QM2A/QM2A for Finance Workshop Answer Sheet

Student name: Iván Velázquez **Student ID:** 20800892

Date: 10-10-25 **Workshop time & room:** 3-4 B81

Tutor's name for this workshop: Shilpi Jha **Worksheet number**

If attending from **another workshop group**, please complete the following:

Your normal tutor ('Taught by' on your timetable):

Your normal workshop day: Your normal workshop time & room:

1. $H_0: \mu > 10$ $H_1 \leq 10$

Distribution: t

Degrees of Freedom $N - 1$ & $40 - 1 = 39$

Critical value: $t_{39, 0.100} : 1.303$

Decision rule: reject H_0 if sampl t-value > 1.303

Sample t-value $= \frac{\bar{x} - \mu}{SE(\bar{x})}$ $SE(\bar{x}) = \frac{s}{\sqrt{n}}$

Sample t-value $= \frac{13 - 10}{0.9645}$ $SE(\bar{x}) = \frac{6.1}{\sqrt{40}}$

$SE(\bar{x}) = \frac{0.1}{6.3295}$

Sample t-value $= 3.1104$ $SE(\bar{x}) = 0.9645$

Decision.

Sample t-value (3.1104) > critical value 1.303 so reject H_0 at 1% of significance level

ie. The samples does provide evidence to contradict the Newspaper claim

Iván Velázquez
10-10-25

20800892
3-4pm B81

(2) $N_A = 40$ $\bar{X}_A = 13$ $S_A^2 = 6.1$
$N_B = 100$ $\bar{X}_B = 15$ $S_B^2 = 8.2$

a) $H_0 = \mu_A - \mu_B = 0$ $H_1 = \mu_A - \mu_B \neq 0$

Distribution : t

Degrees of Freedom : $N_A + N_B - 2 = 40 + 110 - 2 = 148$

Significance level : 5%

Critical values : $t_{148, 0.025} \approx \pm 1.96$

Decision rule : Reject H_0 if sample t-value is either < -1.96 or $> +1.96$

Sampl t-value

$$SE = S^2 = \frac{\bar{X}_A - \bar{X}_B - 0}{SE(\bar{X}_A - \bar{X}_B)}$$

$$SE(\bar{X}_A - \bar{X}_B) = \sqrt{\frac{S^2}{N_A} + \frac{S^2}{N_B}}$$

where $S^2 = \frac{(N_A - 1)S_A^2 + (N_B - 1)S_B^2}{N_A + N_B - 2}$

$$S^2 = \frac{(40-1)6.1 + (110-1)8.2}{148}$$

$$S^2 = 8.2$$

$$SE(\bar{X}_A - \bar{X}_B) = \sqrt{\frac{8.2}{40} + \frac{8.2}{110}}$$

$$SE(\bar{X}_A - \bar{X}_B) = 0.5286$$

Decision : As sample - t value is behind our critical value (-1.96) we are able to reject H_0 at 5% of significance level

i.e. there is enough evidence to reject H_0 at 5% of significance level

In other words there is a difference between the amount of beer drunk by adults in England and Scotland.

b)

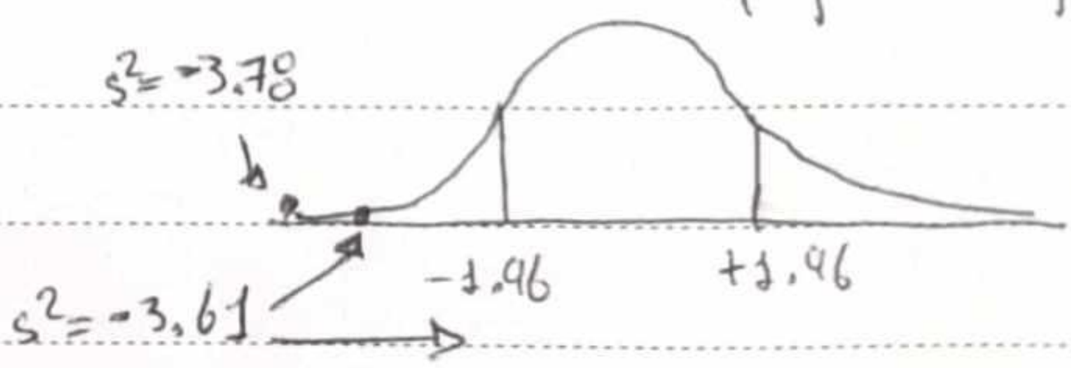
	Decision	
	Decisi Difference	No Difference
H_0	Type 1 error	No error
H_1	no error	Type 2 error

When we decrease the sample size of one side (scalpish) we can be in a way of commiting an Type II error

So as marqued here: $SE(\bar{x}_A - \bar{x}_B) = \sqrt{\frac{8.2}{40} + \frac{8.2}{110}}$

Power = 1 - p(Type 2 error)

$SE(\bar{x}_A - \bar{x}_B) = 0.5286$, if we decrease this number (sample size) we got another $SE(\bar{x}_A - \bar{x}_B)$ and this one tends to the ↓ to 80 right increasing the probability of ~~reject~~ not rejecting Ho



So. in order to reduce the chance of a Type 2 error without increasing the chance of Type 1 error I should increase N.