Econometric Estimation of Demand Function for Gasoline (1980-2012): Iranian Case Study

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Abstract: During last 32 years (1980-2012), nominal price of gasoline have been increased but demand moved in the same way. In fact, low of demand has been declined. The main aim of the study is estimation of this function. Most of the time, the governmental officials tried to adjust gasoline consumption via price hiking but present study shows during last 32 years, nominal price and gasoline consumption moved in the same way. Every year, the government should pay large sum of money for imported gasoline as well as gasoline subsidize. Thus, people consumed it in inefficient manner and gasoline smuggling is a very popular job, especially near boundaries. In the last Iranian year about 70 million L of gasoline have been consumed daily in Iran. This research estimated relationship between nominal gasoline price and gasoline consumption. Estimated regression equation shows positive relationship between price and gasoline consumption. SPSS and EXEL software have been utilised for statistical estimation. The hypothesis is price policy cannot decrease gasoline consumption in Iran significantly and estimated results approved it.

Key words: Demand, sustainable development, pollution, gasoline pricing, gasoline consumption, Iran

INTRODUCTION

The past 32 years have seen a growing realisation that the current Iranian model of gasoline consumption along with policy and pricing is unsustainable. A widely-used and accepted international definition of sustainable development is that development which meets the needs of the present without compromising the ability of future generations to meet their own needs (Acutt and Mason, 1998).

One of the most important threat against sustainable development in Iran is energy subsidize. In this survey, effectiveness of price policy on gasoline consumption has been studied. Surprisingly data and statistical equation demonstrate a positive relationship between nominal gasoline price and consumption.

About 17.5% of GDP (Gross Domestic Production) is allocated to energy subsidize every year. About >25% of GDP is allocated to total subsidize in Iran economics. Gasoline price in Iran is about 12 cent L^{-1}, so people consume it in a diseconomy manner. Official data shows during the last 5 years gasoline consumption increased 10% yearly.

Only in the last year, about 70 million L have been consumed daily by Iranians (Moradi, 2007). From the environmental point of view, this level of gasoline consumption caused high level of air pollution, especially in big cities and because of that Tehran (capital of Iran) is one of the most air polluted cities in the world. Although, Iran is the 4th biggest petroleum producer in the world, it simultaneously imports gasoline from abroad. For example in financial year 2006-07, about 4 billion US\$ gasoline was imported by the Iranian government. In other words, Iran is the biggest gasoline importer in Middle East (Moradi, 2007).

Fortunately, very scientific researches about economic aspect of gasoline in Iran have been carried out by academic persons. One of the best studies has been done by Khataie (2006). Researcher estimated demand and elasticity of gasoline from period of 1981-2003 and forecasts the future of gasoline consumption with utilise of ARDL (Autoregressive Distributed Lag Modelling Approach). In base of the study, gasoline demand model introduced as follow:

$$CG = f(RPG, POP, TK, Y, A) \qquad (1)$$

Where:

CG = Total demand of Gasoline
RPG = Real Price of Gasoline
POP = Population
TK = No. of cars
Y = National income
A = Average life of car in Iran

$$\frac{dCG}{dPOP} \geq 0 \; \frac{dCG}{dY} \geq 0 \; \frac{dCG}{dA} \geq 0 \; \frac{dCG}{dRPG} \leq 0 \; \frac{dCG}{dTK} \geq 0 \qquad (2)$$

Thus for period of 1981-2003 with utilise of ARDL approach demand equation estimated as follow:

$$CG = 11085 - 18.5 \text{ RPG} + 0.0056 \text{TK} - 6037 \text{ D84} \quad (3)$$

Where, D84 is a dummy variable and demonstrate decrease of oil income in year, 1984. Because the other parameters were not significant researcher deleted them. As the equation shows, there is a weak negative relationship between real gasoline price and total gasoline demand. Thus if government increase the gasoline price, the demand level will not change drastically. But number of cars affects the gasoline consumption positively. Abounoori (2006) utilised logarithmic function for estimating gasoline demand function with OLS (Ordinary Least of Square) Approach. Researcher estimated the following equation:

$$\text{Log Clit} = 9.37 + 0.0575 \log \text{Veh} + 0.0188 \log \text{NI} - 0.121 \log \text{PP} + 0.851 \log \text{POP} \quad (4)$$

Where:
Clit = Gasoline consumption
Veh = No. of vehicle
NI = National Income
PP = Real gasoline income
POP = Population

From economical aspect in this equation, parameters are elasticity coefficient. So, we can conclude gasoline demand has low sensitivity ratio with price.

Thus if government raise price, people will not change their demand significantly. This is because of lack of appropriate public transportation in big cities.

Moreover, every year 1 million new cars add to previous cars with high average of consumption most of cars in Iran have four cylinder and burn >10 L gasoline km^{-1}. Iranian gasoline consumption has been studied by official expert (Akhani, 2000) with the comparison between Iran and otherworld situation. As researcher mentioned rate of increase for gasoline consumption between 1975-1995 was about 5.8% annum^{-1}.

MATERIALS AND METHODS

In this study for identification and gathering information, documentary approach has been utilised. For analysing and interpreting, descriptive statistics manner has been used like statistical figures and tables.

Official data about gasoline price and consumption between1981-2011 have been considered for regression analysis. ESPSS and EXEL software have been utilised for analysing and interpreting data. Figure 1 as well as Table 1 shows positive relationship between gasoline price and consumption.

As can be shown in Fig. 1 during last 30 years both variables increased but data shows this relationship is not exactly liner so, different regression models have been regressed.
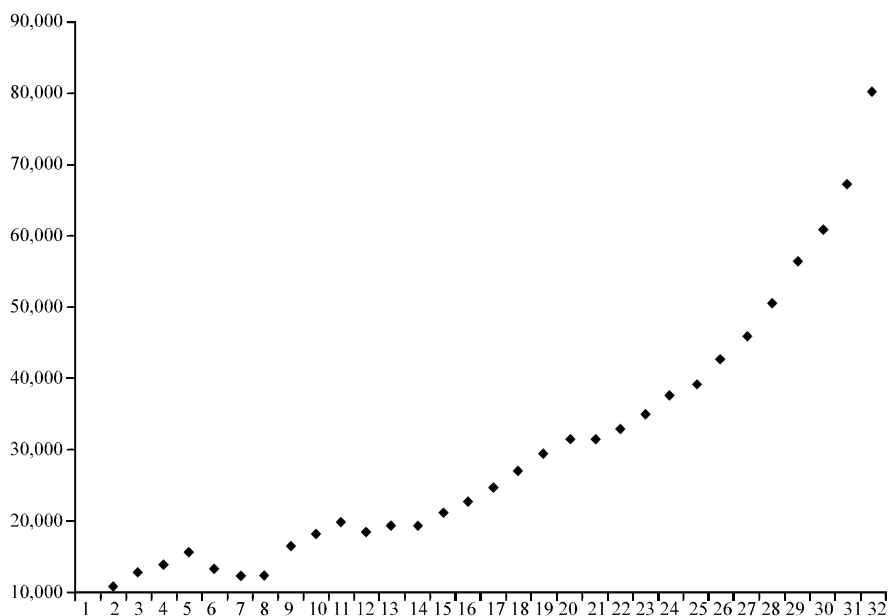

Fig. 1: Gasoline consumption 1980-2011 in Iran

Table 1: Results of Estimated Regression Model

Model	Unstandardized coefficients		Standardized coefficients		
	B	SE	β	t	Sig.
(Constant)	19640.88	1239.613	-	15.84436	1.51E-14
Nominal price	56.96463	3.422818	0.957712	16.64261	4.9E-15

$R^2 = 0.917$; F = 276; Dependent variable (Y): Daily gasoline consumption; Independent variable (X): Gasoline price; Y = 19640.88+56.965 X

RESULTS AND DISCUSSION

Different models had been considered for regression estimation like logarithmic, non-linear and liner. Finally, liner model has been chosen and reported in the study. Although, some researchers calculated weak negative relationship between gasoline price and consumption (Bogosian, 2006), the results are different. Estimated model shows strong positive relationship between gasoline price and consumption, although it is against economics theory but it is not strange in Iran, similarly most of people forecast decreasing in car price after starting quota system but car price has been raised.

It means other variables are also important in gasoline consumption like population, availability of public transport, number of motorbike and cars, etc. SPSS results expressed the estimated equation is significant in 91% level. Regression coefficients results showed in Table 1. Average of nominal price growth with use of geometrical average has been estimated about 0.14 so, nominal price increased 14% yearly. For next year, price forecast is 1000*0.14 = 1140 Rials. If we put this price in equation, next year consumption will be found as: Y = 19640.88+ 56.965(1140) = 84580 thousands L or about 84.5 million L daily. But question is why the results are against economics theory. In other words why gasoline consumption continually hikes? Answer is that in Iran, only a few companies produce car and all of them belong to the government so, no competition exists; they have been supported by the government during the last 2 decades. They have provided low quality cars with high average of gasoline consumption and people have to buy their products. Although, gasoline is cheaper rather than other countries, car is more expensive. It should mention here because of structural inflation in Iranian economic system, researchers have a big gap between real and nominal gasoline price. As can be shown in Fig. 1, real gasoline price has not varied very much but simultaneously nominal price in most of years have been raised drastically. In fact in recent years, real price has been decreased although the variation is small. Among different areas in the world, North America with 45.4% is the biggest and Africa with 2.7% has the smallest share

for gasoline consumption (Akhani, 2000). As it was mentioned before, official data about gasoline consumption has been utilised for drawing figures and statistical analyses. For this purpose, time series between 1980-2011 has been considered.

Figure 1 shows trend of daily gasoline consumption in Iran during the last 31 years (Petroleum Ministry of Iran, 2011). Vertical axe shows gasoline consumption (1000 L day^{-1}) and horizontal axe shows last 31 years (1980-2011).

Figure 1 shows about 70 million L gasoline have been burnt per day during the year 2012, it means during 30 years gasoline consumption increased 7 times more (1980-2012). At the beginning months of 2012 gasoline consumption was beyond the 80 million L day^{-1}.

CONCLUSION

Although, similar researches show weak negative relationship between price and gasoline consumption the results is different (Bogosian, 2006; Khataie, 2006; Abounoori, 2006). Trend of gasoline price and consumption during last 30 years approve the studies' hypothesise. It means gasoline price did not affected consumption significantly, meanwhile this trend direct the country towards unsustainable development. Thus, changing the consumption pattern is necessary.

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