

Elasticities of Electricity

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Abstract – Electricity short fall has been ranked as the core issue of Pakistan economy. Prices of electricity are increasing to suppress the demand. But the result remains the same. In this paper we will examine the various forms of elasticities to sort out the real issue, to materialize the compact policy. Our results show that in Pakistan, the electricity is a necessity good. Moreover, the positive sign of incomes electricity show that the electricity is a normal good. The study recommends the govt. should not increase electricity prices.

Keywords – House Hold, Auto Regressive, Distributed Lag, Necessities, Normal Goods, Time Series.

I. INTRODUCTION

An energy crisis is the foremost and most crucial issue of Pakistan, especially during the last decade. The rise in the electricity demand is more than the supply. To deal with this phenomenon, the Govt. increases the unit price of electricity so that the demand will suppress to meet the supply. So in this paper we will also calculate the price elasticity of demand. We have used the time series data from 1990 to 2010 and investigate income and price elasticities of electricity demand.

There is a wide range of energy sources for example Oil, Electricity, Coal, Nuclear and Gas etc. In Pakistan, the major source of Energy is Gas which almost 40% of the total energy supplies.

The other sources are Oil 29% Hydro 12.8% Coal 11 % Nuclear 2%. The most important source of energy in Pakistan is electricity. It has become necessity of life. It is used both by the house hold and industrialist. Household used for cooling, washing, refrigerating etc. However, Industry is now shifting from electricity to Gas. Analyzing in another way the increase in the electricity demand is due to the fact that the income of the household increases, so they increase the demand of electricity. For this reason it has open a door to research the issue. Hence we will estimate the income elasticity of electricity demand. Another factor which causes the electricity demand to rise is increase in the population growth rate. So we will calculate price and income elasticities of electricity demand for Pakistan.

II. LITERATURE REVIEW

Various studies had been developed to estimate the demand for electricity. Moreover, price and income elasticities for short and long run also estimated by different economist during various time periods. Wilson 1971 finds negative income elasticity, with negative price elasticity. Negative income elasticity shows that the good is inferior. While the theory exhibits that the income elasticity of demand for electricity is positive.

Houthakkar 1973 estimated demand for electricity using both time series and cross sectional data from 48 states. Their estimates show that short run income elasticities is .15 and long run income elasticity is 2.2. And short run price elasticity is -.03 while the long run price elasticity is -.44.

Filippini 1999 find out residential demand for electricity for Switzerland for 48 cities from 1987 to 1990. His results show that price and income elasticities -.59 and .39 respectively.

Filippini and Pachauri 2002 estimated price and income elasticity in Indian urban areas for three seasons, winter, Monsoon and summer. The estimated price elasticity for summer, monsoon and winter .65, .64 and .68 respectively.

Kamerschena and Porterb 2004 estimated the residential price elasticity which varies from -.85 to -.94.

III. METHODOLOGY

The demand for Electricity by the household is different from demand for commodities by the consumers. Filippini explained the household demand for electricity. According to him the household purchase electricity and Capital equipments. The utility of these goods is independence of each other. We can explain in the functional form:

$$X = f(T, A) \text{ ----- (1)}$$

X is a composite commodity

T is an electricity

Electric appliances.

Utility function of the household is

$$U = f(X, T) \text{ -----(2)}$$

The budget constant

$$Y = P_x X \text{ ----- (3)}$$

The household will minimize his expenditures:

$$\text{Minimizing } (P_t \cdot T + P_a \cdot A) \text{ ----- (4)}$$

Subject to $X = f(T, A)$

Maximizing utility:

$$\text{Max } U(X) \text{ S.T } C(P_t, P_a)$$

Thus we will estimate the following equation:-

$$T = S(P_t, P_a, Y)$$

The equation shows that the electricity demands depends upon the prices of electricity, prices of appliances and incomes of the household we will analyze the short and long run in impacts of the variables. The above equation can be written in the form of Auto Regressive distributor lack Model.

$$D_T = \alpha_0 + \sum_{i=1}^p \epsilon_i^p$$

$$\lambda_1 TD_{t-1} + \sum_{i=0}^q \gamma_{1i} TP_{t-1} + \sum_{i=0}^q \gamma_{2i} HY + \mu_i$$

γ_1 and γ_2 are price and income elasticities in the short run. We apply the OLS technique to obtain the

elasticities. However the long run elasticities are obtained by dividing the sum of current and lagged values of each variable by one minus the sum of lagged values of the dependent variable. The data used in this study are from 1990 to 2010.

IV. EMPIRICAL FINDINGS

The results are shown in the following table:

Table 1 : Short run elasticities

Constant	Price Elasticity	Income Elasticity	SEE	Ad.R ²
2.35 (1.8)	-.39* (.51)	2.01** (.24)	.05	.8

Table 2: Long run elasticities

Constant	Price Elasticity	Income Elasticity	SEE	Ad.R ²
2.35 (1.8)	-.62 (.32)	1.9 (1.5)	.05	.8

In parenthesis are standard errors of estimated elasticities.

* Significant at 1 percent.

** Significant at 5 percent.

Results of table 1 and 2 are expected and according to the theoretical background. All the parameters are significant and expected. In the short run the price elasticity is -.39, which indicates that the electricity demand is price inelastic. Although the absolute value increases in the long run but it remains still inelastic. Hence the results show that electricity is a necessity both in short and long run. Our second variable is the stock of electric appliances. In Pakistan the electricity is costly. For this reason the general public limits the use of electricity only for lighting and to some extent cooling. They avoid using electricity for cooking and heating. But the number of these people is very low. For this reason the demand for electricity is less elastic.

Income elasticity has a positive sign indicating that electricity is a normal good. The income elasticity is more than one both in short and long run. It explains that more the income, the demand for electricity also increases.

V. CONCLUSION

Pakistan, during the last decade passes through severe energy crises. Demand and supply both factors are responsible for these crises. In this study our emphasis was on demand side. We have measured the price and income elasticities of electricity demand for domestic use. The results are according to the theory and the signs are as per expectations. The empirical evidences show that electricity in Pakistan is a necessity. Moreover the income elasticity is greater than one and has a positive sign showing that it is a normal good whose demand increases with the rise in income.

Keeping in view the above results, the govt. should not increase the price of electricity to suppress the demand. Because these measures could not achieve the better

results. The govt. should sanction the subsidy to accommodate the masses.

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