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Regression Analysis as a Managerial Research Tool: A Practical Illustration of Demand Analysis in Pakistan

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Abstract
The study is aimed at analyzing demand estimation and forecasting using regression analysis as a Managerial research tool. The article is about estimating demand of Medicam Toothpaste by viewing the effect of various variables like price of Medicam toothpaste, price of Shield toothbrush, price of Colgate toothpaste, advertisement and total revenue on the demand as well as its forecast for the next quarter. The methodology used is multiple regressions using Ordinary least Square method applied on time series data of 1st quarter of 2007 to 2nd quarter of 2014. Coefficients of price of Medicam and price of shield toothbrush show negative association with demand of Medicam toothpaste in Pakistan. The coefficients attached with price of Colgate toothpaste, Advertisement and total revenue of the firm are positively related with demand of Medicam toothpaste. Price elasticity of demand is -0.156, cross price elasticity of demand w. r. t. price of Colgate is 0.014, and w. r. t. price of shield tooth paste is -0.059, advertisement elasticity of demand is 0.076 and total sales elasticity of demand is 0.0247. The forecast result shows that the demand has increased in the 3rd quarter of 2014 having demand of 48181.53 units.
Keywords: Demand estimation, Demand Forecasting, Elasticities of demand, Regression Analysis, Managerial Research Tools.

1. Introduction

Demand estimation can be done by various methods like consumer surveys and observational research or market experiments but the most useful method for estimating demand is regression analysis. Here, the demand estimation starts by examining the determinants of demand for a commodity. Then by aggregating the individual's consumer demand we can get the market demand. Determinants of demand such as price of commodity, price of substitutes, price of complementary products and advertisement can lead towards an understanding of impact of certain variables on the demand of a product. For example, if price of the commodity increases, its demand will decrease or if price of the substitute increases the demand for the product will increase.

Demand is one of the most important aspects of managerial economics, since a firm would not be established or survive if a sufficient demand for its product did not exist or could not be created. The strength of present and future demand for the firm's product are also crucial in determining the most efficient methods of producing and selling the product. Estimation of this demand is important in order to find out impact of various determinants on demand of the product so that firm could make decisions accordingly. This activity also helps in finding out these impacts on various levels like finding out a product's demand at different price levels etc. Managers would also be able to determine the relationships between different variables like relationship of firm's advertisement and sales revenues. By this we can find out that how important estimation of demand could be for a firm.

The objective of this study is to estimate the demand of a consumer good using regression analysis on time series data to see the relationships between various variables at different levels, finding Elasticities of variables and forecasting demand through exponential smoothing technique as a practical implication of Managerial Economics. It would help us to understand how managers could use certain techniques for better decisions.

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

2. Literature Review

A vast literature is available relating to demand estimation and demand forecasting at national and international

level. But we have summarized some of them in our study as follows.

Hakimi et al. (2010) considered the case where member of supply network wants to assess the end customer demand at retail store level. The purpose was to illustrating the other members of supply network the benefits of collaborative initiatives and information sharing. Transactional data was collected through public, media, and concerned retailers. The methodology was composed of consecutive steps that estimated global demand and then by disaggregating demand estimated until store level. The variables used were Quantity of product ordered by retailer, shipped by retailer, ordered by customers and sold to customer. They concluded that by using this methodology, they had been enabled to generate demand scenarios, demand trends and exploitation of market and product knowledge as well as demand estimation at store level even when manufacturer has no access to retailer's store information.

Navok et al. (2001) investigated demand for agricultural processing co-products. The purpose was to propose such a method in which no time series data would be needed and to present an empirical application as well as estimation of demand for sugar pulp, wheat middling and potato waste by livestock in Central Crop Reporting District of North Dakota. Normative estimation technique was used due to lack of data. Econometric and Primal optimization was used to estimate demand. Variables used for each co products were characteristic of individual ration component, number of animals and current prices for product. The study concluded that unique characteristic of each co-product influence their value in livestock nutrient requirement.

Besanko et al. (1998) investigated the impact of price, unobservable product attributes on consumer utility. Data was collected through time series data and source of data was retailers. For estimation, they used assumptions like prices were assumed to be endogenous variables. To empirically validate this assumption, they estimate logit demand systems jointly with equilibrium pricing equations for two product categories using retail scanner data and cost data on factor prices. They found statistical evidence for price endogeneity and they also found that the estimates of the price response parameter and the brand-specific constants are generally biased downward when the endogeneity of prices was ignored. They developed theoretical propositions about the relationship between value creation and competitive advantage for logit demand systems and used empirical results to illustrate how firms use alternative value creation strategies to accomplish competitive advantage.

Rojas (2005) estimated demand with differentiated products for the year 1940-2002. Analysis was conducted in two stages. At first stage, Distance Metric Method devised by Pinkse, Slade and Brett was used to estimate demand and in second stage different pricing models were compared and ranked. The study concluded that antitrust concern should be low in terms of use of market power by the leading beer producer to obtain large price-cost margins. Actual price increases for large brewers' brands as a result of tax increase had minimal variation across cities and leading brewers' brands set a common cost mark-up for all brands regardless of where they were sold and smaller brewers' match these mark-ups.

Raymond (1984) estimated the demand for the characteristics of housing for the year 1984. The purpose of this study was to implement the estimation technique for determining the demand for the characteristics of housing. Authors took primary and secondary data from different cities and applied regression technique as an estimation technique. Variables used in the study are the prices of the characteristic, itself, prices of related characteristics, expenditure or income and socio economic variables. The conclusion of the study was that demand equation estimates behaved remarkably well. The coefficients had expected signs and magnitudes and all almost were highly significant. The price elasticity of demand for living space was approximately unitary, while the demands for other characteristics were more inelastic. The expenditure and income Elasticities were found to be somewhat inelastic.

Haung et al. (2000) evaluated many food programs' effects by demand Elasticities. The demand time series data was collected from Nationwide food survey data ranging from 1987 – 1988. They developed an approach for estimating demand system from household survey data for entire sample of households and for each group of households. They also measured nutrients income Elasticities. The variables used in demand equation were unit values of food category and income. The study concluded that most estimated demand Elasticities were statistically significant and acceptable in sign and magnitude. Estimates of food quality effects obtained in this study showed that food quality played significant role in household budget allocation.

Espey et al. (1997) investigated the factors that systematically affect price elasticity estimates in studies of residential water demand in United States. An econometric model was estimated using price elasticity estimate from previous studies as dependent variable. Demand variables were income, population density, household size, seasonal dummy, evapo – transpiration, rainfall and temperature. The study concluded that population density; household size and temperature did not significantly influence the price elasticity while pricing structure and season significantly affected price elasticity.

Bajari et al. (2003) studied the identification and estimation of Gorman-Lancaster style hednoic models of demand for differentiated products for the case when one product characteristics was not known. The study applied methods to personal computers demand and followed two steps Rosen Approach for identification and estimation. The research revealed preferences conditions from the hedonic model that was used to develop Gibbs

sampling estimator for the distribution of random coefficients.

3. Data and Methodology

As regards to the objectives, time series data about some important variables are collected from one retailer of Cantonment Market, Multan, Pakistan for the period from 1st quarter of 2007 to 2nd quarter of 2014. Multiple regressions approach is employed for estimation of demand function using Ordinary least Square method.

3.1 Demand estimation and Elasticities

To examine the determinants of demand, following linear demand model is formulated as;

$$Q_M = f(Pm, Ps, Pc, Adv, Tr)$$

$$Q_M = A_1\ Pm + A_2\ Ps + A_3\ Pc + A_4\ Adv + A_5\ Tr + u_i$$

Where Q_M is demand of medicam toothpaste in units, Pm is price of medicam toothpaste in Pak. Rupees, Ps is price of shield tooth brush in Pak. Rupees, Pc is price of Colgate toothpaste in Pak. Rupees, Adv is expenditure on advertisement in Pak. Rupees and Tr is total revenue of the firm in Pak. Rupees. As are coefficients and ui is error term. For the estimation of Elasticities, natural log of all the variables are taken to form log – log demand model. This will give the respective Elasticities of demand.

3.2 Demand Forecasting

Single equation econometric method is used for forecasting the demand. First of all, values for the variables are forecasted by assigning weights equal to 0.3 and 0.5 using exponential smoothing forecasting method. Then root mean square error (RMSE) method is used to choose among each forecasted value. The forecasted value of 3rd quarter of 2014 having less RMSE will be considered as more accurate and will be used as forecasting quantity demanded of Medicam. The formula which will be used for this purpose is;

$$F_{t+1} = w\ A_t + (1\text{-}w)\ F_t$$

Where F_{t+1} is forecasted value of future time period, A_t is actual value of current time period, F_t is forecasted value of current time period, and w is weights assigned.

4. Results and Discussion

Based on quarterly time series data, this section provides some important information about the determinants of demand of medicam toothpaste. Table 1 and 2 portrays the results of study which are arranged in five columns. 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. It determines whether we may reject or may not reject null hypothesis at some level of significance (1%, 5%, 10%). For level of significance, probability values are included in 5th column.

4.1 Demand Estimation and Elasticities

The first variable is price of medicam toothpaste and according to law of demand there is negative relationship between price and demand. So negative sign with the coefficient shows that it has inverse relation with quantity demanded because as the price of medicam increases its demand decreases. Coefficient value shows that if price of medicam decreases by one Rupee, the demand of medicam increases by 372.32 units. According to the t-statistics, it is significant variable. Table 2 shows that price elasticity of demand is - 0.155561.

Price of Shield toothbrush is complementary product of Medicam. Negative sign of its coefficient shows that it has negative relationship with demand of Medicam because when the price of shield tooth brush increases, the demand of medicam decreases, which justifies it as the complementary product. The value of coefficient shows that if price of shield tooth brush decreases by 1 Rupee, the demand of Medicam is increased by 342.9702 units. It is a significant variable according to t-statistics. Table 2 gives the cross price elasticity of demand with respect to price of shield tooth paste as - 0.055933.

Price of Colgate toothpaste is having positive coefficient value that shows it as directly related to Demand of Medicam toothpaste. It is justified as substitute product. By increasing 1 rupee of Colgate toothpaste, our demand of Medicam toothpaste will increase by 32.27227 units. It means that people are using Colgate as a substitute of Medicam. According to T-statistic rule, price Colgate is insignificant variable and its cross price elasticity of demand with respect to Colgate toothpaste given in Table 2 is 0.014149.

Fourth variable is advertisement and it has also positive sign attached with its coefficient showing direct relationship with the demand of medicam. Because as advertisement increases, the demand will also increase. The coefficient value shows that if advertisement increases by 1 Rupee, the demand of Medicam increase by 0.007454 units. It is insignificant variable at 10 percent level and advertisement elasticity of demand is found as 0.075955.

Last variable is Total revenue and its coefficient has positive sign shows direct relationship with demand of medicam because when revenue from a product increases, it increases its demand as well. Coefficient value shows that if total revenue increases by 10000 Rupees, the demand of medicam will increase by 5.06 units. It is

statistically insignificant variable. Total sales elasticity of demand is estimated as 0.024743.

R-square result shows that there is 81 percent variation explained in demand due to variation in price of Medicam, price of shield tooth brush, price of Colgate toothpaste, advertisement, and total revenue. Result of F-statistic says that it is a significant and reliable model because the probability value is 0.00. The effect of excluded variables is 56409.83 as shown by constant value.

Table 1: Demand Estimation

Variable	Coefficient	Std. Error	T-statistic	Probability
Constant	56409.83	1106.047	51.00129	0.0000
Price of Medicam	-372.3234	129.4724	-2.875697	0.0083
Price of Shield toothbrush	-342.9702	121.9709	-2.811901	0.0097
Price of Colgate toothpaste	32.27227	112.0957	0.287899	0.7759
Advertisement	0.007454	0.004184	1.781814	0.0874
Total Revenue	0.000506	0.000392	1.288469	0.2099
R-squared	0.815241	Prob. (F-Statistic)		0.0000

Table 2: Demand Elasticities

Variable	Coefficient
Price Elasticity of Demand	-0.155561
Cross price Elasticity of demand with respect to price of Shield tooth Brush (Complementary Commodity)	-0.055933
Cross price Elasticity of demand with respect to price of Colgate tooth paste (Substitute Commodity)	0.014149
Advertisement Elasticity of demand	0.075955
Total Sales Elasticity of demand.	0.024743

4.2 Demand Forecasting

Forecasted results of all variables like price of Medicam, price of Shield toothbrush, price of Colgate toothpaste, advertisement and total revenue are shown in following tables. The forecasted value having low root mean square error (RMSE) is selected as best for the forecast of demand of Medicam toothpaste.

Table 3 shows result of forecasting for price of Medicam toothpaste from given data in column 3. We have used average prices of Medicam toothpaste over the 31 quarters. We have data for F_1 (forecast value for first quarter) that is 15, to get the calculation started and assigned weight of 0.3 for A_1 (actual value for first quarter). Thus F_2 (forecast value for second quarter) is calculated by

$$F_2 = 0.3(15) + (1- 0.3)15 = 15$$

Forecast for other quarters were similarly obtained until F_{31}. Starting again with average prices of the Medicam toothpaste for 31 quarters, for which we have data of F_1 that is 15, but now using 0.5 weights for actual value, A_1. Forecast for second quarter is calculated by;

$$F_2 = 0.5(15) + (1- 0.5)15 = 15$$

The root mean square error for the exponential forecasting using 0.3 weight is

$$RMSE = \sqrt{\frac{109.975}{31}} = 3.03$$

On the other hand, the root mean square error for the exponential forecasting using 0.5 weight is;

$$RMSE = \sqrt{\frac{71.76877}{31}} = 2.45$$

Thus, we are more confident in exponential forecast of 32.94 for the 32nd quarter obtained by using w= 0.5 than in the exponential forecast of 31.50 obtained by using w=0.3. So, the value with small root mean square error is the best for the forecast.

Table 3: Price of Medicam toothpaste

Year	Quarter	Price of Medicam	F(0.3)	F(0.5)
2007	1	15	15.00	15.00
2007	2	15	15.00	15.00
2007	3	15	15.00	15.00
2007	4	16	15.00	15.00
2008	1	16	15.30	15.50
2008	2	16	15.51	15.75
2008	3	17	15.66	15.88
2008	4	17	16.06	16.44
2009	1	19	16.34	16.72
2009	2	19	17.14	17.86
2009	3	19	17.70	18.43
2009	4	19	18.09	18.71
2010	1	19	18.36	18.86
2010	2	20	18.55	18.93
2010	3	20	18.99	19.46
2010	4	20	19.29	19.73
2011	1	23	19.50	19.87
2011	2	23	20.55	21.43
2011	3	23	21.29	22.22
2011	4	23	21.80	22.61
2012	1	26	22.16	22.80
2012	2	26	23.31	24.40
2012	3	26	24.12	25.20
2012	4	27	24.68	25.60
2013	1	30	25.38	26.30
2013	2	30	26.76	28.15
2013	3	30	27.74	29.08
2013	4	30	28.41	29.54
2014	1	34	28.89	29.77
2014	2	34	30.42	31.88
2014	3		31.50	32.94

Table 4 gives the result of forecasting for the price of Shield toothbrush for the data given in column 3. There we have used average prices of Shield toothbrush over the 31 quarters. We have data for F_1 (forecast value for first quarter) that is 8, to get the calculation started and assigned weight of 0.3 for A_1 (actual value for first quarter). Thus F_2 (forecast value for second quarter) is calculated by

$$F_2 = 0.3(8) + (1- 0.3)8 = 8$$

And then forecast for other quarters were similarly calculated until F_{31}. Similar method is applied on this data with the weight of 0.5. So, the forecast for second quarter is calculated by;

$$F_2 = 0.5(8) + (1- 0.5)8 = 8$$

The root mean square error for the exponential forecasting using 0.3 weight is;

$$RMSE = \sqrt{\frac{101}{31}} = 2.91$$

On the other hand, the root mean square error for the exponential forecasting using 0.5 weight is;

$$RMSE = \sqrt{\frac{65}{31}} = 2.34$$

So, the value with small root mean square error 2.34 is the best for the forecast.

Table 4: Price of Shield toothbrush

Year	Quarter	Price of Shield	F(0.3)	F(0.5)
2007	1	8	8	8
2007	2	8	8	8
2007	3	8	8	8
2007	4	8	8	8
2008	1	8	8	8
2008	2	10	8	8
2008	3	10	8.60	9.00
2008	4	10	9.02	9.50
2009	1	10	9.31	9.75
2009	2	10	9.52	9.88
2009	3	10	9.66	9.94
2009	4	10	9.76	9.97
2010	1	10	9.84	9.98
2010	2	12	9.88	9.99
2010	3	12	10.52	11.00
2010	4	12	10.96	11.50
2011	1	12	11.27	11.75
2011	2	17	11.49	11.87
2011	3	17	13.14	14.44
2011	4	17	14.30	15.72
2012	1	17	15.11	16.36
2012	2	19	15.68	16.68
2012	3	19	16.67	17.84
2012	4	19	17.37	18.42
2013	1	19	17.86	18.71
2013	2	23	18.20	18.85
2013	3	23	19.64	20.93
2013	4	23	20.65	21.96
2014	1	25	21.35	22.48
2014	2	25	22.45	23.74
2014	3		23.21	24.37

Now, Table 5 has the result of forecasting for the price of Colgate toothpaste for the data in column 3. We have used average prices of Colgate toothpaste over the 31 quarter. Data for F_1 (forecast value for first quarter) is 12, and assigned weight of 0.3 for A_1 (actual value for first quarter). F_2 (forecast value for second quarter) is calculated by;

$$F_2 = 0.3(12) + (1- 0.3)12 = 12$$

Forecast for other quarters are also calculated similarly, until F_{31}. Similar method is applied on this data with the weight of 0.5. So, the forecast for second quarter is calculated by;

$$F_2 = 0.5(12) + (1- 0.5)12 = 12$$

The root mean square error for the exponential forecasting using 0.3 weight is;

$$RMSE = \sqrt{\frac{112.74}{31}} = 3.07$$

On the other hand, the root mean square error for the exponential forecasting using 0.5 weight is;

$$RMSE = \sqrt{\frac{70.71}{31}} = 2.43$$

So, we can say that the value 2.43 obtained from w = 0.5 is better for forecast than 3.07 obtained from w = 0.3.

Table 5: Price of Colgate toothpaste

Year	Quarter	Price of Colgate	F(0.3)	F(0.5)
2007	1	12	12.00	12.00
2007	2	12	12.00	12.00
2007	3	12	12.00	12.00
2007	4	12	12.00	12.00
2008	1	12	12.00	12.00
2008	2	15	12.00	12.00
2008	3	15	12.90	13.50
2008	4	15	13.53	14.25
2009	1	17	13.97	14.63
2009	2	17	14.88	15.81
2009	3	17	15.52	16.41
2009	4	17	15.96	16.70
2010	1	18	16.27	16.85
2010	2	18	16.79	17.43
2010	3	18	17.15	17.71
2010	4	18	17.41	17.86
2011	1	18	17.59	17.93
2011	2	20	17.71	17.96
2011	3	20	18.40	18.98
2011	4	22	18.88	19.49
2012	1	22	19.81	20.75
2012	2	27	20.47	21.37
2012	3	27	22.43	24.19
2012	4	27	23.80	25.59
2013	1	27	24.76	26.30
2013	2	29	25.43	26.65
2013	3	29	26.50	27.82
2013	4	29	27.25	28.41
2014	1	30	27.78	28.71
2014	2	30	28.44	29.35
2014	3		28.91	29.68

Following Table 6 shows the result of forecasting for advertisement by the data given in column 3. The average of advertisement expenses is used over the 31 quarters.F_1 (forecast value for first quarter) is 200000, and we have assigned weight of 0.3 for A_1 (actual value for first quarter). F_2 (forecast value for second quarter) is calculated by;

$$F_2 = 0.3(200000) + (1- 0.3)200000 = 200000$$

Forecast for other quarters are also calculated similarly, until F_{31}. Similar method is applied on this data with the weight of 0.5. So, the forecast for second quarter is calculated as;

$$F_2 = 0.5(200000) + (1- 0.5)200000 = 200000$$

The root mean square error for the exponential forecasting using 0.3 weight is;

$$RMSE = \sqrt{\frac{4272108}{31}} = 597$$

While, the root mean square error for the exponential forecasting using 0.5 weight is;

$$RMSE = \sqrt{\frac{2696366}{31}} = 474$$

So, we can say that the value 474 obtained from w=0.5 is better for forecast of 32nd quarter.

Table 6: Advertisement

Year	Quarter	Advertisement	F(0.3)	F(0.5)
2007	1	200000	200000	200000
2007	2	200000	200000	200000
2007	3	200000	200000	200000
2007	4	200000	200000	200000
2008	1	300000	200000	200000
2008	2	300000	230000	250000
2008	3	300000	251000	275000
2008	4	300000	265700	287500
2009	1	425000	275990	293750
2009	2	425000	320693	359375
2009	3	425000	351985	392188
2009	4	425000	373890	408594
2010	1	550000	389223	416797
2010	2	550000	437456	483398
2010	3	550000	471219	516699
2010	4	550000	494853	533350
2011	1	625000	511397	541675
2011	2	625000	545478	583337
2011	3	625000	569335	604169
2011	4	625000	586034	614584
2012	1	750000	597724	619792
2012	2	750000	643407	684896
2012	3	750000	675385	717448
2012	4	750000	697769	733724
2013	1	800000	713439	741862
2013	2	800000	739407	770931
2013	3	800000	757585	785466
2013	4	800000	770309	792733
2014	1	900000	779217	796366
2014	2	900000	815452	848183
2014	3		840816	874092

Table 7 shows the result of forecasting for total revenue by the data given in column 3. The average of total revenue is used over the 31 quarters. F_1 is 1500000, and we have assigned weight of 0.3 for A_1. F_2 is calculated by;

$$F_2 = 0.3(1500000) + (1- 0.3)1500000 = 1500000$$

Forecast for other quarters are also calculated similarly, until F_{31}. Similar method is applied on this data with the weight of 0.5. So, the forecast for second quarter is calculated as;

$$F_2 = 0.5(1500000) + (1- 0.5)1500000 = 1500000$$

The root mean square error for the exponential forecasting using 0.3 weight is;

$$RMSE = \sqrt{\frac{52572458}{31}} = 2093$$

While, the root mean square error for the exponential forecasting using 0.5 weight is;

$$RMSE = \sqrt{\frac{32900351}{31}} = 1656$$

So, we can say that the value 1656 obtained from w=0.5 is better for forecast of 32nd quarter than 2093 obtained from w=0.3.

Table 7: Total Revenue

Year	Quarter	Total Revenue	F(0.3)	F(0.5)
2007	1	1500000	1500000	1500000
2007	2	1550000	1500000	1500000
2007	3	1780000	1515000	1525000
2007	4	2200000	1594500	1652500
2008	1	2750000	1776150	1926250
2008	2	3290000	2068305	2338125
2008	3	3580000	2434814	2814063
2008	4	3740000	2778369	3197031
2009	1	3805000	3066859	3468516
2009	2	3970000	3288301	3636758
2009	3	4550000	3492811	3803379
2009	4	4785000	3809968	4176689
2010	1	5290000	4102477	4480845
2010	2	5500000	4458734	4885422
2010	3	5750000	4771114	5192711
2010	4	6050000	5064780	5471356
2011	1	6490000	5360346	5760678
2011	2	6778000	5699242	6125339
2011	3	6900000	6022869	6451669
2011	4	7030000	6286009	6675835
2012	1	7409000	6509206	6852917
2012	2	7990000	6779144	7130959
2012	3	8100000	7142401	7560479
2012	4	8309000	7429681	7830240
2013	1	8630000	7693476	8069620
2013	2	8827000	7974434	8349810
2013	3	9401000	8230203	8588405
2013	4	9682000	8581442	8994702
2014	1	9748000	8911610	9338351
2014	2	9907000	9162527	9543176
2014	3		9385869	9725088

By putting forecasted value of each variable in the linear demand function equation that is given below, we can have forecasted demand for the next quarter.

Q_M = 56409.83 - 372.3234 Pm - 342.9702 Ps + 32.27227Pc + 0.007454 Adv + 0.000506 Tr

= 56409.83 - 372.3234 (22.94) – 342.9702 (24.37) + 32.27227 (29.68) + 0.007454 (874092) + 0.000506 (9725088)

= 48181.53072

48181.53 is forecasted value for the third quarter of 2014.

5. Conclusions and Policy Recommendations

The objective of the study is to analysis demand function using regression analysis by using managerial research tools. For that purpose, the study collects time series data for the period from 1st quarter of 2007 to 2nd quarter of 2014 and surveys a firm of Multan, Pakistan for data purpose. Ordinary least square a form of regression is employed for estimation of econometric results.

The estimates of the study show that the price of Medicam and the price of its complementary product shield tooth paste have inverse relation with the demand of Medicam, while price of Colgate toothpaste, advertisement and total revenue have a direct relation with the demand. The results of elasticities are that the price elasticity of demand of medicam toothpaste is -0.1556, Cross price elasticity of demand with respect to complementary good i.e. shield tooth brush is -0.0559, cross price elasticity of demand with respect to substitute that is Colgate tooth paste is 0.01414, Advertisement elasticity of demand is 0.0759 and Total sales elasticity of demand is 0.0247. The forecasting results show that the demand has increased in the 3rd quarter of 2014 from 47380 to 48181.53072.

On the basis of these results we can conclude that price elasticity of Medicam, cross price elasticity of its complementary product that is Shield toothbrush, and the cross price elasticity of Colgate toothpaste that is a substitute of Medicam, have an inelastic impact on the demand of Medicam, so we can say that the firm should increase its prices to get an increase in total revenues because even if the price will increase the demand will not

be much affected. And through forecast results we can see that demand is already increasing gradually. Moreover it should not focus on its substitutes and complementary products a lot because they have almost no impact on their price and demand. On the other hand, people are loyal with Medicam and have faith in it. Medicam firm can make decisions irrespective of these products. As the advertisement also keeps demand highly inelastic and even if these are making extra expenditure on this, it will not affect much demand of Medicam so the firm should not increase its cost by doing expense on aggressive advertisement.

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