Log Linear Analysis for Cross-Classified Data

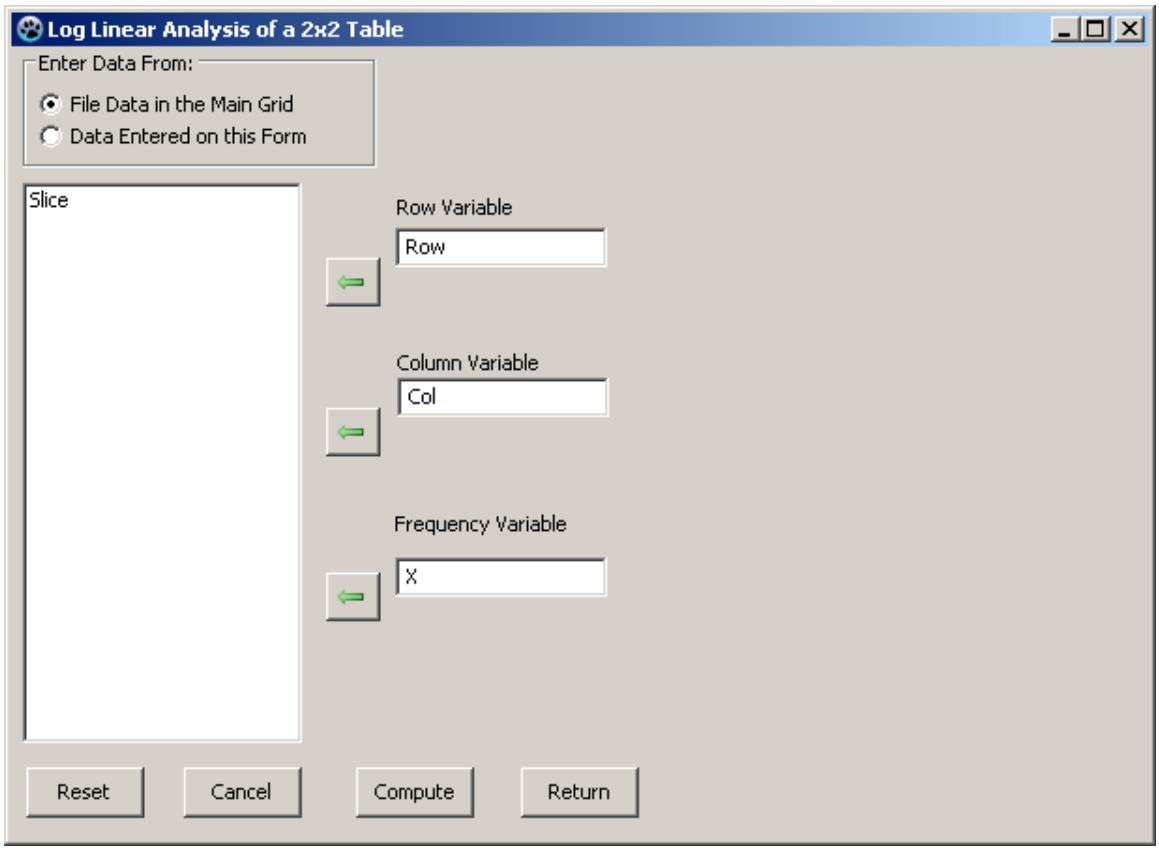
The contingency chi-square test for independence of two categorical variables is often employed in elementary statistical applications. However, the cell frequencies in a table can also be modeled as a regression model where the frequency is a function of the weighted sum of row effects, column effects, interaction effects and error. In practice the log of the frequencies is the dependent variable. This linear model can be expanded to three way or more tables. The investigator will often want to test the individual effects of rows, columns, slices, two-way interactions, three-way interactions, etc.

Three procedures are available for log linear analysis of classification data. These are described and illustrated in each of the sections below.

Log Linear for an A x B Classification TableI
Log Linear Analysis for an A x B x C Classification Table
Log Linear Screen

Log Linear for an A x B Classification Table

When you elect this analysis you see the dialogue boxes shown below. The difference depends on whether you are entering data from the main grid or if you are entering data directly on the form. In our example, we are entering data stored in a file labeled "ABCLogLinData.LAZ" and loaded into the Main Form grid. The results of the analysis is shown below these dialogue boxes. Each parameter is tested using the "G" statistic which is approximately chi-squared.



ANALYSES FOR AN I BY J CLASSIFICATION TABLE

Reference: G.J.G. Upton, The Analysis of Cross-tabulated Data, 1980

Cross-Products Odds Ratio = 1.583
Log odds of the cross-products ratio = 0.460

Saturated Model Results

Observed Frequencies

ROW/COL	1	2	TOTAL
1	27.00	36.00	63.00
2	27.00	57.00	84.00
TOTAL	54.00	93.00	147.00

Log frequencies, row average and column average of log frequencies

ROW/COL	1	2	TOTAL
1	3.30	3.58	3.44
2	3.30	4.04	3.67
TOTAL	3.30	3.81	3.55

Expected Frequencies

ROW/COL	1	2	TOTAL
1	27.00	36.00	63.00
2	27.00	57.00	84.00
TOTAL	54.00	93.00	147.00

Cell Parameters

ROW	COL	MU	LAMBDA ROW	LAMBDA COL	LAMBDA ROW x COL
1	1	3.555	-0.115	-0.259	0.115
1	2	3.555	-0.115	0.259	-0.115
2	1	3.555	0.115	-0.259	-0.115
2	2	3.555	0.115	0.259	0.115

Y squared statistic for model fit = -0.000 D.F. = 0

Independent Effects Model Results

Expected Frequencies

ROW/COL	1	2	TOTAL
1	23.14	39.86	63.00
2	30.86	53.14	84.00
TOTAL	54.00	93.00	147.00

Cell Parameters

ROW	COL	MU	LAMBDA ROW	LAMBDA COL	LAMBDA ROW x COL
1	1	3.557	-0.144	-0.272	0.000
1	2	3.557	-0.144	0.272	0.000
2	1	3.557	0.144	-0.272	0.000
2	2	3.557	0.144	0.272	0.000

Y squared statistic for model fit = 1.773 D.F. = 1
Chi-squared = 1.778 with 1 D.F.

No Column Effects Model Results

Expected Frequencies

ROW/COL	1	2	TOTAL
1	31.50	31.50	63.00
2	42.00	42.00	84.00
TOTAL	73.50	73.50	147.00

Cell Parameters

ROW	COL	MU	LAMBDA ROW	LAMBDA COL	LAMBDA ROW x COL
1	1	3.594	-0.144	0.000	-0.000
1	2	3.594	-0.144	0.000	-0.000
2	1	3.594	0.144	0.000	-0.000
2	2	3.594	0.144	0.000	-0.000

Y squared statistic for model fit = 12.245 D.F. = 2

No Row Effects Model Results

Expected Frequencies

ROW/COL	1	2	TOTAL
1	27.00	46.50	73.50
2	27.00	46.50	73.50
TOTAL	54.00	93.00	147.00

Cell Parameters

ROW	COL	MU	LAMBDA ROW	LAMBDA COL	LAMBDA ROW x COL
1	1	3.568	0.000	-0.272	0.000
1	2	3.568	0.000	0.272	0.000
2	1	3.568	0.000	-0.272	0.000
2	2	3.568	0.000	0.272	0.000

Y squared statistic for model fit = 4.783 D.F. = 2

Equiprobability Effects Model Results

Expected Frequencies

ROW/COL	1	2	TOTAL
1	36.75	36.75	36.75
2	36.75	36.75	36.75
TOTAL	36.75	36.75	147.00

Cell Parameters

ROW	COL	MU	LAMBDA ROW	LAMBDA COL	LAMBDA ROW x COL
1	1	3.604	0.000	0.000	0.000
1	2	3.604	0.000	0.000	0.000
2	1	3.604	0.000	0.000	0.000
2	2	3.604	0.000	0.000	0.000

Y squared statistic for model fit = 15.255 D.F. = 3