

ECON 5350 Problem Set #2

Due: Thursday, October 1 at the beginning of class

1. The following sample is drawn from a normal distribution with mean μ and standard deviation σ :

$$X = (1.3, 2.1, 0.4, 1.3, 0.5, 0.2, 1.8, 2.5, 1.9, 3.2).$$

Compute the mean, median, variance, and standard deviation of the sample. Do not use Gauss for this problem (except maybe to check your answer).

2. A common method of simulating random draws from the standard normal distribution is to compute the sum of 12 draws from the *uniform*[0, 1] distribution and subtract 6. Can you justify this procedure?
3. The random variable X has a continuous distribution $f(x)$ and cumulative distribution function $F(x)$. What is the probability distribution of the sample maximum? [Hint: In a random sample on n observations, $\{X_1, X_2, \dots, X_n\}$, if Z is the maximum, then every observation in the sample is less than or equal to Z . Use the cdf.]
4. In random sampling from the exponential distribution

$$f(x) = (1/\theta)\exp[-x/\theta], \quad x, \theta > 0,$$

find the maximum likelihood estimator of θ and obtain the asymptotic distribution of this estimator.

GAUSS PROBLEMS

5. Let $\{X_1, X_2, \dots, X_{20}\}$ be a random sample from a *uniform*[0, 1] distribution.
 - (a) Generate a histogram to estimate the sampling distribution for Y_1 , the first order statistic, by simulating 500 random samples (each of size 20).
 - (b) Calculate the actual sampling distribution for Y_1 ($n = 20$) and create an xy graph of the pdf. Comment on the similarities and differences between the actual and estimated sampling distributions.
6. Maximum Likelihood and Hypothesis Testing.
 - (a) Find the MLE of λ assuming that the time-series data in [hw2q8.txt](#) are generated from a Poisson(λ) distribution ($n = 11$). The data are the number of homicides in New York City from 1985-1995 as reported by the Bureau of Justice Statistics.

- (b) What is the estimated asymptotic variance of the ML estimate of λ ? Use the result from question 5 of problem set #1 to calculate the exact sample variance. Comment on the performance of the asymptotic variance relative to the exact variance. Also, comment on the difference.