An Analysis of The Problem of Tourist Destination Selection about Vacation and Non Vacation Through Analytic Hierarchy Process

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Abstract

On holidays, tourism will face some problems that are not usually available, such as rising costs, traffic congestion, crowded population and so on. Therefore, the choice of tourist destination will be different from that in ordinary times. The data used in this paper comes from CEPS and has high authority. This paper uses analytic hierarchy process to calculate the different changes of five different factors: diet, cost, accommodation, traffic and scenery during the holiday, which leads to the change of people's interest in the scenic spot. After the calculation is completed, the result needs to be checked, and the CR is obtained by calculating Ci and RI, so that the CR value is less than 0.1, so as to prove that the settlement result is effective. This paper calculates people's optimal choice of tourist destination in ordinary times through analytic hierarchy process, and then changes the weight of factors, so as to select the most promising tourist destination again.

Keywords: *Tourist destination; Analytic hierarchy process; Factor weight*

1.INTRODUCTION

With the rapid development of China's economy and the continuous improvement of people's spiritual life, more and more people travel during holidays. Tourism can not only let us see the beautiful scenery and local customs, but also let us increase our knowledge and broaden our horizons on the way of tourism. For college students, they can personally experience off campus life and exercise their will. For workers, tourism can put aside the pressure and troubles of work, forget the troubles and relax their spirit. For children, tourism can increase the emotion with their parents, get rid of the boredom of learning and cultivate their sentiment.

Due to the continuous promotion of contemporary tourism consumption information and the continuous increase of information obtained by people, people also began to gradually consider the choice of tourism destination. Under the influence of various factors, people began to consider the tourist destination and finally choose the most suitable tourist destination. However, with the arrival of the holiday, various factors change dramatically, which leads to people's choice of tourist destination. The purpose of this paper is to study this change. Through the analytic hierarchy process, calculate the original choice of the best tourist destination, change the proportion of tourist destination factors on this basis, and calculate the optimal choice of tourist destination for the holiday.

2.ANALYTIC HIERARCHY PROCESS

2.1. Introduction of Analytic Hierarchy Process

Analytic hierarchy process (AHP) for short refers to the abstract generalization of real problems into a simple model with levels and steps. It is divided into three main levels: goal, criterion and scheme, and on this basis, it combines qualitative and quantitative. In the analytic hierarchy process, when comparing the influence of two factors that may have different properties on an upper level factor, the scale of 1-9 is usually adopted [4]. See Table 1 for the specific meaning.

Table 1 the scale and meaning

Scale a_{ij}	Meaning
1	C_i has the same effect as C_j

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3	The influence of C_i and C_j is slightly strong
5	C_i and C_j have strong influence
7	The influence of C_i and C_j is obviously strong
9	The influence of C_i and C_j is absolutely strong
2,4,6,8	The influence ratio of C_i to C_j is between the above two adjacent levels
1,1/2, …, 1/9	The influence ratio of C_i to C_j is the reciprocal number of a_{ij} above

In addition, it is also necessary to test the scale given in this table. See Table 2 for the randomness index value.

Table 2 the order and RI

Order n	1	2	3	4	5	6	7
RI	0	0	0.58	0.90	1.12	1.24	1.32

We divide the problem to be solved into hierarchical model and then analyze it, which is called analytic hierarchy process. In reality, we often encounter complex problems with many influencing factors. At this time, we use the analytic hierarchy process to analyze and decompose the problem into multiple levels, and then analyze the influencing factors and the attributes related to the objective decision-making. The more schemes and levels of analytic hierarchy process can show that the more influencing factors, the more complex the decision-making objectives will become [7]. The specific level steps depend on the needs of modeling researchers. The purpose is to make the problem hierarchical, simple and purposeful.

2.2. Application scope and characteristics of analytic hierarchy process

Analytic hierarchy process is a simple and intuitive systematic thinking method that decomposes the problem at multiple levels and then considers it comprehensively. It analyzes and arranges people's subjective judgment of the problem and divides it into a hierarchical structural model. Generally, it is mainly divided into three levels: low, medium and high. The process of using analytic hierarchy process to solve problems is actually to analyze the weight value of each factor in each level, or the role of influencing decision-making objectives. Through a certain linear algebra method, the influence degree of relevant influence elements that we can only describe in language is transformed into clear and definite data comparison, in which the important process is to transform people's qualitative thinking and analysis into quantitative analysis with clear data. That is to say, the fuzziness of human sensory perception is transformed into data as the degree of expression, and the degree of influence is indicated by the size of data. This analysis method is applied to all aspects of life, especially for problems with complex structure [6]. In real society, people are basically faced with complex and systematic problems that restrict or correlate with each other. Lack of quantitative and clear data for problem analysis. The ultimate goal of analytic hierarchy process is to make such a complex system clear, data and quantitative. However, the characteristics of analytic hierarchy process are shown in its advantages and disadvantages.

Table 3 the advantages and disadvantages of hierarchy process

Advantages of analytic hierarchy process	(1) The process method of analysis is complete and systematic. (2) Simple and practical scheme. (3) Little quantitative data information is needed.
Disadvantages of analytic hierarchy process	(1) Cannot provide new solutions to decision makers. (2) It is a simple and practical scheme. (3) There are few necessary quantitative data information and many qualitative components, which is difficult to be convincing. (4) The calculation of eigenvalues and eigenvectors is complex, and the results need accurate values.

Analytic hierarchy process is applicable to any decision-making problem in real life, such as tourism, buying clothes, living and so on.

3.CHOICE OF NON HOLIDAY DESTINATIONS

3.1. Weight calculation of non-holiday criteria layer

When a college student makes an appointment to travel, there are three choices of tourist destinations. We establish a model through analytic hierarchy process, calculate and choose.

(1) Building a model: divide the problem into three levels: the target level - choosing a tourist destination. The scheme level includes West Lake, Jiuzhaigou and Mount Tai. The criterion level includes five criteria: scenery, cost, residence, diet and travel. The connection between each layer is represented by a connected straight line (Figure 1)

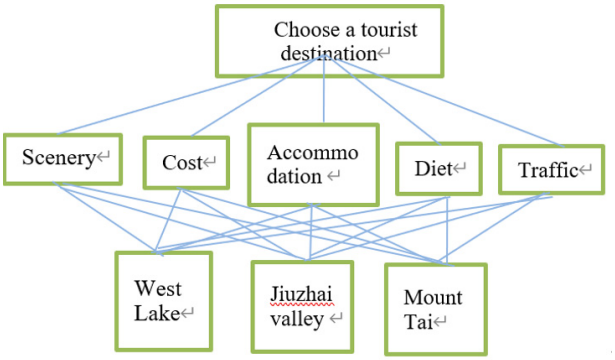

Figure 1 relationship between destination and options

The weight of each criterion K to the target and the weight of each scheme to each criterion are determined by mutual comparison. First, the criterion layer gives weight to the case layer and believes that the scenery is the most important, followed by food, followed by living, followed by travel and expenses [3]. Table 3 uses pairwise comparison discrimination method.

Table 4 corresponding proportion

Project	Scenery	Cost	Diet	Accommodation	Traffic
Scenery	1	8	2	4	6
Cost	1/8	1	1/6	1/4	1/2
Diet	1/2	6	1	2	4
Accommodation	1/4	4	1/2	1	2
Traffic	1/6	2	1/4	1/2	1

Others can be seen according to the meaning of scale 1-9, so a comparison judgment matrix can be obtained [1].

$$A=\begin{bmatrix} 1 & 8 & 2 & 4 & 6 \\ \frac{1}{8} & 1 & \frac{1}{6} & \frac{1}{4} & \frac{1}{2} \\ \frac{1}{2} & 6 & 1 & 2 & 4 \\ \frac{1}{4} & 4 & \frac{1}{2} & 1 & 2 \\ \frac{1}{6} & 2 & \frac{1}{4} & \frac{1}{2} & 1 \end{bmatrix}$$

It is called positive reciprocal matrix. The characteristic of n-order positive reciprocal matrix

$$a_{ij}>0, a_{ji}=\frac{1}{a_{ij}}, a_{ii}=1(i,j=1,2,\cdots,n)$$

Using Matlab to find the maximum eigenvalue $\lambda_{MAX}=5.0459$. The eigenvector corresponding to the eigenvalue is $W=(0.8308,0.0770,0.4722,0.2514,0.1326)^T$. The eigenvector component is obtained by normalizing the eigenvector $W=(0.4711,0.0437,0.2710,0.1426,0.0752)^T$ [2]. It is the sorting vector of the criterion layer to the target layer. Thus forming a new table 3.

Table 5 data summary

Project	Scenery	Cost	Diet	Accommodation	Traffic	Component of eigenvector
Scenery	1	8	2	4	6	0.4711
Cost	1/8	1	1/6	1/4	1/2	0.0437
Diet	1/2	6	1	2	4	0.2710
Accommodation	1/4	4	1/2	1	2	0.1426
Traffic	1/6	2	1/4	1/2	1	0.0752

We also need to carry out rationality test. Through consistency index $CI=\frac{\lambda_{MAX}-n}{n-1}$ randomness index $RI=1.12$ and consistency ratio $CR=\frac{CI}{RI}=0.0102455<0.1$, it shows that the table we constructed is reasonable [5].

3.2. Weight calculation of non holiday tourist destinations at the criterion level

Table 6 proportion of scenery in three areas

Scenery	West Lake	Jiuzhai Valley	Mount Tai	Component of eigenvector
West Lake	1	1/2	2	0.2857
Jiuzhai Valley	2	1	4	0.5715
Mount Tai	1/2	1/4	1	0.1428

$\lambda_{MAX}=3$ can be obtained by MATLAB Conduct rationality test, consistency index $CI=0$, randomness index $RI=0.58$ and consistency ratio $CR=0<0.1$ to meet the consistency. Table 5 shows that Jiuzhai Valley has the largest weight in terms of scenery.

Table 7 proportion of cost in three areas

Cost	West Lake	Jiuzhai Valley	Mount Tai	Component of eigenvector
West Lake	1	1/2	1/3	0.1634
Jiuzhai Valley	2	1	1/2	0.2969
Mount Tai	3	2	1	0.5396

Note: the higher the proportion of expenses, the lower the expenses.

$\lambda_{MAX} = 3.0089$ can be obtained by MATLAB Conduct rationality test, consistency index $CI = 0.00445$, randomness index $RI = 0.58$ and consistency ratio $CR = 0.0077 < 0.1$ to meet the consistency. Table 6 shows that Mount Tai has the largest weight in terms of cost.

Table 8 proportion of diet in three areas

Diet	West Lake	Jiuzhai Valley	Mount Tai	Component of eigenvector
West Lake	1	3	4	0.6250
Jiuzhai Valley	1/3	1	2	0.2385
Mount Tai	1/4	1/2	1	0.1365

$\lambda_{MAX} = 3.0183$ can be obtained by MATLAB Conduct rationality test, consistency index $CI = 0.00915$, randomness index $RI = 0.58$ and consistency ratio $CR = 0.0158 < 0.1$ to meet the consistency. Table 7 shows that West Lake has the largest weight in terms of Diet

Table 9 proportion of accommodation in three areas

Accommodation	West Lake	Jiuzhai Valley	Mount Tai	Component of eigenvector
West Lake	1	4	3	0.6316
Jiuzhai Valley	1/4	1	2	0.1579
Mount Tai	1/3	1/2	1	0.2105

$\lambda_{MAX} = 3.1078$ can be obtained by MATLAB Conduct rationality test, consistency index $CI = 0.0539$, randomness index $RI = 0.58$ and consistency ratio $CR = 0.0929 < 0.1$ to meet the consistency. Table 8 shows that West Lake has the largest weight in terms of Accommodation.

Table 10 proportion of traffic in three areas

Traffic	West Lake	Jiuzhai Valley	Mount Tai	Component of eigenvector
West Lake	1	2	1/3	0.2297
Jiuzhai Valley	1/2	1	1/5	0.1220
Mount Tai	3	5	1	0.6483

$\lambda_{MAX} = 3.0037$ can be obtained by MATLAB Conduct rationality test, consistency index $CI = 0.00185$, randomness index $RI = 0.58$ and consistency ratio $CR = 0.0032 < 0.1$ to meet the consistency. Table 9 shows that Mount Tai has the largest weight in terms of Traffic.

Table 11 specific gravity distribution in three areas

-	-	West Lake	Jiuzhai Valley	Mount Tai
Scenery	0.4711	0.2857	0.5715	0.1428
Cost	0.0437	0.1634	0.2969	0.5396
Diet	0.2710	0.6250	0.2385	0.1365
Accommodation	0.1426	0.6316	0.1579	0.2105
Traffic	0.0752	0.2297	0.1220	0.6483
-	-	0.4184	0.3785	0.2066

According to the results in table 10, the best tourist destination should be the West Lake in non holiday time.

4.SELECTION OF HOLIDAY DESTINATIONS

4.1. Weight calculation of holiday criterion layer

First of all, the criterion layer empowers the other case layer. Because it is a holiday and the tourist destination is full, resulting in the rising cost, it should be considered that the scenery is the most important, but the cost is the most important, followed by living, followed by travel, followed by food and scenery. See Table 11 below for the right to grant.

Table 12 corresponding proportion

Project	Scenery	Cost	Diet	Accommodation	Traffic
Scenery	1	1/8	2	1/6	1/2
Cost	8	1	10	2	5
Diet	1/2	1/10	1	1/8	1/4
Accommodation	6	1/2	8	1	2
Traffic	2	1/5	4	1/2	1

Others can be seen according to the meaning of scale 1-9, so a comparison judgment matrix can be obtained

$$A=\begin{bmatrix} 1 & \frac{1}{8} & 2 & \frac{1}{6} & \frac{1}{2} \\ 8 & 1 & 10 & 2 & 5 \\ \frac{1}{2} & \frac{1}{10} & 1 & \frac{1}{8} & \frac{1}{4} \\ 6 & \frac{1}{2} & 8 & 1 & 2 \\ 2 & \frac{1}{5} & 4 & \frac{1}{2} & 1 \end{bmatrix}$$

$$a_{ij}>0, a_{ji}=\frac{1}{a_{ij}}, a_{ii}=1(i,j=1,2,\cdots,n)$$

Using Matlab to find the maximum eigenvalue $\lambda_{MAX}=5.0610$, The eigenvector corresponding to the eigenvalue is $W=(0.1015,0.8446,0.0610,0.4778,0.2105)^T$ .The eigenvector component is obtained by normalizing the eigenvector $W=(0.0599,0.4982,0.0360,0.2818,0.1242)^T$,It is the sorting vector of the criterion layer to the target layer. Thus forming a new table 11.

Table 13 data summary

Project	Scenery	Cost	Diet	Accommodation	Traffic	Component of eigenvector
Scenery	1	1/8	2	1/6	1/2	0.0599
Cost	8	1	10	2	5	0.4982
Diet	1/2	1/10	1	1/8	1/4	0.0360
Accommodation	6	1/2	8	1	2	0.2818
Traffic	2	1/5	4	1/2	1	0.1242

We also need to conduct rationality test. Through consistency index $CI=\frac{\lambda_{MAX}-n}{n-1}$ $CI=0.01525$, randomness index $RI=1.12$ and consistency ratio $CR=\frac{CI}{RI}=0.01361607<0.1$, it shows that the table we constructed is reasonable.

4.2. Calculation of the weight of holiday destinations in the criterion layer

Although it is a holiday, the weight of the scenery will not change.

Table 14 proportion of scenery in three areas

Scenery	West Lake	Jiuzhai Valley	Mount Tai	Component of eigenvector
West Lake	1	1/2	2	0.2857
Jiuzhai Valley	2	1	4	0.5715
Mount Tai	1/2	1/4	1	0.1428

Due to holidays, the weight of expenses increases, and the expenses of each tourist destination will change accordingly.

Table 15 proportion of cost in three areas

cost	West Lake	Jiuzhai Valley	Mount Tai	Component of eigenvector
West Lake	1	2	1/6	0.1467
Jiuzhai Valley	1/2	1	1/8	0.0840
Mount Tai	6	8	1	0.7692

Note: the higher the proportion of expenses, the lower the expenses.

$\lambda_{MAX}=3.0183$ can be obtained by MATLAB Conduct rationality test, consistency index $CI=0.00915$, randomness index $RI=0.58$ and consistency ratio $CR=0.0158<0.1$ to meet the consistency. Table 14 shows that Mount Tai still has the largest weight in terms of cost.

During the holidays, the number of people in the West Lake is full every day, resulting in more trouble in diet, so the weight will decrease.

Table 16 proportion of diet in three areas

Diet	West Lake	Jiuzhai Valley	Mount Tai	Component of eigenvector
West Lake	1	1/2	2	0.2857
Jiuzhai Valley	2	1	4	0.5715
Mount Tai	1/2	1/4	1	0.1428

$\lambda_{MAX}=3.0$ can be obtained by MATLAB Conduct rationality test, consistency index $CI=0$, randomness index $RI=0.58$ and consistency ratio $CR=0<0.1$ to meet the consistency. Table 15 shows that from the original West Lake, Jiuzhai Valley has the largest weight in terms of diet.

During holidays, accommodation conditions are also

a big problem, so it is difficult to book Jiuzhai valley and West Lake in terms of residence, and the weight is the same.

Table 17 proportion of accommodation in three areas

Accommodation	West Lake	Jiuzhai Valley	Mount Tai	Component of eigenvector
West Lake	1	1	2	0.4
Jiuzhai Valley	1	1	2	0.4
Mount Tai	1/2	1/2	1	0.2

$\lambda_{MAX} = 3.0$ can be obtained by MATLAB Conduct rationality test, consistency index $CI = 0$, randomness index $RI = 0.58$ and consistency ratio $CR = 0 < 0.1$ to meet the consistency.Table 16 shows that the West Lake has the largest weight in terms of accommodation.

In terms of traffic, the weight will not change, so it will remain the same.

Table 18 proportion of traffic in three areas

traffic	West Lake	Jiuzhai Valley	Mount Tai	Component of eigenvector
West Lake	1	2	1/3	0.2297
Jiuzhai Valley	1/2	1	1/5	0.1220
Mount Tai	3	5	1	0.6483

$\lambda_{MAX} = 3.0037$ can be obtained by MATLAB Conduct rationality test, consistency index $CI = 0.00185$, randomness index $RI = 0.58$ and consistency ratio $CR = 0.0032 < 0.1$ to meet the consistency.Table 17 shows that the Mount Tai has the largest weight in terms of traffic.

Table 19 specific gravity distribution in three areas

-	-	West Lake	Jiuzhai Valley	Mount Tai
Scenery	0.0599	0.2857	0.5715	0.1428
Cost	0.4982	0.1467	0.0840	0.7692
Diet	0.0360	0.6250	0.2385	0.1365
Accommodation	0.2818	0.4	0.4	0.2
traffic	0.1242	0.2857	0.5715	0.1428
-		0.2609	0.2684	0.4708

From the results in table 18, we can see that the best tourist destination should be Mount Tai during holidays.

5.SUMMARY

When choosing a tourist destination for holiday tourism, we change the cost, diet and residence of the standard layer. Although not all of them have been changed, the overall impact is huge. From the West Lake we originally chose to Mount Tai, we can find that each step of the change of the standard layer will have a great impact on the target layer.

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