The Lınear Expendıture System And Its Applıcatıon To Turkısh Commodıty Groups

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Abstract

The paper aims to develop marginal budget share, income and price elasticities of household commodity groups' consumption for Turkey by applying the Linear Expenditure System (LES) to the data between 2002 and 2011 Household Budget Survey.

In this study, data of the Household Budget Survey (HBS) conducted and calculated by the Turkish Statistical Institute (TurkStat). Marginal budget share, income and price elasticities under commodity groups were estimated within the framework of the Linear Expenditure System (LES) approach in Turkey. Findings for the price elasticities are consistent with economic theory and that time, price elasticities are negative. While income elasticity of some goods exceed unity, income elasticity of some goods don't exceed unity.

Key words: Linear Expenditure system, Marginal budget share, Income and Price elasticities, Commodity groups.

INTRODUCTION

The problem in this study stems from the fact that what household demand parameters by commodity groups would be in Turkey. In this study, calculation of price and income elasticities drawn from the Linear Expenditure System was aimed, by using expenditure data relevant to the commodity groups included in the Household Budget Surveys (HBS) between 2002 and 2011.

The main aim of this study is to analyze the commodity groups' consumption behavior of the households living in Turkey. As it is known, despite the fact that household consumption expenditures are composed of twelve commodity groups, budget shares for expenditures represent an important part of them.

There are a few studies analyzing the demands for food items in Turkey and in the World that are as follows:

Howe (1977), Sasaki and Saegusa (1974), Narayana and Vani (1996), Huang and Bouis (2001), Burney and Akmal (1991), Lee, Brown and Seale (1994), Lewis and Andrews (1989), Deaton, Castillo and Thomas (1989), Eastwood and Craven (1981), McConnell (1978), Lluch and Williams (1975), Lluch (1973), Philips (1972), Stone (1954), Pollak and Wales (1969), Nişancı (2002), Şahinli (2010).

In our data was established as a cross-section data set in this study. The econometric model was estimated according to this organized and established Household Budget Surveys (HBS) data.

This paper comprises four sections that can be follows: In this second part, The Linear Expenditure System is mentioned, in the third part comprises the data section, in the fourth part estimation results are given and the last section is composed of conclusion section.

MATERIAL AND METHODS

The Linear Expenditure System

In production and consumer theory the mostly used production function and utility function is presumably the one due to Cobb and Douglas (1928). A major shortcoming of the Cobb-Douglas utility function is that preferences are homothetic implying unitary expenditure elasticities so that Engel curves are straight lines through the origin.

In the theory of household behavior in a series of articles: Klein and Rubin (1948-1949), Samuelson (1948), Geary (1949-1950) and Stone (1954). Klein and Rubin developed the LES as the most general linear formulation in prices and income satisfying homogeneity, the budget constraint, and Slutsky symmetry. This function is known as the Stone-Geary utility function and the ensuing demand model as the Linear Expenditure System (LES).

If the basic model is written for each commodity, the following equations might be obtained. The Linear Expenditure System is the most frequently used system in empirical analysis of demand. If the equations are to be used for estimations, solely short-term estimations can be made.

Table 1. Linear Expenditure System Statistics, 2002-2011

Commodity groups	α	β	R²	DW	t-Ratio α	β
Food and non-alcoholic beverages	0,0000000288	4,961101	0,985	1,854	0,367	3,942
Alcoholic beverages and tobacco	0,0000000169	1,397577	0,976	1,742	1,457	11,691
Clothing and footwear	0,0000000200	1,491043	0,994	1,761	2,217	26,670
Housing, water, electric, gas and other fuels	0,0000000744	8,998606	0,977	1,082	0,964	17,203
Furniture, houses appliances and home care services	0,0000000426	2,925118	0,976	1,537	1,398	6,151
Health	89897797,00	0,583921	0,979	2,583	1,386	15,723
Transportation	0,00000000211	6,513846	0,953	1,439	2,706	11,336
Communication	-38670501	1,388018	0,988	1,753	0,835	15,922
Entertainment and culture	0,0000000163	1,146762	0,943	1,412	2,192	5,016
Educational services	-53296028	0,594039	0,981	2,449	1,074	4,392
Restaurant, home meals and hotels	-0,0000000590	2,628890	0,953	1,572	3,359	5,518
Various good and services	-0,0000000137	1,425848	0,972	2,501	1,853	8,447

The LES model general form is as follows;

$$p_i q_i = p_i \beta_i + \alpha_i \left[w - \sum_{j=1}^{m} p_j \beta_j \right] \quad , i = 1, 2, ..., m$$

Where;

m = no. of commodities

p_i = price of ith commodity

q_i = is the commodity of ith commodity

w= total expenditure

β_i = are interpreted as subsistence consumption levels of ith commodity

Advantages:

1. expresses qi as a linear function of real total expenditure x/pi and of relative prices pj=pi,

2. is the only demand system that satisfies all the theoretical restrictions.

Maximum likelihood estimators of μ, γ_i^* and $\Sigma \gamma_i^*$ are estimated from α_i and β_i ordinary least squares estimators.

$$\mu = \Sigma \beta_i$$
$$\Sigma \gamma_i^* = \Sigma \alpha_i / (1 - \mu)$$
$$\gamma_i^* = \alpha_i + \beta_i \Sigma \gamma_j^*$$

Regarding with demand elasticities are calculated as follows:

Marginal budget share of i commodity:

$$\beta_i^* = \beta_i / \mu$$

Income elasticity of i commodity:

$$\eta_{iy} = \beta_i (y / e_i)$$

Price elasticity of i commodity:

$$\eta_i = (1 - \beta_i)(\gamma_i^* / e_i) - 1$$

The Data

The name of the survey was changed as "Household Budget Survey (HBS)" since 2002 whereas it was "Household Income and Consumption Expenditure Survey (HICES)" in 1994. (TurkStat, 2013).

The HBS data between 2002 and 2011, the method of which is given above by the TurkStat were used in this study. This survey data were organized and changed with relevant to the researcher's aim and objective.

12 month-consumer prices index figures were used from the TurkStat's Price Statistics database. Price indexes belong to commodity groups were used. After that price data were converted into real price values. The data set created for study use was distributed by commodity groups.

RESULTS AND DISCUSSION

The estimation of model parameters was calculated by The Least Squares method. Estimation of the model was made by using Eviews 7 econometrics package program. The data relevant to the commodity groups which take place in the Household Budget Survey of between 2002 and 2011 were applied to the Linear Expenditure System.

The regression results are reported in Table 1. The results of these equations seem to have a fit by all standards and expectations. The coefficients and determination coefficient have correct signs. The negative intercepts emphasize the inadequate availability that is the existing very low base of consumption of these items which identifies them as superior goods (Table 1).

R² and DW values of the Linear Expenditure System are given in Table 1. While the lowest R² value %94.3 was in the Entertainment and culture, the highest R² value %99.4 was in the Clothing and footwear.

For 10 observations at 5% level and one explanatory variable taken out of Durbin-Watson table, $d_L = 0.879$ and $d_u = 1.320$. When DW values are examined, Food and non-alcoholic beverages; Alcoholic beverages and tobacco; Clothing and footwear; Furniture, houses appliances and home care services; Health; Transportation; Communication; Entertainment and culture; Educational services; Restaurant, home meals and hotels and Various good and services aren't located any positive or negative autocorrelations in this range. Housing, water, electric, gas and other fuels group isn't located positive or negative regions that are located in undecided region

Marginal budget share, values of income and price elasticities with relevant to commodity groups for the Linear Expenditure System is calculated for estimated parameter values that are as follows in Table 2. The marginal budget shares explain in the expenditure elasticities of demand. If household expenditure per capita is increased by one Turkish lira it is nearly allocated across various items as follows:

Table 2. Distribution of Marginal budget share, price and expenditure elasticities for food

Commodity groups	Marginal Budget Share (%)		
		Income Elasticity	Price Elasticity
Food and non-alcoholic beverages	0,146	0,706546	-1,0000221
Alcoholic beverages and tobacco	0,041	1,116112	-1,0000035
Clothing and footwear	0,044	0,890290	-1,0000035
Housing, water, electric, gas and other fuels	0,264	1,092620	-1,0000691
Furniture, houses appliances and home care services	0,086	1,560441	-1,0000238
Health	0,017	0,931712	-0,9924562
Transportation	0,191	1,612270	-1,0000703
Communication	0,041	1,086822	-0,9985189
Entertainment and culture	0,034	1,525581	-1,0000018
Educational services	0,017	0,984113	-1,0045255
Restaurant, home meals and hotels	0,077	1,803390	-1,0000232
Various good and services	0,042	1,172146	-1,0000039
Total	1,00		

Income elasticity for commodity groups are given Table 2. In line with income elasticities, properties of the products are defined. Those with an income elasticity higher than 0 are normal goods, whereas those with one less than 0 are inferior goods. According to these commodity groups, income elasticity of Alcoholic beverages and tobacco; Housing, water, electric, gas and other fuels; Furniture, houses appliances and home care services; Transportation; Communication; Entertainment and culture; Restaurant, home meals and hotels and Various good and services exceed unity. In this regard, we categorize for commodity groups as a luxury goods. Income elasticity of Food and non-alcoholic beverages; Clothing and footwear; Health and Educational services don't exceed unity. For that reason, these goods are categorized as a inferior goods.

Price Elasticity (PE) can be calculated by the percent change in the quantity demanded by the percent of 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. Demands with an elasticity equal to one in absolute value are unit elastic; the demand is smoothly responsive to price changes.

According to the the Linear Expenditure System model, price elasticities are suitable for economic theory that is values of price elasticities are negative. While price elasticity of all commodity groups are elastic.

When the price elasticities of the all commodity groups are considered, in case of 1% increase Food and non-alcoholic beverages, this might be interpreted as demand for Food and non-alcoholic beverages will grow by 1,0000221%, in case of 1% increase Alcoholic beverages and tobacco, demand for Alcoholic beverages and tobacco will grow by 1,0000035%, in case of 1% increase Clothing and footwear, demand for Clothing and footwear will grow by 1,0000035%, in case of 1% increase Housing, water, electric, gas and other fuels, demand for Housing, water, electric, gas and other fuels will grow by 1,0000691%, in case of 1% increase Furniture, houses appliances and home care services, demand for Furniture, houses appliances and home care services will grow by 1,0000238%, in case of 1% increase Health, demand for Health will grow by 0,9924562%, in case of 1% increase Transportation, demand for Transportation will grow by 1,0000703%, in case of 1% increase Communication, demand for Communication will grow by 0,9985189%, in case of 1% increase Entertainment and culture, demand for Entertainment and culture will grow by 1,0000018%, in case of 1% increase Educational services, demand for Educational services will grow by 1,0045255%, in case of 1% increase Restaurant, home meals and hotels, demand for Restaurant, home meals and hotels will grow by 1,0000232% and in case of 1% increase Various good and services, demand for Various good and services will grow by 1,0000039%. Price elasticities are calculated to be negative as expected in accordance with the economic theory.

CONCLUSION

The study carries out to consumer responsiveness to changes in income and commodity groups' prices. The used methodology was based on a system approach known as Linear Expenditure System (LES). Household Budget Survey data are used between 2002 and 2011.

The most important findings of this study are summarized as follows:

The regression of these equations seem to have a fit by all standards and expectations. The statistics and coefficient of determination have correct signs for expectations.

The marginal budget shares explain in the expenditure elasticities of demand. If household Food and non-alcoholic beverages expenditure per capita is increased by one Turkish lira, 14.6% goes to Food and non-alcoholic beverages, 4.1% goes to Alcoholic beverages and tobacco, 4.4% goes to Clothing and footwear, 26.4% goes to Housing, water, electric, gas and other fuels, 8.6% goes to Furniture, houses appliances and home care services, 1.7% goes to Health, 19.1% goes to Transportation, 4.1% goes to Communication, 3.4% goes to Entertainment and culture, 1.7% goes to Educational services, 7.7% goes to Restaurant, home meals and hotels and 4.2% goes to Various good and services.

According to the the Linear Expenditure System model, price elasticities are suitable for economic theory that is values of price elasticities are negative. Commodity groups' price elasticity are elastic.

While income elasticity of some goods exceed unity, income elasticity of some goods don't exceed unity. In line with, some goods are categorized as luxury goods and some goods are categorized as inferior goods.

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