

## THE ROLE OF THE PRIVATE CONSTRUCTION SECTOR FOR DEVELOPMENT: ARDL ANALYSIS OF PRIVATE CONSTRUCTION SECTOR IN TURKEY<sup>1</sup>

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### Abstract

*In this paper, we examine that the impact of GDP and the value of dwelling residential buildings on the number of dwelling units residential buildings with respect to ARDL cointegration analysis. The analysis can be done for the period of 1991Q1-2010Q3. We use 79 observations. Also, this analysis includes CUSUM and CUSUMSQ test which investigate stability of the model. The findings of the model are that in the long-run GDP affect the number of dwelling units residential buildings negatively, on the other hand, the value of dwelling residential buildings affect it positively. In addition to this, in the short-run both GDP and the value of dwelling residential buildings affect positively.*

**Key Words:**Development, ARDL, Private Construction Sector.

### 1. Introduction

In Turkey, construction sector has been rebounded considerably in last years. There are several reasons to explain this situation. Firstly, HDA(Housing Development Administration of Turkey) has builded almost 43.000 housings in many cities of Turkey in 2003-2010. Many of these are for low-income households. And they have long-term ve low payment refunding conditions. Secondly, real estate has always been tool of investment for people in Turkey. Raising income and new financing tools (like mortgage-in Turkey practicing since 2007) affect this demand. Decreasing credit costs and lenghting terms also affect dwelling demand because of the decreasing interest rates and stability in Turkish economy. Demographics alternations, immigration to urban areas, urbanization, industrialization are another social-economic factor on housing demand. All of this have happened the past decade. On the other hand, private construction sector is other important part of this sector. Private sector contribution to production changes over time. In this situation, we argue that private sector effect on the development. In this paper, we inetigate private construction sector issues.

All these reasons we mention above are affect by raising income (GDP) and changing social-economic structure. And raising income and changing social economic structure are indicator of development. Therefore, this study investigates the effects of GDP and the value of housing residential buildings on the number of housing units residential buildings.

The rest of the paper is organized in five sections. In the next section we present the literature review. In Section 3 we perform the empirical analysis and present the main results. We offer some concluding remarks in Section 4.

### 2. Related Literature

In economics field, there are many studies focusing on the housing demand. One of them study imply that housing demand is positively related with income and also negatively related price and then housing demand differintiate among young and old people. It means that young people housing demand is higher than older ones(Carliner, 1973:532).Housing demand is more sensitive to permanent income rather than single year income. In the literature, although there is different opinion, they think elasticitiy of housing demand is inelastic respectively income and price(Lee and Kong, 1977:305). This is crucial point for many of studies due to empirical results.In this case, in order to Hanushek and Quigley's result, housing demand is inelastic to price change(Hanushek and Quigley, 1980:453).

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In the housing literature, price elasticity is both unreliable and close to zero. Malpezzi and Mayo emphasize that in the long-run income elasticity of housing is much greater than one and contrarily long-run price elasticity of housing lower than one (Malpezzi and Mayo, 1987:716). In this point, income is much greater effect on the housing demand than price. Fontenla and Gonzalez (2009) estimate the housing demand in Mexico using a unique dataset that contains household socioeconomic information, mortgage terms, and physical characteristics of the housing unit. They include information for 21 metropolitan areas of different sizes and geographical location. They find that price elasticity of housing demand is lower than previous studies for developed countries and within the range of developing countries. Permanent income elasticities are also within the range of previous studies with values between 0.76 and 0.80. In contrast, temporary income elasticity is close to zero. Finally, head of household age and number of dependents decrease the amount of housing demanded.

Ingram underlines a very important point in his study that housing is a non-traded good, because of this, something may be different location by location or among regions (Ingram, 1987:144). Halicioğlu states that some factors are important to determine all of housing demand: Economic and Demographic factors (Halicioğlu, 2005:2). As Malpezzi and Mayo (1987) argued that housing markets are not homogeneous and display huge discrepancy country by country or city by city. Because of this, researchers don't still negotiate precisely about the effect of income and price of house (Halicioğlu, 2005:3). Then in order to her paper income and price of house are most significant variables to explain housing demand in Turkey (Halicioğlu, 2005: 7).

The other paper for Turkey; Sarı, Ewing and Aydın denote two major reasons for housing production in Turkey: these are production for dwelling and other one is for profit. High number of dwellings are produced by private construction companies (Sarı, Ewing and Aydın, 2007:9). Also in order to their result, real national income has an effect over housing investment (Sarı, Ewing and Aydın, 2007:16). Coskun (2010) emphasizes some factors that make positive contributions to the expected rate of return of the real estate investment in Turkey. These are positive fundamentals (geo-political position; EU candidacy; industrialization; growing/stable economy etc.), positive sides of demographics and urbanization, İstanbul as emerging metropolis, some public policies on real estate supply, dynamic and creative entrepreneurship, motives in domestic demand and other factors for strong demand, İstanbul Stock Exchange's positive impacts to real estate business, advantages of being a late comer, developments in regulatory framework and developing academic knowledge would be classified as opportunities (or positive factors) supporting the potential values of Turkish economy and real estate business.

Ruddock and Lopes investigate relations between construction sector and development, then their findings, which is interesting, support "Bon curve". The Bon curve claim that the relationship between the share of construction in output and economic development show inverted U-shape relation (Ruddock and Lopes, 2006:722).

In the light of these informations and literature reviews, we investigate Turkish construction sector effects over the development process.

### 3. Empirical Analysis and Model

We use three variables. These are GDP, (**b**), the value of dwelling residential buildings, (**f**), and the number of dwelling units residential buildings, (**a**). And also, the model includes 79 quarterly data and these data are obtained by Turkish Central Bank Data System, from 1991Q1 to 2010Q3. These variables are related with private sector.

ARDL approach is based on ordinary least square (OLS) (Caglayan, 2006:425). Why do we use ARDL approach to cointegration? Answer simple, the other cointegration tests have low power and due to other problem with these test, because of that ARDL approach becomes most popular (Shrestha and Chowdhury, 2005:14). The main advantage of ARDL model is that it can be used when variables are different order of integration (Pesaran and Pesaran, 1997; ind. Shrestha and Chowdhury, 2005:15). Because of that for using ARDL approach, there is not need any unit-roots test (Sharifi-Renani, 2007: 3). The bounds testing is made by following equation:

$$\Delta a = \delta_0 + \sum_{i=1}^m \delta_{1i} \Delta a_{t-i} + \sum_{i=0}^n \delta_{2i} \Delta b_{t-i} + \sum_{i=0}^g \delta_{3i} \Delta f_{t-i} + \phi_1 a_1 + \phi_2 b_{t-1} + \phi_3 f_{t-1} + u_t \quad (1)$$

We investigate hypothesis whether there is cointegration or not. Then we get F statistic(F= 5,362) and we can say that there is cointegration.(  $H_0 : \phi_1 = \phi_2 = \phi_3 = 0$  ) In other word we reject null hypothesis. (we compare our F statistics value respect to Pesaran critical values: at %5 significance level from (3.79) to (4.85)(Pesaran and Shin, 2001)).

Our model long-run coefficients are:

**b= -2,619**

**f= 1,54 x 10<sup>-5</sup>**

This means that if GDP increases the number of dwelling units residential buildings decline, if the value of dwelling residential buildings increases the number of dwelling units residential buildings also rise just in the long-run. This results are very interesting. Because if turkish citizens income increase, they sepent their money other thing except dwelling. But they are sensitive to the value of dwelling residential buildings. Also, long-run coefficient of the value of dwelling residential is very low. This result is consistent with the literature but its sign is not. Furthermore, tother variable GDP's coefficient covers Bon curve expectations and it has a negative sign in the long-run.

Long-run ARDL equation is:

$$a = \delta_0 + \sum_{i=1}^m \delta_{1i} a_{t-i} + \sum_{i=0}^n \delta_{2i} b_{t-i} + \sum_{i=0}^g \delta_{3i} f_{t-i} + u_t \quad (2)$$

And, then, short-run ARDL equation(like ECM) is:

$$\Delta a = \delta_0 + \sum_{i=1}^m \delta_{1i} \Delta a_{t-i} + \sum_{i=1}^n \delta_{2i} \Delta b_{t-i} + \sum_{i=0}^g \delta_{3i} \Delta f_{t-i} + \mu ec m_{t-1} + u_t \quad (3)$$

Firstly, at ARDL model we find optimal lags for each variables respect to model selction criteria for example Schwarz, Akaike ..etc.. Then we know that determining optimal lag is difficult in ARDL model but we try lots of combination. After these procedure we get optimal lags: for a; four lags are suitable, for b; two lags are suitable and lastly for f; one lag is suitable. In the long-run estimation output is in the below:

**Table 1- Long-Run Model**

Variables	Coefficient	S.E.	t values	Prob.
a(-1)	0.448481	0.082660	5.425609	0.0000
a(-2)	0.027556	0.071040	0.387891	0.6994
a(-3)	-0.115932	0.087807	-1.320306	0.1914
a(-4)	0.261746	0.086236	3.035218	0.0035
b	-0.188964	0.224931	-0.840098	0.4040
b(-1)	0.433584	0.209739	2.067258	0.0428
b(-2)	-1.235104	0.202621	-6.095636	0.0000
f	1.07E-05	1.51E-06	7.062256	0.0000
f(-1)	-4.87E-06	1.73E-06	-2.814654	0.0065
c	35201.19	9911.963	3.551385	0.0007
<b>R-squared</b>	0.923262			
<b>Adjusted R-squared</b>	0.911271			
Breusch-Godfrey Serial Correlation LM Test:	<b>n.R<sup>2</sup> =2,744733</b> <b>P-Value(Chi-Square(2))=0,2535</b>			
Heteroskedasticity Test: Breusch-Pagan-Godfrey	<b>F-Stat= 1,449201</b> <b>P-Value= 0,1798</b>			

After that, we compute short-run relationship to use equation 3. Estimation output is in the below:

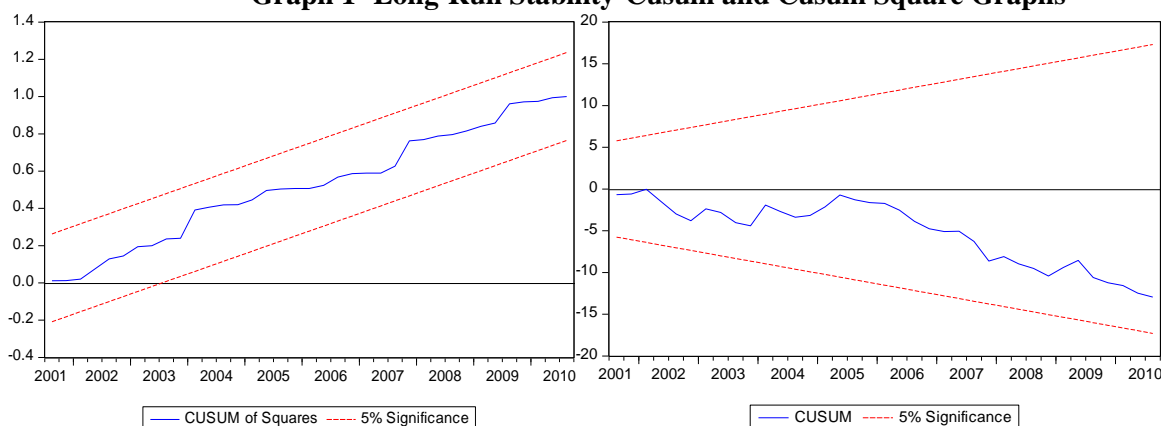
**Table 2-Short-Run Model**

Variables	Coefficient	S.E.	t values	Prob.
aa(-1)	-0.287047	0.084128	-3.412023	0.0011
aa(-2)	-0.173905	0.088215	-1.971389	0.0529
aa(-3)	-0.326447	0.086826	-3.759801	0.0004
bb	0.294677	0.167574	1.758487	0.0833
bb(-1)	0.792456	0.145749	5.437120	0.0000
ff	8.83E-06	1.46E-06	6.058108	0.0000
c	-48.23919	698.9179	-0.069020	0.9452
$\mu ecm_{t-1}$	-0.238370	0.095410	-2.498364	0.0150
<b>R-squared</b>	0.855192			
<b>Adjusted R-squared</b>	0.837639			
Breusch-Godfrey Serial Correlation LM Test:	<b>n.R<sup>2</sup></b> =2,752154 <b>P-Value(Chi-Square(2))</b> = 0,2526			
Heteroskedasticity Test: Breusch-Pagan-Godfrey	<b>F-Stat</b> = 1,450127 <b>P-Value</b> = 0,1928			

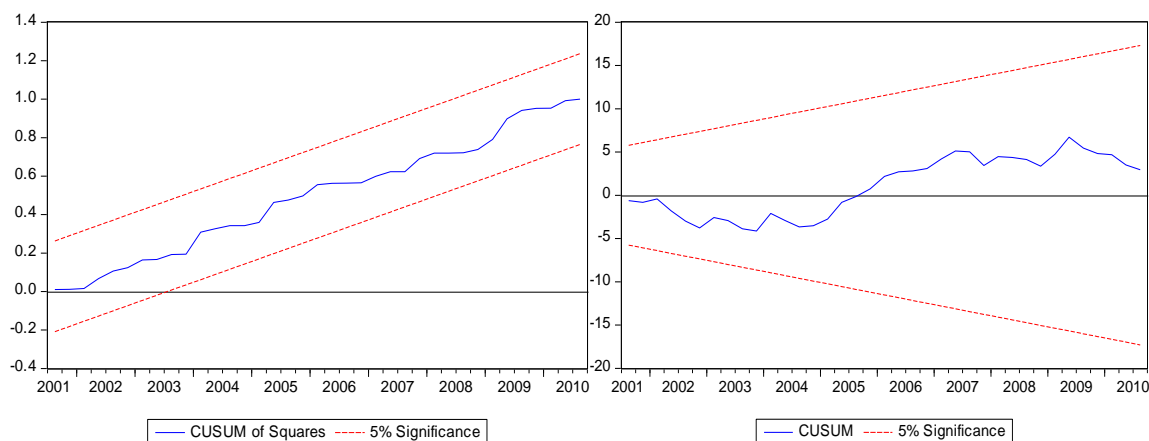
$(\mu ecm_{t-1}) = -0.238$ , this is the coefficient of the error correction. It reflects short-run effect to long-run. This value is compatible our expectations. Our expectations which that value could be negative and statistically significant. This implies that shocks close to equilibrium slowly by %23. Furthermore, we can say in the short-run both GDP and the value of dwelling residential buildings affect the number of dwelling units residential buildings.

Lastly, we have to mention about diagnostic tests. As a result of the estimation, firstly we explore autocorrelation, and there is no autocorrelation in this model. Before of this we use dummy variable to adjust structural breaks , however coefficient of the dummy is not statistically significant and then we don't display it on the table. For the first equation, we look at the cusum and cusum square graph and to show no structural break.

**Graph 1- Long-Run Stability-Cusum and Cusum Square Graphs**



And also, all of the diagnostic test practice for second equation. As a result of that, there is no autocorrelation and no structural break respect to cusum square and cusum.

**Graph 2- Long-Run Stability-Cusum and Cusum Square Graph**

#### 4. Conclusion

In this paper, we investigate the impact of GDP and the value of dwelling residential buildings on the number of dwelling units residential buildings with respect to ARDL cointegration analysis. In this situation, this analysis shows construction sector's importance for the development. As a result of the study, GDP has more effect over the number of dwelling units residential buildings rather than the value of dwelling residential buildings. The model displays stable long-run relationship and then Cusum and Cusum Square tests indicate that. This result is proved by empirically in this paper. Also, other result is proved that in the long-run GDP has negative effect over the number of dwelling units residential buildings but on the other hand the value of dwelling residential buildings has positive effect over the number of dwelling units residential buildings. However, the value of dwelling residential buildings' coefficient is very low in other words close to zero differently from GDP. In the short-run GDP has positive effect over it, the value of dwelling residential buildings has positive effect over it like long-run.

Actually, this result very interesting. In the literature, there is no consensus about relations but some of the papers emphasize that income has positive, price has negative effect. In this point we should mention about that results differentiate from country by country or city by city. Probably, it may occur and already literature denotes this truth. For Turkey, GDP has positive effect in the short-run in consideration of shortage dwelling. In addition to that maybe Turkish culture acts important role. Respect to Turkish culture, they prefers buying dwelling for investment more. But this condition changes over the past decade and Turkish people introduce new investment tools. The other reason, through the time, the level of development of Turkey increase. Especially, as we mentioned before, Turkey has grown rapidly the past decade and still continue. Under the circumstances, this result support 'Bon Curve' paradigm. Bon Curve paradigm is that between share of construction in output or GDP and development indicate inverted U-shape relation.

In this paper, we use private the number of dwelling units residential buildings, the value of dwelling residential buildings and we say that private sector contributions to development low in the long-run. As we mentioned before Turkish construction sector has been rebounded especially for last five years because of HDA's (Housing Development Administration of Turkey) construction. It has builded almost 43.000 housings in many cities of Turkey then many of these are for low-income households.

Private sector is crucial for the residential dwelling because high percentage of the construction of it is realized by private sector. In Turkey, may be HDA's construction for low income group and other part of group changing preferences affect private sector construction negatively. Due to high percent of young population and decreasing members of family are other reason the reduction of private sector construction in the long-run.

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