

# Asymmetric preference in hotel room choice and implications on revenue management

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## ABSTRACT

In selecting a hotel room, guests evaluate specific room characteristics. After their stay, these characteristics are used as reference levels in deciding which hotel room to stay in the future. According to prospect theory, the gains (i.e., upgrade or improving) and losses (i.e., downgrade or worsening) with respect to the reference level are perceived differently by individuals. In particular, losses are weighted more than gains. This research investigates the asymmetric preference in hotel room choice by performing a stated choice experiment among the guests of a hotel in Hong Kong. A mixed logit model is estimated by deriving different coefficients for improving and worsening conditions, and attribute-specific cluster analyses are performed to identify those segments with similar preferences. The results confirm the validity of reference-dependent specification in hotel room choice and provide insights for revenue managers in relation to their aim to maximize revenue for repeat guests.

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## 1. Introduction

Modern hospitality revenue management (RM) practices are evolving quickly in an increasingly competitive business environment. Revenue managers must understand the behavior of decision makers when establishing their pricing strategies. For example, if a guest values a hotel room with an ocean view much more than one with a city view, managers may set up their room price fences accordingly (Masiero et al., 2015). Deriving a utility function from the decision makers can guide the construction of rate fences and help the hotel achieve maximum revenue (Goldberg et al., 1984).

However, the decisions of consumers are far from perfectly rational: they are affected by limited knowledge, emotions, and reference points (Gigerenzer and Selten, 2002). Prospect theory reveals several key aspects of consumer behavior, namely, reference dependence and loss aversion (Kahneman and Tversky, 1979). Theoretically, such diversion indicates the imbalance between the values that guests place on different gains or losses and on different hotel attributes. Such diversion allows the revenue managers of hotels to arbitrage between increased and decreased prices or to grant and remove certain hotel attributes or conditions. If the guests from different market segments have varying degrees of imbalance,

hotel managers may set up more refined pricing fences on each segment to increase their revenues.

Stated choice experiments are widely implemented to calculate consumers' utility functions (Louviere et al., 2000). This study performs a stated choice experiment and utilizes discrete choice modeling techniques to investigate the applicability of asymmetric preference, as introduced by prospect theory, in choosing a room in a single hotel property. Hotel room choices were collected from 651 guests. The asymmetric preference of these guests across different hotel attributes is validated by considering their current room as their reference point. The results show that the weights of gains and losses also vary across different market segments. Hotel revenue managers can utilize these findings when setting up rate fences and making strategic pricing decisions.

## 2. Literature review

### 2.1. Prospect theory

Prospect theory has been applied in various areas, including economics, finance, decision sciences, organization management, and marketing management. A growing literature on economic behavior suggests that the preferences of consumers are reference dependent. The evaluation of an outcome is affected by comparison of the outcome with a reference point (Allen et al., 2014). Proposed by Kahneman and Tversky (1979), Prospect Theory posits that individuals evaluate outcomes not on their absolute level, but

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on their deviation from the reference point. In other words, how an individual evaluates the outcome of a choice is often determined by its contrast with a reference point (Kőszegi and Rabin, 2006). This reference-dependent preference (Munro and Sugden, 2003; Tversky and Kahneman, 1991) suggests that individuals evaluate outcomes as gains or losses relative to a neutral reference point. Given that the reference point categorizes outcomes into gains or losses, the evaluation of outcomes differs above or below such reference point. Individuals react more strongly to losses than to gains (Kahneman and Tversky, 1979), thereby making asymmetric preference as a manifestation of loss aversion behavior. Many empirical studies have found evidence of loss aversion (e.g., Kahneman et al., 1990; Tversky and Kahneman, 1991; Barberis et al., 2001).

Several tourism and hospitality researchers have adopted the concept of reference point to explore various topics, including destination choice (e.g., Nicolau, 2011, 2012), human resources (e.g., Matzler and Renzl, 2007), customer satisfaction (e.g., Füller et al., 2006), online consumer reviews (e.g., Park and Nicolau, 2015), fairness adjustments in the airline and hotel sectors (e.g., Mathies et al., 2013), and price perception (e.g., Wirtz and Kimes, 2007). Mathies et al. (2013) examined how the simultaneous use of customer-centric marketing and RM affects the fairness perceptions of guests and their purchasing choices. They tested a choice model that incorporated reference-dependent fairness adjustments for both price and non-price attributes. The results showed that the reference-dependent adjustments depend on both the direction of and the degree to which an observed attribute level differs from its respective reference point. Nicolau (2011) examined the asymmetric effects of loss aversion by investigating whether individuals show interests in culture when choosing a destination and found that culture-interested tourists are less loss averse. Nicolau (2012) investigated the degree of loss aversion dispersion in the tourism sector and discovered the potential existence of groups of tourists that show varied asymmetric responses to price. By performing a stated choice experiment, Román and Martín (2016) found asymmetries in the hotel attributes preference formation of guests of various hotels in Gran Canaria (Spain).

Oh (2003) discussed several implications of prospect theory to the hospitality industry. A hotel that consistently provides quality service tends to be viewed more favorably than hotels that inconsistently provide better quality. This is because customers tend to overweight a decision outcome that can be obtained with certainty. Furthermore, the isolation effect of prospect theory suggests that customers do not seriously consider the product characteristics that are common to all alternative options in their choice set, thereby producing inconsistent context-dependent preferences (Oh, 2003). Few researchers in the hospitality field have further discussed the implications of the framing effect of prospect theory in the RM pricing context. Framing effect refers to the way in which a choice can be influenced by how such choice is presented to the consumers. Prospect theory implies that the changes from reference points may be valued differently depending on whether they can be classified as gains or losses. Specifically, individuals tend to be more sensitive to losses relative to their reference point than to gains. In other words, loss aversion indicates the asymmetric effects of gain and loss situations on various purchase-related evaluation situations. In RM pricing, Kimes and Wirtz (2003) validated that those price differences that are framed as gains are perceived as fairer than those that are framed as losses even if these situations are economically equivalent.

## 2.2. Repeat purchase behavior of consumers

Many service businesses are not only concerned with attracting new customers, but also with maintaining repeat customers because attracting a new customer requires more efforts than

retaining an existing one. Long-time customers are more profitable to service providers as they tend to purchase more frequently and in greater quantity than new customers (Reichheld and Sasser, 1990). Depending on the industry, a 5% increase in customer retention leads to a 25% to 85% increase in profits (Kerin et al., 2009; Reichheld and Sasser, 1990). Given that the repurchase behavior of consumers leads to long-term profitability for the firm, service providers must identify those factors that influence the repurchase decisions of their customers. Therefore, consumer behavior is modeled on the basis of the choices of consumers and the repeat purchase of various consumer goods and services (e.g., Bawa, 1990; Chintagunta, 1993; Erdem, 1996; Guadagni and Little, 1983; Harris and Uncles, 2007; Petrick et al., 2006). Managers and researchers use customer satisfaction to understand and predict the future behavior of consumers. The perceived quality-satisfaction-behavioral model has also become an important tool in marketing research. Several researchers have found a direct and positive relationship between customer satisfaction and repurchase intention.

The relationship marketing literature suggests that despite its importance in encouraging repurchase intention, satisfaction does not automatically lead to repurchase behavior (Reichheld and Aspinall, 1993). Some scholars have emphasized the crucial role of commitment in building long-term relationships and encouraging repurchase behavior among consumers. Moorman et al. (1992) defined relationship commitment as an enduring desire to maintain a valued relationship. Morgan and Hunt (1994) argued that commitment is positively related to loyalty and repeated purchase because relationship performance is crucial in promoting repurchase decisions in a relational exchange. Achieving satisfaction can strengthen the loyalty of consumers, which in turn increases their tendency to repurchase services (Law et al., 2004; Hicks et al., 2005).

Other scholars have proposed value perceptions as superior indicators of repurchase intentions (Beng, 1999; Petrick, 2002). Cronin et al. (2000) stated that perceived value might be a better predictor of repurchase intention than either satisfaction or quality. Perceived value results from the pre-purchase expectations, transaction assessments, and post-purchase (after-consumption) evaluations of consumers and is critical to the success of consumer-service provider relationships (Lemon et al., 2001). Several researchers have asserted that repurchase behavior is achieved when the customers perceive their transaction with the service providers as valuable. Mittal and Sheth (2001) argued that those service providers that could deliver more value than their competitors would effectively encourage the repurchase behavior of their customers. Some researchers have examined how and why consumers repurchase particular products or services to predict their future behavior or to infer the effect of marketing strategies.

Scholars in the tourism and hospitality field have also examined the repurchase behavior of consumers. Most tourism studies on repeat visitation have investigated the satisfaction construct and its antecedents and found that revisit intention is a consequence of tourist satisfaction (Bigne et al., 2001). Many studies have also identified satisfactory travel experience as the major antecedent of revisit intention (Oppermann, 2000; Baker and Crompton, 2000; Petrick et al., 2001; Kozak, 2001; Jang and Feng, 2007; Alexandris et al., 2006; Chi and Qu, 2008). However, satisfaction with past experience may not be sufficient to explain re-patronage behavior because many customers do not always return to the same service providers despite their satisfaction. Satisfied customers may still switch to other service providers due to their attempt to receive better service or to try something novel or different for fun or thrill (Steenkamp and Baumgartner, 1992).

In summary, the consumer repurchase behavior literature shows that the past experience of consumers with the same product or service is a fundamental aspect of their repurchase decision. By using the current room of hotel guests as their reference point, the

**Table 1**  
Attributes for the stated choice experiment and their levels.

Attribute	Level
View	0 = City 1 = Harbor
Floor	10 = 10th 18 = 18th 26 = 26th
Access to hotel club	0 = No 1 = Yes
Free mini bar	0 = Soft drinks and snacks 1 = Soft drinks, snacks, wine, and beer
Guest smartphone	0 = Unavailable 1 = Available (with free voice calls and data)
Cancellation	0 = Non-refundable 1 = Refundable (up to 24 h prior)
Room price per night	HK\$1600 HK\$2000 HK\$2400 HK\$2800 HK\$3200

Note: HK\$1 is approximately US\$0.13.

present study investigates how these guests react to the positive and negative deviations from their reference levels. The findings can help revenue managers in encouraging the repurchase behavior of their customers. Specifically, this study attempts to investigate the asymmetric preference of hotel guests in their room choice through reference-dependent utility specification by performing a stated choice experiment and a discrete choice modeling technique.

### 3. Data

The data were collected by performing a stated choice experiment between March 2014 and May 2014. The guests of one four-star hotel in Hong Kong were selected as subjects. The room preferences of these guests for a future stay in the same hotel were investigated in the experiment. Two hypothetical room alternatives were designed according to seven attributes, namely, room view, floor level, hotel club access, free mini bar, guest smartphones, cancellation policy, and room price. The attributes were selected after having discussed them with hotel managers, director of rooms and director of revenue. The attribute levels were defined to reflect the actual options that were available at the hotel. These attributes and their respective levels are presented in Table 1.

A pilot study, based on a fractional orthogonal design, was conducted to verify the clarity of the stated choice experiment and to gather the preliminary model estimates that were needed for calibrating an efficient design. In fact, compared with orthogonal designs, efficient designs provide estimates with a smaller standard deviation (Rose and Bliemer, 2009) but require the analyst to have previous knowledge on how the attributes are perceived by the respondents. The efficient design adopted for the main survey was generated using Ngene software (ChoiceMetrics, 2012). In total, 12 choice tasks were included in the final design, each composed of two hypothetical room alternatives (i.e., Room A and Room B). To reduce the overall length of the survey and to minimize respondent fatigue, the 12 choice tasks were split into two blocks, each of which contained six choice tasks. The assignment of choice tasks to the two blocks was performed by the software ensuring minimum correlation between blocks and design attributes (ChoiceMetrics, 2012). Table 2 reports the 12 choice tasks composing the efficient design. Respondents were randomly assigned to either first or second block and for each choice task they were asked to state their preference between the two hypothetical room alternatives.

As part of the survey, the hotel guests were asked to describe the room in which they were currently staying. Among the seven attributes that were used in the experiment, two (i.e., “free mini bar” and “guest smartphone”) were invariant in real life because all guests enjoyed the privilege of both, whereas the other five (i.e., “view,” “floor,” “access to hotel club,” “cancellation policy,” and “room price per night”) reflected the different options that were available to hotel guests at the time of their booking. For these five attributes it was therefore possible to illustrate the preferences of the guests as a function of the attribute levels that were chosen for their current stay. In fact, current stay can be considered as a reference in the valuation of a future repurchase. Therefore, the role of current experience in the formation of the preference for a choice task that involves a repeat purchase can be investigated.

The survey was conducted in the hotel lobby by trained student assistants who approached the hotel guests according to a systematic counting rule. A total of 808 hotel guests participated in the survey. Although the choice experiment was completed by all respondents, missing data were registered, particularly on the data regarding the rooms in which the respondents were currently staying. Given the relevance of this information to the present study, the following analysis was exclusively based on a subset of 651 observations that included the full set of information about the current stay of the guests. The descriptive statistics of the excluded cases were also analyzed to ensure that no distinctive patterns were present in the missing data. The mean values were compared through independent sample tests, and no statistically significant differences were observed between the socio-demographic variables of the excluded and included cases. Table 3 summarizes the descriptive statistics of the sample.

With regard to the attributes that were associated with their current stay, 49% of the guests enjoyed the harbor view, 28% had access to the hotel club, and only 15% opted for a rate that included a refund policy. The hotel guests were evenly assigned to the available floors (from 10th to 27th) for an average room rate of HK\$2434 per night. The majority (73%) of the respondents stayed in the hotel as part of a leisure trip for an average of 3.65 nights, with two- and three-night stays being the most popular options. A consistent share (38%) of the sample reported a monthly household income of US\$9000 or higher. English-speaking countries, such as UK, US, and Australia, were most represented in the sample. Chinese guests accounted for only 7% of the sample.

### 4. Methodology

The 3906 (i.e., 651 respondents  $\times$  6 choice tasks) choice observations were analyzed using the discrete choice modeling technique. Defined within the random utility framework (McFadden, 1974), a discrete choice model builds on the assumption that the respondents select the alternative that maximizes their utility. The following application relies on the mixed logit specification that accommodates preference heterogeneity in the sample by estimating the coefficients of both the means and standard deviations (i.e., random parameter). The mixed logit class of the model can approximate any random utility model (McFadden and Train, 2000) and can be generalized to account for the repeated choices of the respondents (Train, 2009). Following the classic utility specification, the utility that is associated with hotel guest  $n$  for alternative  $j$  in choice task  $s$  can be specified in the following linear form:

$$U_{njs} = \alpha_j + \sum_k \beta_k x_{njsk} + \varepsilon_{njs}, \quad (1)$$

where  $\alpha$  represents the alternative specific constant that is introduced in  $J-1$  alternatives,  $\beta_k$  is the coefficient that is associated with attribute  $x_k$ , and  $\varepsilon$  refers to the unobserved error that is assumed to

**Table 2**  
Experimental design.

Block	View	Floor	Access to club	Free mini bar	Guest smartphone <sup>a</sup>	Cancellation <sup>b</sup>	Price (HKD)	
I	1	City	10th	No	Soft drinks, snacks, wine & beer	Unavailable	Refundable	1600
		Harbour	26th	Yes	Soft drinks, snacks, wine & beer	Available	Non-refundable	2400
	2	Harbour	26th	No	Soft drinks, snacks	Unavailable	Non-refundable	2400
		Harbour	10th	No	Soft drinks, snacks	Available	Refundable	2800
	3	Harbour	26th	Yes	Soft drinks, snacks, wine & beer	Unavailable	Non-refundable	3200
		City	18th	Yes	Soft drinks, snacks, wine & beer	Available	Non-refundable	3200
	4	City	18th	No	Soft drinks, snacks, wine & beer	Unavailable	Non-refundable	2400
		Harbour	10th	No	Soft drinks, snacks	Unavailable	Refundable	1600
	5	City	18th	Yes	Soft drinks, snacks, wine & beer	Available	Refundable	2400
		City	26th	Yes	Soft drinks, snacks, wine & beer	Unavailable	Refundable	2800
	6	Harbour	26th	No	Soft drinks, snacks	Available	Non-refundable	2800
		Harbour	18th	No	Soft drinks, snacks, wine & beer	Available	Non-refundable	1600
II	7	City	26th	Yes	Soft drinks, snacks	Available	Refundable	3200
		Harbour	18th	No	Soft drinks, snacks, wine & beer	Unavailable	Non-refundable	3200
	8	City	26th	Yes	Soft drinks, snacks, wine & beer	Unavailable	Refundable	2000
		Harbour	10th	No	Soft drinks, snacks	Unavailable	Non-refundable	1600
	9	Harbour	18th	Yes	Soft drinks, snacks	Unavailable	Non-refundable	2800
		City	26th	No	Soft drinks, snacks, wine & beer	Available	Refundable	2400
	10	Harbour	18th	Yes	Soft drinks, snacks, wine & beer	Available	Refundable	2000
		Harbour	26th	No	Soft drinks, snacks, wine & beer	Available	Refundable	2000
	11	Harbour	18th	No	Soft drinks, snacks, wine & beer	Unavailable	Non-refundable	3200
		City	10th	Yes	Soft drinks, snacks, wine & beer	Unavailable	Non-refundable	2800
	12	City	10th	Yes	Soft drinks, snacks, wine & beer	Available	Non-refundable	1600
		Harbour	26th	Yes	Soft drinks, snacks	Unavailable	Refundable	1600

<sup>a</sup> The level “Available” was actually presented as “Available (with free voice calls and data)”.

<sup>b</sup> The level “Refundable” was actually presented as “Refundable (up to 24 h prior)”.

**Table 3**  
Descriptive statistics of the sample.

Current stay	Frequency or mean
Room—View	City (51%); harbor (49%)
Room—Access to club	No (72%); Yes (28%)
Room—Cancellation policy	Non-refundable (85%); Refundable (15%)
Room—Room price per night	HK\$2434
Guest profile	Frequency or Mean
Purpose of travel	Leisure (73%); Business (27%)
Nights	3.65
Gender	Male (60%); Female (40%)
Monthly Household income (in US\$)	<\$1000 (1.1%); \$1000–2999 (4.7%); \$3000–4999 (12.3%); \$5000–6999 (20.9%); \$7000–8999 (22.9%); \$9000+ (38.1%)
Nationality	UK (16%); Australia (14%); US (12%); China (7%); Others (51%)

be an independent and identically distributed extreme value type 1.

Under a reference-dependent utility specification, different coefficients are estimated according to whether the attribute represents an improving or worsening condition as compared with the current (i.e., reference) attribute level that is experienced by the respondents in their current stay. In this context, the utility function can be specified in terms of the deviations between the reference and attribute levels as follows:

$$U_{njs} = \alpha_j + \sum_k \beta_{nk(imp)} x_{njsk(imp)} + \sum_k \beta_{nk(wors)} x_{njsk(wors)} + \sum_k \beta_{nk} x_{njsk} + \varepsilon_{njs}, \tag{2}$$

where  $\beta_{(imp)}$  and  $\beta_{(wors)}$  are the coefficients that are associated with improving and worsening conditions for the reference-dependent attributes “price,” “floor,” “view,” “access to hotel club,” and “cancellation,” whereas  $\beta_k$  is the coefficient that is associated with the  $k$  invariant attributes “free mini bar” and “guest smartphone.” The reference-dependent attributes are specified as follows:

$$x_{price(imp)} = \max(x_{ref.price} - x_{price}, 0); \tag{2a}$$

$$x_{price(wors)} = \max(x_{price} - x_{ref.price}, 0).$$

$$x_{floor(imp)} = \max(x_{floor} - x_{ref.floor}, 0); \tag{2b}$$

$$x_{floor(wors)} = \max(x_{ref.floor} - x_{floor}, 0).$$

$$x_{view(imp)} = 1 \text{ if } (x_{ref.view} = 0 \text{ and } x_{view} = 1), 0 \text{ otherwise}; \tag{2c}$$

$$x_{view(wors)} = 1 \text{ if } (x_{ref.view} = 1 \text{ and } x_{view} = 0), 0 \text{ otherwise.}$$

$$x_{club(imp)} = 1 \text{ if } (x_{ref.club} = 0 \text{ and } x_{club} = 1), 0 \text{ otherwise}; \tag{2d}$$

$$x_{club(wors)} = 1 \text{ if } (x_{ref.club} = 1 \text{ and } x_{club} = 0), 0 \text{ otherwise.}$$

$$x_{cancel(imp)} = 1 \text{ if } (x_{ref.cancel} = 0 \text{ and } x_{cancel} = 1), 0 \text{ otherwise}; \tag{2e}$$

$$x_{cancel(wors)} = 1 \text{ if } (x_{ref.cancel} = 1 \text{ and } x_{cancel} = 0), 0 \text{ otherwise.}$$

As shown in Eqs. (2a)–(2e), the attribute that is associated with an improving condition takes a non-zero value only if the attribute that is displayed in the choice task has a more desirable level than what is being experienced by the respondent in his or her current stay. The opposite applies for the attribute that is associated with a worsening condition. Parameters  $\alpha$  and  $\varepsilon$  are defined according to Eq. (1). The reference-dependent specification allowed us to use the current experience of the hotel guests in modeling their preferences for hotel room attributes for future consumption.

The mixed logit model in Eq. (2) was estimated through maximum simulated likelihood methods. Similar to any mixed logit specification, the choice probabilities cannot be exactly computed



**Table 4**  
Model results.

	Coeff.	(t-ratio)
Means for constant and random coefficients		
Constant (alternative A)	-0.0544	(-1.13)
Guest smartphone (available)	0.1949	(2.77) <sup>a</sup>
Free mini bar (beer and wine)	0.2936	(3.66) <sup>a</sup>
Cancellation (improving)	0.2528	(3.10) <sup>a</sup>
Cancellation (worsening)	-0.2330	(-1.41)
View (improving)	0.5525	(5.12) <sup>a</sup>
View (worsening)	-1.4695	(-10.17) <sup>a</sup>
Floor (improving)	0.0119	(1.50)
Floor (worsening)	-0.0386	(-4.47) <sup>a</sup>
Access to club (improving)	0.5515	(5.60) <sup>a</sup>
Access to club (worsening)	-0.6535	(-4.98) <sup>a</sup>
Price (improving)	0.0011	(5.06) <sup>a</sup>
Price (worsening)	-0.0019	(-7.55) <sup>a</sup>
Standard deviations for random coefficients		
Ns Guest smartphone (available)	0.5263	(3.33) <sup>a</sup>
Ns Free mini bar (beer and wine)	0.3929	(1.72) <sup>c</sup>
Ns Cancellation (improving)	0.4809	(1.79) <sup>c</sup>
Ns Cancellation (worsening)	0.5314	(1.22)
Ns View (improving)	0.8602	(5.26) <sup>a</sup>
Ns View (worsening)	1.2885	(8.11) <sup>a</sup>
Ns Floor (improving)	0.0139	(0.19)
Ns Floor (worsening)	0.0495	(2.12) <sup>b</sup>
Ns Access to club (improving)	0.7270	(4.49) <sup>a</sup>
Ns Access to club (worsening)	0.6356	(2.85) <sup>a</sup>
Ns Price (improving)	0.0019	(6.89) <sup>a</sup>
Ns Price (worsening)	0.0023	(6.01) <sup>a</sup>
Initial LL	-2707.43	
Final LL	-2436.39	
AIC	1.2603	

<sup>a</sup> Prob < 1%.  
<sup>b</sup> Prob < 5%.  
<sup>c</sup> Prob < 10%.

and the estimation of the coefficients relies on simulation. In the subsequent application, 500 Halton draws were used for the simulation (for a discussion of the Halton sequence, refer to Train, 2009). Normal, triangular and uniform distributions were tested for the specification of the random parameters and provided similar fits to the data. The normal distribution was therefore selected as the most convenient specification.

Specifying the random parameters allowed us to estimate individual-specific parameters by deriving individual choice probabilities and applying the Bayes rule (Hensher and Greene, 2003). The individual-specific parameters for the improving and worsening conditions that were estimated in the choice model were further used to perform a cluster analysis of the five attributes that were specified as deviations from the reference levels as expressed in Eqs. (2a)–(2e). When conducting the cluster analysis, the hierarchical Ward’s method was initially implemented to select the number of clusters. Subsequently, a non-hierarchical k-means method was implemented to finalize the classification of each respondent in the clusters. The selected clusters were further characterized with respect to a set of specific variables, and mean comparison tests were performed to investigate the clusters and to discuss the managerial implications.

**5. Model results**

*5.1. Results of discrete choice modeling*

Table 4 reports the results from the mixed logit model. The estimates are highly significant, thereby confirming the relevance of the reference points in explaining the preferences of hotel guests for hotel room repurchase. The mean weights of positive and negative deviations from the reference point exhibit an asymmetric

**Table 5**  
Monetary values of losses and gains.

	Improvement (HK\$)	Worsening (HK\$)
City versus harbor view	\$291	\$1336
No club versus club access	\$290	\$594
Low versus high floor	-	\$361

pattern. That is, “losses” are perceived more strongly than “gains” as reflected by the higher absolute values of the mean coefficients that are associated with worsening conditions as compared to those that are associated with improving conditions (e.g., for price attribute  $|-0.0019| > |0.0011|$ ). This finding is consistent with those of the prospect theory literature and reflects the manifestation of loss aversion behavior. Logarithmic and piecewise transformations of the attributes “price” and “floor” were tested during the estimation phase aimed at capturing prospect theory’s property of diminishing sensitivity. Linearity in the utility in both gain and loss domains was retained as it provided the best model fit, that is a higher final log-likelihood (LL) and a lower Akaike information criterion (AIC). Loss aversion also differs among four hotel attributes. The loss condition is weighted, on average, 73% more than the gain condition for price, 18% more for access to hotel club, and 166% more for the room view. Similarly, although the hotel guests do not show any significant preference toward rooms that are located at higher floors, they manifest an aversion to lower-floor rooms. However, loss aversion is not observed for cancellation policy: a coefficient that is not statistically different from 0 is observed for the worsening condition, whereas a positive and significant effect is estimated for improving condition. This finding can be attributed to the low frequency of respondents who have availed of the refundable cancellation policy (see Table 2). Only 15% of the respondents have actually experienced a worsening condition for the “cancellation” attribute in the stated choice experiment.

If the mean coefficients for price are related with those for the other room attributes, the relative monetary (mean) value of the improving or worsening attributes can be estimated. First, the guests are willing to pay, on average, HK\$291 (i.e., 0.5525/0.0019) to upgrade from a city-view room to a harbor-view room, whereas those guests whose rooms are downgraded from harbor view to city view will require an average compensation of HK\$1336 (i.e., 1.4675/0.0011). Second, the guests are willing to pay HK\$290 to upgrade from a room without club access to that with club access, whereas those guests whose rooms are downgraded from with club access to without club access expect approximately HK\$594 from the hotel as compensation. Third, the guests will ask for a HK\$361 compensation to stay in rooms that are 10 floors lower, but will not be willing to pay to stay in rooms that are located in higher floors (Table 5). Therefore, on average, the guests value more the worsening than the improving conditions of such attributes. Their reactions to these conditions are heterogeneous for all the attributes but cancellation (worsening) and floor level (improving), as indicated by the significant standard deviations of the random coefficients. The heterogeneity in the preferences of guests must be investigated further to understand their repeat purchase behavior.

*5.2. Results of cluster analyses*

The individual parameters were retrieved for each significant random coefficient and treated as input variables in several cluster analyses to identify segments with similar preferences. Initially, a cluster analysis was performed jointly on all seven attributes: free mini bar, guest smartphone, price, room view, access to club, floor, and cancellation policy. However, the classification of the clusters was largely driven by the strong preference heterogeneity associated with the worsening condition of attribute “view” (results

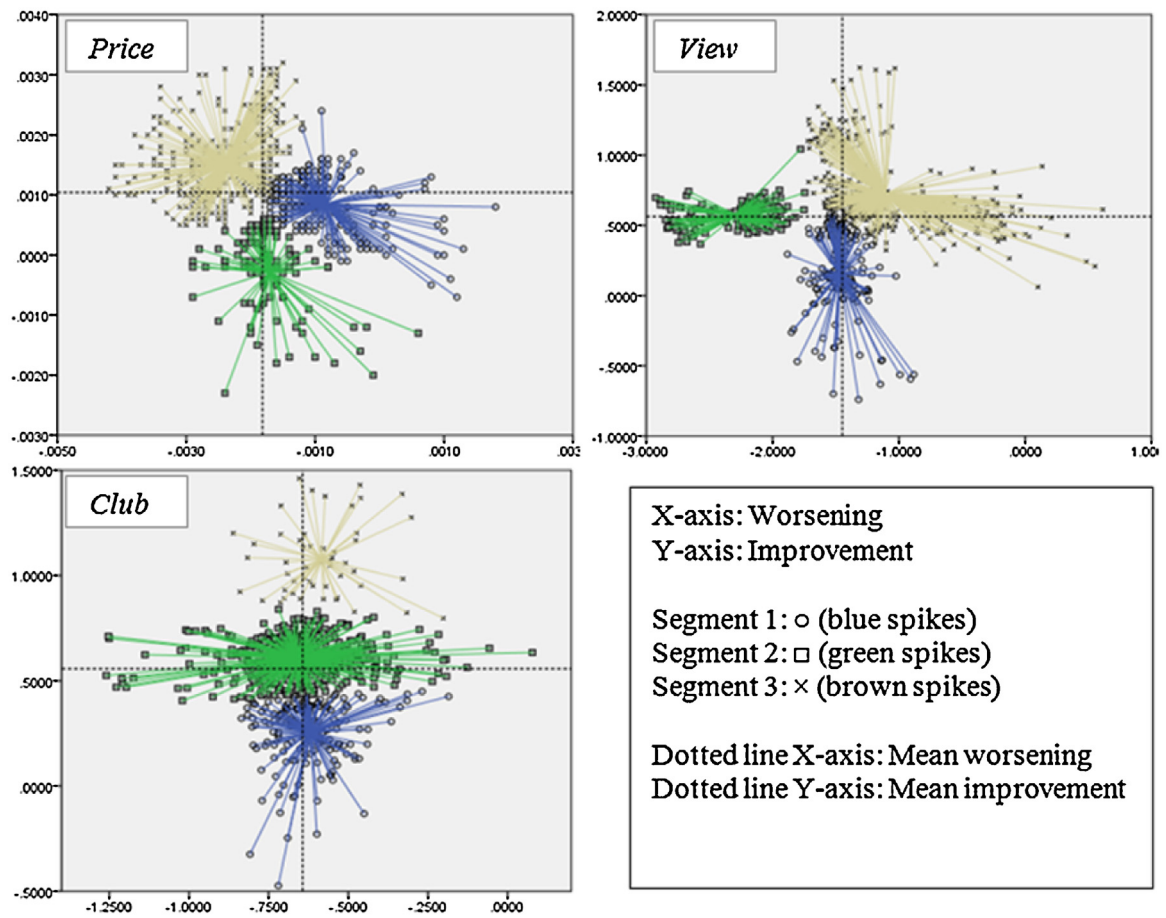


Fig. 1. Representation of bi-dimensional clusters.

available from the authors upon request). In particular, the characterization of the segments revealed that the most reluctant guests to exchange a harbor-view room for a city-view room are more likely to be non-business travelers and Hong Kong first time visitors. To obtain more specific marketing strategies for repeat guests, five separate cluster analyses (i.e. one for each reference-dependent attribute) were further performed. Indeed, the identification of market segments based on different hotel room features or services would facilitate the targeting of ad-hoc promotions.

The hierarchical Ward's classification method was initially used to establish the number of clusters. By analyzing the agglomeration schedule in terms of the distance between the clusters and by favoring a lower number of clusters to facilitate the interpretability of the results, three clusters were selected for each attribute. The non-hierarchical k-means method was then used to finalize the classification of each respondent in the clusters. In line with the model results, the cluster analysis was performed on the worsening condition only for "floor" and on the improving condition only for "cancellation." Fig. 1 graphically presents the bi-dimensional clusters that are associated with "price," "view," and "access to club."

A detailed description of each attribute is provided below along with a comparison of the segments with respect to a set of influential variables. The difference in the mean values of the dichotomous variables was tested according to  $\chi^2$  for overall comparison and Bonferroni for pairwise comparisons, whereas F and Scheffé tests were respectively used for the overall and pairwise comparisons of numerical variables such as attribute coefficients, reference price,

reference floor, and household income categorized into six range levels.

### 5.3. Price

**Segment 1: Neutral.** The guests in this group value the improving and worsening conditions at the same extent as suggested by the same magnitude of the two mean coefficients. Compared with those in other segments (Table 6), the individuals in this segment have experienced on average the lowest reference price and income. This segment has the highest proportion of two-night stays (28% of the segment population) and the lowest proportion of three-night stays (15% of the segment population).

**Segment 2: Improvement indifferent.** Being the smallest among the three segments (15% of the total sample), the individuals in this segment are mainly concerned with worsening situations (i.e., higher prices) as price decreases are weighted below average. Compared with those in the other segments (Table 6), the guests in this segment report the highest room rate paid for the reference stay and the highest household income. This segment also has the highest share of Australian citizens (21%) and does not include Chinese citizens.

**Segment 3: Benefit maximizers.** This segment represents the majority (55%) of the total sample. Both the improving and worsening conditions are perceived as above average, although a worsening condition is weighted almost twice as important as an improving condition. Similar to segment 1 in terms of the characterization of the selected variables (Table 6), the frequency of

**Table 6**  
Specification and characterization of the “price” attribute.

	Segment 1	Segment 2	Segment 3	F or X <sup>2</sup>	Scheffé or Bonferroni
Size (proportion)	198 (30%)	98 (15%)	355 (55%)		
Specification					
Price – Improving	0.0008	–0.0003	0.0015	376.9 <sup>a</sup>	1–2 <sup>a</sup> ; 1–3 <sup>a</sup> ; 2–3 <sup>a</sup>
Price – Worsening	–0.0008	–0.0017	–0.0024	377.1 <sup>a</sup>	1–2 <sup>a</sup> ; 1–3 <sup>a</sup> ; 2–3 <sup>a</sup>
Characterization					
Reference Price	2223	2767	2460	34.69 <sup>a</sup>	1–2 <sup>a</sup> ; 1–3 <sup>a</sup> ; 2–3 <sup>a</sup>
Income	4.52	4.97	4.80	4.23 <sup>b</sup>	1–2 <sup>b</sup> ; 1–3 <sup>c</sup>
Business	26%	31%	27%	0.63	
Gender (female)	41%	32%	41%	3.10	
Two-night stay	28%	16%	19%	8.79 <sup>b</sup>	1–2 <sup>b</sup> ; 1–3 <sup>b</sup>
Three-night stay	15%	28%	23%	7.42 <sup>b</sup>	1–2 <sup>b</sup> ; 1–3 <sup>c</sup>
UK	21%	11%	14%	6.24 <sup>b</sup>	1–3 <sup>c</sup>
Australia	13%	21%	14%	4.64 <sup>c</sup>	1–2 <sup>c</sup>
US	11%	12%	13%	0.66	
China	9%	0%	8%	9.26 <sup>a</sup>	1–2 <sup>a</sup> ; 2–3 <sup>a</sup>

<sup>a</sup> Prob < 1%.  
<sup>b</sup> Prob < 5%.  
<sup>c</sup> Prob < 10%.

two-night stays (19%) is lower than that of three-night stays (23%) in this segment.

5.4. View

Segment 1: *Improvement indifferent*. The guests in this segment show an average aversion toward worsening conditions and a below average satisfaction for improving conditions. Compared with those in other segments (Table 7), only 10% of the guests in this segment have selected a harbor-view room for their reference stay.

Segment 2: *Worsening obsessed*. The guests in this segment show an average attitude toward an improving condition (i.e., upgrade from city view to harbor view), but exhibit a strong aversion for a worsening condition (i.e., downgrade from harbor view to city view). This segment has the highest proportion (86%) of harbor-view rooms as the reference and the lowest share (19%) of business travelers (Table 7).

Segment 3: *Upgrade seekers*. The individuals in this largest segment (56% of the total sample) perceive an above average utility for an improving condition and a below average aversion for a worsening condition. This segment also has the highest proportion of business travelers (32%) and three-night stay guests (25%) (Table 7).

5.5. Access to club

Segment 1: *Improvement indifferent*. The individuals in this segment have an average aversion for worsening conditions (i.e., loss of club access benefit) and a below average utility for improvements (i.e., upgrade to club access). Compared with those in other segments (Table 8), a low proportion (7%) of guests in this segment has selected a club room for their reference stay. This segment also has the highest share of Chinese guests (11%) and the lowest share of Australian citizens.

Segment 2: *Neutral*. The individuals in this largest segment (67% of the total sample) show an average valuation of the worsening and improving conditions. Compared with others (Table 8), this segment has the highest proportion (39%) of guests who have selected rooms with club access for their reference stay as well as the largest share of two-night stays (24%).

Segment 3: *Gain seekers*. The guests in this segment strongly prefer improving conditions, but weigh worsening situations slightly below average. Only 4% of the guests in this segment have a club room (Table 8), and the proportion of guests in this segment who

stay for only two nights (8%) is significantly lower than those in the other two segments.

5.6. Floor (worsening)

Segment 1: *Average worsening sensitive*. The guests in this largest segment (51% of the total sample) have an average sensitivity to worsening conditions. Compared with those in other segments (Table 9), the guests in this segment select the lowest floor level for their reference stay. US citizens are less present in this segment.

Segment 2: *Low worsening sensitive*. The guests in this segment are less dissatisfied (than average) by staying in lower-floor rooms. This segment has the highest household income, which ranges between US\$7000 and US\$8999 (Table 9). The hedonic component of this attribute may therefore support different level of sensitivity across customers in different income groups.

Segment 3: *High worsening sensitive*. The guests in this segment are more dissatisfied (than average) by staying in lower-floor rooms. This segment shows a higher reference floor level and a higher representation of US citizens. Males (68%) are significantly represented in this segment (Table 9).

5.7. Cancellation (improving)

Segment 1: *Low improving sensitive*. The individuals in this segment are less satisfied (than average) by an improvement in the cancellation policy (i.e., from non-refundable to refundable). Compared with those in other segments (Table 10), the guests in this segment report the highest household income, which is slightly above the US\$7000–US\$8999 range.

Segment 2: *Average improving sensitive*. This segment composes 51% of the total sample. Compared with others (Table 10), this segment has the highest proportion of refundable cancellation policy (22%) and the highest likelihood of three-night stays (25%).

Segment 3: *High improving sensitive*. The individuals in this segment are more satisfied (than average) by an improvement in the cancellation policy. The refundable cancellation policy is selected by only 8% of the guests in this segment for their reference stay (Table 10). This segment also has the highest proportion of guests who are staying for two nights (27%).

5.8. Implications on revenue management

The results support the applicability of prospect theory in the hotel room preferences in terms of price, view, access to hotel

**Table 7**  
Specification and characterization of the “view” attribute.

	Segment 1	Segment 2	Segment 3	F or X <sup>2</sup>	Scheffé or Bonferroni
Size (proportion)	142 (22%)	145 (22%)	364 (56%)		
Specification					
View—Improving	0.1511	0.5737	0.7213	268.2 <sup>a</sup>	1–2 <sup>a</sup> ; 1–3 <sup>a</sup> ; 2–3 <sup>a</sup>
View—Worsening	–1.4671	–2.2820	–1.1092	447.1 <sup>a</sup>	1–2 <sup>a</sup> ; 1–3 <sup>a</sup> ; 2–3 <sup>a</sup>
Characterization					
Reference View	10%	86%	49%	164.47 <sup>a</sup>	1–2 <sup>a</sup> ; 1–3 <sup>a</sup> ; 2–3 <sup>a</sup>
Income	4.63	4.85	4.74	0.87	
Business	25%	19%	32%	8.27 <sup>b</sup>	2–3 <sup>b</sup>
Gender (female)	39%	46%	37%	3.45	
Two-night stay	21%	21%	21%	0.01	
Three-night stay	14%	20%	25%	7.10 <sup>b</sup>	1–3 <sup>b</sup>
UK	16%	19%	14%	2.52	
Australia	15%	17%	13%	0.82	
US	13%	10%	13%	1.08	
China	8%	7%	7%	0.78	

<sup>a</sup> prob < 1%.<sup>b</sup> prob < 5%.<sup>c</sup> prob < 10%.**Table 8**  
Specification and characterization of the “club” attribute.

	Segment 1	Segment 2	Segment 3	F or X <sup>2</sup>	Scheffé or Bonferroni
Size (proportion)	161 (25%)	439 (67%)	51 (8%)		
Specification					
Access to club—Improving	0.2554	0.6079	1.0760	1015.6 <sup>a</sup>	1–2 <sup>a</sup> ; 1–3 <sup>a</sup> ; 2–3 <sup>a</sup>
Access to club—Worsening	–0.6199	–0.6592	–0.5841	7.8 <sup>a</sup>	1–2 <sup>a</sup> ; 2–3 <sup>a</sup>
Characterization					
Reference Club	7%	39%	4%	72.98 <sup>a</sup>	1–2 <sup>a</sup> ; 2–3 <sup>a</sup>
Income	4.65	4.75	4.97	0.87	
Business	26%	27%	33%	1.04	
Gender (female)	33%	42%	41%	4.04	
Two-night stay	19%	24%	8%	7.16 <sup>b</sup>	1–3 <sup>c</sup> ; 2–3 <sup>b</sup>
Three-night stay	22%	21%	26%	0.81	
UK	16%	16%	12%	0.61	
Australia	7%	16%	25%	13.39 <sup>a</sup>	1–2 <sup>b</sup> ; 1–3 <sup>a</sup>
US	12%	12%	14%	0.17	
China	11%	7%	2%	5.98 <sup>b</sup>	1–3 <sup>b</sup>

<sup>a</sup> prob < 1%.<sup>b</sup> prob < 5%.<sup>c</sup> prob < 10%.**Table 9**  
Specification and characterization of the “floor” attribute.

	Segment 1	Segment 2	Segment 3	F or X <sup>2</sup>	Scheffé or Bonferroni
Size (proportion)	335 (51%)	172 (26%)	144 (22%)		
Specification					
Floor—Worsening	–0.0387	–0.0248	–0.0522	1278.4 <sup>a</sup>	1–2 <sup>a</sup> ; 1–3 <sup>a</sup> ; 2–3 <sup>a</sup>
Characterization					
Reference Floor	17.91	19.83	20.19	17.68 <sup>a</sup>	1–2 <sup>a</sup> ; 1–3 <sup>a</sup>
Income	4.63	4.94	4.76	2.76 <sup>c</sup>	1–2 <sup>c</sup>
Business	24%	30%	32%	3.92	
Gender (female)	41%	42%	32%	4.61 <sup>c</sup>	1–3 <sup>c</sup> ; 2–3 <sup>c</sup>
Two-night stay	23%	21%	18%	1.30	
Three-night stay	22%	23%	17%	1.85	
UK	16%	16%	13%	0.80	
Australia	14%	17%	13%	1.30	
US	8%	16%	17%	10.76 <sup>a</sup>	1–2 <sup>b</sup> ; 1–3 <sup>b</sup>
China	8%	4%	10%	4.14	

<sup>a</sup> prob < 1%.<sup>b</sup> prob < 5%.<sup>c</sup> prob < 10%.

club, and floor level. The loss aversion behavior of hotel guests is triggered by the reference attributes that they encounter in their previous hotel stay. Therefore, they place more weight on worsening conditions than on improving conditions. The imbalance

between these conditions differs across attributes and guests. Thus, room price can be manipulated against access to club and room view to gain an advantage. In general, a guest who has access to the hotel club values such right 18% higher (when losing this right)



**Table 10**  
Specification and characterization of the “cancellation” attribute.

	Segment 1	Segment 2	Segment 3	F or X <sup>2</sup>	Scheffé or Bonferroni
Size (proportion)	186 (29%)	335 (51%)	130 (20%)		
Specification					
Cancellation–Improving	0.1175	0.2597	0.4168	1243.9 <sup>a</sup>	1–2 <sup>a</sup> ; 1–3 <sup>a</sup> ; 2–3 <sup>a</sup>
Characterization					
Reference Cancellation	9%	22%	8%	23.25 <sup>a</sup>	1–2 <sup>a</sup> ; 2–3 <sup>a</sup>
Income	5.03	4.61	4.64	5.95 <sup>a</sup>	1–2 <sup>a</sup> ; 1–3 <sup>b</sup>
Business	25%	29%	26%	1.10	
Gender (female)	37%	43%	35%	3.97	
Two-night stay	23%	18%	27%	4.56 <sup>c</sup>	2–3 <sup>c</sup>
Three-night stay	18%	25%	16%	5.90 <sup>b</sup>	2–3 <sup>c</sup>
UK	17%	17%	9%	4.90 <sup>c</sup>	2–3 <sup>c</sup>
Australia	17%	13%	14%	1.65	
US	13%	11%	13%	0.78	
China	8%	7%	8%	0.36	

<sup>a</sup> Prob < 1%.

<sup>b</sup> Prob < 5%.

<sup>c</sup> Prob < 10%.

than a guest who does not have club access. By contrast, a guest who has stayed in a harbor-view room values such privilege 166% (when losing the privilege) higher than a guest who has stayed in a city-view room (Table 4). This loss aversion behavior can be used as basis for the allocation of privileges to those guests who have been bestowed with the same privilege in their previous trip and are willing to pay more to maintain such privilege.

In RM practice, different customer segments must be targeted according to their preferences for price, club access, or floor level. However, these segments are not directly observable unless extensively studied. Combining the results of the cluster analyses and pairwise comparisons can produce a general summary of the characteristics of different market segments on the basis of the nationalities or trip characteristics of the guests. Hotels can use these findings to enhance customer satisfaction, promote the loyalty of their repeat guests, and set up price fences that can encourage repeat purchase.

1. British: Among guests who are indifferent in terms of price improving and worsening conditions (i.e., price segment 1), British guests have higher representation than expected. They are also less likely to be persuaded by a better cancellation policy. Only 9% of guests in “cancellation” Segment 3 (high improving sensitive group) are from UK. This is in sharp comparison to other nationalities namely Australia, US, and China for which guests in “cancellation” Segment 3 are not under-represented. British are more rational decision makers in terms of hotel room choice.
2. Australians: Compared to other nationalities, Australians are less likely to be persuaded by price reductions (they account for 21% of “price” Segment 2, improving indifferent group) and more impressed by access to the hotel club (representing 25% of “club” Segment 3, gain seeker group). They are mostly high-end travelers.
3. Americans: Americans hold a variety of values toward staying at a lower floor level. Compared to a proportion of 12% US guests in the entire sample, their proportion in “floor” Segment 1 (average worsening sensitive) is only 8%. Instead, they are represented in larger proportions in both Segment 2 (low worsening sensitive) and Segment 3 (high worsening sensitive). They are more individualistic and diverse travelers.
4. Chinese: Chinese guests tend to focus on price decrease and are indifferent to club access. No Chinese guests belong to improvement indifferent group for price while they represent only the 2% of “club” Segment 3 (gain seekers). These numbers are significantly lower than the respective proportions for other

nationalities. They are frugal guests who look for the best value for their money.

5. Low-income travelers: guests in “price” Segment 1 (neutral group) tend to have lower income (4.52 versus 4.97 and 4.80). Thus, lower-income travelers are rational decision makers who view price decrease and increase more or less equally.
6. Guests who stay for three nights: These guests are more sensitive to price increases. Their presence in highly price sensitive segments (Segment 2 and Segment 3) is over-represented (28% and 23%, respectively) in comparison with Segment 1 (15%).
7. Male travelers: Compared to female travelers, male travelers tend to be dissatisfied by staying at lower floors. In “floor” Segment 3 (high worsening sensitive group) only 32% of them are females, versus 41% for Segment 1 and 42% for Segment 2.
8. Business travelers: Compared to leisure guests, these travelers care more about upgrading to a harbor-view room: they have more percentage in “view” Segment 3 (32% in upgrade seekers group) belong to business guests than in Segment 2 (19% in worsening obsessed group).

Although the general characteristics of the market segments for this particular hotel are highly conjectural and hypothetical, the different weights that the guests in such segments place on the improving and worsening conditions are real. By taking advantage of those different weights, hotel revenue managers could utilize them strategically. For example, price reduction, no matter how slight, tends to work well with repeat Chinese guests, but not for Australian and British guests. Access to hotel club will more likely impress repeat Australian guests, but not Chinese guests. By taking advantage of the different weights that are placed on these hotel room attributes, hotel managers can successfully set up different fences to different market segments in order to increase their profit.

## 6. Conclusions

This study indicates that travelers consider the conditions of their current hotel rooms as the reference point for their future purchases. These travelers are more sensitive to the worsening, rather than to the improving, condition of room attributes. Therefore, prospect theory, particularly asymmetric preference, has a crucial role in the decision making of guests when choosing hotel rooms. The imbalance also differs in terms of price, room view, club access, and floor level. Hotel managers can manipulate room prices against the other three attributes to gain more revenue. For example, given that guests who have stayed in rooms with a better view and access to hotel club place more value to these features when

losing such privileges, revenue managers may utilize this finding in designing the appropriate bundling and pricing schemes.

The relationships among different demographic and behavioral variables provide guidelines for pricing hotel rooms for different groups of guests. A hotel revenue manager can rely on this finding in setting up different price fences for different market segments. The imbalance between improving and worsening conditions provides managers with an ideal condition when allocating different customer segments to various room types.

## 7. Limitations and future studies

Although this research investigates a theoretical framework, its applicability is potentially limited for the following reasons. First, the results only apply to the repeat purchase behavior of guests in the same hotel. This allowed us to focus exclusively on the behavioral response of repeat customers, generally considered a key target segment for hotel marketing departments. To extend these results to multiple hotels, for example, if a hotel manager wants to understand how the previous stay of their guests in another hotel will affect their choices of rooms in his or her hotel, a more extensive study must be conducted across different types of hotel stays. Second, the large amount of data collected in the study is hard to achieve for a single hotel without significant financial support on market research. Third, the discriminative strategies according to the different market segments may be viewed as unfair by guests if they somehow gain such knowledge by communicating with other guests. Fourth, the technical terms that are used in this study may limit the utilization of the results by hotel managers. An intuitive and easy-to-understand guide for hotel managers is a promising way to promote the utilization of this research.

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