

The Relationship between Urbanization and Real Estate Empirical Research Based on the Data of Shandong Province

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Abstract : *Based on the time series data from 1993 to 2011, this article empirically explored the relationship between urbanization and real-estate development in Shandong Province by vector autoregressive model. The results indicated that the urbanization level and real-estate development had long-term co-integration relationship. And the effect of error correction item to urbanization was more obvious than to real-estate development in the short-term. Real-estate development was the Granger causality to urbanization, but urbanization was not the Granger causality to real-estate development. The response of urbanization to its own one standard deviation innovation was obvious first, and then declined rapidly. From the second period, it increased gradually. Its response to the impulse of real-estate development increased rapidly from 1-3 periods, and then kept slow growth. The response of real-estate development to its own one standard deviation innovation and the impulse of urbanization were positive and strong first, and from the fourth period the response increased gradually.*

Keywords : *Urbanization, real estate, vector autoregressive*

1. INTRODUCTION

Urbanization is an important symbol to weigh economy, social, cultural and technical level, as well as to weigh social organization degree and management level of a nation or a local. As material carrier of urban development and important capital source of urban construction, the real-estate industry plays an irreplaceable role in the aspects of industrial structure improvement, domestic demand stimulation, employment expansion and so on. The dominant character of urbanization development is the massive populations entering into the city from rural areas. The unceasing expansion of city scale is bound to promote all kinds of real estate demand increase inevitably. Simultaneously the healthy real estate industry can further promote the various function of the city and impel urbanization to proceed steadily and fast. Therefore, it has important theoretical and the practical significance to understand correctly the dynamic mechanism between urbanization and the real estate development.

2. LITERATURE REVIEW

Many domestic and foreign scholars have explored the relationship between urbanization level and real estate development from different angles. In 1985, American scholar O'sullivan studied the relationship between urbanization and real estate industry from city location angle in his work "urban economics" and drew the conclusion that urbanization advancement and real estate industry development affected mutually. Edward analyzed the influence of real estate industry to urbanization and pointed out that the change of housing price caused the cost of labor force to have the corresponding change and then had the influence to urban population quantity and urbanization advancement. The domestic scholars mainly concentrate on the qualitative research about the relationship of urbanization and real estate development, while the quantitative analysis achievement is not too much. Jiang Jianlin et al. (2003) believed that urbanization and real estate development promote mutually. Urbanization development can bring huge development space to real estate, while real estate development can produce more employment opportunity and thus impetus urbanization level further enhancement. Zhou Hong (2005) thought that urbanization and real estate had the similar development trace in the long run. But real estate development curve

lag slightly urbanization curve. Zhang Xuguang (2008) elaborated the interaction mechanism between urbanization and real estate development in our country by qualitative method, simultaneously also explained how real estate and urbanization restrict mutually. In quantitative investigation aspect, Chen Shiqing, Huang Wei (2007) utilized co-integration analysis and vector error correction model to inspect the relationship between Chinese real estate price and urbanization level from 1991-2005 years, and discovered that enhancement of Chinese urbanization level is the main reason to promote Chinese real estate price. Cheng Kaiming, Xia Qing (2008) made empirical research on the relationship between Chinese urbanization level and real estate price according to 1987--2006 year succession data. They proved there existed long-term equilibrium relation between urbanization level and real estate price. In the short run, real estate price truly restrained urbanization development in some degree, but in the long run, it impelled urbanization level rise unceasingly. From the existing literature, we can see that most current studies do research based on the national time series data or panel data. Only a few of them utilizes local data to analyze the relationship between urbanization and real estate. Although we can learn the research mentality and method from the literature when study the local object, the research conclusion also has great difference because of the big unbalanced development of regional economy. This article attempts to make research about the relationship between urbanization level and real estate development in Shandong Province and provide reference for policy maker to promote economy develop healthy and harmonious.

3. DATA CHOICE AND MODEL CONSTRUCTION

3.1. Data Choice

There are a lot of index to reflect urbanization level. Considering the convenience to acquire data and their authority, this article chooses the ratio of non-agricultural population to the total population in Shandong Province to measure the urbanization level. This article uses real estate investment to reflect real estate development. Data come from "Shandong Statistical Yearbook" (2012), value ranges from 1993 to 2011. In order to eliminate different variance which possibly exists in data series, this article has carried on natural logarithm transformation to the data.

3.2. Model Construction

This article will use vector autoregressive (VAR) model to study the relationship between urbanization and economic development. VAR model was proposed by Sims in 1980. It is commonly used to analyze the linkage of two or more time series. The equation of VAR model is:

$$y_t = A_1 y_{t-1} + \dots + A_i y_{t-i} + B X_t + \varepsilon_t \quad t = 1, 2, \dots, T \quad (1)$$

Where, y_t is k-dimensional endogenous variable, x_t is d-dimensional exogenous variable, i is lag period, t is number of samples. $k \times k$ -dimensional matrix A_1, \dots, A_i and $k \times d$ -dimensional matrix B are estimated coefficient matrix. ε is k-dimensional disturbance vector.

Taking "urban", "inv" express urbanization and real estate investment separately. "LNurban", "LNinv" represent their logarithmic value separately. Then VAR model between urbanization and economic development can be represented as:

$$LNurban_t = \alpha_0 + \sum_{i=1}^n \alpha_{1i} LNurban_{t-i} + \sum_{i=1}^n \alpha_{2i} LNinv_{t-i} + \mu_{1t} \quad (2)$$

$$LNinv_t = \beta_0 + \sum_{i=1}^n \beta_{1i} LNurban_{t-i} + \sum_{i=1}^n \beta_{2i} LNinv_{t-i} + \mu_{2t} \quad (3)$$

Where, α_0, β_0 are intercept of the two equations. μ is white noise, t expresses time number, i expresses lag period.

4. EMPIRICAL ANALYSES

4.1. Unit Root Test

Before establishing VAR model, we should use Augmented Dickey-Fuller (ADF) unit root test to examine whether time series is stationary or non-stationary in order to avoid spurious regression. Test results are shown in table 1.

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Table 1. Unit root test results

Variable	Test type(C,T,K)	ADF test statistic	10% critical value	Test results
LNurban	(C,0,0)	-0.474484	-2.660551	non-stationary
DLNurban	(C,0,3)	-2.926212***	-2.690439	stationary
LNinv	(C,0,0)	1.497150	-2.640235	non-stationary
DLNinv	(C,0,0)	-2.729178***	-2.666593	stationary

Note: Test type (C,T,K) indicates unit root test equations include intercept, trend and lag period.

*** indicates that at 10% level of significance reject original assumptions.

As shown in table 1, at 10% level of significance, time series of “LNurban”, “LNinv” are non-stationary, while the first order differences of all variables are stationary series. That is they are I(1) series. Because the original series is non-stationary, it denotes co-integration relation may exist between the variables.

4.2. Co-Integration Test

Co-integration theory suggests if non-stationary time series are I (1), then co-integration techniques can be used to test the long-term equilibrium relationships among the variables. Here, we used JJ Test to explore the co-integration relationship between LNurban and LNinv. The results calculated by Eviews6.0 are shown in table 2.

Table 2. Unrestricted Co-integration Rank Test (Trace)

Null Hypothesized	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob**
None *	0.591684	15.92350	15.49471	0.0431
At most 1	0.040134	0.696348	3.841466	0.4040

Note: Trace test indicates 1 cointegrating eqn(s) at the 0.05 level, *denotes rejection of the hypothesis at the 0.05 level, **MacKinnon-Haug-Michelis (1999) p-values.

From table 2, we know that at 5% level of significance, there are two co-integration equations between the variables. It shows that there exists long-term dynamic equilibrium between urbanization and economic development.

According to minimum Akaike information criterion(AIC), VEC (2) is the optimal model. The estimated models are :

$$DLNurban_t = 0.020889 + 0.149619DLNurban_{t-1} + 0.053287DLNurban_{t-2} + 0.075498DLNinv_{t-1} + 0.025828LNinv_{t-2} + 1.194141ECM_{t-1} + \varepsilon_1 \quad (4)$$

$$DLNinv_t = 0.032041 + 0.0728400DLNurban_{t-1} + 1.226484DLNurban_{t-2} - 0.333987DLNinv_{t-1} + 0.025828LNinv_{t-2} - 0.892364ECM_{t-1} + \varepsilon_1 \quad (5)$$

The test results of the two equations denote that at 5% significance level, the regression residuals series of each equation fit the normality. The fitting effect of the model is relative good. Observing the two equations, we can find the error correction plays a more important role to adjust the short-term fluctuations of urbanization level.

4.3. Granger Cause Test

Co-integration test proves urbanization and economic development have long-term equilibrium relationship, but it doesn't show whether they have causal relationship. We use Granger Cause Test for the further research, and the results are shown in table 3.

Table 3. Granger Causality Test Results

Null Hypothesis	Lag length	F-Statistic	Prob.
LNurban does not Granger Cause LNinv	1	0.00598	0.9394
LNinv does not Granger Cause LNurban	1	25.9497	0.0001
LNurban does not Granger Cause LNinv	2	0.14924	0.8629
LNinv does not Granger Cause LNurban	2	6.72645	0.0110
LNurban does not Granger Cause LNinv	3	1.72091	0.2319
LNinv does not Granger Cause LNurban	3	4.94594	0.0268
LNurban does not Granger Cause LNinv	4	0.89057	0.5231
LNinv does not Granger Cause LNurban	4	6.80529	0.0204

Granger causality test results show that at 5% significant level, from lag 1 period, real estate investment is the Granger cause for urbanization, but urbanization is not the Granger cause for real estate investment. It shows that urbanization and real estate investment is not bidirectional promotion in Shandong province, which matches the realistic situation. This is because the employment threshold of real estate is low and its industry interrelation with other industry is very strong, which enable real estate industry have high employment attraction. Real estate investment increase may attract massive workforce to enter into urban area in a short time and enhance urbanization level. But the new urban population cannot afford high real estate price because of their weak economic potentiality. Therefore, real estate investment cannot increase urbanization level in the short time.

4.4. Impulse Response Function

Granger cause test only demonstrates the causal relationship between the variables. The specific affecting process and direction need to be analyzed through impulse response function.

Impulse response function is based on VAR model and used to describe the affect path resulted by one S.D innovation of random disturbance term to other variables change. We choose lag 2 as optimal lag period. Horizontal axis represents affected period. Vertical axis represents the response degree of dependent variable to independent variable. The line represents response function curve.

Figure1 and figure2 show response of LNurban and LNinv to Cholesky one S.D. innovations respectively. From Figure1 we can see that urbanization level has a stronger positive response to its own one S.D. innovation at the beginning, but then declines rapidly. After the second lag period, it increases gradually. To the impact of real estate investment, the reaction of urbanization is weak at first, but the effect enhanced gradually and after the fourth lag period, it tends to be stable. From figure2 we can see that real estate investment makes a strong positive response to its own one S.D. and keep stable from the second lag period. After the fourth lag period it begins to increase slowly. To the impact of urbanization, the reaction of real estate investment is strong and from the third lag period it begins to increase slowly.

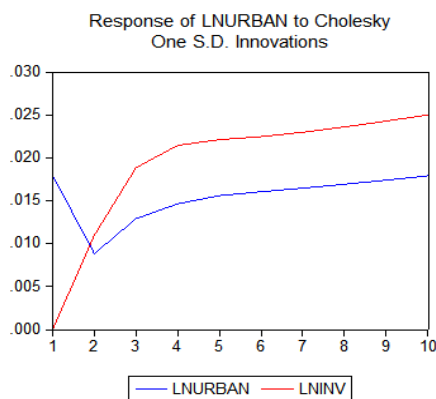


Fig1. Response of LNurban to Cholesky One S.D. innovations

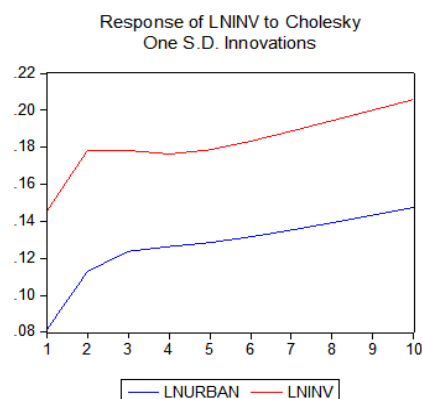


Fig2. Response of LNinv to Cholesky One S.D. innovations

5. CONCLUSION

Urbanization and real estate interact with each other. Urbanization promotes real estate industry prosperity. The new urban population brings huge development space for real estate industry. Real estate industry not only provides residence for the citizen, but also offers employment opportunity for them. Real estate development has accelerated urbanization advancement. Based on the time series data from 1993 to 2011, this article empirically explored the relationship between urbanization and real-estate development in Shandong Province by vector autoregressive model. The results indicated that the urbanization level and real-estate development had long-term co-integration relationship. And the effect of error correction item to urbanization was more obvious than to real-estate development in the short-term. Real-estate development was the

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