Research on the Relationship Between Tourism Economic Growth and Urban-Rural Income Gap Using Mathematical Models

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Abstract: China's tourism economy has developed rapidly in recent years. Due to the growth of social economy, people's living conditions have improved, and they have sufficient material conditions to travel to meet the needs of spiritual civilization. Under this premise, China's tourism economy has developed rapidly. In order to study the factors that promote the development of China's tourism economy and promote the development of China's economy as a whole, this study conducts an empirical study on the relationship between tourism economic growth and urban-rural income gap. This study selects China's economic data from 1994 to 2016, establishes a vector autoregression model, and uses the methods of ensemble analysis and Granger causality test to conduct an in-depth study of the relationship between China's tourism economic growth and urban-rural income gap. analyze. At the end of this study, some suggestions are put forward for the development of tourism economy. This study can provide substantial reference for promoting the development of tourism economy.

Keywords: Tourism economy; model; economic analysis

1   Introduction

The urban-rural income gap can actually reflect the current situation of social development. Therefore, scholars around the world continue to conduct research and analysis on the urban-rural income gap data. The research results related to the urban-rural income gap can effectively enhance social and economic growth and promote social stability and harmony. In order to narrow the income gap between urban and rural areas, many experts, scholars and government officials are looking for ways. As a comprehensive and interconnected industry, tourism can promote economic growth and promote urban and rural development [11].

There are two main views in China on the relationship between tourism and urban-rural income gap. One is that the development of tourism can narrow the income gap between urban and rural areas. In a 2010 study, scholars Pan Xueyang and others analyzed the urban-rural income gap

data of important cities and counties in Sichuan Province [12]. Their research found that developing rural tourism can help farmers increase their income and narrow the income gap between urban and rural areas. Scholars Yuan Zhihui and Wang Dongyang analyzed tourism development and urban-rural income gap in Hainan Province in a 2014 study. The final research results suggest that tourism development, especially the construction of international tourism islands, can narrow the income gap between urban and rural areas. Scholar Liu Fang analyzed the economic indicators of Fenghuang County in 2012. Its research found that the income growth rate of urban residents is higher than that of rural residents, which will lead to a widening income gap between urban and rural areas. In their research on Zhangjiajie in 2015, scholars Wang Yongming and Wang Meixia found that tourism development has no significant impact on the income of rural residents, but only has a significant impact on the income of urban residents. It can be seen from these research results that there is no unified understanding of the relationship between tourism development and urban-rural income gap in the academic circles.

In order to conduct a detailed empirical analysis on the tourism industry development and the urban-rural income gap, this study collected data from 1995 to 2017 to establish a practical sequence VAR model to analyze the long-term equilibrium between China's tourism economic growth and urban-rural income gap. In-depth study of relationships and short-term dynamics. The analysis results of this study found that the development of tourism economy can help the coordinated development of urban-rural income gap [10].

2 Status quo of China's tourism economic development

In recent years, China's economic structure has been continuously adjusted and optimized, people's consumption structure has been upgraded, and tourism has gradually become a popular activity. Nowadays, tourism and leisure has become an important criterion to measure the quality of life [1]. The "Statistical Bulletin of China's Culture and Tourism Development in 2020" issued by the Ministry of Culture and Tourism of the People's Republic of China has made statistics on China's tourism revenue in 2020. Under the influence of the new crown epidemic, the total domestic tourism revenue in China is still 2.23 trillion yuan. The number of tourists in China reached 2.879 billion [5]. In the nine years from 2011 to 2019, China's total tourism revenue and total tourist arrivals have maintained an increasing trend. In 2019, China's total domestic tourism revenue reached 5.73 trillion yuan, an increase of 11.7% over the previous year. In 2019, the total number of domestic tourists in China reached 5.901 billion, an increase of 8.4% over the previous year. China's economy has gradually developed in the direction of high quality in recent years. In 2019, the total number of travel agencies in China was close to 39,000. There are more than 10,000 star-rated hotels, and the total tourism revenue accounts for 11.05% of GDP. These data all show that China's tourism industry has developed rapidly in recent years. As shown in Figure 1. The influence of the role of tourism has become more and more extensive, and it has gradually become an important pillar of China's economic development [4].
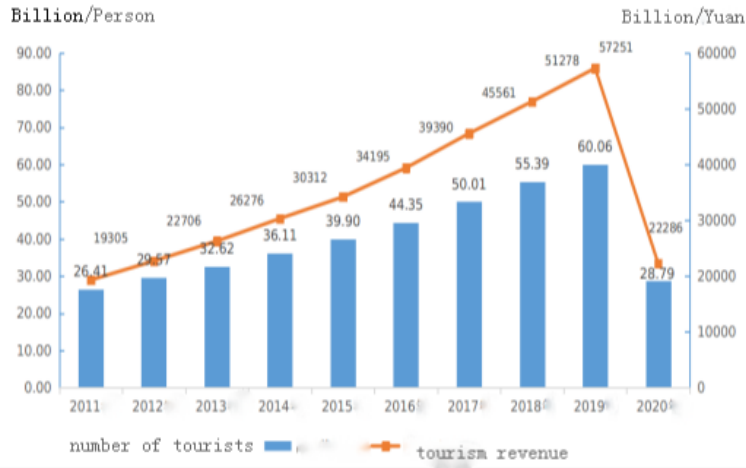
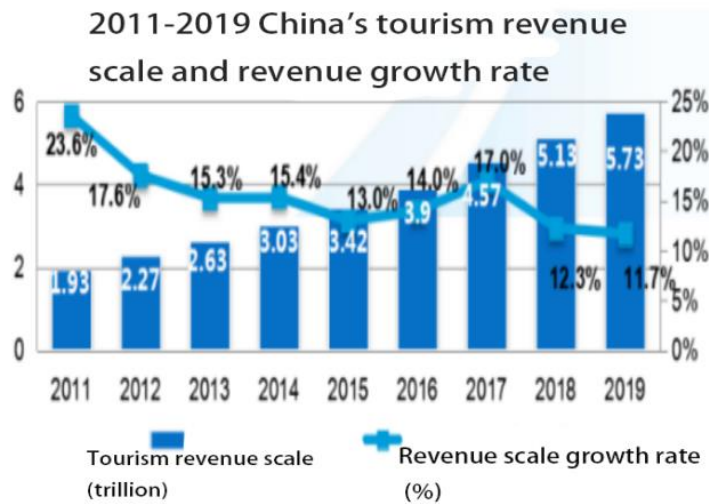Figure 1: Changes in Chinese tourist arrivals

Figure 2: China's tourism revenue scale and revenue growth rate from 2011 to 2019

In recent years, China has placed the tourism industry in an increasingly important position, and has continuously improved the management system of the tourism industry through policies and enhanced its tourism governance capabilities [3]. The tourism enterprise market is becoming more and more active, and a group of tourism enterprises with strong competitiveness, daring to innovate and good at innovation have begun to form. At present, various local governments in China are also paying more and more attention to the integration of tourism and other related industries, using a variety of support policies and measures to continuously optimize the accommodation, catering, shopping and leisure environment of tourist attractions, and improve the level of service capabilities. The development of the tourism industry has stimulated the development of many other industries [13]. The development space and channels of the tourism

economy and tourism industry have been continuously expanded, which has promoted the improvement of the local economy and the improvement of people's livelihood. At present, China's tourism industry system is gradually improving, and the consumption chain industry chain is continuously extended, which promotes the upgrading of products, technologies and industrial status of the tourism economy. Under such a premise, this research will demonstrate the relationship between the urban-rural income gap and the tourism economy, so as to draw a method to promote the development of the tourism economy and narrow the urban-rural income gap [2].

3 Selection of data and models

3.1 Choosing variables in empirical research

Since this study is to analyze the relationship between urban-rural income gap and tourism economic development, the variables in this study are urban-rural income gap and tourism economic growth.

When collecting data on the urban-rural income gap, relative indicators are used. Using relative indicators means that the ratio of urban per capita disposable income to rural per capita net income is the dependent variable in the study. The larger the ratio between the two data, the larger the income gap between urban and rural residents.

In the tourism economic growth data, relative indicators are also used. In this data, the ratio of China's domestic tourism revenue to China's overall GDP is the explanatory variable. From the variables, it can fully reflect the proportion of the tourism economy in the regional economy, which shows the contribution of the tourism industry to the regional economic development [6].

3.2 Research data sources

This study uses the relevant data of China from 1996 to 2018 as a sample. The China Statistical Yearbook has made statistics on the per capita disposable income of Chinese urban residents and the per capita income of rural residents. The data in this study are selected from the China Statistical Yearbook. The tourism revenue data used in the research comes from the statistics compiled by the Ministry of Culture and Tourism of China. The Eiews 8.0 software was used for data analysis in the study. There will be heteroscedasticity in the time series summary of the data. In order to prevent the heteroscedasticity from affecting the data analysis results, this study uses the natural logarithm when selecting values. This study records the natural logarithm of China's tourism economic growth as InTOUR and InGAP.

4 Empirical analysis

4.1 Setting the model

The vector autoregressive model is a commonly used econometric model today. The vector autoregressive model extends the autoregressive model that can only use one variable, so that the model can accommodate the value of more than one variable. Because of the advantages of vector autoregressive models, vector autoregressive models are often used in multivariate

practice sequence model analysis. This study also makes full use of the vector autoregressive model [7].

The vector autoregressive model takes the statistical characteristics of the time series as the starting point, and uses the form of simultaneous equations to analyze the long-term change trend between variables and the shock transmission mechanism. During this analysis, impulse analysis and variance decomposition were used. This study uses the VAR model to describe and analyze the tourism economic growth and the urban-rural income gap. The specific formula is as follows:

$$Z_t = C + A_1 Z_{t-1} + \ldots + A_P Z_{t-p} + \varepsilon_t \qquad (1)$$

In the formula, Zt= (Yt, Xt) is a vector of two endogenous variables. Yt stands for tourism economic growth. Xt represents the urban-rural income gap. ε_t is the random disturbance term. P is the lag order.

4.2 Stationarity Test

In general, the practical sequence of economic variables is not stationary. In order to prevent the time series from affecting the results of the data model, the single integer order of the variable should be judged before studying the time series. The ADF test is used to test the stationarity of the data. The test results show that at the 5% significance level, the ADF statistics of the variables InTOUR and InGAP are all greater than the corresponding critical values. This data result can show that both series are non-stationary. In the first-order difference, the ADF statistics of ΔInTOUR and ΔInGAP are all smaller than the corresponding critical values, and the conclusion that there is a unit root is not accepted. This result shows that the order difference series of the two variables are both stationary and first-order single integral series [9].

4.3 Cointegration Test

Cointegration test is an important part of macroeconomic econometric analysis. Since the cointegration test method was put forward, the cointegration test has become one of the most important tools to analyze the quantitative relationship between the values of non-stationary economic variables. Cointegration test can describe the linear adjustment mechanism between economic variables through a linear error correction model. Cointegration is the common randomness trend that exists in the data. Cointegration can convey a long-term equilibrium relationship, and if a reliable exercise can be found between several variables that seem to de-oil a separate random trend, then after sorting, the random trend brought by the unit root can be excluded. This is the error correction model [14].

The cointegration test method used in this study was the Johansen cointegration test. The results of the cointegration test are shown in Table 1.

Table 1: Cointegration Test Results

Null hypothesis	no cointegration	at most one cointegration
Eigenvalues	0.569	0.158
trace statistics	18.795	3.369
5% threshold	15.641	3.842
P-value	0.015	0.068

It can be seen from Table 1 that the value of the trace statistic is greater than the critical value at the 5% significance level, rejecting the null hypothesis that there is no cointegration equation, but accepting the null hypothesis that there is a cointegration equation. This data result shows that there is a long-term equilibrium relationship between China's tourism economic growth and the logarithmic series of urban-rural income gap, and they all have unique standardized cointegration vectors [8].

4.4 Impulse response analysis

The impulse response function analyzed by the model describes the impact on the current and future values of endogenous variables after a one-time shock is applied to the random error term. Figure 2 clearly shows how the growth of the tourism economy responds to exogenous shocks from the urban-rural income gap. It can be seen from the figure that after a positive impact of one standard deviation on the urban-rural income gap in the current period, the tourism economic growth is basically not affected by the exogenous impact of the urban-rural income gap. In the long run, tourism economic growth is affected by the urban-rural income gap and remains at around 0 [15].
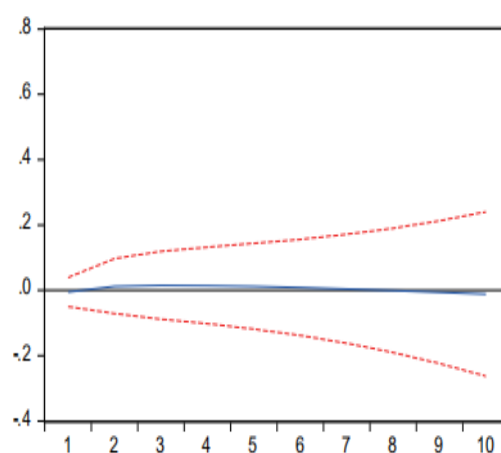

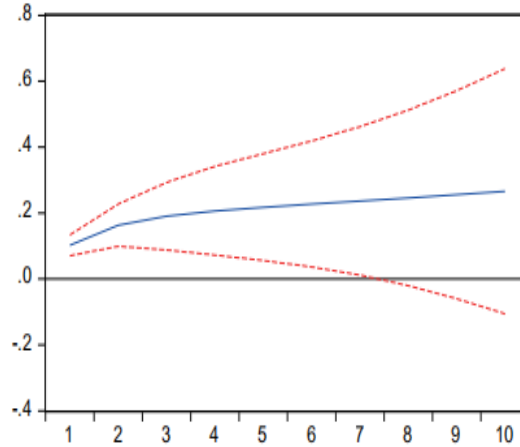Figure 3: Impact of urban-rural income gap on tourism economic growth

Figure 4: Impact of tourism economic growth on the urban-rural income gap

Figure 3 shows the response of the urban-rural income gap to exogenous shocks from tourism economic growth. It can be seen from the figure 4 that the initial shock to the exogenous 1 unit from the growth of the tourism economy has little effect on the nitrogen of the urban-rural income gap. In the long run, the exogenous shock of the tourism economy will reduce the urban-rural income gap by about 0.1 unit.

5   Conclusion

This study uses the VAR model to conduct an in-depth exploration of the relationship between China's tourism economic development and the urban-rural income gap. It can be seen from the impulse response function obtained from the model that the change of the urban-rural income gap has no significant impact on the tourism economy, but in the long run, the development of the tourism economy will have a negative correlation with the urban-rural income gap. In other words, the development of China's tourism economy can narrow the income gap between urban and rural areas. This research conclusion can provide sufficient basis for the development of China's tourism economy and help the development of tourism economy and rural economy.

References

[1] Cheng Chuyi. Analysis on the relationship between industrial structure upgrading, rural labor transfer and urban-rural income gap [J]. Shanxi Agricultural Economics, 2022(06):17-19. DOI:10.16675/j.cnki.cn14-1065/f.2022.06 .005.

[2] Deng Aimin, Li Peng. Analysis and Empirical Research on Influencing Factors of China's Tourism Economy [J]. Macroeconomic Research, 2022(03):106-115+137.DOI:10.16304/j.cnki.11-3952/f. 2022.03.003.

[3] Hu Haihua, Li Qian. Research on the Impact of New Infrastructure Investment on China's Urban-Rural Income Gap [J/OL]. Operation and Management: 1-17 [2022-05-14]. DOI: 10.16517/j.cnki.cn12-1034/f.20220228.002.

[4] King Kong, Li Yujia, Fu Jiaxin, Gai Kexuan. The development of foreign tourism economy and the construction of China's national image [J/OL]. Industrial Economic Review: 1-16 [2022-05-14]. DOI: 10.19313/j.cnki .cn10-1223/f.20220422.002.

[5] Liu Zhen, Yang Yong, Sui Xiayun. Internet Development, Market Vitality Stimulation and Tourism Economic Growth: An Analysis Based on the Perspective of Spatial Spillover [J/OL]. Tourism Science: 1-25 [2022-05-14]. DOI :10.16323/j.cnki.lykx.20220418.001.

[6] Luo Fang, Chen Ying. Industrial structure upgrade, fiscal expenditure bias and urban-rural income gap [J]. Xinjiang Agricultural Reclamation Economy, 2022(03): 50-60.

[7] Wang Jijian. Analysis of Contribution Rate of Influencing Factors of Traditional Industry Transformation and Upgrading Based on VAR Model.

[8] Xu Jing. Structural characteristics and evolution process of tourism economic network in Jiangsu Province [J]. Journal of Nanjing Xiaozhuang University, 2022,38(02):114-119.

[9] Ye Xiaoqing, Wang Weifeng. Estimation of VAR model for three-dimensional panel structure [J]. Statistics and Decision Making, 2022, 38(02): 33-36. DOI: 10.13546/j.cnki.tjyjc.2022.02.006.

[10] Yang Xingyu, Tian Bo, Zhang Fengtai, Wu Jianfeng. Research on the temporal and spatial evolution and influencing factors of China's tourism economic development differences [J/OL]. Resource Development and Market: 1-11 [2022-05-14]. http://kns. cnki.net/kcms/detail/51.1448.N.20220410.0110.002.html

[11] Yang Yi, Wang Yang, Zhou Ying, Zhao Zichen. A study on regional differences in the impact of high-speed rail opening on urban tourism economy [J]. Finance and Economics Theory and Practice, 2022, 43(02): 67-75. DOI: 10.16339/j.cnki. hdxbcjb.2022.02.009.

[12] Zeng Bing, Yang Meiwen. Dividend or Divide: Does Internet Development Bring about Urban-Rural Income Gap? [J]. Journal of North China University of Science and Technology (Social Science Edition), 2022, 22(02): 33-40.

[13] Zhang Ruisi, Wang Yunfeng. Analysis of the Influence of Urbanized Rural Fixed Asset Investment on Urban-Rural Income Gap [J]. Agriculture and Technology, 2022, 42(06): 145-150. DOI: 10.19754/j.nyyjs.20220330032.

[14] Zhu Xiaoyang. The impact and empirical research on the development of digital inclusive finance on the income gap between urban and rural areas [J]. Business Economics, 2022(06):176-179. DOI:10.19905/j.cnki.syjj1982.2022.06.055 .

[15] Zhang Yi. VAR Model Analysis of Influencing Factors of Domestic Tourism Consumption Expenditure [J]. Modernization of Shopping Malls, 2021(24):113-115. DOI:10.14013/j.cnki.scxdh.2021.24.044.