Example 6.3

Research Hypothesis: whether the mean amount spent under proposal A and proposal B is different.

Hypothesis Test: assuming underlying populations normally distributed, with unknown standard deviation, with equal variances, we are comparing the population mean from two independent groups, therefore the test to use is unpaired t-test (two-sided)

Hypotheses:

$H_0 : \mu_A = \mu_B$

$H_1 : \mu_A \neq \mu_B$

Significance level: 5%

Test statistic

$$T = \frac{\bar{x}_A - \bar{x}_B}{\sqrt{s_p^2\left(\frac{1}{n_A} + \frac{1}{n_B}\right)}} \sim t(n_A + n_B - 2) \text{ under } H_0$$

Observed test statistic

$n_A = n_B = 150$

$\bar{x}_A = 1971$, $\bar{x}_B = 2000$

$s_A = 368$ $s_B = 440$

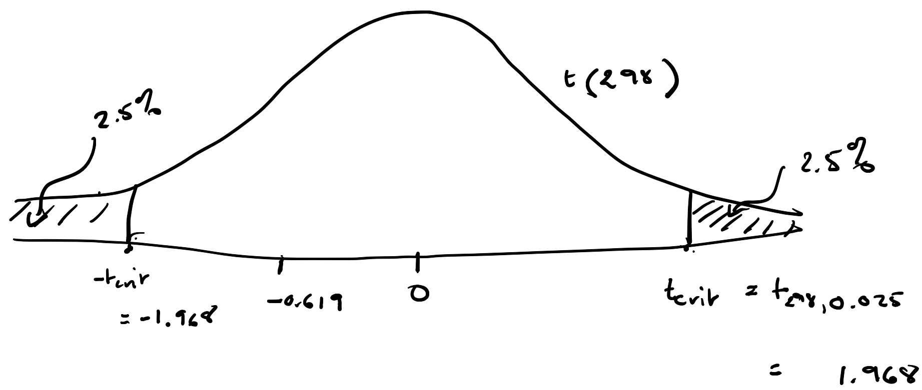
$$s_p^2 = \frac{149 \times 368^2 + 149 \times 440^2}{298}$$

$$= 164512$$

$$t_{obs} = \frac{1971 - 2000}{\sqrt{s_p^2\left(\frac{1}{150} + \frac{1}{150}\right)}}$$

$$= -0.619$$

Rejection Region



Test Decision : $t_{obs} > -t_{crit}$ and $t_{obs} < t_{crit}$, therefore we cannot reject H_0 in favour of H_1

Test Conclusion : There is insufficient evidence to suggest that the mean amount spent under the two proposals is different.

Confidence Interval for true mean difference

$$(\bar{x}_A - \bar{x}_B) \pm t(298\,;\,0.025)\sqrt{s_p^2\left(\frac{1}{n_A}+\frac{1}{n_B}\right)}$$

$$= -29 \pm 1.968\sqrt{164512 \times \left(\frac{1}{150}+\frac{1}{150}\right)}$$

$$= (-121.17, 63.17)$$

So, 0 is a plausible value of 95% Confidence Interval and $\therefore$ it is possible that the true population mean value of the differences is 0.