統計方法 期末作業   EMBA 98 黃[illegible] R07954[illegible]   p1

Chapt. 9

9.47 —

Fig 9.15 Analysis of Variance for time

Service	DF	SS	MS	F	P
display	2 $(p-1)$	500.17	250.08	30.11	0.000
Error	9 $(n-p)$	74.75	8.31		
Total	11 $(n-1)$	574.92			

a. $H_0: \mu_A = \mu_B = \mu_C$ (all treatment means are equal)
H_a : at least two of μ_A, μ_B, μ_C differ (at least two treatment means diff

Define the statistic

$$F = \frac{MST}{MSE} = \frac{SST/(p-1)}{SSE/(n-p)} = \frac{250.085}{8.3056} = 30.11$$

$F = 30.11 > F_{(2,9),0.05} = 4.26$ p-value $\doteq$ 0.000

Reject $H_0: \mu_A = \mu_B = \mu_C$; at least two displays differ

b. A Tukey simultaneous $100(1-\alpha)\%$ confidence interval for $\mu_i - \mu_h$ is

$\left[(\bar{x}_i - \bar{x}_h) \pm q_{(p,n-p),0.05}\sqrt{\frac{MSE}{m}}\right]$, 95% confidence interval $\begin{cases} n=12 \\ p=3 \\ n-p=9 \\ m=4 \end{cases}$

$\mu_A - \mu_B = 24.5 - 20.5 = 4.0$; $\left[4.0 \pm 3.95\sqrt{\frac{8.31}{4}}\right] \rightarrow [4 \pm 5.69] \rightarrow [-1.69, 9.69]$

$\mu_A - \mu_C = 24.5 - 35.75 = -11.25$; $[-11.25 \pm 5.69] \rightarrow [-16.94, -5.56]$

$\mu_B - \mu_C = 20.5 - 35.75 = -15.25$; $[-15.25 \pm 5.69] \rightarrow [-20.94, -9.56]$

B appears to Min the time

c. An individual $100(1-\alpha)\%$ confidence interval for $\mu_i - \mu_h$ is :

$\left[(\bar{x}_i - \bar{x}_h) \pm t_{(n-p),\frac{\alpha}{2}}\sqrt{MSE\left(\frac{1}{n_i}+\frac{1}{n_h}\right)}\right]$ $n_i = 4$ $n_h = 4$, $n = 12$, $p = 3$

$\mu_A - \mu_B = 24.5 - 20.5 = 4$, $\left[4 \pm t_{9,0.025}\sqrt{8.31\left(\frac{1}{4}+\frac{1}{4}\right)}\right] = [4 \pm 4.6128] = [-0.61, 8.61]$

$\mu_A - \mu_C = 24.5 - 35.75 = -11.25$, $[-11.25 \pm 4.6128] = [-15.86, -6.64]$

$\mu_B - \mu_C = 20.5 - 35.75 = -15.25$, $[-15.25 \pm 4.6128] = [-19.86, -10.64]$

10.17

a. $n=1000$. $P_{GM}=36\%$. $P_{Jap.}=26\%$, $P_{Ford}=21\%$. $P_{Chrysler}=9\%$. $P_{other}=8\%$

$E_i = np_i$ at least ≥ 5

$E_{GM} = 1000 \times 36\% = 360 \geq 5$

$E_{Jap} = 1000 \times 26\% = 260 \geq 5$

$E_{Ford} = 1000 \times 21\% = 210 \geq 5$

$E_{Chrylser} = 1000 \times 9\% = 90 \geq 5$

$E_{other} = 1000 \times 8\% = 80 \geq 5$

All E_i Value ≥ 5. So it is appropriate to carry out a chi-square test.

b. $\begin{cases} H_0: \text{Current market share not differ from those of 1990.} \\ H_a: \text{Current market share differ from those of 1990.} \end{cases}$

$$\chi^2 = \sum_{i=1}^{k} \frac{(f_i - E_i)^2}{E_i}$$

$$= \frac{(391-360)^2}{360} + \frac{(202-260)^2}{260} + \frac{(275-210)^2}{210} + \frac{(53-90)^2}{90} + \frac{(79-80)^2}{80}$$

$$= 2.6694 + 12.9385 + 20.1190 + 15.2111 + 0.0125$$

$$= 50.9505$$

$\chi^2_{(n-1),\alpha} \Rightarrow \chi^2_{(5-1),0.05}$ 經由P594查 table A.10表得知為 9.48773

因 $\chi^2 > \chi^2_\alpha \Rightarrow 50.9505 > 9.48773$ 故

Reject H_0: $p_1=0.36$, $p_2=0.26$, $p_3=0.21$, $p_4=0.09$, $p_5=0.08$

10.29

a. $\chi^2 = \sum_{\text{all cell}} \frac{(f_{ij} - \hat{E}_{ij})^2}{\hat{E}_{ij}} = \frac{\left(15 - \frac{40\times26}{78}\right)^2}{\frac{40\times26}{78}} + \frac{\left(0 - \frac{40\times26}{78}\right)^2}{\frac{40\times26}{78}} + \frac{\left(25 - \frac{40\times26}{78}\right)^2}{\frac{40\times26}{78}}$

$\begin{cases} H_0: \text{independence} \\ H_a: \text{not independence} \end{cases}$

$+ \frac{\left(1 - \frac{3\times26}{78}\right)^2}{\frac{3\times26}{78}} + \frac{\left(1 - \frac{3\times26}{78}\right)^2}{\frac{3\times26}{78}} + \frac{\left(1 - \frac{3\times26}{78}\right)^2}{\frac{3\times26}{78}}$

$+ \frac{\left(10 - \frac{26\times35}{78}\right)^2}{\frac{26\times35}{78}} + \frac{\left(25 - \frac{26\times35}{78}\right)^2}{\frac{26\times35}{78}} + \frac{\left(0 - \frac{26\times35}{78}\right)^2}{\frac{26\times35}{78}}$

$= 0.2083 + 13.3333 + 10.2084 + 0 + 0 + 0 + 0.2381 + 15.2380 + 11.6667$

$= 50.8929$

$\alpha = 0.05 \quad r = 3 \quad c = 3 \quad , \quad df = 4$

$\chi^2_{(r-1)(c-1), 0.05}$ 經由 p594 Table A.10 查表 $\chi^2_{4, 0.05} = 9.48773$

因 $\chi^2 > \chi^2_{4, 0.05}$ (即 $50.8929 > 9.4877$) 故

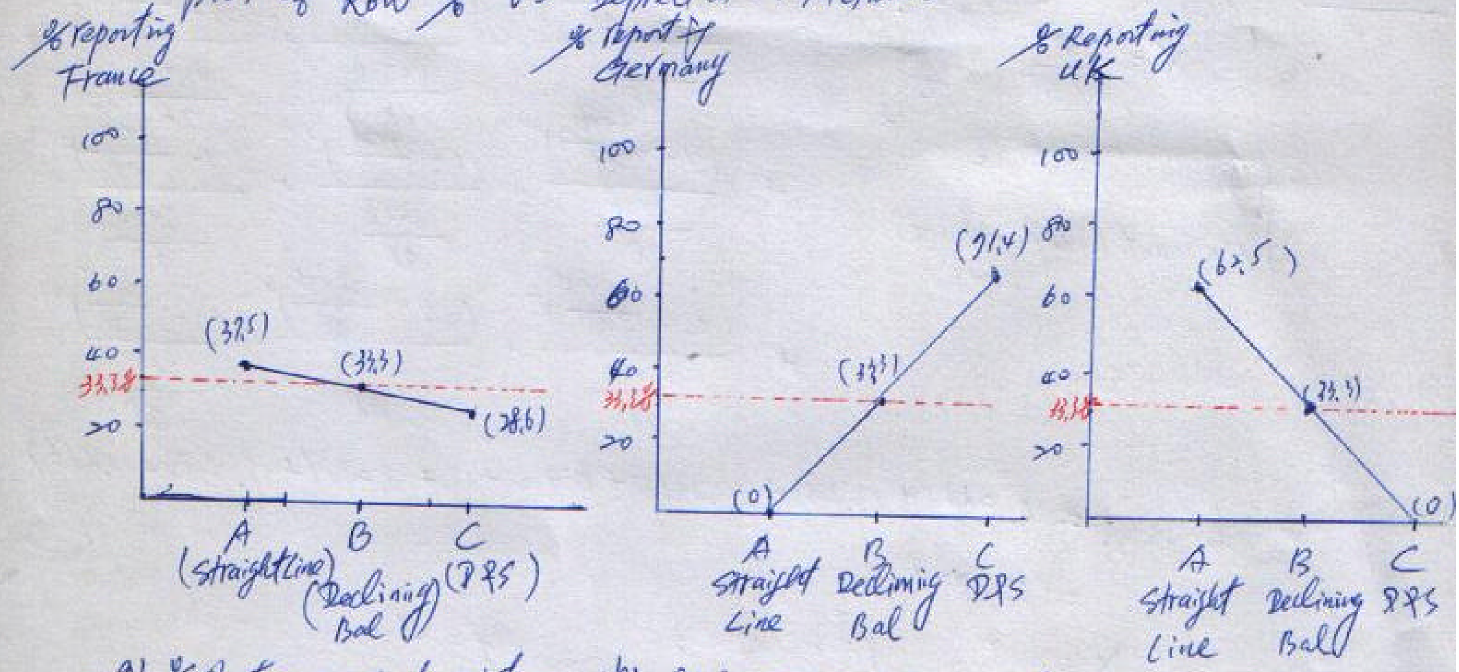
Reject H_0 = independence

b.

Depreciation Methods	France	Germany	UK	total
A. straight line (S)	15	0	25	40
% of row	37.5%	0	62.5%	100%
% of column	57.7%	0	96.2%	51.3%
% of total	19.2%	0	32.1%	51.3%
B. Declining Bal (D)	1	1	1	3
% of row	33.3%	33.3%	33.3%	100%
% of column	3.8%	3.8%	3.8%	3.8%
% of total	1.3%	1.3%	1.3%	3.8%
C. (D&S)	10	25	0	35
% of row	28.6%	71.4%	0	100%
% of column	38.5%	96.2%	0	44.9%
% of total	12.8%	32.1%	0	44.9%
Total Companies	26	26	26	78
% of row	33.3%	33.3%	33.3%	100%
% of column	100%	100%	100%	100%
% of total	33.3%	33.3%	33.3%	

50.89 Chi-square
4 df
2.35E-10 p-value

Plot of Row % VS Depreciation Methods



(a) % of France of depreciation Method (b) % of Germany of Depreciation Method (c) % of UK of depreciation Method

<u>10.39</u>

$$X^2 = \sum_{all} \frac{(f_{ij} - \hat{E}_{ij})^2}{\hat{E}_{ij}} = \frac{\left(69 - \frac{218 \times 200}{600}\right)^2}{\frac{218 \times 200}{600}} + \frac{\left(97 - \frac{218 \times 200}{600}\right)^2}{\frac{218 \times 200}{600}} + \frac{\left(52 - \frac{218 \times 200}{600}\right)^2}{\frac{218 \times 200}{600}}$$

$\begin{cases} H_0: \text{independence} \\ H_a: \text{not independence} \end{cases}$

$$+ \frac{\left(101 - \frac{270 \times 200}{600}\right)^2}{\frac{270 \times 200}{600}} + \frac{\left(93 - \frac{270 \times 200}{600}\right)^2}{\frac{270 \times 200}{600}} + \frac{\left(76 - \frac{270 \times 200}{600}\right)^2}{\frac{270 \times 200}{600}}$$

$$+ \frac{\left(30 - \frac{112 \times 200}{600}\right)^2}{\frac{112 \times 200}{600}} + \frac{\left(10 - \frac{112 \times 200}{600}\right)^2}{\frac{112 \times 200}{600}} + \frac{\left(72 - \frac{112 \times 200}{600}\right)^2}{\frac{112 \times 200}{600}}$$

$$= 0.185 + 8.148 + 5.878 + 1.344 + 0.100 + 2.178 + 1.440 + 20.012 + 32.190 = 71.476$$

$\alpha = 0.01$, $df = (r-1)(c-1) = (3-1)(3-1) = 4$

$X^2_{4,\,0.01}$ 由 P594, table A.10 查表得 13.2767.

因 $X^2 > X^2_{4,\,0.01}$ $(71.476 > 13.2767)$, 故

Reject H_0: independent.