

例 7.3

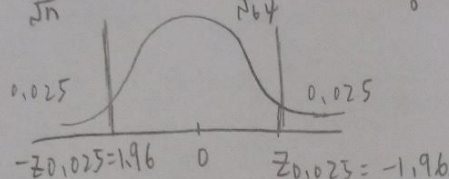
$$H_0: \mu = 30$$

$$H_1: \mu \neq 30$$

$$\alpha = 0.05$$

$$\text{棄卻域 } C = |z| > z_{0.025} = |z| > 1.96$$

$$z = \frac{\bar{x} - \mu_0}{\frac{s}{\sqrt{n}}} = \frac{30.563 - 30}{\frac{2.354}{\sqrt{64}}} = \frac{0.563}{\frac{2.354}{8}} = \frac{0.563}{0.29425} = 1.913$$



Accept H_0 , 沒有充分證據顯示業者宣稱有誤

例 7.4

$$\begin{aligned} P\text{-Value} &= 2P(Z > 1.913) \approx 2P(Z > 1.91) & (Z > 1.91) \\ & & = 1 - P(Z < 1.91) \\ &= 2 \times 0.0281 = 0.0562 > \alpha & = 1 - 0.9719 \\ & & = 0.0281 \end{aligned}$$

所以，我們不能拒絕虛無假設

例 7.5

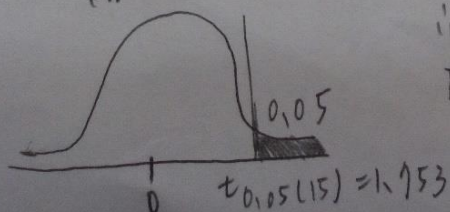
$n=16$, 小樣本, σ 未知

$$H_0: \mu \leq 55 \quad \alpha = 0.05$$

$$H_1: \mu > 55$$

$$\text{棄卻域 } C = T > t_{0.05}(15) = T > 1.753$$

$$T = \frac{\bar{x} - \mu_0}{\frac{s}{\sqrt{n}}} = \frac{59.312 - 55}{\frac{13.189}{\sqrt{16}}} = \frac{4.312}{\frac{13.189}{4}} = \frac{4.312}{3.298} = 1.308$$



Accept H_0 , 今年學生在統計學上的表現並沒有優於去年

例 7.6

設男大生 μ_1

女大生 μ_2

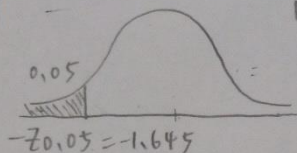
$$\alpha = 0.05$$

$$\text{棄卻域 } C = Z < -Z_{0.05} = Z < -1.645$$

$$H_0: \mu_1 - \mu_2 \geq 0$$

$$H_1: \mu_1 - \mu_2 < 0$$

$$Z = \frac{(\bar{x} - \bar{y}) - (\mu_1 - \mu_2)}{\sqrt{\frac{s_1^2}{n_1} + \frac{s_2^2}{n_2}}} = \frac{6.98 - 7.20}{\sqrt{\frac{0.98^2}{200} + \frac{0.95^2}{180}}} = \frac{-0.22}{0.07853} = -2.801$$



棄卻虛無假設，即男學生平均睡眠
少於女學生

例 7.7

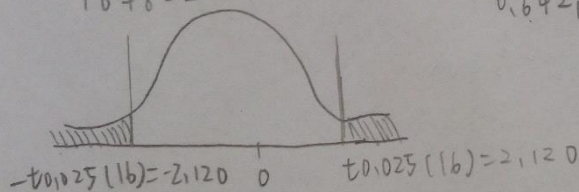
$$\frac{1}{2}\alpha: H_0: \mu_1 - \mu_2 = 0, H_1: \mu_1 - \mu_2 \neq 0$$

$$\alpha = 0.05$$

查表

$$\text{棄卻域} = |T| > t_{\frac{\alpha}{2}}(n_1 + n_2 - 2) = |T| > t_{0.025}(16) = |T| > 2.120$$

$$S_p = \sqrt{\frac{9 \times 0.653^2 + 7 \times 0.62^2}{10 + 8 - 2}} = 0.642, T = \frac{7.728 - 7.546}{0.642 \sqrt{\frac{1}{10} + \frac{1}{8}}} = 0.598$$



Accept H_0 ，即兩種品牌嬰兒奶粉對嬰兒體重成長沒有顯著差異

例 7.8

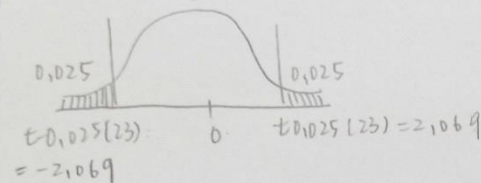
$$\frac{1}{2}\alpha: H_0: \mu_1 - \mu_2 = 0, H_1: \mu_1 - \mu_2 \neq 0$$

$$\alpha = 0.05$$

$$U = \frac{\left(\frac{s_1^2}{n_1} + \frac{s_2^2}{n_2}\right)^2}{\frac{\left(\frac{s_1^2}{n_1}\right)^2}{n_1 - 1} + \frac{\left(\frac{s_2^2}{n_2}\right)^2}{n_2 - 1}} = \frac{\left(\frac{4.82^2}{12} + \frac{8.54^2}{15}\right)^2}{\frac{\left(\frac{4.82^2}{12}\right)^2}{12 - 1} + \frac{\left(\frac{8.54^2}{15}\right)^2}{15 - 1}} = 22.973 \approx 23$$

棄卻域 $C = |T| > t_{\frac{\alpha}{2}}(v) = |T| > t_{0,025}(23) = T > 2,069$

$T = \frac{78,25 - 72,60}{\sqrt{\frac{4,82^2}{12} + \frac{8,54^2}{15}}} = 2,169$



棄卻虛無假設，即兩種教學方法對學生成績表現有顯著差異

T及 7,9

假設 $H_0: \mu_1 - \mu_2 \geq 0$

$H_1: \mu_1 - \mu_2 < 0$

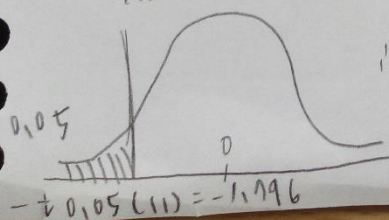
$\bar{d} = (-1) + (-4) + (-4) + 10 + (-2) + 0 + (-1) + (-10) + (-6) + (-3) + (-9) + (-6)$
 $12 = -3,5$

$S_d = \sqrt{\frac{[(-3,5+1)^2 + (-3,5+4)^2 + (-3,5+4)^2 + (-3,5+10)^2 + (-3,5+2)^2 + (-3,5+0)^2 + (-3,5+1)^2 + (-3,5+10)^2 + (-3,5+6)^2 + (-3,5+3)^2 + (-3,5+9)^2 + (-3,5+6)^2]}{12-1}}$
 $= 5,231$

$\alpha = 0,05$

棄卻域 $C = T < -t_{0,05}(11) = T < -1,796$

$T = \frac{\bar{d} - d_0}{\frac{S_d}{\sqrt{n}}} = \frac{-3,5 - 0}{\frac{5,231}{12}} = -2,318$



棄卻虛無假設，接受進修後的員工可以有比較好的工作表現

例 7.10

$$H_0: \sigma^2 < 0.15$$

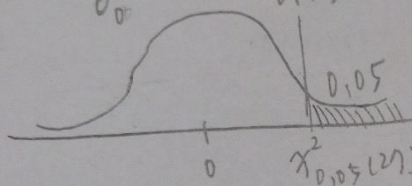
$$H_1: \sigma^2 > 0.15$$

右尾檢定

$$\alpha = 0.05$$

$$\text{棄卻域 } C = \chi^2 > \chi^2_{\alpha}(n-1) = \chi^2 > \chi^2_{0.05}(27) = \chi^2 > 40.11$$

$$\chi^2 = \frac{(n-1)s^2}{\sigma_0^2} = \frac{27(0.35)^2}{0.15} = 22.05$$



1) Accept H_0 , 目前生產線呈

穩定狀況, 不需要做機械

維修工作