Research on the Relationship Between Regional Vitality and Housing Prices

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ABSTRACT. Based on qualitative and quantitative analysis of regional vitality, the paper used a vector autoregressive (VAR) model to empirically study the relationship between regional vitality and its housing prices in China from 2014 to 2018, with the statistics from 31 provinces and cities. The research results show that regional vitality and housing prices have certain driving effects to each other which means that people should think more comprehensively about the regional developments before investing local properties. Besides, the government should better guide a smooth and stable development of the housing prices.

1. INTRODUCTION

The word "vitality" has become a high-frequency word at 19th CPC National Congress. The core of call in reports "developing an economy with more effective market mechanisms, dynamic micro-entities, and sound macro-regulation" for individuals lies in promoting market vitality. At the regional level, the market vitality is the regional vitality.

In 2018, the top four cities with the largest per capital GDP in China ranked Shanghai, Beijing, Shenzhen, and Guangzhou in order, while by highest housing prices ranked Beijing, Shenzhen, Shanghai and Guangzhou top 4 on the list based on the government's cities index in December 2018. It can be found that areas with better economic development generally have higher housing prices. However, we cannot oversimplify this kind of causality only with the unilateral factor. It's necessary to comprehensively analyze the relationship between housing prices and regional development from multiple perspectives.

The vitality of a region is the most important source and driving force for its development. The research on the relationship between regional vitality and housing prices will help us to sort out the underlying cause of different housing prices across regions.

By reviewing the current literature about the influential factors for housing prices and regional vitality, we found that there has not been any in-depth study from the perspective of regional vitality in academia. As for the inherent causes of housing prices, most scholars focus only on the regional economic development which lacks a diverse index system [1-3]. And as for regional vitality, the previous studies put more weight on urban sociology and architecture such as urban design, urban planning, and its governance [4-6]. To address this research gap，the article will conduct a comprehensive qualitative and quantitative study of regional vitality from multiple perspectives to explore the internal relationship between regional vitality and housing prices.

2. RESEARCH HYPOTHESIS

Through a review of existing research, we find that although different scholars have their own definitions of the concept of regional vitality, there is a basic consensus among scholars that regional vitality includes economic, social and cultural aspects. In addition, a region's technological competitiveness, environmental sustainability, medical and health conditions, and transportation facilities also play indispensable roles in the development of such region. Therefore, this paper makes a comprehensive qualitative analysis of the regional vitality from seven dimensions.

On the one hand, the vitality system of a region can be divided into seven important dimensions: economic vitality, social vitality, cultural vitality, technological vitality, environmental vitality, medical vitality, and transportation vitality. Under their mutual integration and interaction, they jointly stimulate the vigorous vitality of the region. When the region is vigorous, that is, the better the economic development, the more stable the social organization structure, the more inclusive the cultural atmosphere, the stronger the scientific and technological innovation capability, the higher the environmental sustainability, the better the medical and health conditions, and the better the transportation facilities, people will be more willing to live here. While housing demand is rising, investment demand is also rising due to the great development potential of the region, thus driving up housing prices in the region. Therefore, the hypothesis of the relationship between regional vitality and housing prices is as follows:

Hypothesis 1: Regional vitality has a certain driving effect on housing prices.

Housing prices can also reflect people's affordability at the current level of regional development, as well as psychological expectations of the future development prospects of the region. When housing prices increase, real estate developers and investment companies, driven by their interests, flooded into the area, promoting the development of housing infrastructure, regional supporting facilities and industrial patterns in the area. With a high-quality regional layout, people have good expectations for the development prospects of the region, which in turn will promote the settlement of residents and the joining of high-quality talents and improve the overall competitiveness of the region. That is, housing prices will play a role in the region's vitality system. Therefore, this article proposes another hypothesis:

Hypothesis 2: Housing prices also have a certain driving effect on regional vitality.

From the perspective of regional vitality, exploring the factors affecting housing prices and the impact of changes in housing prices will help all sectors of society to understand the formation mechanism of housing prices and regional differences. On this basis, it will help residents rationally purchase houses and invest scientifically, and it will also help government departments to introduce related measures to guide the steady development of housing prices.

3. Data Collection and Analysis

This article divides regional vitality into seven dimensions: economic vitality, social vitality, cultural vitality, technological vitality, environmental vitality, medical vitality, and transportation vitality. In order to resolve the complexity caused by too many indicators, each dimension will choose an indicator to measure, as shown in Table 1.

Table 1 Seven Dimensional Measures of Regional Vitality

Regional Vitality	Dimensional Measures	Unit
Economic vitality	GDP per capita	Yuan
Social vitality	Proportion of urban population	%
Cultural vitality	Average number of students in higher education per 100,000 people	People
Technical vitality	Patents granted per 10,000 people	Pieces
Environmental vitality	Green coverage of urban built-up areas	%
Medical vitality	Public expenditure on health and family planning per capita	Yuan
Transportation vitality	Public transport vehicles for every 10,000 people in the city	Bench

At the same time, housing prices are studied using the average selling price of houses in each province and city. In order to better explore the internal relationship between regional vitality and housing prices at different times, this article selected relevant data of 31 provinces and cities in China for the five years from 2014 to 2018 from the Wind database, including seven measures and average selling price of houses. In order to ensure the consistency of the data and avoid excessive distortion, some missing data are supplemented by the data of the previous year in this province.

Because there are too many indicators for measuring regional vitality, in order to obtain comprehensive regional vitality indicators, seven measuring indicators need to be combined. In terms of weight measurement, it can be divided into the same weight and different weights. Due to the different degrees of influence of each vitality on regional vitality, the same weight has disadvantages, so different weights will be selected for calculation. Under different weights, scholars usually use factor analysis to integrate multiple indicators together. Therefore, based on SPSS statistical software, this article uses factor analysis to combine seven measures to obtain regional vitality indicators.

Due to space limitations, the results of regional vitality are not shown here, but from the results, we can find that from 2014 to 2018, Beijing, Shanghai, Tianjin, Zhejiang and Guangdong all top the list for regional vitality and housing prices. Among them, Beijing ranked first in regional vitality and housing prices. Although we can initially find the relationship between provinces and cities with high regional vitality and high housing prices, in order to explore whether there is a causal relationship between the two, further empirical tests are needed.

4. Empirical Process

Most academic research of the relationship between two variables is through the establishment of a fixed effect or random effect model to study, but this way can only study one variable to another variable causality. They are unable to discover the possible internal relationship between the two and examine the effects of endogenous variables as lag terms. Therefore, in order to better explore the causal relationship between regional vitality and housing prices, this article will build a vector autoregressive (VAR) model based on Eviews10.0 software and perform Granger causality tests based on the model. Before establishing a model, the stability of the data needs to be ensured.

4.1 Variable Stationary Test

In order to avoid the "false regression" problem that occurs when the data is not stable, the data needs to be tested for stability first. The unit root test is the most commonly used method for stationary test, so this article will use the ADF unit root test to test the stability of regional vitality (vitality) and housing price (price) data. The test results are shown in Table 2.

Table 2 ADF Unit Root Test Results

Variable	ADF Statistics	P-value	Result
vitality	58.3182	0.6092	Non-stationary
price	6.22037	1.0000	Non-stationary
dvitality	129.006	0.0000***	stationary
dprice	107.825	0.0003***	stationary

Note: *** means significant at 1% level.

It can be seen from Table 2 that the test results of the two variables, vitality and price, are not stable. However, the two variables of regional vitality (dvitality) and housing price (dprice) after the first-order difference are stable and significant at the 1% level. Therefore, we can say that dvitality and dprice are stationary time series, that is, both dvitality and dprice are first-order single integer sequences.

Therefore, this article will establish a VAR model on dvitality and dprice to analyze the relationship between regional vitality and housing prices.

4.2 Determine the Optimal Lag Order of the Model

Next, the optimal lag order of the VAR model is determined by the AIC information criterion and the SC information criterion. The basis is that the evaluation statistics of the AIC information criterion and the SC information criterion achieve the minimum simultaneously. The results of the evaluation statistics are shown in Table 3.

Table 3 Evaluation Statistics of VAR Models with Different Lag Orders

Lag	LogL	LR	FPE	AIC	SC	HQ
0	62.51657	NA	6.91e-05	-3.904295	-3.811780	-3.874137
1	69.87148	13.28629	5.57e-05	-4.120741	-3.843195	-4.030268
2	80.94239	18.57056*	3.55e-05*	-4.576928*	-4.114352*	-4.426140*
3	82.65941	2.658619	4.15e-05	-4.429640	-3.782032	-4.218536

Note: * indicates that the lag order is the best under the evaluation statistics.

It can be seen from Table 3 that in the VAR model with a lag order of 2, the evaluation statistics of the AIC information criterion and the SC information criterion achieve the minimum value simultaneously. In addition, the optimal lag order obtained by the three evaluation statistics of LR test statistics, FRE final prediction error and HQ information criterion is also 2. Therefore, 2 is selected as the optimal lag order.

4.3 Cointegration Test

In order to test whether the variables in the model have a long-term cointegration relationship, the Johansen cointegration test will be used to test whether the variables have a long-term cointegration relationship. The test results are shown in Table 4.

Table 4 Johansen Cointegration Test Results

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.601376	28.87379	15.49471	0.0003
At most 1	0.011607	0.361921	3.841466	0.5474

Note: * denotes rejection of the hypothesis at the 0.05 level.

From Table 4, we can see that in the null hypothesis that there is no cointegration relationship, the P value is 0.0003, which is less than 0.05. The null hypothesis is rejected, that is, there is a cointegration relationship between the variables. In the null hypothesis that there is at most one cointegration relationship, the P value is 0.5474. The null hypothesis cannot be rejected, that is, there is a cointegration relationship equation between the variables. Therefore, a VAR (2) model can be established to study the relationship between regional vitality and housing prices.

4.4 Model Stationary Test

After the test of the stability of the variables and the test of the cointegration relationship, we can build a VAR (2) model and estimate the parameters. The matrix form of this model is shown in Equation 1.

$$\begin{bmatrix} dvitality \\ dprice \end{bmatrix} = \begin{bmatrix} -0.1421 & 0.0955 \\ -0.2046 & 0.1982 \end{bmatrix} \begin{bmatrix} dvitality_{t-1} \\ dprice_{t-1} \end{bmatrix} + \begin{bmatrix} 0.1473 & -0.4762 \\ 0.0557 & 0.1789 \end{bmatrix} \begin{bmatrix} dvitality_{t-2} \\ dprice_{t-3} \end{bmatrix} + \begin{bmatrix} 0.0185 \\ 0.0695 \end{bmatrix} \quad (1)$$

In order to test the stability of the VAR (2) model, the AR unit root diagram is used to test it.
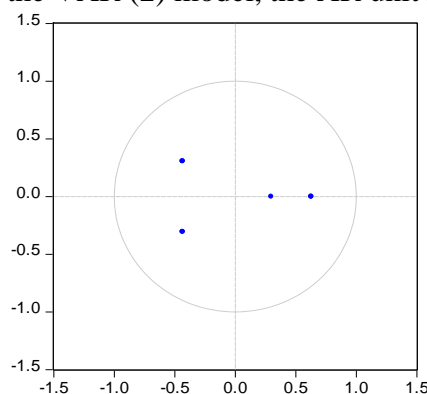

Figure 1 AR Unit Root Diagram of VAR (2) Model

It can be seen from Figure 1 that the reciprocal of all roots of the VAR (2) model are less than 1 and are all in the unit circle, so the established model is stable.

4.5 Granger Causality Test

Based on VAR (2) model, granger causality test was used to study the relationship between regional vitality and housing price. The test results are shown in Table 5.

Table 5 Granger Causality Test Results

Dependent variable: dprice			
Excluded	Chi-sq	df	Prob.
dvitality	5.784386	2	0.0555
All	5.784386	2	0.0555
Dependent variable: dvitality			
Excluded	Chi-sq	df	Prob.
dprice	12.09267	2	0.0024
All	12.09267	2	0.0024

As can be seen from Table 5, in the test where the null hypothesis is that regional vitality is not the Granger cause of housing prices, the P-value is 0.0555. Although it is slightly greater than the significance level of 0.05, it is within an acceptable range. Therefore, we can say that under the 90% confidence level, regional vitality is the Granger cause of housing prices, that is, regional vitality has a certain driving effect on housing prices. This is because when the development of a region is more comprehensive and the region is more dynamic, it will attract more residents to settle down here and attract investors to invest. The increase in housing demand and investment demand will drive up the housing price.

In the test where the null hypothesis is that housing prices are not the Granger cause of regional vitality, the P-value is 0.0024. It is significantly less than the level of 0.05, so we can say that housing prices are the Granger cause of regional vitality, that is, housing prices also have a certain driving effect on regional vitality. This is because when the housing price rises in the local area, driven by the interests, people will strengthen the construction of regional infrastructure, which is conducive to the inflow of high-quality talents, strengthens the regional comprehensive competitiveness, and enhances regional vitality.

5. Summary

The paper conducts both qualitative and quantitative analysis to sort out the underlying cause of different housing prices across regions. The qualitive analysis of regional vitality are built on seven dimensions, including economic vitality, social vitality, cultural vitality, technological vitality, environmental vitality, medical vitality and transportation vitality. And the comprehensive quantitative analysis of regional vitality is carried out by using factor analysis. To analyze the relationship between regional vitality and housing prices, a method based on the VAR model, Granger causality test, is proposed. The research results show that regional vitality and housing prices have certain driving effects to each other. Thus, people should think more comprehensively about the regional developments before investing local properties. On the other hand, government departments need to take the regional differences into account when formulating housing policies, so as to better guide the steady development of housing prices.

References

[1] Xiaoying Jin. Study on the regional difference of wuhan's economic development level and house price [D]. Central China Normal University, 2017.

[2] Shouping Wu. Population migration, residents' income and urban house prices: based on the data of 35 large and medium cities in China [J]. Regional Research and Development, 2019, 38 (01): 56-59.

[3] Jiahui Shi. Research on the correlation between house price and GDP in China [D]. Hunan Normal University, 2019.

[4] Jiwei Lu, Fan Zhang. Coordinated development of historical and cultural heritage and urban vitality [J]. New Architecture, 2016 (01): 32-36.

[5] Panbo Qin. Research on the new vitality of old cities from the perspective of urban governance: taking london as an example [J]. City Watch, 2019 (05): 37-46. 7.

[6] Shuo Cui. Research on the design of public facilities from the perspective of urban vitality [J]. Art Science and Technology, 2019, 32 (11): 201-202.