Research on Regional Sustainable Development Based on Evaluation of Tourism Competitiveness of 21 Cities (States) in Sichuan Province

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Abstract. In accordance with the principles of systemic, hierarchical, and operability, this paper divides into tourism status competitiveness, tourism environmental competitiveness and tourism potential competitiveness to construct an evaluation index system for urban tourism competitiveness. Taking 21 cities in Sichuan Province as the research objects, the tourism competitiveness of each city was evaluated by factor analysis and grey correlation analysis. The evaluation results of these two methods were further evaluated by Kendall synergy coefficient test method. The consistency test and the combination evaluation were conducted, and the tourism competitiveness rankings of each city in Sichuan Province were given. Then, the system cluster analysis classified 21 cities into five levels, according to the evaluation results. Finally, some suggestions on the regional sustainable development in Sichuan Province were listed.

1. Introduction
Regional sustainable development capabilities have recently become an essential element of a region's vigorous development. As part of the urban economic industry, tourism industry evaluates its competitiveness not only by observing its development status, but also the potential development capability. There are some related researches on tourism competitiveness evaluation. Su et al (2003) constructed a tourism competitiveness evaluation system from three aspects: urban tourism potential competition, urban tourism performance, and urban tourism environment support. Zhou et al (2005) classified the influencing factors of urban tourism competitiveness as relative factors and absolute factors. Ding et al (2006) analysed the structure of urban tourism competitiveness evaluation indicators. Yan et al. (2014) used the factor analysis method to establish an evaluation model of urban tourism competitiveness from three aspects: urban status, resource support and potential development.

2. Urban Tourism Competitiveness Evaluation Index System
This paper establishes an evaluation index system for urban tourism competitiveness, which includes 14 indicators. The specific indicators are shown in Table 1. Analysis data derives from Sichuan Statistical Yearbook 2015, Statistical Bulletin of National Economic and Social Development 2014, Sichuan Tourism Administration, Sichuan. Provincial Forestry Department and Forestry Bureau Website.

| Primary indicator                  | Secondary indicators                          |
|-----------------------------------|-----------------------------------------------|
| Competitive status competitiveness| Foreign exchange income from tourism          |

Table 1. Urban Tourism Competitiveness Evaluation Index System
3. Independent Evaluation Results of Two Methods

3.1 Factor Analysis
This paper uses SPSS 16.0 to analyse the data of 21 cities in Sichuan Province. We conduct the feasibility test of factor analysis (Table 2). The KMO test value is 0.721, which is greater than the standard value 0.700. The Bartlett’ test is 0.000, less than 0.050, indicating that variables are correlative. Then we extract three main factors in Table 3, whose eigenvalue are more than 1.000. The factor load matrix embodies the degree of correlation between the original variable and each factor. To name main factors more accurate, this paper uses the maximum variance method to implement the orthogonal rotation of the factor load matrix (Table 4).

| Table 2. KMO and Bartlett's test |
|----------------------------------|
| Kaiser-Meyer-Olkin Measure of Sampling Adequacy. | .721 |
| Bartlett's Test of Sphericity | Approx. Chi-Square | 481.974 |
| | df | 91 |
| | Sig. | .000 |

| Table 3. Eigenvalue, variance contribution rate and cumulative variance contribution rate |
|-----------------------------------------------|
| Main factor | Eigenvalues | Variance contribution rate% | Cumulative variance contribution rate % |
|-----------------|--------------|-----------------------------|----------------------------------------|
| 1 | 8.184 | 58.455 | 58.455 |
| 2 | 2.175 | 15.532 | 73.988 |
| 3 | 1.460 | 10.431 | 84.419 |

| Table 4. Rotated factor load matrix |
|------------------------------------|
| Indices | Factor 1 | Factor 2 | Factor 3 |
|-----------------|-----------|-----------|-----------|
| Total tourism revenue | .930 | .314 | .082 |
We calculated the comprehensive scores and rank the tourism competitiveness of 21 cities in Sichuan Province (Table 5). We found that the factor comprehensive scores of Chengdu, Mianyang, Le Shan, is greater than 0. Meanwhile, Chengdu has the highest score on the main factor 1, indicating that it is the most competitive. In terms of tourism environmental, Panzhihua, Chengdu are the best, while Dazhou and other 11 cities scored negative value.

### Table 5. Rankings of tourism competitiveness of 21 cities in Sichuan Province

| Cities     | Factor 1   | Factor 2   | Factor 3   | Comprehensive score | Sort |
|------------|------------|------------|------------|---------------------|------|
| Chengdu    | 4.09652    | 1.21036    | 0.52030    | 2.63688             | 1    |
| Leshan     | 0.21450    | 0.15740    | -0.46207   | 0.10163             | 2    |
| Mianyang   | -0.01868   | 0.48287    | -0.28335   | 0.03452             | 3    |
| Guangyuan  | 0.08013    | -0.43799   | 0.04639    | -0.01635            | 4    |
| Bazhong    | 0.22917    | -1.23562   | 0.27193    | -0.02959            | 5    |
| Guang'an   | -0.04924   | -1.22455   | 1.68967    | -0.04273            | 6    |
| Ya'an      | -0.01004   | -1.12962   | 1.23867    | -0.05211            | 7    |
| Nanchong   | 0.02517    | -0.43949   | -0.39910   | -0.09518            | 8    |
| Quzhou     | -0.27441   | -0.28010   | 0.97827    | -0.10187            | 9    |
| Deyang     | -0.57956   | 0.93953    | 0.72499    | -0.11723            | 10   |
| Yibin      | -0.36850   | 0.44932    | 0.23733    | -0.12086            | 11   |
| Suining    | -0.26692   | -0.18987   | 0.35126    | -0.14888            | 12   |
### 3.2 Correlation Analysis

The grey correlation analysis is based on the degree of similarity or dissimilarity between the development trends of factors, namely, the “grey correlation degree” to measure the degree of association in factors. Suppose that there are \(m\) objects, \(n\) evaluation indicators, and the original evaluation matrix is \(X = (x_{ij})_{mn}\). Some steps are listed as follows: 1) determine the reference series \(X_o\) and compare series \(X_i\), where \(x_{ij}\) is the optimal value of each indicator, and all indicator values of each scheme constitute a comparison series \(X_i\), \(i = 1, 2, ..., m\). 2) The dimension is processed in a dimensionless manner, and the correlation coefficient between the comparison series and the reference series at the \(j\) point \(\xi_{ij}\) is calculated by:

\[
\xi_{ij} = \frac{\min_j \left| x_{ij} - x_{oj} \right| + \rho \max_j \left| x_{oj} - x_{ij} \right|}{\max_j \left| x_{oj} - x_{ij} \right|}, \quad i = 1, 2, ..., m; j = 1, 2, ..., n
\]

Where \(\rho\) is the resolution coefficient, usually is 0.5. 3) Calculate the grey correlation degree \(r_i\) between the comparison series and the reference series. Since the importance degree of each indicator is different, so the method of calculating the correlation degree is multiplying the weight by the correlation coefficient:

\[
r_i = \sum_{j=1}^n \omega_j \xi_{ij}
\]

4) Sort them according to \(r_i\). The urban tourism competitiveness of 21 cities in Sichuan Province is shown in Table 6. We can find that the comprehensive evaluation value of Chengdu is much higher than other cities, and Ziyang needs to improve its tourism competitiveness.

### Table 6. Evaluation results of urban tourism competitiveness based on grey correlation analysis

| Cities     | Evaluation value | Sort | Cities     | Evaluation value | Sort |
|------------|------------------|------|------------|------------------|------|
| Chengdu    | 0.999948831      | 1    | Panzhihua  | 0.45045068       | 12   |
| Leshan     | 0.459596255      | 2    | Zigong     | 0.450376192      | 13   |
| Mianyang   | 0.455488282      | 3    | Suining    | 0.45032306       | 14   |
| Guangyuan  | 0.452329004      | 4    | Aba        | 0.450288071      | 15   |
3.3 Consistency of Evaluation and Combination Evaluation

Based on the factor analysis and the grey correlation analysis, this paper sorts the tourism competitiveness of 21 cities in Sichuan Province, and uses the Kendall synergy coefficient test method to test the consistency of the evaluation results of two methods. The test results are shown in Table 7, indicating that the evaluation results of the two methods have past the Kendall synergy coefficient on the 0.050 significance level. The combined evaluation results are shown in Table 8.

| Number of methods | Kendall synergy coefficient | Chi-square value | Probability P |
|-------------------|-----------------------------|------------------|---------------|
| 2                 | 0.986                       | 34.429           | 0.006         |

Table 8. Combined evaluation results of two methods

| Cities    | Combined evaluation value | Sort | Cities    | Combined evaluation value | Sort |
|-----------|---------------------------|------|-----------|---------------------------|------|
| Chengdu   | 1.818414416               | 1    | Yibin     | 0.164868415               | 12   |
| Leshan    | 0.280613128               | 2    | Suining   | 0.15072153                | 13   |
| Zigong    | 0.276003096               | 3    | Panzhihua | 0.14921534                | 14   |
| Mianyang  | 0.245004141               | 4    | Aba       | 0.131414036               | 15   |
| Guangyuan | 0.217989502               | 5    | Liangshan | 0.12663692                | 16   |
| Bazhong   | 0.211329778               | 6    | Meishan   | 0.126586631               | 17   |
| Guang'an  | 0.204099912               | 7    | Dazhou    | 0.099057223               | 18   |
| Ya'an     | 0.199387772               | 8    | Ganzi     | 0.095759036               | 19   |
| Nanchong  | 0.177645079               | 9    | Neijiang  | 0.082267522               | 20   |
| Quzhou    | 0.174295224               | 10   | Ziyang    | 0.056954908               | 21   |
| Deyang    | 0.166694543               | 11   |           |                           |      |

3.4 Cluster Analysis

As shown in Table 9, we combined the factor analysis method, it can be divided into five categories according to the level of tourism competitiveness of cities in Sichuan Province. 1) Chengdu. 2)
4. Conclusion
This paper takes 21 cities in Sichuan Province as the research objects, and selects 14 indicators to construct a quantitative evaluation system of urban tourism competitiveness. The construction of tourism cities in 21 cities of Sichuan Province should combine their own tourism development advantages and resources, cities should firmly grasp their own construction and link it to form a network of Sichuan tourism system. Finally, cities should improve the comprehensive competitiveness of tourism development to enhance the capacity of regional sustainable development.

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