Evaluating the Operation Performance of International Tourist Hotel in Taiwan by Data Envelopment Analysis

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Abstract: - This study evaluates operation performances of 67 international tourist hotels in Taiwan by using the Context-dependent DEA model of Date Envelopment Analysis (DEA) in order to find out the performance of these hotels and their competitive advantages. This study differentiates the levels of efficient frontier with the efficiency of each international tourist hotel. Based on the efficiency, the relative attractiveness and relative progress can be computed and classified. They help to objectively evaluate the operation performances of international tourist hotels and find out both rivals and potential rivals, and then progressively adjust the term from short to long for the improvement of operation performance. The result shows the best distribution of each level’s efficient frontier attractiveness: Level one with seventeen hotels; Level two with eleven; Level three with nineteen; Level four with fourteen; Level five with five; Level six with one.

Key-words: - International Tourist Hotel, Data Envelopment Analysis (DEA), Context-dependent DEA

1 Introduction

According to the United Nations World Tourism Organization [23], tourism was a star industry of 21th century. World Tourism Barometer also shows that the growth rate of tourist in Asia-Pacific had reached 14%, which was higher than continents. The growth rate of international tourists, who visiting Taiwan in the first half year of 2010 was 29%. Taiwan government has started several persistent tourism policy such as Doubling Tourist Arrivals Plan from 2002 to 2007; Tour Taiwan Years from 2008 to 2009; Project Vanguard for Excellence in Tourism from 2009 to 2012, and the promotion of economic growth is obvious in order to catch tourists; eyes. Tourism is localized and doesn't offshore that has a significant impact on national economic development. According to the statistics from the Executive Yuan, the number of international tourists visiting Taiwan reached 6.087 million in 2011, a 9.34 percent increase from the previous year; 5.567 million in 2010, a 26.67 percent increased; 4.395 million in 2009, a 14 percent increased. Growth rate in the past few years was the best of the main countries in Asia-Pacific. Tourism is a compound industry that includes natural resources, cultural heritages, transportations, hotels, catering, leisure activities, humanity arts and tourism publicity that creates job openings and foreign earnings. Such services as international tourist hotel play an important role in the development of tourism. For the characteristic of international tourist hotels such as twenty four hour service, unable to store, and can't be moved, hotel is also a capital intensive industry which has a relatively high fixed cost. Both profit seeking and non-profit enterprise aim for low cost and high margin in a short period. As mentioned, the market of tourism has become competitive, and how to measure the operation performances of international tourist hotels should be paid attention to. Here are the purposes of the study:

1. Measure the operation performances of international tourist hotels in Taiwan.
2. Create benchmark analysis for the whole international tourist hotels.
3. Distinguish international tourist hotels into performance levels according to relative efficiency.
4. Find out similar learners and potential rivals by comparing each hotel and the difference of performance between each level.
2 Literatures

2.1 The Definition of International Tourist Hotels in Taiwan

In order to statute for the development of tourism, there are standards for buildings, facilities of tourist hotels, and regulations for administration of tourist hotel enterprises that hotels can be divided into ordinary tourist hotel and international tourist hotel in accordance with building, facilities, operation, management and service. Tourist hotel are those which receive domestic and international tourists. There is an evaluation once every three years to give the classification of hotels and rank the quality and grade of their services.

2.2 International Tourist Hotel Industry Production Efficiency

There are four methods to evaluate production efficiency: Regression Analysis by Richmond [16]; Index Number by Fisher (1922) [11] and Tornqvist [21,22]; Stochastic Frontier Approach, SFA by Aigner et al [1]. (1977), and Data Development Analysis, DEA) by Charnes et al. [5] were used in this study. As we look over the literature at home and abroad, most of them used DEA, for example: Wang and Shang [24,25,26] to analyse the BCC model year 2000 Taiwan 48 international tourist hotels, Chiang [6] to analyse the BCC model year 2000 Taipei 25 international tourist hotels, Barros [4] in Portugal in 2001 BCC model analysis a chain guesthouses 42 branches, Wang et al. (2006) 2004 was a four-stage DEA analysis Taipei 54 international tourist hotels, and regulations for administration of tourist hotels, and distinguish these hotels into performance levels according to relative efficiency. Finally, this study finds out the similar learners and potential rivals by relatively inefficient international hotels (DMU) to adjust their strategies in order to improve the efficiency.

3 Methodology

3.1 Data Envelopment Analysis, DEA

Data Envelopment Analysis is based on the efficiency model made by Far in 1957 [10], and was created by Charnes, Cooper and Rhodes in 1978. This is a method that connects Technical Efficiency, (TE) and production frontier to evaluate efficiency. It hypothesizes that makers or industries are constant returns to scare (CRS), which is called CCR mode. It evaluates overall technical efficiency (OTE), and research workers can choose input-oriented or output-oriented to evaluate depends on their demands. Under the CRS hypothesis, both input-oriented and output-oriented leads the same efficiency value, but most of the industries in the reality is not under the CRS condition. Therefore, Banker [3], Charnes and Cooper (1984) developed (variable returns to scale(VRS), which is called BCC mode. This is a model that factorize overall technical efficiency, OTE into pure technical efficiency, (PTE) and scale efficiency, (SE), which means OTE = PTE×SE. Furthermore, Färe et al. added assumed condition called Non-Increasing Return to Scale, (NIRS), and changed constraint from \( \sum_{j=1}^{n} \lambda_j = 1 \) to \( \sum_{j=1}^{n} \lambda_j \leq 1 \) to resolve the linear programming. Find out the technical efficiency of each decision making unit under NIRS condition and compare with the technical efficiency of variable returns to scale, then the returns to scale of the decision making unit can be figured out.

DEA is non-parametric analysis approach and has the characteristic of unit invariance theorem, but is easily affected by extreme values. According to Golany and Roll [12], number of evaluated units should be twice as much as the sum of input items and output items or the efficiency value of numerous decision making units will be one and cause the problem of hard to identify.

3.2 Context-dependent DEA

Conventional DEA model is hard to identify, so scholars keep developing better models; for instance Anderson and Peterson [2] Super-Efficiency Model,
3.3 Choosing Input Variables

This study chose input items based on literature at home and abroad, industrial characteristics, data reference and the correlation. 

Input variables choosing: The main services of international tourist hotels are accommodation and catering. Hotel industry is labour intensive, requires huge manpower for service and cleaning, so the number of employee will certainly affect labour cost, and labour cost is a big part of operating cost. Number of rooms and space of catering area clearly has the characteristic of fixed inputs, so this study used input-oriented method to evaluate the relative efficiency of each international tourist hotel.

3.3 Pearson correlation coefficient

After deciding input and output variables, Golany and Roll (1989) pointed out that input and output variables should fit isotonicity condition which means when input increases output cannot be reduced, under the DEA analysis. In addition, the number of DMU should be twice as much as the sum of input items and output items. According to Coelli et al. [7], if the increasing (reducing) of input cause the reducing (increasing) of output, the efficiency evaluation of DEA may have an deviation. Therefore, before the first phase of evaluation, this study checked if the liner relationship of two variables fits the isotonocity condition.

4 Empirical Analysis

4.1 Descriptive Statistics

This study mainly focused on evaluating the operational performance of 67 international tourist hotels in Taiwan during the year of 2011, and 22 of them are in Taipei area, 9 of them are in Kaohsiung area, 5 of them are in Taichung area, 5 of them are in Hualien area, 12 of them are in Scenic area, 7 of them are in Taoyuan, Hsinchu and Mioli area, and 7 of them are in other areas. The average room revenue is 249.13 million NT$, and the hotel with the highest revenue is Grand Hyatt Taipei, while the lowest is Hotel Royal Hsinchu. The average catering revenue is 291.96 million NT$, and the hotel with the revenue is Regent Taipei, while the lowest is Emperor Hotel. The average other revenue is 77.91
million NT$, and the hotel with the highest revenue is Regent Taipei, while the hotel with lowest revenue is Astor Hotel Hualien. The average number of employees is 309.03, and the hotel with the most employees is Sheraton Hotel Taipei, while the fewest is Landis Resort Yangmingshan. The average number of rooms is 292.82, and the hotel with the most rooms is Grand Hyatt Taipei, while the fewest is Landis Resort Yangmingshan. The average floor space of catering area is 4062.09 m², and the hotel with the biggest area is Grand Hyatt Taipei, while the smallest is Landis Resort Yangmingshan. The average operating cost is 276.85 million NT$, and the hotel with the highest cost is Grand Hyatt Taipei, while the lowest is Emperor Hotel. Chart 2 shows that positive correlation exists between input and output variables which means input and output increase at the same time, and shows that variable data fit the constant returns to scale condition.

4.2 Analysis of Relative Attractiveness and Relative Progress

According to the model, relative attractiveness of each level are greater than one, and the higher relative progress is the bigger advantage it is. On the other hand, relative progress is greater than one, and the higher relative attractiveness is the smaller advantage it is. In order to improve efficiency, input and output sources should be adjusted. As for different areas, ten of the hotels in level one are in Taipei (DMU1.2.3.4.5.6.8.11.17.25), five in scenic area(DMU41.42.43.45.50), one in Taoyuan, Hsinchu and Mioli area(DMU55) and one in other area(DMU66). Moreover, four of the hotels in level two are in Taipei (DMU10.12.13.21), one in Kaohsiung (DMU23), one in Taichung (DMU32), one in Hualien (DMU40), one in scenic area (DMU44), one in Taoyuan, Hsinchu and Mioli area (DMU52), and two in other area (DMU60.64). Four of the hotels in level three are in Taipei (DMU7.9.14.22), one in Kaohsiung (DMU25.28.30), two in Taichung (DMU31.33), one in Hualien (DMU36), one in scenic area (DMU46), five in Taoyuan, Hsinchu and Mioli area (53.54.56.57.58), and three in other area (DMU59.63.67). Three of the hotels in level four are in Taipei (DMU15.16.18), four in Kaohsiung (DMU24.26.27.29), two in Taichung (34.35), two in scenic area (DMU47.49), and three in other area (61.62.65). What is more, that one of the hotels in level five is in Taipei (DMU19), two in Hualien(DMU37.38), and two in scenic area (48.51).

This study is divided into five levels, and the relative attractiveness of level one is higher than the other levels. Ambassador-Taipei is ranked first in level one while The Westin Taipei is ranked second and Hotel Royal Chiao Hsi is ranked third. The relative efficiency of Ambassador-Taipei is twice as much as The Westin Taipei, and it shows that Ambassador-Taipei has an advantage of dynamic competition.

5 Conclusion and Advice

5.1 Conclusion

International tourist hotels play an important role in tourism. Service quality and operation performance effects the international imagination of Taiwan. This study adopted input-oriented method and creates five performance levels with radial efficiency measure mode, in order to help people in the business to understand their position and competitive environment. Finally, in order improve the tourism imagination, strategy adjustment is needed. About the efficiency of the 67 hotels, level one accounts for 25.3%, level two for 16.4%, level three for 28.4%, level four for 20.9%, level five for 7.5%, and level six for 1.5%. The Levels could be looked up to level one by cutting down the cost and increasing the income aggressively. With regard to areas, 22 hotels in Taipei, 10 of them in level one; 4 in level two, 4 in level three, 3 in level four and only 1 in level five. The result shows that relative performance of Taipei area is better than Kaohsiung, Taichung, Hualien, Taoyuan, Hsinchu and Mioli, and the other areas. It might because of that Taipei have a relatively big market. At level one which has the best efficiency, hotels in Taipei area accounts for 58.8, scenic area accounts for 29.4%. The result shows the regional advantage of Taipei, and better operation performance compare to other area. And scenic area is second after Taipei area. As mentioned Taipei, it is the capital city of Taiwan, also the pivot of business traveling, so it has advantages against other metropolitan areas. On the other hand, scenic area has advantage on natural source, but the huge difference between low season and high season and the difference of target customers makes the performance of each hotel is very big.

5.2 The Limitation

This study adopted context-dependent DEA mode to evaluate relative efficiency, but not asked the experts of international tourist hotel industry. This study also set up the relative weight of input and
output variables, therefore, the followed studies could include expert's prior information into evaluated. As for external factors such as management model, ratio of consumer's nationality, and location, these factors should also be considered in order to press close to the reality of the market to reflect how the change of market effect efficiency of hotels.

References: