Scm 651 Individual HW1
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1.

	On-Campus	Off-Campus	
Underclass	80	20	100
Upper class	60	90	150
Grad	10	40	50
	150	150	300

Expected

	On-Campus	Off-campus	
Underclass	50	50	100
Upperclass	75	75	150
grad	25	25	50
	150	150	

$$\chi^2 = \frac{(50-80)^2}{50} + \frac{(20-50)^2}{50} + \frac{(60-75)^2}{75} + \frac{(90-75)^2}{75} + \frac{(10-25)^2}{25} + \frac{(40-25)^2}{25}$$

$$= 18+18+3+3+9+9 = 36+24 = 60$$

$$d.f = (3-1)(2-1) = 2$$

$$\chi^2_{.01} = 9.21$$

$\chi^2 > \chi^2_{0.01}$, Reject H_0

The proportions of underclassmen, upperclassmen and graduate students who live on-campus housing are NOT equal

2.

Expected Freq:

	1	2	3	4	5
Male	3	4.8	9	6	7.2
Female	2	3.2	6	4	4.8

There are 10 cells in total, and ~~[illegible]~~ 6 of them are less than 5

So $E_{ij} \geq 5$ is 40% which is less than 50%

So No, we can't use the current Cross-tab for Chi-square test

Gotta modify it.

Modified observed Freq:

	1-3	4 5	
Male	10	20	30
Female	18	2	20
	28	22	50

Modified expected Freq

	1-3	4-5
Male	16.8	13.2
Female	11.2	8.8

I used Excel to calculate the p value, which is 7.668×10^{-5}

p-value < 0.01, Reject H_0, and there is relationship between gender and watching pro football on TV.

Tropicana $Y = (\beta_0+\beta_1)+(\beta_4+\beta_5)X+\epsilon$

Minute maid: $Y=(\beta_0+\beta_2)+(\beta_4+\beta_6)X+\epsilon$

Tree Fresh: $Y=(\beta_0+\beta_3)+(\beta_4+\beta_7)X+\epsilon$

Florida Gold: $Y=\beta_0+\beta_4X+\epsilon$

? 6(i) $\beta_4+\beta_6=\beta_4 \rightarrow \beta_6=0$

(b)(ii) $\beta_4+\beta_6=0$

(b)(iii) $\beta_4+\beta_5=\beta_4+\beta_6=\beta_4 \Rightarrow \beta_5=\beta_6=0$

4)(a) $H_0: \beta_1=\beta_2=0$,

$k=2 \quad m=4, \quad n=65 \qquad n-m-1=60$

$R^2_{full}=0.5, \quad R^2_{restricted}=0.3$

$$F=\frac{0.5-0.3}{1-0.5}\times\frac{60}{2}=12$$

$F_\alpha(2,60)=4.98$

$F>F_\alpha(2,60)$, reject H_0

(b) $H_0: \beta_1=\beta_2=\beta_3=\beta_4=0$

$k=4, \quad m=4, \quad n=65. \quad n-m-1=60$

$R^2_{full}=0.5, \quad R^2_{restricted}=0$

$$F=\frac{0.5-0}{1-0.5}\times\frac{60}{4}=15$$

$F_\alpha(4,60)=3.65$

$F>F_\alpha(4,60)$, Reject H_0

5. a) $\beta_1+\beta_4=0$

b) $H_0: \beta_4=\beta_5=0$, H_a: at least one of β_4 and β_5 is not 0
$k=2$

$P(Y=1|I)=\frac{1}{1+e^{-I}}$ $\quad I=\beta_0+\beta_1 X_1+\beta_2 X_2+\beta_3 D+\beta_4 DX_1+\beta_5 DX_2$

$\ln L_{full}=-180 \quad \ln L_{restricted}=-198$

$\chi^2=2(-180-(-198))=36$

$\chi_\alpha=9.21$

$\chi^2>\chi_\alpha$, reject H_0

c) $I=-2+(-0.005)100+2.4(0.2)-0.2\times 0+0+0.$

$=-2-0.5+0.48=-2.02$

$P(Y=1)=\frac{1}{1+e^{+2.02}}=0.1171$ $\quad P(Y=0)=1-0.1171=0.8829$

Odds Ratio $=\frac{0.1171}{0.8829}=0.133=e^{-2.017}$

Assign to	$Y=0$	$Y=1$ (default)
Group 0 (not approve)		$C(0\|1)$ 50000
Group 1 (Approve)	$C(1\|0)$ 50000	

Cost not Approve $=C(1|0)*P(Y=0)=5000\times 0.8829=4414.5$

Cost Approve $=C(0|1)*P(Y=1)=50000\times 0.1171=5855$

Cost approve > Cost Not Approve

$\Rightarrow$ should not approve

∴ Card 1

$u_1(20) \approx u_1(16) + \left(\frac{20-16}{22-16}\right)\{u_1(22) - u_1(16)\}$

$= -15 + \frac{2}{3}(-45) = -45$

$u_2(180) \approx u_2(100) + \left(\frac{180-100}{200-100}\right)\{u_2(200) - u_2(100)\}$

$= 20 + \frac{4}{5}(40-20) = 36$

Total score Card 1 $= 60 - 45 + 36 = 51$

Card 2

$u_1(15) \approx u_1(12) + \left(\frac{15-12}{16-12}\right)\{u_1(16) - u_1(12)\}$

$= 0 + \frac{3}{4} \times (-15) = -11.25$

$u_2(120) \approx u_2(100) + \left(\frac{120-100}{200-100}\right)\{u_2(200) - u_2(100)\}$

$= 20 + \frac{1}{5}(20) = 24$

Total score card 2 $= 60 - 11.25 + 24 = 72.75$

total score card 2 > total score card 1

the student prefer card 2