IOSR Journal of Computer Engineering (IOSR-JCE)
e-ISSN: 2278-0661,p-ISSN: 2278-8727 PP 42-46
www.iosrjournals.org

Advanced Quantitative Techniques Inconsumer Behaviour Economics

Gurumoorthy Pattabiraman[1], Dr. K R Shanmugam[2]
[1]*PHD Research Scholar, Madras School of Economics,Gandhi Mandapam Road, Chennai*
[2]*Director & Professor, Madras School of Economics, Gandhi Mandapam Road, Chennai*

I. INTRODUCTION

Consumer behaviour can be defined as those acts of individuals (consumers) directly involved in obtaining, using, and disposing of economic goods and services, including the decision processes that precede and determine these acts. Understanding how consumers make purchase decisions can help in several ways, especially in policy decisions.

Consumer behaviour, in its broadest sense, is concerned with understanding both how purchase decisions are made and how products or services are consumed or experienced. Consumers are active decision-makers. They decide what to purchase, often based on their disposable income or budget.

Consumer behaviour Economics is the study of how individual customers, groups or organizations select, buy, use, and dispose of ideas, goods, and services to satisfy their needs and wants and its impact on the economy. It refers to the actions of the consumers in the marketplace and the underlying motives for those actions.

Consumers make choices by allocating their limited resources (income) across all possible goods in order to maximise satisfaction. In other words, consumers maximise their utility within the constraints of their budget. Utility is defined as the satisfaction derived by a consumer from the consumption of a good. The relative utility of goods is used to calculate consumer value. As a result, consumer preferences are defined as subjective (individual) tastes of various bundles of goods as measured by utility. They allow the consumer to rank these bundles of goods based on the levels of utility they provide. Understanding consumer behaviour is important because it allows marketers to know and understand the preferences of different consumers, allowing them to form marketing strategies accordingly.Human beings differ in terms of social status, nationality, age, gender, income, occupation, religion, family structure, education, and societal culture. Because of these differences, we have different needs. Life insurers have begun the process of adapting to a distribution environment that includes emerging technologies such as mobile, social media, digital marketing, and online sales in recent years. However, life insurance distribution strategies remain heavily reliant on a network of captive or independent agents and brokers.

Consumer behaviour in the real world frequently differs from what economics and policy predict. This paper sought to investigate whether consumer behaviour related to the purchase of products signifies demand and price in the economy.

Consumer behaviour research has evolved over the period from simple analytical methods to advanced techniques using Artificial Intelligence and Machine Learning.

1. HISTORY OF CONSUMER BEHAVIOUR RESEARCH:

The history of consumer behaviour research is largely intertwined with the history of marketing thought.

In the early years of the development of the discipline, consumer behavior research methods focused on sampling, collecting data, and analytical techniques.

The development of computing in the 1970s made data collection and data analysis simpler and faster, which shifted the focus of consumer research to analytical methods.

In the early 2000s, the focus shifted from data analysis to find the actual meaning behind the data. The focus ofthe research was on providing insights into consumer choices, and how the results could provide support for marketing strategies and tactics.

In the latest phase, New forms of data (e.g. big data, Artificial Intelligence and Machine Learning) have become available, which have given rise to exploring phenomena related to the relationship between firms and consumers and further exploring reasons behind consumer choices and behaviours.

2. FEAUTRES OF CONSUMER BEHAVIOUR:

Significant features of consumer behaviour are as follows:

a. Undergoes a constant change

Consumer behaviour is not static. It undergoes a change over a period of time depending on the nature of the products. For example, kids prefer colourful and fancy footwear, but as they grow up as teenagers and young adults, they prefer trendy footwear, and as middle-aged and senior citizens they prefer more sober footwear. The change in buying behaviour may take place due to several other factors such as an increase in income level, education level and marketing factors.

b. Varies from consumer to consumer

All consumers do not behave in the same manner. Differ-ent consumers behave differently. The differences in consumer behaviour are due to individual factors such as the nature of the consumers, lifestyle and culture.

c. Varies from region to region:

Consumer behaviour varies across states, regions and countries. For example, the behaviour of urban consumers is different from that of rural consumers.

3. LITERATURE REVIEW:

1. According to Engel, Blackwell, and Mansard, 'consumer behaviour is the actions and decision processes of people who purchase goods and services for personal consumption'.
2. According to Louden and Bitta, 'consumer behaviour is the decision process and physical activity, which individuals engage in when evaluating, acquiring, using or disposing of goods and services'.
3. Chrysochou (2002) has noted that Consumer behavior research methods do not always aim at making accurate predictions of such phenomena, but focus mostly at explaining and providing reasoning behind such phenomena
4. Shvets Irina Yurievna (2022) suggests that the consumer's life has been impacted by changes in the economy in many different ways. Also, it establishes customer behaviour with regard to product consumption and acquisition. Customers have seen a variety of changes in their buying habits, particularly during the past several years as the global economic climate has undergone significant shifts. Due to financial difficulties, customers alter their purchasing behaviour during a recession and reduce or limit their purchases. They concentrate on specific goods that they consider vital to their survival. Owing to the unfavourable economic climate, people consistently reduce their spending till they feel financially secure.
5. Reisch, Lucia & Zhao, Min. (2017) says that Behavioral economics research has shown that people's judgements and decisions are often subject to systematic biases and heuristics, and are strongly dependent on the context of the decision, in contrast to the traditional assumption of neoclassical economics that individuals are rational Homo economics that always seeks to maximise their utility and follow their 'true' preferences. In this article, we discuss how the transition of research from neoclassical economics to behavioural economics has influenced research in consumer behaviour and consumer policy. We focus on the effects of key principles such as the status quo bias, the endowment effect, mental accounting, and the sunk-cost effect, as well as other heuristics and biases related to availability, salience, the anchoring effect, and simplicity rules.
6. In their article, "Progress of and Prospects for Hypothetical Purchase Task Questionnaires in Consumer Behavior Analysis and Public Policy," Peter G. Roma, Derek D. Reed, Florence D. DiGennaro Reed, and Steven R. Hursh continue the theme of operant behavioural economics by providing a status report on the use of a hypothetical purchase task questionnaire as a means of gathering data on consumers' behaviour as a prelude to policy formulation. Within the behavioural-analytic or behavioural economic framework, this method represents a useful innovation for consumer research.
7. Herbert Simon's behavioural economics (e.g., 1979) suggests, for example, that firms and consumers "satisfice," producing satisfactory results rather than acting optimally, simply because humans lack the information or cognitive skills required to maximise.

4. OBJECTIVES OF THE STUDY:

As Consumer spending is one of the significant factorsin Demand-pull inflation, this paper focused on the study ofthe significance of Consumer Behaviour, spending patterns, resource allocation etc., in the inflation (Consumer Price Index) of the state.

This study focuses on to analyse the results obtained for the same dataset using three different methods and using three different tools.

The same dataset was studied by a simple cross sectional linear regression method using excel, a Panel data regression using STATA and an ML model using Random Forest Method in R.

Three results were studied to identify the best technique and tool to study the demand pull inflation.

5. DATA SOURCE AND METHODOLOGY

i. Rural and Urban Inflation of Top 5 States which has recorded high inflation during the period May-Aug 2022 were taken for this study.

ii. Top 5 States taken for the study are Andhra Pradesh, Telengana, Maharashtra, Jharkhand and West Bengal.

iii. Consumer Spending under varoios heads such as Essentials, Milk, Snacks, non Veg, Restaurants, Fuel and Transport were taken from the Pyramidx CMIE Sample Data.

iv. The sample data were classified based on occupation, Famil size, Gender,State and Region.

v. Three different analysis using three differet tools and techniques were carried out and compared for significance and the best suited tools and techniques would be identified.

6. ANALYSIS

a. REGRESSION USING EXCEL:

A Cross sectional Multiple Linear Regression model was run using Statewise and Regionwise Inflation as Dependent Variable, State, Region, Occupation, Gender, Results using MS Excel:

SUMMARY OUTPUT

Regression Statistics	
Multiple R	0.52
R Square	0.27
Adjusted R Square	0.27
Standard Error	4.55
Observations	31726.00

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	12	240204.96	20017.08	967.85	0
Residual	31713	655888.87	20.68		
Total	31725	896093.84			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95.0%*	*Upper 95.0%*
Intercept	172.82	0.12	1429.75	0.00	172.58	173.06	172.58	173.06
stte	0.01	0.00	1.69	0.09	0.00	0.01	0.00	0.01
Region	3.72	0.06	58.75	0.00	3.60	3.85	3.60	3.85
Occupation	-0.01	0.01	-0.80	0.43	-0.04	0.02	-0.04	0.02
Gender Dominant	-0.21	0.03	-6.44	0.00	-0.28	-0.15	-0.28	-0.15
Family Size	-0.51	0.02	-24.62	0.00	-0.55	-0.47	-0.55	-0.47
Essentials	0.00	0.00	18.12	0.00	0.00	0.00	0.00	0.00
Milk	0.00	0.00	-7.67	0.00	0.00	0.00	0.00	0.00
Snacks	-0.01	0.00	-34.32	0.00	-0.01	-0.01	-0.01	-0.01
Non Veg	0.00	0.00	23.37	0.00	0.00	0.01	0.00	0.01
Restaurants	0.00	0.00	11.79	0.00	0.00	0.00	0.00	0.00
Fuel	0.00	0.00	-24.52	0.00	0.00	0.00	0.00	0.00
Transport	0.03	0.00	47.92	0.00	0.03	0.03	0.03	0.03

The above regression model turns insignificant with $R^2$0.27 and no independent variables were significant. This signs that for predicting the demand pull inflation, the above model would not be suitable.

Panel Data Regression Model: Results using STATA

```
. xi: reg  inflation i.var1 i.region i.occupation i.genderdominant  essentials
> milk snacks nonveg intoxicants restaurants fuel transport month
i.var1            _Ivar1_1-33         (naturally coded; _Ivar1_1 omitted)
i.region          _Iregion_0-1        (naturally coded; _Iregion_0 omitted)
i.occupation      _Ioccupatio_1-7     (naturally coded; _Ioccupatio_1 omitted)
i.genderdomin~t   _Igenderdom_0-2     (naturally coded; _Igenderdom_0 omitted)

      Source |       SS       df       MS              Number of obs =   31726
-------------+------------------------------           F( 22, 31703) = 6323.84
       Model |  729792.76     22  33172.3982           Prob > F      =  0.0000
    Residual |  166301.58  31703  5.24561019           R-squared     =  0.8144
-------------+------------------------------           Adj R-squared =  0.8143
       Total |  896094.339  31725  28.2456845           Root MSE      =  2.2903

------------------------------------------------------------------------------
   inflation |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
    _Ivar1_9 |  -6.432013   .0648224   -99.23   0.000    -6.559068   -6.304959
   _Ivar1_17 |  -9.224889   .0427557  -215.76   0.000    -9.308692   -9.141086
   _Ivar1_25 |   1.310815   .0515201    25.44   0.000     1.209834    1.411796
   _Ivar1_33 |  -1.224566   .0630804   -19.41   0.000    -1.348206   -1.100926
  _Iregion_1 |   3.981152   .0364724   109.16   0.000     3.909665    4.052639
_Ioccupati~2 |  -1.119165   .0604828   -18.50   0.000    -1.237713   -1.000616
_Ioccupati~3 |  -.9033054   .0562128   -16.07   0.000    -1.013485   -.7931261
_Ioccupati~4 |  -.9400895   .0496624   -18.93   0.000     -1.03743   -.8427494
_Ioccupati~5 |   -.690865   .0556158   -12.42   0.000    -.7998742   -.5818558
_Ioccupati~6 |  -1.559796   .0563159   -27.70   0.000    -1.670177   -1.449414
_Ioccupati~7 |  -1.056731    .054017   -19.56   0.000    -1.162606   -.9508555
_Igenderdo~1 |  -.0252692   .0338796    -0.75   0.456    -.0916746    .0411361
_Igenderdo~2 |   .0498039   .0338748     1.47   0.142     -.016592    .1161998
  essentials |   .0001556   .0000894     1.74   0.082    -.0000197    .0003309
        milk |  -.0008823   .0001419    -6.22   0.000    -.0011605   -.0006041
      snacks |   -.001111   .0001257    -8.84   0.000    -.0013574   -.0008646
      nonveg |   .0006583   .0001057     6.23   0.000     .0004511    .0008655
 intoxicants |   .0015092   .0001996     7.56   0.000      .001118    .0019005
 restaurants |  -.0014719   .0001657    -8.88   0.000    -.0017967   -.0011471
        fuel |   .0000934    .000042     2.23   0.026     .0000112    .0001756
   transport |    .001176   .0003496     3.36   0.001     .0004908    .0018613
       month |   .7061724   .0117503    60.10   0.000     .6831413    .7292034
       _cons |    174.717    .105452  1656.84   0.000     174.5103    174.9237
------------------------------------------------------------------------------
```

The above model was signicant with R square of 0.81. Further, in the above model, demand for fuel is the significant co-efficient affecting the inflation and can be used as a predictor.

ML Model Prediction using Random Forest Method in R:

```
                %IncMSE IncNodePurity
stte             244.36     444118.86
Region           302.68     117811.92
Transport         36.11      68797.86
Restaurants       36.44      44813.28
Non.Veg           31.41      37252.66
Milk              34.28      34697.70
Fuel              34.58      32414.45
Month             87.14      28910.61
Snacks            37.24      26476.70
Occupation        28.89      24946.46
Essentials        33.91      21569.43
Family.Size       18.58       4383.87
Gender.Dominant   11.38        760.83
>
```

In the Random Forest Model, level of significance was measured using its % increase in MSE which determines its significance. As an inflation predictor, State, Region and Month have higher influence in determining the inflation.

11. FINDINGS AND CONCLUSION

Every method described above has strengths and weaknesses, and researchers should be aware of them before selecting a method. Knowing which research method is the right one to conduct is not enough. Each research method requires specific skills and knowledge that require training and practice. In addition, each method is useful as long as it is conducted in proper terms, acknowledging its limits.

On top of the choice of method, most answers to a phenomenon under investigation require personal judgment and experience. Thus, results always have a level of subjectivity introduced from researcher bias, and such bias needs to be taken into consideration as well.

Consumer behavior research methods do not always aim at making accurate predictions of such phenomena but focus mostly on explaining and providing reasoning behind such phenomena. If the aim is to make a prediction, then such predictions come with an error and the aim of the research method is to minimize that error. It is important to keep in mind that statistical significance (i.e. minimizing the error) should not be the only target of the researcher. Instead, researchers should focus on the actual size of the effect and the overall importance of their findings.

Methods in consumer behavior research have been dominated by cross-sectional surveys and longitudinal and experimental research designs. Cross-sectional surveys are the most commonly used design because of the ease in operationalization and interpretation of data, but also because they allow efficient measurement of several types of variables. However, such designs suffer from certain biases, such as social desirability and common method bias. In addition, they have been heavily criticized for their external validity and overall generalizability. Hence, a panel data regression model was used to identify the significant parameters.

To use both the qualifying factors and quantifying values intandem for better predictions, ML model using Random Forest Method was well suited among three. For any economic assessments using consumer behaviour as independent variables, ML models would be well suited.

REFERENCES

[1]. ‘Definepedia.In’. Definepedia - Knowledge Is for Sharing, https://www.Definepedia.in/. Accessed 27 Feb. 2023.
[2]. ‘Definepedia.In’. Definepedia - What is Consumer Behaviour?, https://www.Definepedia.in/. Accessed 27 Feb. 2022.
[3]. Polymeros Chrysochou, (2017, March). Consumer Perception of Product Risks and Benefits•, 409-428.
[4]. Yurievna, Shvets Irina. ‘Economic Changes and Their Impact on Consumer Behaviour: An Empirical Study in the Recent Economic Scenario’. ECS Transactions, vol. 107, no. 1, Apr. 2022, pp. 18165–74. DOI.org (Crossref), https://doi.org/10.1149/10701.18165ecst.
[5]. Roma, P., & Hursh, S. R. (2016). Hypothetical purchase task questionnaires for behavioral economic
[6]. assessments of value and motivation. Managerial and Decision Economics, 37, 306–323.
[7]. Simon, H. A. (1979). Rational decision making in business organizations. The American Economic Review, 69, 493–513.