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Study on Spatial Difference of the Relationship between Regional Tourism and Economic Growth—Comparative Study of Guangzhou, Shenzhen and Zhuhai in Light of VAR Model

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Abstract

Based on the Eviews software and panel data of Guangzhou city, Shenzhen city and Zhuhai city, the study investigated the dynamic relationship between regional tourism and economic growth, using the methods including Cointegration Test, Granger Causality Test, VAR models and Variance Decomposition. The study result shows that there are long-term mutual effects between regional economic growth and regional tourism industry in each area. And in each area, the local GDP, Earning from International Tourism (EIT) and Earning from Domestic Tourism (EDT) have cointegration relationship. Moreover, in one certain area, the contribution rate of different factors to fluctuation of one variable changes over time.

Keywords

Economic Growth, Tourism Development, VAR Model, Cointegration Test, Granger Causality, Regional Differences, Panel Data

1. Introduction

Research on dynamics between tourism development and economic growth has received wide attention in recent

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years with the rapid development of tourism industry. However, either due to different temporal and spatial context or various methods deployed, conclusions of previous studies find much conflicting ideas or contradictions [1]. Currently, four major theories dominate international academic circles, they are: first, TLEG theory (tourism-led economic growth). The theory maintains tourism development that will produce positive spillover effect on foreign exchange, enterprise efficiency, employment, and scale economy, thus contributing to economic growth [2]-[6]; second, EDTG (economic-driven tourism growth) theory. Payne and Mervar, founder of the theory, think that good economic policies, government supervision and sufficient resources investment create a positive climate for tourism development [7]; third, BC (bidirectional causality) theory. The theory is formed based on the research conducted by Apergis [8], Chen [9], Lee [10] and Ribberstaat [11] in nine Caribbean coastal countries, South Korea, Non-OECD countries and Aruba, concluding that relationship between tourism development and economic growth features bidirectional causality; fourth, NC (non causality) theory. Figini [12] and Katircioglu [13] have put forward this theory from their studies.

Tourism-related research in China suffers late start because it is not until 1970s that tourism in China truly starts to become a industry and enjoys development. And correlation study of tourism industry and economic growth only starts from 2006 in China. Yang Yong [14], Chen Youlong [15] and Wu Zhongcai [16] have pointed out that there is no stable causality relation between economic growth and tourism development in China. Pang Li [17], Deng Zutao [18], Wang Jing [19] and Yang Min [20] have conducted research on the relationship between the two in light of regional perspective, taking provincial administrative regions of Hubei, Xinjiang and Fujian provinces as their research subject.

It can be concluded that traditional research on the relationship between tourism development and economic growth tends to be macro, static and absolute, heedless of the dynamic characteristics of the two's relation. That's why papers on spatial difference of the relationship between the two are rare to find. This paper, taking Guangzhou, Shenzhen and Zhuhai for research subject, has constructed a VAR model based on panel date collected so as to analyze spatial difference of the relationship between economic growth and tourism development. The results of the paper serve to provide strategic recommendations for economic construction and tourism development for Guangzhou, Shenzhen and Zhuhai as well as empirical experience for following studies by illuminating innovations of new perspective and method.

2. Research Design and Data Stability Test

The purpose of the study, which lies in correlation analysis of tourism development and economic growth in Guangzhou, Zhuhai and Shenzhen, necessitates choosing appropriate index to represent tourism development and economic growth. In reference to common method deployed in previous studies, the paper uses Gross Domestic Production (GDP) to represent economic growth; In light of diverse indexes to represent tourism development and taking into consideration data availability and statistic caliber reliability, the paper uses Earning from Domestic Tourism (EDT) and Earning from International Tourism (EIT) to represent tourism development. By consulting Guangdong Statistical Yearbook, China Tourism Statistics Yearbook and Guangdong Fifty Years (from 1949 to 1999) to collect relevant information related with the three previous mentioned indexes, the author of the paper has gathered panel date of Guangzhou, Shenzhen and Zhuhai from 1996 to 2012 (For convenience, the author has put prefix of GZ before variables related with Guangzhou, SZ for Shenzhen and ZH for Zhuhai respectively).

For avoidance of influence of factors such as inflation, exchange rate and heteroscedasticity of population and time series, the author has taken a series of counter-influence measures such as deflator adjustment, exchange rate conversion, choice of deflated value and per capita value as actual value, etc, and has applied logarithmic operation to the actual value per capita of the three indexes of Guangzhou, Shenzhen and Zhuhai each year and figured out corresponding data.

To lessen the data heteroscedasticity in the model (can only be lessened but not effaced) and better show the data correlation, the paper, before conducting unit root test for the data, has also applied logarithmic operation to the actual value of GDP per capita, actual value of EIT per capita and actual value of EDT per capita in Guangzhou, Shenzhen and Zhuhai and see the result in **Table 1**.

For avoidance of spurious regression in the process of forming VAR (Vector Auto Regression) model resulting from non-stationarity feature of series involved in the calculation, it is crucial to assess the non-stationarity feature of data series of Guangzhou, Shenzhen and Zhuhai (see **Table 2**). The paper, by deploying ADF method, has concluded that the first-order difference sequence of Shenzhen's data is stationary (integrated of

Table 1. Result after being applied logarithmic operation.

Year	GZLNGDP	GZLNEIT	GZLNEDT	SZLNGDP	SZLNEIT	SZLNEDT	ZHLNGDP	ZHLNEIT	ZHLNEDT
1996	9.085797	6.152087	7.028462	8.748393	5.675754	6.385823	9.340758	7.259487	7.400093
1997	9.150674	6.164481	7.010226	8.815289	5.434125	6.341710	9.381684	7.208942	7.364041
1998	9.218067	6.148871	7.132396	8.862091	5.415094	6.254433	9.428906	7.171044	7.350326
1999	9.280893	6.181638	7.198842	8.913420	5.356988	6.219751	9.459145	7.186811	7.235276
2000	9.337986	6.341393	7.190814	8.955956	6.025997	6.483113	9.506525	7.184144	7.326003
2001	9.441073	6.405947	7.252991	9.057292	6.068809	6.513839	9.582538	7.251665	7.424040
2002	9.554193	6.524184	7.340235	9.174242	6.138463	6.539145	9.674862	7.380325	7.561673
2003	9.689495	6.356610	7.228757	9.308239	5.802748	6.354846	9.811539	7.280524	7.455207
2004	9.812548	6.467083	7.378377	9.439196	6.058257	6.529312	9.915125	7.438768	7.643585
2005	9.916727	6.614704	7.444409	9.546496	6.131256	6.579962	10.018541	7.627092	7.623440
2006	10.041466	6.735321	7.497092	9.648730	6.155131	6.615571	10.147386	7.812593	7.771647
2007	10.163906	6.784236	7.609281	9.740777	6.114408	6.656401	10.284190	7.722116	7.819884
2008	10.266437	6.626420	7.673914	9.810219	6.065993	6.647976	10.347772	7.631087	7.933517
2009	10.363850	6.755108	7.859051	9.869641	6.096983	6.731763	10.391162	7.695735	8.037659
2010	10.473441	6.954986	8.032525	9.942918	6.147146	6.797855	10.499319	7.822616	8.316228
2011	10.570081	6.896353	8.324689	10.029518	6.167554	6.881471	10.602077	7.587485	8.388099
2012	10.660497	6.926957	8.515934	10.116864	6.254126	6.987520	10.660089	7.439080	8.513652

Table 2. ADF test result of time series of Guangzhou, Shenzhen and Zhuhai.

Variables	T statistic	1% Critical value	5% Critical value	10% Critical value
GZLNGDP **2nd order difference**	−3.505393	−4.004425	−3.098896	−2.690439
GZLNEIT **2nd order difference**	−6.146516	−4.200056	−3.175352	−2.728985
GZLNEDT **2nd order difference**	−5.247540	−4.057910	−3.119910	−2.701103
SZLNGDP **1st order difference**	−4.178483	−4.121990	−3.144920	−2.713751
SZLNEIT **1st order difference**	−5.038717	−4.057910	−3.119910	−2.701103
SZLNEDT **1st order difference**	−5.872013	−4.057910	−3.119910	−2.701103
ZHLNGDP **2nd order difference**	−4.517788	−4.057910	−3.119910	−2.701103
ZHLNEIT **2nd order difference**	−4.225740	−4.121990	−3.144920	−2.713751
ZHLNEDT **2nd order difference**	−4.061596	−4.121990	−3.144920	−2.713751

order 1); while in case of Guangzhou and Zhuhai, their data's second-order difference sequence is stationary, designated as (integrated of order 2). The author has chosen the stationary difference sequence of the three data group for late analysis so as to ensure the accuracy of the result.

3. Johansen Co-Integration Test and Granger Causality Test

In previous section, the paper has shown the stationary data series of Guangzhou, Shenzhen and Zhuhai by using ADF Test method and for avoidance of ambiguity, the author has listed the name of indexes that will be involved in the regression and their meanings are also presented (see **Table 3**).

3.1. Johansen Co-Integration Test

Yet, Co-Integration test is necessary before we start to form VAR model, as to ascertain whether long-term equilibrium relation among variables in the model exists or not. Thus, Johansen Co-Integration test is conducted by using Eviews software. The result is shown below (**Tables 4-6**).

Table 3. Naming and definition of indexes.

	Name	Definition
Guangzhou city	**GZGDP**	GZLNGDP **2nd order difference**
	GZEIT	GZLNEIT **2nd order difference**
	GZEDT	GZLNEDT **2nd order difference**
Shenzhen city	**SZGDP**	SZLNGDP **1st order difference**
	SZEIT	SZLNEIT **1st order difference**
	SZEDT	SZLNEDT **1st order difference**
Zhuhai city	**ZHGDP**	ZHLNGDP **2nd order difference**
	ZHEIT	ZHLNEIT **2nd order difference**
	ZHEDT	ZHLNEDT **2nd order difference**

Table 4. Johansen co-integration test for GZ variables.

Characteristic root tracing test				
CE	CV	Trace statistic	5% Critical value	Prob.**
None*	0.939039	68.80668	35.01090	0.0000
At most 1*	0.842440	32.43900	18.39771	0.0003
At most 2*	0.476572	8.415630	3.841466	0.0037
Max-eigenvalue test				
CE	CV	Max-Eigen	5% Critical value	Prob.**
None*	0.939039	36.36767	24.25202	0.0008
At most 1*	0.842440	24.02337	17.14769	0.0043
At most 2*	0.476572	8.415630	3.841466	0.0037
Standardization of cointegration vector				
	GZEDT	GZGDP	GZEIT	
	1.000000	−0.687341	−0.517116	
		(0.37755)	(0.04801)	

Table 5. SZGDP, SZEIT, SZEDT Johansen co-integration test for Shenzhen.

Characteristic root tracing test				
CE	CV	Trace statistic	5% Critical value	Prob.**
None*	0.869832	57.31706	35.01090	0.0001
At most 1*	0.750552	28.77208	18.39771	0.0013
At most 2*	0.486572	9.333025	3.841466	0.0023
Max-eigenvalue test				
CE	CV	Max-Eigen	5% Critical value	Prob.**
None*	0.869832	28.54497	24.25202	0.0127
At most 1*	0.750552	19.43906	17.14769	0.0229
At most 2*	0.486572	9.333025	3.841466	0.0023
Standardization of cointegration vector				
	SZEIT	SZGDP	SZEDT	
	1.000000	−0.073628	−2.031873	
		(0.11316)	(0.04978)	

Table 6. ZHGDP, ZHEIT, ZHEDT Johansen co-integration test for Zhuhai.

Characteristic root tracing test				
CE	CV	Trace statistic	5% Critical value	Prob.**
None*	0.903956	57.39438	35.01090	0.0001
At most 1*	0.781349	26.93610	18.39771	0.0025
At most 2*	0.424046	7.172459	3.841466	0.0074
Max-eigenvalue test				
CE	CV	Max-Eigen	5% Critical value	Prob.**
None*	0.903956	30.45828	24.25202	0.0066
At most 1*	0.781349	19.76364	17.14769	0.0204
At most 2*	0.424046	7.172459	3.841466	0.0074
Standardization of cointegration vector				
	ZHEIT	ZHGDP	ZHEDT	
	1.000000	−11.70409	−4.270640	
		(2.31841)	(0.85188)	

Results show that, under the signification level of 5 percent, GDP, EIT and EDT of Guangzhou (GZEDT, GZGDP and GZEIT respectively), GDP, EIT and EDT of Shenzhen (SZEIT, SZGDP and SZEDT respectively) and GDP, EIT and EDT of Zhuhai (ZHEIT, ZHGDP and ZHEDT respectively) have co-integration relationship.

But by applying co-integration vector after standardization, difference surfaces among the long-term equilibrium equations of the three cities. The equations of the three cities are presented in Formula (1), Formula (2), and Formula (3).

$$GZEDT = 0.687341GZGDP + 0.517116GZEIT \quad (1)$$

$$SZEIT = 0.073628SZGDP + 2.031873SZEDT \quad (2)$$

$$ZHEIT = 11.70409ZHGDP + 4.270640ZHEDT\ . \quad (3)$$

Therefore, in the long run:

For Guangzhou, every 1 percent increase of GDP growth brings 0.69 percent EDT growth; every 1 percent increase of EIT growth brings 0.52 EDT growth;

For Shenzhen, every 1 percent increase of GDP growth brings 0.07 percent EIT growth; every 1 percent increase of EDT growth brings 2.03 percent EIT growth;

For Zhuhai, every 1 percent increase of GDP growth brings 11.70 percent EIT growth; every 1 percent increase of EDT growth brings 4.27 percent EIT growth.

3.2. Granger Causality Test

Granger Causality test is applied to the variables of Guangzhou, Shenzhen and Zhuhai, by using Eviews software. Results are present in **Tables 7-9**.

As **Table 7** shows, Granger Causality relationship is detected between GZGDP and GZEIT as well as between GZEIT and GZEDT. This means economic growth of Guangzhou will have positive impact for international tourism development; in the meanwhile, international tourism development of Guangzhou will contribute to domestic tourism development for Guangzhou.

As **Table 8** shows, one-way Granger Causality relationship between SZEIT and SZGDP and bidirectional causality relationship between SZEIT and SZEDT is detected. This means international tourism development of Shenzhen will contribute to its economic growth; in the meanwhile, international tourism development and domestic tourism development of Shenzhen mutually benefit each other.

As **Table 9** shows, four groups of Granger Causality relationship between ZHGDP and ZHEIT, ZHGDP and ZHEDT, ZHEIT and ZHGDP and ZHEDT and ZHEIT are detected. This means economic growth of Zhuhai will have positive impact for both international tourism and domestic tourism development; in the meanwhile, international tourism development contributes to economic growth of Zhuhai; and domestic tourism development

Table 7. The results of granger causality test (Guangzhou city).

Hypothesis	Observation	F-statistics	Prob.
GZGDP does not Granger Cause **GZEIT**	13	3.55244	0.0787
GZEIT does not Granger Cause **GZEDT**	12	8.46787	0.0210
GZGDP does not Granger Cause **GZEIT**	12	7.06214	0.0302
GZEIT does not Granger Cause **GZEDT**	11	17.2218	0.0556

Table 8. The results of granger causality test (Shenzhen city).

Hypothesis	Observation	F-statistics	Prob.
SZEIT does not Granger Cause **SZGDP**	15	7.79247	0.0163
SZEIT does not Granger Cause **SZGDP**	14	3.38208	0.0803
SZEDT does not Granger Cause **SZEIT**	14	3.15193	0.0917
SZEDT does not Granger Cause **SZEIT**	13	21.5258	0.0013
SZEIT does not Granger Cause **SZEDT**	13	8.89488	0.0126

Table 9. The results of granger causality test (Zhuhai city).

Hypothesis	Observation	F-statistics	Prob.
ZHGDP does not Granger Cause **ZHEIT**	14	4.27328	0.0631
ZHEIT does not Granger Cause **ZHGDP**	14	13.6899	0.0035
ZHEIT does not Granger Cause **ZHGDP**	13	5.69247	0.0290
ZHEDT does not Granger Cause **ZHEIT**	11	29.8551	0.0327
ZHGDP does not Granger Cause **ZHEDT**	11	10.3556	0.0900

of Zhuhai will have positive impact on international tourism development of Zhuhai.

In conclusion, regardless of what research subject we choose, Guangdong Province or Guangzhou, Shenzhen and Zhuhai cities, the Granger Causality test results all indicate complexity of causality relation among variables. Basically, economic growth and tourism development mutually influence and benefit each other, and their relationship will change within different monitoring scope (lag phase).

4. Forming VAR Model

Researchers shall go through "Order setting-Formation-Stability Test" stages to form VAR model, with setting appropriate order being the most important step, which is the lag phase of the model.

From **Table 10**, three of LR, FRE, AIC, SC, HQ falls into the Period 0 of lag phase, and two of them falls into Period 2 of lag phase. To give the VAR model more substantial meaning, we choose Period 2 to form VAR model for Guangzhou

A formula is concluded for Guangzhou VAR model (**Table 11**)

$$\begin{bmatrix} \mathrm{GZGDP}_t \\ \mathrm{GZEIT}_t \\ \mathrm{GZEDT}_t \end{bmatrix} = \begin{bmatrix} 0.003659 \\ 0.031010 \\ 0.035212 \end{bmatrix} + \begin{bmatrix} -0.121024 & 0.061832 & -0.091986 \\ -0.684292 & -0.745881 & -0.112361 \\ -0.318713 & -0.088741 & -0.781388 \end{bmatrix} \begin{bmatrix} \mathrm{GZGDP}_{t-1} \\ \mathrm{GZEIT}_{t-1} \\ \mathrm{GZEDT}_{t-1} \end{bmatrix} + \begin{bmatrix} 0.087500 & 0.035343 & -0.045255 \\ -6.139782 & -0.939752 & 0.273594 \\ -2.257841 & 0.094195 & -0.580675 \end{bmatrix} \begin{bmatrix} \mathrm{GZGDP}_{t-2} \\ \mathrm{GZEIT}_{t-2} \\ \mathrm{GZEDT}_{t-2} \end{bmatrix} + \varepsilon_t \quad (4)$$

Afterwards, we apply stability test to the model by using AR unit root test, the result is shown in **Figure 1**.

According to **Figure 1**, all the reciprocal value of characteristic root of Guangzhou VAR model falls with the scope of unit circle. Therefore, stability exists in the model we have formed and thus the prerequisite for late variance decomposition analysis is established.

Table 10. Choosing order for Guangzhou VAR model.

Lag	LogL	LR	FPE	AIC	SC	HQ
0	49.11092	NA*	1.67e-07*	−7.093988	−6.963615*	−7.120785
1	57.08802	11.04522	2.07e-07	−6.936619	−6.415127	−7.043809
2	69.00334	10.99876	1.82e-07	−7.385130*	−6.472519	−7.572712*

Table 11. Parameter output for Guangzhou VAR (2) model.

	GZGDP	GZEIT	GZEDT
GZGDP (−1)	−0.121024	−0.684292	−0.318713
	(0.44411)	(2.90355)	(1.76062)
	[−0.27251]	[−0.23567]	[−0.18102]
GZGDP (−2)	0.087500	−6.139782	−2.257841
	(0.42586)	(2.78419)	(1.68824)
	[0.20547]	[−2.20523]	[−1.33739]
GZEIT (−1)	0.061832	−0.745881	−0.088741
	(0.04603)	(0.30092)	(0.18247)
	[1.34337]	[−2.47867]	[−0.48634]
GZEIT (−2)	0.035343	−0.939752	0.094195
	(0.06860)	(0.44850)	(0.27196)
	[0.51519]	[−2.09530]	[0.34636]
GZEDT (−1)	−0.091986	−0.112361	−0.781388
	(0.08801)	(0.57537)	(0.34888)
	[−1.04524]	[−0.19529]	[−2.23968]
GZEDT (−2)	−0.045255	0.273594	−0.580675
	(0.10194)	(0.66648)	(0.40413)
	[−0.44394]	[0.41051]	[−1.43684]
C	0.003659	0.031010	0.035212
	(0.00686)	(0.04483)	(0.02718)
	[0.53360]	[0.69174]	[1.29536]

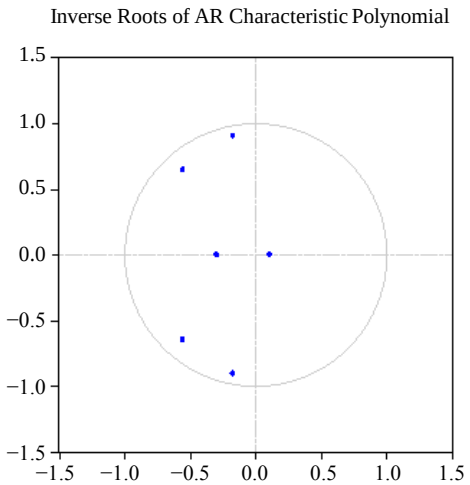

Figure 1. VAR stability test result for Guangzhou VAR model.

Following the track of the VAR model formation for Guangzhou and stability test shown before, formula of VAR model for Shenzhen and Zhuhai, having undergone stability test, are also formed.

$$\begin{bmatrix} \mathrm{SZGDP}_{t-1} \\ \mathrm{SZEIT}_{t} \\ \mathrm{SZEDT}_{t} \end{bmatrix} = \begin{bmatrix} 0.034314 \\ 0.192310 \\ 0.045439 \end{bmatrix} + \begin{bmatrix} 1.103006 & 0.144266 & -0.218296 \\ 1.322413 & 1.075879 & -2.539996 \\ 2.462924 & 0.787265 & -1.659365 \end{bmatrix} \begin{bmatrix} \mathrm{SZGDP}_{t-1} \\ \mathrm{SZEIT}_{t-1} \\ \mathrm{SZEDT}_{t-1} \end{bmatrix} +$$
$$\begin{bmatrix} -0.338357 & -0.072930 & 0.165522 \\ -0.088763 & 0.409542 & -1.591772 \\ -2.111109 & -0.394504 & 0.319134 \end{bmatrix} \begin{bmatrix} SZGDP_{t-2} \\ SZEIT_{t-2} \\ SZEDT_{t-2} \end{bmatrix} + \tag{5}$$
$$\begin{bmatrix} -0.126807 & 0.014087 & -0.022277 \\ -1.730999 & -1.914368 & 2.653152 \\ 0.137699 & -1.122051 & 1.689280 \end{bmatrix} \begin{bmatrix} SZGDP_{t-2} \\ SZEIT_{t-2} \\ SZEDT_{t-2} \end{bmatrix} + \varepsilon_t$$

$$\begin{bmatrix} \mathrm{ZHGDP}_{t} \\ \mathrm{ZHEIT}_{t} \\ \mathrm{ZHEDT}_{t} \end{bmatrix} = \begin{bmatrix} 0.003403 \\ 0.003437 \\ 0.020437 \end{bmatrix} + \begin{bmatrix} 0.163116 & 0.212808 & -0.070984 \\ -2.403966 & -0.161316 & -0.368447 \\ -0.448128 & 0.144155 & -0.857408 \end{bmatrix} \begin{bmatrix} \mathrm{ZHGDP}_{t-1} \\ \mathrm{ZHEIT}_{t-1} \\ \mathrm{ZHEDT}_{t-1} \end{bmatrix} + \varepsilon_t . \tag{6}$$

5. Variance Decomposition

Based on the VAR models, variance decomposition is applied. The purpose of the variance decomposition is to analyze the contribution rate of endogenous variables to structural impact within different periods; in essence, to describe the different contribution rate, in the form of percentage, of all the variables with one region to bring out the fluctuation of one variable in the VAR model. By using Eviews software, variance decomposition operation is conducted. And the results for Guangzhou, Shenzhen and Zhuhai VAR models are shown (**Figures 2-4**).

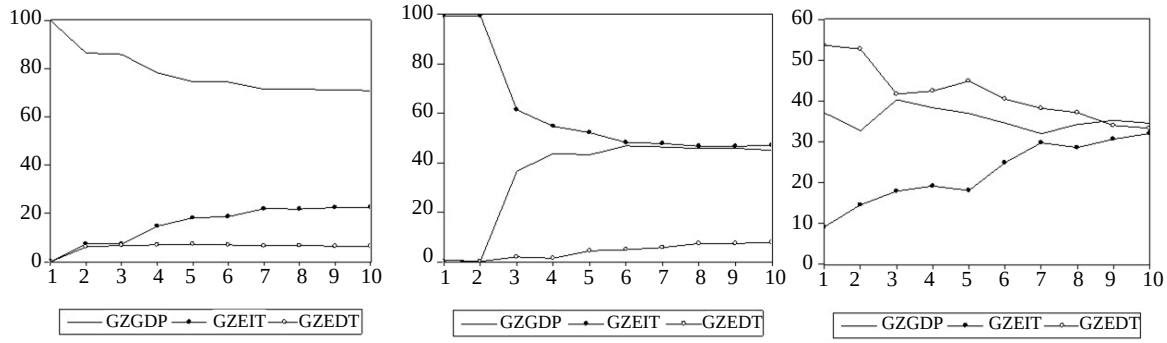

Figure 2. Variance decomposition of GZGDP, GZEIT, GZEDT.

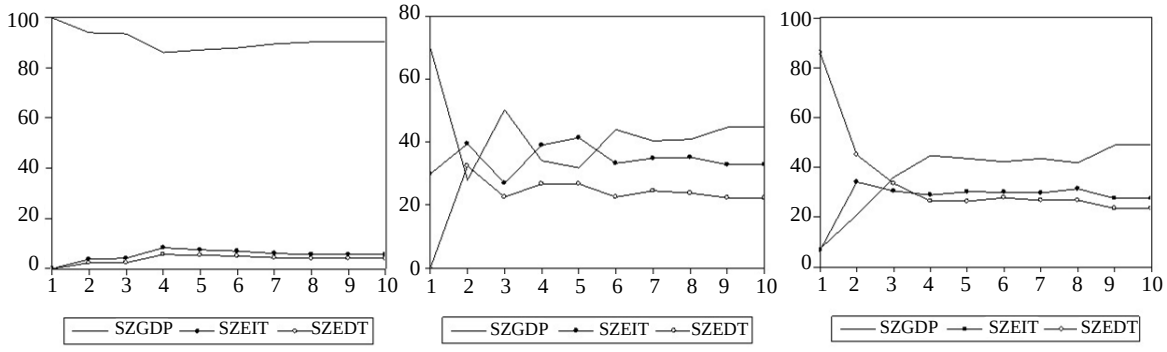

Figure 3. Variance decomposition of SZGDP, SZEIT, SZEDT.

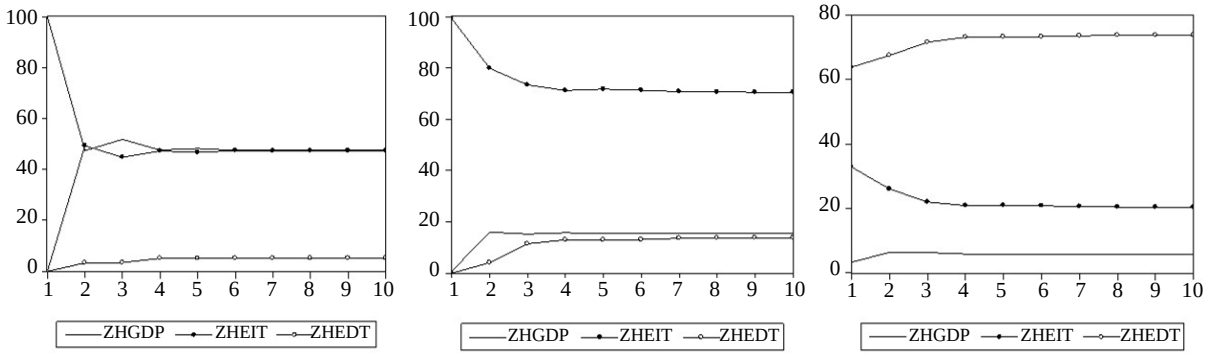

Figure 4. Variance decomposition of ZHGDP, ZHEIT, ZHEDT.

According to **Figure 2**: (1) GDP fluctuation of Guangzhou, in the first period, results exclusively from intrinsic factors, while the intrinsic factors have weaken effect on the GDP fluctuation and only account for 70% for the fluctuation in the last period. And the international tourism and domestic tourism have shown and strengthened their influence on GDP starting from Period 2 and their contribution to GDP have exceeded 20% and 6% respectively in the last period; (2) International Tourism fluctuation of Guangzhou, in the first period, results both from GDP and its intrinsic factors, with minor contribution of GDP. However, from Period 2 to Period 3, GDP has significant rise in affecting International Tourism and maintains a level of over 40%. EDT of Guangzhou has shown and strengthened its effect on international tourism starting from Period 2 and its contribution accounts for 7% in the last period; (3) Starting from first period, Domestic Tourism fluctuation of Guangzhou, is caused by economic growth, international growth and its intrinsic factors, with its intrinsic factors as major contributing factor, accounting for over 50% of the contribution. As with the rise of the contribution of GZGDP and GZEIT to the growth of GZEDT, intrinsic factors' contribution to the growth of GZEDT declines steadily. And the three have almost same contribution rate towards the growth of GZEDT in the last period.

According to **Figure 3**: (1) GDP fluctuation of Shenzhen, in the first period, results exclusively from intrinsic factors, with high contribution rate of about 90%. And the international tourism and domestic tourism have shown their influence on economic growth only starting from Period 2 and reach the highest point in Period 4; (2) Variance decomposition of Shenzhen's EIT shows complex outcome, with the contribution rate of all the three contributing factors fluctuates dramatically and they start to stabilize only starting from last three periods. In Period 2, the contribution rate of SZEDT to SZEIT is over 30% and it starts to fall afterwards. In last three periods, SZGDP, SZEIT's intrinsic factors and SZEDT have stabilized their contribution to SZEIT, with contribution rate of about 40%, 30% and 20% respectively; (3) EDT fluctuation of Shenzhen, starting from first Period, is caused by SZGDP, SZEIT and its intrinsic factors, with intrinsic factors having most contribution rate of about 86%. While in the Period 2 and 3, intrinsic factors' contribution to SZEDT declines and that of the other two contributing factors rises considerably. Starting from Period 4, contribution rate of SZGDP, SZEIT and SZEDT stabilizes, with 45%, 30% and 25% respectively.

According to **Figure 4**: (1) GDP fluctuation of Zhuhai, in the first period, results exclusively from intrinsic factors. However, starting from Period 2, contribution rate of international tourism to GDP rises dramatically to about 50%. From Period 2 to last Period, contribution rate of ZHEIT and intrinsic factors to ZHGDP maintain same level and that of ZHEDT is no more than 5.2% thorough; (2) EIT fluctuation of Zhuhai, in the first period, results from contribution of ZHGDP and its intrinsic factors and the contribution rate of ZHGDP is less than 1%. While from Period 2 to Period 3, the intrinsic factors have less and less contribution to ZHEIT and that of ZHGDP and ZHEDT climbs. From Period 4 to last Period, contribution rate the three contributing factors to ZHEIT stabilizes, with GDP, EIT's intrinsic factors and EDT of 15%, 70% and 15% respectively; (3) EDT fluctuation of Zhuhai, starting from the first period, is caused by ZHGDP, ZHEIT and its intrinsic factors, with its intrinsic factors contributing most, over 60%. After first period, contribution of ZHGDP starts to rise while it maintains at the level of about 6%. Contribution of EIT falls in the first three periods and keeps at the level of about 20% until the last period. Contribution of its intrinsic factors rises in the first three periods and keeps at the level of about 70% until the last period.

From the analysis of variance decomposition, it is concluded that the fluctuation of every variables in the VAR model is affected by contribution of different factors and the contribution rate of each factor would change

over time, showing totally different characteristics in different periods. This, to some degrees, it is necessary and important to introduce the perspective of temporal and spatial difference into the study of the relationship between regional economic growth and tourism development.

6. Conclusions and Recommendations

Based on time sequence and VAR model, and using Eviews software, the author of the paper aims to analyze and compare the dynamic relationship between economic growth and tourism development in Guangzhou, Shenzhen and Zhuhai respectively. Study results show that in the long run, economic growth and tourism development in the three cities show bidirectional causality relationship and mutually influence each other; GDP, EIT and EDT of the three cities all have co-integration relationship and the contribution rate of the other two variables and the intrinsic factors of the third variable to the fluctuation of the third factor would change over time.

Recommendations concerning economic construction and tourism development in Guangzhou, Shenzhen and Zhuhai are proposed in light of regional difference.

(1) A scientific concept of development should be established in coordinating economic growth and tourism development. On the one hand, policy-makers shall bear in mind that economic growth and tourism development are closely related with each other and they should take advantage of the interaction between the two so as to promote development and avoid lopsided development; on the other hand, short-sighted actions should be avoided. Policy-makers shall acknowledge that economic growth, tourism development and all the factors affecting the development of the two are not static and we should analyze their laws of development.

(2) In the long term, economic growth and domestic tourism development of Shenzhen and Zhuhai have great impact on international tourism growth. Therefore, in Shenzhen and Zhuhai, on one hand, policy-makers shall bear in mind the fundamental position of economic growth and hold on to the first and foremost task of economic construction so as to attract international tourists and create good environment for tourism development; on the other hand, we should also spare no efforts in investing in tourism, developing distinctive tourism resources and improving tourism service facilities so as to create brand effect of regional tourism.

(3) Also in the long run, economic growth and international tourism development of Guangzhou have great contrition to domestic tourism development. Therefore, in the process of coordinating economic growth and tourism development in Guangzhou, the first and foremost task of economic construction should also be unremittingly carried out and investment should be made to within-city tourism and improve tourism sites, transportation and hotels so as to attract domestic tourists; on the other hand, we should take advantage of long history and characteristic cultural resources of Guangzhou, make them known to international tourists, and create international brand.

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