International Journal of Disaster Recovery and Business Continuity
Vol.11, No. 1 (2020), pp. 2065-2079

Assessing the Impact of Economic Variables on Housing Rental Prices with Emphasis on the Role of Maskan Bank (Dynamic Spatial Durbin Model in Iranian Provinces)

Sadegh Namjoo[1], Seyed Parviz Jalili Kamjo[2*], Hamid Asayesh[3]

[1]*PhD student in Economics, Islamic Azad University, Aligudarz Branch, Iran*
[2]*Assistant Professor in Econometrics, Financial Economics, Faculty member of Ayatollah Boroujerdi, Boroujerd, Iran*

[3]*Assistant Professor in Monetary Economics, Energy Economics, Faculty member of Ayatollah Boroujerdi University, Boroujerd, Iran*
[1]*sadegh925@yahoo.com*, [2]*parviz.jalili@abru.ac.ir*, [3]*hamid.asayesh@abru.ac.ir*

This paper is extracted from the Ph.D thesis at the Azad University, Aligudarz Branch.

Abstract

Housing is a durable and capital commodity that, on the one hand, serves as a source of income for the family during the period of disability and, on the other hand, has a high share of housing rent in the household's consumer basket. Therefore, the study of effective parameters in it is very important. Since most households in Iran do not have the financial resources to provide housing, they provide the necessary resources for housing through borrowing. One of the largest financial intermediaries in this regard is Maskan Bank, which specializes in this field. Therefore, in this study, to determine the effect of housing facilities granted on housing rental prices in 2006-2015, due to the inhomogeneity of the housing market in all provinces, economic variables such as Maskan Bank grant facilities, private sector investment, inflation rate, economic growth, unemployment rate, real interest rate and cost per square meter based on housing rental behavior in Iranian provinces were examined using the dynamic spatial Durbin econometric method.

According to the results, the direct and indirect effects of housing facilities granted on housing rental prices have become a positive and significant overall effect in each province, which is greater than the two direct and indirect effects. Therefore, by increasing the housing facilities of Maskan Bank, both inside each province and in the neighboring provinces, it will increase housing rental prices and the real interest rate on housing rental prices has a decreasing effect, the direct effect of which is much more than indirect.

Keywords: *Housing rental prices, Housing facilities, Dynamic spatial Durbin model, Panel data spatial econometrics.*

JEL Classification: R32, G23, C21, C23

1. Introduction

The need for some goods has existed for a long time and cannot be removed from the asset portfolio, including housing (Soheili et al., 2014). Therefore, housing is one of the basic human needs and is known as an important stimulus for the economic and social growth and development of any nation. Housing fluctuations affect the ability of households to provide housing, private sector investment, and the national economy, as developments in the housing sector play a key role in exacerbating fluctuations in economic

* Corresponding author

activity. Although several studies have examined the relationship between fluctuations in this sector and the business cycle in the economy, the importance of the housing sector and the relationship with macroeconomic variables, broad and antecedent links with other sectors, and economic activities show that the study of the relationship between this sector and other macroeconomic variables at different time scales is more important than ever before (Nademi and Khochiani, 2018). Since the Great Depression, many politicians and economists have argued that the housing market plays a key role in the economies of countries (Torben, 2016). According to Kim's (2004) study, the housing sector accounts for 30 percent of the world's wealth (Kim, 2004). When the housing market is booming, economic growth is rising and inflation can be threatening. The bursting of such an asset bubble is one of the greatest threats to a country's recession (Briscoe, 2007).

Extensive fluctuations in housing prices and, consequently, rents can be considered the most obvious feature of this sector. Paying attention to the effects of housing price fluctuations on household welfare highlights the importance of examining this issue because the imbalance of supply and demand in this market, the high share of rent in household income and the low profitability of the rental industry compared to other markets have caused dissatisfaction among landlords and tenants. Identifying how these fluctuations are formed, recognizing the order and timing of activities going up and down, and the ability to predict them have been and continue to be of particular interest to planners and economists around the world. Studies in this regard can be used in urban and regional planning and achieve the success of housing policies with accurate and comprehensive knowledge of the market.

In addition to being affected by national factors, the housing market in each region is also heavily influenced by local factors, which further justifies the analysis of the performance of the housing market at the regional level (Oikarinen, 2007). Housing prices in one province seem to depend on housing prices in other provinces, especially in neighboring provinces, and fluctuations usually start in metropolitan areas and spread to other provinces (proximity and neighborhood effects). Studies have shown that the effect of different economic variables on housing prices varies in different parts of a country or city, and housing prices in different parts of the country have an internal relationship with each other (Baltagi and Bresson, 2011).

Over the past four decades, the housing sector has always been one of the most important sectors of Iran's economy, has played a major role in GDP, employment and investment, and has acted as a stimulus for many economic activities in terms of strong past and present relations with various economic sectors, so that the boom and bust of this sector have brought many changes to other sectors and macroeconomics. Accordingly, in this study, the impact of economic variables on housing rental prices is assessed by emphasizing the role of the Maskan Bank, which is active as a major supplier and financial intermediary in the housing market, using the dynamic spatial Durbin econometric method in Iranian provinces.

2. Theoretical Foundations

Housing rental prices represent the price of alternative housing, meaning that each household either has a personal housing unit or rents out a housing unit to meet its housing needs by paying rent. The housing rental market, unlike house selling and buying, does not fluctuate in demand due to its mere nature. The demand side of the rental market enters the market with real consumption incentives unless population growth fluctuates with the rental market trend. Therefore, it seems that at a time when this market fluctuates, an external factor has stimulated it. Due to its heterogeneity, this market can go through different paths in boom and bust periods. Therefore, it is not possible to give a general rule for all sectors, including the market of buying and selling, renting, and luxury and consumable real estate. At the same time, from the perspective of economic experts, due to changes in population growth and declining household rates, it must be acknowledged that housing cannot be as

attractive as it was two decades ago. Some buyers are looking to use a security deposit as a cover to reduce their financial ability to buy a house, and this behavior could be a reason to put more pressure on the rental level. In fact, there is a balance that homebuyers are forced to rent because of the price of the entire unit purchased, so they try to rent at the highest price to make up for the deficit.

Rising house prices can be a trigger for demand in the rental market, as many potential buyers are withdrawing from the market and preferring to seek shelter in the rental market due to a lack of sufficient resources.

The trend of competing markets is certainly affecting the housing market as well. For example, when the turmoil in the foreign exchange market began in 2010, it reached the housing market with a one-year hiatus and affected the market. Therefore, if the fluctuations continue to be serious in the market, it is not unlikely that it will continue to spread to the housing market.

The variable interest rate determines the behavior of the owners of residential units and the rental rate. However, this statement needs to be explained; when it comes to interest rates, it is not just about bank deposit interest rates, but also the rate of return on other markets with quick liquidity. In fact, the owners of the capital not only look at the bank as a return on their assets but also look at other markets. Therefore, if the interest rate is attractive to the owners of residential units, they would rather receive a deposit than invest in these markets and make a profit from it. But if the return of these rates is not desirable, naturally the tendency for rent will increase (Issapour, 2018).

Therefore, housing rental prices are affected by housing prices and the factors that affect it, one of which is the amount of investment and credits granted by the bank in this sector.

2.1. Investing in Housing

Increasing investment in the housing sector will increase investment in other areas of the economy and thus increase production and employment. On a national scale, housing affects inflation, labor mobility, and government budgets through taxes and subsidies. The success of housing programs largely depends on the effectiveness of macroeconomic policies in the macro sector, which in turn affects production and demand in the housing sector. Loan interest rates, credit guidance, taxes, tariffs, public and private investment, and ownership are among the macroeconomic indicators that affect the success or failure of housing programs (Jahanmard, 2010).

Of course, it is noteworthy that increasing the resources of the housing sector alone does not mean increasing the production of housing in the same proportion (Hosseini, 2006). The reason for this is due to the current situation in the housing market, which will be discussed below. Also, in single-product countries such as Iran, which rely on oil revenues, if the wrong decisions are made, the inappropriate increase in liquidity due to the increase in oil revenues will lead to severe inflation in the prices of most goods. This inflation may be controlled in commercial, consumer, and other items by various levers such as imports. However, in immovable goods such as land, buildings, and some services, due to their inherent characteristics (restrictions on immovability, non-commerciality, inability to import, etc.), inflation will not only not be eliminated but will continue. On the other hand, the factors of production will be also oriented towards these goods, the entry of unprofessional and wandering capitals causes the desire for intermediation in them, which will turn such goods, especially land and housing, from a consumer good into a profitable capital good. Finally, it will cause non-optimal allocation of production factors and imbalance in economic interactions (Kamyab, 2011).

2.2. The Relationship Between Credit and the Housing Market

2.2.1. The Effect of Credit on Housing Buyers

ISSN: 2005-4289 IJDRBC

Demand in the first place is a function of the price of goods and income. Loan repayments typically increase people's financial strength. Therefore, the amount of the loan or its interest rate is considered as one of the variables affecting the demand (Benito 2006). The views of Aoki, Proudman, and League (2004) suggest that ease of funding will lead to an increase in demand for housing units. However, Rafiei (2004) states that increasing facilities only in the same period will lead to an increase in demand for housing, but in the following years, due to existing inflation, the ceiling of credit facilities will not be economically efficient.

In Iran, given that the function of credit demand due to low bank interest rates is not much affected by changes in this rate, the amount of credit in the model itself. However, in the face of limited financial resources, with the increase in demand for loans and new financial resources, the interest rate on loans will increase, which will increase the final cost of investment (Khalili Araghi and Mousavi, 2000).

2.2.2. The Effect of Credit on Housing Suppliers

According to Khalili Araghi and Sayeh Mousavi (2000) and Dalal Pourmohammadi (2000), quoting Rafiei, granting housing loans to the private sector will increase housing construction. Other researchers believe that interest rates affect housing supply. The interest rate is the cost of using capital by builders. Increasing the real interest rate will reduce housing construction. In other words, an increase in interest rates on credits paid to the producer reduces the supply of housing by net profit reduction (Blackley, 1999).

Construction in the housing sector has added value and significant benefits, and on the other hand, it requires different inputs and high construction costs. It seems logical that financial markets should contribute to the financing of housing construction by attracting people's deposits and transferring them to builders and benefiting from the profits. In general, it can be argued that with the increase in the amount of credit in the housing sector, the existence of a coherent and powerful market for the construction of new housing units will increase production. This increase will be especially tangible, especially in the area of mass construction and settlement and new cities. There are several ways to finance housing. These methods include primary and secondary mortgage markets, participation bonds or meter purchases of housing units, microfinance, etc., which are referred to in the housing economics literature as financing in the housing sector (Khoshakhlaq et al., 2016).

3. Experimental Background

In this section, internal and external studies on the subject of this research are examined:

3.1. Domestic studies

Rezaian et al. (2018) have used the hydraulic method to determine the factors affecting the rent of residential units. To determine these factors, four characteristics are used for housing, which are the physical-physical variables of residential units, access variables, environmental variables, economic and social characteristics of households. Variables related to spatial features are used through spatial hedonic to bind the rent price function to the location. The spatial hydraulic technique is well able to determine the factors affecting the rent of housing, as well as the impact of housing rent on other features of adjacent housing. The results show that the best model is the linear model and among the residential and residential units of Ilam city, physical and socio-economic factors, more than the variables of neighborhood and access, affect the rent of residential units. Also, the effect of the spatially dependent variable on the spatial hydraulic model on rent is quite significant and positive. The model estimated from the spatial econometric method is conventional, more efficient, and better in terms of goodness of fit, significant percentage of coefficients,

and also explaining the effect of the variables in the model compared to the econometric method.

Mirkatoli and Arian Kia (2017), to evaluate and analyze the spatial indicators of urban housing indicators with emphasis on housing typology, to examine residential units in Gorgan city in terms of access indicators, physical, qualitative, quantitative and satisfaction characteristics of housing architecture. they paid. The aim of the research was applied-developmental and, in terms of the method of conducting, a combination of descriptive, analytical, and correlational research. The statistical population of Gorgan research and 375 research samples have been provided to households in the form of a questionnaire. SPSS and GIS were used to analyze the data. The findings showed that the highest difference and diversity of housing in terms of indicators was in District 2, and the lowest in District 1 due to the very similarity and proximity of the puzzle style of residential buildings in this area with a slight difference. Region 3 ranked average, which could be due to the proximity of immigrant and indigenous peoples living in the region socially, economically, and culturally.

Ziari and Ghasemi (2016) analyzed and evaluated the situation of quantitative and qualitative housing indicators in Saman city. The method of this research was descriptive-analytical. In this study, three decision models of TOPSIS, VIKOR, and COPRAS were used to evaluate the status of housing indicators in the four districts of Saman city. In this study, the ANP network analysis model was used to compare the criteria of each weighting index. The indicators used in this study included six social, economic, fineness, population density, environmental, and housing facilities indicators with a sustainable development approach. To collect the research data, the information obtained from the data of the Statistics Center of Iran (2011), the detailed plan of Saman city (2012), and field studies using a questionnaire with a sample size of 320 households were used. Findings showed that housing in Saman city is not commensurate with the sustainable development approach and there are inequality and stability in most housing indicators in the four districts of Saman city so that in terms of social index, Districts 1 and 4 were relatively favorable, District 2 was unfavorable and District 3 was relatively unfavorable. In terms of economic index, District 1 was unfavorable, District 2 was relatively favorable and Districts 3 and 4 were favorable. In terms of fineness index, Districts 1 and 2 were undesirable and Districts 3 and 4 were favorable. In terms of population density index, District 1 was favorable, District 3 was relatively favorable, and Districts 2 and 4 were moderate. In terms of housing facility index, District 1 was unfavorable, District 2 was favorable, and Districts 3 and 4 were relatively favorable and moderate, respectively. However, in terms of the housing environment index, the four districts of Saman city were in an unfavorable situation.

Ghaderi and Izadi (2016), examined the effect of macroeconomic variables such as urbanization rate, housing taxes, unemployment rates, gross national product, government spending during the housing season, the price index of construction inputs, and the number of building permits issued on housing prices in Iran using the method of estimating normal minimum squares in the period 1971-2012, The results of this study showed that the rate of urbanization, rent, per capita income, housing loans granted by the Maskan Bank to the housing sector, housing tax, unemployment rate, building materials price index have a positive effect on housing prices. The impact of changes in GDP and government spending on the housing season and the number of building permits issued on housing prices were also estimated inversely. Housing prices are primarily affected by urbanization rates, per capita income, rents, and gross national product, and secondly by construction costs, and ultimately the government's monetary and fiscal policies have played a small role in housing prices.

3.2. External Studies

Jay (2017), in a study entitled “Housing Price Rise and Decline: Housing Factor-Based Model Based on Interviews with Local Real Estate Factors”, examined a model based on

the housing market factor to determine the cause of rising and falling housing prices in the United States in the years immediately before the US financial crisis (2009-2009). Key factors influencing housing price fluctuations, such as financing and speculation. Dynamic simulation findings in the study showed how speculative lending methods could lead to increased volatility in housing prices, including a sharp rise immediately after the collapse of exploratory work. In this study, the causes of housing bubbles and political decisions were understood.

Panajotidis and Prints (2016), in a study in Greece from 1997-2003, using monthly-nominal data and Granger causality method, concluded that mortgage lending by the banking system has a significant impact on the housing market.

Desi Vestrehoff (2015) examined heterogeneous expectations, housing boom and bust cycles, and housing supply conditions using a dynamic nonlinear model. He examined the relationship between housing prices, housing stocks, rents, and expected earnings for investment in the housing sector. The results showed that using the variables of investment and construction of buildings in the previous period, the dynamic nonlinear model can estimate the endogenous parameters of the housing boom and bust. Also, based on real estate and urban economy, public beliefs and other behavioral factors can play an important role in creating or bursting the price bubble in the housing market.

Wang and Zhang (2014) examined the importance of changes in key supply and demand factors, such as urban population, wage income, urban land supply, and construction costs, in explaining the rise in housing prices in Chinese cities between 2008 and 2002. put. The results showed that for most sample cities, changes in key factors such as income, land supply, and construction costs could explain much of the real change in housing prices. However, in several coastal cities, the real rise in housing prices had a big deviation from what can be predicted from fundamental changes.

In a study, Tse et al. (2014) examined the relationship between real mortgage interest rates and real housing prices in Wales after the 2007 global financial crisis. The main result of their work was that the global financial crisis has a long-term effect between monetary policy and housing prices so that for every one percent increase in the real interest rate on mortgages, housing prices increase by 6.4 percent.

Tez Sun Ong (2013) measured the relationship between macroeconomic variables and housing prices. He examined empirically whether the upward trend in housing prices in Malaysia has affected changes in GDP, population, inflation, construction costs, interest rates, and real estate profits. In this study, the data were obtained monthly from 2001 to 2010. The research results showed that GDP, population and real estate tax have a positive and significant effect on housing prices.

4. Research Data and Methods

This study was descriptive and causal in which the effect of economic variables on housing rental prices was examined by the method of spatial regression in the provinces of the country (except for the newly established Alborz province whose data was not available) in 2006-2017.

On the other hand, considering that the same stimuli in different geographical areas or, in other words, in the provinces of the country have different results and therefore the price relationship in a country is different from that relationship in each province of the country. In this study, it was tried to first identify the factors affecting housing prices and then use spatial econometric methods to estimate the appropriate model for each province. The method of geographical weight regression was used to deviate during space, which is widely used in the field of econometrics. Using this method, spatial changes can be measured and calculated for explanatory variables in different models. This method has better efficiency and estimation due to the consideration of spatial dependence and heterogeneity compared to conventional econometric methods such as ordinary squares, because if the spatial changes are significant, the least-squares methods will not be able to

estimate the coefficients accurately and precisely. Accordingly, studies to identify the current situation in these areas, its future trends, and to assess the factors influencing the indicators of the housing sector in each region can be beneficial for economic and regional planners in setting economic development plans.

Space in regional development is a general abstract environment in which all economic and social processes take place. The region is a region where the regional scientist evaluates and solves its problems. In other words, regional information is needed for spatial analysis of phenomena. The region is a geographical, socio-economic, and political area or a combination of them with a distinct identity (Pealinck & Klaassen, 1979).

Spatial econometrics is a sub-branch of econometrics that deals with the interrelationship of space and spatial structure in regression models with cross-sectional data or cross-sectional chronological composition. Spatial econometrics is the same as the econometric technique in the use of sample data that has a spatial component with spatial dependence and spatial heterogeneity (Lesage & Pace, 2009). The use of data in which there is a geographical location, length, and width is one of the main differences between conventional econometrics and spatial econometrics (Asgari and Akbari, 2001).

In 1988, Professor Anselin first presented a comprehensive picture of the realities of spatial econometrics in his book, Spatial Econometrics, Methods, and Models (Anselin, 1988). The technique presented in this book continued to provide quantitative and quantitative methods for various economic studies. However, this technique claimed to have better capability and application than conventional econometrics in regional and spatial studies, and when the researcher is faced with local and regional data and observations such as business studies, business, demography, etc., it is also able to replace the conventional models and methods of econometrics (Asgari and Akbari, 2001).

In spatial data, two problems in relationship modeling can occur: (1) the dependence between observations, (2) spatial inconsistency.

These two issues, which violate the Gauss-Markov theorem, are overlooked in conventional econometrics. Concerning spatial dependence, the Gauss-Markov theorem assumes that the explanatory variables in the duplicate samples are constant; spatial dependence violates this assumption. Similarly, spatial inconsistency violates Gus-Markov's hypothesis that there is a unique linear relationship between sample observational data. Spatial weight matrices are used to enter the effects of space in regression models, which are defined by distance (or longitude and latitude) or proximity. Therefore, considering spatial dependence, units that have a neighborhood or proximity relationship should show a higher degree of spatial dependence than locations or units that are farther away. This research will use dynamic panel data methods with a variable space delay that considers spatial proximity. The general form of space dynamics panel data is as follows:

$$Y\_{it} = \propto + \rho WY\_{it} + \beta x\_{it} + v\_{it} \quad (1)$$

where w is the spatial weight matrix, which is usually the proximity matrix of the first order, and the parameter ρ is the dependent variable of the spatial variable WY. ρ is the variable coefficient of spatial delay and indicates the regression parameter that should be estimated and indicates the random error of the relationship. The ρ parameter reflects the spatial dependence in the sample data and measures the average effect of the neighboring or adjacent observations on the dependent variable vector observations. If the spatial dependence between the observations is confirmed in the sample data of the dependent variable, part of the total deviation of the dependent variable at the level of the spatial sample will be explained by any spatial dependence on its neighbors. The ρ parameter reflects this in the sense of a kind of regression. Besides, the ratio of the total dependent variable deviation that is explained by spatial dependence can be calculated. This is indicated by ρWY and $\hat{\rho}$ indicates the estimated value of ρ.

Y_it represents housing rental prices in i provinces, t is time, c is the y-intercept, and x represents an n×n matrix of explanatory variables. Of course, the explanatory variable in the model with panel data may not be symmetrical. The β parameter indicates the effect of the explanatory variables on the deviation in the dependent variable Y. The proximity and

correlation method can be used to determine the proximity matrix (Lesage, 1999). In the proximity and correlation method, the proximity matrix is formed by specifying which observations or areas are related, neighboring, or adjacent. Given spatial dependence, units that have a neighborhood or proximity relationship should show a higher degree of dependence than farther locations. There are different ways to form the proximity matrix method: adjacent face-like, linear, elephant-like, double-sided linear, double-sided face-like, and queen (Anselin and Griffith, 1988).

The main reason for choosing a proximity definition should be the nature of the problem to be modeled. In the matrix, the proximity of the elements on the principal diameter is zero, meaning that the proximity of the region itself is considered zero. In other elements of the matrix, if the regions are adjacent to each other, the number one is zero if they are not adjacent. The matrix w is symmetrical, and according to the contract, the matrix always has a principal diameter with zero elements. The proximity matrix formed should be standardized, a conversion that is often used in applied work. A standardized matrix w is a matrix whose sum of its rows is equal to one, which is called the proximity of the first standardized proximity matrix.

After standardizing the proximity matrix, it is necessary to create a spatial delay variable by multiplying this matrix by each variable. The spatial delay variable shows the average observations from adjacent areas. One of the basic concepts related to spatial proximity is a spatial delay. Space delays are similar to reversing in time series analysis. Unlike the time domain, the spatial delay is the concept of transmission over space but is limited by constraints. These limitations arise when one tries to create similarities between time and space domains (Lesage, 1999). In spatial econometrics, space interdependence between observations can be assessed in four ways:

1. Spatial Autoregressive Model (SAR)
2. Spatial Error Model (SEM)
3. Spatial Autoregressive Error (SARMA)
4. Durbin Spatial Model (SDM)

The Durbin space model is more complete than the above models and is more suitable for estimating dynamic panel models, so it is used in this study, which is as follows.

A model with two explanatory variables is considered (Lesage, 1999):

$$y = x\beta + z\theta \tag{2}$$

It is assumed that the variable z is invisible and is included in the disruption sentences:

$$y = x\beta + \varepsilon \tag{3}$$

And the variable z also has a spatial interval of the dependent variable:

$$z = \rho W z + r$$

$$z = (I_n - \rho W)^{-1} r \tag{4}$$

r is the disruption term of the model.

$$y = x\beta + (I_n - \rho W)^{-1}(\theta r)$$

$$y = x\beta + (I_n - \rho W)^{-1} u \tag{5}$$

Thus, the sentence of the new disruption u is obtained from the product of θr.

$$u = x\gamma + v$$

$$v \sim N(0, \sigma_v^2 I_n) \tag{6}$$

By placing in the above equation, the following equation is obtained:

$$y = x\beta + (I_n - \rho W)^{-1}(x\gamma + v)$$
$$y = x\beta + (I_n - \rho W)^{-1}x\gamma + (I_n - \rho W)^{-1}v \quad (7)$$

With a simplification, the Durbin spatial model (SDM) is specified:

$$(I_n - \rho W)y = (I_n - \rho W)x\beta + x\gamma + v$$
$$y = \rho W y + x(\beta + \gamma) + Wx(-\rho\beta) + v \quad (8)$$

To specify the model, all of the above models are summarized in the form of a Spatial Dynamic Panel Data (SDPD) model and are shown in an equation:

$$y_{it} = \alpha + \tau y_{it-1} + \rho \sum_{j=1}^{n} W_{ij} y_{it} + \sum_{k=1}^{K} \beta_k X_{itk} + \sum_{k=1}^{K} \sum_{j=1}^{n} D_{ij} Z_{itk} \theta_k + a_i + \gamma_t + v_{it} \quad (9)$$

The model disruption component has three parts: the v_{it} intergroup disruption component, the γ_t intragroup disruption component and the a_i disruption component over time so that the total model disruption component is divided into three parts.

$$v_{it} = \lambda \sum_{j=1}^{n} E_{ij} v_{it} + u_{it} \quad i = 1, \ldots, n \quad t = 1, \ldots, T \quad (10)$$

where u_{it} is an error stating that is normally distributed. W is a spatial matrix. a_i indicates individual (cross-sectional) fixed effects or individual (cross-sectional) random effects. γ_t also shows the constant and random effects of time. If t = 0, the models will be static, and if t is 0, the models will be dynamic. That is, the delayed dependent variable will also enter the model, which will be the Spatial Dynamic Panel Data (SDPD) (Yu, Jong & Lee, 2008).

4.1. Research Model

According to the above, the model studied in this study will be as follows:

$$RE_{it} = \alpha + \tau RE_{it-1} + \rho \sum_{j=1}^{n} W_{ij} RE_{it} + \beta_1 GDP_{it} + \beta_2 INV_{it} + \beta_3 CR_{it} + \beta_4 INF_{it} + \beta_5 IR_{it} + \beta_6 UN_{it} + \beta_7 CO_{it} + \sum_{k=1}^{7} \sum_{j=1}^{7} D_{ij} Z_{itk} \theta_k + a_i + \gamma_t + \lambda \sum_{j=1}^{n} E_{ij} v_{it} + u_{it}$$
$$i = 1, \ldots, n \quad t = 1, \ldots, T \quad (11)$$

where, RE: housing rental prices (square meters of a building), GDP: Economic growth, INV: private sector investment in housing, CR: Housing facilities provided by the Maskan Bank, IR: Real interest rate, UN: Unemployment rate, CO: Cost per square meter of building, α: y-intercept, Index i: number of provinces and index t is the period studied.

5. Data analysis

5.1. Investigating the process of renting a house

Figure (1) shows the trend of average changes in housing prices during the years 2006 to 2015 in the country's provinces. In 2006, the average housing price was 19,214 Tomans, and in 2015, the average housing price was 54,526 Tomans. In this period, Tehran province had the highest average housing price equal to 113,603 Tomans and Yazd province had the lowest average housing price equal to 16,430 Tomans.

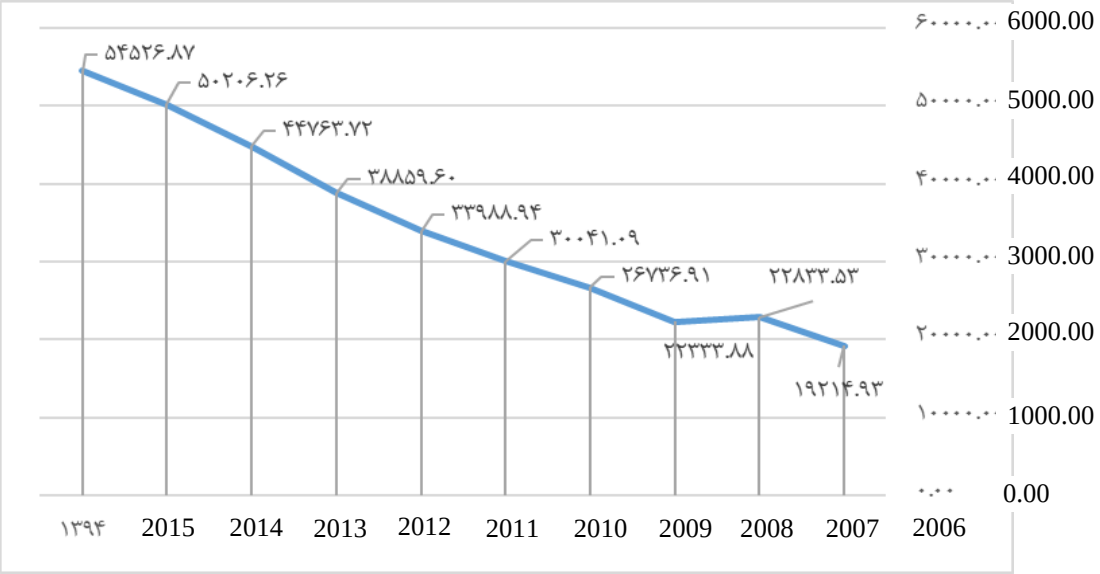

Figure 1. The Trend of Total Changes in the Average Rent of Housing from 2006 to 2015.
Source: research findings

5.2. Durability Test

To change the unit of measurement, the logarithm of the variables is used. The results of examining their durability using the Levin-Lin-Chu test are given in the table below.

Table 1: The results of the unit root test of the model variables

Variable	Test statistic	Probability	Result
Real interest rates	-12.25	0.000	I (0)
Rent	-14.93	0.000	I (0)
Housing facilities provided by Maskan Bank	-11.85	0.000	I (0)
Private sector investment in housing	-12.41	0.000	I (0)
The cost of one square meter of building	-9.97	0.000	I (0)
The unemployment rate	-4.73	0.000	I (0)
Economic Growth Rate	-11.86	0.000	I (0)

Source: research findings

5.3. Model Estimation

The results and findings of the model estimate can be seen in Table (2). According to the coefficients of the variables obtained from the model estimation, their results were interpreted.

Table 2. Estimates of Price Model Estimation by Estimating the Two-Step Coefficients of Arellano-Bover/Blundell-Bond (Spatial Dynamic Panel Data (SDPD)).

Variable	Coefficient	Statistic	Test probability	95% interval estimation	
lre (-1)*	0.0402	6.030	0.000	0.027	0.053

Lcr*	0.0043	2.570	0.010	0.001	0.008
linv	-0.0019	-1.140	0.254	-0.005	0.001
Lco*	0.5965	174.230	0.000	0.590	0.603
lun	0.0006	0.160	0.870	-0.007	0.008
lggdp	0.0012	0.250	0.806	-0.009	0.011
Lrir*	-0.1005	-7.450	0.000	-0.127	-0.074
Constant coefficient	0.1086	3.560	0.000	0.049	0.168
Durbin variables					
*w1x_lcr	0.0638	34.400	0.000	0.060	0.067
*w1x_linv	-0.0107	-3.000	0.003	-0.018	-0.004
w1x_lco	-0.0019	-0.370	0.712	-0.012	0.008
*w1x_lun	0.0857	10.730	0.000	0.070	0.101
*w1x_lggdp	-0.0373	-4.310	0.000	-0.054	-0.020
*w1x_lrir	-0.0787	-5.680	0.000	-0.106	-0.052

Source: research findings

Variables marked with * are statistically significant. According to these variables, the results are then examined for direct and indirect effects and the total that is presented in the table below, because using the SDPD model, the direct effect, overflow, and total effect can be separated from each other. The direct effect indicates the partial elasticity of housing prices in each province compared to the independent variables in the province itself and intra-provincial overflows, while the indirect effect indicates the effects of inter-provincial cumulative overflows and a slight increase in housing prices in each province relative to the change in variables in neighboring provinces.

- The direct and indirect effects of housing facilities granted on housing rental prices have become a totally positive and significant effect in each province, which is greater than the two direct and indirect effects. Therefore, increasing the housing facilities of the Maskan Bank, both within each province and in the neighboring provinces, will increase the price of housing, which will increase the price of housing within each province due to the increase in housing demand. On the other hand, the increase in housing facilities and prices in the neighboring provinces has caused the movement of capital to the neighboring provinces, and as a result, the decrease in its supply will increase the price of housing and its rent in the province.
- The direct positive, significant, indirect, negative, and insignificant effects of one square meter on housing rental prices have become the overall positive and significant effect in each province. Therefore, the price of housing and its rent is mainly affected by the price of materials in the province than by the price of materials in neighboring provinces. This is entirely justified by the cost of transportation.
- The direct positive, insignificant, indirect, positive, and significant effects of the unemployment rate on housing rental prices have become the overall positive and significant effect in each province. This is because the increase in unemployment in the neighboring provinces has led to migration to the neighboring provinces, which in turn leads to an increase in demand and prices and housing rental prices in the province.
- The direct positive, insignificant and indirect effects of negative and significant economic growth rates on housing rental prices have become a totally negative and significant effect in each province because due to the increase in purchasing power in the neighboring provinces, the migration of labor to those provinces has increased. As a result, housing demand in neighboring provinces has declined, resulting in indirectly lower housing rental prices.
- The direct and indirect effects of real interest rates on rental prices have become a totally negative and significant effect in each province, which is greater than the two direct and indirect effects. Therefore, by increasing the real interest rate, it will increase the price

of housing facilities, in other words, make the facilities more expensive for housing applicants, and as a result, the demand for housing will decrease. As a result, housing prices fall directly and indirectly, and consequently, housing rental prices fall.

- The first spatial interval of the dependent variable with a significance factor of 0.0402 indicates the dynamics of the model.

In the method of generalized spatial moments, to eliminate the correlation between the dependent spatial delay variable and error sentences, the interval of independent variables is used as a tool variable in the two-step Arellano-Bover / Blundell-Bond estimators. Therefore, the compatibility of Arellano-Bover / Blundell-Bond two-step estimators depends on the validity of the tools used in the estimate. Although there are no tests to determine whether the moment conditions of an exactly identified model are valid, the Sargan test can determine whether the overidentifying moment conditions are valid (Arellano and Bond, 1991). For this purpose, the Sargan test was used to evaluate the accuracy and validity of tools and to prove the validity of overdiagnosis. Only when the disruption sentences are inconsistent with the variance is inconsistent, the Sargan test is randomly distributed in chi-square distribution. In fact, Arlano and Band (1991) showed that the one-step test of Sargan, despite the variance of the heterogeneity, is more than over-rejected and that the distribution of "A" is not biased towards the distribution of chi-square (Baltagi, 2008) (i.e., the test power is assumed to be hypothetical Is the opposite and distribution is not standardized). The statistics of the Sargan test in the table below show the correct choice of instrumental variables used, the validity of the matrix of instrumental variables used in the model, and the absence of overidentifying restrictions in estimation. Thus, there is no significant correlation between instrumental variables and error sentence components.

Table 3. Specifications for Specifying Generalized Space Moment Models.

Test type	Coefficient	Probability
Parent test	460.890	0.000
Fisher F Statistics (13,257)	354.53	0.000
Raw Moments R^2	0.9994	-
Root MSE (Sigma)	0.0060	-
Over-identification of LM Sargan test	170.205	0.000

Source: research findings

The goodness of fit coefficients of the moment and the goodness of fit spatial coefficients indicate that the model is well defined and the fluctuations of the dependent space variables are able to explain the fluctuations of the dependent spatial variable.

5.3.1. Test for the Effects of Spatial Panel Autocorrelation

In generalized space moment models, three types of tests are used to have spatial effects. Spatial autocorrelation test for disruption sentences, spatial autocorrelation test for the first spatial interval of the dependent variable, and spatial autocorrelation test at the same time of the disruptive and intermittent variables of the dependent variable. The results show that the estimation of the above model without considering the spatial effects will lead to the sharpening of the estimated coefficients.

Table (4). Test of the effects of spatial panel autocorrelation

Test	Symbol	Statistic	Test probability	Result of the test

Spatial autocorrelation test for disruption terms				
Moran MI General	GLOBAL Moran MI	0.8175	0.00	Acceptance of the opposite hypothesis suggests that disruption terms have spatial autocorrelation.
General GC Gray	GLOBAL Geary GC	0.1686	0.00	
Gates-Orders General G0	GLOBAL Getis-Ords GO	-0.8175	0.00	
Moran MI Disruption terms	Moran MI Error Test	20.52	0.00	
LM (Burridge)	LM Error (Burridge)	408.13	0.00	
LM (Robust)	LM Error (Robust)	1.10	0.00	
Spatial autocorrelation test for the first spatial lag of the dependent variable				
LM lag (Anselin)	LM Lag (Anselin)	801.3	0.00	
LM Lag (Robust)	LM Lag (Robust)	1.13	0.00	
Simultaneous spatial autocorrelation test for disruption terms and spatial lag of the dependent variable				
LM SAC (LMErr + LMLag_R)		1.18	0.00	Simultaneous spatial autocorrelation

Source: research findings

5.3.2. Space Heteroscedasticity Test

As the results of Table (5) show, there is no spatial heteroscedasticity.

Table (5). Spatial Heteroscedasticity test in the Generalized Spatial Moment Model.

Test symbol	Test type	Test statistic	Test probability
Engle LM ARCH	Angle	3.7452	0.5530
Hall-Pagan LM	Hall - Pagan	0.2270	0.6638
Machado-Santos-Silva Test	Machado-Santos-Silvia	3.5458	0.1698
Cook-Weisberg LM Test	Cook - Wisberg	0.2931	0.5882

Source: research findings

5. 4. General results and suggestions

Housing, as a durable real estate, is a capital product that is more profitable in the long run than other forms of investment and, along with the lack of a proper social security system, has become a source of household income in old age and disability. On the other hand, considering the high share of housing rental prices in the household consumption basket, it is very important to study the effective parameters in it. In this study, due to the lack of sufficient financial resources for households in Iran, households must provide the necessary resources to provide housing through borrowing. One of the largest financial intermediaries in this regard is Maskan Bank, which is specialized in this field. Therefore,

in this study, to determine the effect of housing facilities granted on housing rental prices in 2006-2015, due to the inhomogeneity of the housing market in all provinces, economic variables such as Maskan Bank grant facilities, private sector investment, inflation rate, economic growth, unemployment rate, real interest rate and cost per square meter based on housing rental behavior in Iranian provinces were examined using the dynamic spatial Durbin econometric method. Because the housing market is not homogeneous and the evidence shows that the housing market should be viewed regionally. The national look to the housing sector can be accompanied by major errors in analyzing the housing market and its price fluctuations.

According to the results, the direct and indirect effects of housing facilities granted on housing rental prices have become a positive and significant overall effect in each province, which is greater than the two direct and indirect effects. Therefore, by increasing the housing facilities of the Maskan Bank, both inside each province and in the neighboring provinces, it will increase housing rental prices. This will increase housing prices and consequently housing prices in each province due to the increase in housing demand. On the other hand, the increase in housing facilities and prices in the neighboring provinces will cause capital to move to the neighboring provinces. As a result, reducing its supply will increase housing prices, resulting in higher rents in the province. On the other hand, the increase in housing prices in neighboring provinces due to the increase in facilities will create expectations for price increases in each province, and suppliers will increase housing prices in any amount. This, in turn, increases housing rental prices. It is noteworthy that, firstly, the direct effects of price increases due to the increase in housing facilities are much less than the indirect effects, and secondly, the indirect effects of Maskan Bank facilities are much greater than other variables. This indicates the importance of the effectiveness of this variable. Therefore, it is suggested that in the case of inflationary conditions, the number of facilities granted by the Maskan Bank to control housing rental prices be reduced. Also, in the recession, it should be noted that the increase in housing facilities in each province has little effect on housing rental prices in the same province, but will increase it further in other neighboring provinces. Therefore, the plan to increase housing facilities is suitable for provinces where housing rental prices are lower in their neighboring provinces to maintain their welfare level than in neighboring provinces.

On the other hand, the real interest rate on housing rental prices has a decreasing effect, the direct effect of which is much greater than the indirect. Because the increase in real interest rates in the province compared to neighboring provinces in Iran is mainly due to differences in provincial inflation rates. Therefore, the increase in real interest rates in neighboring provinces is due to lower inflation in the provinces. This will lead to an increase in reverse migration and lower rents in the province. On the other hand, increasing it within each province will make the facilities more expensive and reduce the demand and price of housing, and consequently housing rental prices.

Therefore, to reduce the effects of increasing rents due to the increase in facilities in neighboring provinces, it is possible to increase the real interest rate in the province, which can be done by increasing the facility rate in this province.

Acknowledgments

References

[1] Jahanmard, Javad (2010). Economic indicators of housing. Thought, pp. 1-3.
[2] Hosseini, Maryam Sadat (2006). Endogenous and extrinsic factors of housing prices. Journal of Development Economics, No. 13, pp. 22-20.
[3] Khalili Iraqi, Mansour. (2012). An Introduction to the Housing Economy. Tehran: University of Tehran.

[4] Good-natured Rahman, Farahmand Shokoofeh, Gharakhani Salman, Gharakhani Dehsorkhi Sasan, (2016), Estimation of housing supply function in cities and villages of Isfahan province (1991-2011), Urban Economics, Volume 1, Number 1 # b00194; From page 37 to page 53.
[5] Soheili, Kiomars; Fattahi, Shahram; Oveyssi, Bahman (2014). Investigating the Factors Affecting Housing Price Fluctuations in Kermanshah., Quarterly Journal of Economic Research, Volume 14, Number 2, Page 6
[6] Asgari, A. And Akbari, N. (2001). Space Economics Methodology, Theory and Application., Journal of Humanities Research, (12), 93 - 122.7-41.
[7] Issapour, Mohsen (2018). Investigating the factors affecting the housing rental market. Analysis of the housing market.
[8] Kamyab, Hamid Reza (2011). Investigating the factors affecting the housing market in Iran. Land and Housing, pp. 8-1.
[9] Nademi, Younes, Ramin Khochiani (2018). Investigating the Relationship between Housing and Some Macroeconomic Variables of Iran: Mojak's Empathy Approach. Quarterly Journal of Econometric Modeling, Year 2, Issue 4, pp. 106-85.
[10] Anselin, L. (1988). "*Spatial Econometrics: Methods and Models*", Dord drecht: Kluwer Academic Publishers.
[11] Arellano, M. and S. Bond (1991). "*Some Tests of Specification for Panel Data: Monte Carlo Evidence and an Application To Employment*", Review Econic Study, 58.
[12] Baltagi, B. H. (2008). "*Econometric Analysis of Panel Data*", John Wiely and Sons Ltd.
[13] Baltagi, B. H., and G. Bresson (2011), "Maximum Likelihood Estimation and Lagrange Multiplier Tests for Panel Seemingly Unrelated Regressions with Spatial Lag and Spatial Errors: An Application to Hedonic Housing prices in Paris", Journal of Urban Economics, 69(1), 24–42. https://doi.org/10.1016/j.jue.2010.08.007.
[14] Benito, A. (2006). The Down –Payment Constraint and UK HousingMarket: Does The Theory Fit The Facts? Journal of Housing Economics, 15(1), 1-20
[15] Blackley, D. (1999). The Long-run Elasticity of New Housing Supply in The United States. Journal of Real Estate Finance and Economics, 18(1), 25- 42.
[16] Briscoe, S. (2007), Editorial: House price indices, Journal of the Royal Statistical Society: Series A (Statistics in Society), 170(1):1-3.
[17] Kim, K. H. (2004), Housing and the Korean economy, Journal of Housing Economics, 13(4): 321-341
[18] Lesage, J. (1999). "*Spatial Econometrics*". Department of Economics University of Toledo.
[19] Lesage, J. & K. Pace (2009), Introduction to Spatial Econometrics, Taylor and Francis Group.
[20] Pealinck, J.H.P., & Klaassen, L.H. (1979). *Spatial Econometrics*. Farnborough: Saxon House.
[21] Yu, J., Jong, R. & Lee, L. (2008). "Quasi Maximum Likelihood Estimators for Spatial Dynamic Panel Data with Fixed Effects when both N and T are Large". *Journal of Econometrics*, 146(1), 118-134.
[22] Torben K. (2016), The nexus between housing and GDP re-visited: A wavelet coherence view on housing and GDP for the U.S, Economics Bulletin, 36(2): 704-720.