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Does Discounting Work in the Lodging Industry?

Robertico R. Croes

University of Central Florida, robertico.croes@ucf.edu

Kelly J. Semrad

University of Central Florida, Kelly.Semrad@ucf.edu

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DOES DISCOUNTING WORK IN THE LODGING INDUSTRY?

Abstract

The central intent of this econometric case study analysis is to examine the relationship between discounting room rates and hotel financial performance. The study provides a theoretical framework that investigates the fundamentals of discounting and empirically assesses the efficacy of the discounting process in the lodging industry. The study adopts an error correction model to properly account for the dynamics of the industry. The results indicate that the variables may be modeled as an integrated process that are linked in the long run and also possess a short-term relationship. The research findings suggest that discounting works both in the short-term and the long-term only if the discount rate exhibits serial correlation or non-stationary tendencies.

Keywords: Hotels, Discounting; Rational Expectations Theory; Error Correction Model

Introduction

A variety of industries incorporate discounting as a short-term pricing strategy in order to increase financial performance during times of decreased product demand. This is especially true of perishable product type industries that experience periodic seasonal demand fluctuations (Brown and Dev 1999; Jeffrey, Barden, Buckley, and Hubbard 2002). However, studies that address hotel pricing strategies as they relate to room rate discounting have shown mixed results as to whether discounting is a feasible strategy. Proponents of discounting posit that implementation of a discounting strategy in hotels may be wise for managers to adopt during uncertain market conditions that are pervasive to the hotel industry (Avinal 2004; Nicolau 2005). Opponents, on the other hand, question this strategy arguing that hotels in general have observed a decline in their rack rate and corporate rate room nights though the number of discounted room sales had increased (Baum and Mudambi 1994; Canina and Enz 2006; Chan and Wong 2006; Enz 2003; Enz and Canina 2008; Enz, Canina, and Lomanno 2004; 2009; Finch, Becherer, and Casavant 1998; Hanks, Cross, and Noland 2002; Kim 1996; Mak 2003; Masson, Mudambi, and Reynolds 1994; Matovic 2002; Mudambi 1994; Quain 2003; Steed and Gu 2005; Vanhove 2005).

This study provides a theoretical framework that investigates the fundamentals of discounting and empirically assesses the effectiveness of the discounting process in the hotel industry. The theoretical framework that is provided recognizes the dynamics of the cyclical behavior of the hotel industry through application of the rational expectations theory (Muth

1961). The model assumes that an expected room rate equals the actual room rate from the previous fiscal period, that supply is a function of the expected room rates, and that actual room rates adjust to demand so as to clear the market and obtain equilibrium (Corgel 2004). The relative slopes of the supply and demand functions determine whether or not the sequence of room rates will converge to the equilibrium price.

This research departs in two meaningful ways from other hotel discounting studies. First, most studies have looked at the effects of changing room rate prices for occupancy, revenues, and profitability from a deterministic perspective. Thus, demand is premised on the notion that it is either elastic or inelastic thereby lacking consideration for the uncertain market demand parameters so characteristic of a dynamic system. This implies that most studies consider the room rate forecasting process as a static phenomenon that involves little to no consideration of the substantial price variability present in the cyclical hotel industry. And, second, the study departs from mainstream hotel discounting literature through its application of a cointegration analysis. A thorough review of literature reveals that this statistical procedure, to the best of knowledge, has not been applied to investigate the empirical relationship between discounting room rates and hotel financial performance. Additionally, in order to determine if lodging managers behave rationally in their price setting behavior the study further employs an error correction technique to capture the expectations formation process of room rates. The application of this statistical technique has also been, so far, conspicuously lacking in the lodging industry research.

Due to the cyclical nature of the lodging industry, a hotel manager typically is confronted with short-term inelasticity of room supply and a reflection of a downward sloping demand schedule (e.g. seasonality); and, consequently, will need to form expectations of room rates he is

likely to obtain (Bull 1997). He may set basic rack rates for the rooms, but may never actually charge those rates in the face of different levels of demand, thereby becoming compelled to offer varying levels of prices on the available room supply. Given the capacity constraints and the aim at high occupancy rates, hotels tend to reflect Walrasian stability in the short-term as they adjust prices rather than change quantities in rooms supplied; or withhold inventory. In this scenario, room rates are cut generating excess room demand. Suppliers respond after an adjustment lag by raising prices again, but without inducing any equilibrium, and so forth. This behavior reveals a dynamic cobweb of price fluctuations that could eventually lead to equilibrium as the room demand patterns change. Equilibrium in the hotel industry, therefore, is not a static position but is dynamic as it changes over time (Bull 1997; Sinclair and Stabler 1997; Vanhove 2005).

Importantly, if a stochastic demand distribution is assumed, then it begs the question of how this market phenomenon is addressed within the room rate forecasting process of a hotel. If the nature of the pricing process is stationary, then the forecasting information required from a business perspective in order to determine price is the historical average room rate. If, on the other hand, the room rate forecasting process is characterized as non-stationary (such as in trending), then the use of historical averages for forecasting room rates is inappropriate.

Several studies fail to recognize that the hotel industry's application of discounting strategies supports the premise that managers could forecast future demand based on past supply and demand schedules (Canina and Carvell 2005; Canina and Enz 2006; Enz 2003; Enz and Canina 2008; Enz et al. 2009; 2004; Enz et al. 2008). It is the aim of the current study to draw attention to this oversight in the lodging research, namely to the consideration for stationarity conditions of room rate time series data sets into the lodging research literature stream. Hence, the study postulates that setting future room rates based on past supply and demand schedules

require assessment of the stationarity conditions of a data set. More specifically, the current study proposes that predicting future performance from past experience requires time series data sets to hold memory, or dependence of observations between data points, rather than being free from it.

The study contributes to the considerable literature denoting explanation and comprehension of the rationality of discounting on hotel financial performance. It addresses three interrelated questions: (1) Does past experience play a role in determining discounting behavior? (2) If yes, what is the nature of this role? And, (3) Is experience a more systematic response to hotel managers' pricing behavior or does it occur only by coincidence? The main premise of this study is that the rational expectations theory along with the cobweb model framework may provide sound explanations of the discounting behavior in the hotel industry. To demonstrate its claim, an econometric case study research design using a convention hotel located in the Central Florida market is employed.

An important concept to understand about the value of using econometric case study designs is that the results are not intended to be generalized from one context to the next. Rather, it is the model and the theoretical proxies that are used that the researcher seeks to validate by applying the model and its theoretical proxies to that of different cases. The interest of this research study is to investigate the empirical relationship between discounting room rates and hotel financial performance under the theoretical implications of the rational expectations theory. The model building has been guided by the premise that the purpose of theory is to explain and predict.

Econometric case study designs are capable of generating a range of interesting findings pertaining to a case's data patterns and also are valuable in determining structural or causal

inferences among variables (Kulendran and Witt 2001). The compressed market information that is available through the proper assessment of time series data set values holds information regarding latent factors that may be observed in time but may not be known by the researcher, may not be identified, and may have otherwise been omitted from analysis but still had influence on the dependent variable. The omitted information referenced here is a strength of econometric modeling that the use of room rate averages may not always detect. However, it also presents a limitation regarding the level of external validity from econometric case studies to that of other cases, which is a frequent criticism of econometric case study designs.

Of critical importance to this study, is whether the incremental use of discounting room rates could work to correct for temporal periods of decreased demand and thus increase short-term hotel financial performance. The study provides theoretical support for discounting as a rational price setting strategy that moves beyond the descriptive analyses that are emerging in the hospitality revenue management literature and that are rooted in deterministic perspectives (Canina and Carvel 2005; Canina and Enz 2006; Enz 2003; Enz and Canina 2008; Enz et al. 2009; 2004; Enz et al. 2008).

Literature review

The study was rooted in an operational based perspective with regard to the challenges presented by the time sensitive, or perishable nature, of room night sales - the loss of which may subsequently impact a manager's fundamental responsibility: to generate maximum revenue from the existing room capacity (Gayar, Hendawi, Zakhary, and El-Shishiny 1998; Nicolau 2005). In recognition of this operational based perspective, the literature reviewed included relevant topics discussed in general hospitality management, economics, revenue management, and marketing literature.

This study identifies the lodging industry as a dynamic system. The distinguishing characteristics of a dynamic system that are recognized as traits of the lodging industry include the following: lag times between a relatively fixed and perishable room supply and uncertain consumer room demand, high fixed costs of hotel operations, and an observed moving process of room rate adjustments over time (Corgel 2004). Through the practice of discounting, managers appear to use these room rate adjustments to avoid the loss of a less frequent sale during times of decreased room demand (Avinal 2004). The result of which could mitigate the market's fluctuating elasticity conditions of the room product (Cross, Higbie, and Cross 2009; Hanks et al. 2002; Jang 2004). Yet, empirical foundation for this industry practice is lacking in extant hospitality literature.

Normative versus realist approaches

Currently, there is debate in the lodging literature regarding how discounting of hotel room rates relates to hotel financial performance. Recent research has implied that high occupancy levels at discounted room rates do not necessarily lead to increased hotel financial performance (Canina and Carvell 2005; Canina and Enz 2006; Enz 2003; Enz and Canina 2008; Enz et al. 2009; 2004). For example, Enz et al. (2009; 2004) and Canina and Enz (2006) claim that the average price in the hotel industry, during the time of their studies, indicates that those hotels that did not discount, scored higher profit levels than those that did discount. The reason offered is that an increase in volume seems to fail to offset the revenue lost due to discounting room rates. These studies, therefore, suggest that discounting usually does not work and implicitly seems to indicate that the average price in the market would coincide with the optimal, or monopoly, price.

In 2006, Canina and Enz confirmed the findings from the 2004 Enz et al. discounting study by applying their findings to individual market segments, specific location types, and primary and secondary markets. The results of the 2006 study supported that discounting does help to fill hotel rooms but the increase in occupancy comes at the cost of decreased revenue. Further, the research implied that hotel managers set their room prices relative to their competitive set rather than by pricing relative to demand conditions. In 2009, the researchers investigated competitive pricing strategies during times of decreased market demand due to poor economic conditions and again claimed that discounting room rates may not be a viable pricing strategy in the lodging industry.

The descriptive statistical analyses used in these studies seems to view equilibrium and elasticity of a room night as static circumstances of the price-setting firm but neither entertains the notion of interdependence of a firm's actions as they are induced by the ever-changing

market conditions. These studies seemed to find validation in van der Rest and Harris' (2008) application of a modified version of Nash's rule to account for changes in room rate prices. The van der Rest and Harris study suggests that hotel demand is more income elastic than price elastic and conclude, therefore, that discounting in the hotel industry does not work. In their view, discounting will encourage customers to upgrade hotel properties, thereby increasing competition rather than inducing greater demand. Chan and Wong (2006) further contend that discounting room rates leads to an increase in competition and a deterioration of the hotel's status. They state that the trend of cutting hotel room rates to maintain desired room occupancy levels may not be as effective a pricing strategy as it once was. Additionally, they suggest that hotel management should consider additional factors other than room price that influence a traveler's selection of a hotel. The findings from Chan and Wang (2006) are echoed in the findings of Kimes (2010). The results from this study recommend that hotel managers should shift their central focus from optimal room capacity utilization, to that of developing and implementing value-adding amenities and/or services.

Studies from opponents of discounting seem to have in common a normative approach towards pricing behavior. They assume that the hotel industry consists of static markets, that market shares of firms may only be derived from demand expansion, and that price does not have a role in attaining, increasing, or maintaining market share, thus implying that hotels are price takers. Discounting opponents propose that only by collectively raising prices hotel profits would increase, which would imply a pure competitive market. Such a perspective suggests that hotel managers should resist the altering of room rates because it would not induce any profit increase; to the contrary, it would only incentivize a "*bazaar behavior*" (e.g. deal seeking behavior) of the customer (Hanks et al. 2002). However, collectively raising prices may be very

difficult to realize in most lodging industry markets. This is probably because the benefit of a commitment to such a strategy dissipates with the high level of strategic interaction in a given lodging market. In other words, collectively raising prices in a given lodging market might work in the long run, but, in the short run, hotel managers may be confronted with vacant rooms to fill because the rooms could only be sold at lower prices due to the downward sloping nature of the demand curve in the lodging industry (Kalnins 2006).

There is also a literature stream that supports discounting as a viable pricing strategy to move perishable products (i.e. room nights) in services industries. Hanks et al. (2002) and Finch et al. (1998) support the use of discounting strategies and maintain that perishable services, such as hotel room nights, are available for a finite life. When the life of the hotel room night expires, the hotel loses the opportunity to sell the service. Further, if the service or product expires and it is not sold, it makes no contribution to high fixed overhead costs. Schmidgall (2006) posits that any contribution from the sale of a product or service would provide revenue to cover part of the firm's fixed costs, including the revenue generated by a discounted room rate. Kimes (2010), although skeptical of the outcomes of discounting, contends that the use of room rate discounting may be used to increase the likelihood of room sales during low demand periods, but that the strategy should not be over used, or adopted over the long run of time. Assertions such as these are based on a service marketing approach that recognizes the value provided to a hotel firm via discounted room rates could mean the difference between posting a net loss or net income during a low demand period.

Hospitality revenue management literature recognizes that hotel managers are required to form expectations of room prices that they are likely to obtain while focusing on probable levels of future consumer demand (Gayar et al. 2008; Steed and Gu 2005). Opponents to discounting

room rates may claim that hotel managers may not be fully capable of this task for several reasons: the heterogeneous profiles of the guests the hotel serves, inadequate knowledge of quantitative techniques that could assist them in setting prices, the pressure to sell a perishable product, and the increasing transparency of pricing information obtained by consumers (Steed and Gu 2005). However, many hotel managers may disagree with this claim and may insist that they do possess the ability to form expectations of room prices that would be likely to sell in future market conditions based on the historic rates that sold during similar anticipated future demand conditions.

The constant price adjustments observed in the lodging industry that discounting opponents may criticize is viewed as an opportunity for hotel managers to use a variable pricing schedule to increase their revenues in the short run (Chatwin 2000; Vinod 2004). Managers may charge a premium rate when demand is inelastic and then may adjust rates (discount) as the available room supply is expected to exceed demand (i.e. low season) while still making a profit due to low marginal costs (Kalnins 2006).

A central focus for managers then is room revenue maximization (Gayar et al. 2008) and therefore they have a tendency to hold a “*heads on beds*” mentality (Hanks et al. 2002). Management’s push for “*heads on beds*” stems from the realization that managers may make a sale at a discounted room rate and earn some profit; or, may price at a premium and have a sale perish while making no profit. From an operational perspective, it does not make sense to managers to accept the maintenance of premium prices at the loss of some profit (Hanks et al. 2002).

The use of discounting room rates is intended to meet managers’ objectives to increase hotel financial performance by bringing the market back to equilibrium when a state of

disequilibria is observed and there is a risk of a negative marginal profit. This seems to indicate that managers perceive long and short-term pricing goals as different strategies. In the short run, managers cannot make adjustments through the available room supply (Finch et al. 1998). The possible option then for adjustment in the short run is price setting to determine an optimal room rate that will sell in accordance with future demand conditions that are yet unknown (van der Rest and Harris 2008).

Managers expect that during periods of excess available room capacity a decrease in room rates may inversely affect consumer demand and therefore short run profits (Jeffrey et al. 2002). Typically, managers may take the price outcome of a present time period and continue it into the next fiscal period while making slight adjustments to price according to their anticipation of future demand (Croes, Semrad, and Yost 2010). The use of past historic rates to set future room prices seems to indicate that the firm's internal market information assists managers in their expectations for future room rates that will sell in tomorrow's market place conditions.

However, over the long run, managers may aggregate financial performance and use the hotel's performance benchmark indicators (e.g. average daily rates) to compare normal costs to actual costs (Nooteboom, Kleijweg, and Thurik 1987). This comparison may assist in managers' projections that require a certain degree of price stability (i.e. firm investment, sustaining or increasing market position, determining appropriate annual marketing and promotion costs, setting goals for market share, adding-value through new amenities, etc. (Choy 1985). A manager may also use long-term performance indicators to compare the hotel's performance to that of a market's performance indicators (i.e. competitive set), like those provided by Smith Travel Research data, to gain a more thorough understanding of the hotel's market position relative to competitors. This comparison may assist managers in determining the appropriate

marketing strategies that they may implement to gain a competitive advantage over the long run while avoiding sales that could perish if inappropriately priced in the short run.

Tellis (1986) suggests that in periods of decreased demand the periodic discounting strategy is an appropriate pricing strategy involving the temporal markdowns of off-season goods. Thus, to maximize revenues, hotels segment customers and charge them different rates based on differing needs and spending behaviors (Avinal 2004; Hanks et al. 2002). Without the use of such segmentation, hotels would offer one price to all market segments which, in a dynamic industry (Finch et al. 1998; Wheaton and Rossoff 1998), would leave a substantial amount of unrealized potential revenue (Hanks et al. 2002). When periodic discounting is implemented for market segments in the hotel industry it becomes a systematic pricing strategy that prices high and decreases price of rooms over time to ensure that the hotel covers its costs and makes a reasonable profit (Nicolau 2005; Kalnins 2006).

Masson et al. (1994), Mudambi (1994), Baum and Mudambi (1995), and Mazzeo (2002) also take issue with the normative approach of pricing embraced by discounting opponents through application of the game theory. They forward a more realist approach asserting that the hotel industry consists of dynamic markets and that market share is a function of the interdependence of players in the market. They suggested the application of game theory in explaining and predicting pricing behavior in the hotel industry. In utilizing the theoretical framework of this theory, Baum and Mudambi (1995) posit that the hotel behavior is determined by the oligopolistic market structure and that mixed strategies are widespread under this condition. This structure instigates two potential behaviors: on the one hand, interdependence of firms promotes collusion in order to maximize profits; on the other hand, aiming at larger market shares encourages firms to cheat. Depending on whether it is a one time and simultaneous-move

game or a sequential-move game, the outcomes for a hotel will differ significantly due to learning and experience of firms' managers from the move process.

However, applying game theory in the hotel industry could be challenging. Cheating is difficult to spot when there are many firms in the market with different cost structures and heterogeneous products. The sheer amount of hotels that are available in most markets indicates fierce competition (Kalnins 2006). With so many players it is difficult to identify honest behaviors. Also contributing to cheating in the hotel industry is its heterogeneity, the encompassment of several ownership structures and forms, such as franchises, management companies, independent owners, and, finally, large corporations with different sets of product attributes. In addition, the practice of "*call-around*" (the practice of exchanging occupancy and rate information via telephone with adjacent hotels) which seems so pervasive in the hotel industry runs counter to oligopolistic prediction of concealment of demand information instead of sharing it (Kalnins 2006). Finally, the existence of the "*deal seeking*" practice of consumers may also render the application of an oligopolistic market structure to price setting in the lodging industry as tenuous. This may be due to the constant observation of variable price patterns in the lodging industry that is inconsistent with price stickiness; which would be expected in a stable market condition warranted by the oligopolistic market structure (Quain 2003; Sandler 2001).

Unlike a static approach to price setting, a realist approach (such as the game theory perspective) views price as playing a pivotal role in determining market share. Therefore, hotels may entertain randomized demand constrained by capacity by engaging in mixed strategies related to price setting of their product (Baum and Mudambi 1995). Price cutting may be harder to detect when demand conditions are volatile. Under these conditions, a hotel may only be able to observe its own price and volume and not those of its rivals. The hotel in question, then, will

be engulfed with rapidly declining marginal costs at output levels below capacity, and demand fluctuations will cause monopoly prices to fluctuate (Baye 2003; Sinclair and Stabler 1997).

When considering the aforementioned characteristics of the lodging industry that are not in line with an oligopolistic market, Baum and Mudambi (1995) forwarded another plausible market structure which may better fit the realities of the lodging industry. They suggested the existence of a monopolistic competitive market structure, which also may have been echoed by Bull (1997), Vanhove (2005) and Shetty (2008). In this market structure there are many players selling similar but not identical products (hotel rooms) that are differentiated by brand names, ownership structures, quality levels, and consumer loyalty (Baum and Mudambi 1995). In this structure, there are few market entry barriers and hotels that possess differentiated products could have a slight control over market prices. A monopolistic competitive market structure has further distinct pricing implications. In the long run equilibrium, a perfect competitor makes a normal profit (Shetty 2008). The normal profit will attract new entrants, which in turn could make some of the existing hotel firm customers defect. As a result, the hotel's portion of the market demand curve would then decrease (Shetty 2008). The hotel would then attempt to protect its profits by increasing its expenditure on product differentiation (e.g. advertising). This attempt may then offset the entry of new hotel establishments. The additional expenditures spent to establish product differentiation, however, may shift the average curve up until there is little excess profit above normal profits sufficient to remain operating in the long run.

This study uses a hotel that exists in the Central Florida hotel market. The Central Florida market contains a high level of consumers that have an abundance of hotel choices that provide similar products. The application of the game theory in explaining and predicting pricing behavior here does not seem to apply because the market appears to be in keeping of a

monopolistic competitive nature, not oligopolistic. The characteristic of heterogeneous products and ownership levels of properties included in the Central Florida market indicate that differences exist among the individual firms and would most likely not allow for collusion among firms.

Hotel industry characteristics

The hotel industry entertains several conditions that influence the degree of intensity of competition. Basic economic theory of costs and supply assumes that goods are produced based on a rough equivalence between fixed and variable costs over a given period of time. Such assumptions are not valid in the hotel industry. The consumption of the product (rooms) requires the consumer to physically move to the hotel thereby implying that the hotel must exist and operate regardless of the amount of consumers it services. This situation has two implications: supply is relatively inflexible and it contains high fixed costs of operation (Bull 1994; Kalnins 2006; Mak 2003; Matovic 2002; Sinclair and Stabler 1997; Vanhove 2005). The incidence, or condition, of a constrained supply coupled with high fixed costs in the hotel industry raises the issue of capacity utilization (Bull 1997; Nicolau 2005). Munic and Israeli (2011) also found that hotels may resort to maximize capacity utilization. Hotels typically strive to operate at full capacity all the time. "...this means that short run industry supply is also very inelastic...[as] suppliers will do all they can to adjust demand to equal capacity supply by altering prices or promotions," (Bull 1997). Nicolau (2005) asserts that hotels are market-oriented businesses, and consequently *"are revenue-dependent in that they are normally required to maintain high revenue levels to survive and generate adequate profit returns."* This condition seems to alter the business objective from one of being focused on profit through cost control to one focused on profit through revenue maximization.

Both conditions may require high occupancy rates mainly to cover high fixed costs, but may not require full capacity utilization. These requisites result from the condition that marginal costs seem initially constant but rise steeply as utilization of rooms reaches 100% capacity. In addition, the industry is plagued with perishability. Capacity utilization in the context of a perishable product makes pricing extremely vulnerable to demand. Producers, then, must adjust prices to influence demand or be left with useless output (Bull 1994; Kalnins 2006; Mak 2003; Matovic 2002; Sinclair and Stabler 1997; Vanhove 2005). This is difficult given the non-static character of the hotel industry. The industry may therefore be characterized by a structural model, (i.e. the cobweb model), which displays relatively long lags between occupancy and room rental changes, as well as between room rental rates and new supply (Brown and Dev 1999; Wheaton and Rossoff 1998). This cyclic frequency, or seasonality, is characterized by fluctuating occupancy levels that significantly impact prices of services and perishable products within the hotel industry (Corgel 2004).

The products of the hotel industry have characteristics that make supply relatively inflexible in the short run. When demand for rooms suddenly spikes or plummets during seasonal changes, the supply of rooms cannot correspondingly expand or contract within a short period to satisfy the new level of demand (Corgel 2004). During times of decreased short-term demand, managers will sell a room as long as the customer is willing to pay more than the variable cost to service the room (Hanks et al. 2002; Kalnins 2006). Under this condition, then, a hotel has a strong incentive to undercut prices. This incentive seems especially strong when hotels may realize premium prices over their marginal cost per room (Bull 1994; Kalnins 2006; Rutherford 2002). At output levels even a little below capacity, marginal costs are likely to be

very low, thus acquiring short-term benefit from filling excess capacity even at deep discounts (Kalnins 2006).

According to Baum and Mudambi (1995) competitive hotels would be willing to let rooms rent for virtually nothing, provided that the marginal revenue from other hotel services justify this strategy. This is in contrast to an oligopolistic market structure where hotels recognize their interdependence and know that by adjusting availability, they may influence price (Baum and Mudambi 1995). The review of literature indicates that the hotel industry is not only dynamic in nature but also seems to entertain a monopolistic competitive structure. The next section will discuss the study's model that reflects both of these market conditions and is founded in the rational expectations theoretical framework.

Methodology

The model assumes a monopolistic competitive market structure for the lodging industry where hotel managers initially do not expect competitors to follow their price increases or decreases. The reason for this expectation is that managers believe that they have a differentiated product and they perceive that their room rate changes may go unnoticed by others in the short run because of substantial price variations. The manager, therefore, is initially only able to observe the price and volume of his hotel and not those of competitors. This means that in the short run, room rates are set without considering price elasticity of demand (Bull 1997; Vanhove 2005). However, through experience he eventually learns that the demand he faces is less elastic because competitors follow his room rate changes; and, also because over the long run of time there is a shift to non-price competition (e.g., advertising, price discrimination, etc). Based on the service industry characteristics that hotels must overcome in the short run, such as capped supply, perishability, and high fixed costs of operation, hotels seek to maximize revenues and profits by finding the optimal relationship between occupancy and room rates.

The model further assumes that under conditions of imperfect competition profit maximization occurs when marginal revenues equal marginal costs. This equilibrium point implicitly defines the hotel room price. Because the manager confronts a downward sloping demand curve, marginal revenue will always be less than price implying that added room sales may only be generated through reduced room rates. A specific dynamic room rate adjustment may arise because hotel managers are influenced by expectations. These expectations are considered rational if the room rates follow autoregressive data generating processes. From this

perspective, the quantity of hotel rooms supplied now (Q_t^s) depends on the prevailing room rate as it was generated by the previous time period (P_{t-1}). The premise of the model is that the demand and supply functions may be specified in format

$$Q_t^d = a + bP_t \quad \text{and} \quad (Q_t^s) = c + dP_{t-1}$$

where a, b, c, and d are parameters specific to individual markets. It is further assumed that price adjusts so that consumers buy all the rooms supplied by a hotel. This adjustment means that

$$Q_t^d = Q_t^s$$

This yields a first order difference equation. That is, the current value of a variable in one time period is expressed as a function of its own past value and some random error:

$$P_t = \frac{d}{b}P_{t-1} + \frac{c-a}{b} \quad \text{or} \quad P_t = f(P_{t-1})$$

This implies an estimation of a backward representation of a forward-looking process, where the qualitative behavior of the equations depends upon the relationship between the slopes of the supply and the demand equations. Since $b < 0$ and $d > 0$, $(d/b) < 0$, the successive values of room price and room quantity alternately decrease and increase. Therefore, convergence of the variables may be expected to a meaningful equilibrium point if $(d/b) < 1$.

This backward representation of the hotel production and consumption model may be captured through an error correction specification. An error correction model (ECM) is based on the assumption that two variables display an equilibrium relationship that determines both short-term and long-term behavior. The ECM results from a general distributed lag relationship linking two variables x (discounting) and y (hotel financial performance):

$$y_t = \alpha_0 + \sum_{i=1}^k \alpha_{1i} y_{t-i} + k \sum_{j=0}^k \alpha_{2j} x_{t-j}$$

which in turn may capture changes in hotel financial performance (y) through changes in discounting room rates (x) by

$$\Delta y_t = \gamma_0 + \gamma_1 \Delta x_t + \gamma_2 \Delta^2 x_t - \gamma_3 (y_{t-k} - \tau_4 x_{t-k}) + \varepsilon_t$$

The error correction property arises from the fact that if y_{t-k} is above its equilibrium value y^* , then Δy_t will be lower than would be otherwise the case; and vice versa if y_{t-k} is below y^* . There are two reasons why this model is appealing for the current study. The first is that short run change is necessary to maintain the long run relationship between the two variables. The second reason is that inclusion of residuals as a variable within the model captures omitted latent variables that may have influenced the dependent variable in the form of error terms (Banerjee, Dolado, Galbraith, and Hendry 1998). The pertinent question, therefore, is whether discounting room rates and hotel financial performance entertain a long-term equilibrium or, in other words, if they are “*cointegrated*.” Recently, the cointegration method appears to be more frequent in tourism literature, particularly in the demand modeling studies (Croes and Semrad, forthcoming; Croes et al. 2010; Croes and Vanegas 2008; Kulendran and Witt 2001; Lim and McAleer 2001; Narayan 2003; Webber 2001) but has not yet been applied specifically to the lodging industry.

The cointegration method precludes the possibility of spurious results. If time series variables are non-stationary in their levels, they are integrated of order one and their first differences are stationary. These variables may also be integrated if one or more linear combinations exist among these variables and if the residuals are stationary. Cointegration means there is a combination of integrated (non-stationary) variables that are stationary. In other words, if the two variables are cointegrated, there is a long-term relationship that prevents them from drifting away from each other thereby establishing an equilibrium relationship between them

over time. In this context, equilibrium refers to a situation where a shock may exert a transient effect on the levels of the processes, but any resulting disequilibrium will eventually dilute from the relationship leaving a residual effect. In the model, price is expected to alternate above and below its final equilibrium value in a stable market incurred by the availability of the stock of hotel rooms. Price, therefore, approaches its equilibrium from two directions.

Thus, if the variables under review appear to be non-stationary and contain a predetermined stochastic trend, these variables share a common stochastic trend (random walks) and their first differences are stationary and, consequently, may be jointly integrated of some order. In this analysis, the unit root test is based on both the augmented Dickey-Fuller (ADF) (1979, 1981) and the Phillips and Perron (1988) tests (PP). The advantage of the PP test over the ADF test is that the PP test is robust to a wide variety of serial correlation and time dependent heteroskedasticity. These tests conclude if the two variables are stationary of order 0, written as $I(0)$, or if they follow a non-stationary trend of 1 denoted $I(1)$ or higher.

A variable is said to be integrated of order $I(1)$ if it must be differenced once to become stationary. To test for integration, each variable should be examined based on the following auxiliary equation:

$$\Delta y^t = \alpha + \rho y^{t-1} + \beta t + \sum \tau^i \Delta y^{t-1} + \mu^t$$

Where (y^t) is the relevant time series variable, (t) is a linear deterministic trend and (μ^t) is an error term with a mean of zero and a variance that is constant.

To test cointegration between the two variables, a Maximum Likelihood procedure applied by Johansen and Juselius (1990) is used. This method is carried out due to the alleged weakness in the Granger methodology of relying on a two-step estimation procedure (Enders 1995). The hypothesis being tested, therefore, is the null of non-cointegration against the

alternative of cointegration between the variables. A vector autoregressive approach is used to model each variable, which is assumed to be jointly endogenous, as a function of all the lagged endogenous variables in the system.

Data, operational definitions, and methods

The study concerns the empirical estimation of the relationship between discounting room rates and hotel financial performance. An econometric case study research design was adopted in the analyses and interpretation of this relationship because of the ability to incorporate compressed market information from latent factors that may have influenced the relationship through the inclusion of residuals as a variable in the model. The benefit of using an econometric case study is that the residuals generated in the analyses are orthogonal to all market information available at the time the room rate forecast is made (Perakis and Sood 2006). So, while a hotel manager may not be able to specifically depict the latent factor that influenced the relationship between the variables; the market conditions that influenced the relationship may be expressed through the systematic expected relationship as well as the erratic behavior of the variables over time.

The study used three years of proprietary monthly historical financial data (2005 – 2007) from one of the largest convention resort hotels in Orlando, Florida. Orlando, Florida is one of the United States most popular destinations for visitor arrivals posting nearly 115,000 rooms in inventory (OOCVB 2008). In the years under examination, the city was the country's second most popular destination for group travel and the first for leisure travel (Smith Travel Research 2008).

The hotel that was used has many operating departments (e.g. golf course, full-service spa, seven full-service restaurants, multiple bars, multiple coffee shops, a food court, gift shops,

transportation services, business centers, arcade room, etc.) that generate profit beyond the sales of the core room night product. The hotel also boasts a wide array of amenities (e.g. child care, swimming pools, tennis courts, fitness center, etc.) that appeal to the two main target audiences of the hotel, which are convention travelers and families. The hotel contains 2,000 guest rooms and suites and commonly uses discounting of room rates as a pricing strategy. The hotel is not located directly on the property of any major theme park in Orlando but it is fairly centrally located to the three main theme parks. The hotel is approximately 1.5 miles from Walt Disney World, 4.5 miles from Sea World and Aquatica, and 10.5 miles from Universal Studios. The information that is used in this study is proprietary financial information. The description of the convention resort hotel is described only to the extent of not compromising the identity of the hotel. The time series data set contained the following variables: monthly demand, monthly available rooms, premium room rates, actual room rates, occupancy rates, department profit, monthly rooms compensated for employees, monthly rooms occupied by reward program members, and total hotel profit contributed by guests (hotel financial performance). Reward program members refer to those room night sales that were consumed by a guest redeeming the room with reward points.

For purposes of this study, discounting is defined as the short-term offering of a room rate that is below the premium rate (Croes et al. 2010). In other words, a discounted room rate is a dollar value that is less than the published premium room rate for a hotel that is offered for a defined period of time. The study calculates the discounting room rate series by dividing the actual charged room rate by the premium rate to arrive to the percentage rate. For the purpose of this study, short-term is defined as the market demand period for which the short-term aspects of flexible factors may adjust room rates, i.e., weekly, monthly and seasonal conditions determine

price. Hotel financial performance is measured by profit per available room (ProfitPAR), before deductions for capital reserve, rent, interest, incomes taxes, depreciation and amortization.

The study employed profit as measurement of performance instead of occupancy captured by revenues, because hotel operations, particularly in the case of a convention hotel, encompass more than just rooms. The benefit of using ProfitPAR as a unit of measurement is that it provides a more accurate indication of hotel financial performance than the traditional unit of measurement, revenue per available room (RevPAR), which only considers revenues generated via the sale of room nights. ProfitPAR considers that hotel operations consist of other services that generate revenues beyond the rooms department. ProfitPAR provided a more complete picture of hotel operations than RevPAR (Brown and Dev 1999). However, the use of profits as the final measurement of hotel operations does not imply that economic gains are the only preference of hotel managers. In order to clean the data, the two variables, discounting and financial performance, were disaggregated to remove the rooms sold and the profit from those rooms that were offered at an inflated discounted rate to hotel employees and loyal customer reward program members. Then the data of the two variables were converted into natural logarithms to create parameter elasticities that are more comprehensible.

The study considers discounting to be a short-term pricing strategy that aims to maximize hotel financial performance by bringing the market back to equilibrium over the long run where all market factors fully adjust. Because room nights are perishable products, occupancy becomes a key factor in hotel financial performance. Occupancy data provides the one widely available, consistent and temporally disaggregated means of monitoring hotel performance (Jeffrey et al. 2002); managers must consider that the value of the room night becomes zero if not sold by a specific point in time (Finch et al. 1998; Hanks et al. 2002). Therefore, short-term room rate

discounting may inflate a low occupancy percentage and increase hotel financial performance. The hotel occupancy rate is used to capture changes in room availability, which in turn implies that a decrease/increase in hotel occupancy rate incurs a decrease/increase in available rooms' inventory thereby decreasing/increasing the hotel room rate. It may then, therefore, be expected that discounting is positively related to hotel financial performance in the short run.

Results

The study followed a sequence of steps in applying the statistical procedures, estimating the empirical results, and making inferences. The data of the two variables, financial performance and discounting, were converted into natural logarithms. Unit root tests were used

to assess the stationarity properties of the time series data set. The properties of the data set will ultimately determine the accuracy of the model. This is because a small change in the parameter estimates of the discount rate could have a large impact on the financial condition of the hotel. As a result, the ordinary least squares or regression approach is often used to assess the relationship between the discount rate and hotel financial performance. However, if the time series data set contains a unit root (i.e. the current value depends on the previous value), then an important assumption of dependence between points of observation of regression is violated. In this case, there seems to be serial correlation present in most of the data. As a result, the neglect for assessing the nature of the data could lead to false results. This means the significance of the discount coefficient could be inflated by ignoring the effects that previous room rates have on the next data value.

The order of integration between the two variables was then tested and determined. Upon determining the order of integration between the variables, the study proceeded with the application of a cointegration analysis to represent the long run solution for hotel room rates. The next focus was to model the variable movements along the long run path using a backward looking model based on an error correction statistical technique.

Unit root tests

The STATA version 9 software package was used to conduct the unit root tests. The tests used were the Augmented Dickey Fuller (ADF) and Phillips-Perron (PP) tests. The results are displayed in Table 1. The ADF and PP tests' statistics were compared with the critical value at the 5% level significance. The tests suggest that the financial performance time strand was not stationary with a deterministic trend (test statistic is -3.139, while the 5% critical value is -3.556). Similarly, the discounting time strand contained a unit root.

While it is not clear from these results how discounting will influence financial performance in the long run, the results indicate that room rates seem to exhibit serial correlation thereby suggesting the presence of non-stationarity. A simple way to address this issue is the inclusion of a lagged discounted rate as an independent variable. A crucial point is to determine how many lags should be included in order to render the time series under consideration stationary. The Akaike Information Criteria (AIC) is appropriate to address this question. Once the number of optimal lags has been determined, the cointegration model, i.e., the stationary variables and their optimal number of lags tackling the serial correlation problems, may be built.

Using the first-difference of the data, it was evident that the data attained stationarity integrated of order one, $I(1)$. In the case of the hotel under investigation, the results of the unit root tests suggest that expectations of future prices may be fostered by past experience, providing some indications of rational expectations. In other words, it seems that the managers of this particular hotel determine expected room rates by carrying past room rates forward to the next financial period. This research finding provides the first evidentiary support that managers seem to be forming room rate expectations by way of a backward looking model to forwardly project room rates. However, it cannot be concluded, at this point, that this is evidence for the rational expectations theory. It is necessary to find support that indicates past experiences as they affect discounting are cointegrated with financial performance, or move together over time. In addition, the time horizon that past experience influences pricing behavior formation must also be determined.

INSERT TABLE 1 ABOUT HERE

Cointegration analysis and error correction model

Given the results of the order of integration between discounting and financial performance, the study applied a cointegration methodology proposed by Johansen (1988; 1991; 1995) and Johansen and Juselius (1990; 1992). Because both variables in the regression were integrated, there was an indication of the presence of a stable long-term or equilibrium linear relationship between the variables. One way to test for integration between the variables is to determine if the residuals from the conventional regression of discounting and financial performance are stationary, $I(0)$. This test revealed that the ADF test statistic (-7.427) exceeded the 1% critical value (-3.662). The results of the PP test (-8.275) confirm those of the ADF test. Based on the results from the unit root tests on the residuals from the conventional regression the variables appear to be $I(1)$. The model may now combine long run information with short-term adjustment by defining the error correction term as the residuals from the level form regression in its lagged order form. An error correction term with a negative value sign (which is expected) would indicate the error correction speed to reach a long-term equilibrium relationship.

In addition, the study establishes the number of cointegrating vectors. For this purpose, the study considered the Trace test. Table 2 presents the Johansen and Juselius test statistics for the number of cointegrating vectors. The Trace statistics reported in Table 2 indicate the existence of at least two cointegrating vectors at the 5% level of significance between discounting and hotel financial performance, thereby providing evidence of the existence of a two directional relationship between the variables. This suggests that discounting and profits are mutually reinforcing the equilibrium relationship, as expected.

INSERT TABLE 2 ABOUT HERE

The presence of a cointegrating relationship does not imply, however, that the study captured some distinguishing features of the model under review. What is known so far is that,

in the long run, there is mean reversion implying that managers pricing decisions seem to be consistent with the likely price behavior of the future. In other words, the relationship between revenues, forecasts, and actual revenues are convergent over the long run of time. Of course, in the short run there may be disequilibrium due to volatile market demand, constrained room supply, a core product that is perishable, and high fixed costs of operation. The implication of convergence is still general at this point because the expectation could be either rational, i.e. using the past to develop expectations of the future, or an adaptive behavior response to current market conditions. The results displayed in Table 3 show that there is a significant positive long run relationship between discounting room rates and hotel financial performance. To determine whether an increase or decrease in revenues is due only to the expected future increases or decreases in room rates, an ECM was used.

As indicated previously, the residuals of the model were stationary in their level form thereby enabling the application of regression using the ECM by replacing the initial error term γ by $(y_{t-k} - \tau_k x_{t-k})$. The study obtained the following results:

$$\Delta \text{LogFinPerf}_t = 0.009 + 1.317 \Delta \text{LogDisc}_t - 0.961 \mu_{t-1}$$

(0.05) (7.47) * (-6.08) *

Adjusted R-square=0.759; F=34.72*; DW= 1.982; Breusch-Godfrey LM test=0.027 (p=0.8689); Breusch-Pagan test = 4.12 (p=0.0424); t-values are shown in parentheses; (*) denotes significance at the 5% level.

The results from the ECM suggest that there is a positive relationship (1.32) between the two variables, revealing that discounting is an effective pricing strategy in the short-term. The estimated adjustment coefficient for discounting is a -0.961 (t=-6.08, being significant at the 5% level) and because the value of the coefficient is less than one ($d/b < 1$) there is a clear convergence to the mean, revealing an equilibrium relationship. In addition, the value of the

adjustment coefficient has the expected negative value sign that is required to generate a cobweb pattern. Because the value of the adjustment coefficient is statistically significant, hotel financial performance adjusts to discounting with one lag thereby correcting short-term financial performance within one month. This means that the correction seems to occur almost instantaneously (0.96).

The value of the short-term coefficient is 1.32 and is statistically significant at the 5% level ($t=7.47$). The long run coefficient is 1.18 ($t=8.59$). The results from the ECM are presented in Table 3. Because the ECM is non-zero (-0.96), it means that the model is not in a position of equilibrium. However, because the ECM has the expected negative value sign, the change in profit level ($\Delta\text{LogFinPerf}$) will be negative to restore the equilibrium. This implies that price is above its equilibrium value and therefore should fall in the next period to correct the equilibrium error. Omitted latent factors, such as market structure and value-based pricing reflecting consumers' willingness to pay, could act as an error correction mechanism that push and pull the discounting room rate and financial performance to a cointegrating relationship over time. Finally, the short-term coefficient (1.32) is larger than the long-term coefficient (1.18) suggesting that managers, in the case of this hotel, quickly learn how to maximize profits and demonstrate a concave relationship between the variables. This means that the influence of discounting on financial performance may be steeper in the beginning but will eventually flatten out over time.

INSERT TABLE 3 ABOUT HERE

Conclusions

The findings of the study propose that expectations of pricing in the future may be cultivated by past experiences and that managers seem to behave rationally in their pricing behavior. The results seem to suggest that discounting room rates works in the short run to compensate for periods of disequilibria and may be considered a rational business response in a monopolistic competitive market. In the case under review, the results indicate that managers

appear to anticipate the correct future price when the predicted and actual prices converge to the mean. This is an indication that managers behave rationally in their pricing setting behavior, and that this rationality in expectation formation appears to manifest itself through the practice of forecasting room rates in the lodging industry. It seems that in order to deal with demand uncertainties and the inelasticity of supply, managers appear to set room rates based on past experiences. The two conditions of demand uncertainties and inelasticity of supply appear to require the application of solid forecasting techniques in the lodging industry in order to form some idea about the likelihood of future room rates (Schwartz and Cohen 2004).

The room rate forecasting process is characterized, however, by a non-stationary process thereby implying that, from a business perspective, pricing cannot rely on the historical average price that is frequently used to assess the relationship between discounting and hotel financial performance in some hospitality revenue management studies. Therefore, the efficiency of these forecasts seems to rely not only on the availability of past information, but also appears to depend on the amount of time between the hotel rates forecast and the actual accrual of rates. This implies that forecasting techniques may not provide enough precise and unbiased information to warrant consistency in actual pricing behavior in the short-term. This means that predicted values could deviate from the actual price values generating, therefore, disequilibrium between prices and profits. This disequilibrium is resolved through a sequence of rate adjustments by the hotel manager and seems to be captured by a cobweb behavior. The latter was estimated through cointegration (the identification of the presence of two vectors) and the error correction analyses.

Finally, the modeling of the study not only provides a theoretical framework to address explicitly the dynamics of pricing behavior in the lodging industry; it may also explain a

phenomenon as the result of rational behavior. This implies that this phenomenon could occur systematically and not just by coincidence. This model, therefore, may constitute a consistent framework for understanding variation in hotel revenue management and room price setting approaches.

A major contribution of the results from this study when considering the literature reviewed is that past discounting studies relevant to the lodging industry that sought to examine the relationship between discounting room rates and hotel financial performance assumed the statistical properties of stationarity and a deterministic system without empirically validating that such assumptions were correct. These studies were based on the hypothesis that discounting and financial performance are stationary entities. The frequency of the time series in conjunction with the time period were not identified as playing major roles in the interpretations of the implications of these tests.

Moreover, past discounting studies did not investigate the empirical properties of time series data sets, as conducted in this study, but rather only assessed the relationship between averages of the data, thereby concluding that discounting does not correct for depressed demand or converge over time to actual earnings (Lim and McAleur 2001; Naravan 2003). The logical consequence of that finding, then, is to recommend to managers not to discount room rates, but to instead carry an average room rate forward from time period to time period. This study contends that previous research may have incorrectly modeled room price expectations; elected to use inappropriate statistical tests; and, therefore, may have entertained misleading conclusions regarding the relationship between discounting of hotel room rates and hotel financial performance.

Summary and discussion

The hotel under investigation seems to have a good reading of pricing in the market in which it operates. This suggestion is derived from the relatively quick process in which room rates revert to equilibrium (96% in one month) and that the short run profit elasticity is larger than the long-term elasticity. In the case of this hotel, one conclusion is that the use of discounting room rates induced optimal use of room inventory. In addition, it also suggests that the operational based strategy of “*heads in beds*” seems to stimulate increased profits in other departments, such as restaurant outlets, valet, spa services, food and beverage, golf course activities, etc. as reflected by the relative high profit elasticity.

The results seem in sync with the premise of the proposed theoretical framework, the rational expectations theory and the cobweb model. Initially, as managers believe that they possess a distinguished product, they price the product above the demand for the hotel room (rack rate). When they notice that they cannot fill the room, they will typically reduce (discount) the room rate in order to increase occupancy (demand). As the managers notice that they have underpriced the hotel room, they will increase the room rate to increase profit levels, and so on. As the managers learn to price in accordance to market demand conditions, they will attempt to protect their profit levels against rivals or newcomers through non-price competition that may increase expenditures, e.g. advertising, increasing quality levels of their product, etc. But paradoxically, the application of non-price competition increases the hotel’s marginal costs of providing a room thereby reaching average costs until all economic rent disappears.

In order to determine if the interpretation of price setting behavior of managers was accurate, anecdotal evidence was collected by way of 10 semi-structured interviews with revenue and general managers from hotel properties in the Orlando, FL market that were associated with

the same competitive set as that of the convention hotel under investigation. The semi-structured interviews revealed three common themes that supported the use of the theoretical framework and the price setting process that was interpreted from the findings of this study. The three main themes included the following: (1) room rate forecasting procedures incorporated the use and evaluation of historical performance over the same dates a year ago; (2) that current economic conditions and demand compression within the market are considered when determining appropriate room rates; and, (3) the ability for managers to accurately price rooms that will sell before expiring requires constant price adjustments; these price adjustments are determined after incorporating additional internal and external market information other than historical demand in order to close the gap between predicted and actual prices in the short-term room sales forecast. The information that was received during the semi-structured interviews lends support to the use of the theoretical framework and the statistical results from the study.

The study proposed a practical industry approach in the implementation of discounting room rates as is in keeping with seasons of diminished demand. The results of this study are unique in that the research recognizes the challenges of the hotel industry's dynamics as they affect discounting pricing decisions; and addresses the "how to" pricing concerns of hotel managers. Previous hotel discounting studies (Canina and Enz 2006; Enz 2003; Enz and Canina 2008; Enz et al. 2004; 2009; Enz et al. 2008) may not have properly accounted for the stationarity conditions of hotel historical financial data. Hotel managers who receive the recommendation to use an average room rate as opposed to discounting rates during low seasons should entertain this notion with care as the average rate may be less than optimal for seasonal market conditions.

The results of this study indicate that the variables, discounting and financial performance, may be modeled as an integrated process that demonstrate convergence in the long run and also possess a short-term relationship. The short-term relationship may provide managers with an indication regarding the adjustment speed required to correct for disequilibria that effects financial performance. The error correction mechanism is of particular value to managers as it offers the extent, or length, of an adjustment process to a seasonal deviation from equilibrium. This information may assist managers in making efficient inferences regarding the appropriate future room rates that correspond to seasonal demand patterns.

Hotel managers know and understand that room demand is not certain, supply of rooms is relatively fixed, elasticity conditions for room demand varies, and that the product they sell is perishable. The main implication of this study is that discounting room rates seems to work in the short and long run, only if the discount rate reveals serial correlation thereby suggesting the presence of non-stationary tendencies. Because there is ample evidence of this condition, due to seasonal or cyclical effects on prices, time trends or extreme shocks to the industry or economy, the hotel manager should be aware of the presence of serial correlation in the price patterns of the hotel. Applying, therefore, the random walk rule instead of historical averages in predicting future prices seems a smart strategy. On the other hand, applying historical averages to predict price could lead to less than optimal results.

This implies that managers could use an error correction model as a forecasting tool to maximize optimal financial performance. This is because of the error correction's ability to adjust to the dynamic settings pervasive in the hotel industry. As hotels strive to operate at full capacity in accordance with market forces, a decrease in demand (low season) will generate an excess supply in the short run. To increase demand, adjustments may be made through the

pricing system – discounting. The ECM captures the dynamic response on the supply side of the equation by adjusting to oscillating market demand conditions and providing managers with an improved forecast resulting in a higher revenue response. And, as managers repeatedly learn from forecasting information they are able to generate new expectations based on past outcomes.

The adjustment coefficient of the ECM provides managers with critical information regarding when and for how long they should discount room rates to correct for the effects that low seasonal demand may have on hotel financial performance. The adjustment coefficient represents parameters of an attractor set, or price bands (high and low room rates) for which the market is willing to pay. A manager may err on setting a room rate but the use of an ECM may provide an adjustment coefficient that will force the pricing process back within the tolerable price limits thereby regaining equilibrium over the long run.

Future research and limitations

It is understood that a manager could set appropriate price adjustments and estimates to account for non-stationarity conditions with the detection of data trends that indicate if a variable is dependent on the previous values of that variable (Croes and Vanegas 2008; Kulendran and Divisekera 2007). The high explanatory power of the statistical techniques used in this study, specifically the use of the ECM, suggests the study holds high internal validity. It is anticipated that future studies that follow the methodological procedures and theoretical framework provided will most likely produce similar results as the statistical procedures applied did more than assess the common hotel industry trends of price setting.

The cointegration analysis revealed a relationship property in the data set between the discounting and hotel financial performance variables that should hold in a larger homogeneous

data set that incorporates additional hotel properties that offer similar products and are within the same competitive set and relative location. In other words, if the discount rate of any hotel exhibits a non-stationary tendency, the manager of that property should consider applying the random walk rule instead of historical averages in predicting future room rates. The presence of non-stationary tendencies is not directly observable, but only after empirical assessment. Therefore, it is necessary for the manager to determine whether serial correlation exists or not when setting room rates.

The expectation that future studies applying the model from the current study is anticipated given that a cointegrated relationship (under similar market conditions) is relatively invariant to changes (Juselius 2008; Kulendran and Divisekera 2007). Importantly, the findings are empirically supported through a statistical assessment that provides evidence that the rational expectations theory may be applicable in the lodging industry. Because omitted factors could act as an error correction mechanism that push and pull the discounting rate and financial performance to a cointegrating relationship over time, it behooves the manager to assess which determinants influence the discounted rate.

It is important to note that the results of this case study may be influenced by criterion related market conditions that include but are not exclusive to the following: the hotel competitive set, location (city, destination) of the hotel, the city infrastructure of the location of the hotel, the competitive structure of the market place, irregular occurrences of location specific events (e.g. hurricanes, tastes and preferences of the consumers visiting the location, economic recession, etc.) It is important for future researchers to recognize the market conditions of the lodging industry from which the hotels under examination are located. It is expected that the market conditions of the industry have influenced the findings of this study. Although the results

that were generated determined the empirical relationship between discounting hotel room rates and hotel financial performance it is necessary to test whether the findings may be confirmed by the financial information from other hotels that are located in alternative destinations with different market conditions (Kulendran and Witt 2001). Therefore, causal inferences must be drawn with care. If one would apply this study's model within the context of different market conditions, they would need to treat parameter heterogeneity as a fundamental concern regarding the validity of their findings (Banerjee et al. 1998). This presents another limitation of the current investigation in that it would be difficult to control for market conditions, or to apply unique characteristics from one location to that of another location. This is due to the inability for one to reject a set of variables from the marketplace as non-robust criteria, or not significant (Mukherjee, White, and Wuyts 1998).

This study provides a platform for future researchers to offer hotel managers more appropriate pricing strategies to compensate for the structural characteristics of the industry. More research should be conducted to determine the benefits of using statistical residuals as opposed to room rate averages to assess historical hotel financial information. Future research in this area may prove important in filling the gap between empirical assessment and industry practice. An important contribution of this line of research may be in reference to the use of residuals over averages. This is because residuals may reveal meaningful patterns in the data that enable meaningful discoveries in the data set, which may then account for other factors influencing financial performance (Banerjee et al. 1998). The methodology of this study requires further testing to determine if the use of an ECM may be used as a viable means to assist hotel managers with a more accurate method to set future room rates.

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Table 1
Unit root tests on LogFinPerf and LogDisc

Variables	ADF Levels	ADF first Differences	PP Levels	PP first Differences
LogFinPerf	-3.941*	-----	-3.965*	-----
LogDisc	-2.362	-----	-2.571	-----
Δ LogFinPerf	-----	-----	-----	-----
Δ LogDisc	-----	-5.556*	-----	-4.405*

Note: Estimates are obtained from STATA version 9 and correspond to 36 observations. Δ indicates the first differencing of the variables. The ADF tests should be compared to the critical values of -2.619, -2.975 and -3.689 and the PP tests at -2.619, -2.975, -3.689 at the 10%, 5%, and 1% levels of significance, respectively.

Table 2

Results of cointegration tests

Relationships	Trace R = 0	Trace R = 1	Critical Values Trace (5%)
LogFinPerf and LogDisc	58.46	15.89	3.76

Note: Trace is the likelihood ratio statistic for the number of cointegration vectors. Each equation contains linear trends but not quadratic trending; and parameters for the trends are restricted. Estimation has been performed with STATA 9.

Table 3
Estimated long-term parameters

Dependent Variable	Independent Variable	Coefficient	t-statistic	Adjusted R ²	DW
LogFinPerf	LogDisc	1.18	-8.59(p<.0000)	.691	2.282

Note: Parameter estimates express the corresponding elasticity values.