Revision

0.1 Confidence Intervals

General Structure of a confidence interval

$$\text{Point Estimate} \pm (\text{Quantile} \times \text{Standard Error})$$

0.2 Hypothesis testing

step 1 Formally write out the null hypothesis H_0 and the alternative hypothesis H_1.

step 2 Compute the Test Statistic (TS)

step 3 Determine, from the statistical tables, the Critical Value CV.

step 4 Use the Decision Rule to form a conclusion about the test.

1 Question 1

- Sample mean $\bar{x} = 121$ (Point Estimate)
- Sample standard deviation $s = 14$ (use this as an estimate for σ)
- Sample Size n = 49 (n.b. Large Sample)

1.1 Confidence Interval

Confidence Intervals are always 2 tailed procedures. Also the level of significance is $\alpha = 0.05$. As it is a large sample the quantile is 1.96.

$$\text{Point Estimate} \pm (\text{Quantile} \times \text{Standard Error})$$

$$\bar{x} \pm \left(\text{Q} \times \frac{s}{\sqrt{n}} \right)$$

$$121 \pm \left(1.96 \times \frac{14}{\sqrt{49}} \right) = (117.08, 124.92)$$

1.2 Hypothesis Test

Step 1: Formally write out the null hypothesis H_0 and the alternative hypothesis H_1.

Let μ_{IT} be the mean score for the ***population*** of experience IT users. Under the null hypothesis, this mean score is the same for the general population (i.e. 100). Under the alternative hypothesis, this mean score is difference than that of the general population.

H_0 $\mu_{IT} = 100$

H_1 $\mu_{IT} \neq 100$

(Remark: this is a two-tailed test $\neq$ in the alternative hypothesis)

Step 2: Compute the Test Statistic

$$TS = \frac{\text{Observed Value} - \text{Null Value}}{\text{Standard Error}}$$

- Observed vale i.e. sample mean = 121
- Null value i.e. expected value under the null hypothesis = 100
- Standard Error - computed for confidence interval = 2.

$$TS = \frac{121 - 100}{2} = 10.5$$

Step 3: Determine the Critical value

Critical values are determined the same way as quantiles are, when computing confidence intervals.

- This test is a 2 tailed procedures.
- The level of significance is $\alpha = 0.05$.
- There is a large sample ($n > 30$).

The critical value is 1.96.
Step 3: Decision Rule

Is the absolute value of the Test statistic greater than the Critical value

$$|TS| > CV?$$

- If Yes, We **Reject** the null hypothesis

- If No, We **Fail to Reject** the null hypothesis

$$|10.5| > 1.96?$$

Yes! We reject the null hypothesis. The mean value for experienced IT users is different (i.e. larger) than the mean for the general population.