

Fall 2014 STAT 350 Project 1 (270 points)

Due Thursday, Feb. 26, 2015

Objectives: Understanding the Central Limit Theory

Instructions

- Groups of 3 – 4 students are required.
- Only PDF files are accepted.
- NO late work is accepted.
- Names and sections of all students in the group on top of each page.
- Statement of contribution for each student (submitted separately).
- Put all code in appendix; nothing is required in the main body.
- Your report should be in the same order as the questions posed. Clearly label each part.
- All discussion should be in complete sentences.

Only one report should be submitted per group with each person submitting their own statement of contribution. Everything should be submitted in Blackboard. For the person who is submitting the report, you can add a separate attachment for the statement of contribution. The statement of contribution should consist of what each student did in the project and if there were any problems with the group as a whole. This statement should not be shared with your group mates.

If you have any question about the project, please post your comment on piazza (preferred), ask TAs in office hours, or discuss it with your instructor.

This project will be much easier to complete in SAS or R, though Minitab will be accepted. It is acceptable for different parts of the project to use different software packages. There is no bonus for the use of SAS or R. Please read the tutorials for details in how to use the various software packages

Grading information:

For each of the distributions, we will be grading on the following information:

- Procedure on obtaining the distribution (more than one software package may be used)
- The plots (histograms and normal quantile plots)
- The Summary table
- Concluding sentence.

In addition to the points mentioned below, you will be graded on organization and style for an additional 30 points. These points will consist of whether the organization of the report is easy to read and the items are in the correct order, whether the student names and sections are at the beginning of the report and if we receive the statement of contribution from each of the students.

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Project 1: Computer Simulation for Central Limit Theorem

Draw an SRS of size n from any population with mean μ and finite standard deviation σ . When n is large, the sampling distribution of the sample mean \bar{x} is approximately Normal.

$$\bar{X} \text{ is approximately } N(\mu, \frac{\sigma}{\sqrt{n}})$$

In this project, you will create 1000 SRS of size n for each of the distributions below. The sample size n depends on the given distribution. For each of the 1000 SRS, compute the sample mean, \bar{x} . So you will have 1000 \bar{x} 's a given sample size n . Then, create a histogram and normal quantile plot for these 1000 \bar{x} 's. For each pair of plots, in a complete English sentence, state whether this sampling distribution is normal or not and why.

- 1) (30 points) standard normal, sample sizes $n = 1, 2, 6, 10$
- 2) (30 points) uniform (0,1), sample sizes $n = 1, 2, 9, 16$, $\mu = \frac{1}{2}$, $\sigma = \sqrt{\frac{1}{12}}$
- 3) (50 points) gamma $\alpha = 5.4$, $\beta = 1$, $\mu = 5.4$, $\sigma = \sqrt{5.4}$, sample sizes $n = 1, 5, 10, 20, 30, 40$, ... until the shape becomes normal
- 4) (60 points) exponential $\lambda = 2$, $\mu = 0.5 = \sigma$, sample sizes $n = 1, 5, 10, 20, 30, 40, 50$, ... until the shape becomes normal.
- 5) (30 points) Poisson, $\lambda = 1$, sample size $n = 1, 2, 5, 10, 20$, ... until the shape becomes normal.
- 6) (40 points) Rolling a 2 on a fair six-sided die n times, $n = 1, 2, 5, 10, 15$,... until the sample becomes normal.

For each of the distributions, please make a table with the value of n , the mean and standard deviation from the data set and the theoretical mean and standard deviation. For each distribution write a sentence stating whether the data is consistent with the theory.

For standard normal part (1);

n	mean of your 1000 \bar{x}	theoretical mean (see above)	standard deviation of your 1000 \bar{x}	theoretical standard deviation (see above)
1				
2				
6				
10				

Create a similar table for part 2) - 6) yourself.
Be sure to show all work for the calculation of the theoretical values.

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