C.I. 6. → CV. 公式. 計算.

共102

Statistics (2) Quiz-1

Date: Apr. 17, 2018

Name：

ID：

14

1. A researcher claim that there is a difference in the distance of travelling to school between day students and evening students. Two random samples are taken, and the data are shown.
   (a) Find the 95% confidence interval of the difference in the means.
   (b) At 0.05 significant level, test the claim.

Day students	Evening students
$\bar{x}_1 = 4.7$	$\bar{x}_2 = 6.2$
$S_1 = 1.5$	$S_2 = 1.7$
$n_1 = 12$	$n_2 = 16$

a. $(\bar{x}_1-\bar{x}_2) \pm t \cdot \sqrt{\frac{S_1^2}{n_1}+\frac{S_2^2}{n_2}}$ (2.201)

df = 11

3 $(-2.835, -0.165)$

(b) ① $H_0: \mu_1 = \mu_2$

2 $H_1: \mu_1 \neq \mu_2$ (claim)

② $\alpha = 0.05$, df = 11

1 CV ⇒ $t = 2.201$

3 ③ $t = (\bar{x}_1-\bar{x}_2) \Big/ \sqrt{\frac{S_1^2}{n_1}+\frac{S_2^2}{n_2}} = -2.47$

④ Decision

2 rej. Ho.

⑤ Summary.

1 有足夠証據支持宣稱.

2

0

2. The manager of a large company claims that the standard deviation of the time (in minutes) that it takes a telephone call to be transferred to the correct office in her company is 1.2 minutes or less. A random sample of 15 calls is selected, and the calls are timed. The standard deviation of the sample is 1.8 minutes. At $\alpha = 0.01$, test the claim that the standard deviation is less than or equal to 1.2 minutes. Use the P-value method.

$\chi^2(0.005) = 31.319$

2 $H_0: \sigma^2 \le 1.2^2$ (claim)

$H_1: \sigma^2 > 1.2^2$

CV: $\chi^2 = 29.141$

df = 14.

test value:

$\chi^2 = \frac{(n-1)S^2}{\sigma^2} = 31.5$

~~$p(\chi^2$~~

p-value < 0.005

⇒ p-value < α

⇒ reject Ho.

① 能夠証據証明宣稱有誤

2.0

29.141

9

3. A researcher claims that students in a private school have exam scores that are at most 6 points higher than those of students in public schools. Random samples of 60 students from each type of school are selected and given an exam. The results are shown. At $\alpha = 0.05$, test the claim.

Private School	Public School
$\bar{x}_1 = 112$	$\bar{x}_2 = 104$
$\sigma_1 = 15$	$\sigma_2 = 15$
$n_1 = 60$	$n_2 = 60$

2 ① $H_0: \mu_1 - \mu_2 \le 6$ (claim)

$H_1: \mu_1 - \mu_2 > 6$

1 ② $\alpha = 0.05 \Rightarrow z = 1.645$

3 ③ $z = \frac{(\bar{x}_1-\bar{x}_2)-6}{\sqrt{\frac{\sigma_1^2}{n_1}+\frac{S_2^2}{n_2}}} = 0.73$

1 ④ Decision: do not reject Ho

2 ⑤ 無足夠証據証明宣稱有誤.

1

4

4. Upright vacuum cleaners have either a hard body type or a soft body type. Shown are the weights in pounds of a random sample of each type. Assume the variable is normally distributed.
   (a) At $\alpha = 0.05$, can it be concluded that the means of the weights are different?
   (b) Find the 95% confidence interval for the difference of the means.

Hard types			Soft types		
21	18	23	14	13	11
20	16	17	13	12	15
Mean = 18			Mean = 13		
Variance = 4.5			Variance = 2.5		

(a) 2 ① $H_0: \mu_1 = \mu_2$

$H_1: \mu_1 \neq \mu_2$ (claim)

1 ② CV: $t(12) = 2.571$

3 ③ test value

$t = \frac{\bar{x}_1 - \bar{x}_2}{\sqrt{\frac{S_1^2}{n_1}+\frac{S_2^2}{n_2}}} = 4.63$

1 ④ reject Ho.

2 ⑤ 有足夠証據支持宣稱是對的.

95% C.I. 2.571 1

① $(\bar{x}_1 - \bar{x}_2) \pm t \cdot \sqrt{\frac{S_1^2}{n_1}+\frac{S_2^2}{n_2}}$

③ $(2.224, 7.776)$

2

10. 6. 8 98

5. In a random sample of 80 Americans, 44 wished that they were rich. In a random sample of 100 Europeans, 46 wished that they were rich. At $\alpha = 0.02$, is there a difference in the proportions? Find the 98% confidence interval for the difference of the two proportions.

18

$\hat{p}_1 = \frac{44}{80} = 0.55$ ①

$\hat{p}_2 = 0.46$ ①

$\bar{p} = \frac{46+44}{100+80} = 0.5$ ②

2 ① $\begin{cases} H_0: p_1 = p_2 \\ H_1: p_1 \neq p_2 \text{ (claim)} \end{cases}$ 1

$\alpha = 0.02$

1 ② $\Rightarrow CV: z = 2.33$

3 ③ $z = \frac{0.55 - 0.46}{\sqrt{0.5 \times 0.5 \times (\frac{1}{80} + \frac{1}{100})}} = 1.2$

④ do not rej. H_0

⑤ 無足夠 2 証据支持宣称.

98% CI. 1

$(\bar{x}_1 - \bar{x}_2) \pm z \cdot \sqrt{\frac{\hat{p}_1 \times \hat{q}_1}{n_1} + \frac{\hat{p}_2 \ldots}{n \ldots}}$ (2.33)

$\Rightarrow$ 3. $(-0.084, 0.264)$

2

9 6. A U.S. Web Usage Snapshot indicated a monthly average of 36 Internet visits a particular website per user form home. A random sample of 25 Internet users yielded a sample mean of 42.1 visits with a standard deviation of 5.3. At the 0.01 level of significance, can it be concluded that this differs from the national average?

n = 25

σ未知 t 2 $\begin{cases} H_0: \mu = 36 \\ H_1: \mu \neq 36 \text{ (claim)} \end{cases}$

= 24 ② 1 $CV: t = 2.797$.

③ 3 $t = \frac{42.1 - 36}{5.3/\sqrt{25}} = 5.75$

$\Rightarrow$ ④ 2 reject H_0.

⑤ Summary:

1 有足夠証据支持宣称即.

1

7. A survey by *Men's Health* magazine stated that 15% of men said they used exercise to reduce stress. Use α=0.10. A random sample of 100 men was selected, and 10 said that they used exercise to relieve stress. Use the *P*-value method to test the claim. Could the results be generalized to all adult Americans?

10

2 ① $\begin{cases} H_0: p = 15\% \text{ (claim)} \\ H_1: p \neq 15\% \end{cases}$ $\hat{p} = 0.1$

② ~~α = 0.05~~ $\Rightarrow$ $\alpha = 0.1$

3 ③ $z = \frac{0.1 - 0.15}{\sqrt{0.15 \times 0.95 / 100}} = -1.4$

2 p-value $= 0.0808 \ngtr \alpha$.

$\Rightarrow$ do not rej. H_0

④

1 ⑤ 無足夠証据証明宣称有誤

3

8. A doctor is interested in determining whether a film about exercise will change six persons' attitudes about exercise. The results of his questionnaire are shown. A higher numerical value shows a more favorable attitude toward exercise. Is there enough evidence to support the claim, at $\alpha = 0.05$, that there was a change in attitude? Find the 95% confidence interval for the difference of the two means.

t_D 6

Before	12	11	8	5	12	9
After	15	11	9	7	10	11

Af − B 3 0 1 2 −2 2 ← D

2 ① $\begin{cases} H_0: \mu_D = 0 \\ H_1: \mu_D \neq 0 \text{ (claim)} \end{cases}$ 10

$df = 6-1$

1 ② $\alpha = 0.05 \Rightarrow t = 2.571$

③ $t = \frac{\bar{x}_D - \mu_D}{s/\sqrt{n}}$

3 $= 1.37$

2 ④ do not rej H_0

1 ⑤ 無足夠証据支持宣称.

6 95% CI.

$\bar{x}_D \pm t \cdot s/\sqrt{n}$ 1

$\Rightarrow 1 \pm 2.571 \sqrt{3.7/6}$

$\Rightarrow (-1.02, 3.02)$ 3

$\bar{x}_D = 1 \rightarrow 2$ or $\bar{x}_D = -1$

$s_D^2 = 3.2 \rightarrow 2$

$t = -1.2$

2.5 10 30 8+5