

Lab Assignment 01

PSTAT 174/274

September 27, 2021

1. Let $X \sim U(-1, 1)$ be uniform on $(-1, 1)$, i.e., $f_X(x) = 1/2$ when $-1 < x < 1$ and zero otherwise. Let $Y = X^2$. Calculate the correlation of X and Y ? Now, use `runif()` in R to generate 1000 I.I.D samples of X 's from $U(-1, 1)$, and Y 's, calculate the sample correlation of X and Y . Are X and Y uncorrelated? Are X and Y independent? Any conclusion on the relationship between uncorrelated and independent?
2. Use `runif()` in R to generate 10, 100, and 1000 I.I.D samples from $U(-1, 1)$ respectively, calculate the sample means, compare these sample means with true mean? Any conclusion on the relationship between sample mean and true mean?
3. Generate 1000 I.I.D samples of size 100 from $U(-1, 1)$, and calculate the sample means. Now, we have 1000 sample means. Plot the histogram of these sample means. What's the asymptotic distribution of these sample means?
4. The file `uspop.txt` contains US population from 1970 to 1990. Plot US population (in Millions) vs Year. Now, take the square root of US population (in Millions), and plot it vs Year. Any difference between these two graphs?