Conjoint Analysis: Determining Customer Preferences

Suggested Reading

Orme, Bryan K., Getting Started with Conjoint Analysis: Strategies for Product Design and Pricing Research, 2006

Conjoint Analysis Background

Conjoint analysis can be used to measure the effect that a variable or attribute has on a decision-making process. Some software implementations of the technique measure importance and part worth. Importance measures how much each attribute influences product choice. Part worth measures how much utility a particular attributed level provides. For example, attributes of a television purchase might be brand, screen size and price. Levels of the attribute price could be $599, $799, and $999. Importance would measure the relative influence that brand, screen size and price each have on the purchase decision. Part worth of price would measure the effect that different price levels have on the likelihood of purchase.

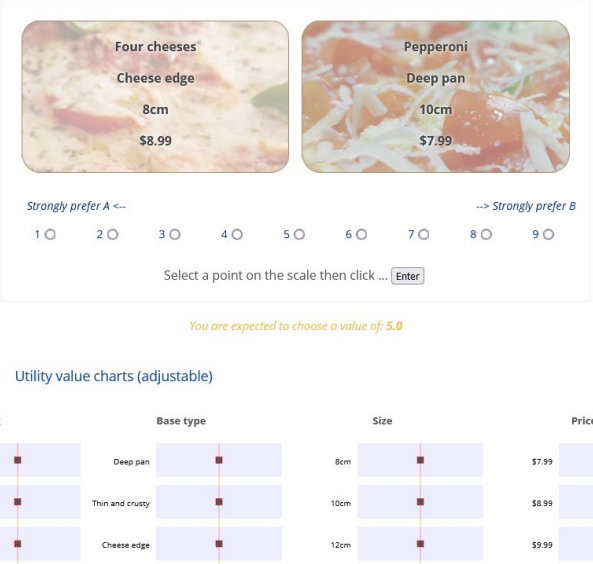
There are several approaches for collecting data for conjoint analysis. The technique used for analysis must be matched to the data collection approach.

Conjoint Analysis Demonstration

1. For a demonstration of conjoint analysis, go to the website:

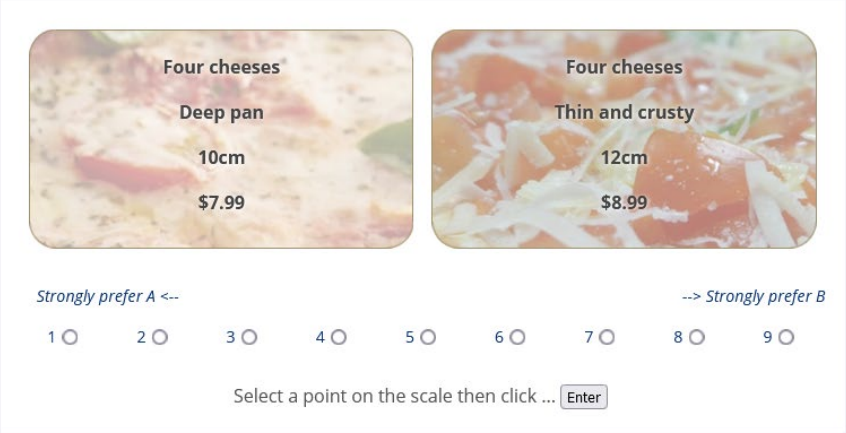
   http://www.dobney.com/Conjoint/CnjtDemo.htm

2. You must choose between the two pizza selections by clicking on the buttons 1-9 to show your preference.
3. Note that the expected utility values are in the center before you select your preference.

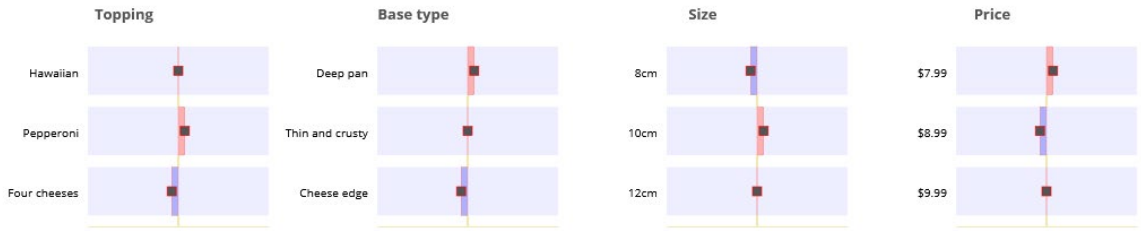


4. Select 9, favoring Pepperoni, Deep Pan, $9.99, then enter.

5. The utility values have been updated to reflect your input. Utility for Pepperoni and Deep pan have increased.
6. Based on your data so far, it's predicting that you will select 3.6 on this screen



Utility value charts (adjustable)



Approach #1: Rank all alternatives

> Green, P., Rao, V. (1971) Conjoint Measurement for Quantifying Judgmental Data, *Journal of Marketing Research*, 8:355-363. August 1971.

The first approach used in conjoint analysis was to create cards with each of the possible permutations of all levels for all attributes. For example, if there were three brands of television (Sony, LG, Samsung), three sizes (35 inch, 42 inch, 50 inch) and three prices ($599, $799, $999), then there could be 3x3x3 or 27 permutations of these attribute levels. This approach uses a complete factorial design (all possible combinations). The experimenter would give a participant all of the cards and ask her to sort the cards in rank order based on personal preferences using the attribute levels. This technique becomes unwieldy for a large number of permutations and generally is not used.

Sample cards (put the cards in order of preference):

TV:	Sony
Size:	35 inch
Price:	$599

TV:	LG
Size:	42 inch
Price:	$799

TV:	Samsung
Size:	35 inch
Price:	$599

plus 24 more cards for a total of 27.

Solution to Approach #1

The rank-order logit command can be used to calculate the coefficients in a “rank all alternatives” approach.

Approach #2: Rate the alternatives

> Green, P.E., Wind, Y. (1975) New way to measure consumers' judgments. *Harvard Business Review*, 53:107-117

The second approach uses a rating, not ranking, of alternatives. The experimenter gives the participant each combination and asks her to rate the alternatives on a scale, for example, from 1 to 10. Sample cards would look like those below.

On a scale of 1 to 10, rate the following television where 1=dislike very much and 10=like very much TV: Sony Size: 35 inch Price: $599 Rating: ☐	On a scale of 1 to 10, rate the following television where 1=dislike very much and 10=like very much TV: Samsung Size: 42 inch Price: $799 Rating: ☐

Solution to Approach #2

The rating of each alternative is used as the dependent variable. Dummy variables are created to distinguish between levels of each attribute. There are L-1 dummies for each attribute, where L is the number of levels for that attribute. The dummy variable is zero if a level does not apply and one if it does. Ordinary least squares regression can be used to regress the rating against the dummy variables. In the television example, the regression would be:

$$rating = b0 + b1*brand2 + b2*brand3 + b3*size2 + b4*size3 + b5*price2 + b6*price3$$

Approach #3: Tradeoff Matrices

> Johnson, R. (1974) Trade-off analysis of consumer values, *Journal of Marketing Research*, 11:121-127, August 1974.

Johnson developed an innovative approach to simplify data collection for conjoint analysis. Johnson asked the respondents to rank alternatives with only two attributes identified for each alternative. By asking subjects to only compare two attributes at a time, it's possible to consider substantially more attributes than is reasonable with the earlier approaches.

Computational solution to Approach #3

Johnson developed the software necessary to analyze the tradeoff matrices data. The software, originally called Adaptive Conjoint Analysis (ACA) was sold through Sawtooth Software, now called Sawtooth Technologies. Additional information on Sawtooth is available at www.sawtooth.com.

Data

From BlackBoard or the G: drive, copy the conjoint.csv file to your desktop.

Rating	1 to 10
Brand	LG, Samsung, Sony
Screen	35 inch, 42 inch, 50 inch
HD	Yes, No
Price	USD 249, USD 399, USD 599, USD 699

Loading Data

1. Open R
2. Start Rcmdr

   install.packages("Rcmdr",dependencies=TRUE)

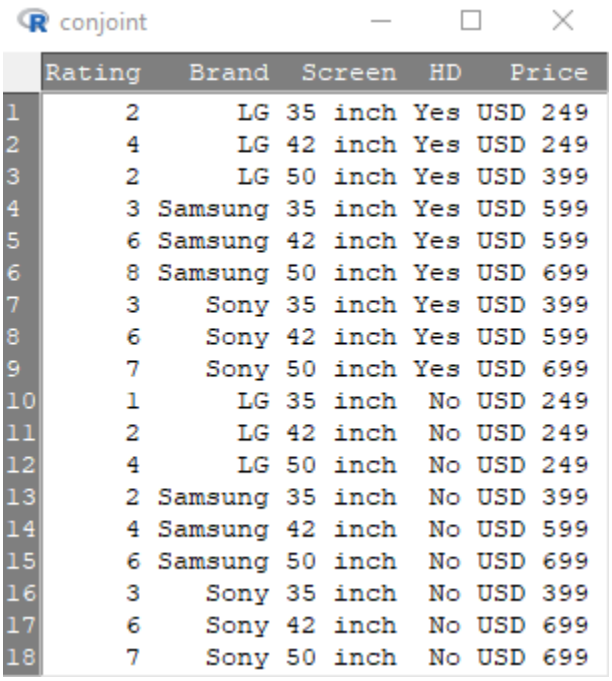
3. Select R CRAN server (select location closest to you), then type:

   library(Rcmdr)

4. In Rcmdr, load the data file conjoint.csv

   a. Click on Data at the top of the screen
   b. Click on Import Data > From Excel file …
   c. Enter the name that you would like to use for this data set; type in conjoint, then OK
   d. Click on the conjoint file, then Open

5. To view the data, click on View data set

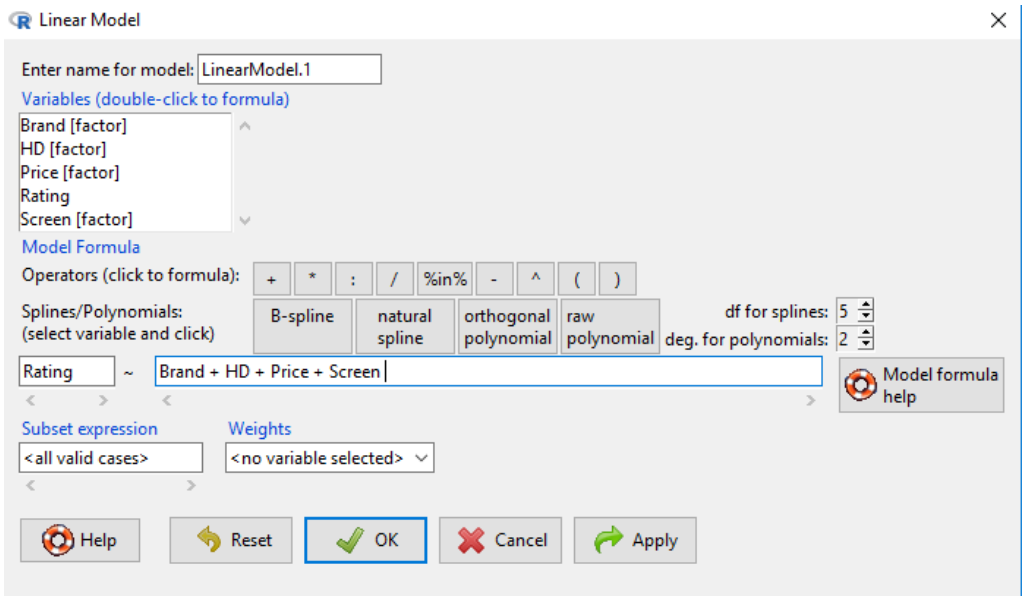


	Rating	Brand	Screen	HD	Price
1	2	LG	35 inch	Yes	USD 249
2	4	LG	42 inch	Yes	USD 249
3	2	LG	50 inch	Yes	USD 399
4	3	Samsung	35 inch	Yes	USD 599
5	6	Samsung	42 inch	Yes	USD 599
6	8	Samsung	50 inch	Yes	USD 699
7	3	Sony	35 inch	Yes	USD 399
8	6	Sony	42 inch	Yes	USD 599
9	7	Sony	50 inch	Yes	USD 699
10	1	LG	35 inch	No	USD 249
11	2	LG	42 inch	No	USD 249
12	4	LG	50 inch	No	USD 249
13	2	Samsung	35 inch	No	USD 399
14	4	Samsung	42 inch	No	USD 599
15	6	Samsung	50 inch	No	USD 699
16	3	Sony	35 inch	No	USD 399
17	6	Sony	42 inch	No	USD 699
18	7	Sony	50 inch	No	USD 699

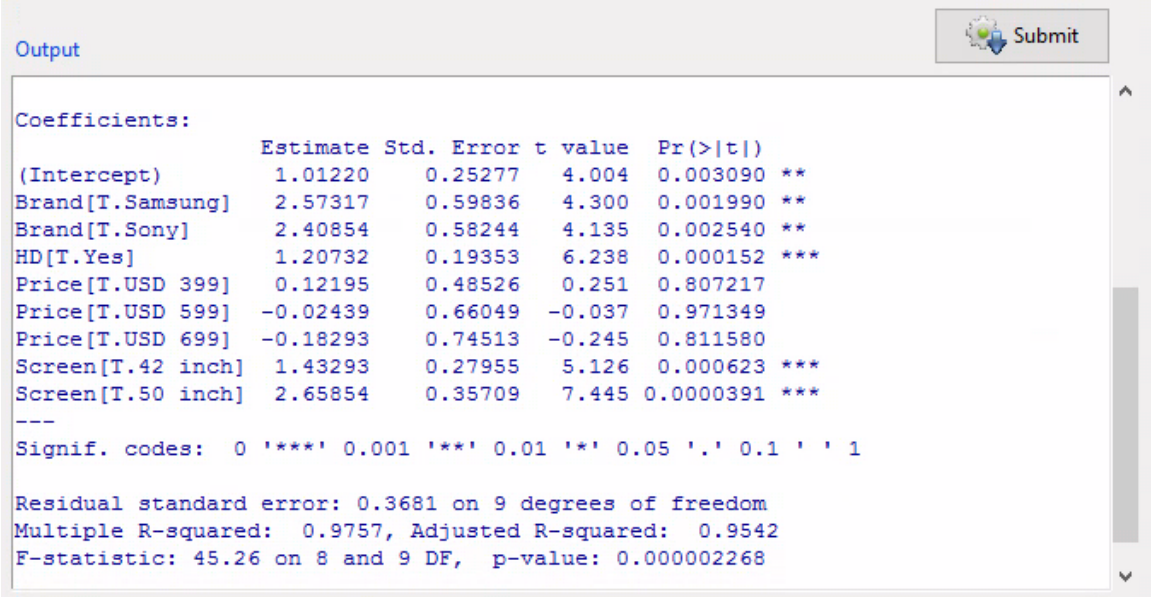
Running Conjoint Analysis

This data was collected using the second conjoint survey approach, rating the alternatives. This approach requires that we run a linear model with rating as the dependent variable and the other variables as independent variables marked as factors. Because we have factors, we will use a linear model, not linear regression.

1. In Rcmdr, click on Statistics, Fit Models, Linear Model
2. For the Y variable, double click on Rating
3. For the X variables, double click on Brand, HD, Price, Screen



4. Click OK to run the model



Model Interpretation

The coefficients are the utility values. Utility is a measure of how much value you derive from that feature. Tables summarizing the utility values for each feature are shown below.

Brand	Utility
LG	0.00000
Samsung	2.57317
Sony	2.40854

HD	Utility
No	0.00000
Yes	1.20732

Price	Utility
USD 299	0.00000
USD 399	0.12195
USD 599	-0.02439
USD 699	-0.18293

Screen	Utility
35 inch	0.00000
42 inch	1.43293
50 inch	2.65854

To calculate the utility of a set of features:

Utility = intercept + Coeff[Brand] + Coeff[HD] + Coeff[Price] + Coeff[Screen]

Where the Brand, HD, Price, Screen feature combinations are the ones being evaluated. For example:

Feature	Utility
Intercept	1.01220
Brand[Samsung]	2.57317
HD[Yes]	1.20732
Price[USD 599]	-0.02439
Screen[50 inch]	2.65854
Total Utility	7.45123

This combination has a utility of 7.45123.

Which combination has the highest utility? Which combination has the lowest utility?