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Efficiency of convention hotels in Thailand: An analysis using stochastic frontier with copula

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ABSTRACT

The purpose of the study concerns efficiency Analysis of Convention Hotels in Thailand by using Stochastic Frontier with Copula. To begin with the Standard Stochastic Frontier Model (SFA), it is generally formulated hypothesis in order to determine two independent random variables between U (represents technical inefficiency) and V (represents uncontrollable disturbances) of the composite error W=V-U . In addition to applying the copula approach to statistical model, the Standard Stochastic Frontier is able to make possible to create estimation of the relationship between the variables U and V. Parameterization of this structure allows the extension of the association between the variables U and V to be measured of using data. Moreover, the independence between U and V, a special case, can be tested. The dependent error components of Stochastic Frontier with copula are less restrictive than the Standard Stochastic frontier and also more attractive to statistical grounds. The results show that copula families which are the most suitable to data process are Gaussian copula; seeing that, the non-linear relationships between θ and S_ρ show dependence between U and V for the data. The results of the analysis show that the large convention Hotels which have a large number of conference accommodations are the highest efficiency than the smaller convention hotels. This study suggests that sharing the operational knowledge among relevant groups will be able to help the development of the operational technologies and can increase the efficiency of the convention hotels in Thailand as well.

Keywords: Stochastic frontier, Copula, Hotel efficiency

1. Introduction

Tourism industry is currently considered as one of the most significant industry braches in the world. It tends to be growing more and more in the future due to technology development in the field of modern and effective management. Moreover, there is investment in tourism facilities and services, especially destination in Southeast Asia. Countries in this region has become a relatively high growth of tourism on account of many natural tourist attraction spots as well as interesting Art and culture to visitors from around the world. In addition to the economic integration with countries in Southeast Asia called Asian Economic Community or AEC, this will benefit both business of leisure hotels and the hotels for the conference which not only provide overnight accommodation but serve meetings and exhibitions as well. Business expansion in conference hotel will be likely to gain more popular soon. Furthermore, attributed to Thailand has offered to host the World EXPO Exhibition in 2020, there will be more convention accommodations and attract a large number of visitors. This can lead to a lot of competition among hotels in the country as well as those in Southeast Asia. The objective of this study is to evaluate and analyze operational efficiency of the hotels for conference in order to lift quality controls and maintain a high standard of the services; other is to improve the development and implementation in order to be competitive under current and future conditions in a market that is now expanding rapidly.

2. Literature review

Akarpong Untong (2011) classified the hotels and guesthouse into five groups with distinctive levels of operational technologies. By used meta-frontier analysis is applied to evaluate the efficiency. Found that the international chain had highest efficient scores. And he is suggesting that different policies and technology should be used to improve the operational efficiencies in the hotel and guesthouse and sharing knowledge within the group would help develop the operational and increase the efficiencies for whole industry.

Murray D. Smith (2007) employing the copula in the stochastic frontier model to joint behavior of U and V in the composite error $W = V – U$ of the stochastic frontier mode. Normally the stochastic frontier models are assumed to be independent random variables. By employing the copula it can be parameterized thereby allowing the data the opportunity to determine the adequacy of the independence assumption. For example constructs a model for panel data that is then used to conduct a Monte Carlo exercise in which estimator bias is examined when the dependence structure is incorrectly ignored.

Jin-Li Hu (2009) used the one-stage stochastic frontier approach (SFA) in the study to simultaneously estimate cost efficiency and factor of cost inefficiency for hotel in Taiwan. An SFA model with three outputs and three inputs is defined. Empirical results show that international hotel in Taiwan are on average operating at 91.15% cost efficiency. Chain systems, tourist guides, and international transportation can significantly improve the cost efficiency of efficiency of international hotel in Taiwan.

3. Methodologies

To begin with the Standard Stochastic Frontier Model (SFA), it is generally formulated hypothesis in order to determine two independent random variables between U (represents technical inefficiency) and V (represents uncontrollable disturbances) of the composite error W=V-U . In addition to applying the copula approach to statistical model, the Standard Stochastic Frontier is able to make possible to create estimation of the relationship between the variables U and V. Parameterization of this structure allows the extension of the association between the variables U and V to be measured of using data. Moreover, the independence between U and V, a special case, can be tested. The dependent error components of Stochastic Frontier with copula are less restrictive than the Standard Stochastic frontier and also more attractive to statistical grounds. The results show that copula families which are the most suitable to data process are Gaussian copula; seeing that, the non-linear relationships between θ and S_ρ show dependence between U and V for the data.

4. The Data

In this study, Cross Section Data has been employed using the data from Hotel and Guesthouse Survey 2010 which was conducted by the National Statistical Office. The survey provides information on the operation of 450 licensed conference hotels nationwide in 2009. The variables cited in this study are based on those in the studies of Akkarapong Anthong and Mingsan Kaosaad (2009). And used analysis software from Jianxu Liu and Songsak Sriboonchitta (2012) Stochastic Frontier software using Copula.

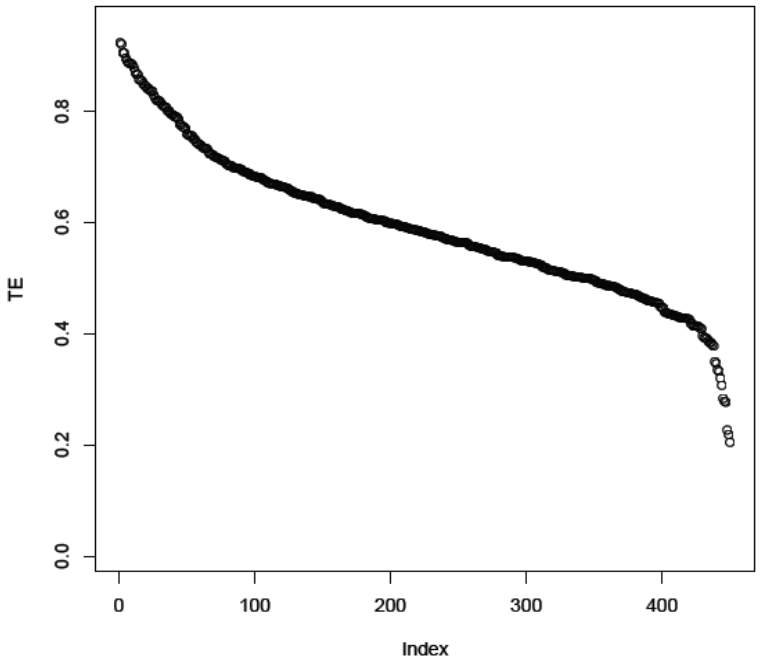
5. Empirical results

Table 5.1 shows Scholastic Frontier with copula and an estimation of Maximum Likelihood (ML) from copula models, which Product copula represents the estimation of Standard Scholastic Frontier. The selection of copula models is based on which model has the highest value of Log-likelihood. As shown on Table 5.1, Gaussian copula is the most appropriate model with the highest Log-likelihood value of -233.0659. Besides, the AIC and BIC values of Gaussian Copula are 466.1674 and 466.2405 respectively, which are the lowest of all. Moreover, a negative correlation at 0.01 significance level between θ and error components has been found. This means that U and V are dependent with each other. Additionally, θ and S_ρ are negatively correlated and have a non zero value. This also reveals that U and V are dependent. According to the estimation on Table 5.1, if conference hotels add one more room (β_1), their revenue will increase by 0.18 percent. For labor factor (β_2), if the hotels add one more employee, their revenue will rise by 0.3 percent. For operational costs (β_3), if the hotels spend one more million baht in operation, their revenue will increase by 0.54 percent. Lastly, if the hotels increase their total assets (β_4) by 1 million baht, their revenue will go up by 0.08 percent.

Table 5.1: Parameter estimate of the Stochastic frontier with copula

	Gaussian copula	FGM copula	Frank copula	Product copula
β_0	5.4069***	4.5207	5.5343	13.9261
β_1	0.1817***	0.1066	0.1553	0.0377
β_2	0.3264***	0.3390	0.3066	0.1711
β_3	0.5404***	0.6095	0.5491	0.8082
β_4	0.0817***	0.0483	0.0710	0.1586
σ_u	0.8751***	0.2674	0.8980	17.0585
σ_v	0.2469***	0.2211	0.5446	0.4355
θ	-0.8604***	0.0313	-3.6968	0
log likelihood	-233.0659	-265.596	-272.2999	-1937.115
S_ρ	-0.8494	0.0104	-0.5267	0
λ	3.5447	1.2094	1.6487	39.1697
σ^2	0.8267	0.1204	1.1031	291.1828
γ	0.9262	0.5939	0.7310	0.0006
AIC	466.1674	531.2276	544.6354	3874.26
BIC	466.2405	531.3006	544.7085	3874.324
Kendall tau	-0.8494	0.0069	-0.3649	0

Technical efficiency TE



From Figure above, it is indicated that the numeric value of conference hotel efficiency ranges from 0.4 to 0.8. The highest and the lowest numeric values of efficiency are 0.9229 and 0.27 respectively. Interestingly, there are 37 conference hotels with high efficiency value between 0.80 and 0.92. On the other hand, 6 out of 450 conference hotels have low efficiency value. It is found that conference hotels are mostly large and have average total assets of 102,013,780 million baht. Being large-sized, these hotels normally have a well-organized and efficient management system along with competent employees. With increasingly high competition, they are trying their best to enhance their operational efficiency. This is clearly seen in the high value of efficiency. However, some conference hotels show a surprisingly low value of efficiency. This is due to their size, low budget, infrequent meetings and small number of conference rooms, and also lack of management efficiency or even shortage of employees.

Table 5.2 Results of efficiency analysis

Rank	TE	Region	Number of conferences rooms	Number of conferences held	Number of attendees	Revenue (million baht)	Number of years in business	Number of guest rooms
1	0.9229	Northeast	6	36	7,200	2,521,427,294	50	193
2	0.9203	South	4	250	25,000	39,370,000	17	109
3	0.9051	North	4	300	5,000	32,194,000	38	100
4	0.8952	Bangkok	7	100	48,000	745,300,000	17	372
5	0.8858	Central	4	2	1,700	41,210,000	6	90
6	0.8662	Central	4	19	7,000	16,761,706	4	74
446	0.2836	North	2	3	300	838,010	8	46
447	0.2787	North	3	10	1,300	7,861,152	18	70
448	0.2268	Northeast	2	8	1,200	198,500	7	22
449	0.2189	North	1	3	100	1,080,970	3	37
450	0.2048	Northeast	1	1	25	68,000	1	5

Source: calculation

According to Table 5.2 showing the first six ranks and the last five ranks of hotel efficiency, hotels in the first six ranks have the highest annual revenue ranging from 16,761,706 to 2,521,427,294 million baht per year. They also have a large number of conference attendees ranging from 1,700 to 48,000 people and also a very high frequency of conference accommodations, from 19 to 300 times per year. Moreover, these hotels can provide the attendees with 90 to 372 guest rooms. In contrast, the hotels

in the last five ranks hold only 1 to 10 annual conferences and have only 5 to 46 conference rooms. The number of attendees and the annual revenue are 25 to 1,300 people, and 68,000 to 7,861,152 million baht respectively. From analyzing Table 5.2, it can be concluded that conference hotels with the highest efficiency are large-sized and well-trusted by many organizations, they generally come up with effective strategies to make their investment most profitable. They are capable of accommodating a large number of conferences and participants. In addition to business conferences or seminars, they can hold many events such as exhibitions or weddings at the same time. They can also provide their guests with good facilities. These strengths enable large hotels to have higher efficiency and outmaneuver than smaller rivals.

Results of the analyzing of factors contributing to inefficiency are presented in the following table:

Table 5.3 Results of analyzing factors contributing to inefficiency

	Estimate	Std. Error	t value	Pr(>t)
(Intercept)	0.39154***	0.03870	10.116	<2e-16
z1	-0.05527***	0.01544	-3.579	0.000382
z2	0.03263**	0.01128	2.892	0.004015

(*** = Significance level of α = 0.01 or having confidence level of 99%,
** = Significance level of α = 0.05 or having confidence level of 95%,
* = Significance level of α = 0.10 or having confidence level of 90%)

Source: calculation

Table 5.3 presents the results of analyzing inefficiency factors. It is clearly seen that a significance level of 0.01 has been found in the ratio of employee per room (Labor Productivity) (Z1). This leads to a conclusion that if conference hotels increase their ratio of employee per room by 1 percent, their inefficiency level will drop by 0.05 percent. As for the ratio of foreign guest per totals (Market and Service Standards) (Z2), if this ratio increases by 1 percent, the hotel inefficiency will decrease by 0.03 percent.

6. Conclusions

The important factors which affect hotel efficiency can be divided into four parts. To begin with the hotel room factor (β_1), increasing in number of rooms will result in higher efficiency, in other words, higher revenue. The supportive reason is that there will be many conference accommodations and a number of attendees in the future due to Asian Economic Community or AEC; therefore, hotel owners should equip with a suitable proportion which is consistent with the capacity of the meeting rooms and participants. Secondly is the labor factor (β_2), if the number of employees are added, the revenue and operational efficiency will be augmented as well. Many conference hotels which provide a large number of conference rooms can arrange many meetings at the same time; therefore, it is important that the hotels have adequate staff to handle

these events. The third factor is the operational costs (β_3) which are considered as the main capital of the business. Compared with other factors, investments on operational costs will yield higher revenue as well as the highest efficiency to the business. On the contrary, increasing in total assets (β_4) has a little effect on the hotel efficiency. A possible cause of this can be that many conference hotels invest their resources on non-performing assets such as hotel decoration, etc.

In addition, there are two variables in the factor model which lead to inefficiency. The first factor is the ratio of employees per room (Z1); if the ratio is raised this can cause the addition of the development of the hotel efficiency and revenue which is consistent with the labor factor (β_2) as mentioned above. The second factor is the proportion of foreign guests per totals (Z2). It is presented that the augmentation of this ration can reduce the hotel efficiency. Obviously, the emphasis of conference hotels on attracting foreign guests will make the hotels perform less efficiently. The cause could be that their management system has been created to meet mostly the needs of Thai guests. In this case, these hotels should give priority and focus more on attracting Thai customers over foreigners.

The analysis of hotel characteristics and efficiency has found that conference hotels with strong operational efficiency are mostly large hotels. They have a large number of guest rooms as well as various kinds of facilities that can satisfy their guests. Moreover, these hotels have sufficient resources of funds to hire highly-skilled staff and well-organized management systems. Therefore, these hotels are able to use their resources more productively than smaller hotels. It is advised that the government impose a policy that will boost operational efficiency for conference/seminar hotels in Thailand. Also, workshops where hotels can share useful tips in management and operation should be encouraged. These factors can yield numerous short term and long term benefits to the industry and prepare the hotels for market competition.

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