ICIC Express Letters
Volume **10**, Number **4**, April **2016**

 ISSN 1881-803X
pp. **831–837**

THE RESEARCH ON LISTED TOURISM COMPANIES GROWTH BASED ON FUZZY COMPREHENSIVE EVALUATION MODEL

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Received September 2015; accepted December 2015

Abstract. *Growth can be the core problem for the development of listed companies. With the rapid development of Chinese tourism, it is of practical importance to accurately evaluate the growth of Chinese listed tourism companies. This paper establishes the growth evaluation index system for listed tourism companies by representative financial indicators, determines the index weight by Analytic Hierarchy Process, and applies fuzzy comprehensive evaluation model to the growth evaluation of listed tourism companies, thus obtaining satisfactory results.*
Keywords: Listed tourism companies, Growth, Fuzzy comprehensive evaluation model

1. **Introduction.** With the rapid expansion of tourism in China, more and more large-scale travel groups in the world have entered into the Chinese market, thus resulting in a white-hot competition for the tourism market. Any enterprise, listed tourism companies included, has to face a severe reality that how to make survival and development in the era of market economy. Moreover, whether enterprises can maintain a continuous and steady growth is the most fundamental and objective standard for enterprises' survival and development capabilities. Under the background, to make an accurate evaluation on the growth of Chinese listed tourism companies can further enhance the understandings of Chinese tourism and be of great significance for the research on the sustainable development of listed tourism companies.

Currently, academic circles at home and abroad have conducted many researches on the enterprise growth, mainly from two perspectives: growth index and research method. From the perspective of growth indexes, various institutions and scholars have explored to establish different systems of growth indexes. According to in-depth investigations on developmental status and inner structure of over 100 Japanese high-tech enterprises, Phillips structured the dynamic evaluation system of growth, including market price, business process, marketing strategy, capital scale, surroundings and other indexes [1]. The Tobin's Q ratio selected by Fagiolo and others to assess the growth of multinational enterprises was representative of the research on single index [2]. Based on empirical analysis of relative literature, Campello et al. built the growth evaluation index system consisting of five dimensions: market share, management level, asset growth, main business income and staff size [3]. Domestic scholars took into consideration the specific situations of domestic enterprises when setting up the index system. Directing at features of science-and-technology enterprises, Zhang and Zhang concluded comprehensive evaluation system of enterprise growth constituted by six factors: tangible and intangible resources, managerial experience, knowledge, business portfolio, organizational system and culture [4]. Guo conducted growth research by selecting 18 tourism listed companies and considering tourism industry own characteristic, internal factors and external factors influencing the development of listed tourism companies. Internal factors include the development prospects of the

industry, the scale of the enterprise, the financial standing of the enterprise and the enterprise's internal comprehensive quality; external factors include the national macroscopic economy, national economic policy, market demand situation, international environment and the change of nature [5]. Cong gave definitions to unconventional business growth which covered three types: scale expansion on the premise of lag in technology, lack of technological innovation on the premise of scale expansion, downsizing but strongly innovative. The reasons for unconventional business growth are the demand pulls of market, grasps of technological opportunities and so on [6].

From the perspective of research methods, StrenStewart&Co. (1980) firstly put forward EVA for growth evaluation on business performance [7]. Kaplan and Atkinson proposed Balanced Score Card for business performance evaluation [8]. Based on growth environment, strategic features and management style, Weinzimmer and others built an evaluation model of multidimensional indexes which not only adopted Beta coefficient but also took into account the influence of currency inflation and GDP on the comparability of evaluation data [9]. Chen and Huang made systematic analysis on various factors impacting business growth ranging from market potential, government support, technological level and support, industry relevance, land supply to the infrastructure [10]. Compared with foreign research methods, domestic scholars were more abundant in this aspect. Resorting to regression analysis of binomial Logistic, Zhang and Li established overall growth evaluation model for Chinese listed high-tech companies [11]. Zhou and Dong conducted growth empirical studies on 17 domestic listed tourism companies through comprehensive evaluation based on the time series three-dimensional data table [12]. Zheng built a growth evaluation system on account of support vector machine to make analysis on the growth of 16 domestic listed commercial banks [13]. Zhang and Chen set up 5-dimension index system, utilizing entropy model to evaluate the growth of listed companies on GEM (Growth Enterprise Market) [14]. Researches and their results mentioned above can offer some reference valuable to this paper.

The paper mainly conducts researches on two aspects. Firstly, financial index system of listed tourism companies' growth is established based on the current literature and financial features of Chinese listed tourism companies. Then, Analytic Hierarchy Process is adopted. The weight of various financial indexes can be figured out through handing out judgment matrix questionnaires to experts and utilizing MATLAB computer programming language. Secondly, based on financial statements of three Chinese listed tourism companies, fuzzy comprehensive evaluation model is exerted to make assessment for those companies, thus obtaining their results of the listed tourism companies' growth. As a result, valuable information can be provided for the users, which promotes the healthy development of listed tourism companies.

2. **Growth Evaluation Indexes System of Listed Tourism Companies.**

Listed tourism companies refer to those companies which are publicly traded in the Shanghai and Shenzhen Stock Exchange and rely on securities market to finance. Their main business includes tourist catering, hotel services, tourist spot services, tourism transportation, tourism information, purchase and sale of tourism products and so on; and their main business income should account for more than 50% of total income [15]. Characterized by strong dependence on natural resources and humanistic resources, tourism is vulnerable to external factors and constraints but with great potential. Therefore, the growth of listed tourism companies is featured with continuity, dynamism, fluctuation, complexity and expansion. On the basis of relative theories on enterprise growth evaluation, growth features of listed tourism companies and relevant literature of scholars at home and abroad, the paper establishes the growth evaluation index system of listed tourism companies as shown in Figure 1.

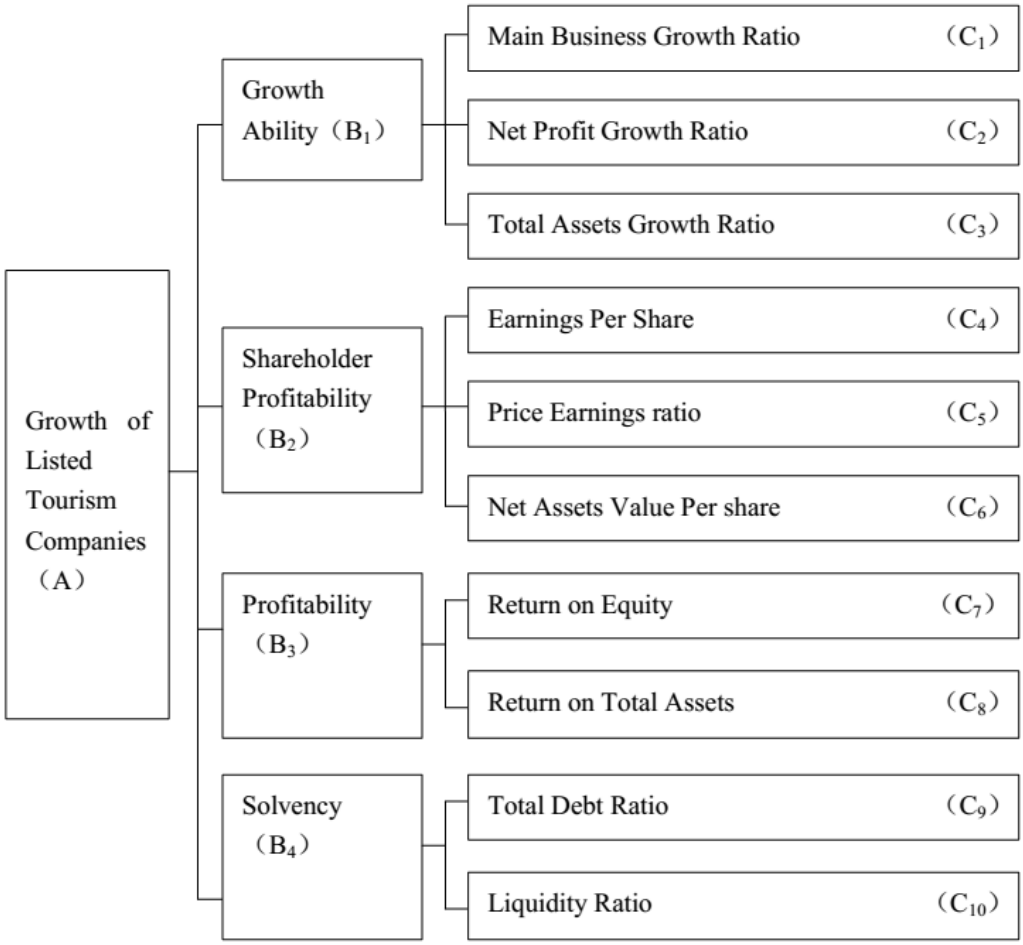

FIGURE 1. Growth evaluation indexes system of listed tourism companies

3. Calculation of Growth Index Weights of Listed Tourism Companies.

3.1. **Introduction to Analytic Hierarchy Process (AHP).** Analytic Hierarchy Process is a kind of systematic analysis method put forward in the 1970s by Saaty, an American famous operational research expert and professor of University of Pittsburgh. The implementation process of AHP method is as follows: firstly break up complex questions into organized levels; secondly provide ration for relative importance of factors among different levels according to the judgment on objective facts, which is to structure comparison judgment matrix; then determine the weights for the sequence of relative importance of factors in each level by means of judgment matrix to get the greatest eigenvalue and eigenvector; finally bring the analysis to the whole problem through the hierarchies analysis, which is the weight of total order sorting.

3.2. **Construction of judgment matrix and single hierarchical arrangement.** Experts are firstly brought in to structure judgment matrix on the basis of above-mentioned indexes. In order to make subjectively comparative results from experts function well, judgments and opinions of experts are synthesized to obtain the comprehensive judgment matrix in each level. Then, consistency check (all C.R.s of each judgment matrix are under 0.1.) and single hierarchical arrangement are conducted for the comprehensive judgment matrix.

There are many methods for the synthesis of original matrix. The paper adopts geometric method which is to get the geometric averages of comparative results of all experts. Geometric averages are utilized to structure the judgment matrix; then C.R.s of each judgment matrix are acquired by consistency check on comprehensive judgment matrix;

finally single hierarchical arrangement for comprehensive judgment matrix is conducted, thus determining the eigenvector catering to maximum eigenvalue of matrixes to get the index weight of each judgment matrix. Here are synthetical and computed results.

A	B_1	B_2	B_3	B_4	W
B_1	1.0000	2.9672	2.0153	3.4714	0.4651
B_2	0.3370	1.0000	1.7226	3.0000	0.2476
B_3	0.4962	0.5805	1.0000	2.3577	0.1919
B_4	0.2881	0.3333	0.4241	1.0000	0.0954
C.R. = 0.0457					

B_1	C_1	C_2	C_3	W
C_1	1.0000	3.2716	3.7895	0.6356
C_2	0.3057	1.0000	1.4029	0.2071
C_3	0.2639	0.7128	1.0000	0.1573
C.R. = 0.0036				

B_2	C_4	C_5	C_6	W
C_4	1.0000	2.6673	4.0760	0.6042
C_5	0.3749	1.0000	2.6673	0.2727
C_6	0.2453	0.3749	1.0000	0.1231
C.R. = 0.0297				

B_3	C_7	C_8	W
C_7	1.0000	3.7841	0.7910
C_8	0.2643	1.0000	0.2090
The second order matrix, C.R. stands consistency check			

B_4	C_9	C_{10}	W
C_9	1.0000	1.5619	0.6097
C_{10}	0.6402	1.0000	0.3903
The second order matrix, C.R. stands consistency check			

3.3. **Total ordering.** According to single hierarchical arrangement results of criterion layer and index layer, multiply the corresponding weight coefficient to get the total ordering results of each index against the target layer:

$$[0.2956, 0.0963, 0.0732, 0.1496, 0.0675, 0.0305, 0.1578, 0.0401, 0.0582, 0.0312]$$

4. The Empirical Research on Listed Tourism Companies Growth with Fuzzy Comprehensive Evaluation Model.

4.1. **Fuzzy comprehensive evaluation model.** Factors influencing the growth of listed tourism companies are of strong complexity and uncertainty. Therefore, the paper resorts to fuzzy comprehensive evaluation model to research the growth of listed tourism companies, making research results more scientific and reasonable.

Fuzzy comprehensive evaluation method has been widely applied in the researches. During the course of making the evaluation, some kind of question is often encountered, which is that each influencing factor should be assessed because of an evaluation determined by various factors; and all factors should be taken into consideration to make a comprehensive evaluation on the basis of the individual evaluation on each factor, a problem of comprehensive evaluation.

Fuzzy comprehensive evaluation model is a kind of model which takes into account various factors to make the synthetic decision for some particular purpose under fuzzy circumstances. Firstly, comprehend and analyze the phenomenon to build a scientific and reasonable index system for the evaluation on the phenomenon and to determine the corresponding judgment set. Then, launch first-level comprehensive judgment; avail the weight vector of each factor and proper operator to determine the fuzzy transformation, on the basis of which second-level and multilevel synthetic judgments are conducted. Next, according to the maximum membership principle, we get the final results after carrying out normalization processing for judgment results of the last layer.

4.2. **Establishment of fuzzy evaluation matrix.** Considering the established growth evaluation index system of listed tourism companies, we suppose U as factor set, V as judgment set:

U = {main business growth ratio C_1, net profit growth ratio C_2, total assets growth ratio C_3, earnings per share C_4, price earnings ratio C_5, net assets value per share C_6, return on equity C_7, return on total assets C_8, total debt ratio C_9, liquidity ratio C_{10}}

V = {high, relatively high, general, low}

The paper selects three samples of listed tourism companies: "Mount Emei A (000888)", "Lijiang Tourism (002033)", and "Xi'an Tourism (000610)". Growth research on financial conditions of first three quarters in 2014 (up to September 30, 2014) is carried out. Within the report period, the growth financial indexes of three samples are as follows (data source: the stock market of Sina Finance) [16-18]:

Mount Emei A (000888):

$C_{11} = 22.91\%$, $C_{12} = 27.82\%$, $C_{13} = 57.66\%$, $C_{14} = 0.54$, $C_{15} = 34.20$, $C_{16} = 6.51$, $C_{17} = 8.24\%$, $C_{18} = 6.61\%$, $C_{19} = 17.27\%$, $C_{110} = 1.84$

Lijiang Tourism (002033):

$C_{21} = 7.25\%$, $C_{22} = 16.18\%$, $C_{23} = 42.18\%$, $C_{24} = 0.59$, $C_{25} = 23.99$, $C_{26} = 6.68$, $C_{27} = 8.64\%$, $C_{28} = 8.71\%$, $C_{29} = 19.45\%$, $C_{210} = 8.79$

Xi'an Tourism (000610):

$C_{31} = -0.74\%$, $C_{32} = -11.70\%$, $C_{33} = -4.19\%$, $C_{34} = -0.06$, $C_{35} = 216.79$, $C_{36} = 2.26$, $C_{37} = -2.69\%$, $C_{38} = -1.97\%$, $C_{39} = 27.41\%$, $C_{310} = 1.21$

According to the judgment set and financial indexes, the paper respectively constructs expert judgment tables for the three listed tourism companies. Then the tables are given to experts to make judgments. Fuzzy evaluation matrixes are built as follows based on statistics of expert judgment tables:

$$R_1 = \begin{bmatrix} 0.64 & 0.18 & 0.18 & 0 \\ 0.36 & 0.64 & 0 & 0 \\ 0.82 & 0.09 & 0.09 & 0 \\ 0.46 & 0.36 & 0.09 & 0.09 \\ 0.36 & 0.36 & 0.28 & 0 \\ 0.55 & 0.18 & 0.27 & 0 \\ 0.28 & 0.36 & 0.36 & 0 \\ 0.18 & 0.45 & 0.18 & 0.18 \\ 0 & 0.09 & 0.82 & 0.09 \\ 0.46 & 0.27 & 0.27 & 0 \end{bmatrix} \quad R_2 = \begin{bmatrix} 0 & 0.18 & 0.45 & 0.37 \\ 0.09 & 0.27 & 0.64 & 0 \\ 0.55 & 0.18 & 0.18 & 0.09 \\ 0.55 & 0.27 & 0.18 & 0 \\ 0.09 & 0.55 & 0.27 & 0.09 \\ 0.64 & 0.09 & 0.27 & 0 \\ 0.36 & 0.28 & 0.36 & 0 \\ 0.45 & 0.18 & 0.27 & 0.10 \\ 0 & 0 & 0.91 & 0.09 \\ 0 & 0.09 & 0.09 & 0.82 \end{bmatrix}$$

$$R_3 = \begin{bmatrix} 0 & 0 & 0.27 & 0.73 \\ 0 & 0.09 & 0.09 & 0.82 \\ 0 & 0 & 0.18 & 0.82 \\ 0 & 0 & 0 & 1 \\ 0.91 & 0 & 0 & 0.09 \\ 0.09 & 0 & 0.36 & 0.55 \\ 0 & 0 & 0 & 1 \\ 0 & 0 & 0 & 1 \\ 0 & 0.09 & 0.73 & 0.18 \\ 0 & 0.09 & 0.82 & 0.09 \end{bmatrix}$$

Taking Mount Emei A (000888) as an example as shown in the fuzzy judgment matrix R_1, as for the index C_1 of the listed tourism company, we can see that 64% of the experts argue that the index reflects a "high" growth of the company; 18% of the experts argue that the index reflects a "relatively high" growth of the company, 18% of the experts "general" while 0% of the experts "low". The rest can be done in the same manner to get the evaluation vector of C_2, C_3, C_4, ..., C_{10}.

4.3. **Calculation of fuzzy comprehensive evaluation model for listed tourism companies growth.** Use total ordering results by Analytic Hierarchy Process as the weight value of each factor.

$$A = [0.2956, 0.0963, 0.0732, 0.1496, 0.0675, 0.0305, 0.1578, 0.0401, 0.0582, 0.0312]$$

Fuzzy comprehensive evaluation model can be determined by matrix R and matrix A. Through calculations, the comprehensive evaluation model is

$S_1 = A * R_1 = (0.4596, 0.2937, 0.2207, 0.0260)$

$S_2 = A * R_2 = (0.2317, 0.2269, 0.3846, 0.1568)$

$S_3 = A * R_3 = (0.0642, 0.0167, 0.1807, 0.7384)$

According to membership principle, growth evaluations of three listed tourism companies are as follows:

Growth of Mount Emei A (000888) is "high" during the first three quarters in 2014 (up to September 30, 2014) (maximum = 0.4596).

Growth of Lijiang Tourism (002033) is "general" during the first three quarters in 2014 (up to September 30, 2014) (maximum = 0.3846).

Growth of Xi'an Tourism (000610) is "low" during the first three quarters in 2014 (up to September 30, 2014) (maximum = 0.7384).

5. **Conclusion.** Based on financial index system of growth evaluation for listed tourism companies, the paper uses Analytic Hierarchy Process to determine the index weights and adopts fuzzy comprehensive evaluation model to conduct researches on listed tourism company growth. The analysis process is simple and feasible; research results are realistic. With the soaring development of tourism, growth researches on listed tourism companies are surely to be gradually perfected and evaluation methods will be more systematic and diverse.

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