ST 502 HW 3 Chapter 7 Problem 35

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January 24, 2017

In this problem we will investiate the calculation of estimates of population parameters from a SRS.

```
library(pander)
sampleSize <- 25
populationSize <- 2000

sample <- c(104, 109, 111, 109, 87, 86, 80, 119, 88, 122, 91, 103, 99, 108, 96, 104,
    98, 98, 83, 107, 79, 87, 94, 92, 97)

pander(data.frame(mean(sample)), caption = "The sample mean is an unbiased estimate of the population m
```

Table 1: The sample mean is an unbiased estimate of the population mean

mean.sample.
98.04

```
# Calculate unboased estimate of population variance.
Xbar <- mean(sample)

Xsq <- apply(X = as.data.frame(sample), FUN = function(data) {
    data^2 - Xbar^2
}, MARGIN = 1)

sumOfSquares <- sum(Xsq)

Sn <- 1/(sampleSize - 1) * sumOfSquares

unbiasedEstimateOfPoulationVariance <- (1 - 1/populationSize) * Sn

unbiasedEstimateOfPoulationSQ <- sqrt(unbiasedEstimateOfPoulationVariance)

# Compare to sampling with replacement as a sanity check
sd(sample)
```

```
## [1] 11.56316
```

```
pander(data.frame(unbiasedEstimateOfPoulationVariance), caption = "Unbiased estimate of population varia
```

Table 2: Unbiased estimate of population variance

unbiasedEstimateOfPoulationVariance
133.6

```r
# Calculate estimated variance of Xbar

SXbar <- Sn/sampleSize * (1 - sampleSize/populationSize)


pander(data.frame(SXbar), caption = "Unbiased estimate of Xbar variance")
```

Table 3: Unbiased estimate of Xbar variance

SXbar
5.281

```r
CI_low <- Xbar - 1.96 * SXbar
CI_high <- Xbar + 1.96 * SXbar

pander(data.frame(ci_low = CI_low, ci_high = CI_high), "95% CI for population mean based on SRS")
```

Table 4: 95% CI for population mean based on SRS

ci_low	ci_high
87.69	108.4