

Research on the Interaction Between the Development of Cultural Industry and the Growth of Tourism Economy in Henan Province

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Abstract: To promote the integration of culture and tourism is an important topic for the prosperity of cultural tourism in Henan Province. In this paper, VAR model is constructed, and other empirical analysis of the interaction between cultural industry development and tourism economic growth in Henan Province is analyzed by means of cointegration test, Granger causality test, impulse response function and variance analysis. The results show that a long-term stable equilibrium relationship exists between the development of cultural industry and tourism economy in Henan Province, and there is a two-way Granger causality, which is positively correlated, especially, the development of cultural industry has a more significant impact on the growth of tourism economy.

Keywords: culture industry, tourism economic, granger causality test, cointegration test

1. Literature Review

During the 13th Five Year Plan period, the tourism industry of Henan Province will still be in the period of structural adjustment and prominent contradictions. The mutual promotion and high-quality coordinated development of cultural industry and tourism industry has become one of the hot issues in academic research. Chen Bingjian constructed a regression model, and used the methods of co integration test and Granger causality test to conduct an empirical study on the interaction between the development of cultural industry and the growth of tourism economy in Gansu Province. The results show that there is a long-term stable equilibrium relationship between the development of cultural industry and the growth of tourism economy in Gansu Province, and there is a one-way Granger causality; cultural industry There is a significant positive correlation between industry and tourism economic growth, but the impact of cultural industry development on tourism economy is more significant [1]. Kang Guohua, Liu Pengfei, Li Yanyan and Yang Dan selected the relevant data of regional economy and tourism development in Henan Province from 2005 to 2015 to study the relationship between tourism development and economic growth in Henan Province. The results show that tourism income is positively

correlated with GDP, and there is a significant linear relationship. The rapid and efficient development of tourism can effectively promote regional economic growth. The speed and quality of regional economic growth are of great significance to the development of tourism [2]. Li Xiaolong and Mao Mingming collected the time series data of Chongqing from 1999 to 2012, established the econometric model based on Romer's economic growth theory, and discussed the impact of Chongqing's cultural industry development on economic growth using the co integration test method. The results show that the total output and employment of cultural industry The number of personnel has a positive effect on economic growth [3]. Xu Cuirong and Zhang Guanghai used the E-G two-step co integration test to test the long-term co integration relationship between cultural industry development and tourism economic growth, and used the Granger causality model to test the Granger causality relationship between cultural industry development and Tourism economic growth. The results show that: in the long term, cultural industry development and tourism economic growth There is a stable co integration relationship between the growth of tourism economy, and there is a two-way Granger causality between them. The development of cultural industry plays a more significant role in promoting tourism economy [4]. Yuan Liansheng and Fu Peng use the data of China's provincial panel in 2000-2014 to empirically test the impact of cultural industry development on regional economic growth. The results show that the development of cultural industry has an impact on regional economic growth Economic growth plays a significant role in promoting economic growth and has an accelerating effect [5]. Some scholars also believe that economic growth plays a greater role in promoting local cultural and creative industries than in contributing to economic growth. In conclusion, there is an interactive relationship between the development of cultural industry and the growth of tourism economy [6]. Most of the literatures are concentrated at the national level, regional level and some provinces with better development. There are few quantitative studies on Central Plains and Henan, and there is no clear definition of the interaction between Central Plains and Henan.

2. Methodology

In this paper, Eviews 8.0 is used to do ADF test for time series *LNTZ*, *LNZP* and *LNSC* to determine the stability of time series.

It can be seen from the sequence diagram that these three groups of sequences have obvious change trend, so it can be preliminarily judged that these three groups of sequences are unstable, and the change trend is almost the same, so there may be a cointegration relationship between them. In order to further verify the results, according to the cointegration theory proposed by Engle Granger, if *LNTZ*, *LNZP* and *LNSC* are cointegrated, their order must be the same. Next, ADF test and cointegration test are carried out for three sets of sequences.

2.1. Stationary Test of Variables

By observing three groups of time sequence diagrams, when performing ADF test, select the test with intercept term, and the test results are shown in Table 1.

Table 1. ADF unit root test results

Variable	ADF-t	Critical value			Prob	Conclusion
		1%	5%	10%		
DLNZP	-3.652	-4.004	-3.098	-2.690	0.018	Steady
DLNTZ	-3.524	-4.200	-3.17	-2.728	0.028	Steady
DLNSC	-3.892	-4.004	-3.098	-2.690	0.012	Steady

From Table 1, it can be seen that at the significant level of 1%, 5%, 10%, the three groups of sequences of *LNTZ*, *LNZP* and *LNSC* did not reject the original hypothesis, and the three sequences were nonstationary sequences. But their first-order difference sequences *DLNTZ*, *DLNZP*, *DLNSC* stationary at 1%, 5%, and 10% significance levels. Therefore, *LNTZ*, *LNZP* and *LNSC* are all first-order single integer sequences, and the long-term trend of the logarithmic sequence of the added value of the tertiary industry, the added value of culture and related industries, and the per capita disposable income is first-order stable. as a result, the long-term relationship among the three variables can be analyzed by cointegration.

2.2. Cointegration Test of Variables

In this paper, E-G two-step method is used to test the cointegration relationship between the added value of the tertiary industry *LNSC*, the fixed asset investment of culture and related industries *LNTZ* and the per capita disposable income *LNZP*. The regression among *LNSC*, *LNZP* and *LNTZ* was done first, and then the residual stability was tested. If the residual sequence is stable, it indicates that there is a long-term stable equilibrium relationship between the dependent variable and the explanatory variable of the regression equation. Establishing a cointegration regression model with constant terms:

$$LNSC_t = \beta_0 + \beta_1 LNTZ_t + \beta_2 LNZP_t + e_t \quad (1)$$

Taking *LNSC* as the dependent variable of regression equation, *LNTZ* and *LNZP* as the independent variables of regression equation, the long-term equilibrium regression

model is constructed, and the regression estimation is carried out according to OLS method, and the cointegration regression equation is obtained as follows:

$$LNSC_t = 5.903636 + 0.6776359 LNTZ_t - 0.13854 LNZP_t + e_t \quad (2)$$

Table 2. Equation regression results

Variable	t	R ²	0.989
<i>LNSC_t</i>	4.361	Adjusted R ²	0.987
<i>LNTZ_t</i>	11.663	DW	1.195
<i>LNZP_t</i>	0.792	F	612.587
-	-	Prob	0.000

Secondly, let *e_t* be the residual sequence of regression equation. From the above regression equation, the residual sequence equation is as follows:

$$e_t = LNSC_t - 0.676359 LNTZ_t - 0.13854 LNZP_t - 5.903636 \quad (3)$$

ADF test is carried out for the residual sequence *e_t*, and the results are shown in Table 5.

Table 3. ADF test results of residual sequence *e_t*

Variable	ADF-t	1% Critical value	Prob	Conclusion
<i>e_t</i>	-3.704	-4.200	0.022	Steady

It can be seen from Table 3 that the residual sequence *e_t* is stable at 1% significance level, which indicates that there is cointegration relationship between the sequences *LNSC*, *LNTZ* and *LNZP*. The F statistic corresponds to Prob value less than 0.05, which excludes the original assumption that the total explanatory variable of the model is zero, indicating that the model as a whole is significant and that *R²* and adjusted *R²* are greater than 98% (Table 2), shows that the model as a whole is well suited. The regression results show that there is a correlation between cultural industry and tourism economic growth in Henan Province. When *LNZP* remained unchanged, *LNSC* increased by 0.676359% , *LNTZ* increased by 1% , *LNZP* increased by 1% , *LNSC* decreased by 0.13854% . It shows that the development of cultural industry has an important impact on economic growth.

3. Empirical Analysis

3.1. Variable Selection and Data Processing

In this paper, the annual fixed asset investment (TZ) and per capita disposable income (ZP) of cultural industry and related industries in Henan Province are selected to represent the development degree of cultural industry, and the value-added of tertiary industry (SC) in Henan Province is selected as the representative of tourism economic growth level, among which the fixed asset investment of culture and related industries in 2018 was the forecast data.

The data are from Henan Cultural Industry Statistics 2005, China Cultural Industry Development Report 2007, Henan statistical yearbook 2004-2019, China cultural and

related industries statistical yearbook 2013-2018, China cultural relics statistical yearbook, China Statistical Yearbook, and National Bureau of statistics. Because there may be Heteroscedasticity in the use of time series data, this paper first makes a natural logarithm transformation on the fixed asset investment, per capita disposable income and the added value of the tertiary industry of variable culture and related industries in Henan Province. The converted variables are recorded as *LNTZ*, *LNZP*, and *LNSC*. The first-order difference sequences are *DLNTZ*, *DLNZP* and *DLNSC* respectively, and the second-order difference sequences are *D²LNTZ*, *D²LNZP* and *D²LNSC* respectively. The data are analyzed by Eviews 8.0 software.

3.2. Granger Causality Test

The AR root chart method is used to verify the stability of the VAR model, and the characteristic root of the characteristic equation is basically located in the unit circle (as shown in Figure 4-4). Therefore, it can be judged that the VAR model is basically stable, indicating that the tourism economic growth and cultural industry development are stable as a whole, which can be used as the basis for further impulse response analysis.

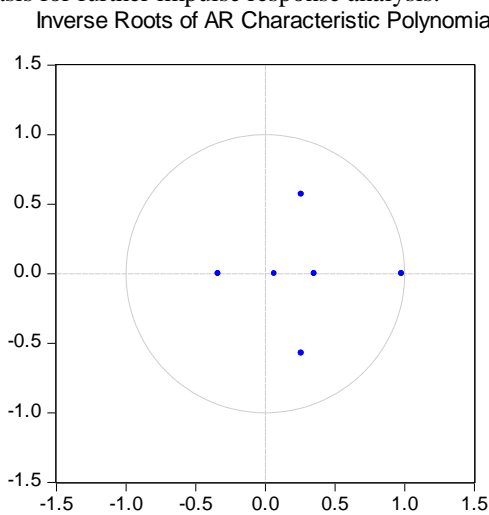


Figure 1. Results of VAR model stability test.

From the previous co integration test results, we can see that there is a long-term stable equilibrium relationship between the development of cultural industry and the growth of tourism economy in Henan Province, but whether this equilibrium relationship presents causality in time needs to be further verified. In this paper, Granger causality test is used to analyze, and according to LR, FPE, AIC, SC and HQ five lagging evaluation criteria, F statistics, AIC standard, SC standard and HQ all pass the third-order lag (Table 4). Therefore, the best lag time of Granger causality test is determined as the third-order lag.

Table 4. Selection criteria of third order lag time lag

Lag	LogL	LR	FPE	AIC	SC	HQ
0	9.39	NA	7.51e-05	-0.98	-0.85	-1.01

1	59.0	68.72*	1.54e-07	-7.23	-6.71	-7.34
2	73.14	13.02	9.65e-08	-8.02	-7.10	-8.20
3	91.61	8.52	6.85e-08*	9.47*	-8.17*	9.74*

In the selection of lag order of the model, the third-order lag has passed three standards, so in the Granger test, this paper tests the first, second and third-order lag successively, and lists the results related to the development of cultural industry in Table 5, 6 and 7 respectively.

Table 5. Granger causality test results for LNTZ by other variables at first-order lag

Dependent variable: LNTZ			
Excluded	Chi-sq	Excluded	Chi-sq
<i>LNSC</i>	4.864494	<i>LNSC</i>	4.864494
<i>LNZP</i>	0.072644	<i>LNZP</i>	0.072644
All	4.910303	All	4.910303

Table 6. Granger causality test results for LNTZ by other variables at second-order lag

Dependent variable: LNTZ			
Excluded	Chi-sq	Excluded	Chi-sq
<i>LNSC</i>	5.966275	<i>LNSC</i>	5.966275
<i>LNZP</i>	1.068792	<i>LNZP</i>	1.068792
All	6.463960	All	6.463960

Table 7. Granger causality test results for LNSC by other variables at first-order lag

Dependent variable: LNSC			
Excluded	Chi-sq	Excluded	Chi-sq
<i>LNZP</i>	3.544170	<i>LNZP</i>	3.544170
<i>LNTZ</i>	0.417058	<i>LNTZ</i>	0.417058
All	3.626727	All	3.626727

From the three tables, it can be seen that the p-value of *LNSC* in the first and second lag periods representing tourism economic growth is less than 0.05, which negates the hypothesis that the test variable is not the causal relationship of the dependent variable, indicating that *LNSC* is the Granger cause of *LNTZ*, and the changes of tourism economic growth will affect the changes of cultural industry. The probability value of *LNZP* lagging behind the first stage is less than 0.05, which rejects the original hypothesis, indicating that the development and change of cultural industry will affect the change of tourism economic growth.

To sum up, there is a two-way causal relationship between the development of cultural industry and the growth of tourism economy. In case of short-term lag, China's tourism economic growth and cultural industry development promote each other, and cultural industry

development has a more significant impact on tourism economic growth.

3.3. Impulse Response Function and Variance Analysis Based on VAR Model

Granger causality test shows that the development of cultural industry plays an important role in the process of tourism economic growth, and also confirms that the added value of the tertiary industry will have a certain impact on the development of cultural industry. In order to further verify, this paper uses the vector autoregression (VAR) technology to decompose the impulse effect and variance to study the dynamic relationship between them.

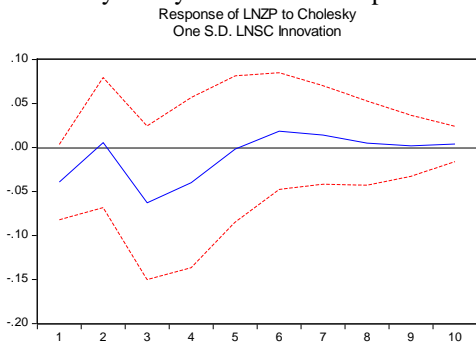


Figure 2. Impulse response function of the impact of LNSC on LNZZP.

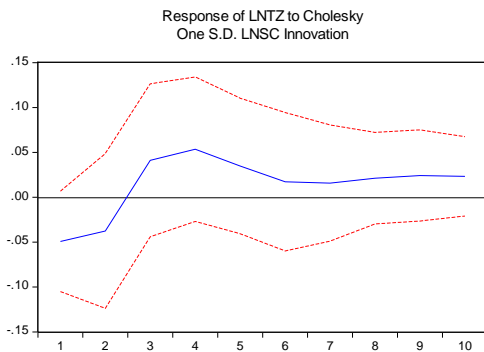


Figure 3. Impulse response function of the impact of LNSC on LNTZ.

Figure 2 shows that when *LNSC* has a positive standard deviation effect on *LNZZP*, the sixth period is the maximum value, and then the effect begins to weaken and tends to zero. It can be seen from Figure 3 that when *LNSC* gives *LNTZ* a positive standard deviation, *LNTZ* will generate a positive pulse response. After the peak value of the fourth period, the response coefficient decreases, and the sixth period tends to be stable. It shows that with the passage of time, the promotion of tourism economic growth to the development of cultural industry will gradually appear and will continue to be stable.

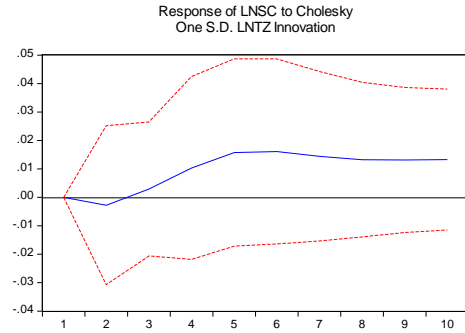


Figure 4. Impulse response functions of the impact of LNTZ on LNSC.

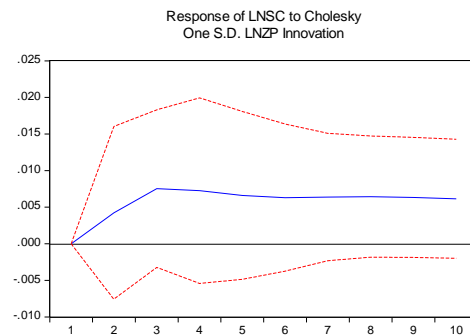


Figure 5. Impulse response functions of the impact of LNZZP on LNSC.

It can be seen from Figure 4 that when *LNTZ* gives *LNSC* a positive standard deviation impact, *LNSC* will have a small negative pulse response, showing a positive response in the second phase, and the maximum positive response in the fifth phase, and then gradually tend to be stable; Figure 5 shows that the impact of *LNZZP* on *LNSC* gradually increases, reaching the maximum in the third period and becoming stable. It shows that the development of cultural industry has a long-term positive effect on tourism economic growth.

Table 8. Granger causality test results for LNSC by other variables at first-order lag

Lag phase	Contribution to the change of tourism			
	S.E.	LNSC	LNTZ	LNZZP
1	0.035767	100.0000	0.000000	0.000000
2	0.043083	98.62365	0.410922	0.965424
3	0.054729	96.96655	0.542135	2.491311
4	0.060556	93.19304	3.337109	3.469848
5	0.064691	87.05456	8.861776	4.083663
6	0.068101	81.85795	13.60135	4.540693
7	0.071267	78.53333	16.51736	4.949315
8	0.074327	76.33714	18.36197	5.300886
9	0.077198	74.50450	19.90893	5.586577
10	0.079818	72.79147	21.39060	5.817931

It can be seen from Table 8 that the contribution rate of changes in economic growth to itself is the largest in the first phase, reaching 100%, and then gradually decreases to 72.29% in the tenth phase; The contribution rate of fixed asset investment to tourism economic growth was

0.00% in the first period, and then increased continuously, reaching 21.39% in the tenth period; The contribution rate of per capita disposable income to the change of tourism economic growth was very small in the first two periods, and then gradually increased to 5.82% in the 10th period. In general, the development of cultural industry in Henan Province contributes more to the growth of tourism economy [7].

3.4. Discussion

Through empirical analysis, this paper holds that there is a long-term stable and balanced relationship between the development of cultural industry and the growth of tourism economy in Henan Province, which is more inclined to the views of Chen Binjian, Xu Cuirong, Yuan Liansheng and other scholars. At the same time, Granger causality test, impulse response analysis and variance analysis are used to further confirm that the development of cultural industry in Henan Province has a strong pulling effect on tourism economic growth, and the conclusion is more rigorous. Based on the reality of Henan Province, this paper is helpful to clarify the thinking, examine and evaluate the relationship between cultural industry and tourism reasonably, so that the corresponding measures are more suitable for the actual needs of Henan Province, and the conclusion is more practical.

4. Conclusions and Suggestions

4.1. Research Conclusion

Based on the previous research results, this paper uses the method of econometric co integration to build VAR model, and studies the interaction between cultural industry and tourism economic growth in Henan Province. The main conclusions are as follows:

The cointegration test shows that there is a long-term stable equilibrium relationship between cultural industry and tourism economic growth in Henan Province. The elasticity coefficient of fixed asset investment in culture and related industries to the third output value is 0.68. For each 1% increase in fixed asset investment in culture and related industries, the output value of the third industry will increase by 0.68%. It can be seen that the development of cultural industry has a significant impact on tourism economic growth.

Granger causality test shows that there is a two-way causality between tourism economic growth and cultural industry development, among which cultural industry development has a more significant impact on tourism economic growth.

The impulse response function shows that the standard deviation of fixed asset investment and per capita disposable income of culture and related industries has a positive effect on the long-term stability of the added value of the tertiary industry, indicating that the development of culture industry has a significant impact on the growth of tourism economy in Henan Province.

The result of variance decomposition shows that since the third period, the contribution rate of fixed asset investment and per capita disposable income of culture and related industries has been on the rise, and the contribution rate of the added value of the third industry to itself has been on the decline. It can be seen that the development of culture industry will have more and more influence on the growth of tourism economy over time[8].

4.2. Suggestion

The empirical results show that there is a long-term stable equilibrium relationship between cultural industry and tourism economic growth in Henan Province. The government should be market-oriented, reform and innovation driven, implement targeted poverty alleviation, optimize the tourism market environment, rely on new media and Internet platforms, promote the transformation of cultural tourism industry, and promote the sustainable and healthy development of tourism in the province.

The conclusion shows that the development of cultural industry in Henan Province has a strong pulling effect on tourism economic growth. The government should increase investment, vigorously support the key technology and core technology of the core cultural industry, transform the traditional cultural industry, cultivate and develop a group of competitive cultural tourism market subjects, transform cultural advantages into cultural tourism industry advantages, innovate publicity methods, and encourage social investment.

Introduce high-end cultural tourism talents, encourage colleges and universities to set up cultural tourism related majors, increase support for cultural tourism innovation practice bases, incubators and other platforms, set up cultural tourism education funds and training, implement talent quality improvement plans, develop and improve the cultural tourism form of "food, housing, transportation, tourism, shopping and entertainment", and improve the level of cultural tourism services.

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