Research about The Linkage Effect of Real Estate Industry in Resource-based Cities

—— Taking Ordos as an example

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Abstract. Resource-based cities is the key battleground to promote the new industrialization and urbanization in our country. But with the excessive growth, resource-based cities meet overcapacity, which makes the resource-based cities meet the bottleneck of sustainable development. This thesis set Ordos as an example, grey relational degree method is used to study the linkage effect of real estate industry to analyze and get the relationship between real estate industry and some other industries in resource-based cities , and give proposals to promote real estate development and regional economy development in resource-based cities.

1 Introduction

Resource-based cities is a kind of special city. Its rise and fall shows a strong dependence to the local resources. The real estate industry in resource-based cities, rises to the prosperity of resources, and down to the exhaustion of resources also. Real estate is one of the basic industry in an area, but also is the leading industry in regional economy development. Because of the chain length and the lateral associate degree, real estate becomes the leading industry and pillar industry in an area, also real estate affects the development of other local industries and promotes the optimization of industrial structure. In an ordinary city, more than 50 industries are estate-related . World Bank analyzed the driving effect of real estate industry in 1994 [1], concluded: if increased $ 10 billion in residential building investment, it will drove demand for 17-22 billion US dollars; if sold $ 10 billion of commercial real estate, 13-15 billion US dollars of other commodities will be sold. Real estate's demand-driven coefficient is big. The development environment of real estate in Resource-based city is special, its linkage effect behaves different from other cities. In this paper, Ordos is setup as an example, to study the development relationship between real estate and other industries in resource cities to provide a theoretical reference for the resource-based city development plan.

2 The development situation research of real estate in resource-based cities and the problems.

2.1 The development situation research of real estate in resource-based cities

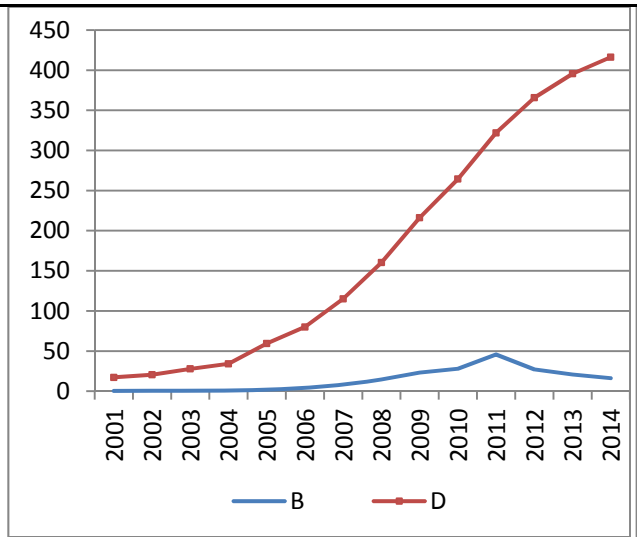
Actually the formation of resource-based cities is the result of transformation of urban functions. These cities existed long ago, in a particular era, depend on development and utilization resource, resource-based cities rapidly rose. Ordos is one of the 18 typical regions in 30 years reform and opening up , the first batch of demonstration base in resource utilization "double hundred projects". It is highly representative in China and the world's resource-based urban.

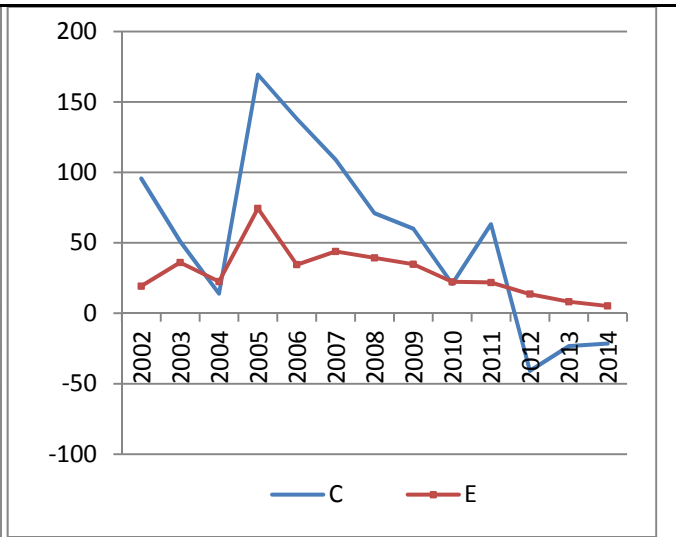
Before 2000, Ordos' economic developed very slow. Since 2000, with the westward movement of the national energy strategy, Ordos' economy and real estate industry developed rapidly. 2001-2011, Ordos' City GDP rose from 17.18 billion yuan to 321.85 billion yuan with a 34.87% annual growth rate. Real estate investment increased from 190 million yuan to 45.78 billion yuan, with a rate of 79.23% annual growth. In 2008, the global financial crisis broke out, the growth of economic and real estate in Ordos slowed down, but the growth rate is still impressive. 2011-2012,

Ordos' real estate investment decreased from 45.78 billion yuan to 27.09 billion yuan in a negative growth rate of 40.8%. Accordingly, real estate accounted for the proportion of GDP reduced. 2012 to this day, GDP growth rate in Ordos has been declining, while the growth rate of the real estate has been negative.

Table 1：The situation of Ordos' real estate investment and GDP [2]

A	B	C	D	E	F
2001	0.19	-	17.18	-	1.1
2002	0.37	95.7	20.48	19.2	1.8
2003	0.56	51.1	27.85	36.0	2.0
2004	0.63	13.9	34.11	22.5	1.9
2005	1.71	169.4	59.48	74.4	2.9
2006	4.06	138.1	80.00	34.5	5.1
2007	8.49	109.1	115.09	43.86	7.4
2008	14.52	71.0	160.30	39.3	9.1
2009	23.23	60.0	216.10	34.8	10.7
2010	28.05	20.8	264.32	22.3	10.6
2011	45.78	63.2	321.85	21.8	14.2
2012	27.09	-40.8	365.68	13.6	7.4
2013	20.76	-23.4	395.59	8.2	5.2
2014	16.30	-21.5	416.22	5.2	3.9





note: (1) A stands years

B stands total investment in real estate development/(1 billion yuan)

C stands growth rate of real estate investment/%

D stands gross regional product/(1 billion yuan)

E stands growth rate of gross regional product/%

F stands proportion of real estate investment in gross regional product/%

(2)Data is from the Statistical Yearbook of the calendar year in Ordos

The data in Table 1 show that real estate investment accounted for the regional economy in the proportion is increasing during the development of Ordos. And in the process of local economic growth, the increases and decreases of real estate investment is sensitive than the gross of city GDP.

2.2 Problems of real estate development in resource-based city.

Resource-based city owned lots of natural resources. This resources can quickly drive real estate market and the whole city prosperity. But the single development model has led many problems in real estate development. Firstly, Real estate structure is onefold. The economy in resource-based city usually shows explosive growth. Behind the rough development of the economic development is the rough development of the city. In the start of real estate, the pre-pull function of realty can stimulate the development of economy and society. But resource-based city's industry structure is to

simple to investment. With a higher rate of profit on real estate investment, the price of realty rises and attracts more investors. This leads the expansion of real estate's development, resulting in the imbalance of industrial structure. Secondly, investment in resource-based city is irrational, supply and demand imbalance. From 2001 to 2011, GDP in Ordos had grew 18.73 time, but the real estate investment had grew 148 times. Some scholars estimated that in 2012 each person owns about 10 houses in Ordos. Even in 2011, the real estate investment growth rate in Ordos becomes negative but the local vacancy rate remains high. According to statistics, by early 2014, there are 40,000 houses in Ordos was on sale. Mayor of Ordos said: Ordos will no longer build new house in the next three years. Thirdly, legal of real estate market is imperfect in resource-based city. Because of the rapid development, there was no chance to improve market monitoring mechanism. At the beginning of urban development, resource-based city developed good, attracted the entrepreneurs who pursuit of high profits . Formal financial funds was no longer to afford the market's demand. Then real estate developers turned to private lending[4]. This irregular financing model, not only accelerated the real estate bubble burst, but expanded the risk to the whole community.

3 Construction and Analysis of Mathematical Model

3.1 Construction of Mathematical Model

Since the 1950s, as the developing countries accelerated the pace of industrialization, associate research during industries has been concerned by the academic and executive in government [5]. Many methods have been used to study linkage effect. Common methods are input-output model, gray correlation model and granger causality test model. In this thesis grey relation analysis method [6] proposed by Professor Julong Den is used to study the correlation effect of real estate in resource-based cities.

Correlation effects of real estate in each regional are difference. The variation of real estate investment and GDP is quite different among eastern, central, western area in our country. Based on inducing action of real estate investment ,Qiming Li (2002) calculated the linkage effect of real estate and other industries. Inferred that the greatest induced effects on real estate is construction and manufacturing [7], followed by is commercial, real estate itself, electricity, gas water supply industry etc. Combined with other scholars' research and development in Ordos, this thesis selected X_0 ,real estate, as reference sequence. And choose X_1 mining，X_2 manufacturing，X_3 electricity, gas and water production and supply industry，X_4 construction，X_5 transportation, storage and postal services，X_6 information transmission， computer services and software industry, X_7 leasing and business services，X_8 scientific research, technical services and geological prospecting industry，X_9 resident services and other services industry as comparative sequence.

Analyzing Grey relational as follows：

3.1.1 Determine the reference sequence and comparative sequence

According to research needs, assuming that there are j evaluation factors under i index that the system studies, which constitute the following original matrix.

$$X_i^j = \begin{vmatrix} X_1^1 & X_1^2 & \cdots & X_1^n \\ X_2^1 & X_2^2 & \cdots & X_2^n \\ \cdots & \cdots & \cdots & \cdots \\ X_m^1 & X_m^2 & \cdots & X_m^n \\ X_0^1 & X_0^2 & \cdots & X_0^n \end{vmatrix} \quad \begin{matrix} \text{i=1,2,3, …,m} \\ \text{j=1,2,3, …,n} \end{matrix} \qquad (1)$$

In formula (1), set up the reference sequence and comparative sequence. Assuming that: the reference sequence is $X_0^j, j = 1,2,3,...,n$; and the comparative sequence

is $X_i^j, i = 1,2,3,...,m, j = 1,2,3,...,n$.

3.1.2 Raw data initial value transformation:

To eliminate the influence of the original data dimension, and make it comparable, the raw data preprocessing is done, considering the economic development irrationality in resource-based city, this paper uses the initial value transformation for processing, and makes the index of each reference with the same starting point.

After convert the initial value, and calculation formula is:

$$X_i^{'j} = X_i^j / X_i^1 \quad (2)$$

3.1.3 Absolute difference sequence

Get the difference sequence of reference sequence and comparative sequence, and the computation formula is as follows:

$$\triangle_0^i = \left| X_o^{'j} - X_i^{'j} \right| \quad (3)$$

According to Formula (3) the minimum and maximum of each difference sequence can be concluded that:

$$\triangle_{\min} = \min_{i,j} \left| X_o^{'j} - X_i^{'j} \right| \qquad i=1,2,\ldots,m;j=1,2,\ldots,n \quad (4)$$

$$\triangle_{\max} = \max_{i,j} \left| X_o^{'j} - X_i^{'j} \right| \qquad i=1,2,\ldots,m;j=1,2,\ldots,n \quad (5)$$

3.1.4 The calculation of grey correlation degree

(1) $X_i^{'j}$ grey relation coefficient is as follows:

$$\zeta(j) = (\triangle_{mix} + \rho \triangle_{\max}) / (\triangle_0^i + \rho \triangle_{\max}) \quad (6)$$

In which: $\rho \in [0,1]$ is resolution ratio, and here selects 0.5.

(2)Calculate grey correlation degree:

$$\gamma_i = \frac{1}{n} \sum_{j=1}^{n} \zeta(j) \quad (7)$$

3.1.5 Relational degree taxis

In order to see the grey correlation degree of reference sequence and comparative sequence, the correlation degree must be sorted from big to small. Assuming that γ_a is the maximum, the corresponding industry for γ_a has the greatest influence on reference industry; assuming that γ_k is the minimum, the corresponding industry for γ_k has the least influence on reference industry.

3.2 Data interpretation and analysis

The history data of the Ordos' real estate industry and related industry investment from Ordos' statistical yearbooks are as shown in table 2.

Table 2 History data of the Ordos real estate industry and related industry investment unit: one hundred million yuan

Industry	2009	2010	2011	2012	2013	2014
X_1	377.400	416.200	323.300	308.400	551.000	641.300
X_2	300.000	388.600	679.300	1108.500	1302.900	1561.200
X_3	136.800	118.900	119.300	120.800	251.600	281.100
X_4	2.100	21.980	28.900	4.200	9.300	25.020
X_5	182.200	238.300	215.300	313.400	232.400	192.600
X_6	1.300	10.500	10.100	4.700	4.600	48.200
X_7	4.300	3.830	35.900	5.100	11.900	7.523
X_8	1.400	1.200	2.100	3.200	11.800	7.551
X_9	1.200	2.700	1.900	12.300	5.370	20.687
X_0	232.300	280.500	457.800	270.900	207.600	162.954

From the foregoing: the way to calculate the correlation degree between real estate and other industries is as followings: Firstly, using formula (2) to transform the initial value in the matrix table 2; Secondly, formula (3) is used to get the difference sequence of normalized correlation industry and real estate industry also to get the maximum and the minimum of the sequence; Thirdly, formula (6) is used to get the correlation coefficient of the real estate industry and related industries in table 3; Fourthly, formula (7) is used to calculate the correlation degree of real estate industry and the relevant industries.

Table 3 Correlation coefficient

Industry	2009	2010	2011	2012	2013	2014
X_1	1.000	0.994	0.942	0.981	0.970	0.948
X_2	1.000	0.995	0.984	0.878	0.841	0.802
X_3	1.000	0.982	0.943	0.985	0.951	0.931
X_4	1.000	0.663	0.607	0.956	0.837	0.619
X_5	1.000	0.995	0.958	0.970	0.979	0.981
X_6	1.000	0.683	0.758	0.881	0.873	0.333
X_7	1.000	0.983	0.740	0.999	0.907	0.946
X_8	1.000	0.981	0.975	0.942	0.707	0.795
X_9	1.000	0.946	0.979	0.667	0.835	0.524
X_0	1.000	0.938	0.902	0.940	0.953	0.963

According to calculation and analysis, gray correlation degree of related industries and real estate are as follows: X_1、0.973，X_2、0.917，X_3、0.965，X_4、0.780，X_5、0.981，X_6、0.755，X_7、0.929，X_8、0.900, X_9、0.825。sorted as table 4：

Table 4 Sort of gray correlation degree

Number	Name	correlation degree	Sort
X_1	mining	0.973	2
X_2	manufacturing	0.917	5
X_3	electricity, gas and water production and supply industry	0.965	3
X_4	construction	0.780	8
X_5	transportation, storage and postal services	0.981	1
X_6	information transmission， computer services and software industry	0.755	9
X_7	leasing and business services	0.929	4
X_8	scientific research, technical services and geological prospecting industry	0.900	6
X_9	resident services and other services industry as comparative sequence	0.825	7

4 Conclusions and recommendations

According to table 4，in Ordos, the largest association industry to real estate is transportation, storage and postal services. Followed by is mining, electricity gas and water production and supply industry, which are resource-based industries. But in common city the largest association industry to real estate is construction. Construction in Ordos sorted in number 8. This is obvious to show that in resource-based cities correlation effect among real estate and other industries is different from common cities. Resource-based city is a kind of special city. To promote the healthy development of the real estate industry in resource-based cities and regional economy, we propose the following recommendations are based on study correlation effect in resource-based city's real estate and other industries such as Ordos City.

4.1 To strengthen human resources and the introduction and investment of new and high technology.

From the development process of resource-based cities, the process was rough, blind and irrational. The main reasons attributed to lack of high-end talent reserves and proper, rational theory-oriented. Human is the main driving force to promote social and economic development. Science and technology is productivity. Resource-based cities blessed with natural resources. Only by invest talents and high-tech, strengthen industrial innovation, establish sustainable development concept of resource use and real estate investment in order to give full play to its advantages in resources to promote the real estate market and regional economy sustainable development.

4.2 Adjust the structure of regional industry and provides a good market environment for the real estate industry development.

With single industrial structure of most resource-based cities in our country, capital circulation is limited to regional economy, which increases the risk in resource-based city's real estate development. Under the situation of current economic downturn and growth difficult, We need to find new investment to boost power and efficient consumption. From the transformation of urban function, through the control of the investment scale in real estate industry, resource exploitation scale, etc., guide the transformation and upgrading of economic structure, avoid single industrial structure, resource-based cities are changed to the general comprehensive cities, enhance the risk resistance ability of the regional economy, and provide a good environment for the development of resource-based cities real estate industry.

4.3 Establish perfect market supervision system and laws and regulations system.

Laws and regulations is an important guarantee for the healthy development of the economy market and the real estate industry. But most resources-based cities in our country only experience a short period of ten years from the start to the prosperity . Fast explosive development covered up defects of laws and regulations. When the current national economy enters a new normal situation, strengthening the transformation of resource-based cities, promoting the shantytowns transformation, and speeding up the pace of urbanization are an important approach to solve the plight of resource-based cities. As planners and resource integrations of urban restructuring and development, the government should play a guiding role, formulate effectively laws regulations, supervision and regulate market's behavior to break the deadlock and regional economic in real estate development and regional economic development in resource-based city .

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