An Econometric Analysis of Demand in Pakistan: A Case Study

Mr. Furrukh Bashir[1], Mr. Shahid Tauqeer[2], Mr. Haseeb Ahmad[3] & Ms. Ismat Nasim[4]
[1]Ph.D Scholar of Economics, University of the Punjab Lahore, Pakistan. [2]Lecturer of I.T and Management Sciences, University of Education Lahore, Multan Campus, Pakistan. [3]Lecturer in Business Administration, University of Education Lahore, Multan Campus, Pakistan. [4]M.Phil Scholar of Economics, Bahauddin Zakariya University, Multan, Pakistan.
furrukh_bashir@yahoo.com

Abstract

Demand estimation is considered as one of the most important element for decision making of the firm. Without estimating it, any manager can't make appropriate decisions. To have an econometric analysis of demand, we have selected a commodity that is "Soap". The Cross sectional primary data of 370 respondents has been collected through stratified random sampling technique from urban areas of Multan city in 2012. Multiple regression analysis technique is opted for having reliable estimates. The study follows Semi-log model to have price elasticity of demand and income elasticity of demand only.The estimates of the study show that the Price, income, family size and advertisement are directly correlated with the demand. On the other side, Age is found to be inversely related to demand of soap. Price Elasticity of demand is calculated as 0.1994 and income elasticity of demand is examined as 0.1722.

Keywords: *Cross-sectional data, Price Elasticity of demand, Income Elasticity of demand, Advertisement, Multan District.*

1. Introduction

Demand is one of the most important aspects of managerial economics, since a firm would not be established if a sufficient demand for its product do not exist or could not be created. Indeed many firms go out of business soon after being set up because their expectation of the sufficient demand for their product fails to materialize, even with a great deal of advertising. Each year, we see many previously established and profitable firms close as a result of consumer's shifting their purchases to different firms and products. Demand is, thus, essential for the creation, survival and profitability of a firm.

The present day firms have to deal with an increasingly uncertain business environment due to the fast changing economic scenario. Decision-making becomes difficult in such uncertainty. Needless to mention that the uncertainty in business environment is due to the complex behavior of market related variables like demand, market share, people's perception and factors affecting demand in the present day as a result of recent policy changes and market forces. The need of the hour for a manager is to know the behaviour of the market related variables, their interrelationship and future movement. The most important aspects in the present day is to know the process of estimation of demand and demand forecasting, factors affecting demand and identification of target groups using scientific tools.

The present project therefore, is designed to sensitize the participants on market demand estimation of soaps; several demand forecasting methods and quantitative analysis of factors affecting the consumer demand for different soaps. This can also anticipate the soap demand for the different segments of the market and can also integrate for the influence of the multiple decision makers on its usage and acquisition.

Demand elasticity of the soaps is estimated to forecast the future demand of soaps of different brand which will help us to know that on what basis the consumer demand and their preference for the soap changes and will also facilitate the firm in their managerial decision making, as well as to use the efficient methods of producing and selling the soap. This estimation of demand has also the objectives of describing and identifying the current as well as future landscape of competition among different soap producing companies.

Apart from introduction in section I, the rest of the paper is arranged as follows: section II portrays review of the literature; section III discusses data and methodological issues. Results are interpreted in section IV. Finally, conclusions and policy implications are given in section V.

2. **Literature Review**

A large number of articles are available regarding demand analysis. These all are discussing many new ideas for managers to improve the profitability of the firm. Few of these researches are taken into consideration in the current section for critical analysis.

Conlon and Mortimer (2008) investigated the impact of product unavailability on demand. They followed the EM algorithm both on periodic and perpetual inventory check to measure the effects of stock outs. Standard demand estimation techniques were used for long term variations in customer's choice as an important source for the identification of substitution patterns. They used data from 54 vending machines like coffee machines while keeping the prices constant. Regression was applied on stock out rates and starting inventory of many top selling products and their substitutes. It was finally inferred that fewer consumers buy other products in the category when the top selling products are stocked out.

Ortega et al. (2009) proposed the paper to provide a thorough analysis of meat demand in China and predicted future trends in meat consumption. Expenditure Demand Elasticities of various meats in China were evaluated using the linear almost ideal demand system. Results of the paper show that the pork primary meat in Chinese diets had become a necessity. While poultry, beef, mutton, and fish were considered luxuries with in the meat budget allocation of Chinese households. Furthermore, the results predicted that for any increase in future meat expenditure, the largest share of that increase would be allocated to pork consumption

Kumar et al. (2011) examined export demand equations for Asian developing countries, viz. India, China, The Philippines, Indonesia, Singapore and Malaysia. In this specification of export demand, exchange rate was included in the relative price variable. The augmented Dickey-Fuller method was applied to test the time-series properties of the variables with annual data from 1970 to 2007. The Granger causality test determined the causality direction between income, relative prices and exports. This confirmed that there existed a long-run co-integrating relationship between real exports, real income of trading partners and relative prices. The long-run income elasticity was ranging between 1 and 1.3 and the relative price Elasticities ranged between -1 and -1.4.

Bosanko et al. (1998) worked on the empirical study of Logit demand brand choice that explicitly accounts for the endogenity of prices. Price was assumed to be determined as the vertical Nash equilibrium among manufacturers and retailers. In this paper the technique of equilibrium frame work was used. It was assumed that the manufacturers and retailers did act as profit maximizing Nash price setters. Therefore whole-sale price and retail margins were determined endogenously in the model. The relationship between the consumer heterogeneity and price endogenity were observed in two product categories those are yogurt and cutups through the variables like price and willingness to pay. It was obvious that heterogeneous consumer differs with their willingness to pay for a particular brand so the retailers had an incentive to use promotion. The sales price was

discriminated between high and low willingness to pay consumers and there was a positive correlation between these variables.

Hays et al. (2007) presented this case study about managerial economics and intermediate price theory. It utilized a publically available database of monthly supermarket scanner data for various cuts of beef to show that these concepts could be easily applied to solve "real world" problems. Linear multiple regression models were used to estimate price, cross, and income Elasticities of demand. A log-linear model was also used to provide direct elasticity estimates. These types of analysis exposed theoretical and methodological problems related to effective demand estimation.

Benkard and Bajari (2004) studied the identification and estimation of Gorman-Lancaster style hedonic models of demand for differentiated products for the case when one product characteristic was not observed. Their identification and estimation strategy was a two-step approach (Rosen, 1974). Relative to Rosen's approach, they generalized the first stage estimation to allow for a single dimensional unobserved product characteristic, and also allowed the hedonic pricing function to have a general and non-additive structure. In the second stage, if the product space was continuous and the functional form of utility was known then there would exist an inversion between the consumer's choices and his Preference parameters. This inversion could be used to recover the distribution of random coefficients non parametrically. The study concluded that in general, consumers' tastes for the various characteristics were highly positively correlated.

3. Data Sources, Model Specification and Methodology

For the analysis of demand for the specific commodity (soap), the Cross sectional primary data of 370 respondents has been collected through stratified random sampling technique from urban areas of Multan city in the months of April and May 2012. We have used multiple regression analysis using Ordinary least Square method to estimate the coefficients. Econometric methodology regarding demand estimation and calculation of elasticities are explained as follows.

a. Demand estimation

To examine the determinants of the demand for soaps, we have formulated the following model;

$$Ds = f [P, Income, Age, Fsize, Adv]$$

Where, Ds stands for demand of soap in units per month, P shows the price of the soap consumed by the respondent in Pak Rupees, Income denotes income of the consumer in Pak Rupees, Age depicts the Age of the respondent in number of years, Fsize explains the Family Size or members of the household. Adv shows the advertisement effect on the respondents which is dummy variable; 1 for Yes and 0 for No.

b. Estimation of Elasticities

For calculation of Price elasticity of demand and income elasticity of demand, we need to use log – log form of the demand equation. The Elasticities of demand w.r.t. price and income of the respondents are calculated by taking the natural log of the variables i.e. Demand of Soap, Price of Soap and Income of the consumer. Here, we have used semi – log model for examining elasticities. Taking natural log of Age, Family size and Advertisement (dummy variable) seem to be illogical that's why we are not taking their logs. The specified model is stated as follows;

$$lnDs = f [lnP, lnIncome, Age, Fsize, Adv]$$

Where, lnDs is log natural of demand of soap, lnP is log natural of price of soap, lnIncome is log natural of Income of the consumer. Age, Fsize and Adv are respectively Age of the respondent, size of the family and advertisement effect on the demand of consumer (dummy variable).

4. Discussion on Econometric Results

Based on cross-sectional data, the following section provides some important implications about the determinants of demand of soap. Tables 1 and 2 portray the results of study which are arranged in five columns. The 1st column indicates the explanatory variables, 2nd column is about value of coefficients, and standard errors are given in third column. For reliability of our coefficient values, two tailed t-test is used whose values are given in 4th column. For the level of significance, we have included probability values in 5th column.

a. Demand Estimation of soap

The first variable that is price, its coefficient has a positive value which depicts that it has a direct relation with the demand of the soap because the consumers are more concerned to the quality of soap irrespective of the price change. Higher the price, higher will be the perceived quality of soap so the demand will also increase. The value of coefficient shows that if the price will increase by 100 rupees then the demand will increase by 5 units. But t-statistic shows that the coefficient is significant at 5 percent level of significance.

Income has positive value which shows that it is positively associated with the demand of soap because as the income of consumer increases, they would like to spend more on purchasing high quality soaps irrespective of the price so the demand of soap will also increase. The value of coefficient shows that if the income increases by 100000 rupees, the demand will increase by 4.42 units per month. Probability values show that the coefficient is statistically insignificant.

With regards to age, the coefficient has negative value which shows that it has negative relationship with the demand of soap because as the age of consumer increases the demand of soap will decrease. As households become more mature, their concentrations on such type of activities will decline. The respondent will prefer to consume less units of soaps. It shows that if the age increases by 1 year then demand will decrease by 7 units. The variable is statistically not significant.

Family size has positive coefficient value which denotes positive association between demand of soaps and family size because as the family size of consumer increases, the demand of soap will also increase. It may be interpreted as the family size is increased by 1 person per family then the demand will increase by 1.3 units per month. It is having statistically significant relationship at 1 percent level of significance.

Coming towards the Advertisement, the study has found positive correlation among advertisement and demand of soap. More frequent advertisement of the soap will lead to higher consumer's awareness about the soap and eventually the demand will increase. It may be explained that the advertisement is being made by the firm; the demand for soap will increase by 1.12 units per month. The relationship between advertisement and demand is not reliable because value is not significant.

Table 1: Demand Estimation

Variable	Coefficient	Std. Error	t-Statistic	Probability
Constant	2.435993	2.215492	1.099527	0.2757
Price	0.055187	0.028717	1.921754	0.0591
INCOME	4.42E-05	4.04E-05	1.093275	0.2784
AGE	-0.075837	0.038625	-1.963406	0.0539
Family Size	1.349322	0.220429	6.121338	0.0000
Advertisement	1.128261	0.839715	1.343625	0.1838
R-squared	0.425013	Probability (F-Stats)		0.0000

R-square value may be interpreted as 42 percent variation in demand is explained due to the variation in price, income, age, family size and advertisement. F-statistic shows that the overall model is significant and reliable.

b. Estimation of Elasticities

Using Semi-log model, we have calculated Price elasticity and Income elasticity of demands. The study analyses that price elasticity of demand is found to be 0.19 on the average. It shows that if price increases by one percent, demand will increase by 0.19 percent. Income elasticity of demand is valued as 0.17 suggesting that firm is producing normal or necessary commodity showing that if firm increases its price to increase total revenue so its demand will not increase as much as price is increased. Because for necessary commodity increase in price will not decrease demand as evident from signs and values of elasticity.

Coefficient of age is -0.006 concludes that as respondent becomes old, the demand for soap will reduce significantly. If age is increased by 1 year, demand for soaps will decline by 0.006 percent. On the other hand, family size is significantly influencing demand for soaps. If family size increases by 1 person, demand will increase by 0.12 percent. If firm is doing advertisement, so it will attract more demand by 0.09 percent on the average.

Table 2: Elasticities

Variable	Coefficient	Std. Error	t-Statistic	Prob.
Constant	-0.603738	0.795947	-0.758515	0.4509
Price	0.199419	0.12273	1.624853	0.1091
Income	0.172203	0.096155	1.790886	0.078
AGE	-0.006994	0.003467	-2.017305	0.0479
Family Size	0.121739	0.019602	6.210465	0.0000
Advertisement	0.096489	0.075641	1.275622	0.2067
R Squared	0.4493	Probability (F-stat)		0.0000

5. Concluding Remarks and Policy Recommendations

The study is aiming at investigating demand for soap and various elasticities of demand w.r.t price and income. By collecting cross sectional data of 370 respondents, the estimates of the study shows that the variable Price has the direct relation with the demand, income has also the direct relation with the demand while age has the indirect relationship with the demand of soap. Family size is the significant variable exerts direct affect on the demand. As greater the family size, higher will be the demand. Advertisement is found to be positively related to demand of the consumers. On the basis of the price and income Elasticities of demand, we conclude that the price elasticity having inelastic value will suggest the manager to increase the price. Other than that income elasticity of demand suggests the manager to understand the nature of the commodity that is Necessity. Increasing price will not decrease the demand because here price elasticity of demand is positive and commodity is also necessary to be consumed in daily life of consumers.

On the basis of the estimated results, it is obvious that increase in the price is fruitful for the manager. Consumers are more conscious about the quality. In addition to this their buying behavior is mainly influence by the effective advertisement. So the firm should try to increase advertisement. The frequent and effective advertisement with a variety of product range is to target the consumers of every age group. Different family size with justified prices will also help the firm to increase their future demand of soap.

References

Conlon, C. T. and Mortimer, J. H. (2008). Demand estimation under incomplete product availability. *NBER working paper series No. 14315.*

Ortega, D. L., Wang, H. H. and Eales, J. S. (2009). Meat demand in China. *China Agricultural Economic Review*, 1(4), 410 – 419.

Kumar, S. (2011). Financial reforms and money demand: Evidence from 20 developing countries. *Economic Systems,* 35(3).

Besanko, D., Gupta, S. and Jain, D. (1998). Logit Demand Estimation Under Competitive Pricing Behaviour: An Equilibrium Framework. *Management Science*, 44(11), 1533 – 1547.

Hays, F. H. and DeLurgio, S. A. (2007). Where's the Beef? Statistical Demand, Estimation Using Supermarket Scanner Data. *Journal of Case Research in Business and Economics,* 1 – 11.

Bajari, P. and Benkard, C. L. (2001). Demand estimation with heterogeneous consumers and unobserved product characteristics: A hedonic approach. *Journal of Political Economy,* 113(6), 1239 – 1276.

Gujarati, D. N. (2005). Basic Econometrics, 4th Edition.