Gazdasági és Pénzügyi Modellek vizsga, 2021.05.12

Értékek generálása:

INPUT

```r
x="wcd0qi"; #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")
cat("ay=",ay,"\n")
cat("az=",az,"\n")
cat("av=",av,"\n")
cat("ss=",ss,"\n")
ar=c( "FB","AAPL","AMZN","GOOG","NFLX","TSLA")
ai=ss-6*floor(ss/6)
ev=2019-(ss-10*floor(ss/10))
cat("ev=",ev,"\n")
cat("reszveny=",ar[ai+1],"\n")
```

OUTPUT

```
> x="wcd0qi"; #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= 119
> cat("ay=",ay,"\n")
ay= 99
> cat("az=",az,"\n")
az= 100
> cat("av=",av,"\n")
av= 48
> cat("ss=",ss,"\n")
ss= 608
> ar=c( "FB","AAPL","AMZN","GOOG","NFLX","TSLA")
> ai=ss-6*floor(ss/6)
> ev=2019-(ss-10*floor(ss/10))
> cat("ev=",ev,"\n")
ev= 2011
> cat("reszveny=",ar[ai+1],"\n")
reszveny= AMZN
> |
```

1. feladat

Kétdimenziós mintarealizáció:

```r
set.seed(ss)
nx=900
v=matrix(c(ax,abs(ax-az),abs(ax-az),az),2)
w=chol(v)
z1=rnorm(nx)
z2=rnorm(nx)
zm=matrix(c(z1,z2),ncol=2)
zn=zm%*%w
```

Statisztikai elemzés:

Használt könyvtár: „moments”

INPUT

```r
#1. feladat

library(moments)

summary(zn) #statisztikai adatok
skewness(zn) #ferdeség
kurtosis(zn) #lapultság
```

OUTPUT

```
> #1. feladat
>
> library(moments)
>
> summary(zn) #statisztikai adatok
       V1                  V2
 Min.   :-35.74334   Min.   :-27.3147
 1st Qu.: -7.39023   1st Qu.: -5.9820
 Median : -0.01551   Median :  0.3281
 Mean   :  0.37445   Mean   :  0.3741
 3rd Qu.:  7.91970   3rd Qu.:  7.1072
 Max.   : 42.62229   Max.   : 34.5349
> skewness(zn) #ferdeség
[1] 0.10553116 0.05935552
> kurtosis(zn) #lapultság
[1] 2.893613 2.994903
>
```

Min: Minimum értékek.

Max: Maximum értékek

1st Qu.: Első kvartilis, a megfigyelések 25%-a ennél a mennyiségnél alacsonyabb

Median: Medián

Mean: Átlag

3rd Qu.: .: Harmadik kvartilis, a megfigyelések 25%-a ennél mennyiségnél alacsonyabb

Ferdeséget a *skewness()* beépített fügvénnyel, **lapultságot** pedig a *kurtois()* függvénnyel végeztem el.

Eloszlás vizsgálata:

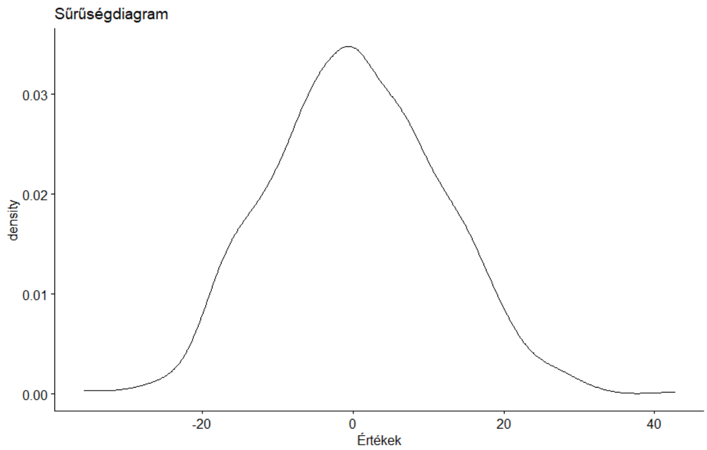
Vizuális igazolás beépített függvényekkel.

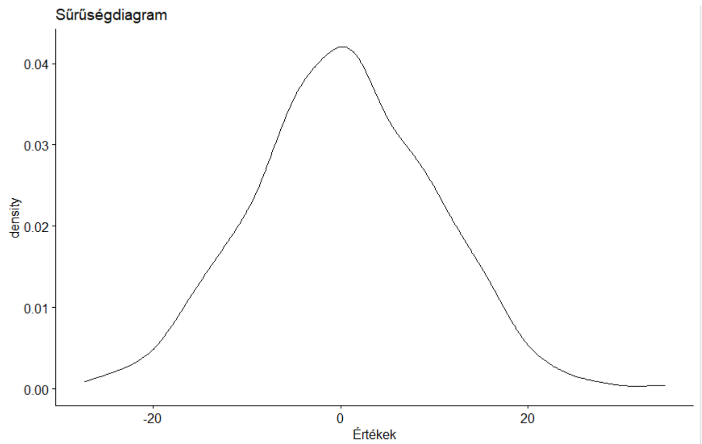
Sűrűségdiagrammal: A harang alakú görbe bizonyítja a normalitást.

INPUT

```
#vizsgálat az 1. oszlopra
library("ggpubr")
ggdensity(zn[,1],
          main = "Sűrűségdiagram",
          xlab = "Tooth length")
#vizsgálat a 2. oszlopra
ggdensity(zn[,2],
          main = "Sűrűségdiagram",
          xlab = "Tooth length")
```

OUTPUT





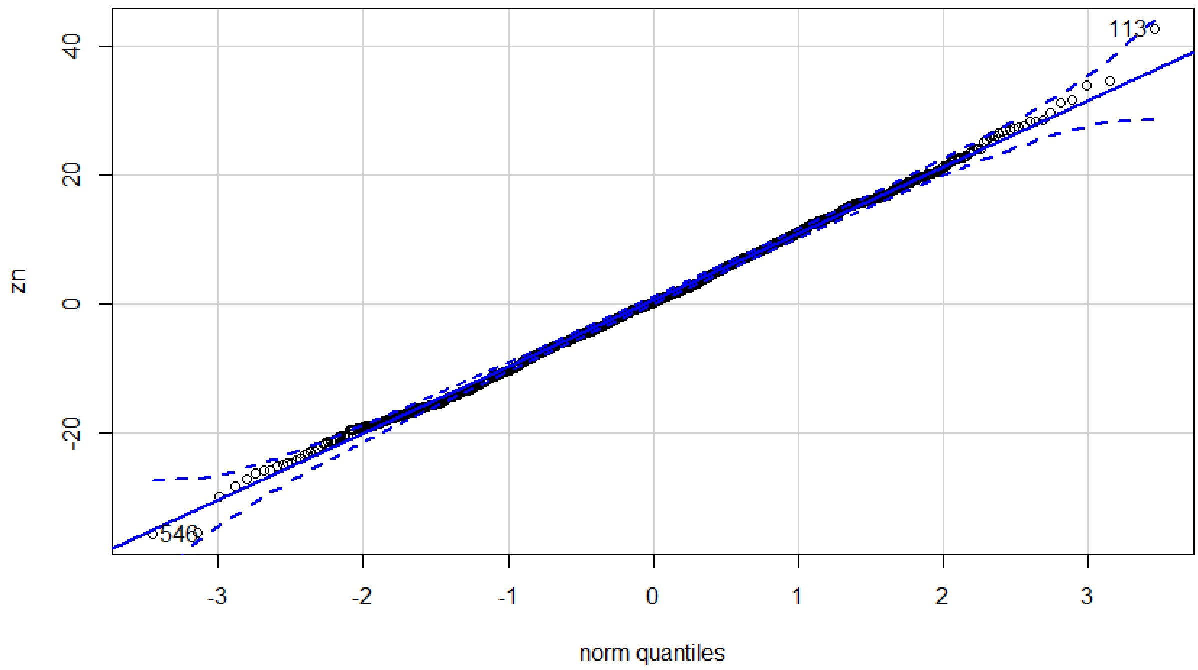
Vizsgálat Kvantilis diagram alapján:

Megrajzolja az összefüggést egy adott minta és a normális eloszlás között, 45 fokos referenciavonalon.

INPUT

```
library("car")
qqPlot(zn)
```

OUTPUT



Tehát megállapítható, hogy **normális eloszlás**.

2. feladat

Peremek függetlensége:

Khí négyzet próbával.

Beépített függvény: *chisq.test()*

INPUT:

```
#2.feladat
#Perem függetlenség vizsgálata Khí-négyzet próbával
chisq.test(abs(zn))
```

OUTPUT:

```
> #2.feladat
> #Perem függetlenség vizsgálata Khí-négyzet próbával
> chisq.test(abs(zn))

        Pearson's Chi-squared test

data:  abs(zn)
X-squared = 3644, df = 899, p-value < 2.2e-16
```

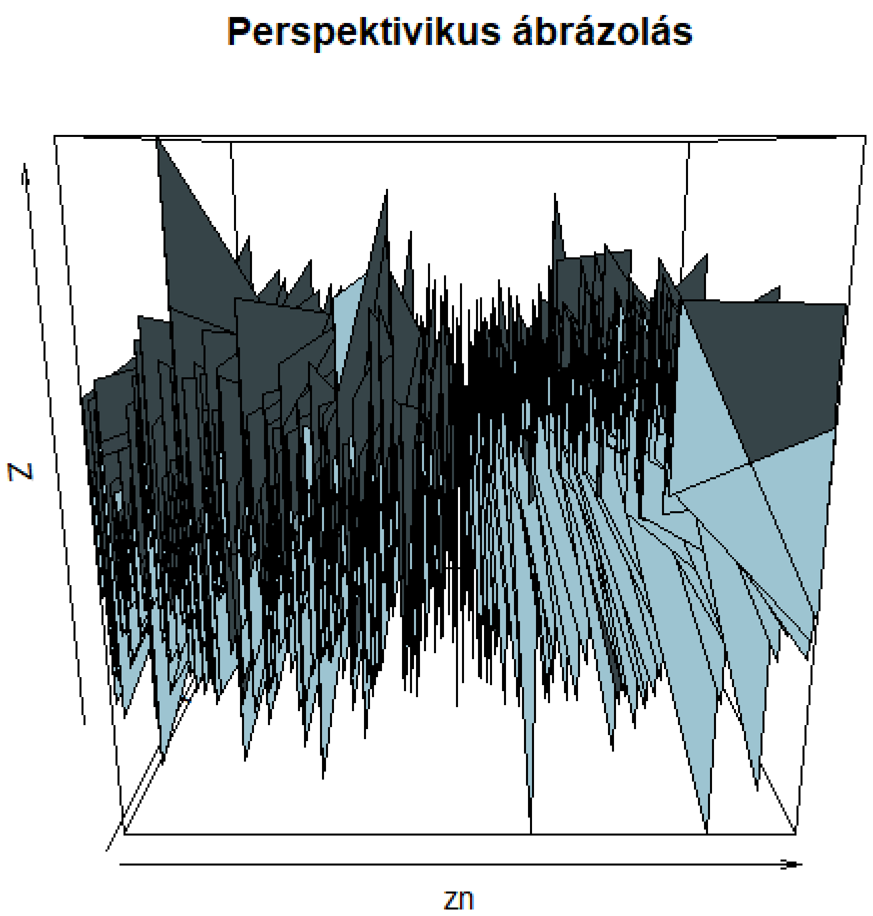
A p érték 2.2e-16, azaz közel van a 0-hoz. **Szignifikáns**.

3. feladat

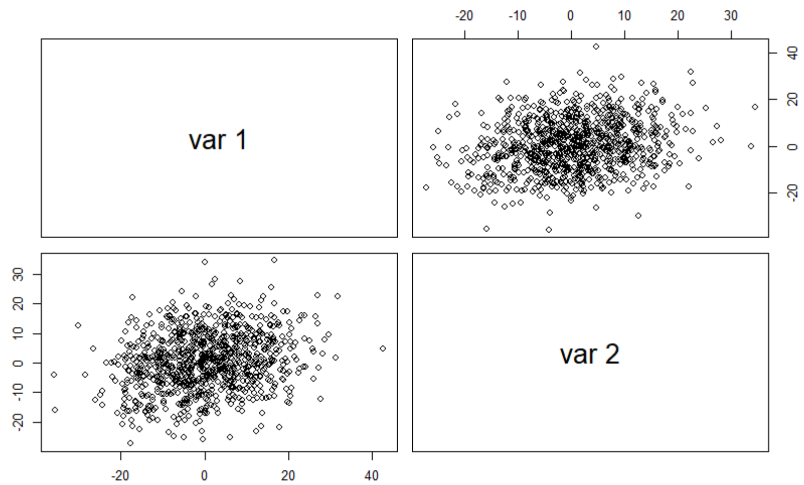
INPUT:

Perspektivikus ábrázolás:

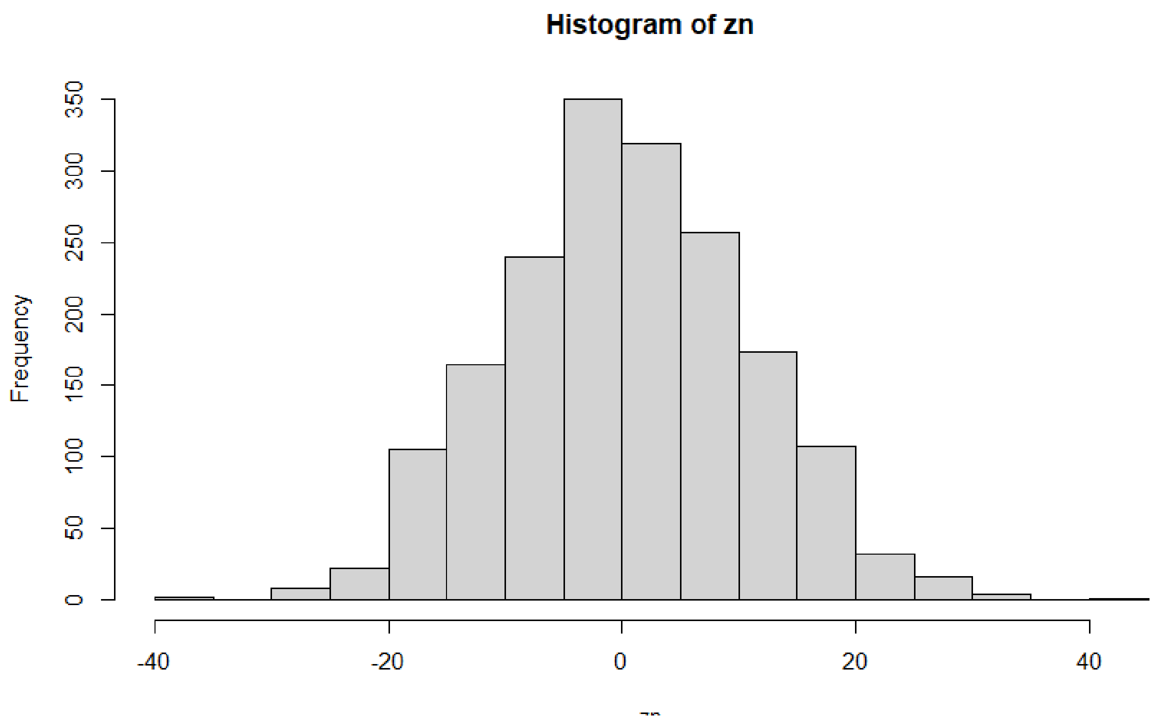
```
#3.feladat
persp(zn,col="lightblue",shade=0.6,main="Perspektivikus ábrázolás")
```




```
54  pairs(zn)
```



```
hist(zn)
```



4. feladat

Brown folyamat generálása:

Ciklusokkal:

```
gbm_ciklus <- function(nsim = 100, t = 500, mu = ax, sigma = (ax+az)/(ax+ay+az), S0 = 100, dt = 1./365) {
  gbm <- matrix(ncol = nsim, nrow = t)
  for (simu in 1:nsim) {
    gbm[1, simu] <- S0
    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)
}
```

Értékek beállítása + vizsgálat:

```
nsim <- 50
t <- 500
mu <- ax
sigma <- (ax+az)/(ax+ay+az)
S0 <- 500
set.seed(ss+17)
gbm <- gbm_ciklus(nsim, t, mu, sigma, S0)
summary(gbm)
```

OUTPUT:

```
       V1                  V2                  V3                  V4                  V5                  V6
 Min.   :5.000e+02   Min.   :5.000e+02   Min.   :5.000e+02   Min.   :5.000e+02   Min.   :5.000e+02   Min.   :5.000e+02
 1st Qu.:1.306e+20   1st Qu.:2.820e+20   1st Qu.:1.766e+20   1st Qu.:1.627e+20   1st Qu.:1.972e+20   1st Qu.:3.090e+20
 Median :5.471e+37   Median :1.047e+38   Median :8.018e+37   Median :8.217e+37   Median :4.540e+37   Median :1.429e+38
 Mean   :1.082e+71   Mean   :8.609e+71   Mean   :9.080e+70   Mean   :1.358e+71   Mean   :7.116e+70   Mean   :2.074e+71
 3rd Qu.:2.306e+55   3rd Qu.:9.781e+55   3rd Qu.:6.100e+55   3rd Qu.:3.162e+55   3rd Qu.:1.820e+55   3rd Qu.:3.972e+55
 Max.   :1.597e+73   Max.   :1.244e+74   Max.   :1.268e+73   Max.   :2.024e+73   Max.   :9.706e+72   Max.   :2.876e+73
       V7                  V8                  V9                 V10                 V11                 V12
 Min.   :5.000e+02   Min.   :5.000e+02   Min.   :5.000e+02   Min.   :5.000e+02   Min.   :5.000e+02   Min.   :5.000e+02
 1st Qu.:2.513e+20   1st Qu.:1.329e+20   1st Qu.:1.682e+20   1st Qu.:3.230e+20   1st Qu.:4.107e+20   1st Qu.:1.305e+20
 Median :1.296e+38   Median :5.098e+37   Median :7.872e+37   Median :1.082e+38   Median :2.018e+38   Median :6.028e+37
 Mean   :1.270e+71   Mean   :1.219e+71   Mean   :2.174e+70   Mean   :1.269e+71   Mean   :3.852e+71   Mean   :1.931e+71
 3rd Qu.:4.137e+55   3rd Qu.:2.157e+55   3rd Qu.:1.747e+55   3rd Qu.:7.427e+55   3rd Qu.:1.117e+56   3rd Qu.:6.808e+55
 Max.   :1.732e+73   Max.   :1.712e+73   Max.   :3.043e+72   Max.   :1.763e+73   Max.   :5.582e+73   Max.   :2.560e+73
      V13                 V14                 V15                 V16                 V17                 V18
 Min.   :5.000e+02   Min.   :5.000e+02   Min.   :5.000e+02   Min.   :5.000e+02   Min.   :5.000e+02   Min.   :5.000e+02
 1st Qu.:1.971e+20   1st Qu.:4.985e+20   1st Qu.:1.535e+20   1st Qu.:2.669e+20   1st Qu.:2.116e+20   1st Qu.:1.605e+20
 Median :1.419e+38   Median :9.614e+37   Median :5.254e+37   Median :1.304e+38   Median :1.164e+38   Median :1.571e+38
 Mean   :1.849e+71   Mean   :1.523e+71   Mean   :7.092e+70   Mean   :3.867e+71   Mean   :1.138e+71   Mean   :1.829e+71
 3rd Qu.:6.894e+55   3rd Qu.:6.555e+55   3rd Qu.:2.315e+55   3rd Qu.:5.873e+55   3rd Qu.:4.111e+55   3rd Qu.:7.275e+55
 Max.   :2.574e+73   Max.   :2.218e+73   Max.   :9.597e+72   Max.   :5.488e+73   Max.   :1.575e+73   Max.   :2.524e+73
      V19                 V20                 V21                 V22                 V23                 V24
 Min.   :5.000e+02   Min.   :5.000e+02   Min.   :5.000e+02   Min.   :5.000e+02   Min.   :5.000e+02   Min.   :5.000e+02
 1st Qu.:2.714e+20   1st Qu.:3.176e+20   1st Qu.:2.461e+20   1st Qu.:2.199e+20   1st Qu.:1.972e+20   1st Qu.:1.714e+20
 Median :1.107e+38   Median :2.043e+38   Median :1.532e+38   Median :8.140e+37   Median :7.783e+37   Median :7.419e+37
 Mean   :2.054e+71   Mean   :3.997e+71   Mean   :1.451e+71   Mean   :1.236e+71   Mean   :1.035e+71   Mean   :5.917e+70
 3rd Qu.:6.942e+55   3rd Qu.:8.726e+55   3rd Qu.:3.743e+55   3rd Qu.:4.034e+55   3rd Qu.:2.660e+55   3rd Qu.:2.565e+55
 Max.   :2.875e+73   Max.   :6.070e+73   Max.   :1.931e+73   Max.   :1.772e+73   Max.   :1.373e+73   Max.   :8.567e+72
      V25                 V26                 V27                 V28                 V29                 V30
 Min.   :5.000e+02   Min.   :5.000e+02   Min.   :5.000e+02   Min.   :5.000e+02   Min.   :5.000e+02   Min.   :5.000e+02
 1st Qu.:1.684e+20   1st Qu.:2.431e+20   1st Qu.:1.334e+20   1st Qu.:1.799e+20   1st Qu.:1.164e+20   1st Qu.:1.079e+20
 Median :2.997e+38   Median :6.658e+37   Median :8.875e+37   Median :8.951e+37   Median :9.334e+37   Median :2.095e+37
 Mean   :4.947e+71   Mean   :8.023e+70   Mean   :1.321e+71   Mean   :1.898e+71   Mean   :2.080e+71   Mean   :3.658e+70
 3rd Qu.:1.747e+56   3rd Qu.:5.440e+55   3rd Qu.:2.731e+55   3rd Qu.:4.676e+55   3rd Qu.:7.377e+55   3rd Qu.:8.844e+54
 Max.   :6.569e+73   Max.   :1.050e+73   Max.   :1.785e+73   Max.   :2.517e+73   Max.   :2.885e+73   Max.   :5.507e+72
      V31                 V32                 V33                 V34                 V35                 V36
 Min.   :5.000e+02   Min.   :5.000e+02   Min.   :5.000e+02   Min.   :5.000e+02   Min.   :5.000e+02   Min.   :5.000e+02
 1st Qu.:2.503e+20   1st Qu.:8.413e+20   1st Qu.:3.511e+20   1st Qu.:1.438e+20   1st Qu.:1.346e+20   1st Qu.:1.256e+20
 Median :6.416e+37   Median :3.175e+38   Median :1.199e+38   Median :6.181e+37   Median :3.111e+37   Median :3.023e+37
 Mean   :9.386e+70   Mean   :1.970e+71   Mean   :1.314e+71   Mean   :5.815e+70   Mean   :4.106e+70   Mean   :9.395e+70
 3rd Qu.:4.121e+55   3rd Qu.:1.189e+56   3rd Qu.:4.812e+55   3rd Qu.:3.199e+55   3rd Qu.:1.599e+55   3rd Qu.:1.713e+55
 Max.   :1.309e+73   Max.   :2.842e+73   Max.   :1.888e+73   Max.   :7.622e+72   Max.   :6.015e+72   Max.   :1.361e+73
      V37                 V38                 V39                 V40                 V41                 V42
 Min.   :5.000e+02   Min.   :5.000e+02   Min.   :5.000e+02   Min.   :5.000e+02   Min.   :5.000e+02   Min.   :5.000e+02
 1st Qu.:1.508e+20   1st Qu.:2.698e+20   1st Qu.:1.622e+20   1st Qu.:3.842e+20   1st Qu.:3.271e+20   1st Qu.:2.521e+20
 Median :1.184e+38   Median :2.349e+38   Median :7.705e+37   Median :1.642e+38   Median :1.103e+38   Median :1.123e+38
 Mean   :8.246e+70   Mean   :5.469e+71   Mean   :6.888e+70   Mean   :5.070e+71   Mean   :8.536e+70   Mean   :3.083e+71
 3rd Qu.:3.888e+55   3rd Qu.:1.428e+56   3rd Qu.:3.081e+55   3rd Qu.:1.078e+56   3rd Qu.:3.463e+55   3rd Qu.:7.421e+55
 Max.   :1.146e+73   Max.   :7.903e+73   Max.   :9.647e+72   Max.   :7.048e+73   Max.   :1.197e+73   Max.   :4.434e+73
      V43                 V44                 V45                 V46                 V47                 V48
 Min.   :5.000e+02   Min.   :5.000e+02   Min.   :5.000e+02   Min.   :5.000e+02   Min.   :5.000e+02   Min.   :5.000e+02
 1st Qu.:1.233e+20   1st Qu.:7.014e+19   1st Qu.:2.383e+20   1st Qu.:2.473e+20   1st Qu.:1.325e+20   1st Qu.:2.222e+20
 Median :3.580e+37   Median :2.007e+37   Median :8.937e+37   Median :1.146e+38   Median :8.526e+37   Median :5.097e+37
 Mean   :1.171e+71   Mean   :3.327e+70   Mean   :1.606e+71   Mean   :1.912e+71   Mean   :4.050e+71   Mean   :1.094e+71
 3rd Qu.:2.914e+55   3rd Qu.:1.102e+55   3rd Qu.:7.787e+55   3rd Qu.:6.230e+55   3rd Qu.:7.795e+55   3rd Qu.:3.036e+55
 Max.   :1.640e+73   Max.   :4.686e+72   Max.   :2.133e+73   Max.   :2.594e+73   Max.   :5.260e+73   Max.   :1.607e+73
```

5-6. feladat:

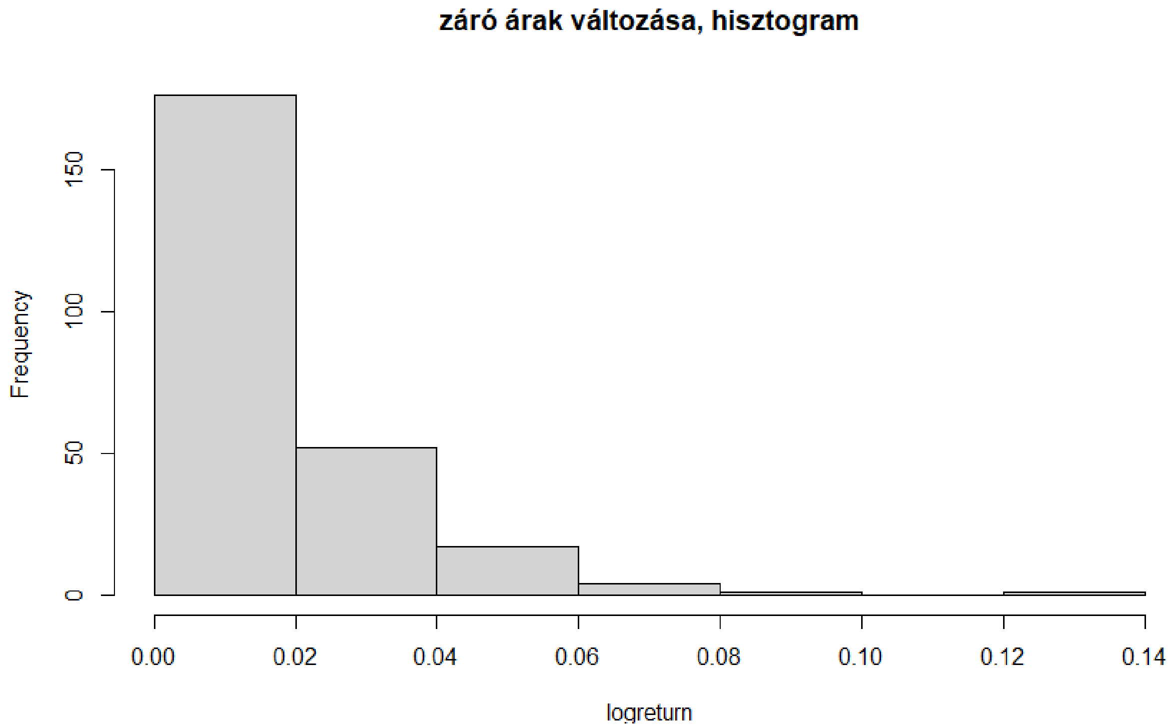
```r
#5-6. feladat
AMZ_details<-read.csv("D:/EGYETEM/GPVIZSGA/AMZN.csv")
zaro=AMZ_details$Close
zaro
logreturn=c()
for(i in 1:length(zaro)-1){
  logreturn[i]=abs(log(zaro[i+1]/zaro[i]))
}
chisq.test(logreturn)
```

OUTPUT

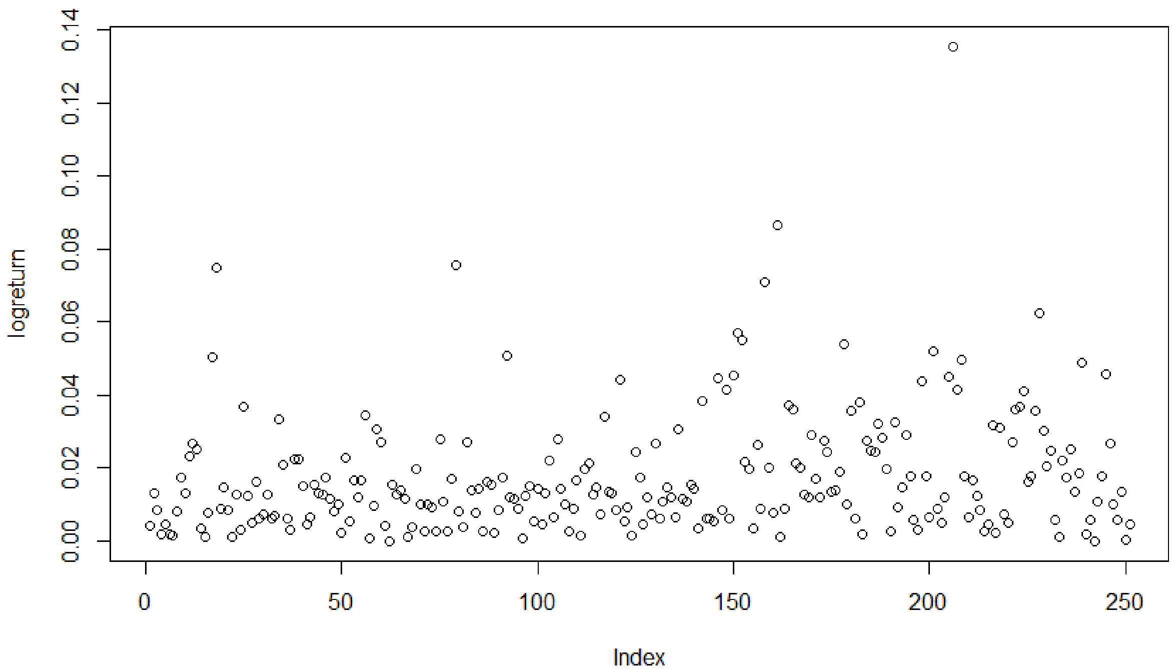
```
> chisq.test(logreturn)

        Chi-squared test for given probabilities

data:  logreturn
X-squared = 3.9943, df = 250, p-value = 1
```

Ábrázolások, becslések:

Hisztogram: hist(logreturn,main="záró árak változása, hisztogram")



Pontbecslés:



7. feladat:

Letöltöttem a 2012-es adatokat, majd elemzem a zárásokat ábrán.

```
#7. feladat
AMZ_details<-read.csv("D:/EGYETEM/GPVIZSGA/AMZN_2.csv")
zaro_2=AMZ_details$Close
zaro_2
hist(zaro)
hist(zaro_2)
```

2011-es záró értékek:

2012-es záró értékek:

Mivel a határok nincsenek messze egymástól, a becslés sikeres volt.