Practice 3 R: Testing IID and Gaussian characters:

1. Generate samples of length n of different IID noises using the following instructions:

- rnorm(n, mean=, sd=)
- runif(n, min=, max=)
- rexp(n, rate=)
- rchisq(n, df=)
- rpois (n, lambda=)
- rt(n, df=)

Observe what happens when you move the parameters.

For different distributions do for example:

- n<-1000
- x<-rexp(n,rate=2)
- plot(x,type="l")
- hist(x,k)

Here k denotes the number of classes of the histogram.

Search for other distributions writing "distributions" in the help utility.

2. Verify the IID character of any sample of the previous exercise. Use the Ljung-Box test with the instruction

- Box.test (x, lag=h, type=c(“Ljung-Box”))

For example:

- n<-10000
- k<-3
- x<-rt(n, df=k)
- plot(x, type="l")
- Box.test(x, lag=h, type=c("Ljung-Box"))

What happens if we do the same for a random walk?

Notice that this must be done for different lags from h=1 to h=log(n).

3. Test the normal character of a simulated Gaussian White noise x using the Q-Q-plot by the instructions:

   Do

- n<-10000
- x<-rnorm(n,0,1)
- qqnorm(x)
- qqline(x)

   And then,

- y<-runif(n,-3, 3)
- qqnorm(y)
- qqline(x)

   Compare the graphics for different values of n and different non Gaussian laws.

4. Generate a Gaussian white noise x. Apply Shapiro-Wilks test:

- shapiro.test(x)

Do the same with a non-Gaussian IID noise y, for example a uniform IID noise. Compare results. Notice that we accept the null hypothesis in the first case and we reject it in the second case, as expected.