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# Research on relationship between inbound tourism and economic growth in anhui province

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## ABSTRACT

This paper analyzes the relationship between inbound tourism and economic growth in Anhui province by using the statistics data of Anhui province from 1991 to 2010, and adopting the methods such as unit root test, cointegration theory, Granger causality test and VAR model etc. in econometrics. The study results show that: the inbound tourism revenue in Anhui province not only has long term positive balance relationship with economic growth, but also has short term dynamic adjustment relationship, therefore, it is the inexorable trend of development in tourism industry of Auhui province to energetically develop inbound tourism industry in Anhui, and make inbound tourism as the pillar industry for social economy and transfer it to strategic pillar industry, which is also an important initiative for promoting economic level of Anhui and driving great development of Anhui economy.

## KEYWORDS

Economic growth; Inbound tourism; Unit root; Cointegration; Granger test; VAR module.



## INTRODUCTION

The relationship issue between tourism development and economic growth is an important issue in academic research and exploration all the time. Seen from research literature, the research conclusions on relationship between tourism development and economic growth can mainly be classified into 3 categories: the first one is that the economic growth brings development of international tourism industry, such as Huang Weili and An Li adopt cointegration test and weak exogeneity analysis, which considers that economic growth is the long term Granger causality of inbound tourism development, however, tourism development is not Granger causality of economic growth[1], and it supports the research conclusion of oh on relationship between inbound tourism development and economic growth in Korea[2]. The second one is that there is no causality relationship between economic growth and international tourism development, and the experts, such as Yang Yong, adopt VAR module to perform empirical research, who thinks that no matter in long term or short term, there is no stable causality between them[3]. Liu Siwei and Wu Zhongcai also prove that there is no causality between inbound tourism and economic growth[4]. The third one is that it is of mutual causality between international tourism industry development and economic growth. Liu Yinghui et al. think international tourism is an important part of service trade export[5], which not only can create employment opportunities and increase foreign exchange earnings from tourism, but also can promote regional economic growth, meanwhile, economic growth also provide necessary external environment and continuous input for development of tourism industry, both of them can promote and influence each other.

## EMPIRICAL ANALYSIS

### Data Source and Indicator Selection

In the paper, the gross domestic product (GDP) of Anhui is used to reflect the economic growth in Anhui district, and the gross domestic product indicator is used to convert GDP into the value calculated with the unchanged price in 1991. The total inbound tourism revenue (IR) is selected as the indicator for evaluating development of inbound tourism industry, which is also converted to the value calculated with the unchanged price in 1991 with consumer price index; the total inbound tourism revenue is comparatively comprehensive and continuous in Anhui tourism statistics over the years, which can also describe the development of inbound tourism industry better, therefore, this index is selected to describe the development of inbound tourism industry. In order to eliminate heteroscedasticity, the natural logarithm of each variable is taken to eliminate the variation trend, and the two variables can be indicated with LGDP and LIR.

The annual data from 1991 to 2010 is selected in the paper as the sample range, and the data are mainly from *Anhui Statistical Yearbook* and *China Statistical Yearbook*. In order to observe the variation trend between variables visually, the author draws the timing diagram and first order differential sequence diagram with Eviews5.0 software, as shown in Figure 1 and Figure 2.

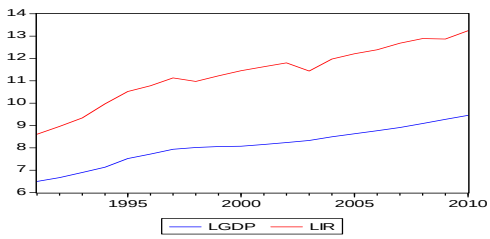


**Figure 1 : Timing diagram**

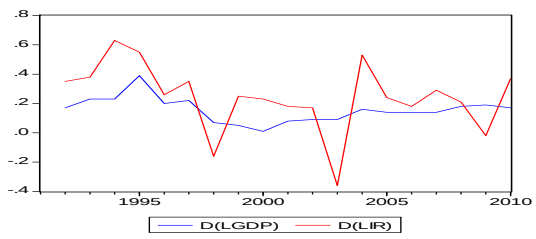


**Figure 2 : First order differential sequence diagram**

As can be seen from Figure 1: the variation feature of logarithm values LGDP and LIR of variables GDP and IR are exactly similar, so we can judge that there is certain common trend and

constant term between them, which may reflect stable and rapid growth trend. In order to eliminate the influence of common tendency, differential treatment shall be done for variables. The variation feature of differential sequence is as shown in Figure 2. Figure 2 shows that: the first-order differential of variable is of stationarity. Therefore, first-order differential may be stable sequence and then perform unit root (ADF) test further.

## Stationarity test of data

All the test results of ADF in the table below are calculated through Eview5.0 software, where, the test type (c, t, k) indicates that constant term, time tendency and order of lag term are contained in unit root test equation respectively.

**TABLE 1 : Test result of unit root**

| Variable | Model (C, T, K) | (ADF) Value | 1% Critical Value | 5% Critical Value | 10% Critical Value | Conclusion |
|---|---|---|---|---|---|---|
| LGDP | (C,T,0) | -3.380526 | -3.924309 | -3.612199 | -3.443079 | Non-stationary |
| LIR | (C,T,1) | -3.206359 | -4.039337 | -3.887523 | -3.52928 | Non-stationary |
| DLGDP | (C,T,0) | -3.014123 | -2.76345 | -2.525033 | -2.246591 | stationary |
| DLIR | (C,T,1) | -4.724771 | -3.856048 | -3.295322 | -3.033356 | stationary |

**Note: C and T in the module form indicates there is constant term or trend term respectively, and K indicates that lag order is adopted**

The ADF test results shows that, in the significance level of 1%, 5% and 10%, the value of test statistics LGDP and LIR are greater than the critical value, and accept the hypothesis that there is unit root in the null hypothesis, therefore, both the sequences of LGDP and LIR are non-stationary sequence, and then continue to perform first-order differential test, which found that DLGDP and DLIR refuse the null hypothesis on the significance level of 1%, 5% and 10%, i.e. the first-order differential of sequence is without unit root, thus, the time sequences of DLGDP and DLIR are stationary, in this way, the horizontal sequence is non-stationary sequence, while first-order differential sequence is stationary sequence, so both LGDP and LIR are first-order integration l (1) sequences, which are tested by unit root, and further test can be performed to check whether there is long-term cointegration relationship between them.

According to the above ADF test, LGDP and LIN are provided with the same integration order, which can meet the cointegration analysis basis, however, whether there is cointegration equation, it shall be determined through cointegration test, and the cointegration test of the paper shall adopt the Johansen method based on VAR model. Meanwhile, the impulse response functions of LGDP and LIN are also based on VAR model. Thus, the VAR model of LGDP and LIN is required to be established firstly.

## Cointegration test

### 1. VAR model

Correct lag order must be selected when establishing VAR model, to make the VAR model reflect the dynamic feature between variables correctly. If the lag order of VAR model is too less, the autocorrelation of residual may be too large, which may cause non-uniformity of parameter estimate; if the lag order of VAR model is too large, the DOF for calculation model parameter will be reduced greatly, which may influence the effectiveness of parameter estimate. In the paper, the maximum likelihood value and the information minimum criterion such as LR (sequential modified LR test statistic), FPE(final prediction error), AIC(Akaike information criterion), SC(Schwarz information criterion), HQ(Hannan-Quinn information criterion) etc. are used as the judging standard of lag order[6]. If there is cointegration relationship between variables, long-term balance relationship is certainly

existed in the system, and the VAR model of cointegration analysis is certainly provided with dynamic stability. Only when the module of all the latent roots of VAR model is less than 1, dynamic stability can be realized in the system. Therefore, all the latent roots used for VAR model of cointegration analysis must be within the unit circle. Thus, according to the maximum likelihood value and information minimum criterion, compare the VAR models with lag orders of 1, 2, 3 and 4, the results are as shown in TABLE 2:

**TABLE 2 : Selection of lag order of VAR model**

| Lag | LogL | Level Test of Each 5% of LR | FPE Final Prediction Error | AIC Akaike Information Criterion | SC Schwarz Information Criterion | HQ Hannan-Quinn information criterion |
|---|---|---|---|---|---|---|
| 0 | -4.831954 | NA | 0.008055 | 0.853994 | 0.950568 | 0.858940 |
| 1 | 25.45067 | 49.20927* | 0.000304 | -2.431334 | -2.141614* | -2.416498 |
| 2 | 30.63159 | 7.123765 | 0.000272* | -2.578949 | -2.096081 | -2.554223 |
| 3 | 32.52342 | 2.128303 | 0.000384 | -2.315427 | -1.639412 | -2.280810 |
| 4 | 38.87255 | 5.555490 | 0.000339 | -2.609069* | -1.739907 | -2.564561* |

**Note: 1. LogL is log-likelihood;**
**2. * Indicates the lag order selected according to the information minimum criterion**

Summarize the comparison result of TABLE 2, and the optimal lag order is 4 according to the maximum likelihood value and information minimum criterion. VAR(4) can reflect the dynamic features between LGDP and LIN correctly and effectively.

## 2. Cointegration test

Johansen cointegration test is to establish strict dynamic relationship between variables based on VAR model, which is of higher test degree. Johansen cointegration test can not only judge whether there is cointegration relationship between LGDP and LIN, but also can calculate the number of cointegration equations accurately. The lag order of test model is required to be set in test, through the above VAR model analysis, for LGDP and LIN, VAR(4) is optimal. Therefore, the lag order of Johansen cointegration test model shall be set as 4; set the test variables LGDP and LIN with certainty trend; and the cointegration equation shall be set as with intercept without certainty trend. The test result is as shown in TABLE 3:

**TABLE 3 : Trace feature of cointegration analysis**

| Hypothesis of Number of Cointegration Equation | Feature Value | Trace Statistics | 5% Critical Value | Probability |
|---|---|---|---|---|
| None | 0.461693 | 15.49471 | 11.53807 | 0.1805 |
| At most one | 0.021445 | 0.390206 | 3.841466 | 0.5322 |

We can know from TABLE 3 that, when H0:r=0, the value of likelihood ratio statistics value is 15.49, which is greater than the critical value 11.54 in the significance level of 5%, therefore, refuse the null hypothesis that H0:r=0, that is to consider there is cointegration relationship between LNGDP and LNIR; and then perform the further test, as when H0:r≤1, the likelihood ratio statistics value equals to 0.39, which is less than the critical value 3.84 in 5%, therefore, accept the null hypothesis that H0:r≤1. Thus, there is only one cointegration relationship between variables in the significance level of 5%.

## 3. Cointegration fitting effect and residual test

As LGDP and LIR are first order integration l(1) sequence, which meets the integration test basis, therefore, test the fitting effect and residual of cointegration equation of inbound tourism and economic growth in Anhui with Engle-Granger two steps method

Step one: perform cointegration regression, to obtain the cointegration regression equation:

Equation LGDP=0.956288+0.631372LIR

(0.2123) (0.01866) $R^2$=0.9845 S.E=0.1069

Where, the figure in the bracket is t test value of the corresponding parameter, and Figure 3 describes the fitting effect and residual of the cointegration equation. The cointegration equation shows that: 1 percent point increase in inbound tourism may drive growth of about 0.63 percent point in gross domestic product in Anhui, which shows that the inbound tourism has significant driving effect on economic growth.

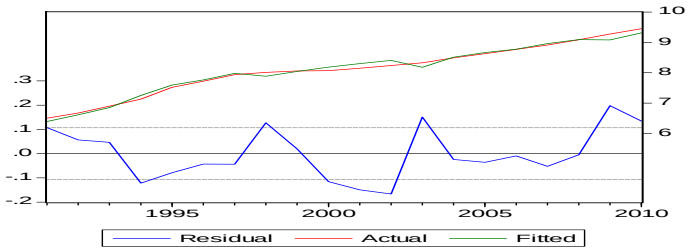


**Figure 3 : Fitting effect and residual of cointegration equation**

## Granger causality test

The above analysis shows that there is cointegration relationship between LGDP and LIN, however, this long term balance relationship is the result of IR change caused by GDP, or the result of GDP change caused by IR on earth? This is required to be confirmed through Granger causality test for LGDP and LIR, as Granger causality test is sensitive to selection of lag order, the lag order may influence the sample capacity and residual stationarity of the test model, so as to influence the accuracy of test result[7], therefore, take lag 1-6 phase, and the test result is as shown in TABLE 4.

**TABLE 4 : Test result of granger causality**

| Lag | Null Hypothesis | Observed Value | F-Statistic | Probability | Conclusion |
|---|---|---|---|---|---|
| 1 | LIR does not Granger Cause LGDP | 19 | 0.01828 | 0.89414 | Accept |
| | LGDP does not Granger Cause LIR | | 4.59280 | 0.04782 | Refuse |
| 2 | LIR does not Granger Cause LGDP | 18 | 0.08565 | 0.91843 | Accept |
| | LGDP does not Granger Cause LIR | | 2.61756 | 0.11085 | Refuse |
| 3 | LIR does not Granger Cause LGDP | 17 | 0.15710 | 0.92271 | Accept |
| | LGDP does not Granger Cause LIR | | 2.22580 | 0.14792 | Refuse |
| 4 | LIR does not Granger Cause LGDP | 16 | 0.40926 | 0.79718 | Accept |
| | LGDP does not Granger Cause LIR | | 3.39061 | 0.07616 | Refuse |
| 5 | LIR does not Granger Cause LGDP | 15 | 0.13229 | 0.97614 | Accept |
| | LGDP does not Granger Cause LIR | | 1.77662 | 0.29878 | Refuse |
| 6 | LIR does not Granger Cause LGDP | 14 | 0.75904 | 0.57046 | Refuse |
| | LGDP does not Granger Cause LIR | | 0.64417 | 0.44077 | Refuse |

The test result shows that: in the case that we take 6 years lag, and the test result is shown in one to five order of lag phase, LGDP is the causality of LIR, while LIR is not causality of LGDP. In 6 order of lag phase, LIR and LGDP are of causality mutually. This indicates that the development of national

economy in Anhui make GDP per capita improve, so as make the quality of cultural environment be improved, improve the social service environment greatly, and improve the satisfaction of inbound tourists, which make the number of inbound tourism rise, and the tourism foreign currency earnings increase. Besides, when inbound tourism developed to certain degree, the development of inbound tourism may also have certain driving function on development of national economy, and both of them are of causality mutually.

## CONCLUSION

This paper has performed empirical research for relationship between inbound tourism development and economic growth in Anhui province by using the data from 1991 to 2010 and a series of econometric model, and obtains the following conclusions:

(1) Inbound tourism development and economic growth in Anhui province are of stronger correlativity. Although the respective growth is unstable, seen from the long term aspect, both of them constitute a long them balance relationship, however, this kind of balance relationship has not strong self modification capacity for unbalanced error adjustment of the current period. In short term, the influence of inbound tourism development on changes of economic growth is significant.

(2) The result of cointegration analysis shows that, inbound tourism revenue of Anhui has single cointegration relationship with GDP, and inbound tourism has long term balance relationship with economic growth. In long term development, 1 unit increase in inbound tourism in Anhui, 0.63 unit will be increased in economic growth, therefore, inbound tourism of Anhui is of long term positive correlation with economic growth.

(3) The result of Granger causality test shows that, although the inbound tourism revenue of Anhui is of no driving function for GDP growth at the beginning, however, seen from the long term cause and effect, they have complete causality, which shows that inbound tourism in Anhui has driving function for economic growth. Thus, developing the inbound tourism energetically may bring development of other correlative industries and promote rapid economic development in Anhui. It is required to develop the inbound tourism industry continuously, quicken strategic transfer of tourism industry in Anhui, and realize tourism and rapid economic development in Anhui.

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