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Demand for New Residential Buildings in Iran's Urban Areas

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ABSTRACT

This study investigates demand for new residential buildings in urban areas of Iran during1976-2010. The demand function for new residential buildings in urban areas was estimated and then the existence of a long-run relationship among variables of this function was studied using the Bounds testing of the Autoregressive Distributed Lag (ARDL) Co-integration procedure. The test confirmed a long-run relationship among the variables, so the coefficients of the short-term and long-term demand for new residential buildings were estimated. The results show that average income of urban households has the biggest impact on long-term demand of new residential buildings and its sign is positive. In the short-term, the biggest impact on the demand for new residential buildings is the average cost of constructing a residential building,with a negative impact on the demand.
KEY WORDS: Demand for New Residential Buildings, Bounds test, ARDL Co-integration techniques
JEL Classification:C51, R21

INTRODUCTION

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Housing has long been regarded as a necessity; a human need for shelter. It is classified as an essential good along with food and clothing. Housing is usually the largest item in a household budget in most countries, normally accounting for about 20% of expenditures (Halicioglu, 2005).Muth (1960) provided the pioneering work on housing markets, but this topic has been very important in the economics literature for many years. There is a large and rapidly developing literature on the non-essential demand for housing (ibid). One of the most important scientific contributions of this literature is the attempt to separate the total demand for housing into the demand for shelter and the demand for investment. The later demand has been important since World War II because housing prices have had periods of sustained increases at times.

In the consumer demand for housing, securing shelter is the most important factor, while the demand for investment is motivated by expected financial returns and other possible factors (Gholizade, 2009). Recognizing and separating these two demands for housing could explain a situation where the rise in housing prices causes increases in housing demand in some countries (which seems to occur in certain periods). One expects the shelter demand for housing to fall as housing prices increase, but one might expect the investment (or speculative) demand for housing to increase with higher prices. If the investment demand is strong and dominates the shelter demand, housing price increases could lead to a net increase in housing demand. Generally, the directional effect of increased housing prices depends on the relative changes in these two demand components.

The assessment of housing demand and the estimation of price and income elasticities are very important for predicting housing demand, estimating the effects of policy changes, and estimating tax revenue from real estate. One of the first empirical studies of housing demand was performed by De Leeuw (1971) using cross section data in the 1960s. Mayo (1981) and Fulpen (1988) also have done vast experimental and theoretical studies on housing demand during the 1960s, 1970s and 1980s. Donatos (1995) and Ge and Lam (2002) have undertaken housing studies in the past two decades for developing countries. In general, developing countries need housing models more than developed countries because their rate of urbanization is significantly higher than developed countries, so the demand for housing is expanding rapidly in urban areas (Halicioglu, 2005). Malpezzi and Mayo (1987) estimate that in most developing countries the income elasticity of housing ranges between 0.5 to 1, and the average price elasticity is approximately -0.2. Goodman (2002) shows that income and rental value have significant impacts on U.S. housing prices in metropolitan areas. He estimated that conditional income elasticities are between 0.4 and 0.45.

Some housing demand studies have been performed in Iran too. Montazeri (1999) estimated the demand for housing in the city of Yazd during 1972-1989 by considering the number of housing units (housing stock) as the dependent variable and residential unit price, consumer price index, urban household income, the interest

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rate for bank loans, number of marriages, and urban population as independent variables. His results confirm that these variables describe housing demand in Yazd significantly.

Palavamzade (1998) estimated an Ekanem demand function for housing in urban areas of Isfahan province using explanatory variables such as residential housing prices, urban household income, mortgage rate, number of marriages, and urban population. Khoshakhlagh et al. (2008) used a hedonic pricing approach to estimate Khomeinishahr's housing demand function. They assumed that the price for a housing unit is influenced by both physical and neighborhood characteristics. They obtained their data through questionnaires and used cross-sectional analysis. Their hedonic pricing model considered location of the property and other major characteristics of the housing units. Their results show that physical, neighborhood and environmental characteristics of residential units affect housing price.

Ghaderi (2003) estimated housing demand by urban households using cross-sectional data from a sample of 12,338 urban households in 2001. He estimated the demand for possessive and rental housing services. His independent variables were rent per square meter of housing, various income measures (permanent, temporary, current and non-work income) and other household socio-economic variables. The results show that permanent, current and temporary income variables, and also marital status, owner's age, non-salaried income, owner's literacy and number of literate people in the household have positive impacts on the demand for possessive and rental housing. The rent per square meter, household size and the number of people who have income in the household have a negative impact on possessive and rental housing demand. They found the income elasticity of demand for possessive and rental house is less than one, suggesting that shelter is an essential good.

Although these studies have investigated housing demand, this study uses a different approach which differentiates short-run from long-run housing demand. Furthermore, this study focuses on the demand for new housing, which is a major driver in most economies. This helps to understand the demand for new residential building in more detail. Residential demand includes the sum of residential buildings completed by the private sector in urban areas and permits issued for the construction of residential buildings in urban areas. Furthermore, this study uses an auto-regressive distributed lag co-integration technique or ARDL model and the Bounds test (Pesaran et al. (2001) to provide more reliable estimates. The cumulative residual tests (CUMSUM) and cumulative squared residual (CUMSUMSQ) are also used to investigate the stability of the model.

METHODOLOGY

Ge and Lam (2002) have presented a general demand function for housing:

$$Q_d = f(G, H, D, t) \qquad (t=1,2,...,n) \tag{1}$$

Where G is a set of macroeconomic variables such as GDP, interest rates, and stock market prices; H is a set of variables specifically related to housing such as housing price, income, and unemployment; and D is a set of demographic variables such as population, number of marriages, and the birth rate. Equation (1) specified in a double log statistic form so that:

$$LnQ_d = \alpha_0 + \alpha_1 LnG + \alpha_2 LnH_t + \alpha_3 LnD_t + \varepsilon_t \tag{2}$$

The variables in equation (2) differ by country. Considering the extensive research conducted by Mayo (1981), Fulpen (1988), Ge and Lam (2002), equation (2) is adjusted for Iran as:

$$LnRD_t = \alpha 0 + \alpha 1 LnY_t + \alpha 2 LnRC_t + \alpha 3 LnLV_t + \alpha 4 LnNM_t + \varepsilon t \tag{3}$$

Where RD is demand for new residential buildings in Iran's urban areas; Y is average real total income of urban households; RC is real average non-land cost of constructing a residential building in urban areas, LV is average real land value for a residential building in urban areas; and NM is the number of marriages registered in Iran's urban areas. Expected signs for the above coefficients are:

$$\alpha_1 \succ 0 \qquad \alpha_2 \prec 0 \qquad \alpha 3 \prec 0 \qquad \alpha 4 \succ 0$$

Several econometric methods have been used in past housing studies. They include univariate co-integration procedures (including techniques developed by Engle and Granger (1987) and the Phillips and Hansen (1990)) which use modified ordinary least squares procedures that allow for the existence of long-run equilibrium (co-integration relationship) among variables in the model. Multivariate co-integration models developed by Johansen (1988), and Johansen and Juselius (1990) have been used when more than one dependent variable is included. Full Information Maximum Likelihood procedures by Johansson (1996) have also been widely used in empirical research. The ARDL model was originally introduced by Pesaran and Shin

(1999) and was further developed by Pesaran *et al*. (2001). It deals with single equation co-integration models and has the following advantages over other models:

- The short-term and the long-term parameters of model can be estimated simultaneously.
- Co-integration tests can be performed without concern whether the model's variables are I(0) or I (1).

Due to these advantages, the ARDL model is applied for investigating the presence or absence of a co-integration relationship among the variables. Equation (3) is specified in ARDL form as:

$$\Delta LnRD_t = \alpha_0 + \sum_{i=1}^{m} \alpha_{1i} \Delta LnRD_{t-i} + \sum_{i=0}^{m} \alpha_{2i} \Delta LnY_{t-i} + \sum_{i=0}^{m} \alpha_{3i} \Delta LnRC_{t-i} + \sum_{i=0}^{m} \alpha_{4i} \Delta LnLV_{t-i} + \sum_{i=0}^{m} \alpha_{5i} \Delta LnNM_{t-i} + \alpha_6 LnRD_{t-1} + \alpha_7 LnY_{t-1} + \alpha_8 LnRC_{t-1} + \alpha_9 LnLV_{t-1} + \alpha_{10} LnNM_{t-1} + \varepsilon_t \quad (4)$$

The Bounds test is used in the ARDL approach to investigate the long-run relationship or co-integration between the variables of equation (3). This test procedure is based on the F or Wald statistic and it is the first step in the ARDL co-integration method. The Bounds test is a joint test for no co-integration ($H_0: \alpha_6 = \alpha_7 = \alpha_8 = \alpha_9 = \alpha_{10} = 0$). The F-test for this method has a non-standard distribution, so Pesaran et al. (2001) have calculated two sets of critical values for a given level of significance. One set (the lower value) assumes that all the variables in the model are I(0). The other set (the higher value) assumes that all variables are I (1). If the calculated F statistic is higher than the upper critical bound value, the hypothesis is rejected (implying that there is co-integration). If the calculated F statistic is between the upper and lower critical values, the result is uncertain. If the calculated F statistic is less than the lower critical bound value, the hypothesis cannot be rejected (implying that there is no co-integration).

If the results confirm the existence of a long-run relation among the variables, we proceed with the long-run estimations and error correction ARDL model. The long-run model is obtained by estimating equation (4) in the context of the ARDL model. In order to obtain the speed of the adjustment and the short term coefficients, it is necessary to estimate the following dynamic error-correction model:

$$\Delta LnRD_t = \alpha_0 + \sum_{i=1}^{m} \alpha_{1i} \Delta LnRD_{t-i} + \sum_{i=0}^{m} \alpha_{2i} \Delta LnY_{t-i} + \sum_{i=0}^{m} \alpha_{3i} \Delta LnRC_{t-i} + \sum_{i=0}^{m} \alpha_{4i} \Delta LnLV_{t-i} + \sum_{i=0}^{m} \alpha_{5i} \Delta LnNM_{t-i} + \lambda EC_{t-1} + u_t \quad (5)$$

In equation (5), λ measures the speed of the adjustment and shows how the deviation from long-run equilibrium leads to changes in the dependent variable in order to move towards long-run equilibrium. EC_{t-1} is the lagged long term estimated error. After estimating the model's coefficients we can test the stability of these coefficients for selected ARDL regressions.

Data

All of the time series data used in this study come from Iran's Statistics Center website and Iran's Central Bank. The time period is from 1976 to 2012. The RC variable is a weighted average of construction costs for completed residential buildings and construction costs for residential buildings under construction by the private sector in urban areas divided by the number of units. It should be noted that this cost does not include land value of a building. The LV variable is a weighted average of the land value of completed residential buildings and the land value of residential building under construction divided by the number units. All variables used are converted into real terms by using the Consumer Price Index (CPI-Constant 2002).

Model Estimation

Unit Root Test

It is necessary to perform unit root tests on all variables of model to ensure that they are I(0) or I(1). The variables cannot be I(2) or greater because the calculated F statistic cannot be trusted since the F-test is based on the assumption that all the variables are I(0) or I(1) (Ouattara (2004)). We used the Augmented Dickey- Fuller test (ADF) to test if the variables are stationary. The Schwarz-Bayesian criterion (SBC) was used to choose the number of lags and whether a trend was included in the model. The results are presented in Table 1. According to the table, all the variables in the model are I (1) except LnLV and LnNM, which are I(0). Since none of the variables are integrated higher than one, we can use the Bounds testing for evaluating the long-run relationship among variables.

Table 1. Augmented Dickey-Fuller Test with an Intercept and Trend

Variable	lag	Test-statistic at 5% significance level	Critical value at 5% significant level	Stationary status
LnRD	0	-2.5746	-3.5514	Non-stationary
First difference of LnRD	0	-5.0630	-3.5562	stationary
LnY	1	-2.3610	-3.5562	Non-stationary
First difference of LnY	0	-3.6771	-3.5562	stationary
LnRC	1	-2.4168	-3.5562	Non-stationary
First difference of LnRC	1	-4.1787	-3.9586	stationary
LnLV	1	-4.1647	-3.5562	stationary
LnNM	0	-3.8699	-3.5514	stationary

Co-Integration Test

To determine the presence or absence of a long-run relationship among variables, we use the Bounds test for equation (4). The null hypothesis is that there is no co-integration among the variables. The results are summarized in Table 2.

Table 2. Bounds Test for Co-Integration

F- statistic	9.328
upper critical value	4.049
Lower critical value	2.85

Table 2 shows that the calculated F-statistic is higher than upper critical bound value. Thus, the null hypothesis that there is no co-integration among the variables in the model is rejected. A long-run relationship exists among the variables and it is possible to estimate short-term and long-term coefficients for variables in the second stage of the ARDL.

Estimation of the Long-Run and Short-Run Coefficients

Equation (4) was estimated by using ARDL to determine the long-term coefficients or elasticities. The results are given in Table 3. The optimum number of lags for the estimation is chosen based on the SBC.

Table 3. Estimation of Long-run Coefficients for Housing Demand

Independent Variables	Coefficient	Standard Error	t-statistics	Probability
LnY	0.474	0.211	2.2441	0.034
LnRC	0.414	0.247	1.674	0.107
LnLV	-0.237	0.139	-1.705	0.101
LnNM	0.425	0.095	4.452	0.000
Intercept	-4.722	2.418	-1.952	0.063

All coefficients (elasticities) are significant at the 10% significance level in the long-run (Table 3). An increase in the average income of urban households, the average cost of constructing a residential building, and the number of marriages increases the demand for new residential buildings in urban areas. An increase in the average land value of residential buildings reduces such demand. The highest elasticity (coefficient) is the average urban household income, 0.47.

Short-term dynamic adjustment coefficients of equation (5) using the ARDL model are presented in Table 4. The results of the diagnostic tests are given in Table 5.

Table 4. Estimation of Short Run Coefficients

Variables	Coefficient	Standard Error	t-Statistics
$\Delta \ln RD_{t-1}$	0.256	0.119	2.144
$\Delta \ln Y_t$	0.321	0.128	2.512
$\Delta \ln RC_t$	-0.900	0.227	-3.962
$\Delta \ln LV_t$	1.157	0.117	1.337
$\Delta \ln NM_t$	0.288	0.074	3.894
INPT	-3.197	1.444	-2.213
ecm_{t-1}	-0.677	0.104	-6.520
R^2		0.78	

All coefficients are significantly different from zero at the 5% level except the average land value of residential buildings. So, an increase in average urban household income and number of marriages increase residential housing demand in the short-run. An increase in average costs of constructing residential housing reduces demand. The coefficient measuring the speed of adjustment, -0.68, is also significant and has the correct sign. The error correction term suggests a high speed of adjustment from short-term to long-run equilibrium in urban areas. Any imbalance in the demand for new residential construction is adjusted by about 70% in the next period.

The diagnostic tests indicate that the model has no problem with serial correlation of residuals (p=.29), incorrect functional form (p=.13), or heteroskedasticity (p=.11) (Table 5). We cannot reject the hypothesis that the error term has a normal distribution (p=.87).

Table 5. Diagnostic Tests with Probability of Statistical Problems

$\chi^2_{SC}(1) = 1.099\,[0.294]$
$\chi^2_{FF}(1) = 2.306\,[0.129]$
$\chi^2_{N}(2) = 0.332\,[0.874]$
$\chi^2_{H}(1) = 2.593\,[0.107]$

Figures (1) and (2) show the results of the CUSUM and CUSUMSQ stability tests, respectively. They show that the coefficients of the error correction model are stable; so, we can say that the demand function of estimated new residential buildings in the urban areas is stable.

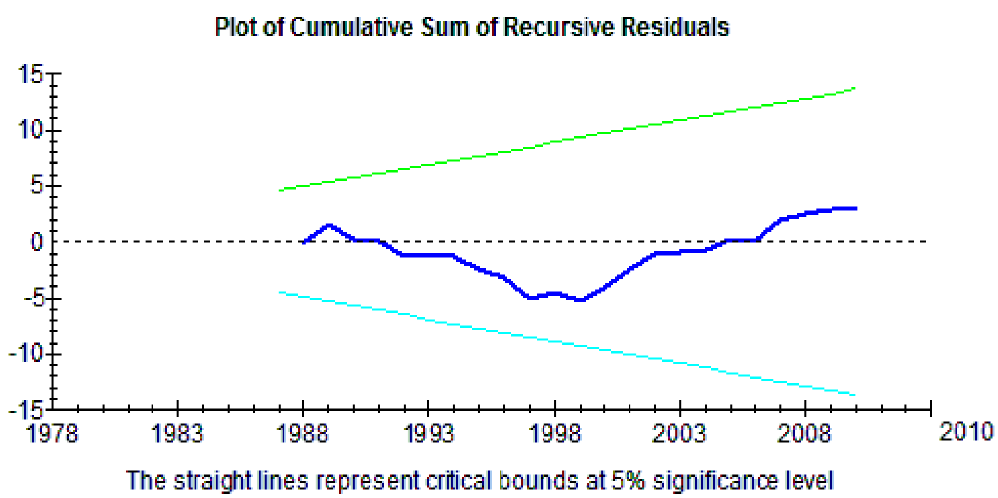

Figure 1. Cumulative Sum of Recursive Residuals (CUSUM)

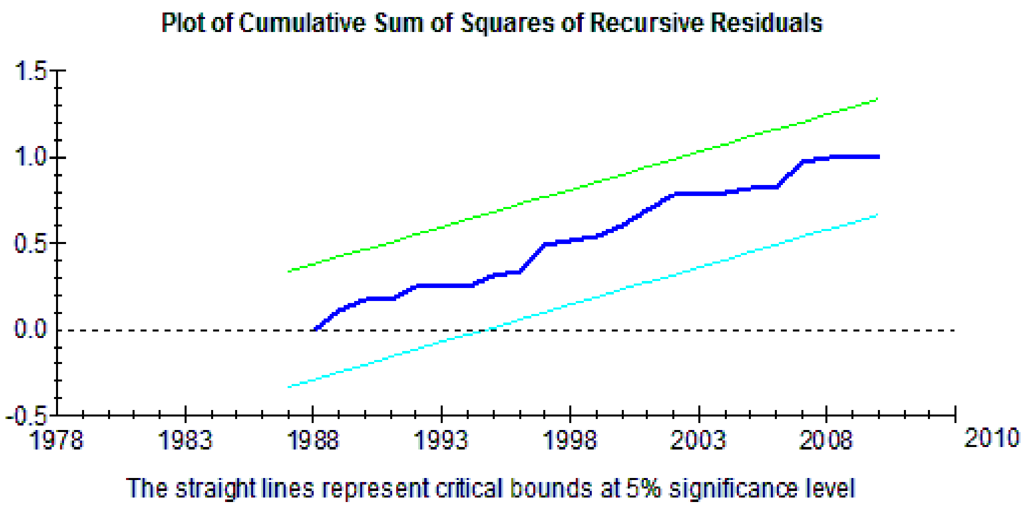

Figure 2. Cumulative Sum of Squares of Recursive Residuals (CUSUMSQ)

Conclusion

The present study uses the Bounds test for the ARDL approach in order to investigate a long-run relationship between new residential buildings demand, the average income of urban households, the average cost of constructing a residential building, the average land value of a residential building and the number of marriages in urban areas. A long-run relationship among the variables was found to exist and established. The results show a positive, significant and low elasticity effect of urban households' average income on demand for new residential buildings in urban areas of Iran in the long-run. A doubling of the average income of urban households increases the demand for new residential buildings in urban areas about 47 percent.

Although the average land value of a residential building was not shown to have a significant impact on the demand for new residential buildings in the short-term, its effect was negative in the long-term. A doubling of land value will decrease demand by about 24% in the long-run. By expanding the analysis to include new residential buildings and new housing units we can see that the increase in housing prices rising from land prices will cause a reduction in demand for residential buildings and new housing units. This may be because of the fact that land and housing are also considered as an investment in Iran.

Perhaps part of the decreased demand is due to the fact that increasing land value has increased raw land purchases and demand for constructing new housing and new residential buildings has fallen. As raw land prices increase people tend to buy raw land as an investment rather than a residential building or a home. This idea makes more sense when we realize that an increase in the cost of constructing new residential buildings in the long-term increases the demand for new residential buildings. Although theoretically we expect that an increase in construction costs causes an increase in prices and therefore a reduction in demand; instead people see increasing construction costs and rising prices as reflecting a housing boom. These events increase the speculative demand for housing. It seems that the increase in speculative demand is greater than the decrease in consumer demand so that a doubling of the average cost of a residential building will increase the long-term demand by about 41 percent even though the rising cost decreases demand in short-term. This result seems to be consistent with the realities of Iranian society because it has been found that in some cases, despite rising prices in the housing market, buying and selling in the market is also booming.

The number of marriages in urban areas has a significant impact on the demand for urban residential buildings in the short-term and long-term. A doubling of marriages increases the demand by about 29 percent in the short-term and about 42 percent in the long-term.

Finally, the CUSUM and CUSUMSQ tests show that estimated demand functions for new residential buildings in urban areas of Iran is a stable demand function. Hence we can conclude that this function can be used as a policy tool in housing planning at a macro-level in the country.

REFERENCES

Azarbayejani, K. and Shahidi, A. and Mohammadi, F., (2009), "Estimation of Foreign Direct Investment, Trade and Growth Relationship: Using Autoregressive Distributed Lag (ARDL) Approach", Quarterly Journal of the Economic Research, Vol.9, No.2, PP.1-17.

De Leeuw, F., (1971), "The Demand for Housing: A Review of Cross-Section Evidence", The Review of Economics and Statistics, Vol.53, No.1, PP.1-10.

Donatos, G., (1995), "A Quantitative Analysis of Investment in New Housing in Greece", Urban Studies, Vol.32, No.9, PP.1475-87.

Engle, R. and Granger, C., (1987), "Cointegration and Error Correction Representation: Estimation and Testing", Econometrica, No.55, PP.251-276.

Fulpen, H., (1988), "An Analysis of the Housing Market in the Netherlands", Urban Studies, Vol.25, PP.190-203.

Ge, X.J. and Lam, K.C., (2002), "Building a House Pricse Forecasting Model in Hong Kong", The Australian Journal of Construction Economics and Building, Vol.2, No.2, PP.57-70.

Ghaderi, J., (2003), "Estimates of housing demand in urban areas", Quarterly Journal of the Economic Research, No. 9 and 10, PP.111-132.

Gholizadeh, A., (2008), "Housing Price Theory in Iran (In Simple Words) ", first, Published by Noore Elm, Tehran.

Goodman, A.C., (2002), "Estimating Equilibrium Housing Demand for Stayers", Journal of Urban Economics, NO.51, PP.1-24.

Halicioglu, F., (2005), "The Demand for New Housing in Turkey: An Application of ARDL Model", Prepared for '2005 Business and Economics Society International Conference', Grand Canyon, Arizona, USA.

Khoshakhlagh, R. and Emadzade, M. and Sharifi, M., (1999), "Estimation Of Housing Demand Function With Using Hedonic Price", Tahghighat- E- Eghtesadi, Vol.55, PP.99-117.

Johansen, S. and Juseliuse, K., (1990), "Maximum Likelihood Estimation and Inference on Cointegration – With Application to the Demand for Money", Oxford Bulletin of Economics and Statistics, Vol.52, PP.169-210.

Johansen, S., (1988), "Statistical Analysis of Cointegrating Vectors", Journal of Economic Dynamics and Control, Vol.12, PP.231-254.

Malpezzi, S. and Mayo, S.K., (1987), "The Demand for Housing in Developing Countries: Empirical Estimates From Houshold Data", Economic Development and Cultural Change, Vol.35, PP.687-721.

Mayo, S.K., (1981), "Theory and Estimation in the Economics of Housing Demand", Journal of Urban Economics, Vol.10, PP.95-116.

Montazeri, M., (1992), "Estimation of Residential Housing in Yazd Province", MA Thesis, Isfahan University.

Muth, R.F., (1960), "The Demand for Non- Farm Housing", The Demand for Durable Goods, Chicago University of Chicago Press.

Najarzadeh, R. and Hoseinpour, M., (2006), "Investigating of Employ Making in Iran's Construction Sector", Tahghighat- E- Eghtesadi, Vol.41, 2(73), PP.329-344.

Ouattara, B., (2004), "Foreign Aid and Fiscal Policy in Senegal, Mimeo University of Manchester.

Pahlevamzadeh, M., (1998), "Estimation of Housing Demand Function in Isfahan Urban Areas (Investigating Importance of Effective Factors on Housing Demand)", MA Thesis, Economic Faculty of Alzahra University.

Pesaran, M.H., Shin, Y., and Smith, R.J., (2001), "Bounds Testing Approaches to the Analysis of Level Relationships", Journal of Applied Econometrics, Vol.16, PP.289-326.

Pesaran, M.H. and Shin, Y., (1999), "An Autoregressive Distributed Lag Modeling Approach to Cointegration Analysis", Chapter 11 in Econometrics and Economic Theory in 20th Century: The Ragner Frisch Centennial Symposium, Cambridge University of Cambridge Press.

Phillips, P. and Hansen, B., (1990), "Statistical Inference in Instrumental Variables Regression With I(1) Process", Review of Economic Studies, Vol.57, PP.99-125.

Reichert, A.K., (1990), "The Impact of Interest Rates, Income and Employment Upon Regional Housing Prices", Journal of Real Estate Economics, Vol.3, PP.373-391.