ay= 99
> cat("az=",az,"\n")
az= 104
> cat("av=",av,"\n")
av= 99
> cat("ss=",ss,"\n")
ss= 638
> ar=c( "FB","AAPL","AMZN","GOOG","NFLX","TSLA")
> ai=ss-6*floor(ss/6)
> ev=2022-(ss-10*floor(ss/10))
> cat("ev=",ev,"\n")
ev= 2014
> cat("reszveny=",ar[ai+1],"\n")
reszveny= AMZN
```

Értékek:

- ax → 100
- az → 99
- az → 104
- av → 99
- ss → 638
- ev → 2014
- reszveny → AMZN

Feladat 1:
Mintarealizáció generálása:

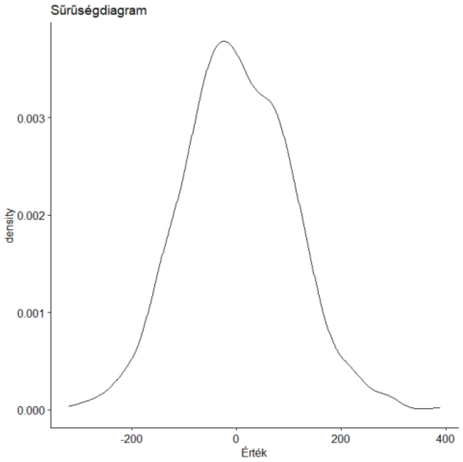
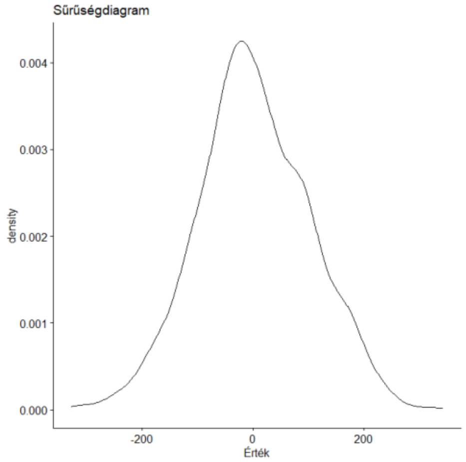
```
> library("moments")
> set.seed(ss)
> nx=900
> v=matrix(c(ax,abs(ax-ay),abs(ax-ay),ay),2)
> w=chol(v)
> z1=sqrt(-2*log(runif(nx)))*sin(runif(nx)*2*pi)
> z2=sqrt(-2*log(runif(nx)))*cos(runif(nx)*2*pi)
> zm=matrix(c(z1,z2),ncol=2)
> zn=10*zm%*%w
> summary(zn)
       V1                  V2
 Min.   :-319.906   Min.   :-326.331
 1st Qu.: -68.524   1st Qu.: -60.218
 Median :  -2.093   Median :  -4.411
 Mean   :   1.398   Mean   :   2.414
 3rd Qu.:  72.951   3rd Qu.:  73.594
 Max.   : 388.647   Max.   : 341.644
> skewness(zn)
[1] 0.11604642 0.04287889
> kurtosis(zn)
[1] 3.099831 3.021771
```

Ahol:

- Min. → minimum érték
- 1st Qu. → Első kvartilis, megfigyelések 25%-a ennél a mennyiségnél alacsonyabb
- Median → medián
- Mean → átlag
- 3rd Qu. → Harmadik kvartilis, megfigyelések 25%-a ennél a mennyiségnél alacsonyabb
- kurtosis() → lapultság vizsgálat
- skewness() → ferdeség vizsgálat

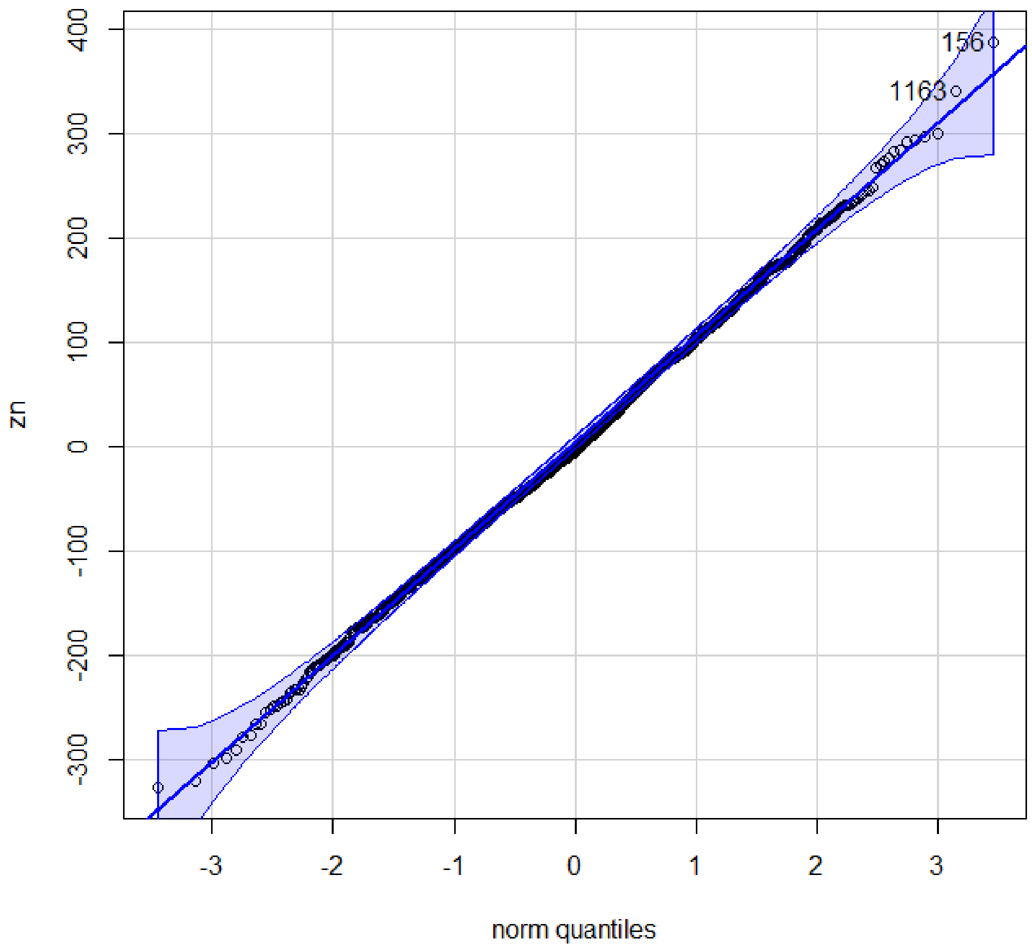
Eloszlás vizsgálata:
vizuális igazolás beépített függvényekkel,
sűrűségdiagram: haranggörbe normalitás bizonyítására

```
> library("ggpubr")
Loading required package: ggplot2
Keep up to date with changes at https://www.tidyverse.org/blog/
> ggdensity(zn[,1],
+           main = "Sűrűségdiagram",
+           xlab = "Érték")
> ggdensity(zn[,2],
+           main = "Sűrűségdiagram",
+           xlab = "Érték")
```

Első oszlopra	Második oszlopra
	

Kvantilis diagram alapú vizsgálat:
Egy 45°-os referenciaintervallumon megrajzolja az összefüggést adott minta és normális eloszlás között

```
> library("car")
Loading required package: carData
> qqPlot(zn)
[1]  156 1163
```



Feladat 3:

Stabilis eloszlás generálása:

```
> gbm_ciklus<-function(nsim=100, t=1000, mu=ax, sigma=1 + (ax+az)/(ax+ay+az), S0=100, dt=1./365$
+ gbm<-matrix(ncol=nsim, nrow=t)
+ for (simu in 1:nsim){
+ gbm[1,simu]<-50
+ for (day in 2:t){
+ epsilon<-rnorm(1)
+ dt=1/365
+ gbm[day,simu]<-gbm[(day-1),simu]*exp((mu-sigma*sigma/2)*dt+sigma*epsilon*sqrt(dt))
+ }
+ }
+ return(gbm)
+ }
> nsim<-1000
> nsim<-100
> t<-1000
> mu<-ax
> sigma<-1+(ax+az)/(ax+ay+az)
> S0<-100
> set.seed(ss+59)
> gbm<-gbm_ciklus(nsim,t,mu,sigma,S0)
```

Összegzés:

```
> summary(gbm)
```

```
       V1                  V2                  V3
 Min.   : 5.000e+01   Min.   : 5.000e+01   Min.   : 5.000e+01
 1st Qu.: 1.369e+30   1st Qu.: 2.938e+31   1st Qu.: 8.543e+29
 Median : 5.842e+58   Median : 3.731e+61   Median : 1.123e+59
 Mean   :1.640e+115   Mean   :4.039e+117   Mean   :4.560e+113
 3rd Qu.: 2.572e+88   3rd Qu.: 5.099e+90   3rd Qu.: 2.201e+87
 Max.   :3.807e+117   Max.   :1.061e+120   Max.   :1.178e+116
       V4                  V5                  V6
 Min.   : 5.000e+01   Min.   : 5.000e+01   Min.   : 5.000e+01
 1st Qu.: 3.150e+31   1st Qu.: 5.610e+31   1st Qu.: 2.833e+30
 Median : 4.174e+60   Median : 9.407e+61   Median : 4.909e+59
 Mean   :9.275e+116   Mean   :6.357e+117   Mean   :6.388e+116
 3rd Qu.: 7.630e+90   3rd Qu.: 1.561e+91   3rd Qu.: 1.052e+90
 Max.   :2.309e+119   Max.   :1.428e+120   Max.   :1.703e+119
       V7                  V8                  V9
 Min.   : 5.000e+01   Min.   : 5.000e+01   Min.   : 5.000e+01
 1st Qu.: 1.060e+31   1st Qu.: 1.205e+30   1st Qu.: 1.487e+31
 Median : 9.634e+60   Median : 1.028e+60   Median : 3.835e+60
 Mean   :7.956e+117   Mean   :9.985e+114   Mean   :1.157e+117
 3rd Qu.: 2.960e+90   3rd Qu.: 7.390e+87   3rd Qu.: 9.212e+89
 Max.   :2.122e+120   Max.   :2.846e+117   Max.   :2.301e+119
      V10                 V11                 V12
 Min.   : 5.000e+01   Min.   : 5.000e+01   Min.   : 5.000e+01
 1st Qu.: 3.360e+30   1st Qu.: 8.925e+30   1st Qu.: 8.322e+30
 Median : 1.484e+60   Median : 6.332e+60   Median : 1.333e+60
 Mean   :8.873e+115   Mean   :7.770e+116   Mean   :9.057e+115
 3rd Qu.: 1.878e+89   3rd Qu.: 7.267e+90   3rd Qu.: 1.703e+89
 Max.   :2.286e+118   Max.   :2.082e+119   Max.   :2.210e+118
      V13                 V14                 V15
 Min.   : 5.000e+01   Min.   : 5.000e+01   Min.   : 5.000e+01
 1st Qu.: 4.286e+30   1st Qu.: 1.071e+31   1st Qu.: 1.494e+31
 Median : 5.573e+60   Median : 3.756e+59   Median : 2.287e+60
 Mean   :1.675e+117   Mean   :1.911e+115   Mean   :3.183e+116
 3rd Qu.: 4.150e+89   3rd Qu.: 7.285e+88   3rd Qu.: 3.585e+89
 Max.   :3.995e+119   Max.   :4.465e+117   Max.   :6.631e+118
      V16                 V17                 V18
 Min.   : 5.000e+01   Min.   : 5.000e+01   Min.   : 5.000e+01
 1st Qu.: 1.132e+30   1st Qu.: 3.162e+31   1st Qu.: 1.659e+31
 Median : 1.287e+59   Median : 6.132e+60   Median : 4.743e+60
 Mean   :6.881e+115   Mean   :3.872e+116   Mean   :1.938e+116
 3rd Qu.: 8.225e+88   3rd Qu.: 4.708e+89   3rd Qu.: 3.432e+89
 Max.   :1.632e+118   Max.   :1.041e+119   Max.   :3.809e+118
```

```
      V19                 V20                 V21
 Min.   : 5.000e+01   Min.   : 5.000e+01   Min.   : 5.000e+01
 1st Qu.: 1.192e+30   1st Qu.: 4.771e+29   1st Qu.: 4.843e+30
 Median : 6.783e+58   Median : 5.372e+59   Median : 4.029e+59
 Mean   :8.966e+114   Mean   :4.480e+114   Mean   :6.906e+115
 3rd Qu.: 9.873e+87   3rd Qu.: 6.886e+87   3rd Qu.: 2.881e+88
 Max.   :2.025e+117   Max.   :1.002e+117   Max.   :1.697e+118
      V22                 V23                 V24
 Min.   : 5.000e+01   Min.   : 5.000e+01   Min.   : 5.000e+01
 1st Qu.: 1.786e+31   1st Qu.: 2.328e+31   1st Qu.: 8.022e+29
 Median : 4.379e+61   Median : 4.267e+60   Median : 1.169e+59
 Mean   :1.963e+119   Mean   :1.207e+118   Mean   :2.170e+114
 3rd Qu.: 1.215e+91   3rd Qu.: 8.663e+89   3rd Qu.: 1.862e+88
 Max.   :5.105e+121   Max.   :2.588e+120   Max.   :5.419e+116
      V25                 V26                 V27
 Min.   : 5.000e+01   Min.   : 5.000e+01   Min.   : 5.000e+01
 1st Qu.: 6.105e+30   1st Qu.: 3.991e+31   1st Qu.: 8.201e+29
 Median : 2.506e+61   Median : 1.199e+61   Median : 2.439e+58
 Mean   :1.338e+117   Mean   :3.712e+115   Mean   :2.245e+114
 3rd Qu.: 3.133e+90   3rd Qu.: 1.070e+89   3rd Qu.: 3.448e+87
 Max.   :2.831e+119   Max.   :8.602e+117   Max.   :5.291e+116
      V28                 V29                 V30
 Min.   : 5.000e+01   Min.   : 5.000e+01   Min.   : 5.000e+01
 1st Qu.: 1.100e+32   1st Qu.: 1.317e+30   1st Qu.: 4.197e+30
 Median : 1.858e+61   Median : 5.577e+58   Median : 9.692e+59
 Mean   :1.685e+118   Mean   :2.187e+114   Mean   :1.435e+115
 3rd Qu.: 2.573e+90   3rd Qu.: 1.839e+88   3rd Qu.: 1.219e+89
 Max.   :4.354e+120   Max.   :4.427e+116   Max.   :3.890e+117
      V31                 V32                 V33
 Min.   : 5.000e+01   Min.   : 5.000e+01   Min.   : 5.000e+01
 1st Qu.: 7.163e+30   1st Qu.: 1.379e+31   1st Qu.: 4.319e+31
 Median : 2.240e+60   Median : 2.961e+60   Median : 2.976e+60
 Mean   :7.947e+117   Mean   :2.099e+116   Mean   :1.379e+116
 3rd Qu.: 3.182e+90   3rd Qu.: 1.002e+90   3rd Qu.: 9.801e+88
 Max.   :1.575e+120   Max.   :5.382e+118   Max.   :3.388e+118
      V34                 V35                 V36
 Min.   : 5.000e+01   Min.   : 5.000e+01   Min.   : 5.000e+01
 1st Qu.: 1.150e+32   1st Qu.: 7.664e+29   1st Qu.: 1.253e+32
 Median : 6.199e+60   Median : 4.188e+60   Median : 1.482e+61
 Mean   :3.528e+114   Mean   :1.590e+117   Mean   :1.320e+118
 3rd Qu.: 2.655e+89   3rd Qu.: 2.564e+90   3rd Qu.: 4.759e+90
 Max.   :8.359e+116   Max.   :4.121e+119   Max.   :2.961e+120
```

…

```
      V85                 V86                 V87
 Min.   : 5.000e+01   Min.   : 5.000e+01   Min.   : 5.000e+01
 1st Qu.: 2.363e+30   1st Qu.: 3.434e+31   1st Qu.: 2.952e+30
 Median : 1.925e+59   Median : 1.169e+62   Median : 1.257e+61
 Mean   :1.556e+116   Mean   :6.701e+119   Mean   :1.540e+118
 3rd Qu.: 3.213e+88   3rd Qu.: 9.487e+91   3rd Qu.: 9.459e+90
 Max.   :3.991e+118   Max.   :1.487e+122   Max.   :3.670e+120
      V88                 V89                 V90
 Min.   : 5.000e+01   Min.   : 5.000e+01   Min.   : 5.000e+01
 1st Qu.: 7.933e+31   1st Qu.: 1.931e+32   1st Qu.: 9.288e+29
 Median : 6.106e+59   Median : 3.788e+61   Median : 9.153e+58
 Mean   :1.925e+117   Mean   :1.728e+117   Mean   :3.730e+115
 3rd Qu.: 2.833e+90   3rd Qu.: 2.196e+91   3rd Qu.: 8.088e+87
 Max.   :4.193e+119   Max.   :3.600e+119   Max.   :9.167e+117
      V91                 V92                 V93
 Min.   : 5.000e+01   Min.   : 5.000e+01   Min.   : 5.000e+01
 1st Qu.: 8.700e+30   1st Qu.: 5.157e+30   1st Qu.: 8.198e+30
 Median : 1.230e+59   Median : 3.467e+59   Median : 7.733e+59
 Mean   :1.029e+115   Mean   :7.401e+114   Mean   :8.479e+116
 3rd Qu.: 7.264e+88   3rd Qu.: 7.447e+87   3rd Qu.: 8.711e+89
 Max.   :2.554e+117   Max.   :1.743e+117   Max.   :2.381e+119
      V94                 V95                 V96
 Min.   : 5.000e+01   Min.   : 5.000e+01   Min.   : 5.000e+01
 1st Qu.: 3.674e+30   1st Qu.: 2.842e+30   1st Qu.: 2.540e+31
 Median : 1.334e+60   Median : 1.030e+59   Median : 8.808e+60
 Mean   :2.473e+116   Mean   :2.880e+113   Mean   :1.223e+116
 3rd Qu.: 1.314e+90   3rd Qu.: 3.460e+87   3rd Qu.: 1.584e+90
 Max.   :5.980e+118   Max.   :6.026e+115   Max.   :3.220e+118
      V97                 V98                 V99
 Min.   : 5.000e+01   Min.   : 5.000e+01   Min.   : 5.000e+01
 1st Qu.: 1.829e+31   1st Qu.: 1.737e+30   1st Qu.: 2.425e+31
 Median : 1.814e+60   Median : 6.943e+58   Median : 2.673e+60
 Mean   :1.175e+118   Mean   :8.953e+114   Mean   :8.800e+115
 3rd Qu.: 2.193e+90   3rd Qu.: 1.353e+87   3rd Qu.: 1.434e+90
 Max.   :2.013e+120   Max.   :2.139e+117   Max.   :1.942e+118
      V100
 Min.   : 5.000e+01
 1st Qu.: 1.068e+32
 Median : 4.488e+60
 Mean   :1.319e+116
 3rd Qu.: 4.531e+89
 Max.   :3.144e+118
```

Feladat 4-5:

Amazon részvények:
https://finance.yahoo.com/quote/AMZN/history?period1=1388534400&period2=1419984000&interval=1d&filter=history&frequency=1d&includeAdjustedClose=true

```
> details<-read.csv("C:/Users/au008907/Documents/AMZN.csv")
> zaro = details$Close
> zaro
  [1] 19.8985 19.8220 19.6815 19.9015 20.0960 20.0505 19.8830 19.5490 19.8770
 [10] 19.7935 19.7900 19.9805 20.3525 20.2270 19.9935 19.3800 19.3140 19.7215
 [19] 19.2100 20.1505 17.9345 17.3075 17.3975 17.3225 17.7295 18.0540 18.0435
 [28] 18.0895 17.4625 17.8600 17.8675 17.6825 17.3690 17.4900 17.3380 17.5890
 [37] 17.9160 17.9900 18.0065 18.1050 17.9890 18.1950 18.6185 18.6080 18.6030
 [46] 18.5265 18.4410 18.5320 18.5755 18.6870 18.7520 18.9385 18.6615 18.4485
 [55] 18.0310 17.5925 17.7355 17.1705 16.9235 16.9145 16.8185 17.1495 17.0980
 [64] 16.6810 16.1500 15.8880 16.3535 16.5905 15.8555 15.5865 15.7955 15.8040
 [73] 16.1840 16.2455 16.5435 16.4660 16.2290 16.8575 15.1915 14.8290 15.0190
 [82] 15.2065 15.3945 15.4005 15.5025 14.8690 14.6355 14.4160 14.6120 15.1430
 [91] 15.2320 14.8810 14.7595 14.8850 14.8380 15.0595 15.2505 15.2455 15.6120
[100] 15.5410 15.5080 15.6890 15.6275 15.4420 15.3595 15.3390 16.1785 16.4835
[109] 16.3750 16.6205 16.7600 16.2955 16.3135 16.3810 16.2810 16.7190 16.3500
[118] 16.2100 16.3620 16.2080 16.3720 16.2845 16.2285 16.2390 16.6195 16.6425
[127] 16.8745 16.6775 16.1905 16.4985 16.3960 17.3100 17.7660 17.7220 17.7950
[136] 17.6225 17.9330 17.9880 18.0420 17.9070 17.9305 16.2005 16.0205 16.0000
[145] 16.1255 15.6495 15.3530 15.6825 15.6160 15.6945 15.5725 15.8400 15.9165
[154] 15.9660 16.3140 16.6605 16.6815 16.7265 16.7565 16.7890 16.6455 16.5795
[163] 16.7010 17.0915 17.1590 17.0010 16.9520 17.1190 16.9500 17.2975 17.3190
[172] 17.1170 16.4875 16.5665 16.5260 16.5595 16.1945 16.3880 16.2000 16.2500
[181] 16.5660 16.2250 16.1815 16.4105 16.0965 16.1605 16.0910 16.1220 15.8730
[190] 15.9205 16.1370 16.1100 15.8490 16.1350 15.7685 15.5695 15.3225 15.4155
[199] 15.2985 15.1430 15.1820 15.3105 15.7665 15.6485 15.6590 14.3530 14.4985
[208] 14.7795 14.7060 14.9535 15.2730 15.2860 15.1405 14.8260 14.8320 14.9930
[217] 15.2555 15.6005 15.5755 15.8240 16.3910 16.1525 16.2465 16.3270 16.5270
[226] 16.6315 16.7820 16.7520 16.6785 16.9320 16.3000 16.3155 15.8250 15.8465
[235] 15.6315 15.3320 15.6250 15.2920 15.3680 15.3660 15.3035 14.7530 14.9440
[244] 14.8865 14.9950 15.3270 15.3145 15.1515 15.4545 15.6020 15.5150
> logreturn=c()
> for(i in 1:length(zaro)-1){
+ logreturn[i] = abs(log(zaro[i+1]/zaro[i]))
+ }
```

Khi-négyzet próba:

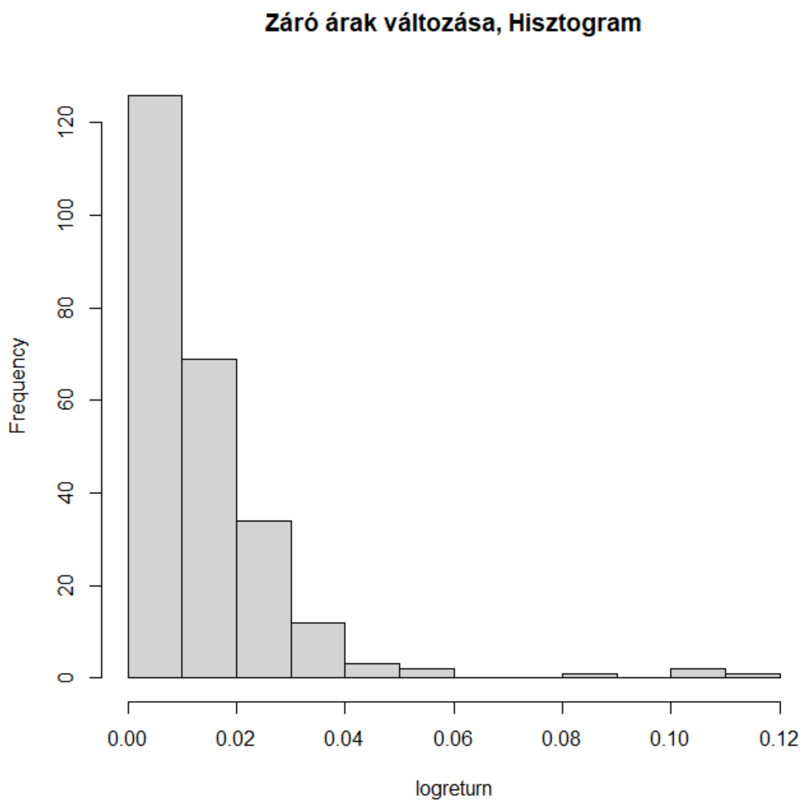
```
> chisq.test(logreturn)

        Chi-squared test for given probabilities

data:  logreturn
X-squared = 4.2944, df = 249, p-value = 1
```

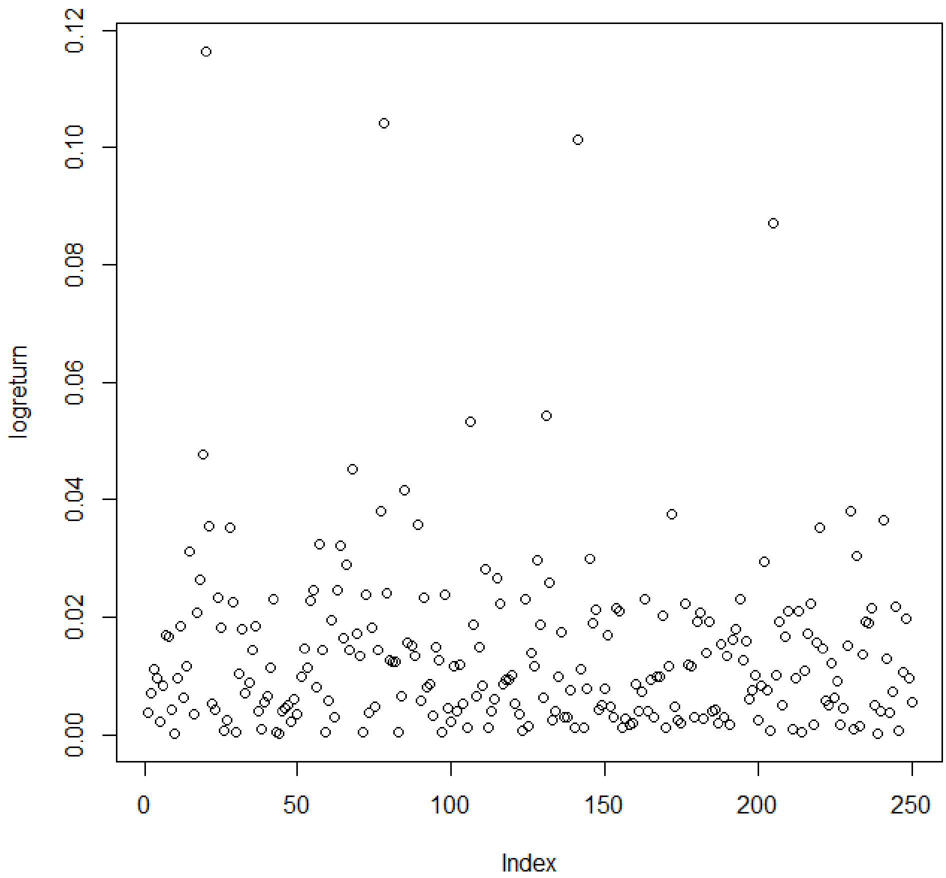
Záró árak változása, hisztogram:

```
> hist(logreturn, main = "Záró árak változása, Hisztogram")
```



Ábrázolás:

```
> plot(logreturn)
```



0.12
0.10
0.08
0.06
0.04
0.02
0.00
logreturn
0
50
100
150
200
250
Index