

STA 575 Practice Problems 1

1. What is the difference between sampling error and measurement error? Please explain.
2. Suppose in SRS wr, \bar{y} is used to estimate μ .
 - a. Show $E(\bar{y}) = \mu$.
 - b. Provide a complete explanation as to what is the meaning of “expectation.”
 - c. Are unbiased estimators better than biased estimators? Please explain.
3. Is the following a true statement? “To invoke the CLT, the sample size must be large and the finite population should be approximately normally distributed.”
4. After invoking the CLT, should you use $z_{\alpha/2}$ or $t_{\alpha/2}$ to construct a CI for a parameter under study? Please explain.
5. Consider a sample size determination problem for μ in which no previous estimate of σ is available. However, other studies have come up with estimates of the extreme (min, max) values of the variable under study. Can this information be used in determining the sample size (n)? Please provide a detailed explanation.
6. Why do exact CIs for population proportions depend on the hypergeometric distribution in SRS wr and the binomial distribution in SRS wr?
7. Consider the scenario in which μ_k , the mean of the k^{th} subpopulation, is under study. If a SRS wr of size n is taken, n_k (the number of units selected from the k^{th} subpopulation) is a random variable. Please describe another sampling design in which n_k is not a random variable.
8. Using sampling with replacement, why is $Var(\hat{\tau}_p) < Var(\hat{\tau})$ if the selection probabilities p_i are approximately proportional to the y_i -values?
9.
 - a. Is p_i in the Hansen-Hurwitz estimator the same as π_i in the Horvitz-Thompson estimator? Explain.
 - b. If in part a. you answered no, under what circumstances are p_i and π_i identical?
 - c. Can the Horvitz-Thompson estimator be used when SRS is performed without replacement? How about with replacement? Explain in detail how to compute π_i in each case.
10. Is the statistical programming language R useful in understanding sampling concepts? Please explain.