

FT Assignment #3

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10.2

We have to test. $H_0: P_1 = P_2 = P_3 = P_4$ vs H_1 : at least doesn't hold.

The test statistic,

$$\chi^2 = \sum \frac{O_i - E_i}{E_i} - n$$

$$E_i = \frac{n}{k} = \frac{206}{4} = 51.5$$

$$= \frac{1}{51.5} [50 + 42 + 32 + 82] - 206$$

$$= 27.243$$

Since $\chi^2 > \chi^2_{k-1} = \chi^2_3 = 7.81$, so the H_0 is not accepted.

10.4

We have to test $H_0: P_1 = P_2 = P_3 = P_4$ vs H_1 : at least doesn't hold.

The test statistic.

$$\chi^2 = \sum \frac{O_i - E_i}{E_i} - n$$

$$E_i = \frac{n}{k} = \frac{1000}{4} = 250$$

$$= \frac{1}{250} [250 + 450 + 150 + 150] - 1000$$

$$= 240$$

Since $\chi^2 > \chi^2_{k-1} = \chi^2_3 = 7.81$ thus the H_0 is not accepted.
The proportions of female students not similar in various department of AIUB.

10.5 Sample size = 36

$$\sum x = 761.6$$

$$\sum x^2 = 16125.5$$

$$\bar{x} = \frac{1}{n} \sum x = \frac{1}{36} \times 761.6 = 21.156$$

$$s^2 = \frac{1}{n-1} \left[\sum x^2 - \frac{(\sum x)^2}{n} \right]$$
$$= \frac{1}{35} \left[16125.5 - \frac{(761.6)^2}{36} \right] = 0.384$$

$$\Rightarrow s = \sqrt{0.384} = 0.617$$

$$Z = \frac{\bar{x} - \mu_0}{s/\sqrt{n}} \sim N(0,1)$$

$$= \frac{21.156 - 21}{0.617/\sqrt{36}} = 1.5104$$

$|z| < z_{1-\alpha/2} = 1.96$. H_0 is accepted.

10.7

We have to test $H_0: P = P_0 = 0.40$ Vs $H_1: P \neq P_0$.

$$\text{Now } P = \frac{8}{25} = 0.32$$

$$\text{Test statistic } Z = \frac{P - P_0}{\sqrt{\frac{P_0 \times Q_0}{n}}} = \frac{0.32 - 0.40}{\sqrt{\frac{0.40 \times 0.60}{25}}}$$

$$= -0.8165$$

Since $|Z| < 1.96$, H_0 is accepted.

10.9

we have to test $H_0: P_1 = P_2$ vs $H_1: P_1 \neq P_2$

Test statistic $Z = \frac{P_1 - P_2}{\sqrt{PQ(\frac{1}{n_1} + \frac{1}{n_2})}} \sim N(0,1)$

$$P_1 = \frac{25}{100} = 0.25$$

$$P_2 = \frac{18}{125} = 0.14$$

$$P = \frac{a_1 + a_2}{n_1 + n_2} = \frac{43}{225} = 0.19$$

$$Q = 1 - P = 1 - 0.19 = 0.81$$

$$Z = \frac{0.25 - 0.14}{\sqrt{(0.19 \times 0.81)(\frac{1}{100} + \frac{1}{125})}} = 2.08995$$

Since $|Z| > 1.96$. So H_0 is rejected.

10.11

$$a=150, b=122, c=120, d=158$$

$$\chi^2 = \frac{n(ad-bc)^2}{(a+b)(a+c)(b+d)(c+d)} = \frac{550(150 \times 158 - 122 \times 120)}{272 \times 270 \times 250 + 278}$$

$$= 7.897$$

$\chi^2 > \chi^2_1 = 3.841$. So H_0 is rejected.

10.12

H₀: residential association

Full attention

H₀: ~~Origin~~ is associated with origin.

H₁: Full attention is not associated with origin.

$$a=1388, b=64, c=64, d=84.$$

$$\chi^2 = \frac{n(ad-bc)^2}{(a+b)(a+c)(b+d)(c+d)}$$

$$= \frac{350(1388 \times 84 - 64 \times 64)^2}{202 \times 202 \times 146 \times 146}$$

$$= 22.003$$

$\chi^2 > \chi^2_{1, 0.05} = 3.84$. So H₀ is rejected, Full attention is not associated with origin.