

# 國立交通大學

國立交通大學管理學院碩士在職專班

經營管理組

碩士論文

影響台灣地區國際觀光旅館成本效率之因素：資料包  
絡分析法之應用

Factors of Cost Efficiency of International Tourist  
Hotels in Taiwan : An Application of Data Envelopment  
Analysis

研究生：廖振舟

指導教授：胡均立 教授

中華民國九十九年六月

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## 中文摘要

本論文在分析台灣國際觀光旅館(ITH)的旅客國籍來源與成本效率的關係。在民國 85 至 96 年期間，華僑旅客的數量對與成本效率有負向關係，本國旅客，北美旅客和日本旅客對成本效率有正向關係。至今亞洲旅客（包含大陸觀光客），歐洲旅客和澳洲旅客，則對成本效率沒有顯著關係。同時，台灣國際觀光旅館加入連鎖體系，距離最近國際機場較近，會改善成本效率。

此外，本論文將台灣國際飯店所在位置區分為台北，高雄，台中，花蓮和風景區。發現台北和風景區的國際飯店其成本效率較佳，高雄的國際飯店成本效率較差。台中和花蓮的國際飯店則對成本效率沒有顯著關係。

關鍵詞：旅客國籍來源，成本效率，國際觀光旅館。

# **Factors of Cost Efficiency of International Tourist Hotels in Taiwan : An Application of Data Envelopment Analysis**

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## **ABSTRACT**

This paper analyzes the effects of nationality sources on cost efficiency of international tourist hotels (ITHs) in Taiwan. From 1996 to 2007, the numbers of overseas Chinese tourists have significantly negative effects on cost efficiency, while the numbers of native, North American and Japanese tourist have significantly positive effects on cost efficiency. The number of other Asian tourists (including mainland Chinese tourists), European and Australian tourists has no significant effect on cost efficiency. Meanwhile, the chain system and shorter distance to the nearest international airport significantly improve cost efficiencies.

Moreover, this study labels the location of the hotel for Taipei, Kaohsiung, Taichung, Hualien and scenic area and discovers hotels located in Taipei and scenic area are good for cost efficiency; hotels in Kaohsiung are poor to cost efficiency. Taichung and Hualien hotels have no concern to cost efficiency.

Keywords: Nationality sources, Cost efficiency, International tourist hotels.

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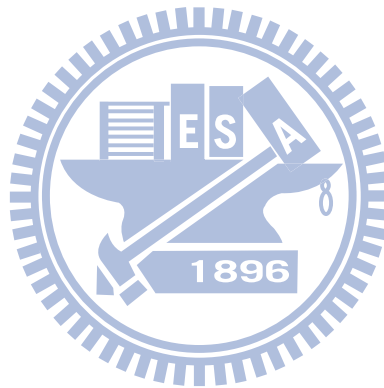
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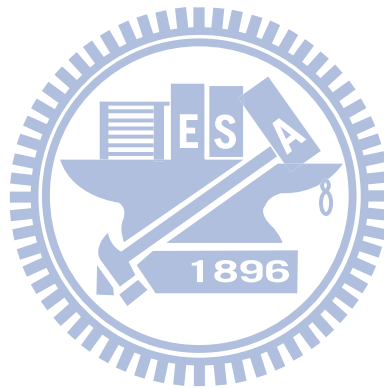
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## 1. Introduction

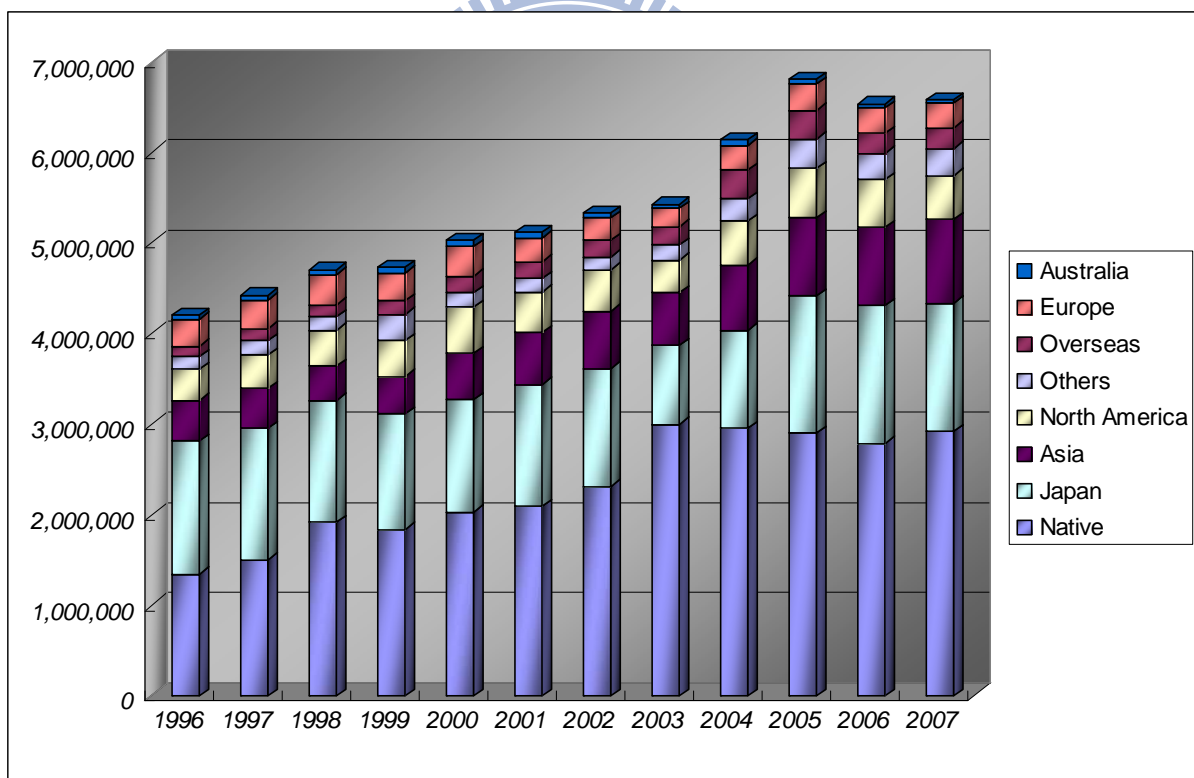
Tourists' consumption is the main revenue stream of international tourist hotels (ITHs) and the amount of them usually affects the operations of these hotels. However, tourists' nationalities also result in different operational performances. According to the report of Tourism 2020 Vision (United National World Tourism Organization (UNWTO), 2009), the global tourism market will grow from 1.006 billion in 2010 to 1.561 billion person-time in 2020, and tourism-related revenue will hit US\$2 trillion. The Asia-Pacific market is forecast of grow from 195 million in 2010 to 397 million person-visits in 2020. In Taiwan, overall tourism revenues have increased steadily. Foreign exchange income from tourism went from NT\$158.5 billion in 2002 to NT\$187.1 billion in 2008, but since 2002 Taiwan's tourism industry has remained at NT\$200 billion. Taiwan is at the phase of maturity and growth appears limited. Therefore, developing international tourism and earning foreign exchange are important ways to enhance overall tourism income in Taiwan. At present, tourism has become the main source for many countries to earn foreign exchange and is important in the global economic development, but it is a complex industry. With the change of demands within Taiwan's tourism market, international tourist hotels have become one of its key and necessary factors.

According to the statistics of the Tourism Bureau in Taiwan, from January to November 2009 the person-time amount for visitors in Taiwan reached 3,945,198, which is 12.94% higher than the same period of the previous last year. The number of tourist visitors to Taiwan grew by 28.46%, hitting 2,031,637 person-time, which set a historical record, and accounted for 51% of the visitors to Taiwan. Most of the foreign visitors are from Asian countries, like Mainland China, Japan, Hong Kong, and Macao. Indeed, the top five sources of foreign tourists are Hong Kong & Macao, Japan, Southeast Asia, the U.S., and Singapore. With most business travelers from Japan, Southeast Asia, the U.S., Mainland China, and Hong Kong & Macao. To date, Taiwan has a total of 95 hotels, of which 65 are international tourist hotels and 34 are general tourist hotels. The occupancy rates of international tourist hotels in August 2009 were as follows: 71.66% in Taipei, 63.21% in Kaohsiung, 61.58% in Taichung, 66.16% in Hualien, and 51.59% in other areas. Therefore, international tourist hotels play critical roles in the domestic tourism and hotel industry (Tourism Bureau, 2009). However, our study is limited by the panel data's latest public year which is 2007, whereas China tourists are not separated until 2007's report.

In 2008, visitors' average consumption during their stay in Taiwan was US\$1,544, and



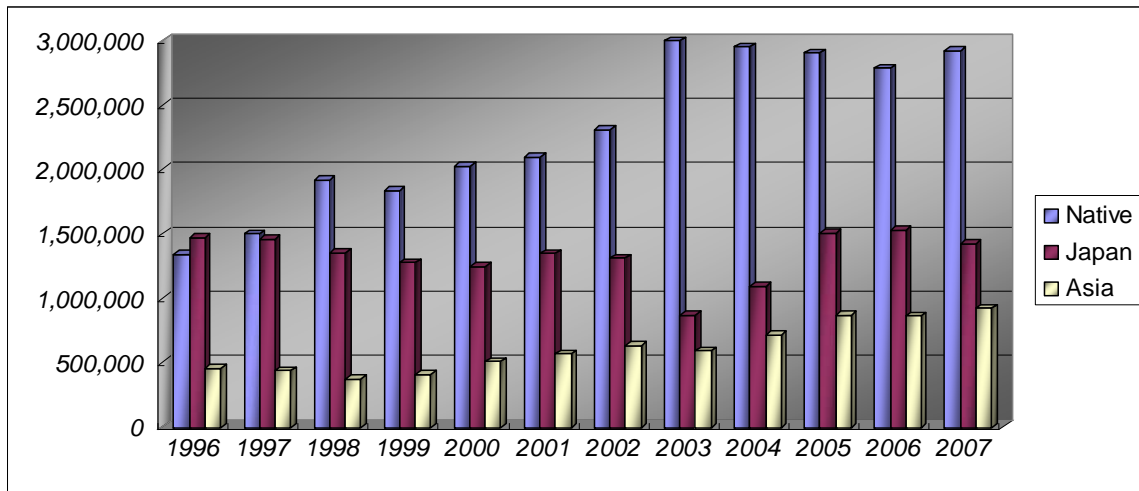
their average daily consumption was US\$211.46, of which the expenditure on hotels accounted for the most (44.74%), followed by shopping (23.02%) (Tourism Bureau, 2008). This indicates that international tourist hotels are the most significant beneficiaries from tourism industry development. However, in a severely competitive environment, the hotel industry is encountering new impacts and challenges. Hotels should urgently enhance service quality and operational performance, construct unique images, strengthen service standards, and demonstrate their characteristics, styles, and multiple functions in order to satisfy the demands of customers from different backgrounds. Operational performance is closely associated with the sustainable development of hotels, and influences related industries. When facing industrial competition, hotels not only should effectively control costs for profits and growth, but also properly improve operational effectiveness. Therefore, how to enhance productivity and effectively use resources to achieve maximum efficiency is an important issue for hotel managers.



**Figure 1.** Numbers of Tourists by Nationality (Hotel check-in numbers)  
 Data sources: Operating Report of International Tourist Hotels in Taiwan (1996~2007)

Figure 2 is another form of the bar chart to understand the trend of the major 3 tourists' nations. Taiwan and Japan tourists account for 70% from the overall. We know Asian tourist which contains China tourist is ramping up rapidly since 2008 but during the period in

this study. During the 1996~2007, the Chinese tourists are included in the Asia area.



**Figure 2.** Numbers of Tourists by Top 3 Nationality (Hotel check-in numbers)

Data sources: Operating Report of International Tourist Hotels in Taiwan (1996~2007)

## 2. Literature review

The World Travel and Tourism Council (WTTC, 2007) indicated that the global tourism industry scale in 2000 was about 10.8% (US\$3.58 trillion) of global GDP. It is estimated that by 2010, the global tourism industry scale will reach 11.6% (US\$6.59 trillion) of global GDP. In 2000, there were 0.19 billion people working in the tourism industry around the world, and it is estimated to be 0.25 billion people by 2010. The tourism industry is important to both the job market and economic growth.

Past research studies on the evaluation of tourist hotels performances were mostly based on financial ratio analysis. Greenberg (1986) employed cost-volume analysis to probe the influence of capital in hotels and the change of sales on business revenues. Anderson et al. (1999b) analyzed the operational efficiency of 48 tourist hotels in the U.S. in 1994 by Stochastic Frontiers Analysis (SFA). The input variables included the number of employees, the number of rooms, casino and entertainment expenditures, and food expenditure and other expenditure, while the output variables included income of rooms, income of casino and entertainment, and income of food and others. The results showed that the average efficiency of 48 tourist hotels was up to 89.4%. Anderson et al. (1999) studied the operational efficiency of 48 tourist hotels in the U.S. by Data Envelopment Analysis (DEA).

The input variables included the number of full-time employees, the number of rooms, casino-related operation expenditure, and food expenditure and other expenditure, while the output variables included total revenue. They found that the average efficiency of 48 hotels was 42%. In other words, in order to maintain efficient output, 58% of expenditure can be decreased.

Tsaur (2001) investigated 53 international tourist hotels in Taiwan in 1996-1998 by DEA and found that the average efficiency of these hotels was 87.33%. Hwang and Chang (2003) analyzed the efficiency of international tourist hotels in Taiwan and the change of efficiency in 1994-1998 by DEA. Their analysis was based on relative efficiency in 1998 and change of efficiency in 1994-1999 for 45 international tourist hotels. The study on the operational efficiency and progress of international tourist hotels found that the operational efficiency of international tourist hotels in Taiwan was significantly different according to types of market, customer source, and managerial models. Barros (2004) studied the operational performance of tourist hotels in Portugal and analyzed 43 tourist hotels in 2001 by DEA under 7 input variables and 3 output variables. The mean of overall technical efficiency scores was 91% and that of pure technical efficiency scores was 94.5%, indicating that most international tourist hotels in Taiwan are efficient.

Yang and Lu (2006) studied the relative performances of 56 international tourist hotels in Taiwan by DEA and found that the scale returns of most of the hotels were low, mainly due to a severely competitive market. The relative efficiency of international tourist hotels located in scenic areas was higher than those in cities. Moreover, the relative efficiency of international tourist hotels located near international airports was lower than those far from international airports. Through SFA, Chen (2007) probed the operational performance of 55 international tourist hotels in Taiwan in 2002 and included 3 input variables and total business income as the output variable. The results showed that the average efficiency of international tourist hotels was 80%. A comparison on the operational performances of chain and non-chain tourist hotels indicated that the efficiency of chain hotels was higher than ordinary independent international tourist hotels. Hu et al. (2010) simultaneously estimated cost efficiency scores and factor cost inefficiency of 66 international tourist hotels in Taiwan during 1997-2006 by one-stage SFA. They used 3 input variables, 3 output variables, and 5 environmental variables. The empirical results show that the average efficiency of international tourist hotels in Taiwan reached 91.15%. Moreover, chain international tourist

hotels, guides, and distance from international airports showed significant influences on the operational performance of international tourist hotels.

Because of different market positioning, international tourist hotels in Taiwan have different customer sources. The studies on evaluating the performance in the hotel industry use various input and output items. Input items include labor, capital, materials & energy, number of employees, number of rooms, total square measure of food department, and business expenditure, while output items include occupancy rate, food amount, total business income, room income, food income, other income, return on investment before tax, average actual room price received, average employee output of food department, international chain hotels, distance from international airports, and construction of evaluation model on hotel performance (Johnson & Ball, 1989; Hwang & Chang, 2003; Hu et al., 2010). As Table 1 shows, most studies tend to evaluate hotel performance by the financial ratio or operational data, and the findings are inconsistent. Moreover, there is a lack of studies on the number of foreign guests in hotels. Thus, this study aims to focus on the nationalities of guests in international tourist hotels and to probe into the influence of their nationalities on the overall technical and cost efficiency of international tourist hotels in Taiwan. This study also evaluates the operational efficiency of international tourist hotels by DEA, which analyzes issues upon multiple inputs and output efficiency in order to explore the relatively inefficient hotels and to serve as a reference for international tourist hotels.

**Table 1.** Literature of the hotel frontier efficiency

<b>Authors</b>	<b>Method</b>	<b>Units</b>	<b>Inputs</b>	<b>Outputs</b>
Anderson et al. (1999)	SFA	48 US hotels, 1994	The number of full-time equivalent employees; the number of rooms; total food and beverage expenses; total gaming-related expenses; other expenses.	Total revenue
Anderson et al. (2000)	DEA	48 US hotels, 1994	The number of full-time equivalent employees; the number of rooms; total food and beverage expenses; total gaming-related expenses; total hotel expenses; other expenses.	Total revenue
Tsaur (2001)	DEA	53 Taiwan hotels, 1996–1998	Total operating expenses; number of employees; number of guest rooms;	Total operating revenues; number of rooms occupied; average daily

			total floor space of the catering division; number of employees in room division; number of employees in catering division; catering cost.	rate; average production value per employee in the catering division; total operating revenues of the room division; total operating revenues of the catering division
Hwang and Chang (2002)	DEA	45 Taiwan, hotels, 1998	number of employees; number of guest rooms; total floor space of the catering division; operational costs.	Room revenue; food and beverages revenue; other revenues
Hwang and Chang (2003)	DEA	45 Taiwan hotels, 1994–1998	Number of full-time employees; guest rooms; total area of meal department; operating expenses.	Room revenue; food and beverages revenue; other revenues
Barros (2004)	DEA	43 Pousada, hotels, 2001	Full-time workers; cost of labor; rooms; surface area of the hotel; book value of property; operational costs; external costs.	Sales; number of guests; nights spent.
Yang and Lu (2006)	DEA	56 Taiwan, hotels, 2002	Total operating expenses; number of employees; number of guest rooms; total area of catering division.	Total operating revenues; average occupancy rate; average room rate; average production; value per employee in the catering division; average production value of catering division.
Chen (2007)	SFA	55 Taiwan, hotels, 2002	cost of labor; total food and beverage expenses; materials costs	Total revenue.
Hu et al. (2009)	DEA	66 Taiwan, hotels, 1997~2006	number of employees; number of guest rooms; total floor space of the catering division.	Room revenue; food and beverages revenue; other revenues
Hu et al. (2010)	SFA	66 Taiwan, hotels, 1997~2006	number of employees; number of guest rooms; total floor space of the catering division.	Room revenue; food and beverages revenue; other revenues

### 3. Methodology and Data

#### 3.1 DEA-CCR Model and Input-oriented CCR Cost Efficiency Model

Data envelopment analysis (DEA) is a linear programming methodology to measure the efficiency of multiple decision-making units (DMUs) using multiple inputs and outputs. This methodology constructs the frontier in the same period. This paper defines the DMU as an international tourist hotel.

We choose to use the input-oriented method among DEA's various models. A more commonly spoken language is described as follows: "By how much can input quantities be proportionally reduced without changing the output quantities produced?"

Assume that there are K inputs, L inputs price, and M outputs for each DMU ( $\times N$ ). The following is the linear program for DEA-CCR Mode:

$$\begin{aligned}
 & \text{Min}_{\theta, \lambda} \quad \theta \\
 & \text{s.t.} \quad -q_i + Q\lambda \geq 0 \\
 & \quad \quad \theta x_i - X\lambda \geq 0 \\
 & \quad \quad \lambda \geq 0
 \end{aligned} \tag{1}$$

Following is the liner program for Input-oriented CCR Cost Efficiency Model:

$$\begin{aligned}
 & \text{Min}_{\lambda, x_i^*} \quad w_i x_i^* \\
 & \text{s.t.} \quad -q_i + Q\lambda \geq 0 \\
 & \quad \quad x_i^* - X\lambda \geq 0 \\
 & \quad \quad \lambda \geq 0
 \end{aligned} \tag{2}$$

where  $q_i$  is a  $M \times 1$  vector of output for the  $i$ -th DMU and  $x_i$  is a  $K \times 1$  vector of input for the  $i$ -th DMU;  $Q$  is a  $M \times N$  output matrix; and  $X$  is a  $K \times N$  input matrix;  $\lambda$  is a  $N \times 1$  vector of constants representing the weight of each DMU;  $w_i$  is a vector of input prices for the  $i$ -th DMU and  $x_i^*$  is the cost- minimizing vector of input quantities for the  $i$ -th DMU, given that the input prices  $w_i$  and the output levels  $q_i$ . The cost efficiency (CE) of the  $i$ -th DMU can be calculated from:

$$\text{CE} = w_i' x_i^* / w_i' x_i \tag{3}$$

The value of CE is between zero and one. Here,  $\text{CE}=1$  presents that the firm is the cost

efficient DMU.

### 3.2 Tobit analysis

Some environmental variables may affect the DMUs' efficiency. Therefore, whether these environment variables will actually have influence on the efficiency among the DMUs plays a very important role on this study.

Tobit censored regression analysis is related a good tool to investigate whether these environment variables: Natives, overseas Chinese, North America, Japan, Asia, European and Australia tourists have an effect on the efficiency scores. We can express the equation as following:

$$\begin{aligned} \text{Ineff}_i &= \alpha + Z_i\beta + u_i && \text{if } \alpha + Z_i\beta + u_i > 0 \\ &= 0 && \text{if } \alpha + Z_i\beta + u_i \leq 0 \end{aligned} \quad (4)$$

$i=1,2,\dots,N$

where N is the number of DMUs;  $\text{Ineff}_i$  presents cost inefficiency scores in this study;  $Z_i$  is the vector of dependent variables as called environment variables;  $\beta$  is a vector of unknown parameters that we want to estimate; and  $u_i$  is the error term following a normal distribution with zero mean and constant variance.

### 3.3 Data Sources and Variable Definitions

This study uses unbalanced panel data from the period 1996 to 2007. We collect all tourism variables from the annual Operating Report of International Tourist Hotels in Taiwan published by the Taiwan Tourism Bureau. We choose all the international tourist hotels with complete data in the report for each year. The numbers of observations from 1996 to 2007 are as follows: 1996 (49 DMUs), 1997 (51 DMUs), 1998 (52 DMUs), 1999 (54 DMUs), 2000 (54 DMUs), 2001 (54 DMUs), 2002 (55 DMUs), 2003 (57 DMUs), 2004 (57 DMUs), 2005 (56 DMUs), 2006 (57 DMUs), and 2007 (56 DMUs), making 652 observations in total.

#### Output variables:

- Total revenues of food and beverages ( $y_1$ ), including incomes from sale of food, snacks, alcohol, beverages in dining room, coffee room, banquet, and night club (tips are not included), measured in units of thousand NT\$ dollars.
- Total revenues of rooms ( $y_2$ ), including incomes from lease of rooms (tips are not included), measured in units of thousand NT\$ dollars.

- Other revenues ( $y_3$ ), including incomes other than the two items mentioned above. They include operating revenues from lease of store spaces, laundry, swimming pool, ball courts, barber-shop, beauty salons and bookstores, measured in units of thousand NT\$ dollars.

**Inputs variables:**

- Number of guest rooms ( $x_1$ ), including the amount of guest rooms that can be provided for tourists by an international tourist hotel. Accordingly, the unit of measurement is simply "rooms", without subsequent adjustment being made for size or quality.

- Number of employees ( $x_2$ ), including total employees who are involved in the operation of international tourist hotels, including medium- and high-ranking executives, guest room and catering staff, cooks, maintenance crews, and repairmen.

- Total floor space of catering division ( $x_3$ ), including the total floor space used by the operational units of all hotels' catering facilities, measured in square feet.

**Input prices:**

- Average price of room operations ( $w_1$ ), referring to the total operating expenses per room, measured in NT\$ dollars/room. We use the total revenue of a hotel divided by the number of rooms.

- Average employee annual wage ( $w_2$ ), referring to the salary and related expenses per employee, measured in NT\$ dollars/individual.

- Average price of F&B (food and beverages) operations ( $w_3$ ), referring to the catering department expenses per square meter of floor space, measured in NT\$ dollars/square meter.

**Environmental variables:**

- Check-in number of Tourists by nationally: The numbers of native, overseas Chinese, North American, Japanese, Asian, European and Australian tourists.

- Hotel locations: Hotels located in Taipei, Kaohsiung, Tai-Chung, Hua-lien and scenic.

- Chain: "0" represents independent managements and "1" represents the hotels joining an international chain type

- Distance to airport: "0" represent the distance between hotels to the nearest Taiwan international airport being less than 70km and "1" means farther than 70km

- Year: 1996 is year 1 and 1997 is year 2, and so on.

The nominal variables have been transformed into real variables in 2001 prices, using the he



GDP deflators. The unit of outputs and inputs price is NT dollar. Descriptive statistics of the variables are summarized in Table 2.

**Table 2.** Descriptive statistics of outputs, inputs, and input prices (Units = NT\$)

<b>Variable</b>	<b>Mean</b>	<b>Standard Deviation</b>	<b>Minimum</b>	<b>Maximum</b>
<b>Outputs</b>				
Total revenues of food and beverages ( $y_1$ )	268,211,000	274,056,000	4,947,276	1,317,330,000
Total revenues of rooms ( $y_2$ )	223,630,000	205,686,000	7,044,733	1,389,700,000
Other revenues ( $y_3$ )	95,046,800	129,901,000	0	702,396,000
<b>Inputs</b>				
Number of guest rooms ( $x_1$ )	73,066	45,100	3,910	259,857
Number of employees ( $x_2$ )	348	246	32	1,266
Total floor space of catering division ( $x_3$ )	1,205	1,311	48	12,037
<b>Input Prices</b>				
Average price of room operations ( $w_1$ )	2,852	1,200	816	8,908
Average employee annual wage ( $w_2$ )	490,032	145,573	82,715	903,692
Average price of F&B operations ( $w_3$ )	101,301	95,785	2,276	1,887,736

## 4. Empirical Result and Discussion

### 4.1 Descriptive Statistics

Table 2 provides descriptive statistics for all variables in the model. The average value of the total revenues of food and beverages ( $y_1$ ) is NT\$268,211,000, total revenues of room revenue ( $y_2$ ) are NT\$223,630,000 and other revenues ( $y_3$ ) are NT\$95,046,800 during the past ten years 1996-2007. Standard deviations of outputs are quite large due to different sizes of these international tourist hotels.

### 4.2 Cost Efficiencies

By using the Deap 2.1 software kindly provided by Professor Tim Coelli, we compute the cost efficiency scores of each DMU from 1996 to 2007. Figure 3 is the trend chart from the average value of each year.

From the operating report, we find some hotels were closed and some hotels were opened in some years or during some time periods. For example, DMU 33 located in Tai-Chung,

which has no data after 2004 and its technical efficiency and cost efficiency are the poorest among all DMUs. The total slack to this hotel in 1996 is: guest rooms could be reduced from 18,193 to 4,593 for a 74.8% reduction, employees could be reduced from 90 to 25 for a 72% reduction, and total floor space of the catering division could be reduced from 140 to 26 for a 81.2% reduction. Nevertheless, we suggest managers to not just use these numbers as their simple strategy but to conduct a deeper study on how to improve the efficiency.

Complete cost efficiency, overall technical efficiency and allocation efficiency scores tables (total 12 tables per year) during 1996 ~ 2007 are in Appendix 1. Also refer Appendix 4 for the plot and formula how to get OTE, TE and AE. In this study, we find out the top 10 best cost efficiency Taiwan hotels each year, record their scores and label them in top 10 ranking numbers. See Appendix 2 for the complete table and see Table 3 for the brief one. 7 of 10 are located in Taipei (DMU#2, 19, 21, 22, 23, 24 and 25). 2 of 10 are located in scenic area (DMU#47 and 51) and one is located in Tai-Nan (DMU#53). Table 3 shows, Taiwan hotels in metropolis, especially in Taipei that is Taiwan's capital, play very important role in whole Taiwan ITHs. The Tobit regression analysis also supports this finding.

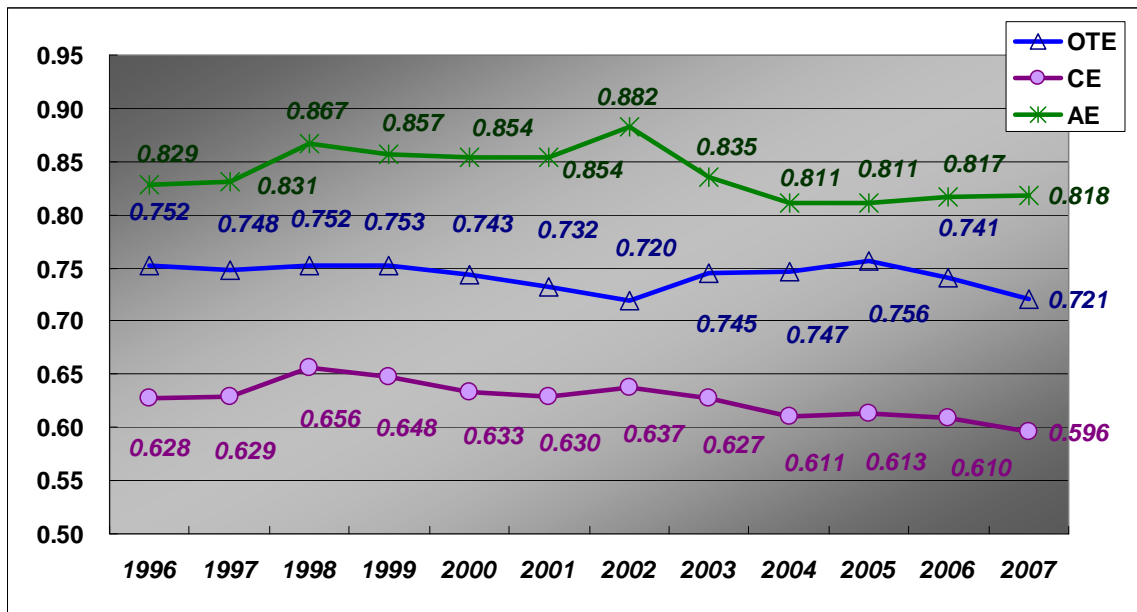
**Table 3.** Top 10 best Cost efficiency Taiwan ITH during 1996 ~ 2007

DMU#	Taiwan ITH Name	CE Ranking
22	Grand Formosa Regent Taipei	1
21	Grand Hyatt Taipei	2
24	Far Eastern Plaza Hotel Taipei	3
23	The Sherwood Hotel Taipei	4
19	Howard Plaza Hotel	5
25	The Westin Hotel (since 1999.10)	6
47	Hotel Royal Chihpen Spa	7
51	The Lalu Sun Moon Lake (since 2002.2)	8
2	The Ambassador Hotel	9
53	Hotel Tainan	10

### 4.3 Trends of Technical, Allocation and Cost Efficiencies

From below trend chart, we found from 2002 to 2005, cost efficiency slowly downgrades. Later, this study will provide more explanation after Tobit regression's findings when we add an environmental variable that is "year" and find the cost efficiency become lower year by year during our study years (1996 ~ 2007). The Japanese tourist numbers significantly fall down in 2003 due to SARS issue while native tourists increased in the same year. Even though, the increase in native tourists also still cannot pull up the ITH cost

efficiency(Also see Figure 2, changes in year 2003).



**Figure 3.** Trends of international Tourist Hotel Efficiency Score in Taiwan (1996-2007)

We convert the cost efficiency into cost inefficiency as  $\text{cost inefficiency} = 1/(\text{cost efficiency}) - 1$ . Table 3 lists the Tobit regression results on cost inefficiency and shows that numbers of natives, North American, Japanese, and Australian tourists will increase cost efficiency of ITHs in Taiwan. The numbers of overseas Chinese and European tourists will decrease cost efficiency. The number of Asian tourists has no significant effects on cost efficiency. Since May 2008, the government in Taiwan has emphasized attracting Mainland Chinese tourists in order to promote international hotels, but there is no significant result so far to support this hypothesis. The chain store system significantly increases the ITHs' cost efficiency. Shorter distances from hotel to the international airport will increase cost efficiency. Moreover, the ITHs' cost efficiency gradually went down from 1996 to 2007.

Note that the numbers of natives and Japanese tourists significantly improved the efficiency. The Japanese tourist numbers significantly fell in 2003 due to SARS. However, native tourists increased in the same year. The increase in native tourists alone still cannot pull up the ITHs' cost efficiency.

Moreover, this study labels the hotels locations for Taipei, Kaohsiung, Taichung, Hualien and scenic and discover hotels in Taipei and scenic are good for cost efficiency; hotels in Kaohsiung are poor to cost efficiency. Taichung and Hualien hotels have no concern to cost efficiency

**Table 4. Results of Tobit Regression on Cost Inefficiency**

Variable	Estimate	t-value	P-value
Constant	1.12233	13.7219 ***	<.001
Native	-2.52E-06	-3.7384 ***	<.001
Overseas	1.73E-05	5.5708 ***	<.001
North America	-1.98E-05	-4.6992 ***	<.001
Japan	-2.16E-06	-2.1313 **	.033
Asia	2.78E-06	1.4183	.156
European	-2.07E-06	-0.2486	.804
Australia	-4.93E-06	-0.1472	.883
Located in Taipei	-0.21996	-2.6235 ***	.009
Located in Kaohsiung	0.294273	3.2555 ***	.001
Located in Tai-Chung	0.012972	0.1070	.915
Located in Hua-Lien	-0.07731	-0.6150	.539
Located in Scenic	-0.37967	-3.8609 ***	<.001
Chain	-0.32433	-6.9334 ***	<.001
Distance to airport	0.264664	2.5681 **	.010
Year	0.011576	1.7779 *	.075

Note: Notations \*\*\*, \*\*, and \* represent significance at the 1%, 5%, and 10% levels.

## 5. Concluding Remarks

The major findings of this paper are as follows: During 1996 to 2007 the numbers of overseas Chinese tourists significantly worsened cost efficiency, while the numbers of native, North American and Japanese tourists have significantly improve cost efficiency. With regard to Asian, European and Australian tourists, there are no relationships with cost efficiencies. The chain system and a shorter distance to the nearest international airport will both improve cost efficiency. The ITHs in Taiwan have becomes more cost-inefficient during 1996 to 2007.

Due to the showdowns and recessions in Taiwan's economic development over the past ten years, cost efficiency has become a major concern for these international tourist hotels to sustain their operations. This study finds significantly positive effects on cost efficiency by increasing tourists from Taiwan, North America, Japan, and Australia. Therefore, the

service design and marketing strategies can be targeted at tourists from these sources in order to promote a Taiwan ITHs' cost efficiency. Moreover, the chain system significantly improves cost efficiency. Small and medium-sized ITHs can hence earn network effects, marketing benefits, joint promotion, quality management, and brand values by joining chain systems.

The 2010 Taipei International Flora Exposition will be held from November 2010 to April 2011. This will definitely attract plenty of Japan tourists to visit Taipei. As for native tourists, more of them will increase ITHs' cost efficiency. This is also necessary for a Taiwan ITHs due to the average of occupancy rate is not always 100%. Joining a worldwide chain system will increase an ITH's exposure to global tourists. Future study may do more accurate analysis on Chinese tourists after new panel data are published with separated China tourist numbers.

Moreover, this study discovers hotels in Taipei and scenic are good for cost efficiency; hotels in Kaohsiung are poor in cost efficiency. Taichung and Hualien hotels have no concern to cost efficiency. Before year 2000, government really puts main resources in North Taiwan (Taipei) and ignores south Taiwan. This paper also supports such a proposition..

The last environmental variable is year. The result tells us a warning message that from 1996 to 2007 the overall cost efficiency gradual decline. This is a serious phenomenon to all Taiwan hotel CEOs and high-level government officers.

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# Appendix 1

## OTE, AE, CE scores during 1996~2007

### Year 1996

ITH Name	DMU#	OTE	AE	CE	ITH Name	DMU#	OTE	AE	CE
The Grand Hotel	1	0.836	0.547	0.458	The Ambassador Hotel Kaohsiung	28	0.644	0.859	0.553
The Ambassador Hotel	2	0.905	0.912	0.825	Han-Hsien international Hotel	29	0.568	0.873	0.496
Mandarina Crown Hotel	3	0.587	0.876	0.514	Grand Hi-Lai Hotel	30	0.908	0.745	0.676
Imperial Taipei	4	0.384	0.813	0.312	Park Hotel	33	0.277	0.920	0.255
Gloria Prince Hotel	5	0.663	0.948	0.628	Hotel National	34	0.621	0.718	0.446
Emperor Hotel	6	1.000	0.560	0.560	Plaza International Hotel	35	1.000	1.000	1.000
Hotel Riverview Taipei	7	0.626	0.731	0.457	Evergreen Laurel Hotel	36	0.752	0.906	0.681
Caesar Park Taipei	8	0.838	0.817	0.685	Howard Plaza Hotel Taichung	37	1.000	0.626	0.626
Golden China Hotel	9	0.683	0.798	0.544	Marshal Hotel	40	0.415	0.868	0.360
Brother Hotel	11	0.882	0.908	0.801	Chinatrust Hotel Hualien	41	0.726	0.736	0.535
Santos Hotel	12	0.635	0.707	0.449	Parkview Hotel	42	0.657	0.835	0.549
The Ritz Landis Hotel	13	0.768	0.912	0.700	Hotel Landis China Yangmingshan	44	0.779	0.815	0.635
United Hotel	14	1.000	0.710	0.710	The Grand Hotel Kaohsiung	45	0.684	0.794	0.543
Sheraton Taipei Hotel	15	0.990	0.843	0.835	Caesar Park Hotel Kending	46	1.000	0.916	0.916
Taipei Fortuna Hotel	16	0.487	0.837	0.408	Hotel Royal Chihpen Spa	47	0.899	0.970	0.872
Holiday Inn Asiaworld Taipei	17	0.887	0.894	0.793	Taoyuan Holiday Hotel	52	0.745	0.599	0.446
Hotel Royal Taipei	18	0.855	0.879	0.752	Hotel Tainan	53	1.000	0.729	0.729
Howard Plaza Hotel	19	1.000	1.000	1.000	Ta Shee Resort Hotel	54	1.000	0.999	0.999
Rebar Crowne Plaza Taipei	20	0.728	0.998	0.727	Jen Dow International Hotel	59	0.419	0.793	0.332
Grand Hyatt Taipei	21	1.000	0.989	0.989	Plaza Hotel	60	0.582	0.469	0.273
Grand Formosa Regent Taipei	22	1.000	1.000	1.000	Le Midi Hotel Chitou	61	0.829	0.918	0.761
The Sherwood Hotel Taipei	23	1.000	1.000	1.000	Miramar Garden Taipei	63	0.614	0.797	0.490
Far Eastern Plaza Hotel Taipei	24	0.973	0.894	0.870	Chinatrust Hotel Sun Moon Lake	64	0.603	0.814	0.491
Hotel Kingdom	26	0.474	0.758	0.360	Ming-Ren Hotel	65	0.351	0.825	0.290
Holiday Garden Kaohsiung	27	0.580	0.746	0.433					



## Year 1997

ITH Name	DMU#	OTE	AE	CE	ITH Name	DMU#	OTE	AE	CE
The Grand Hotel	1	0.671	0.758	0.509	The Ambassador Hotel Kaohsiung	28	0.657	0.860	0.565
The Ambassador Hotel	2	0.974	0.847	0.825	Han-Hsien international Hotel	29	0.634	0.826	0.524
Mandarina Crown Hotel	3	0.551	0.904	0.498	Grand Hi-Lai Hotel	30	0.921	0.713	0.657
Imperial Taipei	4	0.475	0.560	0.266	Howard Plaza Hotel Kaohsiung	31	1.000	0.598	0.598
Gloria Prince Hotel	5	0.690	0.960	0.662	Park Hotel	33	0.297	0.899	0.267
Emperor Hotel	6	0.909	0.597	0.542	Hotel National	34	0.563	0.856	0.482
Hotel Riverview Taipei	7	0.543	0.761	0.413	Plaza International Hotel	35	0.467	0.917	0.428
Caesar Park Taipei	8	0.734	0.848	0.622	Evergreen Laurel Hotel	36	0.678	0.849	0.576
Golden China Hotel	9	0.540	0.900	0.486	Howard Plaza Hotel Taichung	37	0.833	0.781	0.651
San Want Hotel	10	0.801	0.947	0.758	Marshal Hotel	40	0.490	0.787	0.385
Brother Hotel	11	0.816	0.914	0.746	Chinatrust Hotel Hualien	41	0.628	0.828	0.520
Santos Hotel	12	0.661	0.772	0.511	Parkview Hotel	42	0.825	0.764	0.631
The Ritz Landis Hotel	13	0.780	0.896	0.699	Hotel Landis China Yangmingshan	44	0.778	0.891	0.693
United Hotel	14	0.942	0.712	0.671	The Grand Hotel Kaohsiung	45	0.730	0.710	0.519
Sheraton Taipei Hotel	15	0.962	0.843	0.811	Caesar Park Hotel Kending	46	1.000	0.917	0.917
Taipei Fortuna Hotel	16	0.563	0.745	0.419	Hotel Royal Chihpen Spa	47	1.000	0.971	0.971
Holiday Inn Asiaworld Taipei	17	1.000	1.000	1.000	Grand Formosa Hotel	48	0.736	0.816	0.601
Hotel Royal Taipei	18	0.832	0.913	0.760	Taoyuan Holiday Hotel	52	0.665	0.626	0.416
Howard Plaza Hotel	19	1.000	1.000	1.000	Hotel Tainan	53	1.000	0.768	0.768
Rebar Crowne Plaza Taipei	20	0.748	0.969	0.725	Ta Shee Resort Hotel	54	1.000	0.949	0.949
Grand Hyatt Taipei	21	1.000	1.000	1.000	Jen Dow International Hotel	59	0.438	0.708	0.310
Grand Formosa Regent Taipei	22	1.000	0.981	0.981	Le Midi Hotel Chitou	61	0.875	0.907	0.794
The Sherwood Hotel Taipei	23	1.000	1.000	1.000	Miramar Garden Taipei	63	0.617	0.803	0.496
Far Eastern Plaza Hotel Taipei	24	1.000	0.874	0.874	Chinatrust Hotel Sun Moon Lake	64	0.696	0.713	0.496
Hotel Kingdom	26	0.466	0.684	0.319	Ming-Ren Hotel	65	0.484	0.740	0.358
Holiday Garden Kaohsiung	27	0.501	0.784	0.393					

## Year 1998

ITH Name	DMU#	OTE	AE	CE	ITH Name	DMU#	OTE	AE	CE
The Grand Hotel	1	0.726	0.835	0.606	The Ambassador Hotel Kaohsiung	28	0.598	0.902	0.539
The Ambassador Hotel	2	0.927	0.903	0.838	Han-Hsien international Hotel	29	0.630	0.929	0.585
Mandarina Crown Hotel	3	0.568	0.889	0.505	Grand Hi-Lai Hotel	30	0.952	0.662	0.631
Imperial Taipei	4	1.000	0.958	0.958	Howard Plaza Hotel Kaohsiung	31	0.750	0.762	0.571
Gloria Prince Hotel	5	0.660	0.905	0.597	Park Hotel	33	0.337	0.869	0.293
Emperor Hotel	6	0.859	0.628	0.539	Hotel National	34	0.587	0.897	0.526
Hotel Riverview Taipei	7	0.588	0.730	0.429	Plaza International Hotel	35	0.494	0.962	0.476
Caesar Park Taipei	8	0.715	0.914	0.654	Evergreen Laurel Hotel	36	0.626	0.894	0.560
Golden China Hotel	9	0.562	0.918	0.516	Howard Plaza Hotel Taichung	37	0.866	0.831	0.720
San Want Hotel	10	0.978	0.898	0.879	Marshal Hotel	40	0.445	0.795	0.354
Brother Hotel	11	1.000	0.834	0.834	Chinatrust Hotel Hualien	41	0.551	0.894	0.493
Santos Hotel	12	0.636	0.903	0.574	Parkview Hotel	42	0.740	0.911	0.674
The Ritz Landis Hotel	13	0.783	0.819	0.641	Hotel Landis China Yangmingshan	44	0.691	0.827	0.572
United Hotel	14	0.580	0.738	0.428	The Grand Hotel Kaohsiung	45	0.695	0.703	0.489
Sheraton Taipei Hotel	15	0.928	0.939	0.871	Caesar Park Hotel Kending	46	0.882	0.968	0.854
Taipei Fortuna Hotel	16	0.380	0.926	0.352	Hotel Royal Chihpen Spa	47	1.000	1.000	1.000
Holiday Inn Asiaworld Taipei	17	1.000	1.000	1.000	Grand Formosa Hotel	48	0.743	0.917	0.681
Hotel Royal Taipei	18	0.799	0.908	0.726	Howard Beach Resort Kending	49	1.000	0.704	0.704
Howard Plaza Hotel	19	1.000	1.000	1.000	Taoyuan Holiday Hotel	52	0.586	0.701	0.411
Rebar Crowne Plaza Taipei	20	0.819	0.932	0.763	Hotel Tainan	53	0.900	0.775	0.698
Grand Hyatt Taipei	21	1.000	1.000	1.000	Ta Shee Resort Hotel	54	0.916	0.921	0.844
Grand Formosa Regent Taipei	22	1.000	0.973	0.973	Jen Dow International Hotel	59	0.416	0.867	0.361
The Sherwood Hotel Taipei	23	1.000	1.000	1.000	Plaza Hotel	60	1.000	0.734	0.734
Far Eastern Plaza Hotel Taipei	24	1.000	0.965	0.965	Le Midi Hotel Chitou	61	0.952	0.941	0.896
Hotel Kingdom	26	0.451	0.728	0.328	Miramar Garden Taipei	63	0.621	0.825	0.512
Holiday Garden Kaohsiung	27	0.453	0.849	0.385	Chinatrust Hotel Sun Moon Lake	64	0.718	0.787	0.565

## Year 1999

ITH Name	DMU#	OTE	AE	CE	ITH Name	DMU#	OTE	AE	CE
The Grand Hotel	1	0.902	0.840	0.758	Han-Hsien international Hotel	29	0.635	0.913	0.580
The Ambassador Hotel	2	0.994	0.887	0.882	Grand Hi-Lai Hotel	30	0.855	0.777	0.664
Mandarina Crown Hotel	3	0.667	0.794	0.529	Howard Plaza Hotel Kaohsiung	31	0.642	0.851	0.547
Imperial Taipei	4	0.686	0.936	0.642	Park Hotel	33	0.434	0.752	0.327
Gloria Prince Hotel	5	0.713	0.870	0.620	Hotel National	34	0.650	0.860	0.559
Emperor Hotel	6	1.000	0.535	0.535	Plaza International Hotel	35	0.558	0.926	0.516
Hotel Riverview Taipei	7	0.619	0.773	0.478	Evergreen Laurel Hotel	36	0.678	0.865	0.586
Caesar Park Taipei	8	0.734	0.913	0.670	Howard Plaza Hotel Taichung	37	0.722	0.825	0.595
Golden China Hotel	9	0.657	0.875	0.575	The Splendor Taichung	38	0.788	0.700	0.552
San Want Hotel	62	0.932	0.890	0.829	Marshal Hotel	40	0.459	0.862	0.396
Brother Hotel	11	1.000	0.893	0.893	Chinatrust Hotel Hualien	41	0.527	0.873	0.460
Santos Hotel	12	0.597	0.944	0.564	Parkview Hotel	42	0.657	0.847	0.556
The Ritz Landis Hotel	13	0.793	0.883	0.700	Hotel Landis China Yangmingshan	44	0.681	0.851	0.580
United Hotel	14	0.695	0.790	0.549	The Grand Hotel Kaohsiung	45	0.975	0.610	0.595
Sheraton Taipei Hotel	15	1.000	0.889	0.889	Caesar Park Hotel Kending	46	0.853	0.943	0.804
Taipei Fortuna Hotel	16	0.396	0.888	0.352	Hotel Royal Chihpen Spa	47	1.000	0.978	0.978
Holiday Inn Asiaworld Taipei	17	1.000	1.000	1.000	Grand Formosa Hotel	48	0.764	0.966	0.738
Hotel Royal Taipei	18	0.775	0.873	0.676	Howard Beach Resort Kending	49	1.000	0.752	0.752
Howard Plaza Hotel	19	1.000	1.000	1.000	Taoyuan Holiday Hotel	52	0.471	0.806	0.379
Rebar Crowne Plaza Taipei	20	0.823	0.884	0.727	Hotel Tainan	53	0.882	0.856	0.755
Grand Hyatt Taipei	21	1.000	1.000	1.000	Ta Shee Resort Hotel	54	1.000	0.922	0.922
Grand Formosa Regent Taipei	22	1.000	1.000	1.000	Hotel Royal Hsinchu	55	0.611	0.788	0.482
The Sherwood Hotel Taipei	23	1.000	1.000	1.000	Jen Dow International Hotel	59	0.376	0.794	0.298
Far Eastern Plaza Hotel Taipei	24	1.000	0.903	0.903	Plaza Hotel	60	0.683	0.553	0.378
Hotel Kingdom	26	0.369	0.850	0.313	Le Midi Hotel Chitou	61	0.958	0.841	0.805
Holiday Garden Kaohsiung	27	0.530	0.806	0.427	Miramar Garden Taipei	63	0.529	0.891	0.471
The Ambassador Hotel Kaohsiung	28	0.751	0.877	0.659	Chinatrust Hotel Sun Moon Lake	64	0.618	0.857	0.530

## Year 2000

ITH Name	DMU#	OTE	AE	CE	ITH Name	DMU#	OTE	AE	CE
The Grand Hotel	1	0.753	0.845	0.636	The Ambassador Hotel Kaohsiung	28	0.642	0.936	0.601
The Ambassador Hotel	2	0.793	0.959	0.760	Han-Hsien international Hotel	29	0.479	0.976	0.468
Mandarina Crown Hotel	3	1.000	0.665	0.665	Grand Hi-Lai Hotel	30	0.683	0.872	0.596
Imperial Taipei	4	0.733	0.893	0.654	Howard Plaza Hotel Kaohsiung	31	0.524	0.900	0.471
Gloria Prince Hotel	5	0.562	0.916	0.515	The Splendor Kaohsiung	32	0.730	0.780	0.569
Emperor Hotel	6	1.000	0.535	0.535	Park Hotel	33	0.278	0.789	0.219
Hotel Riverview Taipei	7	0.614	0.691	0.425	Hotel National	34	0.562	0.874	0.491
Caesar Park Taipei	8	0.648	0.954	0.618	Plaza International Hotel	35	0.488	0.857	0.418
Golden China Hotel	9	0.642	0.806	0.517	Evergreen Laurel Hotel	36	0.664	0.837	0.555
San Want Hotel	10	0.907	0.881	0.799	Howard Plaza Hotel Taichung	37	0.671	0.844	0.566
Brother Hotel	11	0.915	0.916	0.837	The Splendor Taichung	38	0.972	0.807	0.785
Santos Hotel	12	0.673	0.838	0.564	Marshal Hotel	40	0.466	0.899	0.419
The Ritz Landis Hotel	13	0.808	0.883	0.714	Chinatrust Hotel Hualien	41	0.534	0.873	0.465
United Hotel	14	0.938	0.681	0.639	Parkview Hotel	42	0.594	0.853	0.507
Sheraton Taipei Hotel	15	0.878	0.830	0.729	Hotel Landis China Yangmingshan	44	0.721	0.915	0.660
Taipei Fortuna Hotel	16	0.429	0.824	0.353	The Grand Hotel Kaohsiung	45	0.875	0.685	0.600
Holiday Inn Asiaworld Taipei	17	1.000	0.817	0.817	Caesar Park Hotel Kending	46	0.827	0.926	0.766
Hotel Royal Taipei	18	0.754	0.905	0.683	Hotel Royal Chihpen Spa	47	1.000	0.930	0.930
Howard Plaza Hotel	19	1.000	1.000	1.000	天祥晶華渡假酒店	48	0.655	0.822	0.538
Rebar Crowne Plaza Taipei	20	0.797	0.899	0.717	墾丁 Howard Plaza Hotel	49	1.000	0.761	0.761
Grand Hyatt Taipei	21	1.000	1.000	1.000	Taoyuan Holiday Hotel	52	0.546	0.689	0.376
Grand Formosa Regent Taipei	22	1.000	1.000	1.000	Hotel Tainan	53	0.965	0.897	0.866
The Sherwood Hotel Taipei	23	1.000	0.994	0.994	Ta Shee Resort Hotel	54	0.782	0.950	0.743
Far Eastern Plaza Hotel Taipei	24	1.000	0.893	0.893	Hotel Royal Hsinchu	55	0.644	0.921	0.593
The Westin Hotel	25	1.000	0.845	0.845	Jen Dow International Hotel	59	0.352	0.811	0.286
Hotel Kingdom	26	0.359	0.960	0.344	Plaza Hotel	60	1.000	0.655	0.655
Holiday Garden Kaohsiung	27	0.456	0.847	0.386	Le Midi Hotel Chitou	61	0.822	0.805	0.662

## Year 2001

ITH Name	DMU#	OTE	AE	CE	ITH Name	DMU#	OTE	AE	CE
The Grand Hotel	1	0.652	0.917	0.598	Han-Hsien international Hotel	29	0.545	0.867	0.473
The Ambassador Hotel	2	0.893	0.903	0.806	Grand Hi-Lai Hotel	30	0.609	0.891	0.542
Mandarina Crown Hotel	3	1.000	1.000	1.000	Howard Plaza Hotel Kaohsiung	31	0.558	0.826	0.460
Imperial Taipei	4	0.790	0.850	0.671	The Splendor Kaohsiung	32	0.565	0.854	0.483
Gloria Prince Hotel	5	0.547	0.960	0.525	Park Hotel	33	0.298	0.788	0.235
Emperor Hotel	6	0.849	0.597	0.507	Hotel National	34	0.560	0.849	0.475
Hotel Riverview Taipei	7	0.649	0.626	0.406	Plaza International Hotel	35	0.471	0.822	0.387
Caesar Park Taipei	8	0.626	0.940	0.589	Evergreen Laurel Hotel	36	0.818	0.733	0.599
Golden China Hotel	9	0.659	0.773	0.510	Howard Plaza Hotel Taichung	37	0.607	0.863	0.524
Brother Hotel	11	0.855	0.897	0.767	The Splendor Taichung	38	1.000	1.000	1.000
Santos Hotel	12	0.696	0.792	0.552	Marshal Hotel	40	0.406	0.835	0.339
The Ritz Landis Hotel	13	0.828	0.883	0.731	Chinatrust Hotel Hualien	41	0.750	0.780	0.585
United Hotel	14	0.847	0.728	0.617	Parkview Hotel	42	0.715	0.828	0.593
Sheraton Taipei Hotel	15	0.838	0.937	0.786	Hotel Landis China Yangmingshan	44	0.714	0.905	0.647
Taipei Fortuna Hotel	16	0.478	0.780	0.373	The Grand Hotel Kaohsiung	45	0.580	0.921	0.534
Holiday Inn Asiaworld Taipei	17	1.000	0.817	0.817	Caesar Park Hotel Kending	46	0.918	0.824	0.757
Hotel Royal Taipei	18	0.809	0.901	0.729	Hotel Royal Chihpen Spa	47	1.000	0.882	0.882
Howard Plaza Hotel	19	1.000	0.943	0.943	Grand Formosa Hotel	48	0.763	0.900	0.687
Rebar Crowne Plaza Taipei	20	0.733	0.840	0.616	Howard Beach Resort Kending	49	1.000	0.724	0.724
Grand Hyatt Taipei	21	1.000	1.000	1.000	The Hibiscus Resorts	50	0.418	0.893	0.373
Grand Formosa Regent Taipei	22	1.000	1.000	1.000	Taoyuan Holiday Hotel	52	0.575	0.656	0.377
The Sherwood Hotel Taipei	23	1.000	0.930	0.930	Hotel Tainan	53	0.918	0.993	0.912
Far Eastern Plaza Hotel Taipei	24	0.989	0.958	0.948	Ta Shee Resort Hotel	54	0.657	0.948	0.623
The Westin Hotel	25	1.000	1.000	1.000	Hotel Royal Hsinchu	55	0.658	0.937	0.617
Hotel Kingdom	26	0.370	0.912	0.337	The Ambassador Hotel HsinChu	56	1.000	0.825	0.825
Holiday Garden Kaohsiung	27	0.472	0.789	0.372	Jen Dow International Hotel	59	0.307	0.791	0.243
The Ambassador Hotel Kaohsiung	28	0.718	0.884	0.634	Plaza Hotel	60	0.800	0.417	0.334

## Year 2002

ITH Name	DMU#	OTE	AE	CE	ITH Name	DMU#	OTE	AE	CE
The Grand Hotel	1	0.633	0.917	0.580	Grand Hi-Lai Hotel	30	0.620	0.903	0.559
The Ambassador Hotel	2	0.940	0.912	0.858	Howard Plaza Hotel Kaohsiung	31	0.600	0.808	0.485
Mandarina Crown Hotel	3	1.000	1.000	1.000	The Splendor Kaohsiung	32	0.564	0.867	0.489
Imperial Taipei	4	0.613	0.944	0.579	Park Hotel	33	0.363	0.785	0.285
Gloria Prince Hotel	5	0.658	0.892	0.587	Hotel National	34	0.555	0.834	0.463
Emperor Hotel	6	0.909	0.550	0.500	Plaza International Hotel	35	0.443	0.839	0.371
Hotel Riverview Taipei	7	0.626	0.667	0.418	Evergreen Laurel Hotel	36	0.825	0.753	0.621
Caesar Park Taipei	8	0.628	0.968	0.608	Howard Plaza Hotel Taichung	37	0.647	0.861	0.557
Golden China Hotel	9	0.657	0.757	0.497	The Splendor Taichung	38	1.000	0.935	0.935
Brother Hotel	11	0.957	0.840	0.803	Marshal Hotel	40	0.452	0.851	0.384
Santos Hotel	12	0.603	0.891	0.537	Chinatrust Hotel Hualien	41	0.753	0.768	0.578
The Ritz Landis Hotel	13	0.794	0.925	0.734	Parkview Hotel	42	0.661	0.966	0.638
United Hotel	14	0.649	0.935	0.607	Hotel Landis China Yangmingshan	44	1.000	0.727	0.727
Sheraton Taipei Hotel	15	0.392	0.973	0.382	The Grand Hotel Kaohsiung	45	0.581	0.906	0.526
Taipei Fortuna Hotel	16	0.447	0.858	0.384	Caesar Park Hotel Kending	46	1.000	0.905	0.905
Holiday Inn Asiaworld Taipei	17	0.939	0.918	0.862	Hotel Royal Chihpen Spa	47	1.000	0.890	0.890
Hotel Royal Taipei	18	0.704	0.956	0.673	Grand Formosa Hotel	48	0.969	0.860	0.834
Howard Plaza Hotel	19	1.000	0.870	0.870	Howard Beach Resort Kending	49	1.000	0.746	0.746
Rebar Crowne Plaza Taipei	20	0.706	0.833	0.588	The Hibiscus Resorts	50	0.459	0.996	0.457
Grand Hyatt Taipei	21	1.000	1.000	1.000	Taoyuan Holiday Hotel	52	0.448	0.737	0.330
Grand Formosa Regent Taipei	22	1.000	1.000	1.000	Hotel Tainan	53	0.943	0.960	0.905
The Sherwood Hotel Taipei	23	1.000	0.988	0.988	Ta Shee Resort Hotel	54	0.615	0.920	0.565
Far Eastern Plaza Hotel Taipei	24	1.000	1.000	1.000	Hotel Royal Hsinchu	55	0.683	0.914	0.625
The Westin Hotel	25	1.000	0.967	0.967	The Ambassador Hotel HsinChu	56	0.941	0.991	0.932
Hotel Kingdom	26	0.358	0.922	0.330	Formosan Naruwan Hotel	57	0.532	0.919	0.489
Holiday Garden Kaohsiung	27	0.422	0.900	0.380	Tayih Landis Tainan Hotel	58	0.591	0.891	0.527
The Ambassador Hotel Kaohsiung	28	0.723	0.900	0.651	Plaza Hotel	60	0.451	0.765	0.345
Han-Hsien international Hotel	29	0.523	0.934	0.489					

## Year 2003

ITH Name	DMU#	OTE	AE	CE	ITH Name	DMU#	OTE	AE	CE
The Grand Hotel	1	0.665	0.912	0.607	Grand Hi-Lai Hotel	30	0.688	0.872	0.600
The Ambassador Hotel	2	0.987	0.916	0.905	Howard Plaza Hotel Kaohsiung	31	0.731	0.712	0.520
Mandarina Crown Hotel	3	1.000	1.000	1.000	The Splendor Kaohsiung	32	0.554	0.848	0.470
Imperial Taipei	4	0.608	0.806	0.491	Park Hotel	33	0.404	0.628	0.254
Gloria Prince Hotel	5	0.746	0.890	0.664	Hotel National	34	0.560	0.826	0.462
Emperor Hotel	6	0.570	0.665	0.379	Plaza International Hotel	35	0.422	0.772	0.326
Hotel Riverview Taipei	7	0.592	0.672	0.398	Evergreen Laurel Hotel	36	0.895	0.728	0.652
Caesar Park Taipei	8	0.651	0.981	0.638	Howard Plaza Hotel Taichung	37	0.765	0.754	0.577
Golden China Hotel	9	0.611	0.724	0.442	The Splendor Taichung	38	0.805	0.870	0.700
San Want Hotel	10	0.946	0.967	0.915	Marshal Hotel	40	0.566	0.748	0.423
Brother Hotel	11	0.951	0.832	0.791	Chinatrust Hotel Hualien	41	0.857	0.714	0.612
Santos Hotel	12	0.461	0.857	0.396	Parkview Hotel	42	0.751	0.810	0.608
The Ritz Landis Hotel	13	0.882	0.870	0.768	Farglory Hotel	43	0.994	0.734	0.729
United Hotel	14	0.645	0.833	0.537	Hotel Landis China Yangmingshan	44	0.901	0.878	0.790
Sheraton Taipei Hotel	15	0.553	0.937	0.519	The Grand Hotel Kaohsiung	45	0.597	0.936	0.559
Taipei Fortuna Hotel	16	0.363	0.908	0.329	Caesar Park Hotel Kending	46	1.000	0.795	0.795
Holiday Inn Asiaworld Taipei	17	0.690	0.729	0.503	Hotel Royal Chihpen Spa	47	1.000	0.743	0.743
Hotel Royal Taipei	18	0.693	0.969	0.671	Grand Formosa Hotel	48	1.000	0.743	0.743
Howard Plaza Hotel	19	1.000	0.828	0.828	Howard Beach Resort Kending	49	1.000	0.649	0.649
Rebar Crowne Plaza Taipei	20	0.824	0.768	0.633	The Hibiscus Resorts	50	0.467	0.809	0.378
Grand Hyatt Taipei	21	1.000	0.960	0.960	The Lalu Sun Moon Lake	51	1.000	1.000	1.000
Grand Formosa Regent Taipei	22	1.000	1.000	1.000	Taoyuan Holiday Hotel	52	0.470	0.719	0.338
The Sherwood Hotel Taipei	23	1.000	0.848	0.848	Hotel Tainan	53	0.948	0.953	0.904
Far Eastern Plaza Hotel Taipei	24	1.000	1.000	1.000	Ta Shee Resort Hotel	54	0.598	0.939	0.562
The Westin Hotel	25	0.973	0.848	0.825	Hotel Royal Hsinchu	55	0.628	0.893	0.560
Hotel Kingdom	26	0.515	0.655	0.337	The Ambassador Hotel HsinChu	56	0.743	0.951	0.707
Holiday Garden Kaohsiung	27	0.465	0.787	0.366	Formosan Naruwan Hotel	57	0.605	0.849	0.513
The Ambassador Hotel Kaohsiung	28	0.788	0.883	0.696	Tayih Landis Tainan Hotel	58	0.706	0.843	0.595
Han-Hsien international Hotel	29	0.623	0.847	0.527					

## Year 2004

ITH Name	DMU#	OTE	AE	CE	ITH Name	DMU#	OTE	AE	CE
The Grand Hotel	1	0.710	0.830	0.590	Grand Hi-Lai Hotel	30	0.719	0.887	0.637
The Ambassador Hotel	2	1.000	0.901	0.901	Howard Plaza Hotel Kaohsiung	31	0.643	0.717	0.461
Mandarina Crown Hotel	3	1.000	0.934	0.934	The Splendor Kaohsiung	32	0.595	0.866	0.515
Imperial Taipei	4	0.705	0.716	0.505	Hotel National	34	0.555	0.844	0.469
Gloria Prince Hotel	5	0.666	0.854	0.568	Plaza International Hotel	35	0.524	0.733	0.384
Emperor Hotel	6	0.695	0.506	0.352	Evergreen Laurel Hotel	36	0.887	0.681	0.604
Hotel Riverview Taipei	7	0.649	0.560	0.364	Howard Plaza Hotel Taichung	37	0.715	0.739	0.528
Caesar Park Taipei	8	0.799	0.724	0.578	The Splendor Taichung	38	0.697	0.911	0.635
Golden China Hotel	9	0.629	0.708	0.445	Marshal Hotel	40	0.512	0.694	0.355
San Want Hotel	10	0.769	0.935	0.719	Chinatrust Hotel Hualien	41	0.734	0.733	0.538
Brother Hotel	11	1.000	0.890	0.890	Parkview Hotel	42	0.688	0.818	0.563
Santos Hotel	12	0.552	0.781	0.431	Farglory Hotel	43	0.946	0.775	0.734
The Ritz Landis Hotel	13	0.796	0.899	0.716	Hotel Landis China Yangmingshan	44	0.770	0.983	0.757
United Hotel	14	0.678	0.742	0.502	The Grand Hotel Kaohsiung	45	0.728	0.811	0.590
Sheraton Taipei Hotel	15	0.588	0.842	0.496	Caesar Park Hotel Kending	46	1.000	0.750	0.750
Taipei Fortuna Hotel	16	0.364	0.790	0.288	Hotel Royal Chihpen Spa	47	0.992	0.695	0.690
Holiday Inn Asiaworld Taipei	17	0.773	0.659	0.510	Grand Formosa Hotel	48	0.728	0.825	0.601
Hotel Royal Taipei	18	0.691	0.942	0.651	Howard Beach Resort Kending	49	1.000	0.632	0.632
Howard Plaza Hotel	19	0.774	0.928	0.718	The Hibiscus Resorts	50	0.506	0.688	0.348
Rebar Crowne Plaza Taipei	20	0.617	0.948	0.585	The Lalu Sun Moon Lake	51	1.000	1.000	1.000
Grand Hyatt Taipei	21	1.000	0.945	0.945	Taoyuan Holiday Hotel	52	0.495	0.662	0.328
Grand Formosa Regent Taipei	22	1.000	1.000	1.000	Hotel Tainan	53	0.860	0.883	0.759
The Sherwood Hotel Taipei	23	1.000	0.868	0.868	Ta Shee Resort Hotel	54	0.770	0.915	0.705
Far Eastern Plaza Hotel Taipei	24	1.000	1.000	1.000	Hotel Royal Hsinchu	55	0.604	0.896	0.541
The Westin Hotel	25	0.952	0.903	0.859	The Ambassador Hotel HsinChu	56	0.714	0.921	0.658
Hotel Kingdom	26	0.531	0.596	0.317	Formosan Naruwan Hotel	57	0.528	0.871	0.460
Holiday Garden Kaohsiung	27	0.625	0.648	0.405	Tayih Landis Tainan Hotel	58	0.766	0.785	0.602
The Ambassador Hotel Kaohsiung	28	0.797	0.854	0.680	Evergreen Plaza Hotel(Tainan)	66	0.539	0.918	0.495
Han-Hsien international Hotel	29	1.000	0.666	0.666					



## Year 2005

ITH Name	DMU#	OTE	AE	CE	ITH Name	DMU#	OTE	AE	CE
The Grand Hotel	1	0.701	0.849	0.595	Grand Hi-Lai Hotel	30	0.693	0.901	0.625
The Ambassador Hotel	2	1.000	0.889	0.889	Howard Plaza Hotel Kaohsiung	31	0.629	0.753	0.473
Imperial Taipei	4	0.674	0.798	0.538	The Splendor Kaohsiung	32	0.571	0.890	0.508
Gloria Prince Hotel	5	0.987	0.795	0.785	Hotel National	34	0.625	0.726	0.454
Emperor Hotel	6	0.836	0.420	0.351	Plaza International Hotel	35	0.602	0.744	0.448
Hotel Riverview Taipei	7	0.647	0.584	0.378	Evergreen Laurel Hotel	36	0.870	0.715	0.621
Caesar Park Taipei	8	0.937	0.665	0.623	Howard Plaza Hotel Taichung	37	0.636	0.834	0.531
Golden China Hotel	9	0.587	0.767	0.450	The Splendor Taichung	38	0.700	0.860	0.602
San Want Hotel	10	0.772	0.857	0.662	Marshal Hotel	40	0.510	0.803	0.410
Brother Hotel	11	1.000	0.783	0.783	Chinatrust Hotel Hualien	41	0.744	0.645	0.480
Santos Hotel	12	0.612	0.796	0.488	Parkview Hotel	42	0.610	0.856	0.522
The Ritz Landis Hotel	13	0.963	0.825	0.795	Farglory Hotel	43	0.770	0.881	0.679
United Hotel	14	0.775	0.706	0.547	Hotel Landis China Yangmingshan	44	0.819	0.940	0.770
Sheraton Taipei Hotel	15	0.968	0.807	0.781	The Grand Hotel Kaohsiung	45	0.979	0.591	0.579
Taipei Fortuna Hotel	16	0.417	0.746	0.311	Caesar Park Hotel Kending	46	1.000	0.734	0.734
Holiday Inn Asiaworld Taipei	17	0.758	0.696	0.528	Hotel Royal Chihpen Spa	47	0.993	0.687	0.682
Hotel Royal Taipei	18	0.689	0.983	0.677	Grand Formosa Hotel	48	0.671	0.884	0.593
Howard Plaza Hotel	19	0.912	0.841	0.768	Howard Beach Resort Kending	49	0.958	0.653	0.626
Rebar Crowne Plaza Taipei	20	0.604	0.967	0.584	The Hibiscus Resorts	50	0.379	0.955	0.362
Grand Hyatt Taipei	21	1.000	1.000	1.000	The Lalu Sun Moon Lake	51	1.000	1.000	1.000
Grand Formosa Regent Taipei	22	1.000	1.000	1.000	Taoyuan Holiday Hotel	52	0.687	0.546	0.375
The Sherwood Hotel Taipei	23	1.000	0.880	0.880	Hotel Tainan	53	0.899	0.709	0.638
Far Eastern Plaza Hotel Taipei	24	0.970	0.958	0.929	Ta Shee Resort Hotel	54	0.537	0.804	0.432
The Westin Hotel	25	1.000	1.000	1.000	Hotel Royal Hsinchu	55	0.590	0.924	0.545
Hotel Kingdom	26	0.522	0.604	0.315	The Ambassador Hotel HsinChu	56	0.746	0.978	0.730
Holiday Garden Kaohsiung	27	0.602	0.684	0.411	Formosan Naruwan Hotel	57	0.544	0.916	0.498
The Ambassador Hotel Kaohsiung	28	0.732	0.888	0.650	Tayih Landis Tainan Hotel	58	0.676	0.803	0.543
Han-Hsien international Hotel	29	0.667	0.981	0.655	Evergreen Plaza Hotel(Tainan)	66	0.564	0.899	0.507

## Year 2006

ITH Name	DMU#	OTE	AE	CE	ITH Name	DMU#	OTE	AE	CE
The Grand Hotel	1	0.740	0.850	0.628	The Splendor Kaohsiung	32	0.623	0.844	0.526
The Ambassador Hotel	2	1.000	0.948	0.948	Hotel National	34	0.736	0.673	0.495
Imperial Taipei	4	0.606	0.804	0.487	Plaza International Hotel	35	0.592	0.754	0.447
Gloria Prince Hotel	5	1.000	1.000	1.000	Evergreen Laurel Hotel	36	0.826	0.703	0.581
Emperor Hotel	6	0.782	0.437	0.342	Howard Plaza Hotel Taichung	37	0.650	0.813	0.528
Hotel Riverview Taipei	7	0.629	0.583	0.367	The Splendor Taichung	38	0.704	0.788	0.555
Caesar Park Taipei	8	1.000	0.631	0.631	Marshal Hotel	40	0.476	0.752	0.358
Golden China Hotel	9	0.556	0.750	0.417	Chinatrust Hotel Hualien	41	0.609	0.683	0.416
San Want Hotel	10	0.971	0.805	0.781	Parkview Hotel	42	0.558	0.859	0.480
Brother Hotel	11	1.000	0.789	0.789	Farglory Hotel	43	0.675	0.937	0.633
Santos Hotel	12	0.574	0.791	0.454	Hotel Landis China Yangmingshan	44	0.797	0.907	0.723
The Ritz Landis Hotel	13	0.896	0.952	0.853	The Grand Hotel Kaohsiung	45	0.970	0.635	0.616
United Hotel	14	0.777	0.721	0.561	Caesar Park Hotel Kending	46	1.000	0.754	0.754
Sheraton Taipei Hotel	15	0.912	0.913	0.833	Hotel Royal Chihpen Spa	47	0.833	0.745	0.620
Taipei Fortuna Hotel	16	0.366	0.770	0.282	Grand Formosa Hotel	48	0.557	0.946	0.526
Hotel Royal Taipei	18	0.643	0.992	0.638	Howard Beach Resort Kending	49	0.894	0.687	0.614
Howard Plaza Hotel	19	0.835	0.868	0.725	The Hibiscus Resorts	50	0.348	0.915	0.319
Rebar Crowne Plaza Taipei	20	0.652	0.870	0.567	The Lalu Sun Moon Lake	51	1.000	1.000	1.000
Grand Hyatt Taipei	21	1.000	1.000	1.000	Taoyuan Holiday Hotel	52	0.645	0.552	0.356
Grand Formosa Regent Taipei	22	1.000	1.000	1.000	Hotel Tainan	53	0.850	0.674	0.573
The Sherwood Hotel Taipei	23	1.000	0.846	0.846	Ta Shee Resort Hotel	54	0.519	0.708	0.368
Far Eastern Plaza Hotel Taipei	24	0.968	0.928	0.899	Hotel Royal Hsinchu	55	0.573	0.921	0.528
The Westin Hotel	25	1.000	1.000	1.000	The Ambassador Hotel HsinChu	56	0.755	0.946	0.714
Hotel Kingdom	26	0.491	0.600	0.295	Formosan Naruwan Hotel	57	0.513	0.934	0.479
Holiday Garden Kaohsiung	27	0.567	0.697	0.395	Tayih Landis Tainan Hotel	58	0.677	0.788	0.533
The Ambassador Hotel Kaohsiung	28	0.720	0.917	0.660	Evergreen Plaza Hotel(Tainan)	66	0.651	0.873	0.568
Han-Hsien international Hotel	29	0.605	0.981	0.593	Royal Less Hotel	68	0.618	0.772	0.477
Grand Hi-Lai Hotel	30	0.788	0.881	0.695	Hotel Royal Chiao-His	69	0.907	0.920	0.835
Howard Plaza Hotel Kaohsiung	31	0.590	0.742	0.438					

## Year 2007

ITH Name	DMU#	OTE	AE	CE	ITH Name	DMU#	OTE	AE	CE
The Grand Hotel	1	0.607	0.92	0.558	Hotel National	34	0.510	0.85	0.435
The Ambassador Hotel	2	1.000	0.95	0.947	Plaza International Hotel	35	0.462	0.82	0.380
Imperial Taipei	4	0.527	0.82	0.434	Evergreen Laurel Hotel	36	0.712	0.75	0.534
Gloria Prince Hotel	5	1.000	1.00	1.000	Howard Plaza Hotel Taichung	37	0.604	0.81	0.487
Emperor Hotel	6	0.577	0.59	0.341	The Splendor Taichung	38	0.848	0.59	0.498
Hotel Riverview Taipei	7	0.636	0.56	0.358	Marshal Hotel	40	0.442	0.78	0.346
Caesar Park Taipei	8	1.000	0.64	0.635	Chinatrust Hotel Hualien	41	0.665	0.79	0.522
Golden China Hotel	9	0.526	0.74	0.392	Parkview Hotel	42	0.480	0.90	0.432
San Want Hotel	10	1.000	0.85	0.848	Farglory Hotel	43	0.628	0.94	0.590
Brother Hotel	11	1.000	0.80	0.803	Hotel Landis China Yangmingshan	44	0.789	0.95	0.746
Santos Hotel	12	0.513	0.82	0.419	The Grand Hotel Kaohsiung	45	1.000	0.61	0.608
The Ritz Landis Hotel	13	0.807	0.85	0.683	Caesar Park Hotel Kending	46	1.000	0.79	0.787
United Hotel	14	0.745	0.70	0.518	Hotel Royal Chihpen Spa	47	0.742	0.78	0.582
Sheraton Taipei Hotel	15	0.949	0.96	0.910	Grand Formosa Hotel	48	0.508	0.95	0.482
Hotel Royal Taipei	18	0.628	0.98	0.613	Howard Beach Resort Kending	49	0.641	0.78	0.502
Howard Plaza Hotel	19	0.771	0.87	0.671	The Hibiscus Resorts	50	0.309	0.92	0.284
Grand Hyatt Taipei	21	1.000	1.00	1.000	The Lalu Sun Moon Lake	51	1.000	1.00	1.000
Grand Formosa Regent Taipei	22	1.000	1.00	1.000	Taoyuan Holiday Hotel	52	0.500	0.49	0.247
The Sherwood Hotel Taipei	23	1.000	0.81	0.810	Hotel Tainan	53	0.879	0.60	0.531
Far Eastern Plaza Hotel Taipei	24	1.000	1.00	0.995	Ta Shee Resort Hotel	54	0.525	0.73	0.381
The Westin Hotel	25	1.000	1.00	1.000	Hotel Royal Hsinchu	55	0.543	0.92	0.501
Hotel Kingdom	26	0.509	0.59	0.302	The Ambassador Hotel HsinChu	56	0.830	0.94	0.782
Holiday Garden Kaohsiung	27	0.555	0.68	0.378	Formosan Naruwan Hotel	57	0.459	0.92	0.424
The Ambassador Hotel Kaohsiung	28	0.749	0.86	0.644	Tayih Landis Tainan Hotel	58	0.607	0.80	0.488
Han-Hsien international Hotel	29	0.601	0.93	0.560	Miramar Garden Taipei	63	0.660	0.61	0.403
Grand Hi-Lai Hotel	30	0.806	0.90	0.724	Evergreen Plaza Hotel(Tainan)	66	0.765	0.84	0.642
Howard Plaza Hotel Kaohsiung	31	0.629	0.70	0.442	Royal Less Hotel	68	0.634	0.73	0.462
The Splendor Kaohsiung	32	0.604	0.81	0.487	Hotel Royal Chiao-His	69	0.898	0.91	0.820

Appendix 2  
Best Top 10 Cost-Efficient Hotels during 1996 ~ 2007

DM U#		1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	rank ing
2	The Ambassador Hotel								0.905	0.901	0.889	0.948	0.947	9
3	Mandarina Crown Hotel						1.000	1.000	1.000	0.934				
4	Imperial Taipei			0.958										
5	Gloria Prince Hotel										0.785	1.000	1.000	
10	San Want Hotel			0.879					0.915				0.848	
11	Brother Hotel				0.893	0.837				0.890	0.783			
13	The Ritz Landis Hotel										0.795	0.853		
14	United Hotel													
15	Sheraton Taipei Hotel	0.835				0.889							0.910	
17	Holiday Inn Asiaworld Taipei		1.000	1.000	1.000	0.817								
19	Howard Plaza Hotel	1.000	1.000	1.000	1.000	1.000	0.943		0.828					5
21	Grand Hyatt Taipei	0.989	1.000	1.000	1.000	1.000	1.000	1.000	0.960	0.945	1.000	1.000	1.000	2
22	Grand Formosa Regent Taipei	1.000	0.981	0.973	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1
23	The Sherwood Hotel Taipei	1.000	1.000	1.000	1.000	0.994	0.930	0.988	0.848	0.868	0.880	0.846		4
24	Far Eastern Plaza Hotel Taipei	0.870		0.965	0.903	0.893	0.948	1.000	1.000	1.000	0.929	0.889	0.995	3
25	The Westin Hotel (since 1999.10)					0.845	1.000	0.967		0.859	1.000	1.000	1.000	6
35	Plaza International Hotel	1.000												
38	The Splendor Taichung						1.000	0.935						
46	Caesar Park Hotel Kending	0.916	0.917					0.905						
47	Hotel Royal Chihpen Spa	0.872	0.971	1.000	0.978	0.930	0.882							7
51	The Lalu Sun Moon Lake (since 2002.2)								1.000	1.000	1.000	1.000	1.000	8
53	Hotel Tainan					0.866	0.912	0.905	0.904	0.759				10
54	Ta Shee Resort Hotel	0.999	0.949		0.922									
56	The							0.932						

	Ambassador Hotel Hsinchu (since 2000.12)													
61	Le Midi Hotel Chitou			0.896										
69	Hotel Royal Chiao-His										0.835	0.820		



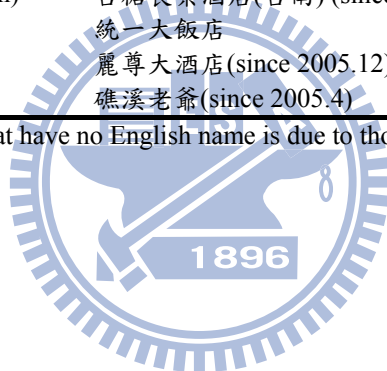
### Appendix 3 Chinese vs. English Taiwan Hotels Names Table

台灣國際飯店中英對照表

1	The Grand Hotel	台北圓山大飯店
2	The Ambassador Hotel	台北國賓大飯店
3	Mandarina Crown Hotel	中泰賓館
4	Imperial Taipei	台北華國大飯店
5	Gloria Prince Hotel	華泰王子大飯店
6	Emperor Hotel	國王大飯店
7	Hotel Riverview Taipei	豪景大酒店
8	Caesar Park Taipei	台北凱撒
9	Golden China Hotel	康華大飯店
10	San Want Hotel	神旺大飯店 (2002.9 改組)
11	Brother Hotel	兄弟大飯店
12	Santos Hotel	三德大飯店
13	The Ritz Landis Hotel	亞都麗緻大飯店
14	United Hotel	台北國聯大飯店
15	Sheraton Taipei Hotel	台北寒舍喜來登大飯店
16	Taipei Fortuna Hotel	台北富都大飯店
17	Holiday Inn Asiaworld Taipei	假日大飯店環亞台北
18	Hotel Royal Taipei	台北老爺大酒店
19	Howard Plaza Hotel	台北福華大飯店
20	Rebar Crowne Plaza Taipei	力霸皇冠 (2008.4 註銷營業執照)
21	Grand Hyatt Taipei	台北君悅大飯店(2003.9 改台北君悅)
22	Grand Formosa Regent Taipei	台北晶華酒店
23	The Sherwood Hotel Taipei	台北西華飯店
24	Far Eastern Plaza Hotel Taipei	台北遠東國際大飯店
25	The Westin Hotel	台北六福皇宮(since 1999.10)
26	Hotel Kingdom	高雄華王飯店
27	Holiday Garden Kaohsiung	高雄華園飯店
28	The Ambassador Hotel Kaohsiung	高雄國賓大飯店
29	Han-Hsien international Hotel	寒軒國際大飯店
30	Grand Hi-Lai Hotel	高雄漢來大飯店
31	Howard Plaza Hotel Kaohsiung	高雄福華大飯店
32	The Splendor Kaohsiung	高雄金典酒店(Since 1999.9)
33	Park Hotel	敬華
34	Hotel National	全國大飯店
35	Plaza International Hotel	通豪大飯店
36	Evergreen Laurel Hotel	長榮酒店
37	Howard Plaza Hotel Taichung	台中福華大飯店
38	The Splendor Taichung	台中日華金典酒店
39	Aster Hotel	花蓮亞士都
40	Marshal Hotel	統帥大飯店
41	Chinatrust Hotel Hualien	中信大飯店
42	Parkview Hotel	花蓮美侖大飯店
43	Farglory Hotel	花蓮遠雄悅來大飯店(since 2002.9)
44	Hotel Landis China Yangmingshan	陽明山中國麗緻
45	The Grand Hotel Kaohsiung	高雄圓山大飯店

46	Caesar Park Hotel Kending	墾丁凱撒大飯店
47	Hotel Royal Chihpen Spa	知本老爺大酒店
48	Grand Formosa Hotel	天祥晶華酒店
49	Howard Beach Resort Kending	墾丁福華渡假飯店
50	The Hibiscus Resorts	山芙蓉渡假大酒店(since 2000.12)
51	The Lalu Sun Moon Lake	涵碧樓大飯店(since 2002.2)
52	Taoyuan Holiday Hotel	桃園
53	Hotel Tainan	台南大飯店
54	Ta Shee Resort Hotel	大溪別館
55	Hotel Royal Hsinchu	新竹老爺大酒店
56	The Ambassador Hotel Hsinchu	新竹國賓大飯店(since 2000.12)
57	Formosan Naruwan Hotel	娜路彎大酒店 (since 2001.6)
58	Tayih Landis Tainan Hotel	大億麗緻酒店(台南) (since 2002)
59	Jen Dow International Hotel	高雄人道國際酒店(原皇統飯店) (2003.2 註銷執照)
60	Plaza Hotel	南華 (2003.11~2004.11 暫停營業)
61	Le Midi Hotel Chitou	溪頭米堤(2001.7 桃芝颱風暫停營業)(2007 重新開幕)
62	n/a	台北亞太(民 90 更名神旺大飯店)
63	Miramar Garden Taipei	台北美麗信花園酒店 (since 2006.5)
64	Chinatrust Hotel Sun Moon Lake	中信日月潭(1999.9.21 地震毀損)
65	n/a	名人大飯店(1999.6 end)
66	Evergreen Plaza Hotel(Tainan)	台糖長榮酒店(台南) (since 2003.12)
67	n/a	統一大飯店
68	Royal Less Hotel	麗尊大酒店(since 2005.12)
69	Hotel Royal Chiao-His	礁溪老爺(since 2005.4)

PS: Hotels of #62, #65 and #67 that have no English name is due to those hotels are closed for a long time



## Appendix 4

### OTE, CE and AE plot

Two inputs ( $x_1$ ,  $x_2$ ) and one-output ( $q$ ) example to illustrate how to calculate total cost efficiency (CE) and allocation efficiency (AE).

- Overall total technical efficiency  $OTE = OQ/OP$
- Overall total cost efficiency as  $CE = OR/OP$
- Allocation efficiency as  $AE = OR/OQ$ .  $\rightarrow CE = OTE \times AE$

