ch 12

المسافة بين العينات ← $M_s B = \dfrac{\sum n(\bar{X})^2 - \frac{(\sum n \bar{X})^2}{n}}{K-1}$

$(d.f)_B \rightarrow K-1$

pooled var (المسافة بين المشاهدات) ← $M_s W = \dfrac{s_1^2(n_1-1) + s_i^2(n_i-1)}{n-K}$

$(d.f)_W \rightarrow n-K$

* مقارنة الوسط لأكثر من مجموعة واختبار الفرضية

$H_0 : \mu_1 = \mu_2 = \mu_i$ | $H_a : \mu_i \neq \mu_i$ مينين مختلفين على الأقل

عدد المشاهدات الكلية (n)

عدد المجموعات (K)

$$\boxed{F_{stat\,(1-\alpha, K-1, n-K)} = \frac{M_s B}{M_s W}}$$

$d.f_{Total} = n-1$

$SS_{Total} = SS_B + SS_W$

من توزيع F

Critical region: $F_{1-\alpha}$

P-value: $P(F > F_{test})$

* اختبار اختلاف مينين داخل مجموعة (LSd)

$$\boxed{t_{(1-\frac{\alpha}{2}, n-K)} = \frac{\bar{x}_1 - \bar{x}_2}{\sqrt{M_s W \left(\frac{1}{n_1} + \frac{1}{n_2}\right)}}}$$

"ANOVA"

	SS	d.f	Ms	F
Between	SS_B	$K-1$	$\frac{SS_B}{K-1}$	$\frac{M_s B}{M_s W}$
within	SS_W	$n-K$	$\frac{SS_W}{n-K}$	—
Total	$SS_B + SS_W$	$n-1$	—	—

ch 11

$$L_{xy} = \Sigma(xy) - \frac{(\Sigma x \, \Sigma y)}{n}$$

$$L_{xx} = \Sigma x^2 - \frac{(\Sigma x)^2}{n}$$

$$L_{yy} = \Sigma y^2 - \frac{(\Sigma y)^2}{n}$$

* ايجاد معامل الارتباط بين مجموعة مشاهدات x ومجموعة y

sample Pearson corr coff

$$r = \frac{L_{xy}}{\sqrt{L_{xx} \cdot L_{xy}}}$$

population Pearson corr coff

$$\rho_{(C.I)} = \left(\frac{e^{2z_1} - 1}{e^{2z_1} + 1} , \frac{e^{2z_2} - 1}{e^{2z_2} + 1} \right)$$

$$z_1 = z - \frac{z_{1-\frac{\alpha}{2}}}{\sqrt{n-3}}$$

$$z_2 = z + \frac{z_{1-\frac{\alpha}{2}}}{\sqrt{n-3}}$$

Hypothesis

① $H_0: \rho = 0$, $H_a: \rho \neq 0$

$$t_{(n-2)} = r\sqrt{\frac{n-2}{1-r^2}}$$

② $H_0: \rho = \rho_0$, $H_a: \rho = \rho_0$

$$z_{test} = z - z_0 \left(\sqrt{n-3} \right)$$

$$z = \frac{1}{2} \ln \frac{1+r}{1-r}$$

$$z_0 = \frac{1}{2} \ln \frac{1+\rho_0}{1+\rho_0}$$

Ch6 "Estimation"

$$\bar{x} \sim N\left(\mu, \left(\frac{\sigma}{\sqrt{n}}\right)^2\right)$$

$\boxed{n<30}$ $\bar{x} \sim t\left(\mu, \left(\frac{s}{\sqrt{n}}\right)^2\right)$

$$\hat{p} \sim N\left(p, \left(\sqrt{\frac{pq}{n}}\right)^2\right)$$

$$\mu = \left(\bar{x} \pm \underbrace{\frac{\sigma}{\sqrt{n}} Z_{1-\frac{\alpha}{2}}}_{\text{الخطأ } (E)}\right)$$

(C.I)

طول الفترة : 2E

Point estimation for : $\mu \to \bar{x}$, $\sigma \to s$, $p \to \hat{p}$

population → Sample

$d.f = n-1$ for (t)

Ch7 "Hypothesis"

① (two tailed) $H_0: \mu = \mu_0$, $H_a: \mu \neq \mu_0$

(Right) $H_0: \mu = \mu_0$, $H_a: \mu > \mu_0$

(Left) $H_0: \mu = \mu_0$, $H_a: \mu < \mu_0$

→ test stat

② $Z_{test} = \frac{\bar{x}-\mu}{\sigma/\sqrt{n}}$ or $t_{test} = \frac{\bar{x}-\mu}{s/\sqrt{n}}$ $\boxed{n<30}$

or $Z_{test} = \frac{\hat{p}-p}{\sqrt{pq/n}}$

→ ③ Critical region or p-value (مرحلة التحكم)

* critical region →

$H_a: \neq$: $Z_{(1-\frac{\alpha}{2})}$ or $t_{(1-\frac{\alpha}{2}, n-1)}$

$H_a: >$: $Z_{(1-\alpha)}$ or $t_{(1-\alpha, n-1)}$ or $\chi^2_{(1-\alpha, (R-1)(c-1))}$

$H_a: <$: $-Z_{(1-\alpha)}$ or $-t_{(1-\alpha, n-1)}$ or $F_{(1-\alpha, K-1, n-K)}$

* p-value →

$H_a: \mu \neq \mu_0$: $2P(Z > \pm Z_{test})$ or $2P(t > \pm t_{test})$

$H_a: \mu > \mu_0$: $P(Z > Z_{test})$ or $P(t > t_{test})$ or $P(\chi^2 > \chi^2_{test})$

$H_a: \mu < \mu_0$: $P(Z < Z_{test})$ or $P(t < t_{test})$ or $P(F > F_{test})$

H_0 ✗ $\alpha > P$ value

H_0 ✓ P value $> \alpha$, 0.05

Ch8 "two population mean"

① Paired → (عينة واحدة قبل و بعد)

d الفرق بين : $\bar{d} \sim t\left(\mu_d, \left(\frac{s}{\sqrt{n}}\right)^2\right)$ ($\bar{x}$ زي)

$d.f = n-1$

$$\mu_d = \left(\bar{d} \pm \frac{s}{\sqrt{n}} t_{1-\frac{\alpha}{2}}\right)$$

(C.I)

$$t_{test} = \frac{\bar{d}-\mu_d}{s/\sqrt{n}}$$

② Two independent samples

$$\bar{x}_1 - \bar{x}_2 \sim t\left(\mu_1-\mu_2, \left(Sp\sqrt{\frac{1}{n_1}+\frac{1}{n_2}}\right)^2\right)$$

$$t_{test} = \frac{\bar{x}_1-\bar{x}_2-(\mu_1-\mu_2)}{Sp\sqrt{\frac{1}{n_1}+\frac{1}{n_2}}}$$

$$\mu_1-\mu_2 = \left(\bar{x}_1-\bar{x}_2 \pm \left(Sp\sqrt{\frac{1}{n_1}+\frac{1}{n_2}}\right) t_{1-\frac{\alpha}{2}}\right)$$

$d.f = n_1+n_2-2$

$$Sp_{\text{pooled (Stdev)}} = \sqrt{\frac{S_1^2(n_1-1)+S_2^2(n_2-1)}{n_1+n_2-2}}$$

Noor Asfoor

ch 10

* اذا أعطى السؤال احتماليين فقط

$H_0: \hat{p}_1 = \hat{p}_2$, $H_a: \hat{p}_1 \neq \hat{p}_2$

لايوجد علاقة بينهم "no assotiation" — يوجد علاقة بينهم "assotiation"

معامل التصحيح

$$Z_{test} = \frac{|\hat{p}_1 - \hat{p}_2| - \left(\frac{1}{n_1} + \frac{1}{n_2}\right)}{\sqrt{\bar{p}\bar{q}\left(\frac{1}{n_1} + \frac{1}{n_2}\right)}}$$

$$\boxed{\bar{p}_{pooled} = \frac{x_1 + x_2}{n_1 + n_2}}$$ {pooled proportion}

هي توزيع χ^2
Critical region : $\chi^2_{1-\alpha}$
P-value : $P(\chi^2 > \chi^2_{test})$

* اختبار أكثر من احتمال أو اذا أعطى السؤال أرقام نجد :

① contingency table (O) ② Expected table (E) ← $\frac{\text{مجموع الصف} \times \text{مجموع العمود}}{\text{المجموع الكلي}}$

معامل التصحيح

$$\boxed{\chi^2_{(1-\alpha, df)\,test} = \sum \frac{(|O - E| - 0.5)^2}{E}}$$

$$\boxed{d.f : (Rows - 1)(columns - 1)}$$

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* اختبار التوزيع الطبيعي "Normality"

① contingency table ② Expected $\boxed{\text{Normal}}$ table ← $\boxed{\text{احتمال } Z \times \text{العدد الكلي}}$

$$\boxed{\chi^2_{(1-\alpha,\, n-1)} = \sum \frac{|O - E|^2 - 0.5}{E}}$$

$$\boxed{d.f = n - 1}$$

(عدد الفئات) : (n)