

Willingness to pay for Features of Car in Iran

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ABSTRACT

Goods and services either have a market that is such cases prices are determined through supply and demand or they don't have any market so their valuation is require to find a criterion of consumer's willingness. Hedonic is a method that by which consumer's willingness to buy goods that don't have any market is assessed. This method base on actual observations of behavior of individuals about a special product or service related to those of which associated with have no market. Vehicle constitutes of many different observable and non-observable specifications and features that all of them don't have any price. Hedonic method has been used in Iranian vehicle market in the years 1385-1387-1389 for pricing these specification and applicer model is logarithms – logarithmic. After estimating of Hedonic equations implicit prices as a criterion of consumer willingness to pay where derived.

KEY WORDS: Vehicle prices, vehicle specifications, willingness to pay, Hedonic prices, implied price.

INTRODUCTION

In many studies in Iran car is considered as a one dimensional product and demand is a function of its price, the price of supplemented and substitute product (such as gasoline prices, the cost of repair and maintenance and etc.) and consumer's income. This attitude causes many feathers of car which affects its price, to be ignored. In this research a realistic model that is able to assess rational behavior of consumers, has been used. In this research multidimensional feature of car consuming product or service consist, the basis of applied pattern.

In this study we try to answer following questions:

1 - What extent is household willingness to pay for each features and specifications of passenger car in Iran market?

2 - Which one of the car features has a greatest impact on the price or other words what features of car does consumer have highest willing to pay for?

Hedonic method is the applied model answer these question. In this method price is a function of observable and non-observable characteristics of good. Consumer choosethe model of the vehicle based on income, acquires utility of features of vehicle as well as acquires utility from other products. Consumers willing are obtained through implied prices. Implicit price reflects the consumer's willingness to one unit increased feature of car.

Theoretical Foundations for research:

Hedonic method or price determination approach is based on the principle of human willingness toward welfare and comes from the Greek word Hedonics which means pleasure and welfare. This word from an Economic point refers to the usefulness or consent which is acquired from consuming of goods and services. Hedonic price function first was used by Hass in (1924) for estimating the price of agricultural lands of Minnesota America so Waugh in thus. Later Waugh (1929) applied it to estimate of vegetables price. In 1939 and 1961 was used by Court and Griliches to America car market. Initially, Hedonic regressions have been considered as an experimental method which adjusted price indices. Theoretical Foundations of this method have been obtained from Lancaster's consumption theory (1966) and Rosen (1974) and shows that a product is a collection of many different characteristic, combined together, has been effective impact on consumer's utility. Applied pattern in this research is Rosen's. We assume that $z = (z_1 \dots z_n)$ is a vector of features of a multidimensional good (such as a car), z_i representsith value of the property in good. Different packages from combining of these features with together offer different goods. If price is considered as a function of specification of produced Hedonic price function will be.

$$P(Z) = F(z_1, \dots, z_n) \quad (1)$$

P is market price. If a classified is derived from the Hedonic price function with respect to each the characteristics of goods assuming that other features are constant, obtained implicit prices in each attribute will be follows:

$$P_{zi} = \frac{\partial p(z)}{\partial z_i} \quad (2)$$

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Rosen states that Hedonic prices shows two side of supply and demand of market for product characteristics. Consumer utility is a function of z (product features), X (other products existed on the market) and S is the consumer's tastes. Consumer regarding with considering the budget constraint chooses X, Z in a way that him utility is maximized.

$$\begin{aligned} \text{Max } U &= U(Z, X; S) \\ \text{S.t } Y &= X + P(Z) \end{aligned} \quad (3)$$

Y is consumer income. By constituting of Lagrange function and is maximizing it we will have:

$$L = U(Z, X; S) + \lambda (Y - X - P(Z))$$

$$\frac{\partial L}{\partial z_i} = 0 \Rightarrow U_{z_i} = \lambda P_{z_i} \quad (4)$$

$$\frac{\partial L}{\partial X} = 0 \Rightarrow U_X = \lambda \quad (5)$$

$$\frac{\partial L}{\partial \lambda} = 0 \Rightarrow Y = X + P(Z) \quad (6)$$

By dividing equation (4) to (5) will be obtained one of the conditions of optimal choice:

$$\frac{U_{z_i}}{U_X} = P_{z_i} \quad (7)$$

Rosen defines the consumer proposal function regarding utility maximizing by consumer.

$$\theta = Y - X = P(Z) \quad (8)$$

θ represents the total amount that consumer spends on desired good after paying for other goods. This proposal function represents the maximum amount of paying that a person is willing to pay for goods with Z characteristics. The final proposal of consumer for using of one additional i th feature of a product is as following.

$$\frac{\partial \theta}{\partial z_i} = \theta_{z_i} = P_{z_i} \quad (9)$$

Consumer final proposal to use of i th feature is equal to implicit price of i th feature. Rosen after checking of consumer behavior has analyzed producer behavior and defined the production cost function as follows:

$$C(M, Z, B) \quad (10)$$

Where B is inputs to production and M is the amount of desired product. Firm's profit function is as follows:

$$\pi = M P(Z) - C(M, Z, B) \quad (11)$$

In this case production unit maximizes its profits by selecting the optimal values of M and Z :

$$\text{Max } \pi = M P(Z) - C(M, Z, B)$$

$$\frac{\partial \pi}{\partial z_i} = 0 \Rightarrow M \frac{\partial P}{\partial z_i} - \frac{\partial C(M, Z_i, B)}{\partial z_i} = 0 \Rightarrow P_i(Z) = \frac{C_{z_i}(M, Z_i, B)}{M} \quad (12)$$

$$\frac{\partial \pi}{\partial M} = 0 \Rightarrow P(Z) - \frac{\partial C(Z, M, B)}{\partial M} = 0 \Rightarrow P(Z) = \frac{\partial C(Z, M, B)}{\partial M} \quad (13)$$

Characteristic is equal to the cost of final production maximum benefit is gain acquired when the marginal revenue result of each.

$$\emptyset = \emptyset(Z, M, B, \pi) = P(Z) \quad (14)$$

$$\emptyset_{z_i} = P_i(Z) \quad (15)$$

If the behavior of maximizing of benefits of supplier firms is considered together with the behavior of optimization consumer's following conditions will gain:

$$\theta = \theta(Z^*, U^*, Y) = P(Z^*) = \emptyset(Z^*, \pi^*, M, B) \quad (16)$$

$$\theta_{z_i} = \theta_{z_i}(Z^*, U^*, Y) = P_{z_i} = \emptyset_{z_i}(Z^*, \pi^*, M, B) \quad (17)$$

Consumer with the highest willingness to pay for a set of attributes purchases from firms which take the least cost to provide these properties.

History of Investigation:

Griliches in a research titled "Hedonic price index for cars, econometric analysis of quality change" has applied Hedonic method for the America passenger car market. In this study has been used the logarithm- liner model. Because the model is logarithmic-logarithmic, extracted implicit prices are not fixing stable, and are depend on the levels of characteristics. He also has introduced the Hedonic price index and has used it for CPI adjustment. Matas in a research called "Hedonic prices for cars: an application to Spanish car market" has studied the Spanish car market. Used functional form is logarithms – linear. He says that in Hedonic equation, coefficients are interpreted as a result of the interaction of supply and demand curves for each of the characteristics of good, so any changing in the curve may over the time cause to change in the estimated coefficients. He tests instability of coefficients over the time. Goodman examines consumer willingness to pay for abilities of automobiles. He has applied his own analysis for the oil shocks during the years of 1978-1979 1979 and obtained Hedonic prices with a particular emphasis on MPG (the amount rate of car movement per mile per gallon). Reyes has used Hedonic method is in the car market in Portugal from 1997-2001. He used Hedonic method to assess the effects of the quality change on good prices. Tumat used Hedonic method in Italian car market.

Hypothesis:

In this research we have tried to prove following assumptions:

1. Fuel consumption has a significant effect on car price.
2. Maximum speed has significant effect on its price.
3. EBD braking system that is part of vehicle safety has a significant effect on its price.
4. The height of the vehicle has a significant effect on prices.

Research model:

In this Research the logarithms – logarithmic model has been used for estimating of Hedonic price equation for 30 car models produced and assembled by automobile factories in three period times. In this study various models were estimated, but at last this method was chosen because of being LOG LIKELIHOD and being lower Schwartz, significant and higher explanatory power and greater number of independent variables. Variables which have been used in study consist of: dependent variable of logarithm of price as well as the independent variables which are divided into two groups of observable and non-observable. These observable variables includes: (1) Performance variables (the power of engine - the weight of the car - engine size - the maximum speed), (2) Ease of driving variables (power steering, dummy variable, that takes one value if power steering is of the standard significations of the vehicle otherwise takes zero value), (3) Vehicle size variables (the height of vehicle),

(4) Fuel consumption variable and (5) Variables related to the vehicle safety (EBD braking in a dummy variable, if the EBD braking is one of the standard features of the vehicle, accepts one value otherwise takes zero value). All non-observable variables have been applied under the name of car brand.

The first estimated Hedonic model related to the selected vehicles in1385 is as follows: (numbers in parentheses indicate the t-statistics amount of each coefficient.)

$$\begin{aligned} \text{Log (p)} = & 2.66 + 0.82 \text{ Log (Engine)} + 1.4 \text{ Log (maxspeed)} + 2.121\text{Log (height)} \\ & (2.22) \quad (1.743) \quad (1.767) \quad (1.89) \\ & - 0.45\text{Log (fuel)} + 1.69\text{Log (weight)} + 0.26 \text{ EBD} \\ & (-3.96) \quad (3.62) \quad (3.150) \end{aligned}$$

The estimated Hedonic model related to the selected vehicles in1387 is as follows: (numbers in parentheses indicate the t-statistics amount of each coefficient.)

$$\begin{aligned} \text{Log (P)} = & -3.875 + 0.928 \text{ Log (power)} + 2.394 \text{ Log (maxspeed)} + 3.817 \text{ Log (height)} - \\ & (-7.501) \quad (3.22) \quad (2.8) \quad (3.243) \\ & 0.935\text{Log (fuel)} + 0.279 \text{ hydraulic} + 0.144 \text{ EBD} \\ & (-2.909) \quad (1.779) \quad (1.747) \end{aligned}$$

The estimated Hedonic model related to the selected vehicles in1389 is as follows: (numbers in parentheses indicate the t-statistics amount of each coefficient.)

$$\begin{aligned} \text{Log (P)} = & -3.76 + 0.83 \text{ Log (power)} + 3.00 \text{ Log (maxspeed)} + 4.131\text{Log (height)} - 1.18 \\ & (-6.85) \quad (3.241) \quad (3.702) \quad (3.323) \end{aligned}$$

$$\begin{aligned} & \text{Log (fuel)} + 0.31 \text{ hydraulic} + 0.21 \text{ EBD} \\ & (-3.56) \quad (1.914) \quad (2.467) \end{aligned}$$

All coefficients are meaning full at the 90% level. In this study white test has been used for checking the Heteroskedastic and Ramsey Reset test for checking the clear error. Results show that the clear error. Result show that Heteroskedastic and clear error don't exist in the estimated equations. Since applied method is based on a Logarithmic form coefficients are interpreted as tension as well.

Implicit prices:

After estimating of Hedonic equations, implicit prices are derived. Because the logarithm – logarithmic model, implicit prices are not fix and are depend on the level of characteristics. Implicit prices show the importance of each feature from the consumer's point of view. Implicit price is extracted for assessment of consumer preferences. In the following table car implicit prices have been obtained in the terms of average price and the average vehicle characteristics.

Table 1) implicit prices of car specifications in sections 1385-1387-1389 (in terms of average price and features)

variable		Section1385	Section1387	Section1389
Performance variables	Engine power	-----	0.194	0.184
	Engine size	10.586	-----	-----
	Vehicle weight	0.033	-----	-----
	Maximumspeed	11.077	20.175	27.55
Variable vehicle size	Vehicleheight	35.039	67.46	79.438
Fuel efficiency varies	Fuel consumption	-1.319	-2.932	-4.036
Ease of variable	Hydraulic control	-----	7.298	8.936
Variable vehicle safety systems	EBD braking	6.552	3.767	5.976

Conclusions

Hedonic method is one of this which is used for the study of consumer's willingness to pay for various features of multidimensional goods. In this study we have used Hedonic method in Iranian car market for three section period. Implicit prices reflect the willingness of households to pay for the vehicle characteristics. Among the considered features, the height of car has the greatest impact on car prices and the consumer has the highest willingness to pay for this feature. Since non-observable features of vehicle are not significant they have been excluded from the model. Research hypotheses were confirmed. Fuel consumption, level has a significant impact on car prices. Its importance fuel consumption level has increased to consumers because of the application of non-price politics such as gas rationing and price policies such as increasing of gasoline prices and consumer is willing to pay a higher price for a car with an improved performance of fuel. EBD braking system as a representative of the vehicle safety system that will significantly impacts significantly on the price so that consumer is willing to pay more for a car equipped with this system. The maximum speed a representative of vehicle performance has a great impact on prices as well. Hedonic method can be used for adjusting CPI (consumer price index). The quality of many of the products improves over the time but CPI cannot show the increase of price as a result of quality improvement and interpreted it as an increased inflation increases that result in bias CPI. Hedonic method can be Used in Iran market for other multidimensional goods such as mobile phones, PC and...

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