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ASSESSING THE CONSUMER PREFERENCES USING CONJOINT ANALYSIS: AN APPLICATION IN FISHERIES SECTOR

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Fish has become an indispensable part in the food basket as it is considered as a healthy food which is rich in edible protein. It is a source of cheap and nutritious food assuring good food security. Day by day, fish consumption level is increasing nevertheless there exists a wide variance among the buyers for fish. There are some attributes and preferences in buying fish which makes a perfect fish consumption pattern and trends among the consumers. Conjoint analysis is one such technique which enables to understand the factors that drives people to consume and buy fish. It analyses the underlined phenomena of choosing a rational decision of the consumers in fish consumption.

Definition

Conjoint analysis is a survey based statistical technique used in market research that helps determine how people value different attributes (feature, function, benefits) that make up an individual product or service. Its purpose is to determine how people perceive and value different features or attributes of a particular product or service.

Theoretical back ground

Conjoint analysis mainly consists of three fundamental processes. First of these is defining the ideal product features set, which provides the consumer with maximum utility. Second is determining the level of relationship between combinations of the product. Third is usage after the market margin simulation, profitability analyses and segmentation analysis. The starting point of conjoint analysis relies on total utility theory, according to which it can be said that total utility is a function of the price utility and quality utility.

Two different calculation methods are used in the conjoint analysis in order to determine the significance levels of the product characteristics. First of them is the determination of the differences between partial utility values (part-worth values) of every feature. In partial utility model, every feature level of the product is free from each other feature level partial benefits constitute the total utility of the consumer. General consumer evaluation on the product or service and thus, contribution of every characteristic to his preference is determined by partial utility (part-worth). Part-worth contribution model (additive part-worth), which is used widespread in the conjoint analysis can be explained as follows (Manly, 1995):

$$Pref_{ijkl} = a_i + b_j + c_k + d_l$$

Where,

$Pref_{ijk}$	=	Consumer preference or total utility
a_i	=	Product A feature part-worth in level i
b_j	=	Product B feature part-worth in level j
c_k	=	Product C feature part-worth in level k
d_l	=	Product D feature part-worth in level l is expressed so

In this study, the full concept method was chosen for the collection of data that is evaluated in the conjoint analysis. Accordingly, question cards are prepared for every feature level and are provided to consumers,

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which include features that are determined regarding the product and level of every feature. Thus, the degree of participation of consumers to every alternative and the level of perception for each alternative are determined.

Practical Utility

Conjoint analysis uses "derived importance" values for each attribute or feature. They are extensively used for a variety of purposes in economics, business management, consumption patterns, personnel and financial matters etc. In fisheries sector, conjoint analysis provides an insight on assessing the trends and pattern in buying fish, fish consumption behaviour, estimating the demands of different fisheries etc. Moreover, studies to the assess the attitude of the consumers preference and willingness to pay for the different value added products can also be measured using this technique.It also enables to use the results in developing market simulation models that can be used well into the future.

Data requirement

The data related to the preferences in buying different species of fish traded across the different markets of a particular place with its different attributes such as price/quality/freshness/source of purchase/ characteristics of purchase place etc.

Worked out example

Given below is a problem undertaken to assess the trends and pattern of fish consumption. The consumer's decision in buying fish is assessed with the different attributes of consumer's choice. The different attributes for buying fish and fish consumption are given as follows. The highest preference in buying fish is calculated using conjoint analysis and their inferences are given below.

Attributes	Factors
Drivers for buying fish	Price/ Affordability Availability Accessibility
Sources of Purchase	Landing Centre Retail Market
Features of purchase centres	Distance Freshness Variety of species

A full-factorial design includes all possible combinations of these attributes. There are 18 possible product concepts or cards that can be created from these three attributes:

3 drivers for buying fish × 2 sources of purchase × 3 features of purchase centres = 18 cards

Further assume that respondents rate each of the 18 product concepts on a scale from 0 to 10, where 10 represents the highest degree of preference. Table 1 shows the conjoint experimental design. Here we use XLSTAT to analyse data from conjoint questionnaires to attain the corresponding inference of our problem. XLSTAT - Conjoint analysis uses experimental designs to select a number of profiles and allow interviewed people to make their rankings (Table 2)

Steps for Conjoint Analysis

1. Launch XLSTAT, click on the **CJT** icon and then click on **Designs for conjoint analysis**.

2. A dialog box will then appear. You can now enter the name of the analysis, the number of factors (four in our case) and the number of profiles to be generated (10).

3. In the **Factors** tab, activate the **select on a sheet** option and select the data in the Factors sheet. Do not select labels associated to each column.

4. In the **Output tab**, individual sheets are not activated since the use of these sheets is not necessary for the tutorial. In a comprehensive analysis though, they can be very useful in order to get the responses filled directly by respondents.

5. Click on **OK**, a new dialog box appears. This allows you to select a specific fractional factorial design or to optimize the design (D-optimal). Here, we used the **optimize** option.

6. Click the Optimize button, the calculations run and the results are displayed.

7. For the aim of this study, 15 individuals have been questioned about their preferences. The survey answers can be found in the CJT design sheet and the results of the analysis in the CJT Analysis sheet.

8. Once the conjoint design is filled with the responses, you are ready to run the analysis. One option is to click on the button **Run the analysis** which automatically launches the interface with loaded data.

9. Once you click on the **OK** button, the computations are performed and the results are displayed.

10. Averages are calculated and displayed on charts. These give an idea of the importance of each factor.

Table 1: Conjoint Experimental Design

Card	Drivers for buying fish	Purchase Centres	Features of purchase centres
1	Price/Affordability	Landing Centre	Distance
2	Price/Affordability	Landing Centre	Freshness
3	Price/Affordability	Landing Centre	Variety
4	Price/Affordability	Retail Market	Distance
5	Price/Affordability	Retail Market	Freshness
6	Price/Affordability	Retail Market	Variety
7	Accessibility	Landing Centre	Distance
8	Accessibility	Landing Centre	Freshness
9	Accessibility	Landing Centre	Variety
10	Accessibility	Retail Market	Distance
11	Accessibility	Retail Market	Freshness
12	Accessibility	Retail Market	Variety
13	Availability	Landing Centre	Distance
14	Availability	Landing Centre	Freshness
15	Availability	Landing Centre	Variety
16	Availability	Retail Market	Distance
17	Availability	Retail Market	Freshness
18	Availability	Retail Market	Variety

Table 2: Rank of Preference in buying fish

Card	Drivers for buying fish	Purchase Centres	Features of purchase centres	Rank of preference
1	1	1	1	5
2	1	1	2	5
3	1	1	3	0
4	1	2	1	8
5	1	2	2	5
6	1	2	3	2
7	2	1	1	7
8	2	1	2	5
9	2	1	3	3
10	2	2	1	9
11	2	2	2	6
12	2	2	3	5
13	3	1	1	10
14	3	1	2	7
15	3	1	3	5
16	3	2	1	9
17	3	2	2	7
18	3	2	3	6

Table 3: Partial utilities (Individual data)

Source	Ind 1	Ind 2	Ind 3	Ind 4	Ind 5	Ind 6	Ind 7	Ind 8	Ind 9	Ind 10	Ind 11	Ind 12	Ind 13	Ind 14	Ind 15	Average
Intercept	5.31	5.08	5.44	4.66	5.5	5.33	5.7	5.72	6.11	5.97	5.02	5.233	5.164	5.433	4.789	
drivers-price/affordability	3.23	3.33	1.54	-3.25	2.33	2.66	2.56	-3.56	-3.56	1.54	2.66	1.22	1.54	3.33	3.33	1.26
drivers-Accessibility	-4.25	-2.03	1.54	1.12	2.36	3.45	-3.33	2.56	2.89	1.54	3.45	-1.22	1.54	-2.03	-2.03	0.370667
drivers-Availability	2.83	1.56	2.33	1.56	-4.56	5.42	4.85	2.8	-4.63	2.33	5.42	0.375	2.33	1.56	1.56	1.715667
Source of purchase-retail centre	1.22	1.504	1.882	2.089	0.251	0.945	1.619	0.591	1.501	0.015	0.566	1.958	0.633	2.33	1.156	1.217333
Source of purchase-landing centre	-1.22	-1.504	-1.882	-2.089	-0.251	-0.945	-1.619	-0.591	-1.501	-0.015	-0.566	-1.958	-0.633	-2.33	-1.156	-1.21733
Features of purchase centre-Distance	0.375	1.54	2.66	-2.03	1.22	-2.03	1.54	-3.25	1.22	-2.03	-2.03	1.54	1.56	-0.251	2.66	0.1796
Features of purchase centre-Freshness	-0.365	1.54	3.45	1.56	-1.22	1.56	1.54	1.12	-1.22	1.56	1.56	1.54	1.504	1.22	3.45	1.253267
Features of purchase centre-variety	0.365	2.33	5.42	1.156	0.375	2.33	2.33	1.56	0.375	1.156	2.33	2.33	-1.504	-1.22	5.42	1.6502

Table 4: Importance's (Individual data)

Source	Ind 1	Ind 2	Ind 3	Ind 4	Ind 5	Ind 6	Ind 7	Ind 8	Ind 9	Ind 10	Ind 11	Ind 12	Ind 13	Ind 14	Ind 15	Average
Drivers for buying fish	69.079	38.335	58	23.737	35.938	30.769	52.779	11.765	37.747	18.021	35.042	34.615	40.667	38.899	35.938	37.42207
Purchase Centres	13.813	31.915	30	30.303	42.552	51.282	29.952	57.353	33.487	56.974	6.15	38.462	33.269	31.743	42.552	35.32047
Features of purchase centre	17.108	29.75	12	45.96	21.51	17.949	17.269	30.882	28.766	25.005	58.808	26.923	26.064	29.358	21.51	27.25747

Table 5: Aggregated utilities

Card	Drivers for buying fish	Purchase Centres	Features of purchase centres	Utility score
1	Price/Affordability	Landing Centre	Distance	0.1153
2	Price/Affordability	Landing Centre	Freshness	0.1156
3	Price/Affordability	Landing Centre	Variety	0.2331
4	Price/Affordability	Retail Market	Distance	0.4003
5	Price/Affordability	Retail Market	Freshness	0.5112
6	Price/Affordability	Retail Market	Variety	0.5103
7	Accessibility	Landing Centre	Distance	0.1328
8	Accessibility	Landing Centre	Freshness	0.3312
9	Accessibility	Landing Centre	Variety	0.4545
10	Accessibility	Retail Market	Distance	0.2569
11	Accessibility	Retail Market	Freshness	0.2011
12	Accessibility	Retail Market	Variety	0.3013
13	Availability	Landing Centre	Distance	0.2213
14	Availability	Landing Centre	Freshness	0.4333
15	Availability	Landing Centre	Variety	0.2003
16	Availability	Retail Market	Distance	0.2136
17	Availability	Retail Market	Freshness	0.5656
18	Availability	Retail Market	Variety	0.4433

Table 5: Aggregated Importances

Drivers for buying fish	37.42
Purchase Centres	35.32
Features of purchase centre	27.26

Interpretation of results

Partial utilities or worth values of the combinations, which were designed in the scope of the conjoint analysis and total worth value is composed of sum of factor level scores. The combination, which has the highest total worth is defined as the product feature set providing the consumers with optimum utility. Feature set, which has the lowest total worth value, provides the consumers with minimum level of benefit. In other words, the factor and factor level having the highest total utility is preferred by consumers with priority. The combination, which has the lowest total utility value is the product set that consumers prefer least. The aggregate utilities and aggregate Importances point out the highest priority of the consumer's choice. The results interpret that the optimum fish quality set, which provides the consumers with optimum benefit is the variety of fish from the retail fish markets which are highly fresh and easily available. i.e., the study explored that the optimum fish quality set, which provides the consumers with optimum benefit is the variety of fish from the retail fish markets which are highly good quality and fresh as presented in table 5. The product feature set furnished in table 8 is scrutinized as the optimum fish quality set of the study area with the highest

total worth utility score of 0.5656. Moreover the primary choice considered by the consumer in buying fish and in fish consumption are the different drivers such as price/affordability, accessibility, availability with a score of 37.42. All the other attributes have only a second or third choice of preference.

Suggested readings

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