Homework III
Test for Row-Column Independence and Homogeneous

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1) In this example, we seek to determine whether or not there is an association between gender and preference for ice cream flavour. The data come from a hypothetical survey of 920 people that ask for their preference of ice cream flavours. Test whether the claim is true at significance level 0.05 .

Input data:

102	V101	39	80	281	327	102	91

	Gender	Flavour	Value
1	1	1	39
2	1	2	80
3	1	3	281
4	2	1	327
5	2	2	102
6	2	3	91

H_0: There is an association between gender and preference for ice cream flavour.
H_1: There isn't an association between gender and preference for ice cream flavour.

OUTPUTS:

Gender * Flavour Crosstabulation

			Flavour			
			Chocolate	Vanilla	Strawberry	Total
Gender	Men	Count	39	80	281	400
		Expected Count	159,1	79,1	161,7	400,0
		% within Gender	9,8%	20,0%	70,3%	100,0%
		% within Flavour	10,7%	44,0%	75,5%	43,5%
		% of Total	4,2%	8,7%	30,5%	43,5%
	Women	Count	327	102	91	520
		Expected Count	206,9	102,9	210,3	520,0
		% within Gender	62,9%	19,6%	17,5%	100,0%
		% within Flavour	89,3%	56,0%	24,5%	56,5%
		% of Total	35,5%	11,1%	9,9%	56,5%
Total		Count	366	182	372	920
		Expected Count	366,0	182,0	372,0	920,0
		% within Gender	39,8%	19,8%	40,4%	100,0%
		% within Flavour	100,0%	100,0%	100,0%	100,0%
		% of Total	39,8%	19,8%	40,4%	100,0%

43,5% of people are men and 56,5% of people are women.

40,4% of people who are prefer strawberry flavoured ice cream.
39,8% of people who are prefer chocolate flavoured ice cream.
19,8% of people who are prefer vanilla flavoured ice cream.

Men prefer strawberry flavoured ice cream with 70,3% percentage.
Women prefer chocolate flavoured ice cream with 62,9% percentage.

35,5% of people who are women and prefer chocolate flavoured ice cream.
30,5% of people who are men and prefer strawberry flavoured ice cream.
9,9% of people who are women and prefer strawberry flavoured ice cream.
4,2% of people who are men and prefer chocolate flavoured ice cream.

89,3% of who prefer chocolate flavoured ice cream are women.
75,5% of who prefer strawberry flavoured ice cream are men.
56,0% of who prefer vanilla flovoured ice cream are women.

Men prefer strawberry flavoured ice cream more than expected
Men prefer chocolate flavoured ice cream less then expected.
Women prefer chocolate flavoured ice cream more then expected.
Women prefer strawberry flavoured ice cream less then expected.

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	316,050[a]	2	,000
Likelihood Ratio	347,793	2	,000
Linear-by-Linear Association	315,663	1	,000
N of Valid Cases	920		

a. 0 cells (0,0%) have expected count less than 5. The minimum expected count is 79,13.

Since 0 cells(0,0%) have expected count less than 5, also we have large sample size.
We will use Pearson Chi-Square Test.
Results give p-value=0,000 < 0.05 (or $\chi^2_p = 316{,}050 > \chi^2_{0.05,2} = 5{,}99$) .
Gender and flavour are not independent. So H_0 cannot be rejected. There is an association between gender and preference for ice cream flavour at the 0.05 significance level.

Symmetric Measures

		Value	Asymptotic Standard Error[a]	Approximate T[b]	Approximate Significance
Nominal by Nominal	Phi	,586			,000
	Cramer's V	,586			,000
	Contingency Coefficient	,506			,000
Ordinal by Ordinal	Kendall's tau-b	-,556	,024	-23,369	,000
	Kendall's tau-c	-,623	,027	-23,369	,000
	Gamma	-,817	,022	-23,369	,000
N of Valid Cases		920			

a. Not assuming the null hypothesis.

b. Using the asymptotic standard error assuming the null hypothesis.

Both gender and flavour variables are nominal.
We can look Cramer's V (58,6%) or Contingency Coefficient (50,6%) values
also p value=0,000<0.05.
It could be mentioned that there is strong relationship between gender and flavour.