ch 6

*** for estimation:**

- σ ✓ : Z distribution → $Z = \dfrac{\bar{X} - \mu}{\frac{\sigma}{\sqrt{n}}}$
  - Sample mean ($\bar{X}$), Population mean (μ), population std (σ), sample size (n)
- σ x :
  - $n \geq 30$: Z → $Z = \dfrac{\bar{X} - \mu}{\frac{s}{\sqrt{n}}}$
  - $n < 30$: t_{n-1} → $t = \dfrac{\bar{X} - \mu}{\frac{s}{\sqrt{n}}}$
    - sample std (s)

→ Binomial: if $n\hat{p}\hat{q} \geq 5 \Rightarrow$ Z → $Z = \dfrac{\hat{p} - p}{\sqrt{\frac{pq}{n}}}$

- sample proportion ($\hat{p}$), population proportion (p), q → $(1-p)$

Hypothesis testing:

ch 7

*** one sample inference**

- σ ✓ : Z distribution → $Z = \dfrac{\bar{X} - \mu_0}{\frac{\sigma}{\sqrt{n}}}$
- σ x :
  - $n \geq 30$: Z → $Z = \dfrac{\bar{X} - \mu_0}{\frac{s}{\sqrt{n}}}$
  - $n < 30$: t_{n-1} → $t = \dfrac{\bar{X} - \mu_0}{\frac{s}{\sqrt{n}}}$

→ for Binomial: if $np_0q_0 \geq 5 \Rightarrow$ Z → $Z = \dfrac{\hat{p} - p_0}{\sqrt{\frac{p_0 q_0}{n}}}$, $Z_{corr} = \dfrac{|\hat{p} - p_0| - \frac{1}{2}}{\sqrt{\frac{p_0 q_0}{n}}}$

* Two samples inference

ch8

Test statistic and p-value → α X

Paired samples → $t = \dfrac{\bar{d} - \Delta}{\frac{s}{\sqrt{n}}} = \dfrac{\bar{d}}{\frac{s}{\sqrt{n}}}$ (Δ always $= 0$)

→ t_{n-1} distribution

independent samples → $t = \dfrac{\bar{x}_1 - \bar{x}_2}{s\sqrt{\frac{1}{n_1} + \frac{1}{n_2}}}$

→ $t_{n_1+n_2-2}$ distribution

$$s = \sqrt{\frac{(n_1-1)s_1^2 + (n_2-1)s_2^2}{n_1+n_2-2}}$$

ch10

Binomial proportions: 2 methods

* Normal theory method

Z " Normal distribution

if $n_1\hat{p}\hat{q}_1 \geq 5$ and $n_2\hat{p}_2\hat{q}_2 \geq 5$ ⇒ $Z = \dfrac{\hat{p}_1 - \hat{p}_2}{\sqrt{\hat{p}\hat{q}\left(\frac{1}{n_1}+\frac{1}{n_2}\right)}}$, $Z_{corr} = \dfrac{|\hat{p}_1 - \hat{p}_2| - \left(\frac{1}{2n_1}+\frac{1}{2n_2}\right)}{\sqrt{\hat{p}\hat{q}\left(\frac{1}{n_1}+\frac{1}{n_2}\right)}}$

$$\hat{p} = \frac{x_1 + x_2}{n_1 + n_2}$$

* Contingency-table

Goodness-of-fit

χ^2_{g-k-1} ← df

groups ← g, k → estimated diameters

$$\chi = \sum \frac{(O_{ij} - E_{ij})^2}{E_{ij}}$$

2x2

χ^2_1 ((chi-square))

df ← 1

$$\chi = \sum \frac{(O_{ij} - E_{ij})^2}{E_{ij}}$$

OR

$$\chi_{corr} = \sum \frac{(|O_{ij} - E_{ij}| - 0.5)^2}{E_{ij}}$$

R x C

$\chi^2_{(R-1)(C-1)}$ ← df

Rows ← R, C → Columns

$$\chi = \sum \frac{(O_{ij} - E_{ij})^2}{E_{ij}}$$

ch 11

* Correlation coefficient

→ when $H_0: \rho = 0$ → t_{n-2} distribution → $t = \frac{r\sqrt{n-2}}{\sqrt{1-r^2}}$

$n-2$ → df

→ when $H_0: \rho = \rho_0$ ← قيمة هو معيّني يا هاني الصفر ، 0.3 مثلاً

Normal distribution → $\lambda = \frac{Z - Z_0}{\frac{1}{\sqrt{n-3}}}$

→ Z transformation

$Z_0 = \frac{1}{2} \ln\left(\frac{1+\rho}{1-\rho}\right)$ OR $\tanh^{-1}(\rho)$

$Z = \frac{1}{2} \ln\left(\frac{1+r}{1-r}\right)$ OR $\tanh^{-1}(r)$

ch 12

* One way Anova

~ we use it to compare the means for different groups

$F_{(k-1)(n-k)}$ distribution

df

tot number of groups

tot number of observations

$$F = \frac{\text{between MS}}{\text{within MS}}$$

$\Downarrow$

H₀ is rejected!

we have to know which groups differ from each other.

σ ✓

$\Downarrow$

Normal distribution

$$z = \frac{\bar{y}_1 - \bar{y}_2}{\sqrt{\sigma^2\left(\frac{1}{n_1}+\frac{1}{n_2}\right)}}$$

σ X

tot observations

t_{n-k} distribution

tot number of groups

group (1) mean

within MS ((pooled S))

$$t = \frac{\bar{y}_1 - \bar{y}_2}{\sqrt{s^2\left(\frac{1}{n_1}+\frac{1}{n_2}\right)}}$$