

# A Grey Relational Analysis of the Influence Factors of Tourism Industry in Guangdong Province

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**Keywords:** Guangdong; tourism; grey relational analysis.

**Abstract.** This article launched grey system theory to analyze the tourism industry in Guangdong Province from 2005 to 2014, which indicated that the regional economy development level is the most influencing factors of Guangdong tourism industry. The article proposed policies and suggestions for the rapid growth of the tourism industry in Guangdong by maintaining sustainable and stable development of Guangdong economy, promoting coordinated development of the tourism industry in east and northwest Guangdong, implementing concentrated improvement strategy. This template explains and demonstrates how to prepare your camera-ready paper for *Trans Tech Publications*. The best is to read these instructions and follow the outline of this text. .

## Introduction

Guangdong is a major tourism province in our country all the time. Especially in recent years, Guangdong has been promoting transformation and upgrading of tourism with all its strength, the tourism has been growing rapidly with good development trend, major tourist economy indexes such as total tourist income, tourist foreign currency earnings, the number of inbound tourists staying overnight received, and the number of star hotels has been ranking first in China which all show the powerful strength of tourism of Guangdong and establish the solid foundation of building a province with strong tourism industry. Tourism industry is in relation to many industries. To become a province with strong tourism industry, Guangdong province has to understand the influence factors relating to tourism development precisely. To provide theoretical foundation for great-leap-forward development of Guangdong tourism, the paper makes correlation degree analysis applying Grey Theory.

## Empirical Analysis

**Build Reference Sequence.** Tourism industry is an industry of great integrity. To show overall development situation of tourism industry, the index called tourist income is often used to judge in the industry. The index of total tourist income is also used as a reference sequence of the development of Guangdong tourism in this article which is  $Y = \{Y(k) \mid k = 1, 2, \dots, n\}$ . See sheet 1 for details of the reference sequence.

Sheet 1 Tourism Reference Sequence of Guangdong Province-Fact Sheet of Total Tourist Income

Year	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Total tourist income (hundred million RMB)	1882.6	2120.1	2455.06	2668	3068.39	3809.44	4835.27	5794.74	6716.69	7850.56

Data resource: Statistic Yearbook of Guangdong from 2006 to 2015

**Build Comparison Sequence.** There are many influence factors of tourism. A scientific index system is needed to find out some key influence factors of Guangdong tourism. Referring to related literature and taking physical truth of Guangdong province into consideration, the article establishes 8 indexes including GDP, GDPPC, Urban Residents Disposable Income, and Volume of Passenger

Transportation as comparison sequence- $X_i = \{X_i(k) \mid k = 1, 2, \dots, n\}, i = 1, 2, \dots, m$ . See sheet 2 for details of the comparison sequence.

### Sheet 2 Comparison Sequence of Influence Factors of Guangdong Tourism Development

Year	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Number of Students in Regular Higher Educational Institutions (ten thousand)	87.47	100.86	111.97	121.6	133.41	142.66	152.73	161.68	171	179.42
Number of Star Hotel	1128	1207	1171	1165	1181	1209	1156	1092	1083	1012
Passenger Capacity (ten thousand)	161357	197314	206504	484161	428705	467049	522095	586299	175109	193299
Volume of Passenger Transportation (hundred million people/kilometer)	2043.23	2245.37	2626.7	2552	2853.3	3342.2	3851.8	4372.1	3538	3966.5
Coverage Rate of the Population of Radio and TV Programs (%)	96.25	96.55	97.15	95.75	97.6	98	98	99.9	99.9	99.9
GDP of Guangdong Province (hundred million RMB)	22557.4	26587.8	31777	36797	39482.56	46013	53210	57068	62475	67810
GDPPC of Guangdong Province (RMB)	24647	28747	33890	38748	41166	44736	50807	54095	58833	63469
Urban Per Capita Disposable Income (RMB)	14769.9	16015.6	17699	19733	21574.72	23898	26897	30227	29537	32148

Data resource: from sorting data of Statistic Yearbook of Guangdong from 2006 to 2015

**Application of Dimensionless Method.** See sheet 3 for standard data sequence coming from dimensionless method with equalization method:

$$x_i(k) = \frac{X_i(k)}{X_i(l)}, k = 1, 2, \dots, n; i = 0, 1, 2, \dots, m$$

### Sheet 3 Reference Sequence and Comparison Sequence after Applying Dimensionless Method

Year	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Total Tourist Income	0.456932	0.515	0.5959	0.6476	0.74474	0.9246	1.17359	1.406	1.6302	1.9054
GDP of Guangdong Province	0.5083	0.599	0.7161	0.8292	0.8897	1.0369	1.199	1.286	1.4078	1.528
GDPPC of Guangdong Province (RMB)	0.561259	0.655	0.7717	0.8824	0.93743	1.01872	1.15697	1.232	1.3397	1.4453
Urban Per Capita Disposable Income (RMB)	0.635267	0.689	0.7613	0.8487	0.92795	1.02786	1.15688	1.3	1.2704	1.3827
Volume of Passenger Transportation (hundred million people/kilometer)	0.650891	0.715	0.8368	0.8129	0.90895	1.0647	1.22704	1.393	1.1271	1.2636
Passenger Capacity (ten thousand)	0.471543	0.577	0.6035	1.4149	1.25283	1.36489	1.52575	1.713	0.5117	0.5649
Number of Star Hotel	0.989127	1.058	1.0268	1.0216	1.0356	1.06015	1.01368	0.958	0.9497	0.8874
Number of Students in Regular Higher Educational Institutions (ten thousand)	0.641826	0.74	0.8216	0.8926	0.97892	1.04679	1.12068	1.186	1.2547	1.3165
Coverage Rate of the Population of Radio and TV Programs (%)	0.983146	0.986	0.9923	0.978	0.99694	1.00102	1.00102	1.02	1.0204	1.0204

**Calculation of Correlation Coefficient.** First is to calculate the absolute difference of comparison sequences and reference sequences  $\Delta_i = |Y_i - X_i|$ , to reach the output in sheet 4. We can see from sheet 4 that the maximum value is 1.3405 and the minimum value is 0.0076. Second is to assign 0.5 to  $\rho$  and get the Correlation Coefficient Matrix in sheet 5 according to the formula:

$$\xi_i(k) = \frac{\min_i \min_k \Delta_i(k) + \rho \max_i \max_k \Delta_i(k)}{\Delta_i(k) + \rho \max_i \max_k \Delta_i(k)}$$

Sheet 4 Difference Value between Comparison Sequence and Reference Sequence

Year	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
GDP of Guangdong Province	0.0514	0.0845	0.1202	0.1816	0.145	0.1122	0.0254	0.121	0.2224	0.3774
GDPPC of Guangdong Province (RMB)	0.104326	0.14005	0.1759	0.2348	0.19269	0.09412	0.01661	0.175	0.2905	0.4601
Unban Per Capita Disposable Income (RMB)	0.178334	0.17427	0.1654	0.2012	0.18321	0.10326	0.0167	0.106	0.3598	0.5227
Volume of Passenger Transportation (hundred million people/kilometer)	0.193959	0.20071	0.2409	0.1654	0.16421	0.1401	0.05346	0.014	0.5031	0.6419
Passenger Capacity (ten thousand)	0.014611	0.06205	0.0076	0.7673	0.50809	0.44028	0.35216	0.307	1.1185	1.3405
Number of Star Hotel	0.532194	0.54382	0.431	0.374	0.29086	0.13555	0.15991	0.449	0.6806	1.018
Number of Students in Regular Higher Educational Institutions (ten thousand)	0.184894	0.2255	0.2257	0.245	0.23418	0.12219	0.0529	0.22	0.3756	0.5889
Coverage Rate of the Population of Radio and TV Programs (%)	0.526214	0.47163	0.3965	0.3305	0.2522	0.07642	0.17256	0.386	0.6098	0.885

Sheet 5 Correlation Coefficient Matrix of Guangdong Tourism Industry

Year	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
GDP	0.928321	0.88048	0.8343	0.7651	0.80496	0.84416	0.96948	0.834	0.7252	0.6052
GDPPC (RMB)	0.854239	0.8106	0.7711	0.7139	0.75386	0.86758	0.98435	0.772	0.6671	0.5561
Unban Per Capita Disposable Income (RMB)	0.768526	0.77279	0.7823	0.7455	0.76348	0.85561	0.9842	0.852	0.6168	0.5239
Volume of Passenger Transportation (hundred million people/kilometer)	0.752584	0.7459	0.7084	0.7823	0.78353	0.81055	0.92516	0.989	0.5336	0.4719
Passenger Capacity (ten thousand)	0.987788	0.91237	1	0.4273	0.53109	0.56712	0.62195	0.654	0.3379	0.2984
Number of Star Hotel	0.51936	0.51389	0.5725	0.6074	0.6668	0.81585	0.78822	0.562	0.4572	0.3594
Number of Students in Regular Higher Educational Institutions (ten thousand)	0.761752	0.72234	0.7221	0.7048	0.71443	0.83185	0.926	0.727	0.6064	0.4937
Coverage Rate of the Population of Radio and TV Programs (%)	0.522222	0.54987	0.5931	0.6371	0.69857	0.89174	0.77459	0.6	0.4849	0.3925

**Calculation of Correlation Coefficient.** According to the formula

$$r_i = \frac{1}{n} \sum_{k=1}^n \xi_i(k), k = 1, 2, \dots, n$$

, we can calculate the correlation degree of comparison sequences and total tourist income. See sheet 6 for details.

Sheet 6 Grey Correlation Degrees and Ranking of Influence Factor of Tourism in Guangdong Province

Comparison Sequence	GDP of Guangdong Province	GDPPC of Guangdong Province	Volume of Passenger Transportation	Number of Students in Regular Higher Educational Institutions	Unban Per Capita Disposable Income	Passenger Capacity	Coverage Rate of the Population of Radio and TV Programs	Number of Star Hotel
Correlation Degree	0.8704	0.7995	0.7813	0.7463	0.7148	0.6711	0.6391	0.6115
Ranking	1	2	3	4	5	6	7	8

**Result Analysis.** As we can see from sheet 6, the total tourist income of Guangdong province most relates to local economic development indexes of GDP and GDPPC. The correlation degrees are 0.8704 and 0.7995 ranking first and second respectively; as an influence factor of the accessibility of tourist destinations, traffic has a great effect on tourist income and is a major influence factor of total tourist income, in which the correlation degrees between total tourist income and volume of

passenger transportation and passenger capacity are 0.7813 and 0.6711, ranking third and sixth respectively; the number of students in higher educational institutes also has relatively significant influence to tourist income with a correlation degree of 0.7463 ranking fourth. This indicates that, on one hand, people who receive higher education are more willing to travel, and on the other hand, Guangdong tourism requires higher standard of service quality in tourism; in addition, urban per capita disposable income is also a big influence factor with a correlation degree of 0.7148 ranking fifth which indicates that residents in Guangdong province have a strong desire to travel and that the tourist income is affected significantly by tourists in the province; while the correlation degree between tourist income and coverage rate of the population of radio and TV programs and the number of star hotel are relatively low which are 0.6391 and 0.6115 ranking the last but one and the last one respectively indicating that the establishment of star hotel in Guangdong has lagged behind the development of its tourism, that the utilization ratio of information resources is low, that the propaganda for tourism is not satisfying leading to poor contribution to tourism made by information resources.

## Conclusion

Sheet 6 shows that the ranking of grey correlation degree of influence factor of tourism in Guangdong province from high to low is that: GDP of Guangdong province, GDPPC of Guangdong province, volume of passenger transportation, number of students in regular higher educational institutions, urban per capita disposable income, passenger capacity, coverage rate of the population of radio and TV programs and the number of star hotel, among which GDP of Guangdong province and GDPPC are in the first two positions showing that the regional economy development level is the most important influence factor of tourism development in Guangdong and that the strong economic strength of Guangdong province has great driving effect on its tourism industry.

## Policy Suggestion

To ensure continuous and stable development of Guangdong economy and to provide inexhaustible power for the development of tourism industry. In recent years, economy of Guangdong province has been faced with more complex and changeable difficulties and challenges from domestic and international economic situation. Guangdong economy should adapt to the New Normal initiative, implement innovation-driven development strategy, hang on to the opportunity of "Made in China 2025 Strategy" carried out in our country, accelerate economy transformation and upgrading, actively promote the "One Belt and One Road" construction, strengthen domestic and international regional cooperation<sup>[1]</sup> and ensure continuous and stable development of Guangdong economy to provide inexhaustible power for the development of tourism industry.

To promote coordinated development of tourism industry in Pearl River Delta and the eastern, western and northern regions of Guangdong province. The Pearl River Delta with a strong tourism industry should bring its superiority of capital and talents into full play, radiate and drive development of the relatively backward eastern, western and northern regions of Guangdong province and finally become a powerful engine for tourism development of the whole province. To promote tourism cooperation in the province greatly, to create the pro-poor tourism mode, to actively support key project construction in tourism developing zones, to cultivate excellent tourism projects of developing zones and to buildup tourism attraction and competition of developing zones.<sup>[2]</sup>

To carry out cluster development strategy. To build tourism industrial park and distinctive district, create competitive industry cluster and achieve scale benefit, each region should integrate tourism resources according to industrialization level, development foundation, cultural background and other conditions. For example: Guangzhou, Shenzhen, Zhuhai and other cities can stress development of theme park, Shaoguan, Meizhou, Heyuan and other mountain cities tourism

industrial cluster and Zhanjiang, Jiangmen, Shantou, Chaozhou and other cities coastal tourism industrial park <sup>[3]</sup>.

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