Income Elasticity of Housing Demand in Turkey

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ABSTRACT
This paper aims to study the income elasticity of housing demand for Turkey. Data used cover period from 1998.1 through 2012.3. The elasticities measured along with the adjustment parameter are estimated with the Error Correction Model (ECM) derived from Autoregressive Distributed Lag Model (ADL). Results indicate that income elasticity of housing demand is inelastic in the short run and elastic in the long run. Also, the adjustment speed of income elasticity of housing demand is %49. So, it can be said that, housing market is efficient in Turkey.

JEL Classification: R21

Key Words: Income Elasticity, Housing Demand, Error Correction Model,

1. Introduction

There are plenty of surveys about income elasticity of housing demand in the literature. The demand for housing has been generally determined to be income inelastic. In additions to this, some of the income elasticity identifications are classified for owners and renters and also long run and short run income elasticities.

In Mayo (1981), the income elasticities of housing demand both renters and owners are inelastic. His findings are 0.25 to 0.70 for renters and 0.36 to 0.87 for owners. In Carliner (1973), income elasticity of housing demand is between 0.6 to 0.7 for owners and 0.5 for renters. De Leeuw (1971) estimates 0.8 to 1.0 for renters and 0.7 to 1.5 for owners. However, in the United State Houthakker and Taylor (1970) stated that the income elasticity of housing demand is elastic. Muth (1960) reached similar conclusion in his survey. He estimates 0.8 to 1.0 for renters and 1.25 to 1.46 for owners. Muth (1965) also estimated the stock elasticity. According to his results, the stock elasticity of non-farm housing is 0.9. Using same estimation methods but with the different variables Lee (1964) found that a stock elasticity of non-farm housing is 0.34.

Belsky, Xiao and McCue (2006) separated homeowners as non-elderly homeowners and elderly homeowners. According to the results, for non-elderly homeowners the income elasticity of housing demand is 1.18 for renters and 0.97 for owners. For elderly homeowners, the income elasticity of housing demand is 0.66 for renters and 0.52 for owners.

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Lorenz Curve is used as an alternative method to estimate income elasticities of housing demand. The study of Kakwani and Podder (1973), study of Haque (1989) and study of Tran-nam and Podder (1992) can be given as examples. The other study about income elasticity of housing demand is research by Harmon (1988). His estimates imply that the long run income elasticity is 1.00 and the short run elasticity is 0.70.

In this study, the short run and the long run relationship between the housing demand and income in Turkey has been analyzed. The model has been estimated using quarterly data from 1998.1 to 2012.3. Number of dwellings was considered as housing demand. The other variable used is GDP. Data used have been obtained from Turkish Statistical Institute.

By using the variables above, in the first stage of the study; the long term relationship has been analyzed with The Engle-Granger Cointegration Model and in the second stage of the study, the income elasticity of housing demand and the speed of adjustment has been analyzed with Error Correction Model (ECM) and Autoregressive Distributed Lag Model (ADL) model.

2. Housing Market in Turkey

Before proceeding to the econometric analysis of housing demand, to give an overview of the housing market in Turkey will be appropriate. When analyzing housing markets, the most common variables used are followings: House Price Index, Number of Dwellings Rate, Housing Supply and Housing Demand (Bekmez, Ozpolat, 2012c:4).

House Price Change as quarterly series from 2008 to 2012 for Turkey has been shown in Table 1.

Table 1: House Price Index

	Q1	Q2	Q3	Q4
2008	105.6	98,0	94.8	88,0
2009	85.3	88.7	90.8	92,0
2010	92.1	92.6	93.5	93.5
2011	95.2	96.4	98.4	100.8
2012	103.5	106.7	114.5	116,0

Source: GYODER (2012)

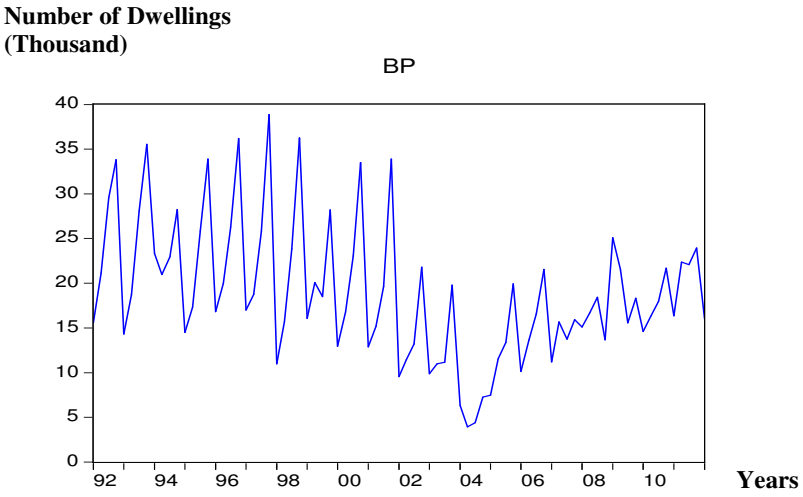
According to Table 1, house prices are considerably fluctuating. The Reidin House Price Index shows that house prices recorded an upturn in 2012 Q1 increased by 2.6 % reaching to 103.5. The rate of increase for new houses was higher than that of average house prices. Despite these increases, demand has continued to rise, due to the low interest rates on mortgage loans (European Mortgage Federation, 2010:62-63). Unlike many other European Countries, Turkish Housing Market has not been significantly affected by the 2008 financial crisis (Bekmez ve Özpolat, 2012a and 2012b).

In real terms, house prices have fallen about 30%-70% across much of the country over the past three years, because of inflation. Housing market has excellent value now in Turkey, due to the revaluation occurred in 2008 financial crisis. The other reasons can be given as following (Global Property Guide for Turkey, 2010:10):

- Turkish Mortgage Markets are still so undeveloped,
- There are no capital gains taxes after holding property for 5 years,
- Income taxes are reasonable,
- interest rate are falling,
- Economic growth is rapid

Number of dwelling is shown in Figure 1. Number of Dwellings has risen since 1992 in Turkey. With the government support, Especially after 2004, building permits have considerably increased (Reiden, 2012:15).

Figure 1: Number of Dwellings



In the first nine months of 2012, number of dwellings for housing decreased by %9,4, (TSI,2012).

3. The Model

The aim of the study is to whether there is a long run relationship between housing demand and income analyze by using Error Correction Model (ECM). To analyze the long run and the short run elasticities need to be estimated. ECM model allow analyzing the speed of adjustment from short run equilibrium to long run equilibrium as well as short run and long run elasticities. Quarterly data from 1998.1 to 2012.3 have been used in order to estimate the model. The variables included in the ECM model are the number of dwellings as indicators of housing demand and National Income. The data have been obtained from The Turkish Statistical Institute (TUIK).

The Engle-Granger Cointegration propose consists of a two-step procedure. At first step, the model is estimated by using Ordinary Least Square (OLS) and stationary of the residuals are tested. At second step, if this is not rejected, the regression model is predicted replacing β by its previously calculated OLS estimate $\hat{\beta}$ (Charemza, 1999:132).

Engle-Granger cointegration approach explains the model as the following:

$$Y_t = \beta_0 + \beta_1 X_t + \varepsilon_t$$

In the model, Y_t and X_t imply that the variables are cointegrated at first I (1) level. The cointegration between these variables depends on stationary of error term (ε_t). In other words, if error term is level I (0) stationary, variables are cointegrated (Sevüktekin, 2010:486).

In a regression analysis, if there is an existence of cointegration between variables, Error Correction Model (ECM) can be used to estimate the long run and the short run parameters and elasticity (Fraser, 2010:6).

The Model can be written as the following: assuming a first order disequilibrium relationship is observed:

$$Bp_t = b_0 + b_1 y_t + b_2 y_{t-1} + \mu_1 Bp_{t-1} + \varepsilon_t$$

With the estimating error correction equation:

$$\Delta Bp_t = \lambda\beta_0 + b_1 \Delta y_t - \lambda Bp_{t-1} + \lambda\beta_1 y_{t-1} + \varepsilon_t$$

Where ΔBp_t and Δy_t implies that changes in (In) building permits and (In) reel income; Bp_{t-1} and y_{t-1} are one period lagged (In) levels of these variables. λ is the adjustment parameter estimating the speed of adjustment to long equilibrium, b_1 is the estimated short run elasticity and β_1 is the estimate of the long run elasticity of housing demand to income, ε_t is the regression error.

It can be derived a single equation ECM from a general ADL model (Best,2008:12):

$$Y_t = \alpha + \beta_0 Y_{t-1} + \beta_1 X_t + \beta_2 X_{t-1} + \varepsilon_t$$
$$\Delta Y_t = \alpha + (\beta_0 - 1) Y_{t-1} + \beta_1 X_t + \beta_2 X_{t-1} + \varepsilon_t$$
$$\Delta Y_t = \alpha + (\beta_o - 1) Y_{t-1} + \beta_1 \Delta X_t + (\beta_1 + \beta_2) X_{t-1} + \varepsilon_t$$
$$\Delta Y_t = \alpha + \phi_0 Y_{t-1} + \beta_1 \Delta X_t + \phi_1 X_{t-1} + \varepsilon_t$$

Where $\phi_0 = \beta_0 - 1$ and

$$\phi_1 = \beta_1 + \beta_2$$

The equation can be rewrite in error correction form as

$$\Delta Y_t = \alpha + \beta_1 \Delta X_t - \phi_0 (Y_{t-1} - \phi_1 X_{t-1}) + \varepsilon_t$$

The ADL model provides similar information to the ECM

$$Y_t = \alpha + \beta_0 Y_{t-1} + \beta_1 X_t + \beta_2 X_{t-1} + \varepsilon_t$$

β_0 estimates the proportion of the deviation from equilibrium at time t-1.

$\beta_0 - 1$ is the speed of adjustment.

β_1 estimates the Short Term effect of X on Y.

$\beta_1 + \beta_2$ estimates the Long Term effect of a unit change in X on Y. (The Coefficient on X_{t-1} in the ECM)

And the total long term effect/long term multiplier –k_1- is

$$k_1 = \frac{\beta_2 + \beta_1}{1 - \beta_0}$$

Y and X will be in their long term equilibrium state when $Y = k_0 + k_1 X$ Where

$$k = \frac{\alpha}{1 - \beta_0}$$

According to above, the model can be rewritten as the following:

$$InBp_t = \alpha + \beta_0 InBP_{t-1} + \beta_1 InY_t + \beta_2 InY_{t-1} + \varepsilon_t$$

Where:

Bp_t = Number of Dwellings

Y_t = GDP

4. Empirical Results

Properties of the variables in the model should be checked to determine if they have the appropriate specifications. Firstly, it is necessary to determine whether the variables are difference stationary or trend stationary. A test of stationary (or non stationary) that has become popular over the past several years is the unit root test. This is done by Dickey-Fuller Unit Root test. The Unit Root Test estimates that each variable in the model includes a unit root. It involves testing the coefficient of the Least Square Estimate β_1 in $\Delta y_t=\alpha_0+\alpha_1 t+\beta_1 y_{t-1}+\sum^{n}_{i=2}\beta_i y_{t-i}$, is equal to unity (Gujarati, 2004:814). The unit roots are tested by using the Augmented Dickey-Fuller (ADF) test, and the results shown in Table 3.

After Augmented Dickey-Fuller (ADF) has been analyzed Engle-Granger Cointegration test has been made in order to estimate cointegration between the variables. The results of cointegration are shown in Table 4.

3.1. Unit Root and Engle Granger Cointegration Test

Certain properties of the variables in the model must be checked in order to determine the appropriate specification for estimation purposes. Firstly, it is necessary to determine whether the variables are difference stationary or trend stationary. This is done by testing the null hypothesis that each variable included in the model contains a unit root.

If the variables are first stationary, Engle Granger Cointegration Test and Error Correction Test can be estimated. The unit roots are tested by using the augmented Dickey-Fuller (ADF) test, and the results are shown in Table 3.

Table 3: Test For Unit Roots (Augmented Dickey Fuller) (data in first levels with constant and trend and data in log levels with constant in parenthesis)

Data	Test Statistics
Bp	-3.51
Y	-4.39

Critical values are; -4.14(%1), -3.49(%5), -3.17(%10)

According to results of unit roots test, variables are stationary at first levels I(1). So, to analyze the long run relationship between the variables, Engle Granger Cointegration Test can be estimated. The results of analysis are shown in Table 4.

Table 4: Results For Engle-Granger Cointegration Test

Data	Test Statistics	Lag Value	Degree of Cointegration
Error Term ε_1	-2.61	(3)	I(0)
Error term ε_2	-2.84	(3)	I(0)

Critical values are; -2.60(%1), -1.94(%5), -1.61(%10)

To estimate Error Correction Model (ECM), variables must be cointegrated. According to results of Engle Granger Cointegration test, the variables are cointegrated at level degree.

3.2. ECMs and ADL Models

The cointegration between housing demand and income implies that using an ECM to estimate short run and long run elasticities and associated adjustment parameters to long run equilibrium status between housing demand and income. The results for the paper are shown in Table 5.

Table 5: The Results for Error Correction Model

Quarterly Adjustment	Short-Run Equilibrium	Long-Run Equilibrium
0.49	-0.87	0.07
(0.001)	(0.016)	(0.0096)
[4.48]	[-2.48]	[2.68]

Our model can be written as follows:

$$LBP = 0.176 - 0.871*LY + 0.502*LBP_{(-1)} + 0.941*LY_{(-1)}$$

The findings indicate that the short run elasticity is -0.87 and the long run elasticity is 0.07.

β_0 (0.502) estimates the proportion of the deviation from equilibrium at t-1 that is maintained at time t-1. $\beta_0 - 1$ (0.49) is the speed of adjustment.

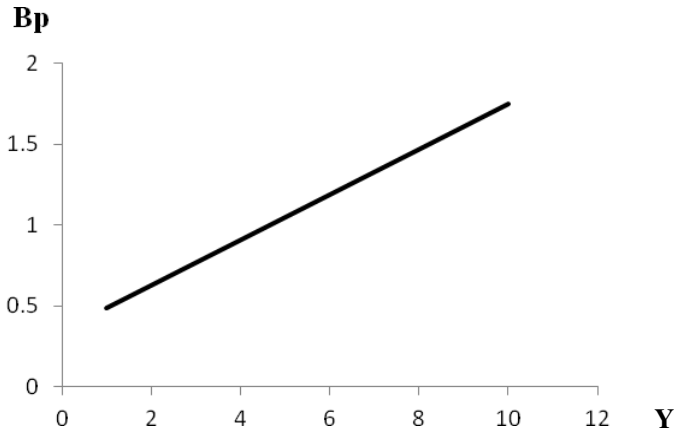
β_1 (-0.87) estimates the Short Term effect of X on Y.

$\beta_1 + \beta_2$ (0.07) estimates the Long Term effect of a unit change in X on Y. (The Coefficient on X_{t-1} in the ECM)

And the total long term effect/long term multiplier $-k_1$- and k_0 calculated as respectively 0.1428 and 0.346.

Y and X will be in their long term equilibrium state when $Bp = 0.346 + 0.14Y$. The figure of the long run income elasticity is shown in Figure 2.

Figure 2: The Long Run Income Elasticity of Housing Demand



Summary and Conclusion

The aim of the paper is to estimate short run and long run income elasticities of housing demand in Turkey. According to the results, the short run elasticity is -0.87 and the long run elasticity is 0.07.

The short run elasticity is negative however, the long run elasticity is positive and it implies that housing is a normal good in the long term. One possible explanation for this result is related to sustainable

income levels. In the short run, when income increases, housing demand will decrease. However, in the long run when income increases, housing demand will increase. Because of the sustainable development, people invest on housing and the share of income for other expenditures is less than housing expenditures. These broad explanations have been based on the permanent income theory and life-cycle theory of consumption which observe that the expenditures elasticity in the short run is smaller than in the long run.

The other important result is the speed of the adjustment process. In each period, 49% of the income deviation has been corrected. So, the housing market in Turkey can be considered as an efficient market.

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Appendix

Diagnostic Tests

Figure 1: CUSUM Breakpoint Test Results

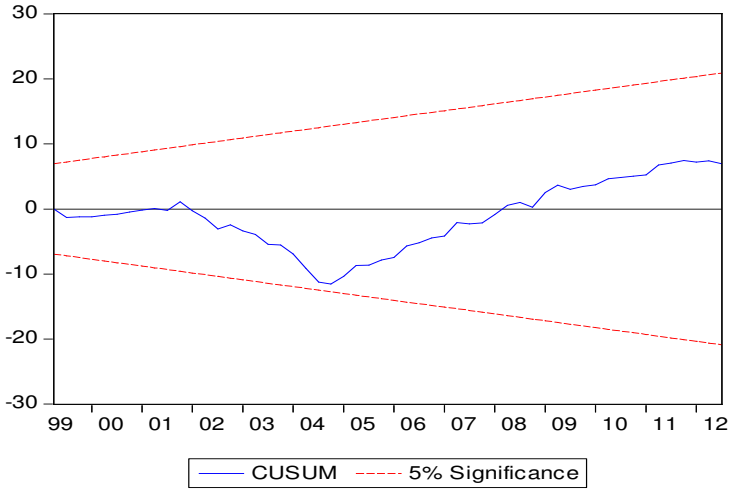

Figure 2: CUSUMQ Brakpoint Test Results