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Q3

Exercise 7.6 of the textbook (page 244-245)

1) Estimate μ.

$$\hat{\mu} = \frac{\sum observations}{n} = \frac{12.00+11.97+...+12.02+12.04}{36} = \frac{430.04}{36} \approx 11.9456$$

Thus, the estimation of μ is 11.9456 (ounces).

2) Place a bound on the error of estimation. Assume $N = 1800$.

$$Var(s^2) = \frac{(X_i - \hat{\mu})}{n-1} = \frac{(12.00-11.9456)^2 + (11.97-11.9456)^2 + ... + (12.02-11.9456)^2 + (12.04-11.9456)^2}{36-1} \approx 0.0058$$

$$\hat{Var}(\hat{\mu}) = (1 - \frac{n}{N})\frac{s^2}{n} = (1 - \frac{36}{1800})\frac{0.0058}{36} \approx 0.000159$$

The bound of error of estimation is

$$B = 2\sqrt{\hat{Var}(\hat{\mu})} = 2\sqrt{0.000159} \approx 0.02513.$$

Therefore, the average amount of fill lies within the bound of error 0.02513 (ounces) of the estimation.