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Pricing determinants in the hotel industry: Quantile regression analysis

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ABSTRACT

Due to the skewed distribution of hotel prices, quantile regression provides a more flexible and complete characterization of the determinants of the hotel prices at the higher and lower tail of the distribution. This study applies quantile regression approach to investigate the major determinants of hotel room pricing strategies. The ordinary least square regression is also used for comparative purposes. The data are drawn from 58 international tourist hotels in Taiwan and average room rate (ARR) is used as the proxy of hotel room price. The results of OLS and quantile regression share common characteristics but also have differences in some aspects. The OLS results reveal that number of rooms, hotel age, market conditions and number of housekeeping staff per room are the main attributes of hotel room rate. The quantile regression results further demonstrate that room number and the number of housekeeping staff per guest room do not significantly influence hotel price at the low price quantile. Hotel age and market conditions are only significant determinants in high-price category. Additionally, for the high-priced quantile hotels, the proportion of foreign individual travellers positively and significantly influences room price. The empirical results can help hoteliers in shaping investment and pricing strategies.

1. Introduction

Tourism is a major industry in many countries and an important factor in global economic development. This phenomenon is partly attributable to the growth of the hotel industry. According to the data from the Taiwanese Tourism Bureau, 46.09% of the expenditures from inbound tourists are made within their hotels. This statistic reflects the importance of the hotel sector in the tourism industry development. The number of hotels in Taiwan has increased rapidly in recent years, reaching 3342 hotels with a total of 142,632 rooms in 2007. Because of the policy of opening up Taiwan to tourists from China, at least 55 new tourist hotels are expected to open during 2008–2012. The rapid expansion of the hotel industry has produced a highly competitive market. Effective resource allocation, careful marketing strategy formulation and enhanced customer loyalty have become essential for survival.

The room pricing decision is one of most important aspects of hotel marketing strategies, since hotel price is one of the main influences on accommodation selection decisions (Lockyer, 2005). Additionally, room prices influence consumer perceptions of service quality (Lewis and Shoemaker, 1997; Oh, 2000; Mattila and O'Neill, 2003) and consumer satisfaction (Voss et al., 1998). Pricing strategies are more flexible than other marketing strategies and more easily adjusted to a changing environment. They are closely related to seasonality, price regimes and different facilities (Espinet et al., 2003). However, products of the hotel industry are highly perishable. Simultaneously, product supply is relatively inflexible and cannot be changed overnight (Baum and Mudambi, 1995). Furthermore, cancellation, no-shows and overbooking problems exist because advanced booking is allowed (Lai and Ng, 2005; Schwartz, 2006). Thus, the hotel industry faces uncertain and fluctuating demand, creating difficulties in making price decisions.

Unlike the discussion of pricing strategies in the marketing literature, pricing instruments have received little attention in tourism marketing (Mazanec, 2002). Some studies have attempted to develop models to maximize hotel revenue or profits. Compared to the normative literature, empirical studies have frequently focused on the demand side and have analyzed the relationship between room rates and consumer perceptions or satisfaction (Mattila and O'Neill, 2003; Matzler et al., 2006; Danziger et al., 2006). However, few studies have focused on the determinants of hotel price. Kotler and Armstrong (1996) conclude that a firm's internal and external factors simultaneously influence pricing decisions. Internal factors include marketing goals, marketing

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strategy mix, cost and organization. External environment factors contain the nature of the market and demand, competitors and other environmental factors. Additionally, Collins and Parsa (2006) also identify numerous influences on pricing decisions, including star rating, management type, location, size and amenities. The studies most closely related to this study are Israeli (2002), Bull (1994), Espinet et al. (2003) and Monty and Skidmore (2003), all of which has used ordinary least square regression in their analysis.

According to the data of the Taiwan Tourism Bureau, the highest average room rate is seven times the lowest for a sample of 58 Taiwanese international tourist hotels. Given that hotel prices exhibit a skewed distribution, the assumption of normal distribution error terms in OLS is not guaranteed, and may produce misleading results. Quantile regression solves the above problems and also provides a more flexible and complete characterization of the determinants of hotel prices, especially when there is an interest on the determinants of the hotel price at the higher and lower tails of the distribution.

Thus, the main objectives of this paper are twofold. First, this work applies quantile regression to the study of the determinants of 58 international tourist hotels in Taiwan in 2006. Second, based on the empirical results, suggestions for the hotels' pricing strategies are provided. The remainder of this paper is organized as follows. Section 2 reviews the related literature. Subsequently, Section 3 describes the study methodology. The fourth section then contains a discussion of data and variables that are used in our study. The empirical results and discussion are then presented in Section 5. The final section concludes the study.

2. Literature review

Hoteliers frequently find themselves unable to maximize hotel profits via cost control in real world situations. They have to spend more time on price decision making (Kim et al., 2004). Pricing decisions can be difficult and are often speculative, owing to the uncertainties associated with dynamic environments (Kortge et al., 1994). Generally, hotel pricing techniques include cost based pricing, competition driven pricing and customer-driven pricing. Cost based pricing and competition driven pricing are commonly used in practice and have became the mainstream pricing techniques. However, the simplified characteristics may lose its effectiveness in complex and competitive operating environments (Arnold et al., 1989). The main disadvantage of cost based pricing is that the unit costs are difficult to access and may result in over-pricing or under-pricing problems (Collins and Parsa, 2006). Meanwhile, customer-driven pricing not only relies on costly market research but also encounters the problem of consumer unwillingness to reveal their reservation price (Danziger et al., 2006). Competition driven pricing assumes that competitors know the value customers place on offerings (Danziger et al., 2006). Additionally, this approach often leads to inappropriate price cutting because of market share oriented seeking (Collins and Parsa, 2006). Based on the above weakness, Nagle and Holden (1995) present a value based pricing technique and noted that it is more profitable than the other room pricing techniques. The method of value based pricing is to proactively change the customer's pay willingness by learning and leveraging the benefits pursued by the customer. This is quite different from customer-driven pricing approaches based on reacting to customers pay willingness (Feldman and Wurst, 2001). However, the value based pricing technique is harder to adopt than other pricing techniques. The main reason is that successful value based pricing depends on precise value model estimates of the type offered by experimental design (Feldman and Wurst, 2001). Each pricing technique has its own advantages and shortcomings. Furthermore, hotel pricing faces the complexity of human activities and environmental circumstances (Steed and Gu, 2005, p. 370). That is, hotels cannot make price decisions based on one dimension.

Relatively few studies have addressed hotel pricing problems (Chung, 2000). Some studies have attempted to construct pricing models to maximize hotel revenue or profit. Gu (1997) accounts for vacancy room demand, consumer price sensitivity and relevant costs in room pricing and constructs a quadratic room pricing model for optimizing profitability. Koide and Ishii (2005) present a model to account for hotel room allocations with early discount, cancellations and overbooking. Kim et al. (2004) develop a multi-stage synthetic model of hotel room pricing, and the model considers fixed and variable costs, profit goals, identification of market competition, factors needed to measure a differentiation price premium and price standard limits.

Contrary to normative studies, most empirical studies focus on the demand side and analyze the relationship between room rate and customer perceptions or satisfaction. Mattila and O'Neill (2003) examined the relationships between hotel room pricing, occupancy and customer satisfaction in US midscale hotels, and identified a significant relationship between room price and customer satisfaction. However, the linkage between occupancy rate and customer satisfaction is insignificant. Oh (2003) investigates the influence of price fairness on overall price, quality and valued judgments. Danziger et al. (2006) applies a behavioral process measure to examine the contribution of strategic assets in determining customer perceptions of hotel room price.

However, factors hoteliers account for in realistic price decision making have received little attention. The closest studies related to this topic are Israeli (2002) and Bull (1994). Israeli (2002) analyzed whether and how star rating and corporate affiliation affect pricing decisions with different locations. The results suggested that the star rating is a stable and consistent predictor of room prices. Bull (1994) used a hedonic price model to investigate the influence of star rating, hotel age, distance and transportation factors on price decision making. The results reveal that the room rates decrease as the hotel's distance from the town center increases or star rate decreases. Furthermore, room rates increases for motels with restaurant facilities. Espinet et al. (2003) and Monty and Skidmore (2003) also applied the hedonic price approach to investigate the determinants of hotel room rates. Furthermore, Espinet et al. (2003) examined the effect on price of different characteristics of holiday hotels and found that town, hotel size, distance to the beach and availability of parking spaces are the main determinants of hotel pricing. Monty and Skidmore (2003) used data on price and amenities collected from bed and breakfast accommodations in Southeast Wisconsin and found that hotel amenities such as provision of hot tubs, private baths and a larger room were statistically significant determinants of price. Additionally, location characteristics, day of week, and time of year are also found to be important. It provides an excellent basis for variable selection.

According to the average room rate data from 58 Taiwanese international tourist hotels, the highest average room rate is seven times the lowest. This wide gap reflects the fact that hotel managers weigh their individual characteristics, the changing environment and consumer demand factors to make their pricing decisions. Prior empirical studies employing regression analysis have indicated that star rating, brand name, location and the number of rooms are key predictors of hotel room price. However, the traditional regression model only considers the average relationship between hotel price and several other explanatory variables. The main limitation of the conventional method tells little about the tail behavior of the distribution. Naturally, it is inadequate to sketch only the conditional mean or median pricing behavior. Quantile regression is particularly useful when the conditional distribution has an asymmetric shape. Quantile regression has been widely applied in numerous fields. It was

initially and primarily used to study wage distribution, wage inequality and wage determinants (Buchinsky, 1998; Bedard, 2003; Skoufias, 2003; Min and Kim, 2003; Martins and Pereira, 2004; Sakellariou, 2006; Melly, 2005). It is also applied to industry analysis (Görg et al., 2000; Girma and Görg, 2007; Yasar et al., 2006) and finance (Dimelis and Louri, 2002; Fattouh et al., 2005; Coad and Rao, 2006; Somers and Whittaker, 2007). Thus, it is desirable to apply the quantile regression technique in the tourism field to investigate the determinants of hotel pricing.

3. Methodology

Regression analysis is principally intended to investigate the relationship between a dependent variable and predictor variables. However, the traditional least squares regression only enables researchers to approximate the conditional mean and conditional median located at the center of the distribution. Such regression analysis can only give an incomplete description of a conditional distribution (Mosteller and Tukey, 1977). Quantile regression is applied when an estimate of the various quantiles in a population is desired. First proposed by Koenker and Bassett (1978), quantile regression enables the estimation of conditional quantile functions, where each function characterizes the behavior of a specific point in the conditional distribution, and thus it fully represents the conditional distribution. Besides characterizing the full description of the conditional distribution, the quantile regression has several other useful features. First, the quantile regression model employs a linear programming representation which simplifies examination. Second, the quantile regression objective function is a weighted sum of absolute deviations, and thus the estimated coefficient vector is not sensitive to outliers. Third, quantile regression estimators may be more efficient than ordinary least square estimators when the error term is non-normal (Buchinsky, 1998). Thus, the quantile regression approach can obtain a more detailed picture of the relationship between selected variables and hotel room rates. The basic quantile regression can be written as:

$$y_i = x_i'\beta_\theta + u_{\theta i} \quad \text{with} \quad Quant_\theta(y_i|x_i) = x_i\beta_\theta \tag{1}$$

where x_i' denotes a vector of regressors, β_θ represents the vector of parameters to be estimated, and $u_{\theta i}$ is a vector of residuals. $Quant_\theta(y_i|x_i)$ represents the θ^{th} conditional quantile of y_i given x_i'. The θ^{th} regression quantile solves the following problem:

$$\min_\beta = \sum_i \theta|y_i - x_i\beta| + \sum_i (1-\theta)|y_i - x_i\beta| = \min_\beta \sum_i \rho_\theta u_{\theta it},\ \theta \in (0,1) \tag{2}$$

where ρ_θ is known as the "check function" and defined as:

$$\rho_\theta(\varepsilon) = \theta\varepsilon \quad \text{if } \varepsilon \geq 0$$

$$(\theta - 1)\varepsilon \quad \text{if } \varepsilon < 0$$

Eq. (2) is then solved by the linear programming technique. The median regression, which is a special case of the quantile regression, is obtained by setting $\theta = 0.5$. Other quantile of the conditional distribution can be obtained via variation of θ. To convey a sense for the relationship of selected explanatory variables across the entire conditional room price distribution, the results for the 10th, 25th, 50th, 75th and 90th quantiles are reported. In this study, we apply the bootstrap method illustrated in Buchinsky (1995) to obtain estimates of the standard errors for the coefficients in quantile regression. Buchinsky (1995) suggested using the bootstrap method since it is robust. In addition, it performs well for a relatively small sample size. Similar to Anderson and Pomfret (2000), Bauer and Haisken-DeNew (2001) and Fattouh et al. (2005), standard errors of the estimates were obtained via bootstrapping with 1000 repetitions. Additionally, this study also illustrates and compares the quantile regression estimates that differ from the OLS estimates. For more discussion on the model specification of quantile regression, refer to Koenker (2005).

4. Data and variables

Hotels in Taiwan can be categorized as international tourist hotels, ordinary tourist hotels and ordinary hotels. According to the 2006 survey, Taiwan had 60 international tourist hotels with a total of 17,830 rooms, 29 ordinary tourist hotels with a total of 3265 rooms, and 2598 ordinary hotels with a total of 99,192 rooms. Comprehensive data is only available for international tourist hotels. Empirical data are from the Annual Operation Report of International Tourist Hotels for 2006, published by Taiwan's Tourism Bureau of the Ministry of Transportation and Communications. After discarding hotels that provided incomplete data from our study, a final sample of 58 international tourist hotels remained.

Regarding variable selection, hotels often used multiple distribution channels to sell rooms. O'Connor (2003) and Law et al. (2007) found that room rates differed according to distribution channel. Additionally, room prices varied depending on season, and the occurrence of trade events exhibitions or conferences. Kimes (1999), Chung (2000) and Cheung and Law (2001) used average room rate (ARR) as a proxy of hotel room price. This study also applied ARR as the dependent variable for empirical data. Table 1 lists the distribution of hotels by average room rate. Shapiro-Wilk Shapiro-Francia tests are conducted to check for normality of the data. These tests confirm the non-normality of the residuals and indicate that the quantile estimators may be more efficient relative to OLS estimators. The Breusch-Pagan test shows that heteroskedasticity is present in the data. Thus, the OLS estimators may be less efficient. To correct the problem of heteroskedacity, ARR is log-transformed.

Based on previous studies, the number of rooms partly explains hotel pricing behavior (Israeli, 2002). Larger hotels are typically more luxurious than small hotels and therefore charge higher room prices (Chung and Kalnins, 2001). The room capacities of the 58 international tourist hotels in Taiwan range from a maximum of 873 rooms to a minimum of 50 rooms. Therefore, room number represents HOTEL SIZE as one of the independent variables in this study.

Older firms may achieve higher sales than newer ones because of reputation and accumulated brand name capital effects (Anderson et al., 1998). However, older firms may attempt to ride on their established reputation and not update their facilities. According to data obtained from the Taiwan Tourism Bureau, 28 of 58 selected sample hotels have been in business since the 1970s. 12 of hotels were established in the 1990s. Furthermore, 53 of the 58 hotels have been established for more than 5 years. To

Table 1
The distribution of hotels by average room rate.

Average room rate (USD)	Frequency	Percentage (%)
Less than 50	4	6.90
50–100	34	58.62
100–150	12	20.69
150–200	7	12.07
More than 200	1	1.72
Total	58	100

understand the influence of the number of years of hotel operations on hotel room rates, this study adopted the AGE factor.

The hotel industry in Taiwan is becoming increasingly competitive. Chain operation is one of the main strategies used by Taiwanese hotels. The Hilton Hotel, the first international chain management hotel, opened in Taipei in 1973. Since then, more and more independent hotels have increasingly joined international franchise-chains to improve their management and competitiveness. Early theory suggested that franchised firms can raise capital more cheaply than non-franchised firms (Oxenfeldt and Kelly, 1969; Hunt, 1973). However, payments to the parent company may also reduce profits by increasing variable costs. Some studies also found that brand name can partly explain hotel pricing behavior (Wu, 1999; Israeli, 2002; Danziger et al., 2006). There were 58 hotels in the sample, of which 33 are chain-affiliated and 25 are not. To evaluate the chain-operated effects on the pricing strategies of the sample hotels, the factor called MANAGEMENT is adopted as a dummy variable with a value of one if the hotels are chain operation and zero otherwise.

Foreign travelers in Taiwan can be classified into group travelers and foreign individual travelers (FIT). With the growth of the Taiwanese tourism industry, foreign travelers have increased from 703,776 in 1973 to 3,519,827 in 2006. The FIT accounted for 63% of foreign travelers in 2006. Based on market positioning, each hotel has its primary source of customers. For example, FIT accounted for 100% of foreign travelers staying at the Sherwood, Hotel Royal Taipei and Ritz Landis hotels, while over 80% of foreign travelers staying at the Santos Hotel, Hotel Riverview Taipei and Taoyuan Hotel were classified as group travelers. Based on customer-driven pricing technique, different types of customers may have different preferences and price sensitivities. Thus, customer characteristics may determine pricing decisions. In this study, the variable FIT denotes the proportion of foreign individual travelers to total hotel customers.

Location is the only attribute of the lodging product that is totally fixed. Managers can vary service style, service level, design and decor, but cannot change the fixed geographical position (Bull, 1994). Numerous studies have identified location as one of the major determinants of hotel price (Bull, 1994; Israeli, 2002). However, some studies, such as Arbel and Pizam (1977), found that there is no significant relationship between hotel price and distance. Thus, the effects of location on hotel price needs to be further investigated. In previous studies, location can be represented as distance from the town centre, highways or local attractions. Like most literature, this study adopted the distance of hotels from he city center to investigate the effect of location on hotel price.

According to the competition driven pricing, price decisions depend on market conditions. Hotels in Taiwan can be classified into two types: resort hotels and city hotels. Compared to city hotels, resort hotels generally offer more scenic surroundings and better leisure facilities. Monty and Skidmore (2003) found bed and breakfast accommodations located near tourist areas charge significantly higher as compared to those located in other areas. This study constructs a dummy variable RESORT for market conditions (1: resort hotel; 0: city hotel).

Table 2
Definitions of independent variables.

Variables	Definition
ARR	log-transformed of average room rate
SIZE	Number of rooms in the hotel
AGE	Time a hotel has been operating
MANAGEMENT	Chain affiliate = 1, independently owned = 0
FIT	Ratio of foreign independent travelers
RESORT	Resort hotel = 1, city hotel = 0
DISTANCE	The distance from the hotel to city center
HOUSEKEEPING/ROOM	Number of housekeeping staff members per room

Based on cost based pricing techniques, hotel prices can be partly attributed to the cost of input resources for the management of international tourist hotels. According to the data of the Tourism Bureau in Taiwan, the primary source of the cost of the hotel was salary cost. Thus, the number of housekeeping staff members per room was used as a proxy for labor costs. The number of housekeeping staff per guest room can also be considered an indicator of service quality. We expect that the high values of this ratio indicate that hotels have more manpower to provide quick service, thus reducing clients' waiting or queuing time and increasing their satisfaction (Wang et al., 2006).

The definitions of dependent variables in this study are shown in Table 2.

The VIF technique was used to test the existence of multicollinearity. The VIF values for all variables are below 2, and thus no multicollinearity was detected. The summary statistics of the variables are presented in Table 3.

The following equation is the basic model of the empirical study:

$$\ln P = \alpha + \beta_1 \mathrm{ROOM} + \beta_2 \mathrm{AGE} + \beta_3 \mathrm{MANAGEMENT} + \beta_4 \mathrm{FIT} + \beta_5 \mathrm{RESORT} + \beta_6 \mathrm{DISTANCE} + \beta_7 \mathrm{HOUSEKEEPING/ROOM} + \varepsilon$$

In doing so, we try to assess the determinants that guide managers pricing decisions.

5. Empirical results

Table 4 lists the estimated coefficients for room, age, management type, FIT ratio, market condition, distance and housekeeping staff per room at the 10th, 25th, 50th, 75th and 90th quantiles. The OLS results are also listed for comparative purposes. All the OLS dependent variables except for management type, FIT and distance have a significant influence on hotel room price. However, the results of the quantile regression are mixed and more complicated. The results of different quantiles are worth special notice.

OLS regression estimates a positive and significant influence of total room number on hotel price. The results of the quantile regression further indicate that the value of the estimated coefficient on the number of rooms varies over the conditional hotel room rate distribution. When the quantile regression is evaluated at the 10th quantile hotel, the number of rooms has an insignificant influence on hotel price. For mid- and high-priced hotels, the coefficient on numbers of rooms increases. Hotel size

Table 3
Summary statistics of the sample ($n = 58$).

	Mean	Median	Maximum	Minimum	Std. Dev.
ARR	96.14748	86.66154	247.0769	40.61538	43.88182
Room	299.7414	269	873	50	149.0752
Age	18.82759	19.5	47	1	12.10066
FIT	62.56983	66.885	100	6.39	23.79541
Distance	4.552392	2.424081	37.61148	.0640042	6.795053
Housekeeping staff/room	.3002873	.2867313	.7072072	.1358974	.1133616

Table 4
Empirical results for hotel price determinants.

	OLS	10th quantile	25th quantile	50th quantile	75th quantile	90th quantile
Constant	3.556987*** (0.000)	3.36528*** (0.000)	3.171313*** (0.000)	3.662361*** (0.000)	3.666938*** (0.000)	3.669826*** (0.000)
Room	.0009892*** (0.001)	.000481 (0.507)	.0009628** (0.046)	.0009419** (0.032)	.001132*** (0.006)	.0010564*** (0.001)
Age	−.0084271** (0.019)	−.0034375 (0.718)	−.0045322 (0.449)	−.008598 (0.122)	−.0092567** (0.043)	−.0083272** (0.012)
Management	.0170261 (0.853)	.1299597 (0.547)	.0908561 (0.521)	.0682586 (0.618)	.0092918 (0.934)	.0310453 (0.710)
FIT	.003069 (0.106)	.0052838 (0.232)	.0032334 (0.315)	.0004818 (0.859)	.0039556* (0.085)	.0045424** (0.023)
Resort	.4568447*** (0.004)	.1119749 (0.756)	.2961361 (0.334)	.3879016 (0.172)	.5944349*** (0.005)	.7095174*** (0.000)
Distance	−.0025553 (0.752)	.0087211 (0.656)	.0040164 (0.808)	.0030556 (0.830)	−.0123987 (0.320)	−.0136897 (0.153)
Housekeeping/room	1.725732*** (0.000)	.7041302 (0.442)	2.000602** (0.015)	1.95058*** (0.007)	1.981884*** (0.001)	1.935589*** (0.000)

* Significant at 10%-level.
** Significant at 5%-level.
*** Significant at 1%-level.

thus influences room prices. This phenomenon may result from larger hotels in high-price category being able to achieve economies of scale and reduce their costs to provide more amenities or facilities. Thus, room rates in large-sized hotels are higher than the rates charged by small-sized hotels.

Some studies found chain-affiliation to be a strategy to signal a hotel's service quality and this became a key determinant in pricing decisions (Israeli, 2002; Wu, 1999). The OLS regression estimates presented in this study demonstrate an insignificant relationship between hotel management type and room price. The quantile regression results also reveal similar results. That is, management type, independent-owned or chain-affiliated, is not the main determinant of room price in Taiwan. The reason the brand name effect is not significant may owing to some customers consider independent hotels provide superior personal service and home atmosphere. Thus, chain-affiliated hotel room price is not necessarily higher than independent ones in Taiwan.

From the OLS results, the age of the international tourist hotels is negatively related to hotel price. However, the quantiles estimated coefficients for the 75th and 90th quantiles are significant, while those for the 10th, 25th and 50th quantiles are insignificant. That is, older hotels do not take advantage of their reputation, and this is especially the case for high-priced hotels. This phenomenon may be partly attributed to consumers having higher service quality expectations on high-priced hotels and some old hotels in Taiwan do not regularly conduct renovations or update their facilities. Thus, high-priced older hotels appear to be cheaper than new ones in the same pricing category. However, there is no clear relationship between hotel age and room price for low and mid-price hotels.

Our OLS regression estimates further indicated that the ration of FIT travelers does not significantly influence hotel price. The quantile regression results show that the values of the estimated coefficient on the ratio of FIT travelers varies over the conditional hotel room rate distribution are different. For the high-priced quantile (75th and 90th quantile) hotels, the FIT traveler ratio positively and significantly influences hotel price. However, there is no significant relationship between room rates and the proportion of foreign individual travellers. Thus, for accommodations in the low-priced category, the differentiated pricing strategy seems harder to adopt. High-priced accommodations target individual travelers and charge them higher room rates since individual travelers have higher budget and lower price sensitivity.

Generally, city hotels and resort hotels do not operate in the same segment since the customer's sources of them are quite different. Our OLS empirical results demonstrate that hotel location (resort or city) is a key determinant on hotel price. The quantile regression results also reveal similar results for the high-price quantile. This suggests that resort hotels, which are located in scenic area, appear more expensive especially for those in the high-priced category. This phenomenon may due to the availability of more leisure amenities and scenic surroundings which a resort offers. Thus, hotels located near scenic areas appear to be more expensive.

Although most studies emphasize the importance of the distance effect on hotel pricing decisions, both OLS regression and quantile regression estimates indicate that distance does not significantly influence price. The result is in line with Espinet et al. (2003). However, the magnitude and sign of the estimated coefficients are different as we move up the conditional distribution while distance variable enters with an insignificantly positive coefficient at the 10th, 25th and 50th quantiles. It turns out to be insignificantly negative in the 75th and 90th quantiles. The main reason for this phenomenon is that most Taiwanese international tourist hotels are clustered in major metropolitan areas and located near city center. Thus, the relationships between hotel location and room price are ambiguous.

Finally, the OLS regression results also show that higher housekeeping staff members per room are associated with higher room prices. However, when the quantile regression is evaluated at the lowest price hotels (10th quantile), the variable housekeeping staff members per room does not significantly influence the hotel price. That is, salary cost is not the main concern for budget accommodations when determining room price rate. For other hotels, cost considerations are the key factor when determining room price. It also indicates that hotel price mostly reflects and signals service quality.

6. Conclusions

This article provides a novel means of identifying the attributes of hotel room rates. It helps broaden existing hotel pricing research by considering the impact of external environmental factors and incorporates the concept of market segmentation. Furthermore, the analytical results provide preliminary evidence of hotel pricing decisions that offers enormous potential for future research. If hotel investors understand what attributes matter most to hotel price determination, they will be able to focus their marketing efforts on these attributes and shape investment and pricing strategies.

Our results reveal that the results of OLS and quantile regression share common characteristics but also differ in some aspects. The results of quantile regression can provide a complete version of hotel pricing determinants. The OLS empirical results show that room number, hotel age, market conditions and the number of housekeeping staff per guest room are the main determinants of a hotel room rate. The quantile regression results further demonstrate that room number and the number of housekeeping staff per guest room do not significantly influence hotel price at the 10th quantile. Hotel age and market conditions are only significant determinants in high-price category. OLS

results also show that hotel prices are not significantly influenced by FIT traveler ratio, management type and distance from the hotel to the city center. However, the quantile regression results indicate that for the high-priced quantile hotels, the proportion of foreign individual travellers positively and significantly influences room price.

Based on the above results, hotel managers should be aware of its start up size to achieve economies of scale and then increase room prices. For example, larger hotels, defined as those with more than 500 rooms, such as the Grand Hyatt Taipei and the Grand Formosa Regent Taipei, charge higher prices than other hotels. Older hotels, especially for those in the high-priced category, should undertake renovations and update their facilities to pursue higher revenue. For example, the Landis Resort Yangmingshan and the Royal Chihpen Resort Hotel completed renovations recently and kept its room rates high. The empirical results also imply that costs or quality differentials can explain the price differences. Improving service quality by adding more employees or amenities can increase room rates. However, the cost of quality improvements should not be overlooked. Hoteliers should evaluate whether it would be profitable to add employees or amenities.

Analytical results also indicate that chain-affiliation is not the only method of increasing hotel room price and revenue. Hotels typically must pay a menu of fees for joining a chain and thus obtain standardized operating processes and management knowledge (Mazzeo, 2004). These fees may offset the benefits of being chain-affiliated. Our results imply that hotels should weigh the benefits and costs before joining a chain. Alternatively, chain-affiliated hotels should promote themselves and increase their customer loyalty and the customers' willingness to pay. Regarding the quantile regression results on the FIT variable, tourist hotels in Taiwan should segment customers via pricing in order to differentiate between their target markets. High-priced category hotels should adjust their marketing strategies to target individual travelers, especially business travelers, because business travelers typically stay longer and are prepared to pay more for a room than tourists. Hotels like the Ritz Landis Hotel and the Sherwood Hotel designed their personalized services for business travelers, including well appointed business centers, meeting lounges, concierge and international conference facilities to attract individual business travelers. Furthermore, based on the empirical results on the relationship between the market condition and the room price, the resort hotel should set its price in the high-priced category to attract luxury travelers and increase pay willingness. For example, resort hotels like the Lalu Hotel Sun Moon Lake and the Landis Resort Yangmingshan often charge higher rates than other luxury city hotels.

As with any research, this study also has certain limitations. Due to data availability, the research focuses on the international tourist hotel industry in Taiwan. Since the empirical results are based on relatively small sample size, the findings should not be over-generalized. To enhance the generalizability of the results, further scrutiny through theoretical and empirical studies is required. A cross-country comparison can be made to broaden the usefulness of the results. Moreover, pricing decisions may be influenced by other cultural, historical or psychological factors that can be incorporated into future studies. Further research should also address the determinants of hotel room rates across different marketing channels.

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