ESTIMATING ELASTICITIES WITH THE ALMOST IDEAL DEMAND SYSTEM: TURKEY RESULTS

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ESNEKLİKLERİN YAKLAŞIK İDEAL TALEP SİSTEMİ İLE TAHMİN EDİLMESİ: TÜRKİYE SONUÇLARI

Abstract

In this study, data of the household income and consumption expenditure surveys conducted by the Turkish Statistical Institute for 2003 year were used; price elasticity under twelve product groups were estimated within the framework of the almost ideal demand system approach in Turkey was analyzed. Price elasticities were obtained and the product groups were as follows: Food and non-alcoholic beverages; Alcoholic beverages, cigaratte and tobacco; Clothing and footwear; Housing and rent; Furniture, houses appliances and home care services; Health; Transportation; Communication; Entertainment and culture; Educational services; Restaurant and hotels and various good and services.

Key Words: An almost ideal demand system, Price elasticity.

Özet

Bu çalışmada, Türkiye İstatistik Kurumu tarafından yürütülen Hanehalkı Gelir ve Tüketim Harcamalarının 2003 yılı verileri kullanılmıştır. On iki mal grubu için fiyat esneklikleri yaklaşık ideal talep sistemi çerçevesinde tahmin edilmiştir. Fiyat esneklikleri şu şekildedir: Gıda ve alkolsüz içecekler; alkollü içecekler, sigara ve tütün; Giyim ve ayakkabı; Konut ve kira; Mobilya, ev aletleri ve ev bakım hizmetleri; Sağlık; Ulaştırma; İletişim; Eğlence ve kültür; Eğitim hizmetleri; Restaurant ve otel, çeşitli mal ve hizmetler şeklindedir.

Anahtar Kelimeler: Yaklaşık ideal talep sistemi, Fiyat esneklikleri.

1. Introduction

Nutrition leads the fundamental requirements of human beings. People with certain purchasing power look for certain properties in the food they purchase, such as quality, brand, health, hygiene etc. Conversely, people lacking purchasing power try to get fundamental food of sufficient amount. In parallel with increasing disparities in the distribution of income in Turkey, famine and poverty have commenced to take the lead on the economic agenda.

Proportion of food expenditures in total expenditures in Turkey was calculated to be 35.5 % in 1987 and 38.5 % in 1994 (Şengül, 2004). This figure was established as 35.2 % in 2002. According to these results, it is understood that a large part of the incomes of Turkish households is allocated to food consumption and remains income is distributed by necessities to the other commodity groups.

Due to expenditure and consumption diversities between the households in Turkey, examination of the expenditure items structure represents an issue of great importance. Moreover, price elasticity of expenditure items is significant instruments in the formation of an effective economy policy and the formation of budget policies.

The problem in this study stems from the fact that what household demand parameters by commodity groups would be in Turkey. In addition, as for the importance of this study for Turkey, it reveals the expectation that despite advanced technological developments in the globalized world of today, famine, food insecurity and food consumption will continue to be an important problem in the world and in Turkey in the future, just like it is today.

In this study, calculation of price elasticity drawn from the Almost Ideal Demand System was aimed, by using expenditure data relevant to the commodity groups included in the Household Income and consumption expenditures surveys for 2003. The main goal of this study is to analyze the consumption behavior of the households living in Turkey. As it is known, despite the fact that household consumption expenditures are composed of various commodity groups, budget shares for expenditures represent an important part of them. With in this study, it is possible to monitor, via the price elasticity, the commodity groups for which the most and the least expenses were made by the consumers.

The Almost Ideal Demand System (AIDS) was selected for the study use for its following advantages: The AIDS model provides

arbitrarily the first order approximation for any demand system. It provides definite estimations of axioms of choice. It aggregates consumers perfectly. It has a functional form which is consistent with household budget data. It is easier to make estimations in the form of linear approach and easily used to test homogeneity and symmetry constraints (Blanciforti and Green, 1983).

There are numerous studies analyzing the demands for expenditure groups in world countries, whereas the number of the studies conducted in this regard in Turkey is not sufficient. In the large majority of these few studies, cross section data are used, yet studies conducted with time series data remain insufficient. There are a few studies analyzing the demands for food items in Turkey that are as follows: (Baydemir, 1998), (Koç, 1995), (Ekinci, 1996) and (Nişancı, 2002). While our data was established as a panel data set in our study, the data of the other studies in Turkey wasn't. The econometric model was estimated according to this established data.

In our study, 12 level-1 statistical regions to reflect whole Turkey were included in the scope of the study and departing from this, price elasticities relevant to whole Turkey were obtained for 2003.

Studies conducted related with the Almost Ideal Demand System within and out of the country were examined, and the results were compared with some of these studies, and the results obtained in our study are consistent with the economic theory in general. The results of the 2003 Household Income and Consumption Surveys carried out by the TURKSTAT were used. The model of almost ideal demand system was estimated for twelve commodity groups which are Food and non-alcoholic beverages, Alcoholic beverages, cigaratte and tobacco, Clothing and footwear, Housing and rent, Furniture, houses appliances and home care services, Health, Transportation, Communication, Entertainment and culture, Educational services, Restaurant and hotels and Various good and services.

Price elasticities were found in line with the parameters estimated from the AIDS. According to the results obtained, consumer demand estimation of the households living in Turkey was analyzed.

Concerning the demand analysis, many studies were conducted in the econometric dimension. Discussion about the results obtained from some of them realized by country data except Turkey and the findings related with our study were addressed below.

14

Elasticities obtained in the other studies carried out, on the other hand, are as follows: In their study, Deaton and Muellbauer (1980) found the food price elasticity as 0.07 in the levels model and as 0.22 in the first order difference model. In their study, Blanciforti and Green (1983), using dynamic-linear an almost ideal demand system, made an estimation of 11 aggregated product groups. Here, the expenditure and price elasticities were obtained as respectively 0.37 and -0.32 for solely food-relevant values. In their study, Blanciforti, Green and King (1986), examined the post-war consumer behavior of the USA with the "An Almost Ideal Demand System". Food expenditure elasticity was found as 2.06 with no autocorrelation and as 1.11 with autocorrelation.

In his study of Hutasuhut et al. (2001), meat consumption and socio-demographic data, of the SUSENAS surveys of household food expenditure and consumption of 1990, 1993, and 1996, was used to estimate the meat demand in Indonesia. The estimated prices of beef and the poultry group were observed to be respectively -0.92 and -1.09.

Pollak and Wales (1987), pooling the data of per capita consumption expenditures in Belgium, the United Kingdom and the United States of America between 1961 and 1978, tested the quadratic expenditure system. In the study conducted, price elasticities for Belgium, the United Kingdom and the United States of America were found as respectively -0.463, -0.08, and -0.71. In our study, the data relevant to household consumption expenditures were pooled and a set of panel data was formed. Price elasticity was found to be -0,9999 for 2003 in our study.

In Turkey, on the other hand, there are econometric studies on demand analysis, though in limited number. Results of some of these were given below in comparison with our study.

In their studies, Koç (1995) and Baydemir (1998) used data relevant to the food and the food sub-groups out of household consumption expenditures. While Koç (1995) made econometric analysis of red meat and its products demand and supply. Ekinci (1996) investigated the relations between the demands for certain food products which are important in human nutrition and the factors affecting the demand for this foodstuff in Turkey. Baydemir (1998), using the data obtained through household food consumption surveys conducted in eight periods in about two years and the LA /AIDS model, estimating the central demand model of Erzurum province, established the elasticities which are fundamental data regarding food consumption which might be

used in the analysis of food policies. The objective and the findings of our study are different from the given studies.

In her study, Ekinci (1996) obtained food expenditure elasticities in the distinction of rural and urban areas and the results she found were respectively 0.6316 and 0.7172 on average. In our study, price elasticity was found to be -0,9999 for 2003 on the basis of Turkey.

Deaton-Muellbauer (1980a and 1980b) An Almost Ideal Demand System was used in our study. The theoretical infrastructure of the An Almost Ideal Demand System was drawn from the article written by Deaton-Muellbauer (1980a and 1980b).

In his study, Nişancı (2002), using the AIDS by regions in the rural and urban areas in Turkey, found income, price and savings elasticity estimations, endeavored to analyze consumer behavior patterns. In our study, household consumption expenditures for 2003 were used. Twelve regions were included in the study. In our study, the AIDS model was used and price elasticities were obtained.

2. Material and Method

Household Income and Consumption Expenditures Survey

The Turkish Statistical Institute (TURKSTAT) has launched annual regular budget surveys since 2002. 2002 Household Budget Survey (HBS) was conducted on a total of monthly 800 and annually 9 600 sample households. 2003 HBS was conducted on a total of monthly 2160 and annually 25 920 sample households for a year period between 1 January and 31 December 2003. 2004, 2005 and 2006 HBS were conducted on a total of monthly 720 and annually 8 640 sample households.

Consumption expenditures cover the information on purchases in the survey month, consumption of their own production, household consumption from in-kind income and transfers, purchases by the household to be given as a present/support and monthly average value of consumptions made in the last year on durable goods like car, white goods, computer, television, camera, furniture, heating and cooling systems COICOP/HBS has been used to classify the consumption expenditures.

The estimation level of the HBS of 2002 is the distinction between whole Turkey, urban and rural areas. Estimations were drawn on the basis of 12 Level-1 regions and 26 Level-2 regions from the distinction made between rural and urban areas in the Statistical Regional Units Classification in the survey 2003. Starting from 2004 on the other hand, in the distinction between whole Turkey and rural and urban areas made via annual survey results, it is possible to make estimations at regional level by combining every year's survey results with those of the previous one (TURKSTAT, 2008). The HBS data, the method of which is given above by the TURKSTAT, were used in this study. These survey data were organized in line with the researcher's objective.

3. Organization of Data Sources

The data obtained from the Household Income and Consumption Expenditures Survey of 2003 was put in ascending order by bulletin within the level-1 statistical regions. Level-1 Statistical regions are Istanbul, West Marmara, Aegean, East Marmara, West Anatolia, Mediterrenean, Central Anatolia, West Black Sea, East Black Sea, North East Anatolia, Central East Anatolia, South East Anatolia.

In the data relevant to 2003, general sum of total monthly consumption expenditures, total monthly food expenditures, and expenditure values regarding Food and non-alcoholic beverages; Alcoholic beverages, cigaratte and tobacco; Clothing and footwear; Housing and rent; Furniture, houses appliances and home care services; Health; Transportation; Communication; Entertainment and culture; Educational services; Restaurant and hotels and Various good and services was taken.

12 month-consumer prices index figures were used from the TURKSTAT's Price Statistics database. Price indexes belong to commodity groups were used separately for every group. After that price data were converted into real values.

The data set created for study use was distributed by each item group. Moreover, the data which were regions in the cross section and 12 month-observations of 2003 in the time section were combined and the panel data set was obtained. Thus, the data set used in the analysis consists of 144 observations.

4. Groupings of Commodities

Households distribute their expenditures between the main product groups (food, wear, house etc.) at the first stage, and between sub-groups (bread and cereals, vegetables and fruits, meat and fish, etc.) at the second stage.

With a view to enabling re-establishment of the product groups, whether there are price indexes relevant to product groups or not was taken into consideration. Distributions of commodity groups are shown in Table 1.

Table 1. According to the 2003 year, distribution of twelve commodity groups and abbrevations of belong to these groups.

Commodity Groups	Abbreviation of Commodity Groups
Food and non-alcoholic beverages	Group1
Alcoholic beverages, cigaratte and tobacco	Group2
Clothing and footwear	Group3
Housing and rent	Group4
Furniture, houses appliances and home care services	Group5
Health	Group6
Transportation	Group7
Communication	Group8
Entertainment and culture	Group9
Educational services	Group10
Restaurant and hotels	Group11
Various good and services	Group12

The results of the expenditure surveys carried out in Turkey target expenditures, thus information is not given about amounts and prices in these surveys.

5. Model and Estimation Methods

In this section, how to make an estimation parameter of an almost ideal demand systems are shown as follows:

If the basic model is written for each commodity, the following equations might be obtained:

$$w_1 = \alpha_1 + \gamma_{1.1}\ln p_1 + \gamma_{1.2}\ln p_2 + \qquad + \gamma_{1.12}\ln p_{12} + \beta_1 \ln (x/P^*) + u_1$$

$w_2 = \alpha_2 + \gamma_{2.1}\ln p_1 + \gamma_{2.2}\ln p_2 + \quad\quad + \gamma_{2.12}\ln p_{12} + \beta_2\ln(x/P^*) + u_2 \quad\quad (1)$

$w_{12} = \alpha_{12} + \gamma_{12.1}\ln p_1 + \gamma_{12.2}\ln p_2 + \quad\quad + \gamma_{12.12}\ln p_{12} + \beta_{12}\ln(x/P^*) + u_{12}$

In this equation, w_i represents the budget share of ith good, p_j is price of the jth good, x is total expenditure on all goods and P^* is price index.

It is possible to generalize and demonstrate the system in the equation 1 with matrices for n number of products and k number of variables:

$y = X\beta + u$

Where,

y = the column vector of the observations (n x1) relevant to y_i dependent variable;

X = (nxk) matrix indicates n observation value of explanatory variables from X_1 to X_k and is known as data matrix. The first column composed of one (1) values indicates the constant term.

β = the column vector of k number of unknown parameters (k x 1)

u = the column vector of n number of u_i error terms (nx1).

Since additivity and negativity constraints are automatically met by the model in the AIDS, no test is done for these constraints.

The Almost Ideal Demand System (AIDS) was selected for the study use for its following advantages. The AIDS model provides arbitrarily the first order approximation for any demand system. It provides definite estimations of axioms of choice. It aggregates consumers perfectly. It has a functional form which is consistent with household budget data. It is easier to make estimations in the form of linear approach. It can be easily used to test homogeneity and symmetry constraints (Blanciforti and Green, 1983).

Price elasticity belongs to AIDS model are calculated as follows: (Ekinci, 1996).

$$\varepsilon_{ii} = -1 + \frac{\gamma_{ij}}{w_i} - \beta_i \quad\quad \text{Price elasticity} \quad\quad (2)$$

19

6. Empirical Results

The Generalized Least Squares method was used in the estimation of model parameters. Estimation of the model was realized by using Eviews 5 econometrics package program. The data relevant to the commodity groups which take place in the Household Income and Consumption Expenditures Survey of 2003 were applied to the An Almost Ideal Demand System, and the results obtained are given in Table 2.

Table 3. Distribution of Statistics Values Belong to an Almost Ideal Demand System

Commodity Groups	R^2	DW
Group1	0.676404	1.328429
Group2	0.243525	1.377579
Group3	0.963313	1.758742
Group4	0.998675	1.777880
Group5	0.999522	1.704177
Group6	0.983187	1.380046
Group7	0.997916	1.474771
Grup8	0.828031	1.687589
Group9	0.992573	2.168511
Group10	0.997013	1.642922
Group11	0.513040	0.622939
Group12	0.999049	1.958161

R^2 and DW values relevant to the almost ideal demand system are given in Table 3. For 2003, the lowest R^2 value was in the Alcoholic beverages, cigaratte and tobacco group with 0.243525, while the highest value was found in the Furniture, houses appliances and home care services group with 0.999522.

DW values relevant to the almost ideal demand system are given in Table 3. For 144 observations at 5 %-level and twelve explanatory variables taken out of Durbin-Watson table, $d_L = 1,564$ and $d_u = 1,908$. When the DW values are considered, there is positive autocorrelation in the groups of group1, group2, group6, group7 and group 11. Group3, group4, group5, group8 and group10 aren't located positive or negative regions that are located in undecided region. For group9 and group12, we can't reject hypothesis belong to positive or negative autocorrelations.

According to the AIDS model, price elasticity values belong to every commodity is calculated for estimated parameter values that are as follows in Table4.

Table 4. Distribution of price elaticities for commodity groups

Commodity Groups	Price Elasticity
Group1	-0,9999
Group2	-0,9954
Group3	-1,0014
Group4	-1,0684
Group5	-0,9998
Group6	-1,0199
Group7	-1,0009
Group8	-0,9865
Group9	-1,0068
Group10	-0,9939
Group11	-0,9977
Group12	-0,9985

Price Elasticity (PE) can be calculated by the percent change in the quantity demanded by the percent change in price. PE measures the responsiveness of a change in demand, after a change in price. When the PE of a good is greater than one in absolute value, the demand is said to be elastic; it is highly responsive to changes in price. Demands with an elasticity less than one in absolute value are inelastic; the demand is weakly responsive to price changes.

Goods which are elastic, tend to have some or all of the following characteristics: a. They are luxury goods, expensive and a big % of income e.g. sports cars and holidays. b. Goods with many substitutes and a very competitive market.

Goods which are inelastic tend to have some or all of the following features: a. They have few or no close substitutes, e.g. petrol,

cigarettes. b. They are necessities and addictive. c. They cost a small % of income or are bought infrequently.

Price elasticities belong to AIDS model are suitable for economic theory that is values of price elasticities are negative. For group1, group2, group5, group8, group10, group11, group12 commodity groups, price elasticities are inelastic that is demand is not elastic and the other group that these are group3, group4, group6, group7 and group9 are elastic.

When the price elasticities of the commodity groups are considered respectively, in case of 1 % increase in group1, this might be interpreted as demand for group1 will grow by 0,9999 %; demand for group2 will grow by 0,9954 %; demand for group3 will grow by 1,0014 %; demand for group4 will grow by 1,0684 %; demand for group5 will grow by 0,9998 %; demand for group6 will grow by 1,0199 %, demand for group7 will grow by 1,0009 %, demand for group8 will grow by 0,9865 %, demand for group9 will grow by 1,0068 %, demand for group10 will grow by 0,9939 %, demand for group11 will grow by 0,9977 % and demand for group12 will grow by 0,9985 %.

The lowest and the highest price demand elasticities were observed in respectively group8, and group4. In line with this, it is possible to say that consumers are more responsive to price changes in group4, and less responsive to price changes in group8. Negotiation of the products' price elasticities are calculated to be negative as expected in accordance with the economic theory.

7. Conclusions

Price elasticities were found in line with the parameters estimated from the AIDS. Findings for the price elasticities for AIDS model are consistent with economic theory. At that time, price elasticities are negative.

While 7 of price elasticities are not elastic, 5 of price elasticities are elastic. Whereas group 8 has the lowest price demand elsaticity, group 4 has the highest price demand elasticity. Consumers in group in 4 are more sensitive than consumers in group in 8.

With the help of the studies relevant to the analysis of consumption expenditures, producers will gain knowledge about the structure of consumer demand, while consumers will gain knowledge about learning and determining consumption patterns. In line with this, in

the analysis of production units, production decisions, and sector, decision-makers, that are managers, will benefit from these analysis results while they elaborate effective macro-economic policies.

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