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Abstract

Current studies show that online hotel bookings are growing constantly as consumer increasingly uses Internet for the arrangement of their travel. One of the important factor in online hotel booking is the rating and review of past customers. However, the impact of online reviews are not fully explored in online hotel booking setting. For that purpose, we choose two most popular tourist destinations in the world: Paris and London. Our analysis shows that both stars ratings and customer reviews positively affect hotel pricing. Besides, high stars hotels benefit more from higher customer satisfaction. The implication of these results is that hotels should strive to please customer as their future revenue depends on the satisfaction of previous users. This study also guides hotel manager how to make price decisions of hotel room.

Keywords: *Online Reviews; Word of Mouth; Online Hotel Booking; Hotel Pricing*

1 INTRODUCTION

Internet users in the world are increasing each year. Since consumer increasingly uses e-commerce sites for purchasing many products and services, Internet becomes preferred sales channel for many industries. Travel industry is one of the first and successful industries to use Internet for this purpose and studies show that online travel sales keep growing. With a 16% share, hotel accommadation is the second largest sales item after air travel among online travel sales and revenue generated through online hotel booking increases(Marcussen 2007). Recent studies show that travel reviews are increasingly becoming an important factor in hotel selection by travelers. As indicated by Milan (2007), millions of travelers log on daily to Travel websites like Expedia.com and experience a property through hotel generated photos, written text and hotel reviews by previous customers. Milan (2007) indicates that 84% of people visiting a Travel website hosting consumer generated content have their hotel choices affected by what they see and online hotel shoppers find reviews and candid photography much more convincing than other features of hotels. Buhalis and Law (2008) indicate that because of the rise in internet applications in the tourism sector, consumers are becoming incredibly powerful and are increasingly able to determine elements of their tourism products.

The studies mentioned above show that online hotel shopping and online reviews are becoming increasingly important for both hotel consumers and hotel management. However, researcher analyzed the different aspect of online reviews in particular sectors, the impact of online reviews are not fully explored in online hotel booking setting. For that reason, we investigate how online reviews affects the hotel's pricing decision in this paper. By controlling hotel star, our anlysis shows that hotels set higher prices if they have higher online review scores and lower if they have lower online review scores. Furthermore, high stars hotels benefit more from higher customer satisfaction. Apart from previous studies, this paper shows the significant impact of online hotel reviews on pricing decisions of hotel management. The managerial implication of these results is that hotels should strive to please customer as their future revenue depends on the satisfaction of past users. This study also guides hotel management about how to take into account online hotel reviews and determine their prices accordingly.

The remainder of the paper is organized as following. In section 2, relevant studies in hotels and online customer reviews literatures are summarized. We describe our data in Section 3 and model is analyzed in Section 3. The paper is concluded in Section 6.

2 LITERATURE REVIEW

Online reviews are extensively studied in many of the e-commerce application and researchers show online reviews reduce information asymmetry between seller and buyer. This is especially true for the book and movie products as evaluation of these products are difficult prior to purchase. Among these studies, Chevaliear and Mayzlin (2006) examine the effect of consumer reviews on relative sales of books on Amazon.com and BarnesandNoble.com and they show that customer communication on the internet has an important impact on customer behavior. They find that an improvement in a book's reviews leads to an increase in relative sales at that site. Sen and Lerman (2007) find that negative reviews are more effective for utilitarian products whereas positive reviews are more effective for hedonic product. Duan et al. (2008) and Liu (2006) find positive correlation between sales performance and review volume in the movie industry.

Authors also study the effect of trust and risk in electronic marketplaces. Among these studies, Verhagen et al. (2006) analyzes how consumer perceptions of risk and trust affect purchasing at e-bay auction sites.They found that while party trust and party risk directly affects attitudes toward purchasing, the effect of institutional trust and institutional risk to purchasing are through party trust and party risk. By analyzing text comments at e-bay auction site, Pavlou and Dimoka(2006) show that buyer's are willingness to pay more for the seller who received favorable reviews before.

Few recent studies investigate the impact of online reviews on consumer's hotel selection decision. Vermeulen and Seeger (2009) conduct an experimental study and conclude that exposure to online reviews increases hotel consideration in consumers. By using survey methodology, Dickinger and Mazanec (2008) show that the most important drivers of online hotel booking are recommendations of friends and online reviews. Our paper is different from these papers in two respects. First, while these researchs analyze mainly how customer's hotel selection decision is affected by online reviews, we investigate the impact of online reviews on the pricing decision of hotel manager. In other words, while previous researchers investigate demand side of the hotel market, we investigate the supply side of the hotel market. Another difference is that while other two studies use experimental and survey data, we used real historic data extracted from an online hotel booking website.

3 BACKGROUND

The offering of hotels to the customer can be classified as service delivery. Some of the characteristic of service delivery are that customer contact is high, output is intangible and evaluation of the service can be done only after delivery of service (Stevenson, 2007). Thus, customer takes into account many features of the hotel in order to decreases risk of hotel decision. As the most frequently mentioned quality features, star rating of the hotel plays important role in the customer decision and studies show that every one out of two customer consider star the most important attribute in the selection process (Callan, 1998). Therefore, we expect that

H1a. Hotels with higher star set higher price compared to hotels with the similar online review score

However, star attribute did not measure some subjective quality dimensions such as how nice hotel staff, cleanness of hotel room and value for money. For this reason, most people choose hotels based on recommendation of friend and earlier studies shows that word of mouth is one of the important factors in hotel selection process (Dickinger and Mazanec 2008). Online reviews is considered as the counterpart of the word of mouth in the cyber world and recent studies found that online reviews play important role in the customer decision process (Dickinger and Mazanec 2008, Vermeulen and Seeger 2009). As a quality measure, online reviews complement star features and higher online reviews can

increases popularity of the hotel. For these reasons, we expect that hotels with higher online reviews charge premium over other hotels as everything else is being constant and we hypothesize that,

H1b. Hotels with higher online review score set higher price compared to hotels with the same star.

While hotels with higher online reviews set higher price levels in the same segment, there may be significant differences regarding consumers' sensitivity to price information in different segments. For example Petrick (2005) divide travelers into three segments based on their price sensitivity: high sensitives, less sensitives and the segments of ''moderates''. They found that less (high) price sensitive customers spent more (less) money and they have higher (lower) income.This result implies that less (high) price sensitive customer mostly choose high (low) star hotels. Besides, Baker and Crompton (2000) found that customer that values quality higher are willing to pay more for it. For this reason, we expect that less price sensitive customer are willing to pay more for higher online review score. Thus, we hypothesize that,

H2. High star hotels charge more than low star hotels for the same unit increase in online reviews.

4 DATA

Our data come from is one of the biggest online hotel booking sites called as booking.com. After customers enter the location, check-in and check-out date, available hotels are listed in this website. In these listing, it is possible to obtain information about price, star, address, map and average customer review score of the hotels. If specific hotel's web site is clicked, customer can get further information about pictures, facilities, hotel policies and individual review scores and comments of previous customers. Individual review score is calculated in the following way. First, customers rate hotel quality in terms of hotel staff, services/facilities, cleanness of hotel room, comfort and value for money. The score in these dimensions can be poor, fair, good or excellent and counts for 1, 2, 3 and 4 points respectively. All these points are added and divided by 2 for the final individual score. Information about hotels' region in Paris and London is obtained from Booking.com's classification. Since some hotels do not have price for single room, we used the price of standard double room as the dependent variable.Table I displays the descriptive statistics of the variables and figure I and II display the price and average internet review relationship for Paris and London respectively.

City	Variable	Number of Observations	Mean	Standard Deviation	Minimum	Maximum
Paris	Number of Hotel Reviews	785	131.97	152.45	5	1461
	Average Hotel Review Score	785	7.18	0.73	4.6	9.1
	Hotel Star	785	2.88	0.7	1	4
	Room Price Per Night	785	109.1	44.54	28	285
London	Number of Hotel Reviews	536	153.13	222.9	5	1876
	Average Hotel Review Score	536	7.11	1	3.9	9.5
	Hotel Star	536	3.22	0.91	1	5
	Room Price Per Night	536	103.31	55.52	28	305

Table I: Descriptive Statistics

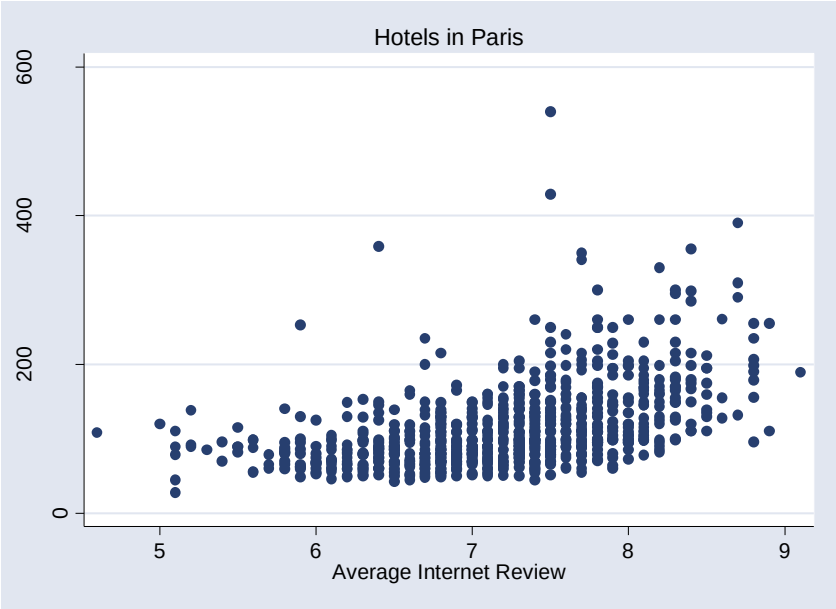

Figure I: *Hotel prices and average internet review in Paris*

Figure II: *Hotel prices and average internet review in London*

5 METHODOLOGY AND ESTIMATION RESULT

Before testing the hypothesis, we first identify the outliers in the data set using the Grubbs methodology. Grubbs' test (Grubbs (1969) and Stefansky (1972)) is used to detect one outlier at a time in the univariate data set. The outlier is removed from the data set and the test is iterated until no outliers are detected. This test is also known as the maximum normed residual test. The outliers of the price variable are detected through the Grubbs' test and the econometric analysis is conducted after the removal of the outliers from the data set. The test identifies 13 hotels as an outlier for the Paris hotels data set and cutoff price is determined to be 295 Euros. Grubbs methodology does not identify any outliers for the London hotels data set.

First hypothesis ask the question of whether higher review score and star result in higher pricing of the hotel rooms. The impact of these variables on room price is tested by estimating the coefficients of the following equation using OLS:

$$\text{Room Price} = \beta_0 + \beta_1 \text{Hotel Review} + \beta_2 \text{Hotel Star} + \sum_{i=1}^{N-1} \beta_{i,D} \text{Hotel Region Dummy}_i \quad 1$$

where N is the number of regions in each city. By using hotel star (hotel review) as an explanatory variable in our regression model, we find the effect of hotel review (hotel star) on room price independent of the star (review score) of the hotel. Regional dummies are used as control variables. The t-statistics are calculated using heteroskedasticity consistent robust standard errors. The multicollinearity of explanatory variables are investigated using the variance inflation factor (VIF). For hotels in Paris the VIF value is 1.22 and 1/VIF is 0.82. For London hotels the VIF is equal to 1.6 and 1/VIF is 0.62. Since VIF values for both Paris and London hotels are smaller than 10, we conclude that there is no multicollinearity problem in our regression analysis.

Table II displays the regression results of equation 1 for the hotels in Paris and London. t-statistics calculated using robust standard errors are displayed in parentheses below the coefficient estimates. The data is annual. One star next to the standard errors denotes that the coefficient is significant at 5%. Two stars denote that the coefficient is significant at 1%.

The significance of the coefficient of hotel star and hotel review test the hypothesis 1a and 1b respectively. Table II shows that, for all of the regression specifications with different sets of explanatory variables, the coefficient of hotel review is significant at 1% and the sign of the coefficient is positive. Thus, the regression results validate our first hypothesis by showing that hotels with higher review score (star) set higher price levels compared to hotels with the same star (review score) in the same region. In other words, the room price increases as review score and star of the hotel increase.

	Paris			London		
	(1)	(2)	(3)	(1)	(2)	(3)
Hotel Review	30.52 (15.01)**	15.8 (9.32)**	14.3 (8.74)**	31.38 (14.6)**	9.94 (5.14)**	13.716 (6.81)**
Hotel Star		37.26 (21.46)**	32.5 (20.54)**		38.19 (15.28)**	34.872 (14.25)**
Regional Dummies			All 19 of the regional dummies are significant with negative coefficients.			9 of 21 regional dummies are significant with negative coefficients.
Constant	-110.16 (7.72)**	-111.64 (9.2)**	-50.85 (3.93)**	-119.9 (8.32)**	-90.54 (7.52)**	-105.06 (7.90)**
R-Square	0.25	0.54	0.63	0.31	0.56	0.62
Number of Observations	785	785	785	536	536	536

Table II:Analysis of the Effect of Review Score on Room Price for Hotels in Paris and London

Our second hypothesis ask the question of "Does the sensitivity of room prices to review scores increase with the increase in the star of the hotel?" In order to test this hypothesis, we need to estimate the effect of review score for each group of hotels having the same star rating. For that purpose, we define hotel star interaction variable as Hotel Star Dummy(s)*Hotel Review. The hotel star dummy(s) takes the value of 1 if the hotel has that star rating and zero otherwise. Interaction variable makes possible to measure the additional change in the coefficient of hotel review as a result of changing review score of the hotels belonging to specific star rating. By controlling the region that hotel belongs to, the impact of

hotel reviews and intreaction variables on room price are tested by estimating the coefficients of the following equation using OLS:

$$\text{Room Price} = \beta_0 + \beta_1 \text{Hotel Review} + \sum_{i=1}^{S-1} \beta_{i,I} \text{Hotel Star(s) Interaction} + \sum_{i=1}^{N-1} \beta_{i,D} \text{Hotel Region Dummy}_i \quad 2$$

where S is the rating of hotel having the highest star. In equation 2, β_1 measures the common effect of review score for all the hotels and $\beta_{i,I}$ measures additional effect of review score for hotels belonging to specific star.

Table III investigates the second hypothesis for hotels in Paris using equation 2. The room price of the hotels in Paris is regressed on hotel review, interaction variables that define the interaction between hotel star and hotel review and regional dummies. The coefficient of the interaction variable measures the change in the coefficient of Hotel Review according to Hotel Star. Hotel Star2 Dummy is equal to 1 if hotel star is 2 and 0 otherwise. The interaction variable (Hotel Star2 Dummy*Hotel Review) measures the difference in the response of hotel price to internet review score with respect to base hotel star which is 1-star hotels in our case. t-statistics calculated using robust standard errors are displayed in parentheses below the coefficient estimates. The standard errors are heteroskedasticity consistent standard errors. 13 outliers identified by the Grubbs' test are dropped from the data set. 19 regional dummy variables are used to identify 20 different regions in Paris.

Table III shows that the coefficient of hotel review is different for the different star hotels. All of the interaction variables are significant presenting the difference in the coefficient of hotel review with respect to star. The coefficient of the interaction variable of the 4 star hotels is the largest and the coefficient of the interaction variable of the 2 star hotels is the smallest. Thus, for 4 star hotels the sensitivity of the hotel price to online hotel review is larger since the coefficient is equal to (9.3+12.15) and the coefficient of review for 2 star hotels is smaller (9.3+2.06). Note that coefficient of one star hotel is 9.3. Since the coefficient of online hotel reviews is much larger for the higher star hotels, an improvement in the online reviews of higher star hotels (increase in average online hotel review) will cause a much higher increase in the price of higher star hotels.

	(1)	(2)
Hotel Review	11	9.3
	(5.75)**	(4.69)**
Hotel Star2 Interaction	1.45	2.06
Variable	(2.3)*	(2.46)*
Hotel Star3 Interaction	5.02	4.97
Variable	(7.87)**	(5.7)**
Hotel Star4 Interaction	13	12.15
Variable	(16.94)**	(12.74)**
Regional Dummies		All 19 of the regional dummies are significant with negative coefficients.
Constant	-9.77	35.55
	(0.86)	(2.99)**
R-Square	0.60	0.68
Number of Observations	785	785

Table III: Hotel Star Sensitivity Analysis of the Effect Review Score on Room Price for Hotels in Paris

Table IV presents the test of the second hypothesis for the hotels in London. Similar to the hotels in Paris, higher star hotel prices are much more sensitive to changes in online hotel reviews in London. The coefficient of 5 star hotel interaction variable is 17.81 and statistically significant where the coefficient of 2 star hotel interaction variable is not significant. The coefficients of the interaction variables increase as the star of the hotels increases. Thus, the price sensitivity of higher star hotels to the changes in review score is higher.

	(1)	(2)
Hotel Review	6.85	10.77
	(3.56)**	(5.27)**
Hotel Star2 Interaction Variable	0.50	-0.45
	(0.86)	(0.66)
Hotel Star3 Interaction Variable	2.93	2.07
	(4.68)**	(2.91)**
Hotel Star4 Interaction Variable	9.1	7.75
	(11.96)**	(9.05)**
Hotel Star5 Interaction Variable	19.69	17.81
	(16.17)**	(14.26)**
Regional Dummies		9 of 21 regional dummies are significant with negative coefficients.
Constant	12.61	-3.81
	(1.17)	(0.31)
R-Square	0.67	0.72
Number of Observations	536	536

Table IV: Hotel Star Sensitivity Analysis of the Effect Review Score on Room Price for Hotels in London

As a result, the results presented in tables III and IV validate the second hypothesis by showing that as the star rating of hotels increases, the coefficient of review score increases. In other words, the price of higher star hotels are much more sensitive to online reviews compared to lower star hotels.

6 DISCUSSION AND CONCLUSION

Many studies like Vermeulen and Seeger (2009) indicate that consumers prefer hotels with higher online reviews. Thus, demand for these hotels can be higher compared to hotel with low review score. Our paper complement these studies showing that higher review score result in higher price set by the hotels. By decreasing the price competition among hotels and increasing profit margin, online review can also be differentiating factor for hotel with high review score. This implies that hotels should strive to please customer as their future profitability depends on the satisfaction of past users.

Our result also shows that star rating of hotels significantly affects the sensitivity of room prices to review score. Specifically, higher review score increases the price of the higher star hotels more. These results suggest that satisfaction of less price sensitive customer is more critical than high price sensitive customers as less price sensitive customer values quality higher. Furthermore, high customer satisfaction increases the likelihood of repurchase decision of less price sensitives more than high price sensitives as they value quality more than price Baker and Crompton (2000).

Since hotels have fixed capacity and seasonality is important in tourism sector, both underpricing and overpricing of the hotels result in revenue loss. Furthermore, internet substantially reduced search cost of travelers and it is possible to view the price information of most of the hotels through web sites such as booking.com.Thus, fair pricing of hotel room over the internet become more important. The result of these paper can be used for this purpose and hotel manager can decide prices of hotel room by taking into account star rating, review score and the region information of their hotels.

In summary, we investigate the impact of online customer reviews on the hotel prices in this paper. Our analysis shows that pricing decision of the hotel management is significantly affected by online reviews. The results of this paper have also many practical implications for the hotel management.

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