

Chi Square Problems

Problem 1:

In consumer marketing, a common problem that any marketing manager faces is the selection of appropriate colors for package design. Assume that a marketing manager wishes to compare five different colors of package design. He is interested in knowing which of the five is the most preferred so that it can be introduced in the market. However, there were two versions of the brand and the researcher wanted to find out whether color preferences of the consumers vary across the two versions. A random sample of 400 consumers each was carried out in two versions of the brand which reveal the following:

Package Color	Preference by Consumers (version1)	Preference by Consumers (version 2)
Red	70	85
Blue	106	90
Green	80	80
Pink	70	80
Orange	74	65

Does the version of the brand influence consumer preferences for package colors?

Problem 2:

A marketing firm producing detergents is interested in studying the consumer behavior in the context of purchase decision of detergents in a specific market. It would like to know in particular whether the income level of the consumers influence their choice of the brand. Currently there are two brands in the market. Brand 1 is the premium brand while Brand 2 is the economy brand.

Income level was classified as Lower, Middle, Upper Middle and High and random sampling procedure was adopted covering the entire market. A sample of 300 consumers participated in this study. The following data emerged from the study. Analyze the data using chi-square test and draw your conclusions.

Income level	Brand 1	Brand 2
Lower	25	65
Middle	30	30
Upper Middle	50	22
High	60	18

Chi Square Problem Solutions

Problem 1:

H_0 = The brand version does not influence consumers preferences for package colors

Package Color	Preference by Consumers (version1)	Preference by Consumers (version 2)	Column total
Red	70	85	155
Blue	106	90	196
Green	80	80	160
Pink	70	80	150
Orange	74	65	139
Row total	400	400	800

(Row, column)	$EV_{(row,column)}$	$X^2_{(row,column)}$
11	77.5	0.73
21	98	0.65
31	80	0
41	75	0.33
51	69.5	0.29
12	77.5	0.73
22	98	0.65
32	80	0
42	75	0.33
52	69.5	0.29

$$X^2 \text{ (calculated)} = 4$$

$$Df = 4 * 1 = 4$$

$$X^2 \text{ (table)} = 9.49$$

As $X^2 \text{ (calculated)} < X^2 \text{ (table)}$, therefore we accept the H_0 , i.e. the brand version does not influence the consumers preferences for package colors.

Problem 2:

H_0 = The income level of the consumers does not affect their choice of the brand when buying detergents.

Income level	Brand 1	Brand 2	Column total
Lower	25	65	90
Middle	30	30	60
Upper Middle	50	22	72
High	60	18	78
Row total	165	135	300

(Row, column)	EV_(row,column)	X²_(row,column)
11	49.5	12.13
21	33	0.27
31	39.6	2.73
41	42.9	6.82
12	40.5	14.82
22	27	0.33
32	32.4	3.34
42	35.1	8.33

$$X^2 \text{ (calculated)} = 48.77$$

$$Df = 3 * 1 = 3$$

$$X^2 \text{ (table)} = 7.82$$

As $X^2 \text{ (calculated)} > X^2 \text{ (table)}$, therefore we reject the H_0 , i.e. the income level of the consumers affect their choice of the brand when buying detergents.