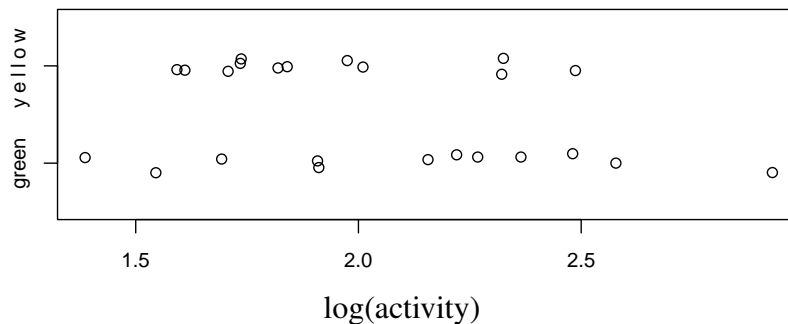


STATISTICS FOR EES — EXERCISE SHEET 6

1. A programmer develops a program FAIRCOIN to simulate coin-tossing. To test the program he simulates 1,000,000 coin tosses. The results is 497985 times “head”. He realizes that this differs from the expected number of heads by 2015. He thinks “Hmm, quite a lot... But it’s only a deviation of 0.5%. It’s quite probable to get such a random deviation.”. Do you agree with him? Give reasons for your point of view.

2. Sample $n = 10$ values from a normal distribution with $\mu = 0$ and $\sigma = 5$. Apply the z -test to this sample for the null hypothesis $\mu = 0$, first assuming $\sigma = 5$ and then using the σ that is estimated from the sample. Repeat this 10.000 times. How often is the null hypothesis rejected on the 5% level if the true σ is used and how often if the estimated σ is used? How does this change when the sample size is $n = 100$?

3. a) Can the following values be true or are some of them obviously wrong?
 $\bar{x}(\text{yellow}) = 1.93$, $\sigma(\text{yellow}) = 0.30$, $\bar{x}(\text{green}) = 2.12$ and $\sigma(\text{green}) = 0.45$



b) Adam claims that the activity with green light is significantly higher. Do you agree?

c) Eve responds: None of the means is significantly different from 2.0. Is she right?

The data come from 12 birds. Each bird gave a activity value for green and one for yellow. The paired samples are shown in the second graph.

d) How do you describe the activities corresponding to the two colors?

e) Compute the t-statistic to test if the means are equal. The standard deviation of the differences is $s=0.27$.

f) Describe the result of the test.

