An Alternative Hotel Pricing Technology: Hedonic Price Model for Pricing Beach Resort Revenue in Thailand.

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Abstract

Two classical methods for pricing the average daily rate (ADR), ADR Rule of Thumb Method and Discounted Cash Flow Analysis Method have some limitations. The aim of this research is to find the determinants of average room revenue and to propose an average daily rate prediction model of beach resorts in Thailand using a hedonic price method, as an alternative pricing technology. Three groups of independent variables are identified from a literature reviews and verified by experts: resort rating, physical attributes, and location attributes. Average daily rate is the dependent variable of the prediction model. The study finds that a log–log multiple regression model with 11 determinants is the best prediction model and the variables with highest effect on average daily rate are, in descending order, star rating, being located on Samui or Phuket Islands, spa availability, and international brand availability. The research findings are useful for investors or developers, government authorities, and academics.

Keywords: pricing, hotel pricing technology, physical attribute, location, Thailand, hedonic price model

1. Introduction

Technology is the practical use of scientific discoveries (Cambridge, 2019). Two classical methods for pricing the average room rate (average daily rate, ADR) are the $1-per-$1,000 Method or ADR Rule of Thumb Method (Deveau et al., 1996; O'Neill, 2003) and Discounted Cash Flow (DCF) Analysis Method (O'Neill, 2003). However, both methods have some limitations such as no empirical evidence and financial structure negligence problems of ADR Rule of Thumb Method and assumption requirement problem of Discounted Cash Flow (DCF) Method (O'Neill, 2003).

This research aimed to find the determinants of ADR and to propose an ADR prediction model, using the hedonic price method, of beachfront resorts located in Thailand, as an alternative pricing method. Thailand has the world's top-ranked beaches, guaranteed by the Global Beachfront Awards and Asia's Leading Beach Destination in 2014 (Thailand Convention & Exhibition Bureau, 2015). According to the Tourism Authority of Thailand (2015), there are 9,874 hotels and resorts in Thailand, of which 5,730 (about 58.03%) are resorts and 2,224 resorts (about 38.81%) are located in 11 beachfront provinces (out of 76 Thai provinces), namely, Krabi, Phuket, Phangnga, Trad, Chonburi, Rayong, Petchburi, Suratthani, Prachuabkirikhan, Satoon, and Chumporn.

In addition, information from a survey of 9,865 hotels and resorts by Thailand's National Statistical Office (2012) showed that room revenue is the major component of hotels' and resorts' revenues in all regions (National Statistical Office, 2012). This information is in accordance with research in Portugal by Oliveira et al. (2013), where room price is one of the key variables of hotels' performance. From this information, it is evident that room revenue directly affects business performance and hotels' and resorts' values. This is because hotels and resorts are usually appraised by income approach, by which their values are derived from their future net operating income (Raleigh and Roginsky, 1999). This finding is consistent with the work of Corgel and deRoos (1993), who reported that hotels' and resorts' values should be calculated from their ADRs. Additionally, for hotels' and resorts' operator perspective the better ADR can lead to better NOI (Net Operating Income) under operating conditions as normal state of the economy (O'Neill &Mattila, 2016).

This study reviewed several former research studies concerning hotels' and resorts' ADR prediction models in several regions around the world, and the literature review revealed different determinants, as well as the form of the proposed ADR prediction model. It can be concluded that hotels in different regions may have different significant determinants and the determinants, as well as the prediction models, are not accurate enough to be used to predict suitable prices of beachfront resorts in Thailand.

In addition, a literature review showed there is no previous research that directly mentions determinants and a price prediction model of beachfront resorts in Thailand. There are several expected contributions to be made from the findings of the research. Resort investors and entrepreneurs could use the determinants and their correlation coefficients as well as the ADR prediction model as supporting data in making decisions for several key business operations, such as project feasibility studies, pricing room rates, resort value appraisal, and resort renovation for higher room rates. In addition, government authorities could launch effective measures to promote the hospitality industry by improving public facilities concerning the key determinants. Finally, academics could find it useful to access the determinants and ADR prediction model applicable to beachfront resorts in Thailand as a usable source of information for further research.

2. Literature Review

The hedonic price model is an implicit price prediction model of goods using multiple regression analysis (Rosen, 1974). The hedonic price model is a famous method adopted by several researchers in analyzing the ADR of hotels. Surveying former research works in various regions and with various sizes of hotels, the authors found that the most extensive models are log–linear and linear regression models with adjusted R^2 values or R^2 values within the range of 0.311–0.820. The details of each study are as follows.

Israeli (2002) studied 215 hotels in Israel and proposed linear-form models with three significant determinants: 1) star rating, 2) hotel brand, and 3) number of rooms. The models had a range of 0.620–0.820 adjusted R^2 values. In the same year, White & Mulligan (2002) collected data from 584 hotels in four states in the United States, namely, Arizona, Colorado, New Mexico, and Utah, and also proposed linear-form models with a range of 0.570–

0.583 adjusted R^2 values. There were four significant determinants in the models: hotel brand, average room size, central business district (CBD) location, and location in travel destination. Monty & Skidmore (2003) studied 15 bed and breakfasts in Wisconsin, United States. They found that best-fit models for their work were of a linear form with a range of 0.605–0.714 adjusted R^2 values and three significant determinants: location attributes, increasing weekend price from weekday price, and increasing price during travel season. Thrane (2007) collected data from 74 hotels in Oslo, Norway and reported that the best-fit models were in log-linear form with a range of 0.703–0.705 adjusted R^2 values. It was found that some physical attributes, such as the availability of a minibar, hair dryer, room service, and free parking, have significant effects on room rate. However, hotel brand and distance from city center are also significant. Furthermore, Chen & Rothschild (2010) collected data from 73 hotels in Taipei and proposed log-linear models with a range of 0.681–0.703 adjusted R^2 values. There were four significant determinants in this research: hotel brand, average room size, hotel facilities, and CBD location.

The studies of key determinants and the best-fit prediction models for hotel business has come to be an interesting topic for researchers, as seen by the many works that have been undertaken in various regions at the same time. Zhang et al., (2011) collected data from 243 hotels in New York, United States and proposed log–linear models with a range of 0.311–0.686 adjusted R^2 values, with hotel facilities as the major significant determinant. Rigall-I-Torrent et al. (2011) studied 197 hotels in Costa Brava, Spain and proposed a linear-form model with 0.808 adjusted R^2 value. They reported four significant determinants: star rating, hotel facilities, private beach (has or has not), and usable beach (has or has not). Finally, Abrate et al. (2011) studied 140 hotels in Turin, Italy and found that the best-fit model was a linear form with 0.780 adjusted R^2 value and two significant determinants: star rating and hotel facilities.

Moreover, there are several related research works that may not be directly undertaken in the hotel industry but that show the application of the hedonic price method. For example, Sinclair et al., (1990) studied hedonic prices of holiday packages in Costa del Sol in Malaga, Spain and summarized the significant determinants of the package prices as star rating, hotels attributes, and location attributes. Roubi & Littlejohn (2004) studied determinants of hotel transaction values in the United Kingdom. Data were collected from 211 hotels during 1996 to 2002 and seven determinants, sorted by their levels of effects on the values, were identified: number of rooms, local economic conditions during the year, details of recreation facilities, meeting and banquet facilities, affiliation with major hotel chain, number of food and beverage outlets, and location attributes. In addition, Thrane (2005) analyzed the prices of package tour accommodation to the Canary Islands offered in the catalogues of four Norwegian tour operators. Data were collected from 252 packages. Four determinants were found from the research results: tour operator attributes, destination attributes, hotel star rating, and package attributes. However, some variables were found not to affect package prices significantly, that is, swimming pool for children, sport facilities, age of hotel, 24-hour reception. In addition, this research concluded that a hotel's star rating is strongly affected by package price. Finally, Haroutunian et al. (2005) studied holiday package prices in Mediterranean countries from quality characteristics informed in tour operator brochures using the hedonic price method. The results showed that information from the brochures of tour operators can result in the analysis being misleading, implying that physical attributes alone are not enough to analyze implicit prices.

Even though these research works are not very accurate for use in predicting the revenues of beachfront resorts in Thailand directly, their determinants, forms of best-fit models, and the range of accepted adjusted R^2 values provide the necessary information to perform this research.

3. Methodology

This research analyzed beach resort price determinants and developed an ADR prediction model using the hedonic price method. The dependent variable of the hedonic price model is the price of goods and the independent variables are the goods' physical attributes (Rosen, 1974). Furthermore, location attributes and hotel rating can be included as independent variables for more plausible results, as proposed by several literatures, e.g. Bartik (1987), Israeli (2002), Rigall-I-Torrent et al. (2011), Abrate et al. (2011), Sinclair et al. (1990) and Thrane (2005).

According to Halvorsen and Pollakowski (1981), there is no general function form for the hedonic price model. However, four function forms are normally used in former research works (Israeli, 2002; White & Mulligan, 2002;

Chen & Rothschild, 2010; Abrate et al., 2011; Rigall-I-Torrent et al., 2011; Zhang et al., 2011):

1. linear form;
2. log–linear form that transforms the dependent variable by taking the logarithm;
3. linear–log form that transforms the independent variables by taking the logarithm; and
4. log–log form that transforms both types of variables by taking the logarithm.

For multiple regression analysis normally, the multicollinearity problem should be prevented by removing or merging any pair of the independent variables that have correlation of more than 0.750 (Prasith-rathsint & Sukkasem, 1993). Moreover, the variance inflation factor (VIF) is a well-known multicollinearity investigative tool, in which the VIF value of each selected independent variable in a multiple regression equation should not be more than 10.

There are four statistical criteria used for evaluating multiple regression analysis models, as presented in Table 1 (Prasith-rathsint and Sukkasem, 1993; Panichwong, 2002; Wanitbancha, 2003).

The independent variables were selected for insertion in the model by the stepwise regression method. This method analyzes previous inserted variables and the last inserted variable simultaneously when there is a new variable inserted in the model.

Finally, the model adopted in this research was tested by two statistical tests, that is, pair-sample t-test and Theil's U Test, with data from 90 random beachfront resorts that had not been used in the multiple regression analysis process. Pair-sample t-tests compare the mean of the observed ADRs and the mean of the ADRs calculated from the model at 0.05 significance level in order to verify the accuracy of the model. Meanwhile, Theil's U Test always provides a value of more than 0. A value of less than 1 shows that the model is accurate while, on the other hand, a value of more than 1 indicates the model is not accurate. The less value the test shows, the more accurately the model can predict the dependent variable (Makridakis et al., 1983).

Table 1. Statistical Criteria for the Best-fit Model

Statistical Criteria	Condition	Statistical Meaning
Significance Value of Independent Variables	All variables have a t-test significance value of not less than 0.05	All variables in the model are significant
Adjusted R^2	As much as possible	The higher the value is, the closer the data are to the fitted regression model
Variance Inflation Factor (VIF)	Not more than 10	No multicollinearity of the independent variables
Residual	1. Residuals are normally distributed 2. Residuals' mean is equal to zero 3. There is no heteroscedasticity problem 4. No relationship between each residual (Durbin–Watson statistic between 1.50 and 2.50)	All conditions of the residuals from multiple regression analysis are satisfied

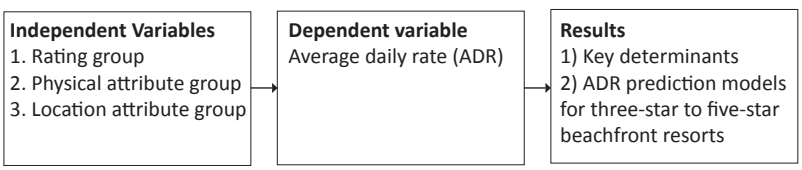
Table 2. Independent Variables that Affect ADR

Group	Independent Variables	Sources										
		Israeli (2002)	White and Mulligan (2002)	Monty and Skidmore (2003)	Thrane (2007)	Chen and Rothschild (2010)	Zhang et al. (2011)	Rigall-I-Torrent et al. (2011)	Abrate et al. (2011)	Sinclair et al. (1990)	Roubi and Littlejohn (2004)	Thrane (2005)
Rating	1. Star rating	X						X	X	X		X
	2. Brand	X	X		X	X						
Physical Attributes	1. Number of rooms	X			X					X	X	
	2. Average room size		X		X	X				X	X	
	3. Hotel's facilities				X	X	X	X	X	X	X	X
Location Attributes	1. Located in CBD		X	X	X	X				X	X	X
	2. Located in travel destination		X	X						X	X	X
	3. Private beach (has/has not)							X		X		X

4. Hypothesis

From the literature review and screening by experts in the hospitality industry, there were nine independent variables affecting ADR, which can be categorized into three groups. The first group is hotel rating. This consists of star rating and brand, which were found in previous research works, that is, Israeli (2002), White & Mulligan (2002), Thrane (2007), Abrate et al., (2011), and Rigall-I-Torrent et al. (2011). The second group is physical attributes, which consist of number of rooms, average room size, and hotel facilities, mentioned in such former research works as Sinclair et al. (1990), Roubi & Littlejohn (2004), and Thrane (2007). The third group is location attributes, comprising four variables: CBD location, travel destination location, private beach availability, and usable beach. These variables are found in Sinclair et al. (1990) and Thrane (2005). The details of the variables and their references are presented in Table 2.

Figure 1. Variable Framework of Research



ADR is prescribed as the dependent variable. The variable framework presented in Figure 1 establishes hypotheses in which each independent variable (rating variables, physical attribute variables, and location attribute variables) has effects on the dependent variable, or the ADR of beachfront resorts in Thailand.

5. Data

5.1 Sources of Data

In 2012, the Thai Hotel Association rated 118 beachfront resorts into 37 five-star resorts, 56 four-star resorts, and 25 three-star resorts (Thai Hotel Association, 2012). However, the number of resorts from this source was too small to perform multiple regression analysis, whose minimum sample size should be calculated using at least five samples for each independent variable, as suggested by Bartlett et al. (2001). Using this method, data from 564 sample resorts (273 three-star resorts, 190 four-star resorts, and 101 five-star resorts) were collected from agoda.com (www.agoda.com), the most popular hotel reservation website in Thailand (www.alexa.com, 2014). From the authors' exploratory survey, by comparing resort ratings from the Thai Hotel Association (2012) and agoda.com, it was

found that 86.44% (102 of 118 matching resorts) of the resorts were rated at the same level, showing that data from agoda.com has enough validity to be used in this research. Moreover, research work by Law and associates in 2015 which interviewed about importance of online distribution channel in found that online distribution channel is increasing importance in tourism products. As for the quantity of data collected in the research, the actual sample size was more than the minimum sample size of 110 resorts (22 independent variables multiplied by 5 samples per variable). The actual ratio between the acquired sample size and the number of independent variables was 25.64 (564 divided by 22).

The data about physical and location attributes of the sample resorts were collected from public information. In addition, the ADR of a resort was calculated from its average 12-month room rate for all room types available on agoda.com. In order to control the effect of the period on the resorts' ADRs, all data items were collected during September to December 2014, which was the data collection phase of this research.

5.2 Research Variables

ADR is an important indicator for use in measuring hotels' sales performance. It was calculated in a specific period, such as monthly, quarterly, or yearly. The unit of ADR is the Thai Baht (Thailand's currency) or a conversion from another applicable currency per room per night. ADR was calculated using Equation 1 below (Raleigh and Roginsky, 1999).

$$ADR = \frac{Room\ Revenue}{Number\ of\ Rooms\ Booked} \quad \text{(Eq.1)}$$

In Thailand, the Annual Registration Statement (56-1 Form) and 2014 annual reports of four large hospitality companies presented their major revenues generated from room revenue, as presented in Table 3.

Table 3.
Revenue Structure of Four Large Hospitality Companies in 2014

Company	Room Revenue Ratio	Beachfront Resort	Total Hotels & Resorts
CENTEL (2014)	56%	9	13
ERW (2014)	61%	8	16
MINT (2014)	62%	10	21
DTC (2014)	54%	3	12

Furthermore, Thailand's Ministry of Tourism and Sports has defined a resort as a place that leases temporary rooms for the rest of tourists or travelers. The majority of resorts are located in attractive natural destinations. The services and facilities of resorts depend on their ratings, which can be classified into five levels from one star to five stars, the most luxurious being a five-star hotel (Ministry of Tourism and Sports, 2007). In agoda.com, the star rating of the hotels shown in the website were determined by their owners in order to show the comfort, facilities, and amenities that the customers can expect (www.agoda.com, 2019).

In this research, three groups of independent variables that affect the beachfront resorts' ADRs were derived from the review of several former research works, as mentioned in Section 3. The variables were classified into three groups: rating (the authors inserted "R" ahead of these variables' names), physical attributes ("P"), and location attributes ("L"). All variables were verified by 13 experts, who were high-level managers in the hotel industry with more than 5 years of experience, before the researchers began to collect the required data from the resorts' public information. The experts' details are presented in Table 4.

Table 4. Experts' Details

No.	Role	Organization	Number of Responsible Hotels
1	Management in sales and marketing	Listed company in hotel business	5
2	Management in finance	Listed company in hotel business	26
3	Management in business development	Listed company in hotel business	16
4	President	Sales and marketing consultant	4
5	Management in finance	Listed company in hotel business	5
6	Management in operations	Company in hotel business	5
7	Management in finance	Listed company in hotel business	11
8	Management in marketing	Listed company in hotel business	4
9	Hotel's owner	Standalone hotel	2
10	Hotel's owner	Standalone hotel	1
11	Hotel's owner	Standalone hotel	1
12	General manager	Standalone hotel	1
13	Hotel's owner	Standalone hotel	1

Table 5. Independent Variables of the Prediction Model

Group	No.	Variable	Description	Measure
Rating	1	R_Star3	Three-star beach front resort (yes or no)	Dummy
	2	R_Star4	Four-star beach front resort (yes or no)	Dummy
	3	R_Brand	Resort's international brand (has or has not)	Dummy
Physical Attributes	4	P_Rmsize	Average room size (square meters)	Scale
	5	P_Staff	Staff performance score from agoda.com review	Scale
	6	P_Room	Room standard score from agoda.com review	Scale
	7	P_Outlet	Number of outlets in resort	Scale
	8	P_Pool	Swimming pool availability (has or has not)	Dummy
	9	P_Fitness	Fitness availability (has or has not)	Dummy
	10	P_Spa	Spa availability (has or has not)	Dummy
	11	P_Recrea	Others recreational facilities, such as tennis, squash, etc. (has or has not)	Dummy
	12	P_Rs	Room service availability (has or has not)	Dummy
	13	P_Internet	Availability of free internet in room (has or has not)	Dummy
Location Attributes	14	L_Pk	Located on Phuket Island	Dummy
	15	L_Sm	Located on Samui Island	Dummy
	16	L_Hh	Located in Hua-Hin, Cha-am, Pranburi	Dummy
	17	L_Chon	Located in Chonburi, Rayong	Dummy
	18	L_Krb	Located in Krabi, PhangNga	Dummy
	19	L_Oth	Located in others destinations, such as Lanta Island, Chang Island	Dummy
	20	L_Ovw	Location score from agoda.com review	Score
	21	L_Bhwd	Width of private beach (meters)	Score
	22	L_Bhplay	Usable beach availability (has or has not)	Dummy

After the variable list was verified by the experts, 22 independent variables were collected for the analysis process. They can be classified into dummy and scale variables. Dummy variables are 1 if the hotel has the computing attribute and 0 otherwise. Furthermore, all dummy variables have to be standardized before performing multiple regression analysis. The details of the independent variables of the prediction model are presented in Table 5.

The correlation values of all independent variables are presented in Table 6. A pair of variables was found that had a correlation value of 0.919, which is more than the 0.750 suggested by Prasithrathsint and Sukkasem (1993). These variables were P_Staff (staff performance score from the agoda.com review) and P_Room (room standard score from the agoda.com review). These two variables were merged into one variable by factor analysis. The new variable's name was

Table 6. Correlation Values of All Independent Variables

Independent Variable	R_Star3	R_Star4	R_Brand	P_Rmsize	P_Staff	P_Room	P_Outlet	P_Pool	P_Fitness	P_Spa	P_Recrea
R_Star3	1.000										
R_Star4	-0.690	1.000									
R_Brand	-0.265	0.033	1.000								
P_Rmsize	-0.354	0.067	0.066	1.000							
P_Staff	-0.469	0.136	0.174	0.347	1.000						
P_Room	-0.453	0.109	0.177	0.350	0.919	1.000					
P_Outlet	-0.514	0.141	0.385	0.181	0.248	0.244	1.000				
P_Pool	-0.239	0.165	0.074	0.096	0.057	0.080	0.180	1.000			
P_Fitness	-0.499	0.147	0.324	0.217	0.325	0.314	0.490	0.233	1.000		
P_Spa	-0.516	0.168	0.289	0.255	0.338	0.332	0.445	0.207	0.517	1.000	
P_Recrea	-0.267	-0.005	0.168	0.135	0.165	0.173	0.343	0.157	0.275	0.344	1.000
P_Rs	-0.303	0.174	0.086	0.050	0.125	0.125	0.237	0.249	0.264	0.245	0.105
P_Internet	-0.114	0.073	0.104	0.074	0.149	0.157	-0.008	0.003	0.107	0.089	0.022
L_Pk	-0.110	0.033	0.059	0.075	0.037	0.040	0.224	0.014	0.213	0.131	-0.065
L_Sm	-0.059	0.021	0.047	0.026	0.111	0.110	0.022	0.080	0.038	0.079	0.121
L_Hh	-0.019	0.012	-0.004	0.043	0.042	0.041	-0.048	-0.018	-0.067	-0.049	-0.097
L_Chon	-0.001	0.002	0.108	-0.058	-0.125	-0.137	0.025	-0.050	0.093	-0.048	-0.087
L_Krb	-0.007	0.057	-0.060	-0.027	0.007	0.029	-0.072	-0.005	0.027	-0.006	-0.097
L_Oth	0.200	-0.108	-0.141	-0.082	-0.089	-0.100	-0.199	-0.032	-0.308	-0.139	0.181
L_Ovw	-0.134	0.016	0.095	-0.004	0.272	0.314	0.177	0.012	0.078	0.147	0.142
L_Bhwd	-0.277	-0.047	0.196	0.200	0.209	0.229	0.363	0.125	0.220	0.283	0.403
L_Bhplay	-0.156	-0.007	0.104	0.082	0.137	0.152	0.147	0.152	0.042	0.182	0.402

Independent Variable	P_Rs	P_Internet	L_Pk	L_Sm	L_Hh	L_Chon	L_Krb	L_Oth	L_Ovw	L_Bhwd	L_Bhplay
R_Star3											
R_Star4											
R_Brand											
P_Rmsize											
P_Staff											
P_Room											
P_Outlet											
P_Pool											
P_Fitness											
P_Spa											
P_Recrea											
P_Rs	1.000										
P_Internet	0.092	1.000									
L_Pk	0.106	0.030	1.000								
L_Sm	0.152	0.056	-0.287	1.000							
L_Hh	-0.085	-0.003	-0.257	-0.168	1.000						
L_Chon	0.022	0.006	-0.220	-0.144	-0.129	1.000					
L_Krb	0.020	-0.036	-0.218	-0.142	-0.128	-0.109	1.000				
L_Oth	-0.217	-0.060	-0.341	-0.223	-0.200	-0.171	-0.169	1.000			
L_Ovw	0.103	0.018	-0.012	0.048	-0.041	-0.077	-0.058	0.104	1.000		
L_Bhwd	0.145	0.016	-0.103	0.135	-0.038	-0.080	0.020	0.071	0.202	1.000	
L_Bhplay	0.110	0.047	-0.322	0.325	0.012	-0.174	-0.050	0.228	0.233	0.592	1.000

P_StfRm (physical attribute score, derived from staff performance score and room standard score from agoda.com review) and its component score was 0.510. After merging the correlated variables, the final number of independent variables is 21.

The acquired data were analyzed by the hedonic price model to find the relationships between the independent variables and the dependent variable (ADR of the resort). Then, the key independent variables, or the determinants of ADRs, were identified and discussed. Section 6 presents these results.

6. Results

From the analysis, the log–log form model produced an adjusted R^2 value of 0.833, which was the highest value among all forms of model, and all statistical criteria mentioned in Table 1 were satisfied. The adjusted R^2 values of all models are presented in Table 7. Referring to the stepwise regression method, the variable with the highest correlation coefficient was first inserted in the model and the variable with the next highest coefficient was the next to be inserted. This process was repeated until all variables were inserted in the model. The regression result showed there were 11 independent variables that were significant at the 95% confidence level; their descriptive statistic results are shown in Table 8. The other independent variables were deleted from the model, as they were not significant at the 95% confidence level; in other words, they could not improve their adjusted R2 values when they were added to the model. However, it should be noted that because the model is in log-log forms, the model gives increasing ADRs for 3-star, 4-star, and 5 star hotels, respectively, even the coefficient of R_Star3 is higher than R_Star4.

Table 7. Adjusted R^2 of All Models

Model Form	Adjusted R^2
Log–log	0.833
Log–linear	0.818
Linear	0.752
Linear–log	0.671

As for the other statistical values for multiple regression analysis, the acquired model complied with the mentioned criteria, as per the results shown in Table 9. The scatter plot between the residuals and predicted ADRs from the model was free dispersed, showing that the predicted ADRs do not depend on the residuals and the model does not have a heteroscedasticity problem.

Finally, the acquired model is shown in Equation 2.

$$\begin{aligned}\log(ADR) = {} & 310.693 \log(R\_Star3) + 155.068 \log(R\_Star4) \\ & -69.550 \log(L\_Sm) - 69.529 \log(P\_Spa) \\ & - 64.742 \log(L\_Pk) - 48.687 \log(R\_Brand) \\ & + 0.017 \log(L\_Oth) + 0.869 \log(L\_Ovw) \\ & + 0.615 \log(P\_Rmsize) + 0.616 \log(P\_StfRoom) \\ & + 0.017 \log(L\_Bhwd) + 21.850 \qquad \text{(Eq.2)}\end{aligned}$$

where, P_StfRoom= 0.510 (P_Room) + 0.510(P_Staff)

From the model's log–log form, it is difficult to analyze the changes in ADR when some independent variables are changed because the ADR will change into non-linear form. For example, (1) the model gives increasing ADRs for 3-star, 4-star, and 5 star hotels, respectively, even the coefficient of R_Star3 is higher than R_Star4; and (2) Some variables such as Located on Samui Island, Spa availability, Located in Phuket Island, and Resort's international brand are indicators of the higher ADR of hotels, but their coefficients are minus. Table 10 illustrates more about this issue. If room size were fixed to 45.00 square meters and the location score from the agoda.com review were to increase from 8.10 to 8.50, the ADR would increase by 147.07 baht. However, if the score were to decrease from 8.10 to 7.70, the ADR would decrease 148.02 baht. Table 10 shows the non-linear effect of independent variable changes on the ADR.

The pair-sample t-test value of the selected model is 0.313 at the 0.05 statistical significance level. The result shows that the observed and predicted ADRs from the proposed model are not significantly different, conforming to Theil's U statistic value of 0.435, and showing that the proposed model is acceptably accurate.

Variables	Coefficient	Std.Error	t-Statistic	Sig.	Collinearity Statistic: VIF*
Constant	21.850	16.817	1.299	0.194	
P_Rmsize	0.615	0.032	19.102	0.000	1.807
R_Star3	310.693	27.304	11.379	0.000	4.644
R_Star4	155.068	21.825	7.105	0.000	2.654
L_Ovw	0.869	0.119	7.276	0.000	1.229
L_Bhwd	0.017	0.003	6.501	0.000	1.545
L_Oth	41.796	18.961	2.204	0.028	1.484
P_Spa	-69.529	15.912	-4.369	0.000	1.577
P_StfRoom	0.616	0.153	4.033	0.000	1.660
L_Pk	-64.742	16.281	-3.976	0.000	1.401
L_Sm	-69.550	20.703	-3.359	0.000	1.421
R_Brand	-48.687	21.924	-2.221	0.027	1.190

Note: * Variance Inflation Factor

Table 8. Descriptive Statistics of all Significant Variables in the Best-fit Model (log–log Model)

Statistical Test	Result
Adjusted R^2	0.833
VIF of all variables (less than 10)	Yes
Residual analysis	
1. Normally distributed.	Yes
2. Mean is equal to zero.	Yes
3. Does not have heteroscedasticity problem.	Yes
4. No relationship between each residual. (Durbin–Watson statistic between 1.50 and 2.50)	1.810
Number of independent variables	11

Table 9. Statistical Test Results of the Best-fit Model (log–log Model)

Predicted ADR 3,439.55 Baht/room/might		Location Score from agoda.com Review				
		7.70	7.90	8.10	8.30	8.50
Room Size (sq.m.)	43.00	3,200.83	3,272.93	3,344.78	3,416.40	3,487.80
	44.00	3,246.38	3,319.50	3,392.38	3,465.02	3,537.43
	45.00	3,291.53	3,365.66	3,439.55	3,513.20	3,586.62
	46.00	3,336.29	3,411.43	3,486.33	3,560.98	3,635.40
	47.00	3,380.68	3,456.82	3,532.71	3,608.36	3,683.77

Table 10. Sensitivity Analysis Table

7. Discussion

The research results were presented to hotel industry experts for verification and feedback. Moreover, some interesting issues arise from a comparison of the research results with those of previous studies. First, a resort's star rating is the most sensitive variable because it implies the resort's overall quality, which conforms to Sinclair et al. (1990) in Costa del Sol, Malaga, Spain and Israeli (2002) in Israel. Focusing on location of resorts, it was found that the ADRs of the resorts located in Samui and Phuket Islands are higher than those of Thailand's other regions. The experts explained that, according to their experience, Samui and Phuket Islands are the most expensive destinations in Thailand, and all expenses of hotel and resort entrepreneurs are very high owing to land prices, construction costs, and operational expenses. This finding means three-star resorts on Samui or Phuket Islands may have higher ADRs than four-star resorts in other locations. Another interesting issue is that beach usability was found to have no impact on hotels' ADRs. This finding differs to that presented in Rigall-I-Torrent et al. (2011) in Costa Brava, Spain and in Hamilton (2007) in coastal districts of Schleswig-Holstein, Germany. Based on the experts' experiences, they were of the opinion that most online customers prefer rooms with sea views and swimming pools to beaches. A surprising finding is that spa availability is the fourth highest determinant, and affects ADR more than the other physical attribute variables, that is, room size, the room standard score from the agoda.com review, and the staff performance score from the agoda.com review. It was found that the correlation between spa availability (P_Spa) and star rating was the highest value. This finding could support the importance of spa service to resorts' ADRs.

8. Conclusion

This study was found that a log–log multiple regression model with 11 determinants is the best model to predict the ADR of Thailand beachfront resorts at a 95% confidence level with 0.833 adjusted R^2 value. Meanwhile, the variables with the highest effects are star rating, Samui Island location, spa availability, Phuket Island location, and international brand availability. In other words, resorts with five stars, spa service, or international brands, or those located on Samui or Phuket Islands will have higher ADRs than others will. The research findings provide very useful information to investors or hotel entrepreneurs in understanding customers' satisfaction with each component of resorts, for example, resort rating, location, service, brand, room size, room standard, staff, and usable beach. Such information could help them find the optimal balance between room price and resort quality, which was proved by Hartman (1989) to increase resorts' operating profits by improving occupancy rates. This information could help them make effective decisions for their key business operations and investment decisions, such as project feasibility studies, pricing room rates, resort value appraisal, and resort renovation for higher room rates. In addition, they can also use the predicted ADR to recheck the room rate gained from the other hotel pricing technologies. Government authorities could also use the research results to launch effective measures to support tourism by improving public regulations or facilities, such as promoting entrepreneurs to develop resorts with higher value to tourists by determining the appropriate components identified in this study, so as to increase national income. Moreover, academics could benefit from this research by using the research results, especially the determinants and ADR prediction model applicable to beachfront resorts in Thailand, as a usable source of information for further research.

Finally, two limitations should be noted. Firstly, the results were applied only to Thai beach resorts, most of whose room revenue is generated from the online travel agent channel. This is because the data were collected from www.agoda.com. Based on experts' opinions, the behavior of customers who use online travel agents to find and book resorts is different from that of general customers on several issues, as discussed in Section 7. Moreover, in 2011 Toh, Raven and DeKay informed concerned issues about online travel agents' (or OTAs') room price are the larger hotels set the room price, which OTAs must follow (Toh, Raven & DeKay, 2011). Nevertheless, room price of the smaller chain and independent hotels are more dominant in setting by OTAs. In addition, when hotels have high vacancies rate room price will reduce and will vice versa when hotels have high-occupied rate.

Secondly, this research focused mainly on the revenue perspective. However, some independent variables that lead to changes in ADR could also cause increases of investment or operating costs to entrepreneurs. Therefore, resort entrepreneurs, as well as other research users, should understand this concern when applying the results of this research in the real world, in order to acquire a comprehensive perspective.

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