

## THE RESEARCH ON LISTED TOURISM COMPANIES GROWTH BASED ON GREY RELATIONAL DEGREE MODEL

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**ABSTRACT.** *As an objective evaluation to the ability of enterprise development, growth is the core issue during the development of listed companies. With the rapid progress of China tourism, it is significant to accurately evaluate the growth of Chinese listed tourism companies. This paper uses representative financial indexes to build up a growth evaluation system of listed tourism companies, and evaluates the growth of listed tourism companies based on grey relational degree model, thus obtaining their results of the listed tourism companies' growth. The results can provide investors with effective decision-making information and actively promote the healthy development of listed tourism companies.*

**Keywords:** Listed tourism companies, Growth, Grey relational degree model

1. **Introduction.** During recent years, the global tourism industry has experienced rapid development. At the same time, Chinese tourism industry has achieved greater impact in the world. China's economy has entered into the new normal and the industrial structure and economic growth pattern are being adjusted and changed. So the status of tourism is increasingly becoming apparent among the new normal of Chinese economy. Tourism has become an important pillar industry in national economic development. How to survive and develop under the new normal of Chinese economy could be a serious reality that all listed tourism companies have to be faced with. The most basic and objective standard to check enterprises' ability of survival and development is to see if they can grow continuously and stably. Under this background, accurate evaluations for Chinese tourism companies growth are not only good for China tourism industry management, but also significant for research on sustainable development of listed tourism companies.

Till now, there have been many researches about corporation growth by institutions and scholars at home and abroad, using different models or methods. In 1998, Weinzimmer et al. constructed a multidimensional evaluation index system based on three growth affecting factors: growth environment, strategic features, and management style. They used  $\beta$  coefficient method to evaluate, and also took account of the effects that caused the comparability of evaluated data by inflation and GDP price index [1]. In 2007, Cefis and his companions adopted Bayesian panel data to analyze collected industrial data, to show the relationship between Brett's Law and corporate growth [2]. In 2008, Coad and his partners adopted regression analysis to analyze corporate data, and they thought creative ability is critical to corporate growth [3]. In 2010, Cassia and Colombelli studied some Italian medium-sized enterprises and their findings suggested some factors that determine the growth of medium-sized enterprises, including proactivity, risk taking posture and investment aimed at growth [4]. In China, in 2009, using binary logistic regression analysis, Zhang and Li structured an overall growth evaluation model for Chinese high technology listed companies [5]. In 2010, Zhou and Dong took an empirical research on

17 listed tourism companies, using the comprehensive growth evaluation based on time series stereo data list [6]. In 2011, Zheng established a support vector machine (SVM) based growth evaluation model to analyze the growth of 16 listed commercial banks [7]. In 2014, Zhang and Chen established five dimensions index system, using the entropy model to evaluate GEM listed companies [8]. In 2015, Gong and Wang analyzed the order parameters of companies, and derived the functional relationship of a company between its development state and vitality [9]. In 2016, Lv together with his partners used factor analysis to evaluate 19 sporting goods listed companies, based on statistics from 2009-2013 panel data of this industry [10]. All the above mentioned researches are used for references in this paper.

The paper mainly conducts researches on two aspects. Firstly, financial index system of growth evaluation for listed tourism companies is established based on the current literature and financial features of Chinese listed tourism companies. Secondly, based on financial statement of 7 listed tourism companies, grey relational degree model is exerted to make assessment for those companies, thus obtaining their results of the listed tourism companies' growth, which is also the innovation point in the paper. As a result, accurate information can be provided for the users, which promotes the healthy development of listed tourism companies.

**2. Establishment of Growth Evaluation Index System for Listed Tourism Companies.** Listed tourism companies refer to listed companies whose main tourism business income accounts for no less than 50% of total revenue, including tourist catering, hotel service, scenic spots tourism service, tourism transport, tourism information, tourism product marketing, etc. [11]. Tourism industry depends on both natural and human resources strongly, and thus can easily be restricted or affected by external factors. We can say that risks and potentials coexist in tourism industry. To sum up, the growth of listed tourism company is continuous, dynamic, fluctuant, complex and extended. In this paper, after combining relevant company growth evaluation theories and growth features of listed tourism companies, and then referring to Chinese and foreign literature, we build up an evaluation index system of listed tourism companies growth from financial perspective, as shown in Figure 1.

The growth evaluation indexes system is mainly based on financial perspective, and attaches more importance to appraisal indexes which can directly reflect the management performance of companies.

### **3. The Empirical Study on Listed Tourism Companies Growth Based on Grey Relational Degree Model.**

**3.1. Grey relational degree model.** In control theory, people often use the depth of color to show the transparency of information. Black means information unknown, white means information well known, while grey means part information known and part unknown. Accordingly, black system is the system information unknown, white system refers to all information well known system, and grey system is between white and black systems [12].

The grey system is a system with poor information, so statistical methods are difficult to work. The grey system theory can deal with poor information system, but only for projects with little observation information. Grey system theory was proposed in 1983 by Chinese famous scholar Deng Julong. The research's object is uncertainty poor information system that part information is known and part unknown. The theory aims to have exact description and understanding of the real world, on the basis of the part information that has been known. In other words, the grey system is to obtain unknown information of system using known information, and change the system from grey to white [13,14].

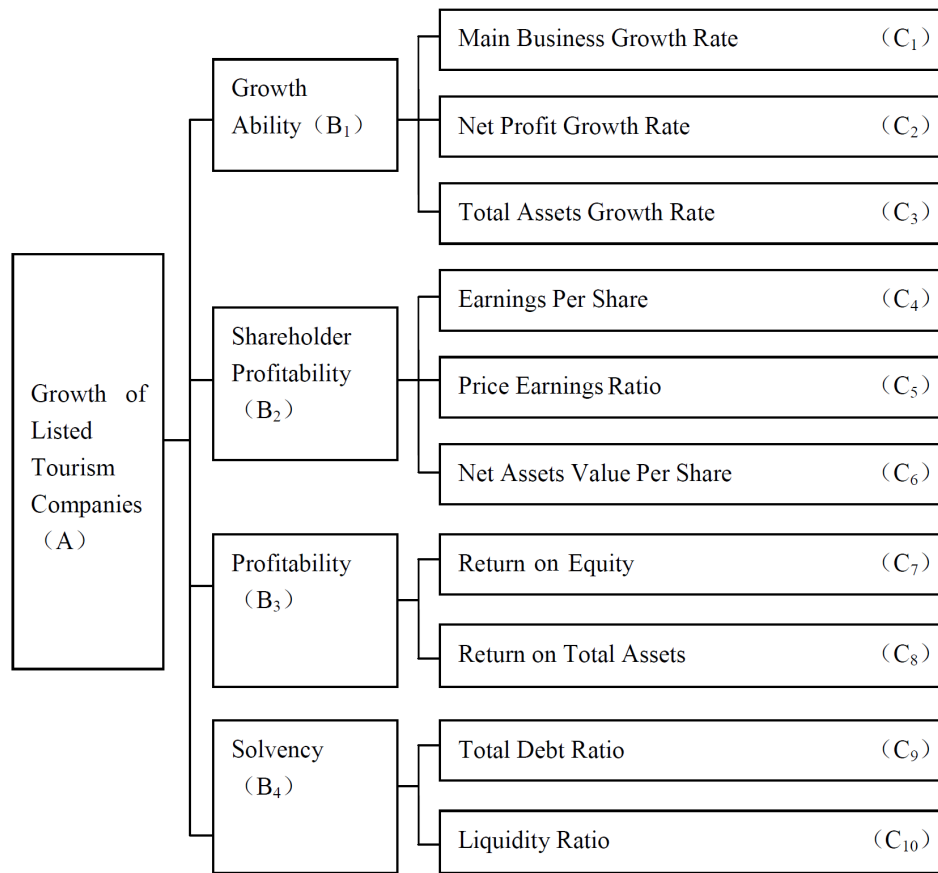


FIGURE 1. Growth evaluation index system of listed tourism companies

Grey relational analysis is one of the main applications of grey system theory. Grey comprehensive evaluation method is based on grey relation to compare and order the evaluated objectives, by comparing the relational degree between the best plan and all evaluated plans. Grey comprehensive evaluation method is easy to calculate and understand, and hence is more and more used to evaluate social, economic and managerial problems.

**3.2. Grey evaluation of listed tourism companies growth.** This paper, from a financial perspective, selects representative financial indexes to establish growth evaluation index system of listed tourism companies, and evaluates the growth of listed tourism companies based on grey relational model. The index system is not likely to include all the indexes known and unknown, but focus on researching part of the important indexes, based on financial perspective and growth features. So the information we used for growth evaluation of listed tourism companies is incomplete as it should be, which means that this evaluation system is typically grey, and will be more scientific and reasonable to be evaluated by grey relational degree model.

Grey growth evaluation of listed tourism companies is firstly to figure out satisfactory growth index sequence, based both on selected financial indexes from the growth evaluation index system and financial index data of the evaluated companies. This satisfactory growth index sequence will be taken as a reference sequence and together with the actual sequence of the evaluated companies to constitute a grey evaluation sample space. In this space, the similarity of correspondent financial index curves between the reference sequence and objects' index sequence will be directly compared and analyzed, and then the similarity degree will be defined by uniform grey relational degree.

**3.3. Grey relational model of listed tourism companies growth.** Grey relational model of listed tourism companies growth is applicable to evaluate growth of certain companies in the same industry, based on financial indexes of different companies during the same accounting period. The essence is a horizontal evaluation of different companies in the same industry. The result of the evaluation is to give a growth-based ranking of evaluated companies, which will offer scientific basis for different listed tourism companies for their decision-making and management.

*3.3.1. Grey sample space selection.* This paper selects 7 listed tourism companies, China Youth Travel Service (CYTS) (600138), Mount Huangshan Tourism (600054), Songcheng Shares (300144), Lijiang Tourism (002033), Mountain Emei A (000888), OCT A (Overseas Chinese Town A) (000069) and Beibu Gulf Travel Service (BGTS) (603869), and then makes growth research on their financial situation in 2014 (2014.1.1-2014.12.31) (data source: Sina Finance Stock Market) [14]. All the companies are financially defined using selected financial indexes based on the growth index system built above. We use  $X_k = \{X_k(1), X_k(2), \dots, X_k(10)\}$  to express the vector of No. K Company's index sequence composed of several indexes. Obviously all the individual value gathers to reflect the growth standing of K company during the accounting period.

The 10 selected financial indicators are not judged by being the biggest or smallest, so the confirmation of reference sequence of satisfactory financial situation cannot be across-the-board. For some financial indicators, there may be an optimal expected value, but for some others, it may be the bigger the better. In this paper, we use Delphi method to confirm satisfactory financial index value separately for these financial indexes, and then to create reference sequence of satisfactory financial situation, using vector  $X_0 = \{X_0(1), X_0(2), \dots, X_0(N)\}$  to express.

In total there are 10 vectors that constitute the grey financial evaluation sample space, composed by growth standing index sequence and reference sequence of satisfactory growth situation of the 7 companies.

$$\begin{bmatrix} 37.78 & 66.35 & 47.14 & 0.72 & 99.04 & 6.75 & 16.98 & 47.95 & 50 & 1.50 \\ 13.86 & 6.05 & 7.49 & 0.53 & 54.76 & 6.10 & 8.23 & 12.09 & 36.57 & 1.14 \\ 15.13 & 37.42 & 2.28 & 0.44 & 45.20 & 4.71 & 9.42 & 28.64 & 34.42 & 1.10 \\ 37.78 & 18.12 & 11.19 & 0.65 & 99.04 & 6.18 & 10.49 & 20.63 & 8.54 & 3.26 \\ 11.33 & 21.87 & 47.14 & 0.66 & 33.37 & 6.75 & 9.53 & 19.85 & 21.78 & 5.82 \\ 20.30 & 66.35 & 14.17 & 0.72 & 40.12 & 6.69 & 10.75 & 47.95 & 18.09 & 1.72 \\ 9.10 & 12.81 & 7.96 & 0.66 & 15.76 & 3.87 & 16.98 & 14.09 & 66.01 & 1.59 \\ 4.24 & 7.32 & -4.58 & 0.32 & 91.15 & 2.87 & 11.13 & 33.37 & 22.88 & 1.27 \end{bmatrix}$$

FIGURE 2. Growth index sequence of the samples and satisfactory growth reference sequence

*3.3.2. Grey transformation of sample sequences.* Company financial evaluation indexes often have some number graduations due to their different economic meanings. In order to avoid the excessive disparity among the original data, ensure the factors affecting companies' financial situation are in the same order and keep their privileges, we need to make grey transformation of the samples.

There are a number of grey transformation methods, like initialization, equalization and interval valued. As for enterprise financial evaluation of the same industry, the original sequence is index sequence composed of several financial indexes during an accounting period but not time sequence, and we will take equalization for grey transformation.

The vectors  $X_k = \{X_k(1), X_k(2), \dots, X_k(N)\}$  in the sample space can be transformed as the following, and then we get interval valued sequence  $Y_k = \{Y_k(1), Y_k(2), \dots, Y_k(N)\}$ :

$$Y_k = \frac{X_k(i) - \min X_k(i)}{\max X_j(i) - \min X_j(i)}$$

1	1	1	1	1	1	1	1	0.7575	0.2577
0.2060	0	0.2334	0.5250	0.4603	0.0325	0	0	0.4077	0.0085
0.3247	0.5202	0.1326	0.3000	0.3535	0.4742	0.1360	0.4615	0.4503	0
1	0.2002	0.3049	0.8250	1	0.8531	0.2583	0.2381	0	0.4576
0.2114	0.2624	1	0.8500	0.2115	1	0.1486	0.2164	0.2304	1
0.4788	1	0.3625	1	0.2925	0.9845	0.2880	1	0.1662	0.1314
0.1409	0.1121	0.2425	0.8500	0	0.2577	1	0.0558	1	0.1038
0	0.0211	0	0	0.9053	0	0.3314	0.5934	0.2495	0.0360

FIGURE 3. Interval valued sequence

3.3.3. Calculation for relational coefficient between the max and min differences. Get the difference sequence from grey exchanged interval valued sequence  $Y_k = \{Y_k(1), Y_k(2), \dots, Y_k(N)\}$ , by formula  $\delta_{0k} = |Y_{0k}(j) - Y_k(j)|$ :

0.7132	1	0.7666	0.4750	0.5317	0.1675	1	1	0.2697	0.2493
0.6753	0.4798	0.8674	0.7000	0.6465	0.5258	0.8640	0.5385	0.3071	0.2577
0	0.7998	0.6951	0.1750	0	0.1469	0.7417	0.7619	0.7575	0.1999
0.7886	0.7376	0	0.1500	0.7885	0	0.8514	0.7836	0.5271	0.7423
0.5212	0	0.6375	0	0.7075	0.0155	0.7120	0	0.5913	0.1264
0.8551	0.8879	0.7575	0.1500	1	0.7423	0	0.9442	0.2425	0.1539
1	0.9789	1	1	0.0947	1	0.6686	0.4066	0.5079	0.2217

FIGURE 4. Difference sequence

Based on the difference sequence, we get the maximum difference  $\delta_{\max} = 1$ , and minimum difference  $\delta_{\min} = 0$ .

$$\delta_{\max} = \max_k \max_j \delta_{0k}(j) \quad \delta_{\min} = \min_k \min_j \delta_{0k}(j)$$

Then calculate relational coefficient by formula:  $\xi_{0k}(j) = \frac{\delta_{\min} + \rho \delta_{\max}}{\delta_{0k}(j) + \rho \delta_{\max}}$ .

0.4121	0.3333	0.3947	0.5128	0.4846	0.7490	0.3333	0.3333	0.6496	0.6673
0.4254	0.5103	0.3657	0.4167	0.4361	0.4874	0.3666	0.4815	0.6195	0.6599
1	0.3847	0.4184	0.7407	1	0.7729	0.4027	0.3962	0.3967	0.7144
0.3880	0.4040	1	0.7692	0.3880	1	0.3700	0.3895	0.4868	0.4025
0.4896	1	0.4396	1	0.4141	0.9700	0.4125	1	0.4582	0.7982
0.3690	0.3603	0.3976	0.7692	0.3333	0.4025	1	0.3462	0.6734	0.7646
0.3333	0.3381	0.3333	0.3333	0.8407	0.3333	0.4279	0.5515	0.4961	0.6928

FIGURE 5. Relational coefficient

Here  $\rho$  is distinguishing coefficient, and we normally take  $\rho = 0.5$ . Relational coefficient is the basis of relational degree. Relational degree can be calculated based on relational coefficient, by formula:  $\beta_{0k} = \frac{1}{N} \sum_{j=1}^N \xi_{0k}(j)$ .

TABLE 1. Relational ranking of sample enterprises

Corporate Name	Relational Degree	Comprehensive Ranking
CYTS	0.4870	5
Mountain Huangshan Tourism	0.4769	6
Songcheng Shares	0.6228	2
Lijiang Tourism	0.5598	3
Mountain Emei A	0.6982	1
OCT A	0.5416	4
BGTS	0.4680	7

Based on above data, calculate the relational degree of the above 7 companies, ranked as Table 1.

Relational degree value shows the relational degree between evaluated companies' and satisfactory financial situation. The higher degree, the better financial situation, while the lower the worse. As shown in above table, the relational degree ranking about growth for the 7 companies based on 2014 data, from high to low is: Mountain Emei A, Songcheng Shares, Lijiang Tourism, OCT A, CYTS, Mountain Huangshan Tourism, and BGTS. Among them, Mountain Emei A has maximum relational degree with the reference sequence composed by best growth financial index, the value up to 0.6982, which shows that Mountain Emei A will have the best growth in the future. While BGTS has minimum relational degree, only 0.4680, showing its comparatively weak growth that needs to be further strengthened.

The results show that it is feasible for the grey relational model to be used to study the growth of listed tourism companies, and it is accordant with practical circumstances. Songcheng Shares, for example, achieved high growth in 2015.

**4. Discussion.** From above empirical study, we can see that the top 3 listed tourism companies are all scenic spot enterprises, namely, Mountain Emei A, Songcheng Shares and Lijiang Tourism. Their good growths are closely allied to natural resources, which makes each scenic spot unique and irreplaceable. These scenic spots attract a large number of tourists from home and abroad every year, which brings them considerable tickets income as their main revenue. The stable income also makes the market expected to reflect better. While the poor growth companies like BGTS, they have average performance in all aspects, especially the 3 growth ability indexes are almost all lower than other companies. BGTS even has a negative growth on its total assets, which may lead to its poor comprehensive ranking.

It is notable that among the 7 listed tourism companies compared to satisfactory reference index, even the worst relational degree is high up to 0.4680, no much less than the best degree 0.6982, which means the 7 selected companies have relatively average ability on growth. This is due to the sample selection criteria in this paper: removing the companies that were already suspended, and had special treatment (ST) or abnormal financial index during the selection. We should select sample companies with average overall index quality.

Besides, in this paper we mainly evaluate enterprise growth based on part of historical financial data and present market data, and do not consider other factors like non-finance index and enterprise scale. Moreover, this paper compares growth mainly based on relative index value, but lacks consideration of enterprise scale; there could be a result of low growth for big scale enterprises.

**5. Conclusion.** To sum up, this paper firstly builds up a growth evaluation index system of listed tourism companies, including related financial indexes like growth ability,

shareholder profitability, profitability and debt paying ability, based on financial features of Chinese listed tourism companies. Then, the paper evaluates the growth of listed tourism companies based on grey relational model. Hope this growth evaluation method can provide investors with effective decision-making information, and actively promote the healthy development of enterprises.

With further development of China tourism, we will have more systematic and sophisticated growth evaluations for Chinese listed tourism companies. In evaluation index system of listed tourism companies, not only financial index, non-financial index such as government policies and current market situation will also be taken into consideration. In the aspect of evaluation method and data selection, our research will be based on the new progress of intelligent computing, management evaluation model and big data, to constantly improve growth evaluation system of listed tourism companies.

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