十八、卡方檢定

Chi-Square Test

 1.欲檢驗兩個名目變數(nominal variables)之間是否有相互關連性的關係,即使用卡方檢定。 例如:性別(男或女)與抽煙行為(抽或不抽)是否關連?性別(男或女)與素食行為(葷食、素 食)是否關連?學歷(大學、高中、國中、國小)與宗教信仰類別(佛教、基督教、天主教、 道教)是否關連?

自變數爲分立變項		因變數爲分立變值
Nominal scale		Nominal scale
X_1		Y_1
X_2	~	Y_2
:		:
X _n		Y _m

2.兩變數(sex1 * class1)獨立的檢定

sex * class Crosstabulation

			class				Total
			class 1	class 2	class 3	class 4	Total
		Count	3	4	2	5	14
		Expected Count	3.2	1.8	3.6	5.4	14.0
	男	% within sex	21.4%	28.6%	14.3%	35.7%	100.0%
		% within class	42.9%	100.0%	25.0%	41.7%	45.2%
GOV		% of Total	9.7%	12.9%	6.5%	16.1%	45.2%
sex		Count	4	0	6	7	17
		Expected Count	3.8	2.2	4.4	6.6	17.0
	女	% within sex	23.5%	0.0%	35.3%	41.2%	100.0%
		% within class	57.1%	0.0%	75.0%	58.3%	54.8%
		% of Total	12.9%	0.0%	19.4%	22.6%	54.8%
		Count	7	4	8	12	31
Total		Expected Count	7.0	4.0	8.0	12.0	31.0
		% within sex	22.6%	12.9%	25.8%	38.7%	100.0%
		% within class	100.0%	100.0%	100.0%	100.0%	100.0%
		% of Total	22.6%	12.9%	25.8%	38.7%	100.0%

3.檢定兩變數 sex1 和 class1 是獨立的假設

虛無假設 H₀:兩變數 sex1 和 class1 是獨立的

對立假設 H1:兩變數 sex1 和 class1 是不獨立的

4.在 SPSS 當中開啓 SPSS_DM_Sample.sav 數值檔案

5. Analyze→Descriptive Statistics→Crosstabs...開啓 Crosstabs 視窗

Crosstabs		×
<mark>#</mark> var0001 #var0003 <mark>#</mark> crosstab	R <u>o</u> w(s): #sex1 Column(s): #class1	OK <u>P</u> aste <u>R</u> eset Cancel
	1	

Display clustered bar charts		
Suppress <u>t</u> ables		
Statistics Cells Format		

6.將要進行卡方分析的第一個變數 sex1 點選進入 Row(s):的小視窗中,第二個變數 class1 點 選進入 Column(s):的小視窗中。

7.點選下面的 Statistics.... 按鈕,開啓 Crosstabs: statistics 次視窗

Crosstabs: Statistics		×		
√ Chi-square	Co <u>r</u> relations	Continue		
Nominal	Ordinal	Cancel		
Contingency coefficient	<u>G</u> amma	Help		
<u>P</u> hi and Cramer's V	<u>S</u> omers'd	ricip		
<u> L</u> ambda	⊡Kendall's tau- <u>b</u>			
<u>U</u> ncertainty coefficient	⊡Kendall's tau- <u>c</u>			
Nominal by Interval	<u> </u>			
<u> </u>	R <u>i</u> sk			
	<u>M</u> cNemar			
Cochran's and Mantel-Haenszel statistics				
Test common odds ratio equ	als: 1			

8. 勾選左上角的 Chi-square 選項,點選右上角的 Continue 按鈕,回到 Crosstabs 視窗

Crosstabs: Cell Display	
Counts	Continue
√Observed	Cancel
√Expected	Help
Percentages	Residuals
√Row	<u>U</u> nstandardized
√Column	<u>S</u> tandardized
√Total	<u>A</u> dj. standardized

9.點選下方的 Cells... 按鈕,開啓 Crosstabs: Cell Display 次視窗

10. 勾選左上角 Counts 小區塊內的 observed 和 expected 兩個選項, 點選右上角的 Continue 按 鈕, 回到 Crosstabs 視窗

11.點選右上角的 OK 按鈕,以執行 Crosstabs 內的 chi-square test 指令

12.獲得以下結果

sex1 · class1 closstabulation					
		class1			Total
		1	2	3	10141
sex1	1 Count	22	6	6	34
	Expected Count	15.9	6.8	11.3	34.0

sex1 * class1 Crosstabulation

		class1			Total	
		1	2	3	Total	
	% within sex1	64.7%	17.6%	17.6%	100.0%	
	% within class1	78.6%	50.0%	30.0%	56.7%	
	% of Total	36.7%	10.0%	10.0%	56.7%	
	Count	6	6	14	26	
	Expected Count	12.1	5.2	8.7	26.0	
	2 % within sex1	23.1%	23.1%	53.8%	100.0%	
	% within class1	21.4%	50.0%	70.0%	43.3%	
	% of Total	10.0%	10.0%	23.3%	43.3%	
	Count	28	12	20	60	
Total	Expected Count	28.0	12.0	20.0	60.0	
	% within sex1	46.7%	20.0%	33.3%	100.0%	
	% within class1	100.0%	100.0%	100.0%	100.0%	
	% of Total	46.7%	20.0%	33.3%	100.0%	

- 13.Pearson 卡方檢定統計量的值 11.480,自由度 2,其 p 值(Significant)0.003。若顯著水準為 0.05,則顯示兩變數(sex1, class1)為統計不獨立,即 sex1 的高低與 class1 有關。
- 14.卡方檢定的應用時,期望次數(expected count)低於5的方格不能多餘5%。若多於5%, 則需考慮合併期望次數低於5的方格,使其能適合其檢定條件。

Chi-Square Tests						
	Value	df	Asymp. Sig. (2-sided)			
Pearson Chi-Square	11.480 ^a	2	0.003			
Likelihood Ratio	11.941	2	0.003			
Linear-by-Linear Association	11.219	1	0.001			
N of Valid Cases	60					

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 5.20.