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Research Article

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Empirical analysis of the interaction between urbanization level and real estate price of Jiangxi province

Wei Liu[1], Yong'an Bao[2] and Fuyang Xue[3]

Hohai University, China

ABSTRACT

Based on the existing researches, this paper conducts theoretical analysis on the relationship between urbanization level and real estate price under inflation. By using the related yearly data of Jiangxi from 1996 to 2012, it carries out correlation analysis, unit root test and Johansen cointegration test, and finally does an empirical analysis on their relationship using Granger causal test method. It finds that there is a long-term balanced relationship between urbanization level and real estate price and they form mutual Granger reasons for each other. Finally, it provides suggestions about government policies on the coordinated development of urbanization level and real estate price given the practical situations in Jiangxi.

Key words: urbanization level; real estate price; cointegration; Granger test

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INTRODUCTION

Cities emerge from the development of the economy and the society. Urbanization is the process where the space for the economic development gathers and separates. The level of urbanization is one of the important standards in measuring a nation's economic development. Therefore, issues related to urbanization have aroused the attention of governments at all levels, many of whom have included them in the report on the work of the government.

The growth of the urban economy inevitably accumulates population and promotes urbanization. Urbanization level and speed are concepts based on population. The increasing of urban population marks the rising of urbanization level. The speed of the increasing is the speed of urbanization. With the population growing, the real estate market develops rapidly and the price for real estate increases. In qualitative analysis, there is a positive correlation between urbanization level and real estate industry.

Since the reform and opening-up policy, urbanization in Jiangxi province has been speeding up and making impressive progress. Its urbanization level rises from 24.58% in 1996 to 41.36% in 2012 (shown in table 1 and graph 1) with an annual increasing rate of around 3.95%. The level is estimated to reach 64.78% in 2020, meeting the standard for a moderately developed country.

As urbanization fast proceeds, the real estate price that affects the well-being of the Chinese people has been increasing. The same is for the average real estate price in Jiangxi. It increases at a rate of 11.21% (shown in table 1 and graph 1) during the 17 years from 1996 to 2012, exceeding the growing rate of the disposable income of urban residents in the same period. Such soaring housing price makes it very difficult for many urban families to buy a house, which all social sectors are deeply concerned about. Housing problem is not just economic but social. How to control the rising price has become a core question asked by current government and scholars. Many researchers have conducted careful analysis on the reasons for rising housing price from different perspectives.

About the relationship between urbanization level and real estate price, there have been a number of academic discussions and researches, producing different theories.

Most researchers believe that urbanization pushes real estate price. Yang Liu and Hang Leiming argue that housing price inhibits urbanization[1] (2007). Chen Shiqing and Zhu Yulin applied cointegration analysis and inaccuracy correction model to empirically analyze the relationship. They found that the growth of urbanization level accounts for the soaring price and the two factors form a sustainable positive change. But their research excludes regional and other related factors[2] (2007). Based on Chen's research, Ren Murong and Liu Bo used the panel data of the provincial urbanization rate and the average housing price from 1999 to 2006 and applied section and time estimation by using retail price index to deflate and eliminate price factors. By such empirical analysis, they concluded that urbanization level positively influences housing price (2009). But they fails to design more explanatory variables in the regression model[3]. Luo Yongming analyzed the influence of urbanization on housing price in China by linear and non-linear models. They found that there is a positive correlation between urbanization and housing price and that the relationship in all provinces features "double-peak" distribution and spatial correlation[4] (2011). Xu Ke and Lu Hai analyzed urbanization level and the development level of real estate industry. They claimed that urbanization is the fundamental driving force of the real estate industry, and that the development of the latter is the result and outer characteristic as well as a restricting factor of the former[5] (2012).

However, all the researches above fail to take inflation into consideration. To eliminate such shortcoming, this paper uses data from statistical yearbook of Jiangxi province and statistical yearbook of China, considers inflation factors and conducts Granger causal test to find the relationship between urbanization level and real estate price, as well as the reason why housing price soars.

2. THEORETICAL ANALYSIS, RESEARCH METHODS, VARIABLE SELECTION AND DATA PROCESSING

2.1. Research methods

The data used in this paper comes from statistical yearbook of Jiangxi province and statistical yearbook of China and is processed by VAR inaccuracy correction model. With the consideration of inflation, it conducts correlation test, ADF unit root test, Johansen cointegration test and Granger causal test to explore the relationship between urbanization level and real estate price.

2.2. Selection of variables

(1) Urbanization level (*UR*) or urbanization rate. It is a figure index measuring the urbanization degree. In normal researches, the proportion of urban residents to the whole population is chosen to measure urbanization degree with unit as %.

(2) Real estate price(*HP*). It is the average price of commercial housing, a kind of mixed average price. It reflects the average of prices of all the commercial housing in a country or a region during a specific period, which can be classified into different kinds according to housing types. The average price=the total sales amount/total sales area. The unit is *yuan*.

(3) Consumer price index(*CPI*). It is a macro-economic index illustrating the changes of the consumption and service costs of a family. At present in China, the *CPI* index takes last year (100) as its base year. *CPI* =(value of a group of set commodities calculated according to current price/value of a group of set commodities calculated according to the price of the base year)×100%. The unit is %.

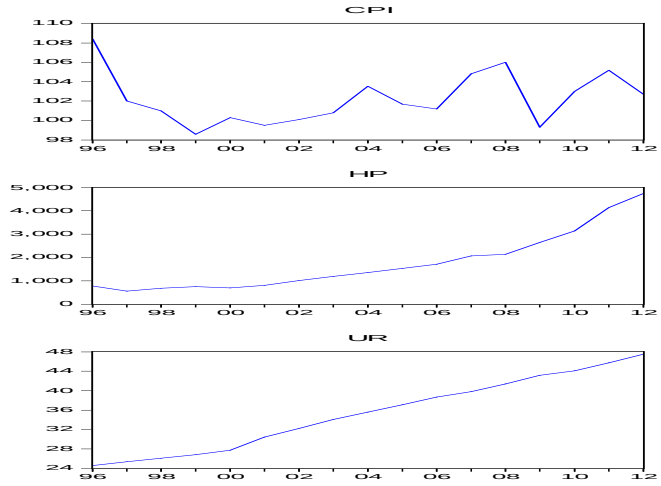
2.3. Data sources and processing

The data for *UR* , *HP* and *CPI* comes from statistical yearbook of Jiangxi province and statistical yearbook of China from year 1996 to 2012. The urbanization degree, the average price of commercial housing and consumer price index are taken as the index value of urbanization level and real estate price and the inflation index respectively as is shown in table 1 and graph 1. Also, to avoid the influence and possibility of heteroscedasticity, this paper takes the natural logarithm of *UR* , *HP* and *CPI* , and then analyzes them using the Eviews6.O software.

Table 1:urbanization level(UR),real estate price(HP),consumer price index(CPI) of Jiangxi province

Year	UR (%)	HP (*yuan*)	CPI (%)
1996	24.58	778.86	108.40
1997	25.32	550.30	102.00
1998	26.05	678.01	101.00
1999	26.79	746.81	98.60
2000	27.69	698.52	100.30
2001	30.41	799.47	99.50
2002	32.20	1013.51	100.10
2003	34.02	1184.10	100.80
2004	35.58	1354.69	103.52
2005	37.10	1528.68	101.70
2006	38.68	1707.99	101.20
2007	39.80	2071.89	104.80
2008	41.36	2135.70	106.00
2009	43.18	2642.81	99.30
2010	44.06	3143.68	103.00
2011	45.70	4147.40	105.20
2012	47.51	4744.66	102.70

Data from the statistical yearbook of Jiangxi province and statistical yearbook of China.



Graph 1:line chart of UR-HP-CPI

3. EMPIRICAL ANALYSIS

According to the selected data and against the background of inflation, the VAR model of the relationship between urbanization level and real estate price is as follows:

$$\ln HP_t = a_0 + \sum_{t=1}^{n} a_{1t} \ln UR_{t-1} + \sum_{t=1}^{n} a_{2t} \ln HP_{t-1} + \sum_{t=1}^{n} a_{3t} \ln CPI_{t-1} + \mu_{1t}$$

$$\ln UR_t = \beta_0 + \sum_{t=1}^{n} \beta_{1t} \ln UR_{t-1} + \sum_{t=1}^{n} \beta_{2t} \ln HP_{t-1} + \sum_{t=1}^{n} \beta_{3t} \ln CPI_{t-1} + \mu_{2t}$$

a_j and β_j are two coefficients of the equation. a_{jt} and β_{jt} before UR and HP constitute the influence of urbanization upon real estate price and vice versa respectively. μ is the inaccuracy item of white noise, t the time and j the lag orders.

3.1. Correlation analysis

Based on the data in table 1, the Eviews6.0 software conducts a correlation analysis on urbanization level UR, real estate price HP and inflation rate CPI as is shown in table 2:

Table 2: correlation analysis

Correlation Probability	LNCPI	LNHP	LNUR
LNCPI	1.000000		

LNHP	0.302247	1.000000	
	0.2384	-----	
LNUR	0.179943	0.966270	1.000000
	0.4895	0.0000	-----

The related coefficients are:

$r(UR, HP) = 0.966270$, $r(UR, CPI) = 0.179943$, $r(HP, CPI) = 0.302247$

The resulted coefficients are:

$r(UR, HP) = 0.966270$, $r(UR, CPI) = 0.179943$, $r(HP, CPI) = 0.302247$

These correlated coefficients show there's correlation between UR and HP while the correlation is not strong between UR and HP . Urbanization level probably pushes forward real estate price or the latter influences the former. To clarify the relationship between real estate price and urbanization level under inflation, this paper will conduct ADF unit root test, Johansen cointegration test and Granger causal test.

3.2. Unit root test

Granger believes it leads to fake regression to use unstable sequence to regress. When variables have unit roots, that is sequence instability, values of the traditional statistical quantities t , F , DW and R^2 will be inaccurate. To insure the accuracy, efficiency and best condition of the regression result, based on the data in table 1, this paper applies ADF test to explore the features of time sequences of the sample data. The ADF stability test is conducted based on the following regression equation:

$$\Delta y_t = \beta_1 + \beta_{2t} + (\rho - 1) y_{t-1} + a_i \sum_i^m \Delta y_{t-i} + \varepsilon_t$$

ε_t is the inaccurate item of pure white noise and the choice of the lag orders means no sequence correlation in ε_t . Accepting the original hypothesis implies that the time sequence contains unit root, that is unstable. The Eviews6.0 software conducts ADF test on the original sequence of related variables and the first difference sequence (D) respectively. The results are shown in table 3:

Table 3: results of ADF unit root test

Name of variables	Value of ADF	5% t-Statistic	Prob.*	conclusion
LNUR	-1.04654	-3.73320	0.9067	Reject H_0
LNHP	-4.95577	-3.73320	0.0061	Accept H_0
LNCPI	-3.76453	-3.75974	0.0496	Accept H_0
D(LNUR)	-2.77033	-3.08100	0.0860	Accept H_0
D(LNHP)	-7.26218	-3.08100	0.0000	Reject H_0
D(LNCPI)	-3.04121	-3.14492	0.0592	Accept H_0

The conclusion in table 3 shows that the statistical quantity of ADF of $\ln UR$, $\ln HP$ and $\ln CPI$ time sequences is bigger than the boundary under the 5% notable level. It accepts the original hypothesis and the time sequence contains unit root. Therefore, it is an unstable sequence. The ADF value of its first difference sequence is smaller than the boundary, proving it's an unstable sequence. As $\ln UR$, $\ln HP$ and $\ln CPI$ are all single integer sequences, there's cointegrated relationship among them.

3.3. Johansen cointegration test

The paper uses Granger "two-phase" method to explore the cointegrated relationship among the variables but it may lead to inaccuracy when dealing with limited samples. Therefore, this paper will use Johansen cointegration test, which conducts cointegrated test on related variables based on dynamic hysteresis model (VAR). This method compares one by one the trace values with values under no cointegration and under one or two cointegration. When the trace value of regression equation exceeds the boundary distribution value under hypothetical condition, the hypothesis is rejected. When the former is less than the latter, accepted. Based on table 1, the Eviews6.0 software sets cointegration test on related variables. The results are shown in table 4:

Table 4：results of Johansen cointegration test

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None *	0.8351	27.0340	21.1316	0.0066
At most 1	0.3785	7.1339	14.2646	0.4734
At most 2	0.0234	0.3559	3.8415	0.5508

The cointegration equation is transmitted to mathematical expression. Result is:
*LNCPI =0.044394 *LNUR+ 0.006308 *LNHP*

This expression leads to a long-term balanced relation that is positively correlated among $\ln UR$, $\ln HP$ and $\ln CPI$. The data in table 3 indicates a cointegration among $\ln UR$, $\ln HP$ and $\ln CPI$ under the 5% notable level, and a sustainable economic relationship between real estate price and urbanization level. Granger believes when there is cointegration among variables, these variables contain at least one kind of Granger causal relation. Therefore, this paper will talk about the causal relation between real estate price and urbanization level under inflation.

3.4. Granger causal test

$\ln UR$, $\ln HP$ and $\ln CPI$ are all time sequences and contains cointegration among themselves. The Granger theory is used to test the causal relations between real estate price and urbanization level as is shown in table 5:

Table 5: result of Granger causal test base on VEC model

Null Hypothesis:	Obs	F-Statistic	Prob.
LNHP does not Granger Cause LNCPI	15	3.6401	0.0649
LNCPI does not Granger Cause LNHP		0.1575	0.8563
LNUR does not Granger Cause LNCPI	15	3.7353	0.0614
LNCPI does not Granger Cause LNUR		3.1565	0.0866
LNUR does not Granger Cause LNHP	15	2.3012	0.1506
LNHP does not Granger Cause LNUR		0.0931	0.9119

According to table 5, under inflation and the 5% notable level, UR is the Granger test result of HP and vice versa. This indicates that there is a notable correlation between real estate price and urbanization level in Jiangxi and that the growth of its urbanization results in the soaring real estate price.

CONCLUSION

In the analysis, this paper considers under inflation, the cointegration between real estate price and urbanization level, or long-term balanced relationship. The Granger causal test shows that real estate price and urbanization level from mutual Grander reasons for each other, and that urbanization is a necessary part of the modernization and results in the soaring real estate price.

Suggestions

Jiangxi should stick to urbanization with its own characteristics, recognize the significance of urbanization and plan its urbanization using scientific methods. Only through a sustainable urbanization can a healthy and orderly real estate market develop, and can the residents be insured to enjoy the benefits brought by the reform and urbanization. Meanwhile, the local government should take effective measures to ensure an adequate supply of security housing, economical housing, capped-price housing and public rental housing as to increase both quantity and quality of the housing supply to meet the people's need. At the same time, it should maintain stability while pursuing progress, control the scale of urban development and the speed of urbanization. In this way, the quality of urbanization can be ensured, the soaring real estate price can be reduced, so that we can achieve a rational and stable price for real estate and a healthy housing industry.

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