

Spatial Spillover Effects of The Real Estate Industry on Economic Development -from Destocking Perspective

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Abstract: Based on the statistical data of 31 provinces of China from 2005 to 2015, A spatial lag model is applied to study the Spatial Spillover effects of the real estate industry on economic development. The results show that: the real estate stocks have a significant negative effect on regional economic development; Due to the economic downturn, the real estate investment and total investment in fixed assets continue decreasing, the descending speed of the former is faster than the latter. The real estate industry will, through its accounts for a high proportion of the total social investment, further through the accelerator effect, drag on economic growth; The increase of average price plays a positive significant role in boosting the development of regional economy in recent years; The profit rate of the real estate industry continues declining, and despite a further increase in the added value of real estate industry, it is not enough to significantly promote regional economic development. Therefore, to formulate effective policies can make the relationship more balanced between supply and demand of real estate, and can make real estate investment structure and inventory more reasonable, in order to make economic growth more stable.

1. Introduction

At present, China's economy has been in a critical period of economic transformation, upgrading and structural adjustment. The rate of economic growth has gradually slowed down, and the excess production capacity caused by the backlog of multiple industry products has become an important factor that restricts the further development of China's economy. By the end of 2015, China's commercial housing sales amounted to 720 million square meters, the inventory cycle was up to 30.2 months, indicating that China's real estate inventory was at a high level. In the macroeconomic environment where the downward pressure on the economy continues to increase. Will the large amount of real estate inventory affect the healthy development of the economy?

As an important sector of the national economy, Real estate itself is a part of the economic development. Therefore, the healthy development of real estate will contribute to the sustained development of the economy. Previous studies have supported this conclusion. Coulson and Kim



found that short-term fluctuations in housing investment had a more important impact on the national economy, and its strong changes will lead to instability on the national economy^[1]. Huang and Wu, from the national level research, found that real estate investment can cause economic growth^[2]; from the regional level, real estate investment not only can promote and enhance the economic growth in the region, but also can it promote economic growth in other areas^[3], and the contribution and influence of China's real estate investment on the regional of economic is greatly different^[4-5], the eastern region is the highest, followed by the central region, the western region is the least^[2], which are evidences that real estate investment can lead to economic growth.

But at the same time, the development of real estate may have adverse effects on economic growth. Shen using the spatial panel model, shows that the development of China's real estate industry has a promoting effect on the financial stability of the eastern and western regions, but real estate's inventory is not conducive to the China's financial stability^[6]. Han using the PVAR model, through the 31 provinces of China's macro data research, found that the real estate inventory has a negative impact on economic growth, real estate investment and housing prices^[7]. Since 2014, the real estate investment continued to decline, which has a negative impact on related consumption growth, economic development pulled by the real estate prosperity stage is over^[8].

China's economy has entered a new normal context, Real estate high inventory problems caused by blind investment in real estate are urgent to be solved. As can be seen from the existing research, quantitative research on the impact of real estate inventory on regional economics are scarcely involved. In addition, most scholars present the research from the whole country and one city's perspective, but ignore the regional own characteristics of the real estate industry.

Since 2015, the government has introduced a lot of inventory policies, but the stock of real estate remains still high, and the stimulating effect is not obvious. By introducing spatial weight into traditional OLS regression, analysis is extended to two dimensions-space and time, we study the spatial spillover effects of the real estate inventory on regional economic development. This is of great practical significance for solving the high inventory of real estate, to promote the healthy development of the real estate market, and to coordinate the regional economic development. The remainder of this paper is organized as follows: the second part introduces main data source, variable selection and model construction; the third part analyzes the model estimation and results; The fourth part draws conclusions and gives policy recommendations.

2. Methodology

In this section, considering the existence of spatial correlation among China's provincial economy development, it is necessary to test its spatial correlation. Spatial autoregressive model (SLM) is a popular model, which is used to study on interdependence in neighboring regions. The behavior of the regions within the system has an impact on each other and ultimately results in a balanced outcome, that is to say, the behavior of one region affects the behavior of the surrounding area, and the behavior of the region is eventually formed by the influence of the behavior of the surrounding area. Its mathematical expression is as follows:

$$y_{it} = \rho \sum_{j=1}^N W_{ij} y_{jt} + X_{it} \beta + \varepsilon_{it} \quad (1)$$

Where Y is the dependent variable vector, W is the spatial weight matrix, ρ is the spatial autoregressive coefficient, X is the explanatory variable vector, β is the regression coefficient vector, ε represents stochastic disturbance term vector.

3. Variable selection and data source

3.1 Data description

The data are mainly derived from China Statistical Yearbook, Statistical Yearbook of Provinces, Regional Statistical Yearbook of China and Wind database. The regional economic development level

mainly includes GDP, local fiscal revenue, fixed assets investment, per capita net income of farmers, urban residents' disposable income and the proportion of the three industries; The real estate industry level includes real estate inventory and real estate industry representative index. From 2005 onwards, the country has begun to control the real estate industry, the "eight" and "six" regulations have been promulgated, and then national and local government gradually has begun to adjust real estate industry market, and has introduced a number of regulations and policies, so the time window is from 2005 to 2015.

3.2 Variables selection

The variables selected in this paper include the level of regional economic development, real estate inventory in various regions and the related indicators affecting the development of real estate industry.

3.2.1 Regional economic development level

Adopted Yang's method of measuring China's regional economic development^[9], Table 1 shows comprehensive evaluation index system of regional economic development level, CD represents comprehensive index of economic development.

Table 1 Comprehensive Evaluation Index System of Regional Economic Development

Index	Code	Unit	Property	Weight
GDP	a1	Billion	+	0.1393
Per Capital GDP	a2	Yuan/person	+	0.0680
Local fiscal revenue	a3	Billion	+	0.1599
Fixed assets investment	a4	Billion	+	0.1428
Retail sales of social consumer goods	a5	Billion	+	0.1574
Balance of deposits of financial institutions	a6	Billion	+	0.1738
Per capita net income of farmers	a7	Yuan/person	+	0.0557
Urban residents' disposable income	a8	Yuan/person	+	0.0956
Proportion of output value of third industry	a9	Percent	+	0.0075

3.2.2 Real estate inventory

The definition of the real estate inventory in existing literature is few. Follow Han Guogao's definition of real estate stock^[7] and defines it as dividing the construction area by sales area of commercial buildings in each province. Use kc to represent real estate stocks. The greater the value is, the higher the real estate inventory will be.

3.2.3 Control variables

The control variable selects the representative index that influences the development of real estate industry. Indicators take ratio form, so that it can reflect the reasonable structure of the real estate industry, and eliminate the impact of the consumer price. Among them, reir represents the dividing real estate industry added value by GDP, reif represents dividing real estate investment by social total investment, ap represents average price of commercial housing.

4. Model construction and empirical analysis

Set up SLM model, formula (2):

$$CD_{it} = \alpha_0 + \alpha_1 kc_{it} + \alpha_2 reir_{it} + \alpha_3 refi_{it} + \alpha_4 ap_{it} + \rho \sum_{j=1}^N W_{ij} CD_{jt} + \varepsilon_{it}$$

$$\sum w_{ij} CD_{jt}$$

is the spatial lag term, ρ is the coefficient of spatial lag correlation, ε_{it} Represents a random disturbance term.

4.1 Calculation of regional economic development level

The level of regional economic development is calculated by the method of comprehensive evaluation, to start with, which needs to determine the weights. The common methods of determining weights are subjective and objective weighting methods. Considering that there are great differences among different regions, it is difficult to make a uniform assignment by subjective weighting method. Therefore, The entropy weight method is adopted. In order to compare between different years, we adopt Yang's improved entropy method^[9], which adds the time variable into this method, making the analysis results more reasonable.

4.2 Spatial correlation analysis

4.2.1 Global spatial autocorrelation

The spatial autocorrelation test of regional economic development was carried out by using Arcgis and GeoDa software. Firstly, the spatial weighting matrix of 31 provinces is constructed. In this paper, R (Rook Contiguity) method is adopted to establish the 0-1 spatial weight matrix (31 * 31). In order to eliminate the island effect of Hainan Province, Hainan was set up to be adjacent to Guangdong province. Then, we calculate the overall Moran I index of China's regional economic development during 2005-2015 years. Table 5 shows the global Moran I index is positive and significant at 1% confidence level, which indicates that the level of regional economic development in China has significant spatial agglomeration effect on Geography: Provinces of high economic development level are central to high level.

Table 2 Moran'I Index of Regional Economic Development in 2005 -2015 Years

year	2005	2007	2008	2009	2010	2011	2012	2013	2014	2015
Moran I	0.343	0.344	0.344	0.336	0.336	0.328	0.321	0.316	0.348	0.334
Z value	3.573	3.271	3.371	3.286	3.336	3.164	3.148	3.126	3.394	3.151
P value	0.002	0.003	0.003	0.008	0.003	0.005	0.004	0.006	0.003	0.006

4.2.2 Autocorrelation test of local space

In order to further demonstrate the level of regional economic development, spatial agglomeration is tested by the local spatial correlation. Figure 1 shows the LISA agglomeration of regional economic development in 31 provinces in 2005 and 2015. The dark area is H-H, which belongs to the province of high economic level spatial lag area, slightly light area is L-L, which belongs to the low level spatial lag area, the provinces of which belongs to negative cluster region with low economic level. Provinces of higher economic level are adjacent to each other, the eastern coastal areas are with higher economic level; Western regions are relatively lower; The central areas do not show significantly cluster. See from the trend, the overall spatial pattern has not changed greatly, which indicates that regional economic level in different provinces exist spatial correlation. If the spatial correlation is not taken into consideration, it will inevitably lead to deviation of estimation.

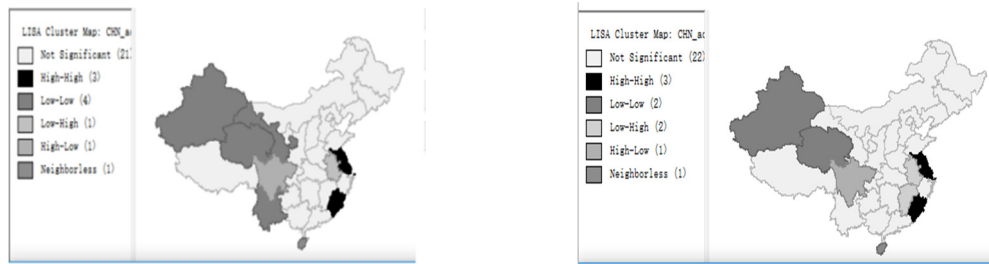


Figure 1 LISA Concentration Diagram of Regional Economic development in 2005 and 2015 years

4.3 Space panel econometric analysis

The regional economic development level, real estate industry data and the spatial weighting matrix are introduced into Stata12.0 software. Spatial fixed effect, Time fixed effect and both fixed effects are estimated respectively. The estimation results are shown in Table 3.

Table 3 shows individual effect, time effect and both effects of the SLM model were all significant at the 1% confidence level, indicating that the real estate inventory on the regional economic development has obvious spatial spillover effect. In the both fixed effect model, the Hausman test showed that original model was rejected at the significant level of 1%, so fixed effect model was better than random effect model. Moreover, the log likelihood of both fixed model is the highest. We combine the data characteristics and practical significance, the estimation results of both fixed model are chosen.

Table 3 The Estimation Results of Fixed Effects of SLM Model

	variable	Spatial fixed effect	Time fixed effect	Both fixed effect
Main variable	kc	-0.007***	-0.011	-0.013***
		(2.692)	(-1.975)	(-3.929)
Control variable	reir	0.508	-3.832***	0.312
		(1.195)	(6.084)	(0.777)
	refi	-0.256***	-0.329***	-0.196***
	ap	0.155***	0.152***	0.091***
		(5.930)	(4.758)	(3.423)
	ρ	0.512***	0.002***	0.201***
		(10.653)	(0.043)	(3.305)
	σ^2	0.002***	0.010***	0.002***
		(12.816)	(13.058)	(13.007)
	R^2	0.4515	0.210	0.008
	Log-Likelihood	548.8971	305.6937	592.1909
	Hausman test	-0.09	49.85***	126.98***
			(prob>chi=0.0000)	(prob>chi=0.0000)

“***、**、*” respectively represents 1%、5%、10% significance level.

Through estimation results of both fixed model, further analysis found that the real estate inventory coefficient is -0.013, which is significant at 1% level, indicating that the higher the real estate inventory is, which is not conducive to the promotion of regional economic development. In the short term, the inventory pressure is too large, and it will take a certain period to digest the established stock. Real estate stocks may cause negative effects as follows: (1) Because the real estate companies mainly use credit funds for the operation of real estate, the existing inventory is too high and occupies large

funds, which lead to long payback period, so the use value is too high, resulting in new real estate underemployment rate, the new investment is at a low level, there are obvious negative effect on stimulating regional economic development. (2) Due to the presence of a large number of real estate stocks, although the government issued a number of related policies, the stock structure of real estate can not be quickly adjusted to a reasonable interval, which in turn result in total high supply. Consumer spending and consumption tendency have not changed, so the short-term supply and demand sides cannot form the benign interaction. (3) The real estate industry chain is length and strong relevance. As real estate inventory is too large, first of all, investment of the real estate reduces, which in turn reduces related downstream industry demand and has impact on related industries, leading to a negative effect on regional economic development; Secondly, the reduced investment of real estate will produce negative impact on the other industries, in order to deal with the real estate of unwanted inventory, making other industries actively reduce production.

The coefficient of the control variable *refi* is significant at the confidence level of 1%, with an estimated value of -0.196. It shows that the increase of *refi* is negative to regional economy. As shown in Figure 2, the real estate and total investment in fixed assets due to the economic downturn continues to decline, the formal rate is declining larger than that of the latter, the real estate through its high accounts for proportion of the total social investment, further through the accelerator effect, will drag on economic growth. The increase of *AP* has a positive effect on regional economy. Under normal circumstances, general goods and services prices accounted in CPI, which will be deducted from the factors in the actual GDP statistics, but housing prices which account for high total domestic consumption will not be included in CPI, *AP* average price increase will boost regional economy. There exists a certain lag, house prices increase will promote the rent and other housing consumption costs, and will increase price of durable consumer goods and services by stimulating home appliances and decoration services. Moreover, Although housing price is high, investors still take optimistic attitude towards it. Because the channel of investment is limited, real estate has become a good investment tool. The real estate industry added value accounted for the proportion of GDP (*reir*) coefficient is not significant. This may be because the golden age of the real estate industry has gone, the profit rate of the real estate industry continued to decline, which means the real estate industry do not have enough driving force to stimulate the development of regional economy.

4.4 Robustness test

In order to ensure the reliability of the estimation results, this paper tests the robustness by changing the spatial weights. The spatial weight of the robustness test is the reciprocal of the shortest distance between two provinces.

Table 4 Space and Time Fixed Robustness Test

Variable	Both fixed effects (0-1 matrix)	Both fixed effects (reciprocal of the shortest distance between two provinces)
<i>kc</i>	-0.013*** (-3.929)	-0.014*** (-4.197)
<i>reir</i>	0.455 (1.135)	0.455 (1.135)
<i>refi</i>	-0.196*** (-3.408)	-0.161*** (-2.838)
<i>ap</i>	0.091*** (3.423)	0.106*** (4.111)
ρ	0.201*** (3.305)	0.429*** (3.116)

σ^2	0.002*** (13.007)	0.002*** (12.916)
R^2	0.008	0.05
Log-Likelihood	592.1909	591.0687

The estimation results show that the estimated coefficients of each variable are similar, and the significance levels and symbols do not change, which shows that the model is robust and the results are reliable.

5. Main conclusions and policy recommendations

Real estate inventory has a significant negative effect on regional economic development. The existing real estate inventory is too high and occupies huge funds, while consumer consumption trend has not changed, the imbalance between supply and demand lead to the the negative impact on regional economy; Real estate industry chain is long and has strong relevance, which further reduce the level of regional economic development of other industries; As a result of the economic downturn, the amount of investment in real estate and fixed assets continue to decline, which will decline economic development; The increase in average housing price has a positive effect on the regional economy; As the real estate industry continues to decline in interest rates, with the real estate industry added value increasing, which can not significantly promote economic development.

The supply structure of real estate should be adjusted. For the high real estate inventory in third and fourth-tier cities, land transfer should reduce; government can come forward to buy real estate, transform them into low rent housing, and make the real estate supply structure more reasonable; Combine with the local real estate situation, make suitable local real estate policy and discuss with real estate developers to set down the bottom line of real estate price, break consumer further expectations of reducing price. These policies in the long term can play an effective role. In the short term, the local government according to local conditions, adjust real estate market structure, let the market mechanism play a decisive role in high real estate inventory regulation.

Reference:

- [1] Coulson N E, Kim M S. Residential Investment, Non-residential Investment and GDP [J]. Real Estate Economics, 2000, 28(2):233-247.
- [2] Huang Zhonghua, Wu Cifang, Du Xuejun. The Real Estate Investment and Economic Growth -- Based on the National and Regional Panel Data[J]. Finance and Trade Economics, 2008 (8): 56-60.
- [3] Zhang Hong, Jin Jie, Shi Quan. Real Estate Investment, Economic Growth and Spatial Effect—An Empirical Research Based on the Spatial Panel Data from 70 Cities in China[J]. Nan Kai Economic Research, 2014 (1): 42-58.
- [4] Lu Juchun, Jia Ziwu, Tian Hongfen. Research on Regional Disparity of Real Estate Investment and Economic Growth in China[J]. Journal of Wuhan University of Technology, 2008, 30 (6): 959-963.
- [5] Luo Guoyin. Different Contribution of Real Estate Investment to Regional Economic Growth -- Based on Panel Data Analysis[J]. Search, 2010 (9): 50-51.
- [6] Shen Bo. the Influence of Real Estate Industry on Regional Financial Stability in "Destocking" Perspective-An Empirical Study Based on Spatial Panel Model [J]. Journal of He Bei University of Economics and Business, 2016, 37 (3): 61-66.
- [7] Han Guogao. the Influence of Real Estate Stocks on China's Real Estate Market and Economic Growth Based on PVAR Model [J]. Management Modernization, 35 (1): 16-18.
- [8] Zhu Jianfang. The Drop of Real Estate Investment Affect Economic Growth [J]. Market Observation, 2014 (1): 44-45.
- [9] Yang Li, Sun Zhichun. The Development of Western New—Type Urbanization Level Evaluation Based on Entropy Method [J]. Economic Problems, 2015 (3): 115-117.

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