Proceedings of the 3rd International Conference on Management Research and Economic Development
DOI: 10.54254/2754-1169/171/2025.21848

A Study on the Influence of Dynamic Pricing of High-end Hotels on Consumers' Mood and Attitude

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Abstract: With the growth of online travel platforms, hotel prices can be dynamically adjusted using systems considering macro (e.g., market demand, season) and micro (e.g., environment, reviews) factors that affect consumer attitudes. This study investigates the impact of hotel dynamic pricing on consumer sentiment and attitude via quantitative research and literature analysis. It collects online reviews of five-star hotels on OTA platforms for quantitative study to clarify the relationship between hotel pricing strategies and consumer emotions and attitudes. Focusing on consumers' emotional responses to dynamic pricing in the Internet context and analyzing them based on OTA reviews provides a novel perspective. By observing consumer feedback, it also aims to offer suggestions for improving hotel pricing strategies on online travel platforms, thereby enhancing user attitudes and the effectiveness of marketing and revenue management in the hospitality industry.

Keywords: Dynamic pricing, Hotels, Consumer sentiment and attitude, OTA platforms

1. Introduction

In recent years, the development of the Internet has driven the prosperity of the online travel market. OTA platforms have become important channels for hotel bookings. With the application of information technology, hotels, especially high-end ones, frequently adjust prices dynamically considering various factors. This has drawn consumers' attention and sometimes led to dissatisfaction due to issues like "big data killing". Meanwhile, the increasing number of five-star hotels has intensified market competition. Against this backdrop, this study aims to explore the influence of hotel dynamic pricing on consumers' emotions and attitudes. It uses literature analysis and mathematical statistics methods, collecting and analyzing online review data of five-star hotels on OTA platforms. By doing so, it hopes to provide new insights into this field and offer suggestions for improving hotel pricing strategies and enhancing user experience.

2. Literature Review

2.1. Definition of dynamic pricing

Dynamic pricing research dates back to the 1970s US civil aviation industry. Gallego G and Van Ryzin G[1] initially defined it as a process where product prices respond to changing demand, resulting in a set of nearly static prices. Haws and Bearde also defined it as a time-varying pricing

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strategy based on consumers and/or the environment. Generally, it emphasizes time variation in differential pricing and is commonly used in industries with stable short-term supply as a revenue management strategy.

With the Internet's growth, more complex rules have emerged, enabling e-commerce platforms to adjust prices more often. In China's web2.0 context, Wang Zhonghua et al.[2] defined dynamic pricing as a strategy for enterprises to sell the same product to different consumers or segments at different prices according to market demand and supply capacity to maximize revenue. This definition highlights market segmentation and expands the logic of dynamic pricing beyond supply-demand and seasonality to include competitors' prices and consumers' willingness to pay.

2.2. Research significance and perspective of dynamic pricing

In terms of research significance, dynamic pricing benefits enterprises by enhancing resource allocation efficiency, optimizing inventory management, and increasing profitability. For consumers, it affects factors like perceived price fairness, social norms, and trust, thus altering their purchase willingness and attitude.

At the enterprise application level, scholars focus on pricing model development and strategy. Raju C [3] used reinforcement learning for online monopoly retail dynamic pricing but lacked analysis of optimal reorder and volume discount. Kimitoshi Sato [4] established models considering competitive pricing and consumer risk aversion for perishable products but overlooked monopoly policy. Foreign scholars often lack numerical calculation applications, while domestic ones like Duan Wenqi and Ke Lingfen [5] use such methods. Their bilateral platform model shows dynamic pricing is better with strong cross-network effect and similar competitive platform shares. Forward-looking consumers are more receptive to dynamic pricing.

In consumer research, foreign scholars pioneered in studying the impact of online dynamic pricing on attitude through experiments. Garbarino E and Maxwell S [6] found pricing norms significantly affect consumer negative reactions and purchasing attitude. Domestic scholars then explored from the emotional aspect. Geng Congcong et al. [7] studied the influence of customer emotions on post-purchase behaviors and introduced emotions as an intermediary variable. However, cognitive perspective research on community penetration is lacking.

3. Sample selection and data sources

3.1. Sample selection and data sources

The study selects 128 five-star hotels in several cities from Ctrip.com between September 2020 and September 2022. Ctrip is chosen due to its large market share and abundant user comments. Sample cities and hotels are screened considering popularity, hotel quantity, user comments, and ratings. Data sources include hotel prices, service quality ratings from Ctrip, and consumer sentiment index obtained by classifying review text using the SnowNLP library and plain Bayesian principle.

3.2. Data collection and processing methods

Python is used to crawl hotel review data. After crawling 37,216 original comments, data cleaning is carried out. Based on keywords related to price perception, obvious leading comments, blank or meaningless comments are removed, leaving 6,518 valid reviews.

3.3. Indicator construction and measurement

For consumer sentiment index, the SnowNLP library is adopted for text mining and classification. 200 reviews are pre-trained and divided into training and test sets. The resulting classification

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outcome serves as the index. Regarding service quality index, it refers to an existing evaluation index system, assigning weights to user ratings of hotel location, service, facilities, food and beverage, and overall comfort to calculate the index.

3.4. Research process

The research process follows a series of steps. It begins with the research background and questions, followed by literature collection and hypothesis formulation. Then, quantitative and qualitative research is conducted through data collection and indicator construction. Finally, hypothesis validation is carried out to complete the study.

4. Model Demonstration and Suggestion Based on Review Data

4.1. The impact of dynamic pricing on consumer attitudes

Geng Congcong et al. [8]used users' online rating to measure consumers' attitudes in the study of customer sentiment and post-purchase behavior under the background of hotel dynamic pricing, and established an ordered regression model according to the ordered characteristics of dependent variables. In view of the fact that the dependent variable in this paper is a continuous variable, a new regression model expression (Formula 4-1) is established on the basis of the above model:

$$ln(s) = \alpha + \beta_1 CF + \beta_2 FR + \gamma_1 T + \gamma_2 Q \text{ (Formula 4-1)}$$

Among them, $\alpha$is a constant term, β_1、β_2、γ_1、$\gamma_2$are coefficients, and s represents a dependent variable consumer attitude. CF、FR represent the main explanatory variables: price fluctuation frequency and price fluctuation range.T、Qrepresent the control variables: travel type and service quality.

At the same time, the obtained data are regressed step by step, and three regression models are constructed on the basis of Formula 4-1. M1 is the regression result of the main explanatory variable, and M2 and M3 represent the regression results of gradually increasing travel types and service quality (Table 4-1). The regression results show that both the control variables and the independent variables are significant at 1%, and the whole model passes the F test at 1% significance level, but the goodness of fit needs to be improved. Among the independent variables, the regression coefficient of price change frequency is -0.28, which shows that the higher the dynamic price frequency, the lower the consumer attitude; The regression coefficient of the price fluctuation range is 0.049, which indicates that the hotel price fluctuation range has a significant positive impact on consumers' attitude, assuming that H1 passes the verification. The preliminary regression results of consumers' emotions and attitudes also show that the hotel dynamic pricing strategy will not significantly affect the consumption attitude of non-enjoyment consumers such as business trips.

Table 1: Regression Results of Dynamic Pricing and Consumer Attitude

variable	M1	M2	M3
Price fluctuation range	0.061***	0.070***	0.049***
	(0.016)	(0.016)	(0.007)
price change frequency	-0.180***	-0.270***	-0.280***
	(0.023)	(0.023)	(0.023)
quality of service		0.049***	0.225***
		(0.01)	(0.004)

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Table 1: (continued).

Travel Type-Leisure Travel			0.415*** (0.009)
constant term	4.563*** (0.015)	4.507*** (0.018)	4.082*** (0,054)
Number of observations	6518	6518	6518
R2	0.030	0.070	0.170

Note: *, ** and *** represent statistical significance at the level of 10%, 5% and 1% respectively, and those in brackets below the coefficient are standard errors, and the regression result of the variable "Travel Type-Business Travel" is not significant, so it is excluded.

4.2. Intermediary role test

In this paper, the sequential test method proposed by Wen Zhonglin and Ye Baojuan [9]is used to test the mediating effect, which respectively tests the relationship between dynamic pricing (change frequency and fluctuation range) and consumer sentiment, the relationship between consumer sentiment and consumer attitude, and the relationship between dynamic pricing (change frequency and fluctuation range) and consumer attitude. The regression model formula of intermediary effect is as follows:

$$ln(s) = \alpha_1 + \beta_1 CF + \beta_2 FR + \theta CS + \gamma_1 T + \gamma_2 Q \text{ (Formula 4-2)}$$

$$CS = \alpha_2 + \beta_3 CF + \beta_4 FR + \gamma_3 T + \gamma_4 Q \text{ (Formula 4-3)}$$

α_1、α_2 are constant terms, and β_1、β_2、β_3、β_4、γ_1、γ_2、γ_3、γ_4、θ are coefficients. S represents the dependent variable consumer attitude, and CF、FR represent the independent variable price fluctuation frequency and price fluctuation range respectively. T、Q represent the control variable travel type and service quality respectively, andCSrepresents the intermediary variable consumer sentiment.

4.2.1. Relationship between dynamic pricing and consumer sentiment

In this paper, the relationship between dynamic pricing and consumer sentiment is verified by stepwise regression method, and three regression models are constructed on the basis of formula 4-3. M1 is the regression result of the main explanatory variable, and M2 and M3 represent the regression results of gradually increasing travel types and service quality (Table 4-2). Regression results show that the control variables are all significant at 1% level; Independent variables are all significant at 1% level except the frequency of change in M1 model. Among them, the regression coefficient of price fluctuation range is 0.003, the standard error is 0.007, t is 3.1, p<0.01, the regression coefficient of price fluctuation frequency is -0.03, the standard error is 0.010, t is 2.9, p<0.01, which shows that the former positively affects consumer sentiment, while the latter negatively affects consumer sentiment.

Table 2: Regression Results of Dynamic Pricing and Consumer Emotion

variable	M1	M2	M3
Price fluctuation range	0.011*** (0.001)	0.017*** (0.001)	0.003*** (0.001)

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Table 2: (continued).

price change frequency	-0.021** (0.010)	-0.026*** (0.010)	-0.03*** (0.010)
quality of service		0.049*** (0.010)	0.058*** (0.004)
Travel Type-Leisure Travel			0.072*** (0.009)
constant term	0.776*** (0.060)	0.745*** (0.080)	0.672*** (0.023)
Number of observations	6518	6518	6518
R2	0.030	0.070	0.170

Note: *, ** and ***represent statistical significance at the level of 10%, 5% and 1% respectively. The standard error is in brackets below the coefficient, and the regression result of the variable "Travel Type-Business Travel" is not significant, so it is excluded.

4.2.2. Relationship between consumer emotion and attitude

The author uses stepwise regression method to verify the relationship between consumers' emotions and attitudes, and constructs three regression models. M1 is the regression result of the main explanatory variable, and M2 and M3 represent the regression results of gradually increasing travel types and service quality (Table 4-3). The regression results show that the control variable travel type (leisure travel) is significant at 5% level, and the rest are significant at 1% level; The independent variable consumer sentiment index was significant at the level of 1%, the regression coefficient was 0.267, the standard error was 0.040, t was 6.675, $p<0.01$, indicating that the mood of hotel consumers positively affected their attitudes.

Table 3: Regression Results of Consumer Emotion and Attitude

variable	M1	M2	M3
Consumer sentiment index	0.266*** (0.040)	0.266*** (0.040)	0.267*** (0.040)
quality of service		0.012*** (0.030)	0.003*** (0.030)
Travel Type-Leisure Travel			-0.037** (0.009)
constant term	-0.430*** (0.020)	-0.438*** (0.020)	-0.404*** (0.025)
Number of observations	6518	6518	6518
R2	0.377	0.378	0.379

Note: *, ** and *** represent statistical significance at the level of 10%, 5% and 1% respectively. The standard error is in brackets below the coefficient, and the regression result of the variable "Travel Type-Business Travel" is not significant, so it is excluded.

4.2.3. Relationship among Dynamic Pricing, Consumer Emotion and Attitude

Finally, this paper verifies the relationship among dynamic pricing, consumer sentiment and attitude, and constructs three regression models on the basis of Formula 4-2. M1 is the regression result of the main explanatory variable, and M2 and M2 represent the regression result of gradually increasing travel types and service quality (Table 4-4). The regression results show that all the control variables are significant at 1% level except the trip type in M2 model at 5% level. The independent variables

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were all significant at 1% level, among which the regression coefficient of consumer sentiment index was 1.404, the standard error was 0.04, and t was 35.1, p<0.01. The regression coefficient of price fluctuation range is 0.010, the standard error is 0.03, t is 3.33, p<0.01. The regression coefficient of price change frequency is -0.238, the standard error is 0.018, t is -13.22, p<0.01. This shows that after consumer sentiment and dynamic price (price fluctuation range and price fluctuation frequency) are brought into the regression equation at the same time, the price fluctuation range still has a significant positive impact on attitude, and the price fluctuation frequency still has a negative impact on attitude.

Table 4: Regression Results of Dynamic Pricing, Consumer Emotion and Attitude

variable	M1	M2	M3
Consumer sentiment index	1.414***	1.416***	1.404***
	(0.023)	(0.04)	(0.04)
Price fluctuation range	0.044***	0.040***	0.010***
	(0.003)	(0.003)	(0.003)
price change frequency	-0.038***	-0.040***	-0.238***
	(0.018)	(0.018)	(0.018)
Travel Type-Leisure Travel		0.035**	0.314***
		(0.017)	(0.039)
quality of service			0.144***
			(0.018)
constant term	3.465***	3.444***	3.139***
	(0.021)	(0.023)	(0.045)
Number of observations	6518	6518	6518
R2	0.378	0.379	0.385

Note:*, ** and ***represent statistical significance at the level of 10%, 5% and 1% respectively. The standard error is in brackets below the coefficient, and the regression result of the variable "Travel Type-Business Travel" is not significant, so it is excluded.

Using SPSSAU software and Bootstrap sampling method, this paper establishes a mediating effect model, and tests the mediating effect of consumer sentiment on the relationship between hotel dynamic pricing (price change frequency and price fluctuation range) and consumer attitude (tables 4-5 and 4-6). The results show that the frequency and amplitude of hotel price changes have a significant indirect effect on attitude through consumer sentiment, and consumer sentiment belongs to some intermediaries. In the relationship between price fluctuation range and attitude, the mediating effect of consumer sentiment is 80%, and the sign is positive, which is consistent with hypothesis H2. In the relationship between price change frequency and attitude, the mediating effect of consumer sentiment is 15%, but the sign is negative, which is inconsistent with the hypothesis H2. Therefore, assuming that the H2 part is verified, the mediating effect of consumer sentiment on price fluctuation range and attitude is more significant.

Table 5: Breakdown Table of Total Effect, Direct Effect and Mediating Effect of Consumer Emotion on Attitude by Fluctuation Range

Item	Effect value	Standard error of indirect effect	95% confidence interval		Relative effect value	Inspection conclusion
			upper limit	lower limit		
Total effect	0.049***	0.000	0.018	0.081	80% 20%	Partial intermediary

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Table 5: (continued).

Indirect effect	0.039	0.000	0.000	0.041
Direct effect	0.010***	0.000	0.006	0.056

Note: *, ** and *** represent statistical significance at the level of 10%, 5% and 1% respectively

Table 6: The development process of the decomposition table of the total effect, direct effect and intermediary effect of changing frequency on attitude

Item	Effect value	Standard error of indirect effect	95% confidence interval		Relative effect value	Inspection conclusion
			upper limit	lower limit		
Total effect	-0.280***	0.000	-0.035	-0.012		
Indirect effect	-0.042	0.000	-0.050	-0.031	15% 85%	Partial intermediary
Direct effect	-0.238***	0.000	-0.300	-0.064		

Note: *, ** and ***represent statistical significance at the level of 10%, 5% and 1% respectively

The intermediary effect of consumer sentiment can also be explained by hotel user comments. Some low-scoring users report:

"The hotel room is average, but the price increase is too fast, so I don't think the price/performance ratio is high", "I checked into the hotel on May 1st and left the hotel on May 3rd. The hotel suddenly increased its price during my stay, because there was a concert in the Expo Park. I am very dissatisfied with this. The hotel has raised the price of the guests who are staying because of the concert. This is an obvious slaughter! " This shows that frequent price changes have a negative impact on consumers' perception of value and fairness, which in turn leads to negative emotions among consumers. According to Zhang Ge Zero [10] s research on consumers' emotions, emotions will be transmitted in consumers' subsequent experiences, which will lead to the negative emotions being reviewed when making attitude judgments, and ultimately the overall attitude will be significantly reduced.

In view of the price fluctuation range, some high-rated users reported: "During the epidemic period, the discount was very strong, which was particularly affordable, and you will come back next time you engage in activities", "It's very cost-effective when you have a special discount" and "It's very cost-effective to stay in a single room in Tomb-Sweeping Day, which means that the room is relatively small, which is suitable for consumers who don't often stay in hotels. But the hotel is very clean, and the most important thing in the hotel is cleanliness. In short, this price is good! If I can maintain this hygiene standard, I will come again in the future! " . This shows that the greater the hotel's price reduction, the lower the consumer's perceived cost, which in turn enhances the perceived value, and the perceived value further causes consumers' positive emotions (pleasure and surprise). The research of Zhang Ge Zero [11] shows that surprise emotion can make the positive evaluation of product or service characteristics easier to obtain, which also improves the possibility of recalling this characteristic, which also explains how the positive emotion of consumers can cause a significant improvement in the overall attitude.

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5. Conclusion

This study reveals significant insights into the impact of high-end hotel dynamic pricing on consumers. Firstly, dynamic pricing directly affects consumer attitudes; higher price increases or lower change frequencies improve them. Secondly, consumer sentiment mediates this relationship. Larger off-peak discounts enhance perceived value and positive emotions, while frequent price changes cause negative emotions and reduce attitudes, with price increase being a more significant factor. Thirdly, different pricing strategies lead consumers to focus on different cost-performance factors. Finally, emotions influence the satisfaction dimensions consumers care about in different types of hotels.

Hotels can thus implement market segmentation in pricing, attend to consumer sentiment, and manage online images. Online platforms should supervise prices and avoid misusing technology. Future research could explore this topic further for more industry insights.

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