

U Wroclaw, Fall 2015
Applied Stats
DISCUSSION/LAB3: Modeling contd- GOF tests and simulation

We will use three data sets: MBODY.MTW, FOOT.MTW and IQLEAD.MTW

TO DO

You will write a report from the lab today. The report will follow the order of the exercises we do in class. The report is to be concise and the graphs are to be small and illustrative. You need to incorporate them into the report. The graphs should be of a size that would allow at least 6 of them to fit on a page, if nothing else was on a page. You will submit **printed reports to me in class tomorrow (Tuesday) for grading. Make sure you write your name clearly on the top of the reports. The reports have to be typed. The reports should not take more than 2 pages. If your report consists of several pieces of paper, the paper has to be stapled.**

1. Generate a sample of size 500 from a gamma distribution with shape 10 and scale 1 (threshold=0), that is $\text{Gamma}(10, 1)$.
 - a. Describe the shape and summary stats of the sample.
 - b. Plot a probability plot for the sample from the $\text{Gamma}(10, 1)$ model. Comment on the features of the graph - does it show a good fit? Why?
 - c. Plot a probability plot of the sample with an exponential model with mean equal to 10. Does the graph show a good fit?
 - d. Plot a probability plot of the sample with a lognormal model with location 2.24 and scale 0.33. Does the graph show a good fit?
 - e. Test using A-D if the sample comes from the $\text{Gamma}(10, 1)$ model. Report the value of the test stat and the p-value together with the conclusion regarding the distribution of the sample. Do not forget to STATE the null and alternative hypotheses!
 - f. Test using A-D test if the sample comes from the exponential model with mean equal to 10. Report the value of the test stat and the p-value together with the conclusion regarding the distribution of the sample. Do not forget to STATE the null and alternative hypotheses!
 - g. Test using A-D if the sample comes from the lognormal model with location 2.24 and scale 0.33. Report the value of the test stat and the p-value together with the conclusion regarding the distribution of the sample. Do not forget to STATE the null and alternative hypotheses! Compare the results of GOF analysis from points e) and g). Conclusions?
2. We will work with the data set finscores.MPJ. The data set finscores.MPJ contains final course scores for two of my classes; an introductory statistics class- stat152, and a pre-calculus class – math 126.
 - a. Compare the scores in the two classes and decide if the performance of students in these classes was similar or one class performed better than the other.
 - b. Are the distributions of the scores in the two classes similar? Similarities, differences?
 - c. Decide if the scores in both/any of the classes follow a normal distribution. If yes, state the hypotheses you tested, and the test results.

SIMULATION EXERCISES

1. I want to generate one observation from a χ^2 distribution with 10 degrees of freedom. Using a random number generator I generated an observation from the uniform distribution on the interval (0, 1). The observation I generated is 0.977. Using the FTSS (Fundamental Theorem of Statistical Simulation) I computed the value of the corresponding observation from $\chi^2(10)$ distribution. What was that value?
2. I want to generate one observation from a Pareto distribution with shape parameter α which has the following pdf:

$$f(x) = \begin{cases} \frac{\alpha}{x^{\alpha+1}} & \text{if } x \geq 1, \\ 0 & \text{otherwise.} \end{cases}$$

Using a random number generator I generated an observation from the uniform distribution on the interval (0, 1). The observation I generated is 0.5. Using the FTSS I computed the value of the corresponding observation from Pareto distribution with $\alpha = 2$. What was that value?