Exercises revised:

1. An i.i.d. sample of n = 30 is selected from a population of N = 400 shoppers. Score x is the dollar value of merchandise purchased. From this sample it is calculated that the sum of the x-scores is equal to 277.2 and the sum of the squares of these same x-scores is equal to 2666.

a. Give a 99% C.I. for the population mean μ. Use the z-method (approximate C.I. for large n).

\[ x \pm 2.576 \sqrt{\frac{\text{Var}(x)}{n}} = 9.24 \pm 2.576(1.8998) \sqrt{\frac{2666}{30}} \]

b. Had the sample instead been taken without replacement, but with equal probability, the 99% C.I. would incorporate the FPC. Give this interval.

\[ 9.24 \pm 2.576(1.8998) \sqrt{\frac{2666}{30}} \cdot 0.963 \]

- 0.963

\[ \text{FPC} \]

\[ \frac{400}{30} = 13.33 \]

- 13.33

- 400 - 1

- 296.3

- 0.963

C. The members of this population are either residents or visitors. It is known that 20% of the population are visitors. The i.i.d. sample has 11 visitors (not the 6 expected). The average x-score of the 11 is denoted xBAR and the average x-score of the 19 residents in the sample is denoted x1BAR and the average x-score of the 19 residents in the sample is denoted x2BAR. From the above information what is the numerical value of (11/30) x1BAR + (19/30) x2BAR?

\[ = \bar{x} = 9.24 \]

D. Refer to (c). What is the population proportion \( \hat{w} \) of visitors?

\[ \hat{w} = 0.2 \]

E. Refer to (c). What is the Plan B estimate of μ? Assume xBAR = 8.6 and x2BAR = 9.4.

f. Refer to (e). Give the 99% Plan B C.I. for μ. Compare its width with (a).

\[ \text{ASSUME } s_1 = 1.6, s_2 = 1.4 \]

\[ \bar{x}_i, \bar{x}_j, \bar{x}_k \pm 2.576 \frac{s_i^2 + s_j^2 + s_k^2}{m_1 + m_2 + m_3} \]

\[ \bar{x}_i, \bar{x}_j, \bar{x}_k \pm 2.576 \frac{1.6^2 + 1.4^2}{30} \]

\[ 9.24 \pm 2.576 \sqrt{\frac{1.6^2 + 1.4^2}{30}} \]

2. Refer to (1) but suppose that instead Plan A has been used to select the sample of 30, comprised of an i.i.d. sample from visitors and, independently, a second i.i.d. sample from residents.

a. How many of each type are selected using Plan A?

b. Suppose as above that xBAR = 8.6 and x2BAR = 9.4. Give the Plan A estimate of μ.

\[ \bar{x} \]

\[ \bar{x} = 8.6 + 0.8(9.4) = 9.24 \]

Plan A always gives \( \bar{x} \).

c. Refer to (b). Suppose also as above that \( s_1 = 1.6 \) and \( s_2 = 1.4 \). Give the Plan A 99% C.I. for \( \mu \). Compare its size to that of (1a) and (1f). Which is typically the smallest?

\[ \bar{x} \pm 2.576 \sqrt{\frac{\text{Var}(x)}{n}} = 9.24 \pm 2.576 \sqrt{\frac{1.6^2 + 1.4^2}{30}} \]

3. Consider once again that the sample of 30 is i.i.d. In addition to y = dollar value of purchase we also gather x = age of purchaser. Suppose we find that xBAR = 29.7, yBAR = 277.2 / 30, s(x) = 12.2, s(y) = 1.87, and the sample correlation is \( \text{rhoHAT} = 0.7 \). Assume the population mean \( \mu(x) \) is known to be 33.5.

a. Give the usual 95% C.I. for \( \mu(y) \) using the z-score.

b. Give the regression estimate of \( \mu(y) \) not \( \bar{y} \).

\[ \mu(y) = 9.24 + 0.87 \frac{18.7}{12.2} (33.5 - 29.7) \]

c. Give the 95% C.I. for \( \mu(y) \) based upon the regression estimate of \( \mu(y) \).