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## Discounting An Empirical Justification For Its Value In The Lodging Industry

Kelly J. Semrad  
*University of Central Florida*



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DISCOUNTING: AN EMPIRICAL JUSTIFICATION FOR ITS VALUE IN THE LODGING  
INDUSTRY

by

KELLY J. SEMRAD  
B.S. University of Oklahoma, 2000  
M.S. Saint Thomas University, 2003

A dissertation submitted in partial fulfillment of the requirements  
for the degree of Doctor of Philosophy  
in the College of Education  
at the University of Central Florida  
Orlando, Florida

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Major Professor: Robertico Croes

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## ABSTRACT

The central focus of this study is to provide an empirical explanation regarding the efficacy of the managerial expectation formation process as it contributes to the understanding of discounting room rates as a rational strategic phenomenon in the lodging industry. The study assesses the nature of the relationship between discounting hotel room rates and hotel financial performance when considering the non-stationary conditions of a time series data set. The study was rooted in an operational based perspective with regard to the challenges presented by the perishable nature of room night sales - the loss of which may impact a manager's fundamental responsibility: to generate maximum revenue from the existing hotel room capacity.

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. There is limited research regarding the empirical relationship between discounting room rates and hotel financial performance, as well as the internal process that a hotel manager uses to determine an accurate room rate that corresponds to seasonal lodging market demand conditions. An empirical foundation for this practice is lacking in the extant hospitality literature. Literature reveals that, although the lodging industry commonly incorporates discounting as a pricing strategy, recent research implies that high occupancy levels at discounted room rates do not necessarily lead to an increase in hotel financial performance. The contrast then between what is practiced and the recommendations from pricing strategy studies has led to lack of consistent agreement in current lodging literature regarding how discounting of hotel room rates relates to hotel financial performance. This study is at the forefront in its use of the methodological procedures that support a theoretical framework

capable of providing explanations regarding managers' internal process of discounting as an effective pricing strategy that could compensate for times of decreased room demand.

An econometric case study research design was used in conjunction with a cointegration analysis and an error correction model (none of which are otherwise appropriated as assessment tools in the lodging industry). These applications provide a means to understand the expectation formation process of managers' room price setting strategies. They also assess the empirical nature of the relationship between the variables by accounting for the erratic variations of room demand over time as induced by random error fluctuations. A non-deterministic system was assumed and supported through the analysis of the stationarity conditions of the time series data set under investigation. The distinguishing characteristics of a dynamic system that are recognized as traits of the lodging industry are further supported by the theoretical framework of the rational expectations theory and the cobweb model. The results of the study are based on secondary financial data sets that were provided by a midscale independently owned leisure hotel in the Orlando, FL market and that is located on Walt Disney World property.

The results of this study delineate from the current normative economic recommendation based on descriptive research that claims discounting hotel room rates does not increase hotel financial performance. The current study does not draw an association between the variables from the presupposition of a deterministic marketplace, nor does it recommend to managers to hold a constant average daily rate over time. Based on the findings of the statistical procedures performed and the theoretical framework, the 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.

Through use of an error correction model, the major findings of this study imply several concepts: that residuals may be treated as a variable within the study's model in order to better understand the short run dynamics that may lead to equilibrium correcting room price positions over the long run of time; that discounting room rates works in the short run; and, that managers use a rational price setting strategy to set future room rates. All of the aforementioned concepts fall within accordance of the rational expectations theory. The study concludes that while the constant room rate adjustments observed in the lodging industry may display what appears to be a random structure that deviates from the expected systematic, or stable, financial performance of a hotel over time, the deviations in performance are actually a rhythmic synthesized process of market information from past and current times. Hence, hotel managers appear to be using a backward looking model to forwardly project optimal room rates to match uncertain consumer demand. The empirical assessment employed in this study supports this determination.

My dissertation is dedicated to my beautiful Mom! This dedication cannot do justice for the immense amount of love, respect, and awe I have for her! I exercised ALL of the life lessons (ALL of which I cannot list here) that I learned from her in my endeavor to complete my PhD. She taught me that fear was natural but to run from it was not acceptable. She taught me to set goals, to reach for challenge, to always dream and to never quit or settle. At times, she forced me to fight for me and for what I believed but I never endured a fight alone – she was there. I learned from her that my most powerful self-possession is my heart and my mind and therefore I must learn to communicate emotions and thoughts. She taught me that I must earn the respect of others and likewise they must earn mine. I found out I can never retract words or actions that hurt but I learned that forgiveness is a beautiful gift to give. She taught me that we all stumble, that we all need help, and there is no shame in asking for it. I learned that those who are closest to me already know I need help and I do not need to ask. I will forever recognize the sincerity of a smile, enjoy the laughter in a day, and will forever feel greatness about going the extra distance for those I love and for what I care for because of her. I don't know how she did and does all she has done for my sister and me. The strength of her soul, the endless love from her heart, the stability of her mind, the depth of her intelligence, and her endless fight for family, life, and a promise that everything will be okay - forever makes her the finest person in my life!

What I value most at the end of my quest for a PhD is not the degree but knowing that I learned from my Mom and that in some semblance, I am like her. Thank you Mom! For without all of what you gave me my whole life, I, (not this dissertation) would not be possible! The pages of this dissertation represent more than a study, more than research, more than theory, they represent a time that without your lessons I would not have prevailed. I love you and will forever strive to make you proud!

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The completion of this dissertation marks a stand at the end of a path to obtain a PhD. Such a stance (for me) could not have been possible without many people to assist along the way! I will try to give the proper respect and recognition to those people and to express my admiration and appreciation for them here – although, I don't believe that my words will capture how much their support and guidance will always mean to me.

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## CHAPTER ONE: INTRODUCTION TO THE STUDY

### Introduction

The purpose of this study is to explain the managerial expectation formation process of price setting as it contributes to the understanding of discounting hotel room rates as a rational strategic phenomenon in the lodging industry. In order to accomplish this purpose, the study will first assess the nature of the relationship between discounting hotel room rates and hotel financial performance when considering the non-stationary conditions of a time series data set that seem pervasive in the lodging industry.

Chapter one provides background information that is intended to serve the readers with a broad overview regarding the use of room rate averages to set room rates in the lodging industry; considers potential concerns pertaining to the adoption of static models to set room prices of a perishable product supply; discusses the stationarity interpretations of data from past discounting studies relevant to the lodging industry; and, reviews the use of a hotel's average daily rate (ADR) as a financial performance predictor. A statement of the research problem and the purpose of the study will then follow. After a succinct description of the adopted theoretical framework, the research questions are presented along with a brief description of the methodology to be used in the study. Finally, the significance of the proposed study is discussed with respect to its potential theoretical and practical contributions, followed by the study's limitations.

### Background

A hotel manager assesses a firm's financial performance based on the internal microeconomics of the hotel and its accounts, concentrating on room rate pricing, costs (inputs),



productivity (outputs), and profitability of the firm (Brown & Dev, 1999; Jeffrey, Barden, Buckley, & Hubbard, 2002). Such financial assessment is captured within the firm's revenue management system, where, through the setting of optimal room rates, the goal is to generate maximum revenue from the existing room capacity.

A central focus, then, of hotel managers as perceived by many hospitality practitioners and researchers is room revenue maximization (Gayar, Hendawi, Zakhary, El-Shishiny, 2008). Managers dedicate critical attention to this focus because they understand that the sale of room nights is time-sensitive, or perishable, (Cross, Higbie, & Cross, 2009) and is the most significant financial contributor to hotel financial profitability (Pan, 2007; Schmidgall, 2006).

However, in the lodging industry which is characterized as a dynamic system that displays cyclical lag times between a relatively fixed supply and uncertain demand (Corgel, 2004), the hotel manager is charged with one of the most problematic and unique facets of the hospitality industry – managing the perishable nature of the core product (room nights) (Hanks, Cross, & Noland, 2002); and, adjusting to the seasonal demand conditions that may influence the sale of that core product (Jang, 2004).

The price adjustment process that occurs in relation to the varying consumer demand for a perishable product may be surmised as a dynamic or moving process (Hanks et al., 2002). This means that if the supply of available hotel rooms increases, or exceeds demand, hotel room rates will tend to fall through the use of discounted rates that are representative of an elastic product acclimatizing to decreased consumer demand. And, if demand for hotel rooms is greater than the available room inventory, hotel room rates will tend to rise to price levels representative of an inelastic product (Abbey, 1983; Bull, 1997). The elasticity conditions of a room night in a lodging market are reflected by an equilibrium price where the intents and purposes of

consumers are to seek and purchase the lowest room rate at a given level of quality. In conjunction with the intents and purposes of consumers are those of the hotel managers whereupon they seek to make the most profit from the sale of a room night before it expires.

These seemingly competitive desires of consumers seeking to maximize the utility of a room night (marginal utility) and managers striving to achieve the highest profit from the sale of a room night is indicative of a neoclassical economic synthesis process from both the supply and demand sides of the lodging industry (Sandler, 2001). Thus, there is the presence of dynamic pricing for hotel room nights in a market where the elasticity conditions of the room night product should not be considered stationary over time (Bull, 1997). To help clarify the concept of how elasticity conditions may vary for hotel room nights over distinctive time frames, consider the following example.

A hotel room night during a low demand period may be regarded as an elastic product. This means that there is an ample supply of rooms that a consumer may purchase at most hotels (quality level notwithstanding). However, during a finite time period (e.g. spring break week), the demand for a room night may drastically spike. As managers anticipate possible depletion of the hotel's room supply during this time period, the room night product may be deemed an inelastic product. This is due to the fluctuating ratio of rooms available (supply) and the increased demand for that fixed room inventory.

The most significant aspect of managing a perishable product, in this case a room night, whose sales are influenced by fluctuating demand, involves an accurate prediction of the concentration level of consumer flows to the location of the hotel and an optimal room rate that will sell during relatively short periods of the year (Jang, 2004). These short periods may be characterized by varying demand patterns that create high, low, and shoulder seasons (Allock,

1994) that reflect room prices (e.g. premium room rate, discounted room rate) that are sensitive to market demand conditions. This means that hotels may experience short-term seasonal offsets between room supply and demand that may present conditions of risk and uncertainty that impact a manager's pricing decisions (Nicolau, 2005). These decisions are based on future expected room demand and the optimal room rate that may avoid a room vacancy and the potential sale of that room from expiring (Morrison, 1998).

Managers strive to alleviate uncertain future room demand expectations by forecasting future demand based on room inventory and specific time intervals that pertain to past, current, and predicted room demand. In this way, they may hope to determine the appropriate pricing, packaging, and promotional strategies that could be considered if a situation of over or under capacity of rooms was projected in terms of low or high industry occupancy rates (Bitran & Mondschein, 1995; Choi & Mattila, 2003; Choy, 1985; Jayaraman & Baker, 2003; Talluri & van Ryzin, 2005). Thus, the hotel's forecast of occupancy rates and the hotel's expected financial performance impacts future firm investment decisions that are based on the calculation of economic return of some future expectation of financial performance (Nicolau, 2005).

The common price setting methods used to determine the optimal room rate and room capacity utilization involve room inventory allocation models that focus on selling each room available to the customer who is willing to pay the most for it, while at the same time ensuring that the sale of every room is above the rate to cover marginal sales cost (Vinod, 2004). The room inventory allocation models used to determine optimal room prices vary from deterministic linear programming, probabilistic linear programming, stochastic dynamic programming (Gallego & van Ryzin, 1997; Gallego & van Ryzin, 1994; Weatherford & Bodily, 1992), single

resource capacity control, network capacity control, and threshold pricing (Talluri & van Ryzin, 2005).

Although the rooms inventory allocation models all differ in their application, the models do possess several commonalities. The models all attempt to provide an accurate forecast of the relationship between hotel occupancy rates, rates charged, and financial performance. And, the expected revenue generations by the models during times of soft demand (low seasons) are of critical importance to hotel managers to avoid the loss of a less frequent sale (Schwartz & Cohen, 2004). Perhaps a common detracting feature of these models may pertain to the reference of a hotel's ADR of rooms sold in the hotel (occupancy rate) as not only the benchmark to detect financial performance (RevPAR<sup>1</sup>) but also as an indicator to assess financial performance over time, and to predict future room rates.

A potential problem with setting room rates using these common room inventory allocation models is not per se the results that are produced but rather that they are not "*thinking managers*." This means that the forecasted results generated from these models may sometimes be accurate or may not be accurate. However, "*thinking*" managers are required to chose and implement the room rates produced by these models in the right context and at the right time. Failure to grasp that a hotel's business cycles are characterized by short-term sales variation may lead to the adoption of figures such as average occupancy rates and ADR to predict future room rates without the consideration of the pattern of variation over a time span (Brown & Dev, 1999). The result may reveal a distortion of the stochastic demand patterns of room night sales (Baker & Riley, 1994).

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<sup>1</sup> A hotel's occupancy rate multiplied by its ADR provides a hotel manager with a unit of measurement used to evaluate hotel financial performance, which is revenue per available room (RevPAR) (Chan & Wong, 2006).

The accuracy of using a hotel's ADR over time as a financial indicator of performance and as a predictor of future room rates to match future market demand conditions is guided by linear correlative perspectives between the variables (Croes & Semrad, 2009). The correlations require that the relationship between the variables remains relatively stable over time, a condition that is not evident in the price setting process or consumption trends of the lodging industry (Finch, Becherer, & Casavant, 1998). In conforming to this conventional perspective, a potential problem may arise from spurious correlations within the data (Hoover, 2003). That is, there may be a contamination of the accuracy of managers' expectations of appropriate future room rates (Narayan, 2003). Furthermore, the use of ADR over time assumes that the revenue productivity of a time period is completely independent of the previous time period (Jeffrey et al., 2002).

This assumption of independence between time periods does not seem to conform to hotel managers' price setting behavior. Managers know that when occupancy falls short of expectations, they cannot make adjustments through room supply in the short run (Finch et al., 1998). Therefore, the possible option for adjustment in the short run is price setting to avoid the sale of a room night from perishing. Here, managers typically take the price outcome of a present time period and continue it in the future (Baker & Collier, 2003; Croes, Semrad, & Yost, 2010). Therefore, managers seem to take the past into account thus violating the independence assumption made by the use of the traditional rooms inventory allocation models.

The interpretation of ADR as a financial performance indicator over time ignores the effects of fluctuating room demand patterns that seasonal consumption produces in the lodging industry. Avinal (2004) suggests that when room demand forecasts exceed capacity, the hotel should sell the limited capacity only to the most profitable mix of customers. However, when room capacity exceeds demand, the hotel may stimulate demand for the consumable rooms

inventory by introducing lower discounted room rates that may otherwise go unsold if offered at a premium room rate (Hanks et al., 2002).

That is, in order for a hotel to maximize revenues, the recommendation is that the service provider (hotel manager) should adjust room prices over time based on the current and predicted room demand, thereby creating a dynamic pricing schedule that corresponds with fluctuating market demand conditions (Chen & Schwartz, 2008). However, Enz (2003) gives reference to a directional research stream in current hospitality literature that claims that the use of discounting hotel room rates does not increase room demand as much as it does decrease revenues (Canina & Enz, 2006; Enz, Canina & Lomanno, 2004; Enz & Canina, 2008).

The recommendation to lodging managers from the results of these studies is for managers not to discount room rates during times of decreased demand. This recommendation stems from the adoption of descriptive statistics (i.e. ADR) as a variable assumed to remain stationary over time (Croes et al., 2010). However, if managers are misguided in their adoption of an ADR as a financial performance predictor they may perceive that increasing occupancy levels at discounted room rates may lead to a decrease in ADR and consequently a decrease in RevPAR which would then be perceived as a decrease in hotel financial performance (Brown & Dev, 1999; Chan & Wong, 2006).

Perhaps a fundamental pricing principle to note here is the difference between the short and long-term importance of financial performance to hotel managers. In the short run, managers are concerned with determining the optimal room price that will sell in current market conditions to avoid a room from remaining vacant while incurring high fixed costs of operation (van der Rest & Harris, 2008). In reference to low demand periods, a short-term hotel management goal may be to compensate for the elastic nature and the excess available room capacity through the

adjustment of price with the expectation that a decrease in price may inversely affect room demand and therefore short run profits.

However, over the long run, managers aggregate financial periods and integrate market conditions where normal costs<sup>2</sup> become the forefront and a ‘normal value’ (i.e. ADR) is calculated as the room rate, *ceteris paribus*<sup>3</sup>, with cyclical effects removed and a trend path assumed that would maximize future hotel financial performance (Uner, Kose, & Gokten, 2008). Here, the prices are set on the basis of normal costs without regard to fluctuating demand in the short run (Nooteboom et al., 1987). Generally speaking, normal costs are used as the basis for comparison to actual costs.

Normal costs almost always vary in projection from actual costs due to unusual internal or external market place factors that may affect financial performance. The concentration and value of normal costs are the long-term firm projections that may be used for purposes of firm investment, sustaining or increasing market position, determining appropriate annual marketing and promotion costs, setting goals for market share, etc. (Choy, 1985). These firm projections require a certain degree of price stability, which is perhaps better represented through the use of normal costs as opposed to dynamic pricing, or fluctuating prices over time (Nooteboom et al., 1987).

There is limited research regarding the internal process that a hotel manager uses to determine an accurate room rate that corresponds to seasonal lodging market demand conditions. This study forwards a methodological foundation to explain how managers may optimize current

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<sup>2</sup> “Normal costs are defined, “As costs from which the effects of short-term demand fluctuations are eliminated,” (Nooteboom, Kleijweg, & Thurik, 1987, p. 1000).

<sup>3</sup> *Ceteris paribus* (“With other things the same”) refers to the assumption that all other market conditions remain equal, or that a particular market factor or variable may be assumed fixed, or without orthogonal ties to other market place variables that may influence the output of a firm (Juselius, 2008, p. 232).

market information from historical financial data. The study pockets the traditional rational expectations theory to promote the manager's internal process of discounting as a valid and reliable pricing strategy to compensate for times of decreased room demand; and statistically assesses the short and long-term relationships between discounting of hotel room rates and hotel financial performance. Literature reveals little about the connection between the non-stationarity conditions of time series data sets and the use of the rational expectations theory as applied to discounting room rates in the lodging industry.

### Problem Statement

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, like those of the lodging industry, which experience periodic seasonal demand fluctuations (Brown & Dev, 1999). In spite of common lodging industry practice regarding the use of discounting as a pricing strategy to move perishable supply, recent hospitality management research has implied that high occupancy levels at discounted room rates do not necessarily lead to an increase in hotel financial performance (Canina & Enz, 2006; Chan & Wong, 2006; Enz, 2009; Enz & Canina, 2007; 2008; Enz et al., 2009; Enz, et al., 2004). The mixed results from pricing strategy studies pertaining to the relationship between discounting room rates and hotel financial performance has led to debate and to lack of consistent agreement in current lodging literature regarding how discounting of hotel room rates relates to hotel financial performance (Croes et al., 2010; Cross et al., 2009).

Advocates of the discounting strategy support the microeconomic principle of supply and demand, which implies increased incremental revenue through increased consumer interaction



and room sales could transpire (Avinal, 2004; Donaghy et al., 1995; Enz, 2003; Hanks et al., 2002; Jeffrey et al., 2002). This implication is supported by neoclassical economic theory that views pricing and demand as interrelated (Chen & Schwartz, 2003). Conversely, opponents of discounting room rates cast doubt on its effectiveness as a pricing strategy, arguing that hotels in general have observed a decline in their rack rate though the number of discounted room sales had increased (Canina & Enz, 2006; Chan & Wong, 2006; Enz & Canina, 2008; 2007; Enz, Canina, & Lomanno, 2009; Enz, et al., 2004).

Regardless of the advocacy or opposition deduced regarding the efficacy of discounting as a pricing strategy, the results of previous studies may not have accurately used statistics that could empirically account for the correct interpretation of the effects of discounting on hotel financial performance. This may be due to several reasons: (1) the lack of access to proprietary historical financial time series data sets of hotels; (2) the absence of application regarding statistical procedures that may properly assess the stationarity conditions of a time series data set; and, (3) the deficient application of salient theoretical principles that could provide a deductive explanation regarding the practical cognition of hotel managers' price setting behavior in the lodging industry.

Conceivably, the reasons pertaining to why past studies failed to employ proper statistical analyses that could empirically assess the relationship between discounting room rates and financial performance is not of critical importance here. Rather, it is the deterministic perspective that researchers have assumed regarding the properties of hotel data that fail, through the adoption and application of average prices, to address the influence of oscillating market conditions in the lodging industry.

A deterministic system is without representation of random fluctuations that may occur between supply and demand and the effects those fluctuations may have in the development of future conditions in the system (Levin, McGill, & Nediak, 2005). In other words, all market conditions are anticipated and expected to occur. This is not likely to be an acceptable approximation of the characteristics of the lodging industry that requires managers to recognize the internal constraints of the hotel (i.e. fixed capacity, high fixed costs of operation, perishable nature of the product) and to operate within the external market constraints that may influence room night sales and generate demand uncertainty (i.e. seasonality, competitive market structure, weather, economic recession, SARS, national disasters, etc.) (Corgel, 2004; Jang, 2004).

Acceptance of research results and adoption of methods pertaining to the relationship between discounting room rates and hotel financial performance with the presumption of determinism places restrictive value on dynamic room pricing schedules. The loss of value is that the dynamic pricing schedules correspond to highly stochastic consumer demand. In this circumstance, the impact of random factors that may offset the balance between room supply and demand would be denounced.

When adopting determinism in the context of the relationship between discounting room rates and hotel financial performance, one fails to isolate the corresponding instances (time periods); where market conditions are not favorable, there is a downward slope of room demand, managers' level of demand uncertainty increases, and the hotel is not performing optimally (Jeffrey et al., 2002). Instead, average room rates over time are used to avoid losing potential revenues that may be incurred by discounting room rates. The logic behind the acceptance of

average room rates is indicative of a *reductio ad absurdum*<sup>4</sup>, which implies increased room sales at a discounted room rate is not compensated for through an increase in occupancy levels in the short-term.

The notion that discounting room rates may entail losing money via a possible decrease in market share, a potential increase of switching costs, and the potential disintegration of price integrity are more important than short-term occupancy boosts induced by discounting room rates (Chan & Wong, 2006; Enz & Canina, 2008) are all of valid concern to hotel managers. However, so is the critical expiration date of room night sales that is maintained through high fixed costs of operation (van der Rest & Harris, 2008). Herein lays the root of the debate of discounting room rates as an efficient pricing strategy. Do managers tolerate decreased occupancy levels in the short run to maintain market position over the long run; or, should managers compensate for periods of short-term decreased demand by filling rooms at discounted rates with the expectation that the short-term increase in demand may lead to equilibrium in the future? The contribution of this study is that it empirically validates hotel managerial decisions to discount room rates as a method to project expected future performance from past experience that may then result in financial compensation during uncertain market demand conditions.

#### Purpose of the Study

The purpose of this study is to explain the managerial expectation formation process of price setting as it contributes to the understanding of discounting hotel room rates as a rational strategic phenomenon in the lodging industry. In order to accomplish this purpose, the study will

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<sup>4</sup> *Reductio ad absurdum* (“reduction to the absurd”) is a logical rebuttal to common practice procedures that takes a proposition to its logical extremes where the logical extremes may negate the reason for the original proposition (Pollock & Cruz, 1999).

first assess the nature of the relationship between discounting hotel room rates and hotel financial performance when considering the non-stationary conditions of a time series data set that seem pervasive in the lodging industry.

In addition, the study seeks to explain the use of the rational expectations theory (Muth, 1961) as a synthesizing process that may allow for expectation formation of future room prices in dynamic market conditions, as opposed to adaptive expectations where the expected value of today's price is representative of average prices over time. While the latter may be a more evaluative process of aggregated market demand conditions, the use of averages suggests that the conditions are representative of a relatively static market. That is, the use of adaptive expectations is a response to current conditions that, while dynamic today, may represent a static condition tomorrow.

The fundamental objectives of this study will pertain to the examination of the relationship between discounting hotel room rates and hotel financial performance. This will be accomplished through a statistical assessment that considers the use of error terms (residuals). This study posits that pricing decisions based on averages may prove to be less than optimal for fluctuating demand conditions in the lodging industry. This study will call for critical attention regarding the use of statistical residuals as opposed to averages in order to account for an omnibus expectation regarding market information that may assist hotel managers in making efficient inferences pertaining to the appropriate future room rates as they correspond to fluctuating demand patterns.

This means, in order to properly assess the relationship between the variables, a non-deterministic system will be assumed in order to account for the erratic variations of room demand over time as induced by random error fluctuations, (i.e. error terms or residuals) in the

data. The error terms from the data will be treated as a variable within the study's model in order to provide an indication that the estimated model is reasonably specified. The reason for including residuals within the model pertains to the assumption that every dependent variable has both a structural (normal patterned) behavior and an irregular (erratic) behavior. Mukherjee, White & Wuyts (1998) reference that the inclusion of error terms within a model may provide a data rich source that prevents the generation of a blurry relationship between the dependent and independent variables and may provide meaningful clues regarding stochastic shocks within a system that may have influenced that relationship to drift away from a meaningful equilibrium.

In a traditional regression analysis the time series data used is assumed to be stationary. Under this assumption it would seem appropriate to use averages (i.e. ADR) as the explanatory variable. However, due to the constant price adjustments of room rates in the lodging industry to compensate for the lags between room supply and consumer demand, hotel financial time series data sets do not appear stationary. Therefore, the use of a regression analysis may produce significant relationships between the variables that are actually unrelated. This results in a spurious regression (Granger & Newbold, 1974; Narayan, 2003). This means there may be variance in the dependent variable that may not have been detected and/or is falsely explained by the independent variable. The variance in the dependent variable that is not detected and/or explained is the error term. Therefore, the inclusion of residuals within a statistical analysis may produce results that are representative of a clearer relationship between the variables under investigation. To further explain the potential statistical power of including error terms, consider the following lodging industry example.

Using a regression analysis, a hotel manager may analyze a month of financial data containing the daily discounted rate offered and the total daily hotel profit. After examining the

influence of discounting room rates on total hotel profit, the manager concludes that discounting hotel rooms on certain days of the week (e.g. Tuesdays and Fridays) does not seem to positively influence total profits and therefore decides not to discount on these days. It is possible that these results may be accurate for both days, for just one day, or for neither of the days. If the results of the regression analysis generated a spurious relationship between the variables, then the manager will make the wrong inference regarding the effect of Tuesday's and Friday's room discounting on total hotel profit.

However, if the manager examines the data more closely with the inclusion of residuals as a variable he may find that the coefficient of determination decreases and does not account for a majority of variance in the dependent variable. This is because the use of residuals detects additional latent factors in the market place that may have influenced the dependent variable but were not specified in the model. For instance, perhaps on two of the Fridays in the month the accessibility cost to the location of the hotel increased and therefore may have influenced the concentration level of the amount of travelers to the area. Or, perhaps it would appear that another day of the week (e.g. Saturdays) discounted room rate was positively influencing total hotel profits. However, in this case, the increase in profit may have been due to more travelers arriving because of additional attraction and activity promotions. Therefore, it may not necessarily have been the discount of hotel room rates influencing total profit on Saturdays but rather other promotions in the area.

This example is intended to demonstrate that the variance in the dependent variable may not always be accounted for exclusively by the independent variable thereby producing erroneous results generated by a spurious regression. The use of statistical residuals may be a

valuable tool in developing a more accurate representation of additional latent factors that could be influencing the relationship between the variables (Mukherjee et al., 1998).

### Theoretical Framework

To anticipate future room demand, hotel managers clearly depend upon past performance to set future room rates. The literature on explaining price setting in the lodging industry is largely lacking in providing any clear conceptual framework or frameworks, paradigms, processes and interactions on this relationship. The most that is available next to a multitude of descriptive analyses is based on normative thought that is flawed in its arrival to support stochastic processes that are long established in the lodging industry. This may be partially ascribed to normative processes assuming a deterministic perspective that suggests hotel managers know with certainty the variables that will influence hotel room demand (Arthur, Holland, LeBaron, Palmer, & Tayler, 1997). This is not a pragmatic perspicacity capable of representing the dynamics of the lodging industry.

Normative statements express what managers “*should do*” in order to optimize price setting strategies without taking into consideration a backward looking thought process to forwardly project future expectations of price and financial performance (Kalnins, 2006; Corgel, 2004). The lack of consideration for situational demand constraints within the lodging industry literature detours the building of a coherent knowledge base for understanding, explaining, and predicting hotel management pricing decisions.

A review of mainstream hospitality literature reveals a void in research pertaining to the price setting formation process of room rates in the lodging industry. Mainstream literature reviews room price setting strategies within the context of the effects of price on hotel financial

performance. These studies are beset with descriptive analyses that assume support of stochastic processes and the dynamics of the lodging industry. However, research findings and conclusions that are generated from such studies may possess threats to statistical conclusion validity regarding proper representation of the variability within time series data sets (Creswell, 2003; Mukherjee et al., 1998). This means, the use of descriptive statistics may not properly account for the non-stationary conditions of a time series data set. If this is the case, then past researchers may have drawn erroneous inferences from the data because of insufficient statistical power or violation of statistical stationarity assumptions of the data (Creswell, 2003).

This study attempts to explain discounting as a rational phenomenon. Rationality, according to the rational expectations theory, implies that the relationship between discounting and actual earnings must be convergent over the long run of time (Muth, 1961). This is because the use of the rational expectations theory implies that the time series should be integrated over the long run; and, that the series will remember its past (i.e. hold memory between period observations) (Hoover, 2003). This is because agents (in this case, hotel managers) are considered to be rational optimizers who would like their expectations to be unbiased and precise (Muth, 1961).

In this context, hotel managements' expectation formation process of room rates would demonstrate "memory" where the best expectation of today's room price would be the value of yesterday's room rate charged (Jeffrey et al., 2002). However, the time order of stochastic shocks to the system may induce deviations that display a random structure from the expected systematic performance of the hotel (i.e. random walks) (Hoover, 2003). The distribution of these deviations will be near to either -1 or +1 and over time the error correction mechanism will bring the variables closer to a general equilibrium of 0 (Sandler, 2001, p. 211). The standard



empirical measure, therefore, is an examination of the consistency or rationality of market expectations. This means that variables may drift apart in the short run but cannot diverge over the long run as the variables should return to unity, or cointegrate to equilibrium under observation of the rational expectations theory (Hoover, 2003).

The expectation formation process of appropriate room rates that coincide with anticipated room demand seems to be fundamental to successful hotel management operations (Pan, 2007). Value of expectation involves how price will affect the firm's future levels of occupancy, revenue, and profit. Because the competitive structure of the lodging industry is mainly induced by the short-term inelasticity of supply, pricing becomes volatile. Consequently, a hotel needs to form expectations of the prices that it is likely to obtain while focusing on probable levels of future demand. The incidence of constrained supply compounded with the perishable nature of the hotel room night product raises the issue of capacity utilization (Finch et al., 1998; Jeffrey et al., 2002; Schwartz, 1998; Schwartz & Cohen, 2003; van der Rest & Harris, 2008; Wheaton & Rossof, 1998).

This situation provides incentives for hotel managers to reduce current price with the expectation of higher prices in the future (Choy, 1985; Finch et al., 1998; Hanks et al., 2002; Schwartz & Cohen, 2004). This managerial activity reduces prices in periods of excess supply and tends to raise prices in periods of excess demand thereby providing a degree of automatic price stabilization and market equilibrium (Avinal, 2004).

For these reasons, current supply and demand of hotel rooms will depend both on expected prices and on prices previously projected to prevail in the current market period. A higher expected future price will raise the current price. A higher expectation of pricing today based on the expectations of the past will raise the room rate and hence depress demand thereby

decreasing the current price of a room night (Corgel, 2004; Croes et al., 2010). The application of the rational expectations theory may capture this expectation formation process of lodging managers.

Literature reveals little about the use of the rational expectations theory as applied to discounting room rates in the lodging industry. The theory describes economic situations in which the outcome of product sales depends partly upon what managers expect to happen (Muth, 1961) in a market. This theory plays a central role in the determination of hotel business cycles according to future expectations of room demand and price limitations that are appropriate to match those demands.

Opposition of discounting as a pricing strategy stems in part from studies that correspond to a static rather than a dynamic industry, such as that of the lodging industry. Within a dynamic industry, it is assumed that expected price equals actual price from the previous fiscal period; that supply is a function of expected price, and that actual price adjusts to demand so as to clear the market (Carlson, 1968; Corgel, 2004). This formulation generates either convergent or divergent sequences resulting in the rise and fall of perishable product prices to regain market equilibrium (Carlson, 1968; Jeffrey et al., 2002). In periods where the relative slopes of demand and supply are offset, market equilibrium becomes discordant with supply and demand functions (Nelson, 1975). Such offsets are captured in hotel seasonality levels of occupancy resulting in price fluctuations of room rates (Corgel, 2004).

From the oppositional perspectives to discounting, managers respond to offset of supply and demand as an adaptive response to market conditions. However, the position of discounting proponents implies that the time series data strand of a hotel's discounted rates should '*hold memory*,' reflecting constant disturbances within the lodging market (Croes & Semrad, 2009). If

a time series data strand is said to '*hold memory*,' this means that a time period is not free from influence from the prevailing period. For example, a hotel manager may carry a past room rate that was set based on specific market conditions (i.e. decreased demand) forward to the next fiscal period to assist in reducing his level of uncertainty regarding the appropriate price that would sell under current market conditions.

Price adjustments therefore seem to account for the oscillations in the market conditions. This adjustment process over time is the foundation of the dynamic setting that is standard in the lodging industry. In the short run, analyzing the dynamics of room supply and demand is useful under the condition of seasonal shifts (Kalnins, 2006; Mac, 2004; Schwartz & Cohen, 2004). The seasonal shifts cause a disturbance or shock to the lodging market that may or may not lead to equilibrium stability.

Suppliers (hotels), in general, display a delayed response to this disturbance. As hotels strive to operate at full capacity and at optimal financial room rate capacity in accordance with market forces (van der Rest & Harris, 2008), a drop in demand will generate an excess supply of room nights in the short run. To increase demand, adjustments may be made through the pricing system – discounting. Though suppliers will respond after a time lag to recover revenue, they again may not find equilibrium (Carlson, 1968). The question then becomes, what process is suitable for examining market expectations in the lodging industry?

### Research Questions

Based on a review of literature from the disciplines of lodging and economics, the study will be guided by the following research questions:

Q<sub>1</sub>: Do the time series under investigation demonstrate persistent trends of the past?

- Q<sub>1a</sub>: Is there an empirical relationship between hotel room rate discounting and hotel financial performance?
- Q<sub>1b</sub>: If an empirical relationship exists, does the correlation coefficient carry the expected negative value sign that would indicate an inverse relationship between room rate discounting and hotel financial performance?
- Q<sub>2</sub>: Is there a long-term cointegrating relationship between discounting of hotel room rates and hotel financial performance?
- Q<sub>3</sub>: Is there a short-term relationship between discounting of hotel room rates and hotel financial performance?
- Q<sub>4</sub>: Is the lodging managerial expectation formation process of room rate price setting based on a backward looking model where expected and current room rates are dependent upon past rates charged?

### Methodology

The research questions of this study are concerned with the empirical estimation of the relationship between discounting room rates and hotel financial performance. The study will adopt an econometric case study design in the analysis and interpretation of this relationship. Statistical tests are important when determining whether the expectations about price and financial performance are close to unity. In order to properly assess the research questions, each variable will be observed at a number of consecutive points in time through implementation of unit root tests, cointegration analysis, and an error correction model.

The methodology of this study will examine the long run deviations from the unity relationship between discounting room rates and hotel financial performance in the lodging

industry as is implied by the rational expectations theory. This examination will be accomplished by following a sequence of steps in applying the statistical procedures, estimating the empirical results, and making practical inferences from the results generated by the statistical analyses performed. The data of the two variables, discounting (independent variable) and financial performance (dependent variable) will be converted into natural logarithms. The order of integration between the two variables will then be tested and determined. Upon determining the cointegration, the study will proceed with the application of an error correction model.

The first statistical assessment will include unit root tests in order to determine the stationarity properties of the time series data set. Stationarity conditions of time series data sets are important to establish in order to determine if stochastic shocks could influence the variables to drift away from unity (Banerjee, Dolado, Galbraith, & Hendry, 1994). This determination is necessary for two key reasons. First, it is important to determine if a previous hotel room rate sold is associated with a current period's actual room rate; and, if that current room rate would be associated with expected future room rates. Establishing if there is a dependency between the fiscal periods of room rates charged and expected room rates may provide evidence that hotel managers are behaving rationally in their price setting behavior. Second, it is important to determine the stationarity conditions of a time series data set in order to assess the amount of adjustment time that will occur if the variables are to converge to equilibrium.

In this study, the adjustment time indicates the length of time (time horizons) that will pass before points of convergence emerge between discounting room rates and hotel financial performance (Juselius, 2008). Points of convergence refer to the degree to which managerial expectations are considered rational and are related to the availability of more information from the lodging market of the hotel's location.

Cointegration methods may be applied in order to investigate the adjustment time of hotel managers' expectation formation process. Cointegration does not imply, however, that in the short run errors or deviations do not occur in systematic patterns, or are not serially correlated. Instead, cointegration indicates that in the long run the data set should be mean-reverting to equilibrium (Johansen & Juselius, 1990; Kulendran & Witt, 2001; Lim & McAleur, 2001; Webber, 2001).

An error correction model will then be used to display whether discounting room rates and hotel financial performance have both a short and/or a long-term relationship. The results of these tests will bear significant implications for hotel managers in assessing how far actual room rates charged deviate from the expected room rates projected.

#### Significance of the Study

The study contributes to the considerable literature regarding the efficiency and rationality of discounting in the lodging industry through the assessment of the effect of discounting of hotel room rates on hotel financial performance as supported by the principles of the rational expectations theory with the introduction of a cointegration analysis. The study further examines the short and long-term relationships of discounting on hotel financial performance through use of an error correction model. These methods of examination are significantly lacking in the lodging literature.

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 without empirically validating that such assumptions were correct. These studies are based on the hypothesis that discounting and financial performance are

stationary, and do not identify the frequency of the time series in conjunction with the time period 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 proposed 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 & McAleur, 2001; Naravan, 2003). The logical consequence of that finding, then, is to recommend to managers not to discount room rates. This study contends that previous studies 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.

There is a simplistic significance of the research applied in this study regarding its deviation from normative thought to a realist approach. The statistical procedures that will be adopted are framed and supported by the rational expectations theory and applied within the context of discounting room rates in the lodging industry. The methodological sequence of the statistical assessments that will be performed capture and attempt to address the lodging industry's dynamic characteristics in order to provide managers with a rational "*how to*" set room prices as opposed to "*what they should do*" during times of decreased room demand.

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. An important contribution of this line of research may be in reference to the use of statistical residuals over averages. As previously discussed, 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 market factors influencing hotel financial performance other than the independent variable (Banerjee et al., 1994). The use of room rate averages may otherwise suppress such critical data information through the aggregation of actual room rates charged over time. The methodology of this study may be carried forward as a potential viable means to assist hotel managers with a more accurate method to price room rates.

The findings from this study may prove important in filling the gap between empirical assessment and lodging industry practice by advancing a consistent understanding of the effects of discounting room rates on hotel financial performance. Such consistency is currently lacking in both the lodging literature and the industry.

#### Limitations of the Study

The study will use an econometric case study analysis to assess a practical lodging industry concern regarding the pricing of hotel rooms. Importantly, the findings will be empirically supported through a rigorous statistical assessment. The high explanatory power of the statistical techniques used in this study, specifically the use of the error correction model, suggests that the study will hold high internal validity for the hotels under investigation (Juselius, 2008). However, the results of this study are anticipated to have limitations regarding the external validity of the findings, which is a frequent criticism of econometric case study designs.

The important concept here is that econometric case study 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. 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 & Witt, 2001). However, researchers are often advised to take a cautionary approach regarding the inference of a timing context to which a causal relationship is established (Juselius, 2008). This means that the observed variables in a finite time horizon may appear to be strictly exogenous; yet, the same variables under observation at another time may be endogenous due to different environmental conditions (Banerjee et al., 1994).

The recommendation to proceed with caution regarding causal inferences is not exclusive to econometric case study research designs. However, 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 averages may not always detect. However, it also presents a limitation regarding the reliability of generating consistent results over time due to changing market conditions; as well as the level of external validity of econometric case studies.

The aforementioned limitation is a frequent criticism from reviewers regarding the value of econometric case study designs. However, it is important to remind the readers of this study about the nature of the theoretical proxy adopted: the rational expectations theory. In the rational expectations literature, econometric implementation of a model is typically done by constructing a variable (in this case a room rate) that equals the difference between some quantity realized at date  $t$  and the optimal forecast of that quantity at  $t - 1$  (Dickson, 2009).

From the perspective of a hotel manager, given a superior optimal room rate forecast, errors (residuals) should be orthogonal to all market information available at the time the room

rate forecast is made (Perakis & Sood, 2006). Therefore, the influence of undetected latent factors in the market place may not be recognized before period  $t$  but may still provide critical information for price setting in the lodging industry. Thereby, the model of this study and the methodology becomes not only a valuable price setting tool for hotel managers, but also provides evidence pertaining to the increased level of external validity that the model of this study may have when compared to that of others.

A limitation pertaining to the use of the rational expectations theory as the theoretical proxy in econometric modeling is the assumption that the model is true or correctly specified, which means that the variables (discounting room rates and hotel financial performance) express a non-recursive relationship, are not correlated with some error -  $\varepsilon_i$ , and that there are not residual autocorrelations (Dickson, 2009). The misspecification of the model may create spurious evidence of convergence between the variables (Juselius, 2008; Narayan, 2003). For this reason, a Maximum Likelihood estimator will be used as suggested by Johansen and Juselius (1990) as opposed to the Ordinary Least Squares estimator that is inconsistent when there are residual autocorrelations. A Durban Watson test and a Bruesh-Godfrey LM test will then be used to check for left over residual autocorrelations.

Limitations pertaining to data specifics that may be exclusive to the current investigation may be the sensitivity of the robustness criteria to which alternative market place latent variables have influenced the time series data set of the hotels under examination (Durlauf & Quah, 1998). 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 these market conditions of the industry will influence the findings of this study. Although, the results generated by the statistical techniques that will be used to determine the relationship between discounting hotel room rates and hotel financial performance are considered relatively invariant to change (Kulendran & Witt, 2001). 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., 1994).

This presents another limitation of the current investigation in that it would be difficult to control for market conditions, or to apply unique market characteristics to that of another location (e.g. Orlando, FL compared to Las Vegas, NV). This is due to the inability for one to reject a set of variables from the market place as non-robust criteria, or not significant (Mukherjee et al., 1998). Market conditions are known to show a high level of multi-collinearity (Perakis & Sood, 2006) where exclusion or neglect to acknowledge all of the market conditions or some of the conditions may substantially degrade the explanatory power of the statistical tests proposed in this study's methodological framework.

## CHAPTER TWO: REVIEW OF THE LITERATURE

### Introduction

Chapter two proceeds to a discussion pertaining to how the perishable nature of room night sales contributes to the dynamics of the lodging industry and to the pricing uncertainty experienced by hotel managers. The economic factors of price change will be reviewed to provide clarification regarding different research perspectives that concern the interpretation of the relationship between discounting room rates and hotel financial performance.

The literature review then proceeds to an examination of the common pricing approaches that are used by hotel managers to assist in their expectation formation process of future room rates; as well as why those common pricing approaches may or may not be the most effective means to generate room rates that coincide with future market demand conditions that are yet unknown. Finally, a review of recent research and ongoing debates regarding discounting studies relating to hotel financial performance will be provided.

### Perishability

A product is said to be perishable when its revenue generating capabilities drop to zero at a specific point in time – immediately following the expiration of a sale period (Baker & Collier, 2003; Finch et al., 1998; Hanks et al., 2002). A perishable product becomes available at a specific date/time, maintains availability for a specified length of time, and after that date/time, its potential sale succumbs to the expiration date. This means that the option to carry inventory of a perishable product forward to the next period (e.g. the date of a new sale) does not exist (Baker & Collier, 2003; Dana, 1998). For example, once a night passes, the “*could have been*” revenue of an empty hotel bed is lost forever due to the sale’s expiration (Hanks et al., 2002;

Werthner & Ricci, 2004). Thus, perishable products are a fragile entity with regard to their revenue generating capacity. This being the case, firm management must critically strategize to avoid the loss of product sales.

The travel and tourism industry is largely comprised of business sectors that supply perishable products and services that travelers seek to consume when visiting a destination (Werthner & Ricci, 2004). These sectors may include: transportation services, lodging accommodations, restaurants, bars, special events, theme parks, attractions, activities, etc. Firms that supply these services to travelers are often capacity-limited with the amount of available units that may be consumed at a specific time period and which operate at high fixed costs of operation (Heo & Lee, 2009). Service firms that are capacity-limited are subject to potential income loss if all available units are not sold within a specified time interval (Nicolau, 2005).

Travel and tourism firms are acutely sensitive to that potential loss of income when considering the perishability of their core product (Jang, 2004). Compounding that sensitivity is the inconsistency of consumer demand over time (Jang, Morrison, & O'Leary, 2004). Jang (2004) attributes temporal variations of consumer demand in the travel and tourism industry primarily to external market constraints (e.g. weather, economic recession, competitive market structure, etc.) that create conditions of seasonality. Seasonality pertains to the level of consumer flows that arrive to a specific destination or firm during a relatively short period of a day/week/month/year thereby creating high and low demand seasons (Jang, 2004; Morrison, 1998). Nadal, Font, and Rosselo (2004) provide a review of multiple variables that may be associated with causes of seasonality that may influence the amount of perishable products sold in a travel and tourism market place. These variables include: natural phenomenon (i.e. climate and season of the year), social factors and policies concerning consumption patterns of market

segments, public and legislated holidays, school schedules, festivals, and other tourism generating events.

When considering the variables that may be associated with the cause of seasonality in a travel and tourism market place, it is important to understand that the very concept of seasonality pertains to the level of consumer flows that enter that market. This means that consumers purchasing travel and tourism products are required to physically move to the geographical orientation of the firms in order to consume the products of this industry (Divisekera, 2003). This implies that regardless of the amount of consumers a travel and/or tourism firm serves, it must continue to exist and operate within its market location and cannot hold its perishable product inventory for future sale (Dana, 1998). Thus, without traveler movement to the physical location of the firms, the travel and tourism products will perish and any contribution they might have made to high fixed costs of operation will be lost (Divisekera, 2003; Kalnins, 2006).

The lodging sector supplies one of the most frequently consumed perishable products in the travel and tourism industry. The travel and tourism industry is concerned with the macroeconomics of the functions of supply and demand within a specific location (i.e. destination, multiple counties, state, region, country, etc.) (Damonte & Damonte, 2003). However, the macroeconomics of a location is typically not the primary concern for hotels. The lodging industry and the hotels that exist within a geographic location are more concerned with the microeconomics of firm financial performance pertaining to the management of a fixed product supply that must contend with external demand constraints within the market place (Jeffrey et al., 2002). Therefore, the remainder of the discussion pertaining to perishability will shift from examination within the travel and tourism industry to the context of the lodging industry, a sector industry of travel and tourism.

## Perishability: Part and Parcel of a Dynamic Industry

The lodging industry is recognized in travel and tourism literature as possessing one of the most perishable forms of a product that represents a near “*pure service*,” a room night sale (Abbey, 1983; Hanks et al., 2002; van der Rest & Harris, 2008) that is heavily influenced by volatile market conditions induced by varying demand patterns (Jang, 2004; Jeffrey & Barden, 2000; Jeffrey et al., 2002). The issue of room revenue maximization for a hotel becomes more challenging when considering that the lodging industry is plagued with the perishable nature of its core product (Brannas, Hellstrom, & Nordstrom, 2002).

Capacity utilization in the context of a non-storable product makes pricing of that product severely susceptible to the offsets of volatile demand conditions. Being that hotel managers are clearly aware that the sale of room nights is the hotel’s primary revenue producing product that contributes to the high fixed costs of operation of their firm, they are committed to pricing rooms to optimally match demand conditions (Schmidgall, 2006). Managers are all too familiar with the knowledge that if a room night sale perishes the potential profit from that room sale and its contribution to high overhead costs also expires and is lost forever (Baker & Collier, 2003; Hanks et al., 2002).

Because the room supply of a hotel is relatively fixed, yet room demand varies considerably over time, a hotel cannot correspondingly expand or contract its available room inventory to a market’s seasonal demand surges that could be either positive or negative (Chen & Schwartz, 2008; Corgel, 2004). Hotel managers, then, must adjust room prices to influence consumer demand or be left with useless output (Bull, 1997; Kalnins, 2006; Mak, 2004; Matovic, 2002; Sinclair & Stabler, 1997; Vanhove, 2005). This becomes a difficult task to accomplish given the non-static nature of the lodging industry.

Industries that supply goods and services that have fixed availability, volatile demand, and/or are deemed perishable are consistent with the economic traits of a dynamic industry (Croes & Semrad, 2009; Finch et al., 1998). Within a dynamic industry such as that of the lodging industry, it would appear that past prices and financial performance influence future price setting expectations of managers. This is evidenced by a cobweb price setting behavior (Carlson, 1968) where constant price adjustments are made to room rates in order to avoid room sales from perishing. The cobweb price setting behavior demonstrates that the expected hotel room price equals the actual room price from the previous fiscal period; that available room supply would be a function of expected room price; and, that room prices would be adjusted to consumer demand thereby resulting in a clearing of the market (Chatwin, 2000; Corgel, 2004).

For purposes of this study, a clearing of the market is indicated by a firm's market equilibrium that is representative of a competitive dynamic setting where a firm's marginal costs equal firm marginal revenues and marginal profit equals zero (Baum & Mudambi, 1995). Schmidgall (2006, p. 242) defines marginal costs in the hospitality and travel and tourism industries as the increase or decrease in cost as a result of one more or one less unit of output being sold. For example, if a hotel sells 100 rooms on Friday night and increases the occupancy level by 50 rooms on Saturday night the marginal cost incurred will be the increased cost for the quantity of rooms sold that accompanies the 50 room unit increase. Kalnins (2006) notes that the marginal costs for room units sold in the lodging industry are quite low ranging from \$15 - \$20 per room unit sold. This means that hotel guests pay a substantial price increase over the hotel's marginal cost per room unit sold. Therefore, a hotel manager may offer a fairly large discounted hotel room rate while still incurring a profit from that room sale.



When a state of equilibrium is observed in the dynamic setting, marginal cost of room units sold is in balance with the marginal revenue made from the room units sold. But, if at a given point in time, the hotel manager observes decreased consumer demand (e.g. low season) the manager may be faced with room night sales that may perish taking the potential marginal revenue associated with those room sales along with them. The manager must then decide if he should decrease room prices to try and sell more rooms in the short run to avoid room nights from perishing. If the rooms perish before they are sold, the hotel may enter a state of disequilibria where a negative marginal profit would be the result (Cross et al., 2009; Schmidgall, 2006). Managers attempt to avoid states of disequilibria as witnessed by the observation of constant price adjustments of room night sales in the lodging industry.

The rising and falling of room prices may be conceptualized by a cobweb model that is used to map the dynamics of price changes and fluctuations in supply and demand over time (Carlson, 1968; Laselle, Svizzero, & Tisdell, 2005). The cobweb model may be used as a visual representation of the non-stationary lag times between a hotel's occupancy levels and room prices over time. The use of a cobweb model may benefit hotel managers in determining points of time where there appears to be a positive or negative excess demand for hotel rooms (Wellman, Reeves, Lochner, & Vorobeychick, 2004).

Figure 1 is an adopted graph from Bull (1997, p. 112) that conceptualizes the price adjustments of a hotel's rooms to match consumer demand over time. The initial room price is represented as  $P_1$  where the expected consumer demand is  $Q_1$ . However, as depicted by the graph consumers only demand  $Q_2$  at a specific point in time. Therefore, in order to compensate for the decrease in demand, hotel managers offer a short-term price adjustment (i.e. discounted room rate) that is represented as  $P_2$ . The decrease in room price at point  $P_2$  stimulates consumer

demand. During periods where supply is inelastic (e.g. low season) the demand schedule would shift to the right. The seesaw action of elasticity conditions for room supply and consumer demand in a market will continue to shift the demand schedule over time until eventually a short run equilibrium is achieved as indicated by points one through seven.

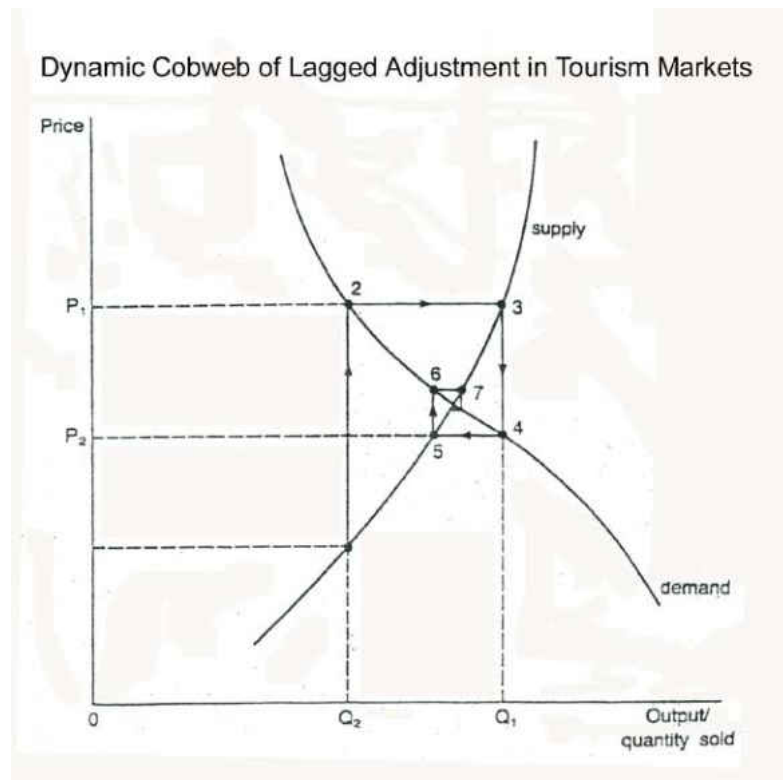


Figure 1. Price Adjustments to Hotel Rooms

Source: Bull (1997, p. 112)

This visualization of room price dynamics over time is a basic step that may provide managers with an understanding of how past room rates charged appeared to move from one financial period to the next. The cobweb model may therefore provide managers with an illustration that may reduce some level of uncertainty regarding how past room prices may be

applied to help form future room rate expectations that may clear the market. Wellman et al., (2004, p. 24) notes "...that most hotel agents take a relatively straight forward approach to price setting expectations by estimating the hotel clearing prices in accordance with observed historical averages of room rates." As previously discussed in this study's introduction, the observation of historical averages to set market clearing room rates may be problematic due to the aggregation of volatile demand over time and the assumptions of normative economic expectations.

Because a hotel's room capacity is relatively fixed and perishable by the dynamic nature of the industry, a critical importance is placed on managers' accurate anticipation of future room demand. Thus, managers are challenged to set room rates according to future expectations that represent tolerable price limits that the consumer is willing to pay. Intensifying the challenge of managers to set room rates that are within tolerable price limits is the increasing transparency of the lodging industry's market structure (Enz, 2003). Most hotel managers will release a specific amount of room inventory to some kind of a discounted distribution channel (i.e. global distribution systems, distribution service providers, third party websites, and travel agencies) to assist in avoiding those rooms from perishing (Carroll & Siguaaw, 2003). Managers' expectation from the release of those rooms is that the discounted distribution channel may reach potential consumers that are beyond the geographical constraints of the hotel's marketing efforts and that the rooms will then sell (McMillan, 2002).

However, Enz (2003) claims that most hotel managers are almost required to release a portion of their rooms to discounted distribution channels because consumers have learned from the errors in managers' pricing strategies that they are able to receive less expensive room rates when using the discounted distribution channels (e.g. Orbitz, Expedia, Priceline, etc.) rather than

going directly to the hotel. This information is easy for consumers to acquire as search costs have been dramatically reduced by such distribution channels; and, the ability to quickly access price information on the web seems to have altered the balance of bargaining power between hotels and consumers (McMillan, 2002). This shift in the bargaining power between hotels and consumers may place additional pressure on managers to lower room rates that may be just above the market equilibrium price on the discounting distribution channels (Schwartz & Cohen, 2004).

As managers struggle to set room rates that will avoid expiration of a room sale they may act in accordance with a dynamic pricing schedule strategy. This is also the case as they attempt to avoid the need to release rooms to discounting distribution channels, and/or enter into a price-cutting match with those distribution channels. In each case they will sell a room as long as the customer is willing to pay more than the marginal cost associated with the room unit sale increase (Baum & Mudambi, 1995; Hanks et al., 2002). This is to compensate for specified time intervals that demonstrate situations of room overcapacity resulting in periodic states of disequilibrium for hotels. During these specified time intervals, managers have a strong incentive to use an interim discounted room rate that adheres to the conditions of decreased demand in the market place to avoid the critical expiration of a room night sale (Bull, 1997; Kalnins, 2006; Rutherford, 2002).

The incentive to discount room rates is justified from the management's rationale that productivity (output) levels that are even a little below desired capacity would incur low marginal costs, thereby acquiring at least a short-term profit benefit from filling excess room capacity during times of decreased room demand (Kalnins, 2006). Hoover (2003) posits that management's rationale to offer an interim discounted room rate for a perishable product may be

reflected in the non-stationary properties of a firm's financial time series data set where the decision to discount is expressed by financial observations that are time dependent (e.g. low seasons). This means that the time series data sets should hold memory or contain a unit root thereby indicating that managers are using the information from a previous fiscal period to help formulate the expected future room rate that could be offered.

It is important to cautiously consider and account for time dependent observations in a data set in order to properly assess the relationship between discounting room rates and hotel financial performance in order to determine *how* managers formulate an expected room rate that would sell in the market. Without proper assessment of the stationarity conditions of a hotel's time series data set, one cannot determine if points of observation are associated with one another.

If points of observation are non-stationary, as is a characteristic of dynamic industries, then they are assumed to be correlated which could produce spurious data interpretations (Juselius, 2008). In addition, a misspecification of the order of variables in the model may be possible (Mukherjee et al., 1998). In the context of this study, a misspecification would mean that one cannot be sure if discounting room rates influenced financial performance; or, if financial performance influenced the discounting of room rates; or, if the variables were jointly affected by an undetected latent variable in the market place (Hoover, 2003).

The next section will discuss the economic factors of price change pertaining to the elasticity conditions of a charged room rate that may partially account for the non-stationary conditions of room rates.

## Elasticity Conditions of a Hotel Room Night Product

Gayar et al. (2008) maintain that a central focus of hotel managers is room revenue maximization. With this focus in mind, a hotel needs to form expectations of the room prices that it is likely to obtain while focusing on probable levels of future consumer demand. This expectation formation process seems to be fundamental to successful hotel management operations. Value of expectation involves how price will affect the hotel's future levels of occupancy, revenue, and profit. However, the competitive structure of the lodging industry does not allow managers to easily form this expectation due to the economics of price change in the market.

Traditionally, it is the demand conditions for room nights in a market that determines a hotel's pricing strategy (Jayaraman & Baker, 2003). However, a problematic feature characteristic of market demand conditions for room nights is its temporal variability that affects the economics of price change in a market (Jeffrey & Barden, 2000; Jeffrey et al., 2002). This means that one cannot assume that the price elasticity for room accommodations remains stationary, or fixed, over time (Abbey, 1983; Law, 2004).

For example, during high season periods room demand may become inelastic as the fixed supply of rooms is absorbed by the increase in demand from consumers. Yet, during low seasons, as occupancy rates decline in hotels, the increased availability of rooms may be considered an elastic product (Bull, 1997). Management's knowledge of the measure of elasticity that hotel room nights hold in a market is critical information to obtain when setting room rates, but may also be difficult to accurately assess due to the influence of various factors (both known and unknown) in the market place (Uner et al., 2008).

Hospitality literature has produced two streams of estimations regarding the price elasticity conditions of a room night in the lodging industry. Vinod (2004, p. 178) defines price elasticity as a measure of the change of room night sales resulting from a change in room rates. One of the estimations pertaining to the price elasticity of a room night is that the product is inelastic. This means that the price of a room night would have a minimal effect on the shift or the level of room demand (Cross et al., 2009; Damonte & Damonte, 2003; Enz, 2003; Enz & Canina, 2008). This viewpoint is generally adopted when researchers view the demand for room nights as one of the following: a static entity that does not vary substantially over time in a market; when the market structure is considered oligopolistic; and/or, when a specific customer segment (e.g. business travelers) is deemed to be less resistant to room rate changes (Vinod, 2004).

Support of the proposition that room nights are an inelastic product would most likely mean opposition towards the use of discounting room rates as a pricing strategy (Enz, 2003). This is due to the hypothetical approach that does not recognize the prices of a room night and consumer room demand to be interrelated. This means that a decrease in room price would not encourage more consumers to enter a market, which could result in an increase of room night sales (Canina & Enz, 2006; Chan & Wong, 2006; Enz & Canina, 2008; 2007; Enz, et al., 2004; Enz et al., 2009; Jeffrey et al., 2002). Instead, researchers who support this view may recommend a hotel manager to hold a high ADR despite periods of decreased room demand; or, even suggest that managers offer a flat rack rate<sup>5</sup> sustained over an infinite time horizon (Chan & Wong, 2006; Enz, et al., 2009).

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<sup>5</sup> A *rack rate* constitutes the most expensive published room rate that a hotel is able to charge for a room night sale (Vinod, 2004).

Under this hypothetical approach, approximate room price elasticities are calculated for room demand by measuring the average room price and aggregate tax receipts for lodging within a specified market basket (e.g. state, destination, multiple counties, etc.) (Bonham, Fujii, Im, & Mak, 1992; Mak, 2004; Quain, 2003). This calculation favors a macroeconomic linear approximation from the demand side equation that may not properly take into consideration the lodging managers' critical need to avoid the sales of room nights from perishing during times of decreased room demand (Damonte & Damonte, 2003).

However, there is also support in hospitality literature that views a hotel room night as an elastic product (Bull, 1997; Croes et al., 2010; Divisekera, 2003; Vinod, 2004). This viewpoint is more concerned with the movement of room sales from the microeconomic supply side of the room nights available in a hotel (Weatherford, Kimes, Scott, 2001). Under this perspective, the relationship between room supply and demand falls within accordance of the traditional neoclassical economic theory whereupon room prices rise when room demand is strong and prices fall when room demand is weak. As mentioned earlier, this rise and fall results in a dynamic pricing schedule that may be conceptualized by a structural time series graph, a cobweb model, which displays the lag times between room supply and rates charged.

The elasticity estimates of price change in the lodging industry are not contested here. Indeed, a room night may be an inelastic product at one point of observation and elastic at another point based on the level of consumer demand in the market place. However, the assumed position that the elasticity condition of the rooms' product remains stationary over time is refutable (Bull, 1997; Croes & Semrad, forthcoming). The dynamic nature of the lodging industry lends itself to that challenge (Nicolau, 2005). Unfortunately, there is not a hospitality



literature base that is well-established referencing this “seesaw action” of the elasticity conditions of a room night product is lacking.

This may be due to the role of price being unclear in travel and tourism literature regarding how price influences consumer demand in the choice selection of a destination (Schutze, 2008). However, once a consumer chooses the destination of travel it seems that tourism literature favors that price may play an important role in the individual product selection (e.g. lodging accommodations) at the destination of choice (van Dijk & van der Stelt-Scheele, 1993). Under van Dijk and van der Stelt-Scheele’s (1993) assertion, regarding the importance of price for an individual product selection, managers of these individual firms must price their products in accordance with future demand conditions that are yet unknown – creating situations of management uncertainty regarding the appropriate pricing of their perishable products.

#### Approaches Used to Determine Expected Room Rates

When considering the inherent traits of a hotel’s fixed room inventory amalgamated with high fixed costs of operation that are incurred (regardless of the amount of rooms that are consumed by the guests of a hotel), managers are challenged to determine the correct course of strategic action that would allow them to best utilize the available room capacity (Bull, 1997; Nicolau, 2005). Revenue management disciplines would define the “*best capacity utilization*” of available rooms as the process of optimally matching consumer demand to the available room supply with the most profitable mix of customers to maximize hotel revenues (Baker & Collier; 2003; Kimes, 1989; Vinod, 2004).

While management may endeavor to consistently operate at full capacity, this expectation is not a realistic perspective based on the oscillating demand patterns observed in the lodging

industry (Corgel, 2004; Jang, 2004; Morrison, 1998). A hotel may realize this expectation during an influx of high season room demand where in the short run the available room supply may be considered price inelastic. Under such conditions, hotel managers may attempt to maximize profits through an increase in room rates to match the positive surge in room demand (Bull, 1997). However, the condition of price inelasticity for hotel rooms is not a permanent condition over the long run (Abbey, 1983). *How then do hotel managers preserve revenues during diminished demand seasons when the room night sale flips to a price elastic product?* Lodging literature reveals that hotel managers, though not fully aware of future consumer demand expectations, may elect to use several different types of pricing approaches to arrive at a room rate that they hope will sell.

#### “Guess and Check” Pricing Approach

Van der Rest and Harris (2008, p. 171) state that, “Hotel managerial pricing decisions are subject to risk and uncertainty that may lead to more than one possible revenue outcome.” So, hotel managers risk over pricing a hotel room that will never sell, or under pricing a room that customers would have been willing to pay more for (Hanks et al., 2002). It is possible, however, that they may price the room accurately; albeit, the accuracy may not be strategically based. As managers’ uncertainty levels increase regarding their own capability to arrive at the most appropriate room rate, that would maximize the profit from a room sale, and avoid it perishing, they may elect to insert “*pragmatic variables*” into the final calculation of a room rate.

These pragmatic variables may include concepts such as, “*rules of thumb*” that are used to guide price setting (i.e. what worked in the past may work again); or, “*gut feelings*” where the manager inserts personal bias (i.e. the managers’ years of experience in the industry, intuition,

etc.) to make pricing decisions (van der Rest & Harris, 2008). The use of these pragmatic variables seem to become more common during times of soft consumer demand where managers do not have perfect market information and there is negative excess demand of available rooms (Sandler, 2001). Or, may be used when a manager is aware that the hotel's operating environment is changing, but the model used to generate prices cannot be refit to include such circumstantial information (Schwartz & Cohen, 2004). Regardless of the reason for the insertion of pragmatic variables into the forecasting of future room rates the cause is similar. Managers fear that the resultant drop in sales volume could become a critical condition for a hotel's financial livelihood (Weng, 1995).

The use of pragmatic variables to form an expectation regarding an appropriate future room rate seems to indicate that managers are using a "*guess and check*" process that may not be strategic at all. One may ask, "*Why would managers use pragmatic variables to guide them in their price setting behavior of hotel room rates?*" Surely, common-sense practices cannot always be reliable in a competitive setting, and could not establish regularities in price setting that could be converted into organizational knowledge. Perhaps the answer to this question may be an outgrowth from managements' experience regarding erred prices that were produced by revenue inventory allocation models that used historical financial averages to set viable future room rates.

### Linear Pricing Approach

Hotels typically seek to maximize revenues and profits through the optimal balance between occupancy levels and room rates (Hanks et al., 2002; Shetty, 2008).

Hanks et al. (2002) observe that whatever the revenue outcome is there is also probably some unrealized revenue potential left on the table. The problem is that managers are uncertain

regarding how much money was actually left behind in a room sale (Cross et al., 2009). Part of this problem may be induced by a misspecification of linear programming models that used room rate averages over time without the consideration of error terms that potentially could have provided managers with pricing information compressed within historic financial data (Mukherjee et al., 1998).

Weatherford et al. (2001, p. 54) state that, "...most major hotel chains use linear programming based models to generate future room rates." If we recall from the discussion in the study's introduction, the most accepted price setting methods used to determine optimal room rates and room capacity utilization that would assist managers in pricing rooms and in avoiding the perishing of a room night include: deterministic linear programming, probabilistic linear programming, stochastic dynamic programming (Gallego & van Ryzin, 1997; Gallego & van Ryzin, 1994; Weatherford & Bodily, 1992), single resource capacity control, network capacity control, and threshold pricing (Talluri & van Ryzin, 2005).

Room price forecasts generated by such linear programming based economic models run the risk of producing room rates where managers err on interpreting price points that the market would be willing to pay for a room night (Gayar et al., 2008). Mukherjee et al. (1998, p. 25-26) explains that the assumption of linearity and the use of averages in a model may leave a substantial amount of market information unexplained due to residual variations that have not been considered within a statistical model. The lack of inclusion of random error terms in a model and the exclusive use of averages presents a "*smoothing*" of the data over time where the lag times between room supply and consumer demand are not properly expressed.

The linear programming based economic models assume, through the aggregated use of ADR and occupancy rates, that the price elasticity of a room night remains stationary over time

in conjunction with the room demand, and that the two do not drift away from one another in a competitive lodging market. In other words, the assumption is that the market remains in a constant state of equilibrium where room supply and consumer demand follow a linear trend path. These are conditions that are not omnipresent within the lodging industry as evidenced by the previous review of the lodging industry's dynamic characteristics.

Thus, most hotel managers respond to the room rates produced from linear programming based economic models that do not properly account for the uneven distribution of room demand over time. That response is a kind of yoyo price setting reaction (Hanks et al., 2002). This reaction generally occurs when a hotel sets room rates that trickle down from a flat rack rate, which does not consider the current elasticity conditions of a room night product. The yoyo affect may be an effort to avoid the loss of a room sale that may perish if inappropriately priced out of accordance with oscillatory performance of consumer demand (Hanks et al., 2002). Through revenue management practices, hotel managers attempt to set optimal room allocations (units) and room rates that would guarantee the most profit from those units based on expected future consumer demand (Choi & Kimes, 2002; Smith, 2009). The primary goal then of the revenue management system used in a hotel is to maximize room revenues (Gayar et al., 2008).

However, this goal becomes difficult to accomplish due to the uncertainty of oscillating demand cycles observed through seasonal consumption patterns that do not assume a linear trend; as well as erratic increases and/or decreases in room sales and occupancy levels that hotel managers may not have anticipated (Fanelli, 2007). Due to the cost structure of hotels (i.e. high fixed costs of operation) and the economics of price change for a perishable product, the contribution to profit and overhead per room unit sold is high when the hotel is operating at market equilibrium (Baker & Collier, 2003). And, vice versa, when the hotel is operating in a

state of disequilibria the loss of profit and potential contribution to overhead costs is also high and may jeopardize the future livelihood of a hotel firm (Nicolau, 2005).

As previously mentioned, the perishable nature of a hotel's core product, its relatively fixed room inventory, the high fixed costs of operation, the oscillating demand cycles, and constant price adjustments that correspond with patterns of varying room demand in the market portrays a dynamic system that does not assume a linear path. The use of linear economic models to form future expected room rates that could be congruent with uncertain future consumer demand may result in the following scenarios: (1) during a high season the rooms may not be priced to the maximum value consumers would have been willing to pay; and, (2) conversely, during the low seasons the rooms may be over priced forcing managers to use deep discounts and price cutting as the expiration date for a room night sale approaches (Baum & Mudambi, 1995).

By principle of the "*Law of Supply and Demand*"<sup>6</sup> a dynamic system gives rise to a cause-effect institution that demonstrates asymmetric qualities influenced by the fluctuations of hotel financial performance that is manipulated by varying consumer needs and demands, and room inventory (product) availability in the market place (Law, 2004; Nooteboom et al., 1988). Based on these industry qualities, hotel managers are challenged to find a means to preserve hotel revenue during diminished demand seasons and to maximize revenue during peak seasons thus resulting in optimal capacity utilization of the available room inventory. In order for managers to overcome this challenge of a dynamic industry, they must consider the following question, "*What pricing strategy should be adopted to maximize revenues that may offset the*

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<sup>6</sup> The Law of Supply and Demand is referred to as the common sense principle that describes the generally observed relationship between supply, demand, and price in accordance with neoclassical economic theory. This means that as demand for a product increases the price may also increase thereby attracting new suppliers who increase in the supply brings price back to equilibrium (McCallum, 1970).

*imbalances that a fluctuating market creates in terms of a fixed product supply and volatile consumer demand over time?”*

There are many possible answers to this question. However, both a “*guess and check*” approach and a linear pricing approach may not be the most advantageous expectation formation process for managers to depend upon for future room prices that could correspond with uncertain future consumer demand.

#### Normative Economics Pricing Approach

Normative economics advocate, “*what ought to be.*” From a firm’s management perspective regarding production, “*what ought to be*” is that a firm’s costs and its supply will be produced based on a rough equivalence between fixed and variable costs over a defined period of time (Nooteboom et al., 1988). Such a normative approach may not be a practical supposition from the perspective of a lodging manager for the reason that the purchase and utilization of the core product requires that the consumer physically move to the supplier (hotel) (Croes et al., 2010). This means that the hotel will continue to exist and to operate, like that of other travel and tourism firms, regardless of the amount of consumers it services within a defined time period (Divisekera, 2003). The amount of consumers that a hotel services could vary in number between a full house (100% occupancy rate) down to a vacant house (0% occupancy rate).

As previously mentioned, regardless of the hotel’s occupancy level during any specified time period, the available room inventory (supply) is relatively inflexible; and, the hotel property is maintained through high fixed costs of operation (Bull, 1997; Kalnins, 2006; Mak, 2004; Matovic, 2002; Sinclair & Stabler, 1997; Vanhove, 2005). The resultant response from hotel managers’ concern that the firm is heavily revenue dependent while demand is inconsistent is to

reach for the normative solution regarding “*what they should do*” in order to reduce their level of uncertainty pertaining to the appropriate pricing of the perishable product supply.

The normative economic expectation approach is widely practiced in the lodging industry through the application of a hotel’s ADR in room revenue allocation models that determine optimal room prices that may match future anticipated room demand (Gallego & van Ryzin, 1997; Gallego & van Ryzin, 1994; Talluri & van Ryzin, 2005; Weatherford & Bodily, 1992). However, the use of ADR fails to recognize the short-term sales variations over time (Brown & Dev, 1999), which may result in a distortion of the stochastic demand patterns of room night sales (Baker & Riley, 1994; Jeffrey et al., 2002). Failure to consider the stochastic demand patterns of room night sales assumes that a state of market equilibrium is static. However, an examination of the dynamics of price adjustments over time in a cobweb model will reveal that this is not usually the case regarding the sales of perishable products (Lasselle et al., 2005). One can observe that room supply and consumer demand vary substantially over time resulting in a rise and fall of room rates charged.

Under assumptions of normative economic expectations, managers would assume that room rates remain stationary over time; that the threat of rooms perishing would not induce price decreases; that the room product’s elasticity conditions remain constant over time; that room prices should be set on normal costs without regard to fluctuating room demand in the short run; that every financial period is independent of the previous financial period; that the market place is representative of a deterministic system as opposed to a dynamic system; and, that past rates charged for room nights did not play a role in the expectation formation process of future room prices (Baker & Collier, 2003; Croes et al., 2010; Levin et al., 2005; Nooteboom et al., 1987). As previously discussed in the study’s introduction and above, the normative economics



approach, which functions from the use of room rate averages over time, may not be the most practical price setting approach to account for the dynamic nature of the lodging industry.

Perhaps a more opportunistic approach to price setting for managers may be from a rational perspective where the market is not assumed to be stationary and a dynamic pricing schedule is formed. To move towards this perspective, it is necessary to review the variable pricing approach and the rational expectations theory.

### Variable Pricing Approach

Nicolau (2005) contends that hotels are market-oriented businesses, and consequently “...are revenue-dependent in that they are normally required to maintain high levels of revenue to survive and generate adequate profit returns.” If one considers that consumer demand for hotel rooms is not stationary over time, then this claim seems to shift the business objective from a traditional focus on profit through cost control to that of profit through revenue maximization (Croes & Semrad, forthcoming; Nooteboom et al., 1987). In acceptance of this position, the logical response of hotel managers would be to install a variable pricing schedule for the available room inventory to maximize revenues during high demand periods and minimize the loss of income from rooms perishing during low demand periods.

Weatherford et al. (2001, p. 53) defines variable pricing as a strategy used to offer the same product at different prices during different points of time or different prices to specific customer segments to coincide with shifts in the demand curve. The adoption of a variable pricing strategy assists hotel managers in realizing their primary goal, which is to maximize revenue from the hotel’s most significant revenue generating department, the rooms department (Pan, 2007; Schmidgall, 2006). A variable pricing schedule strives to reach high occupancy rates

charged at the highest price point that the market is willing to pay, mainly to cover a hotel's high fixed costs of operation.

However, the use of a variable pricing strategy may not always require that the hotel reach full capacity utilization if the managers consider the equilibrium price point where room rates charged cover the marginal costs while accurately pricing the rooms to match consumer demand conditions. In order to accomplish a variable pricing strategy that would maximize profits, it may benefit managers to deviate from a normative expectation to a rational expectation of price setting that includes volatile market information that the use of room rate averages may not capture. This means that managers will need to consider the economics of price change that may influence the relationship between room supply and consumer demand (Abbey, 1983).

A variable pricing schedule is commonly observed in a competitive lodging market structure where there are too many competitors that lack control of enough units for any one firm (hotel) to significantly influence the market price of a product (Baum & Mudambi, 1995). This type of market structure makes hotels highly sensitive to fluctuating occupancy levels (Vinod, 2004). In response to this sensitivity, Baum and Mudambi (1995) posit that competitive hotels would be willing to let a hotel room sell at a near break-even point, under the condition that the marginal rate of revenue from the consumption of other hotel services (e.g. food and beverage department) would substitute for the potential loss of revenue from the discounted room night sale.

The practice of decreasing room rates with anticipation of an increase of activity in other operating departments to compensate for the price decrease of the core product is in stark contrast to what may be observed in an oligopolistic market structure where there are only a handful of interdependent firms serving a common customer (Baum & Mudambi, 1994). In an

oligopolistic market, suppliers are able to withhold available inventory to manipulate market prices thereby allowing for a quicker correction of market disequilibria compared to that of a competitive market structure (Mudambi, 1994). The ability to correct for market disequilibria through the withholding of available rooms inventory would imply that several hotels within the market place possess enough room units to have market price leverage power.

However, in a competitive lodging market where there are many hotels within any one given competitive set and no one hotel possesses majority market power, managers risk the loss of market share if they withhold available inventory or raise the hotel's room prices (Croes & Semrad, forthcoming; Croes et al., 2010). Consumers, after all, do have the option to purchase from a substitute competing hotel that offers lower room rates. This means that no single firm possesses market price leverage power and the best scenario is to make a normal profit from the rooms sold under the assumption of perfect competition (Croes et al., 2010; Shetty, 2008). In the observation of firms earning normal profits, new hotels appear within the market, the product substitution ratio increases, and consumers seek the best value in the market place. This process may result in an undesirable shift of the market position that an existing hotel holds in the demand curve, as well as periods of both positive and negative excess room demand (Shetty, 2008).

The management goal of a variable pricing schedule is to determine an optimal room rate that will guarantee the maximum profit from a room sale while minimizing the latent effects of unrealized profit potential from a room rate that was sold too low for current market demand conditions (Hanks et al., 2002). In order to accomplish this goal, hotel managers attempt to establish discrete hotel room price points that delineate available room supply to match

anticipated room demand from consumers whereby market equilibrium is established (Weatherford et al., 2001).

This may become a difficult goal for managers to realize being that many of the revenue management systems adopted by hotels that generate the variable pricing schedule function from either the linear programming based economic models and/or the normative expectations formation approach both of which function from the inclusion of a hotel's ADR and average occupancy rates over time (Weatherford et al., 2001). However, the use of averages over time does not consider the dynamics of the industry but rather assumes that room rates do not adjust, consumer demand does not vary substantially, and the elasticity conditions remain constant, resulting in what appears to resemble the characteristics of a static market rather than a dynamic one.

Therefore, hotel managements' goal for installing a variable pricing schedule that would allow the hotel to maximize profits according to anticipated consumer demand may never be realized as the room prices generated may leave behind a substantial amount of revenue; whether the rate was too low or lost forever, or if the rate was too high due to the use of average prices producing erroneous future room rates.

#### Rational Expectations Pricing Approach

A proactive pricing approach concentrates on product price fluctuations that are considered to be effective price adjustments considering that they are based on anticipated reactions of customers and competitors (Pan, 2007). This approach is contrary to the immediacy of price adjustment afforded by the adaptive pricing approach. In this approach, the focus is to make price adjustments after analyzing the firm's own costs and market circumstances (Finch et

al., 1998). The adaptive pricing approach is not addressed in this study as it excludes itself by its reactionary evaluative function to price adjustment as compared to expectations formation process function that works to project future room rates. Instead, it is discussed in brief here only to indicate that a proactive pricing approach is evident in the lodging industry aside from the aforementioned pricing approaches.

Cross et al. (2009) conducted 16 structured interviews with hospitality revenue management leaders from some of the largest hospitality firms in the industry to gain insight regarding methods used to set perishable product prices. An emerging qualitative trend from the data collected by Cross et al. (2009) was that 100% of the revenue management leaders indicated that they attempt to use a proactive pricing approach although this approach seems to generate an increased level of price uncertainty for managers as opposed to the more spontaneous adaptive response to price setting.

Typically, the lodging industry is confronted with issues pertaining to the management of uncertain future consumer demand expectations (Chatwin, 2000; Choy, 1985). Managers' adoption of discounting hotel room rates as a rational pricing strategy is used to avoid the critical expiration of a hotel's core product during times of decreased room demand (Kalnins, 2006). This strategy is essential to managers considering that hotels are strongly revenue dependent firms affected by high fixed costs of operation required to maintain a property, and by periods of decreased demand both of which intensify a hotel's inability to be resistant to profit instability (Jeffrey & Barden, 2000; Nicolau, 2005; Uner et al., 2008). This intensification increases managers' level of uncertainty regarding the appropriate room rates that will sell in accordance with current market conditions (Enz et al., 2009). Thus, it appears there is great value in a strategic approach to price setting that could soften or countermand profit instability.

This study principally focuses on explaining the managerial expectation formation process of price setting as it contributes to the understanding of discounting hotel room rates as a rational strategic phenomenon in the lodging industry. Rationality, according to the rational expectations theory, implies that the relationship between discounting room rates and hotel financial performance (i.e. actual earnings) is convergent over the long run of time (Muth, 1961). That is, the variables may drift apart from one another in the short run but should come back together, or cointegrate, to equilibrium over the long run.

According to the neoclassical economic theory, the relationship between the price of a product and its consumer demand is interrelated. This means that, the lower the price, the higher the quantity demanded could become and vice versa (Chen & Schwartz, 2008). When applied to the lodging industry, hotel managers may respond with price cutting (discounting) of room rates during times of low or uncertain demand with the expectation that a lower room price may stimulate an increase in room demand. This is based on the notion that, with the reduction of price, more rooms will be sold and more consumers could enter the market (Jeffrey & Barden, 2000; Jeffrey et al., 2002).

Based on the wide application of discounting hotel room rates in the lodging industry it would seem that hotel managers depend upon this relationship to matriculate in order to compensate for times of decreased room demand. Acceptance of this relationship between product price and consumer demand provides incentives for hotel managers to reduce current prices with the expectation of higher prices in the future (Choy, 1985; Finch et al., 1998; Hanks et al., 2002; Schwartz & Cohen, 2004). This means that managers would reduce room prices in periods of excess room supply and would tend to raise room prices in periods of excess consumer demand thereby providing an indication of the desire to maintain market equilibrium.

As managers adjust room prices in an attempt to achieve some degree of stabilization between room supply and consumer demand, they engage in a pricing process where current supply and demand of hotel rooms will depend both on expected prices and on prices previously projected to prevail in the current market period (Carlson, 1968; Chatwin, 2000). A higher expected future room price will raise the current room price (Corgel, 2004). A higher expectation in the past of today's room price will raise the price and hence depress consumer demand thereby decreasing the current price (Schwartz & Cohen, 2004). The achievement of some degree of stabilization between room supply and demand by using past price information to project future room rates seems a practical approach for hotel managers to use in their expectation formation process for future room rates. Management practice of setting room rates based on a backward looking thought process to forwardly project future expectations of room price and hotel financial performance coincides with the theoretical premise of the rational expectations theory (Muth, 1961).

However, the extant lodging literature does not provide a systematic analysis of a rational price setting process and is largely lacking in forwarding theoretical frameworks that could explain hotel managers' expectation formation process of future room rates. Recent research departs from the expected inverse relationship between a product's price and consumer demand pertaining to the selling of room nights. The findings from the literature research seem to indicate that hotel managers are not well aware of how a room price may influence overall hotel financial performance (Canina & Enz, 2006; Enz et al., 2009; Enz et al., 2004).

This interpretation of managers' ability to formulate optimal room rates that would maximize profits is based on a hospitality research stream that criticizes the lodging industry's wide application of discounting room rates to stimulate increased room sales during times of

depressed consumer demand. However, one may contend that it is the perspective from which the lodging industry is viewed (i.e. whether static or dynamic) that determines if the use of discounting room rates is a rational synthesizing process or a normative economic expectation of future demand.

### The Debate on Discounting Room Rates

Currently, there is lack of consistent agreement between hospitality researchers and practitioners regarding the relationship between discounting hotel room rates and hotel financial performance. Researchers have become critical concerning industry practitioners' use of discounting room rates to generate earnings during periods of decreased demand (Hanks et al., 2002; Higley, 2003; Steed & Gu, 2005).

The majority of the current empirical studies that contribute to developing the debate regarding this relationship are published in the *Cornell Hospitality Quarterly*, are produced solely by the Center for Hospitality Research at Cornell University, or in tandem with the Smith Travel Research Global (STR). The primary focus of the journal and the center is to provide scholarly research with hospitality management implications where the reading audience of researchers and industry practitioners alike is targeted. The value of STR participating in the research is that the company is recognized as possessing the most comprehensive sample of major international hotel chains and brands. And, is also recognized as a leader in compiling and disseminating information to researchers and the industry regarding historical hotel performance trends.

Articles have been published in the *Cornell Hospitality Journal* and in industry reports that are produced by the Center for Hospitality Research at Cornell University. The manuscripts



pertain to the relationship between discounting room rates and hotel financial performance (1999-2010). They reveal that the research findings and hospitality management implications are heavily slanted towards the recommendation for hotel managers *not* to discount room rates due to its negative effects on hotel financial performance.

In the current literature, this recommendation has not been substantially challenged to the contrary. Moreover, hotel managers do not seem to embrace the recommendation of current research and continue to discount room rates despite the empirical evidence that would advise them not to use this pricing strategy. As researchers continue to present evidentiary support regarding *why* discounting does not work across hotel competitive sets and/or within different geographic locations, the question begs itself, “*Why would hotel managers continue to discount room rates?*”

#### We Said, “Stop Discounting!”

The opposition’s perspective regarding why managers should not discount room rates to compensate for a decrease in demand is based on the research claim that hotels that discount room rates more than their competitors may have higher occupancy levels but generate lower RevPAR values. Consequently, there is indication of the existence of a negative relationship between discounting room rates and hotel financial performance (as measured by RevPAR) (Canina & Carvell, 2005; Canina & Enz, 2006; Canina & Enz, 2008; Enz, 2003; Enz & Canina, 2007; Enz et al., 2009; Enz et al., 2004).

The research claim is based on the speculation that the constant price adjustments of room rates witnessed in the lodging industry is management’s reaction to the concern of rooms perishing due to the stress of temporal variations of demand, and that their understanding of

projected earnings are at best, uncertain (Hanks et al., 2002). This would imply that managers appear to lack an understanding of future market conditions, which may cause them to fall short of expectations regarding projected earnings from room night sales. The referenced oppositional literature stream to discounting suggests the use of maintaining room rate averages over time, as well as to maintain price integrity as a way to address uncertainty of the future demand conditions in the market.

The methodological framework that has been adopted as the foundation for the critique regarding the use of discounting room rates to increase hotel financial performance is based on the results from descriptive statistical analyses from a preliminary study that was conducted in 2004 by Enz, Canina, and Lomanno. The study examined the relationship between pricing strategy and the average percentage difference in RevPAR and occupancy for 6,913 U.S. hotels relative to a hotel's competitive set. The examination also assessed this relationship for each price segment (i.e. luxury, midscale, and economy hotels) as well as for hotel location (i.e. airport, urban, suburban, interstate, resort and small metro or town) in major metropolitan areas.

The data set used was provided by STR and was comprised of national hotel historical performance benchmark indicators for the years 2001-2004. The data consisted of annual figures for rooms' revenue, rooms sold, rooms available at each property, and rooms available in each competitive set. From the data, the researchers were able to calculate the annual ADR for each property (N= 6,913), the annual ADR for each competitive set, the annual RevPAR for each property, and the annual RevPAR for each competitive set. The data set was cleaned to remove performance outliers of individual properties where the annual RevPAR exceeded one standard deviation from zero.

Room rate discounts were determined after grouping hotels by their price positions. That is, hotels that posted a percentage difference below the annual ADRs of its competitive set were determined to be using discounting as a pricing strategy. While the study did not formally define the variable, discounting, the calculation to determine which hotels were using this pricing strategy implies that discounting would be defined as the offering of room rate that is below the annual ADR of a competitive set. And, because the study references “annual” data, this would imply that discounting was used as a long-term annual pricing strategy. The sum of the percentage of properties in the data set that was determined to use discounting as a pricing strategy varied between 53.8% - 54.5% over the course of the four years under examination.

Based on this statistic, the authors concluded that it appeared that most hotels set room rates in relation to that of their competitors, and hotels in general do not seem to set room rates based on demand conditions (Enz et al., 2004). The implication is that most hotel managers set prices in accordance to what they observe as the pricing strategy of their direct competitors and that they do not synthesize market information to form expectations regarding future room rates and demand.

Overall, the research results provided evidence that regardless of a hotel’s location the majority of the price segments that used discounting as a pricing strategy posted higher annual occupancy levels but that the annual percentage differences in RevPAR, financial performance, were lower than the competitive set. And, vice versa, hotels that held higher annual ADRs had lower occupancy levels but a higher annual RevPAR value. The variable, financial performance, was measured by the hotel’s annual RevPAR and was calculated by taking the annual occupancy rate multiplied by its annual ADR (Chan & Wong, 2006).

Based on these results, the hospitality management implications were that increasing occupancy levels at discounted room rates results in a lower annual RevPAR value and therefore discounting room rates negatively affects hotel financial performance. The preliminary study did provide evidence that discounting room rates does increase occupancy levels (increase market share) but that this occurred at the sacrifice of decreasing revenues.

Since the release of the results from the preliminary study of Enz et al. (2004) there have been several studies that have followed the same or a similar methodological design with similar data sets from STR. The results from these confirmatory studies corroborate the initial findings and appeared to have strengthened the research claim that “*Discounting doesn’t work*” (Canina & Enz, 2006; Enz & Canina, 2009; Enz et al., 2004).

#### Don’t Discount: Add-Value

The lodging industry has been described as following the moves and countermoves of a competitive dynamic process where the firms are inherently dependent upon what their competitors do (Canina, Enz, & Harrison, 2005). This means that firms will imitate the marketing initiations of direct competitors to counteract those firms from gaining market share or achieving product differentiation within the market place. Porter (1985) classifies firms that achieve product differentiation by their ability to provide a unique value to their customers that direct competitors cannot easily imitate. This would require firms to offer something other than that of a low price for a product (e.g. a discounted room rate), which could be easily mocked by direct competition and would most likely not result in product differentiation.

Establishing product differentiation may be of particular importance in the lodging industry due to the continued use of room distribution and sales that occur over the Internet

(Carroll & Siguaw, 2003; Enz, 2003). Carroll and Siguaw (2003) note that although the preference of managers would be to drive the consumer to their proprietary website to book rooms, they almost always use some kind of discounted distribution channel to clear their inventory of unsold rooms. A product differentiation problem emerges for managers when considering that many of the discounted distribution channels that they use to clear the unsold room inventory use price cutting strategies to compete with their distribution channel's competitors. Managers would like to avoid having room rates as the consumers' main consideration for purchasing a room (Enz, 2003). And, instead have consumers select to purchase a room in a particular hotel because of value-added amenities and/or services that launch product differentiation (Canina et al., 2005; Carroll & Siguaw, 2003; Enz, 2003).

Canina et al., (2005) support the notion that if a hotel establishes product differentiation in a market place by offering unique value, when compared to that of its competitors, it will be able to charge premium prices for rooms and will not be forced to discount room rates during seasonal downturns. Hence, hotels that focus on establishing value at price premiums would sustain more profit than direct competitors in the market due to an increase in RevPAR figures (Dube, Enz, Renaghan, & Siguaw, 1999). This recommendation to shift the central focus from optimal room capacity utilization, to that of value-adding amenities and/or services seems to be gaining momentum in the discounting research (Canina et al., 2005; Carroll & Siguaw, 2003; Kimes, 2010; Kimes, 2009).

However, the creation of such value-adding components comes with an associated cost to develop and maintain those amenities and/or services (Canina et al., 2005; Kimes, 2010; Porter, 1985). While this may be a practical approach for specific hotel competitive sets in the lodging industry such as that of the luxury hotel sector, it may not be a practical reality for other hotel

competitive sets that do not have a niche customer base that would be willing to pay price premiums such as that of luxury hotels.

The viewpoint that customers would be willing to pay a sustained premium room price for a unique value does not seem to consider the dynamics of the lodging industry. Product differentiation is important to establish in the lodging industry where there is a high product substitution ratio (Higley, 2003). However, establishing unique value over that of competitors seems more beneficial as a long-term firm marketing goal not a short run sales goal. In the short run, would the typical customer be willing to pay a premium price for a room night during periods when the room supply exceeds consumer demand?

Kimes (2010) used an online survey to question 980 international hotel revenue managers between 2009-2010 and found that the managers reported that discounting room rates and price cutting were their most popular pricing strategies used during the recent economic recession to try and offset the decrease in demand from the corporate and leisure traveler market segments. Price cutting is the offering of an extreme discounted room rate that is lower than what would be offered during usual circumstances and that may result in price wars (Chan & Wong, 2006). The managers also indicated that if faced with similar future economic conditions they would try to avoid using these price setting strategies, and focus instead on value-added packages and the use of “*intelligent discounting.*”

Kimes (2009) discusses intelligent discounting as a pricing strategy that may be implemented as a non-price and/or as a price related method to discount room rates. Non-price methods involve establishing product differentiation that may include the offering of superior service quality, using strategic partnerships, focusing on loyalty programs, locating ulterior revenue sources, and penetrating new market segments. Price related methods may include

offering discounted room rates to specific market segments, using opaque distribution outlets to increase room sales, and promoting hotel packaging of supporting products.

The use of intelligent discounting seems to offer managers some price setting resistance to the price cutting strategies of hotel rooms used on discounting distribution channels (Miao & Mattila, 2007). Specifically, in the context of a non-price method of providing consumers with a certain level of trust that after a room night purchase they will receive an observable level of quality that is anticipated when buying directly from the hotel (Carroll & Siguaw, 2003; Henley, Cotter, & Herrington, 2004; McMillan, 2002). Garbarino and Sonim (2003) posit that consumers may form an expected reference price for a product through price searches on the Internet. A consumer's expected reference price is determined by accessing the highest market price, the average market price, and lowest market price (Garbarino & Sonim, 2003).

After an expected reference price is formed a consumer will have a price estimate of how much they are willing to pay for a room (Bolton, Warlop, & Alba, 2003). This means that when a price stimulus, or promotion, for a hotel room night seems plausible for a consumer they may book the room. Alford and Engelland (2000) claim that consumers may be more prone to purchase from a "*believable*" source if the price estimate is not exceeded; and, that the believability of a source increases the closer it is related to the direct seller (i.e. the hotel). This may provide managers an opportunity to overcome the price transparency of the lodging market, and to price rooms above the price cut of discounting distribution channels as long as the managers do not price above the consumers' price estimates.

The findings from Kimes' studies (2010; 2009) regarding the use of intelligent discounting emphasized that the message was not intended to recommend hotel managers not to discount but rather that they should discount in an intelligent and strategic way. This seems to

indicate that managers should consider both the long and short run goals of the hotel. In the long run, hotel managers may be concerned with developing a competitive advantage and product differentiation through value-adding amenities and/or services. However, in the short run, sales profit goals are focused on avoiding a room night product from perishing. These two goals may seem contradictory of one another. However, if managers realize their long-term goals of adding value to achieve price integrity they may find that future short run goals that attempt to avoid a room night from perishing may become more achievable (Canina et al., 2005).

The use of intelligent discounting departs from adding-value amenities/services while maintaining price premiums for hotel rooms, which may not account for the short run sales profit goals of managers. When considering that managers are challenged to avoid the expiration of room nights, are faced with affording high fixed costs of operation, and are aware that the marginal costs associated with a room sale are relatively low, short run profit goals become critical to achieve. Low marginal costs associated with room sales seem to provide managers with an incentive to make some profit by selling a room at a discounted rate rather than to have a room remain vacant to maintain premium prices.

#### Why Managers Continue to Discount

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 & 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 & 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).

Management's focus is on room revenue maximization (Gayar et al., 2008) and therefore they have a tendency to hold a "*heads on beds*" mentality (Hanks et al., 2001). 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., 2001).

Hotel managers and proponents of discounting also do not view the elasticity conditions of hotel room nights as remaining stationary over time (Abbey 1983; Bull, 1997; Croes & Semrad, forthcoming; Croes et al., 2010; Vinod, 2004). Hotel managers recognize the dynamic cycles of seasonality and consumer demand schedules in the lodging industry (Corgel, 2004) and price rooms based on those fluctuating levels of demand in the market place (Jayaraman & Baker, 2003). This indicates that managers depend upon the inverse relationship between room

price and consumer demand in accordance with the neoclassical economic theory (Steed & Gu, 2005).

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. Based on this objective, discounting is defined as the short-term offering of a room rate that is below the rack rate (Croes et al., 2010; Croes & Semrad, forthcoming). Hotel managers calculate the discounted rate by identifying the occupancy level that is necessary to hold marginal revenue and marginal costs in balance (i.e. at equilibrium) (Finch et al., 1998). This seems to indicate that managers perceive long and short-term pricing goals as different strategies. This definition and calculation of a discounted room rate is contrary to that of the opponents where they view discounting as a long term pricing strategy of rates that are less than the ADR (Canina & Enz, 2006; Enz et al., 2004).

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 price that will sell in accordance with future demand conditions that are yet unknown (van der Rest & 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 et al., 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 expectation formation process of future room rates.

However, over the long run, managers may aggregate financial performance and use the hotel's performance benchmark indicators (e.g. ADR) to compare normal costs to actual costs (Nooteboom et al., 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 STR, 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.

Croes and Semrad (forthcoming) assessed the long and short run relationships between discounting and hotel financial performance from 2004-2007 for a convention hotel located in a tourism destination (Orlando, FL). The researchers found evidentiary support through the use of a cointegration analysis that discounting room rates is not an effective pricing strategy over the long run of time. The study indicated that the use of averages is a more viable price setting strategy to that of discounting for long-term price setting practices and firm projections.

However, through use of an error correction model the researchers found indication that in the short run discounting room rates may be an effective pricing strategy to avoid expiration of room night sales. The error correction mechanism indicated a cobweb pricing behavior where the variables, discounting room rates and hotel financial performance (as measured by profit per available room (ProfitPAR), converged to equilibrium in the short run. This finding suggests that

hotel managers' wide application of discounting room rates in the industry may be a worthwhile short-term price setting strategy to correct for market disequilibria.

However, how do managers arrive to the discounted rate? Do they use an internal price setting process to assist them in their expectation formation process of room rates? Or, do managers price only in accordance with competitors in the market place as suggested by Enz et al. (2004) and Canina and Enz (2006)? Recent proponent discounting studies have produced ulterior findings to those published in the *Cornell Hospitality Quarterly* and the Center for Hospitality Research at Cornell University.

Baum and Mudambi (1995) as well as Mazzeo (2002) proposed the use of the game theory as opposed to normative economics to explain and predict the price setting behavior of managers in the lodging industry. Baum and Mudambi (1995) suggest that hotel managerial price setting behavior may be determined by the market structure of a geographic location of a particular lodging industry. The researchers found that in an oligopolistic market structure two potential managerial price setting behaviors emerged: 1) there may be an interdependence between hotels that promotes collusion in order to maximize individual firm profits; and, 2) hotels that aim to increase market share may price cut the market room rate to increase room sales. Consistent application of the game theory in the lodging industry presents circumstantial challenges in developing an understanding of how managers set room rates. This is due to the majority of lodging market structures representing a competitive market place (Kalnins, 2006).

In a competitive market structure, there are many players (hotels) that consist of different cost structures and offer heterogeneous products (Croes & Semrad, forthcoming). In a competitive market structure there are also several different forms and structures of hotel ownership, such as independent owners, franchises, and management companies, as well as large

corporations with different sets of attributes (Croes et al., 2010). Another trait of a competitive market structure is managers' use of the "*call around*," or the sharing of occupancy and room rate information via telephone with adjacent hotels. These characteristics of a competitive market seem to run counter to that of oligopolistic price forming strategies where hotels conceal the level of consumer demand instead of sharing it (Kalnins, 2006).

Croes et al. (2010) assessed the stationarity conditions of a time series data set for a convention hotel in order to determine if managers used a rational price setting approach in their expectation formation process of future room rates that may adhere to demand conditions that are yet unknown. Unit root tests indicated that managers, in the case of the hotel under examination, may use a rational price setting approach to set future room rates and may not exclusively form prices based on competitors' room rates, as suggested by Enz et al. (2004) and Canina and Enz (2006).

This means that the rational expectations theory (Muth, 1961) may be applicable to managers' expectation formation process of future room prices. Under this theory, the time series data set should hold memory, or contain a unit root. The time strand for the variable, *discounting*, revealed a unit root in the Croes et al. (2010) study. In the rational expectations literature, econometric implementation of a model is typically done by constructing a variable (in this case a room rate) that equals the difference between some quantity realized at date  $t$  and the optimal forecast of that quantity at  $t - 1$  (Dickson, 2009). This means that the variable, *discounting*, is time dependent providing indication that managers carry an actual charged room rate forward to the next fiscal period with the assumption that the price will sell if there is not a shock to the system (i.e. the assumption of *ceteris paribus*).

The variation of the research results generated by opponents and proponents of discounting as an effective pricing strategy during times of decreased demand seems to depend on several different perspectives. The first pertains to the perception of an individual recognizing the lodging industry as being representative of a static or dynamic system. The difference in perception regarding traits of a static or dynamic industry seems to place different emphasis on long and short-term profit goals. Those that view the industry as possessing static traits claim it is more necessary for managers to focus on establishing value-added amenities and/or services to assist in establishing product differentiation in the market place.

However, those individuals who view the industry as dynamic seem more concerned with short-term profit goals through the sales of rooms. While both sides of the discounting debate do not claim that the other's viewpoint is not important, they do not share the same perspective regarding the order of importance of profit goals. Therefore, the literature remains split regarding whether short-term profit goals will lead to the ability to achieve long-term value-added amenities and/or services; or, whether establishing value over the long run implies that hotel managers could charge premium prices in the short run and will not have to discount during periods of decreased demand.

The second perspective pertains to the viewpoint of managers' ability to form expectations of future room prices that will sell in the market. Opponents to discounting who value the accuracy of research findings that do not recommend the use of discounting suggest the use of an ADR over time rather than price adjustments to match varying demand. This recommendation is based on the assumption of normative economics where the lodging industry is viewed as representative of a static industry where available rooms, consumer demand, and inelastic conditions remain constant over time. Whereas, proponents of discounting take into

consideration a rational price setting approach where the assumption is that managers use a backward looking thought process to forwardly project future expectations of price and financial performance that vary over time (Corgel, 2004; Kalnins, 2006). This describes a process where the outcome of product sales depends partly upon what managers expect to happen (Muth, 1961) in a market. This rational price setting process plays a central role in the determination of variable pricing schedules that follows in accordance with future expectations of consumer demand and price limitations that may be appropriate to match those demands.

The third difference in perspectives is the different statistical analyses used to assess the relationship between discounting room rates and financial performance.

The normative recommendation for managers to use an ADR over time is formed through the adoption of descriptive statistical analyses that assume support of stochastic processes and the dynamics of the lodging industry. On the other hand, proponents of discounting room rates use econometric procedures to assess the stationarity conditions of time series data sets and include the use of statistical residuals that account for latent factors in the market place that may have influenced the statistical validity of past charged room rates (Mukherjee et al., 1998).

## CHAPTER THREE: METHODOLOGY

### Introduction

The following chapter discusses the methods that will be used in the study to empirically assess the stationarity conditions of the time series data set, the relationship between discounting hotel room rates and hotel financial performance, and whether the rational expectations theory in conjunction with the cobweb model may hold relevant in explaining the managerial expectation formation process of room price setting. The chapter begins with an explanation regarding why an econometric case study design was selected to examine the research questions and follows with a listing of operational definitions used in the study. Each of the research questions and the supporting hypotheses that will be examined are reviewed. The literature that was used to formulate the questions and the hypotheses is provided as well as the methodological procedures that will be used to empirically assess the questions. The limitations to the study are revisited and the chapter concludes with a summary.

### Research Design

The purpose of this study is to explain the managerial expectation formation process of price setting as it contributes to the understanding of discounting hotel room rates as a rational strategic phenomenon in the lodging industry. In order to accomplish this purpose, the study will first assess the nature of the relationship between discounting hotel room rates and hotel financial performance when considering the non-stationary conditions of a time series data set that seem pervasive in the lodging industry.

The study aims to provide an explanation regarding hotel managers' room price setting formation processes as supported by the cobweb model and the rational expectations theory. It



also endeavors to determine the short and long term empirical relationships between discounting room rates and hotel financial performance.

The study will adopt an econometric case study research design. This research design was selected for multiple reasons. The first reason is that the design critically focuses on a single organization where the unit of analysis is a subunit of the organization (Kalmi, Jones, & Kauhanen, 2008), in this case a hotel manager. Second, econometric modeling detects stochastic trends in time series data sets that “*knit*” variables together through an integrated process that shares the same stochastic trends. The link that knits the variables provides preliminary evidence of an equilibrium relationship between the variables. Additionally, the research design was selected as it may provide robust empirical findings that could include the influence of unknown, undetected latent factors in the lodging market place; while still accounting for some variance in the dependent variable (i.e. hotel financial performance) (Perakis & Sood, 2006).

The time series data sets from three hotels are included in the study providing they possess characteristics as follows: discounting is used as a pricing strategy; the hotels are under the same management; hotels are part of the same competitive set; and, hotels exist within the same geographic location. In this way, the researcher may more accurately interpret the results from the statistical procedures performed without having to account for criterion related market conditions that may be inconsistent across competitive sets, within different geographic locations, and that may vary under different corporate management groups thereby tainting the statistical validity of the econometric procedures performed (Hoover, 2003).

## Operational Definitions

In order to clearly understand how the variables are operationalized in the statistical procedures referenced in the following sections, their definitions are revisited in Table 1.

Additionally, a basic definition for some of the relevant statistical terms is also provided in Table 1.

Table 1. Operational Definitions and Statistical Terms

<b>Term</b>	<b>Definition/Explanation</b>	<b>Formula/Denotations</b>	<b>Resource/Information</b>
Discounting hotel room rates  (Independent variable)	The offering of a room price that is below the rack rate	$D_{rate} = RR - ADR$  <i>Where <math>D_{rate}</math> is the discounted rate; <math>RR</math> is the rack rate; and, <math>ADR</math> is the actual average daily rate</i>	(Croes et al., 2010; Croes & Semrad, forthcoming)
Hotel financial performance  (Dependent variable)	The total revenue generated by rooms sales in a given period measured by RevPAR	$RevPAR = \text{Rooms Revenue} / \text{Rooms Available}$	(Chan & Wong, 2006)
Rack rate	The price for a room night before any discount has been taken into account	Denoted as RR (rack rate)	(Schmidgall, 2006)
Average daily rate (ADR)	The average room price charged for a specified time interval (e.g. day, month, year)	$ADR = \text{Hotel revenue} / \text{Number of rooms sold}$	(Enz et al., 2004)

Term	Definition/Explanation	Formula/Denotations	Resource/Information
Cointegration	The independent and dependent variables are cointegrated when the non-stationarity of one variable corresponds to the non-stationarity of another variable indicating that a linear combination that is integrated of an order one less than the variables	Denoted as $X_t \sim CI(d,b)$ Where $X_t$ is the integrated vector, cointegrated (CI) of order $(d,b)$	(Engle & Granger, 1987; Juselius, 2007)
Long run equilibrium relationship	A relationship between the independent and dependent variables whereupon over the course of time the relationship may deviate, or the variables may wander away from one another, but not by an increasing deviation due to the discrepancy (errors) in the relationship being integrated of no level greater than zero	$\beta x_t = \beta_0$ (equilibrium)	(Banerjee et al., 1994)
Short-term relationship	A short run relationship where the adjustment in the dependent variable depends not on the independent variable but on the extent to which the independent variable deviated from an equilibrium relationship with the dependent variable	(See page 24 – 25)	(Banerjee et al., 1994)

## Research Questions, Hypotheses, and Methods

Each of the following sections pertaining to the study's research questions and hypotheses are discussed in terms of the purpose of the study and the manner in which they reflect the research problem. The hypotheses support the research questions to be investigated and are guided by industry practice that is logically derived and/or guided through the development of confirmatory or disconfirmatory empirical results as generated by previous studies. The methods that will be used to assess each research question are contained within the individual sections along with their anticipated results.

### Research Question 1: Hypotheses and Methods

The rooms department is the most significant financial contributor to hotel financial performance (Pan, 2007; Schmidgall, 2006). Therefore, managers dedicate critical attention to room revenue maximization to avoid the loss of a room night sale from perishing (Cross, Higbie, & Cross, 2009). From a managements' perspective, a goal may be to consistently operate at full capacity with an optimal room rate that will sell in accordance with market forces (van der Rest & Harris, 2008). However, managers also identify that a drop in demand will generate an excess supply of room nights that will perish before making a contribution to high fixed costs of operation. In order to avoid this loss, adjustments are made through the pricing system in the form of discounting with the hope of increasing consumer demand (Avinal, 2004).

Currently, there is a lack of consistent agreement between hospitality researchers and practitioners regarding the relationship between discounting hotel room rates and hotel financial performance. Most of the current lodging literature (1999 – 2010) pertaining to the examination of this relationship is critical concerning industry practitioners' use of discounting room rates to

generate earnings during periods of decreased consumer demand (Canina & Enz, 2006; Canina et al., 2005; Cross et al., 2009; Enz, 2009; 2003; Enz & Canina, 2007; Enz et al., 2009; 2004; Steed & Gu, 2005).

The emerging recommendation from this stream of research is for hotel managers to shift their focus from room revenue maximization to that of adding value to differentiate their hotel from its competitors while maintaining premium prices rather than to discount rooms to increase occupancy levels (Canina et al., 2005). This recommendation is due to a series of confirmatory studies that claim that managers who discount rooms more than their competitive set may realize higher occupancy levels than competitors but a decrease in financial performance (i.e. RevPAR) (Canina & Enz, 2006; Canina et al., 2005; Cross et al., 2009; Enz, 2009; 2003; Enz & Canina, 2007; Enz et al., 2009; 2004).

This research claim indicates that there is a negative relationship between discounting and hotel financial performance. Consequently, the constant room price adjustment process may be considered an ineffective pricing approach to correct for the dynamic offsets between room supply and demand over time. The practical implication to managers, then, is not to discount but rather to adopt a constant ADR over the course of time. This recommendation is derived from the adoption of descriptive statistical analyses that assume support of stochastic processes and the dynamics of the lodging industry. However, research findings and conclusions that are generated from such studies may possess threats to statistical conclusion validity regarding proper representation of the variability within time series data sets (Creswell, 2003; Mukherjee et al., 1998).

This means that the use of descriptive statistics assumes that a linear relationship represents the consumption trends in the lodging industry (e.g. ratio between room supply and

consumer demand) (Croes & Semrad, 2009). This assumption may not properly account for the non-stationary conditions of a time series data set that reflect the dynamics of the industry (Jeffrey & Barden, 2000). If this is the case, then past researchers may have drawn erroneous inferences from the data because of insufficient statistical power or violation of statistical stationarity assumptions of the data (Creswell, 2003; Jeffrey et al., 2002). Given this error potential, research question number one and its supporting hypotheses pertaining to the empirical relationship between the variables is generated.

Q<sub>1</sub>: Do the time series under investigation demonstrate persistent trends of the past?

H1<sub>0</sub>: The time series under investigation do not demonstrate persistent trends of the past.

H1<sub>1</sub>: The time series under investigation do demonstrate persistent trends of the past.

Q<sub>1a</sub>: Is there an empirical relationship between hotel room rate discounting and hotel financial performance?

H1<sub>a0</sub>: There is not a statistically significant relationship between hotel room rate discounting and hotel financial performance.

H1<sub>a1</sub>: There is a statistically significant relationship between hotel room rate discounting and hotel financial performance.

Q<sub>1b</sub>: If an empirical relationship exists, does the correlation coefficient carry the expected negative value sign that would indicate an inverse relationship between room rate discounting and hotel financial performance?

H1<sub>b0</sub>: The correlation coefficient does not carry the expected negative value sign that would indicate an inverse relationship between room rate discounting and hotel financial performance.

H1<sub>b1</sub>: The correlation coefficient carries the expected negative value sign that would indicate an inverse relationship between room rate discounting and hotel financial performance.

In order to determine if an empirical relationship exists between the variables, a series of statistical analyses will be used. The first that will be used are unit root tests. The next procedure will involve the preliminary step of a cointegration analysis, i.e. a simple regression analysis.

#### *Assessing the Stationary Properties of the Series: Unit Root Tests*

In its preliminary form, an integrated process provides evidence of cointegration between the variables when the variables are converted into natural logarithms and when unit root tests (i.e. Augmented Dickey-Fuller (ADF) (1981; 1979) and Phillips-Perron (PP) (1988) reveal that the time series is non-stationary, or contains a unit root in its level form. A time series that is integrated of order zero, specified as  $I(0)$ , indicates that the series is stationary and assumes a linear trend in its level form. If a series in its level form is found to be non-stationary the data may be differenced to transform the series to a stationary property. If the first difference of the series achieves stationarity, it is said to be integrated of order one (i.e.  $I[1]$ ) (Banerjee et al., 1994). If a second difference must be used to achieve stationarity, then it is integrated of order two ( $I[2]$ ); and, if it must be differenced further to achieve stationarity, then the series is integrated of order  $d$  ( $I[d]$ ) (Hendry & Juselius, 2000).

The ADF test will be used to detect a unit root in this study due to its intolerance of integrated processes that may generate a spurious regression. That is, the ADF test does not function from an autoregressive integrated moving average (ARIMA) ( $p, d, q$ ) process which accommodates an underlying integration of  $I(d)$  to move through the time series. Rather, the

ADF test functions from an autoregressive moving average model (ARMA) process where the  $d^{\text{th}}$  difference of the ARIMA process arrives to a stationary ARMA ( $p = \text{AR}, q = \text{MA}$ ) process (Banerjee et al., 1994). Examination of a unit root will be accomplished using the following equation for the ADF test regression.

$$y_t = \beta D_t + \phi y_{t-1} + \sum \psi_j \Delta y_{t-j} + \varepsilon_t \quad (\text{Equation 1})$$

Where  $D_t$  is a vector that represents deterministic components of the series.  $\Delta y_{t-j}$  is the lagged operator of  $p$  that is used to estimate the ARMA structure of error terms that signifies the amount of lagged changes in the dependent variable (i.e. hotel financial performance) that would capture autocorrelated omitted latent variables compressed within the series that would have otherwise only been included in the error term (Banerjee et al., 1994). The value of  $p$  also signifies a level that the error ( $\varepsilon_t$ ) will not be serially correlated. An assumption of the ADF test is that  $\varepsilon_t$  are homoskedastic and the test is based on a least squares estimating approach (Dickey & Fuller, 1981).

In order to increase the statistical conclusion validity pertaining to a unit root in the series, a second test will be performed. The PP test (1988) will also be used in this study to assess the stationarity properties of the time series data set. This test approaches the potential issue of serial correlation of the error terms differently than the ADF test. Rather than resting on the assumption that  $\varepsilon_t$  are homoskedastic, and the effects of omitted variables in the series are extracted from the  $\varepsilon_t$  and then estimated in the ADF equation through the form of lags, the PP test omits unobservable orders of  $p$ , or  $\Delta y_{t-j}$ . Instead, the PP test uses a non-parametric correction to modify the statistics omitting the information and then estimating the effect that autocorrelated errors may have on the results (Phillips & Perron, 1988). Therefore, this test rests on the



assumption of heteroskedasticity in  $\varepsilon_t$ . The PP test regression will be performed based on the following equation.

$$\Delta y_t = \beta D_t + \pi y_{t-1} + \varepsilon_t \quad (\text{Equation 2})$$

The use of two unit root tests that account for autocorrelated errors differently will assist in determining if the time series data set possesses a unit root. The ADF is effective when  $\varepsilon_t$  is homoskedastic and the PP test is more effective when  $\varepsilon_t$  is heteroskedastic. The use of both tests will reduce the likelihood of committing a Type I error. The ADF and PP tests' statistics will be compared with the critical value at the 5% level of significance.

Evidence of a unit root indicates that the time series data set "*holds memory*." This is a typical data trait of dynamic industries that are affected by stochastic shocks to the system (Hendry & Juselius, 2000; Juselius, 2007). Therefore, the null hypothesis of the unit root tests performed is that the series is non-stationary. It is important to test for unit roots to avoid the possibility of a spurious regression where the results may taint forthcoming results of the procedures performed later in the study. Spurious regressions may generate a higher coefficient of determination than what that value should actually be; or, may provide indication of a relationship when in actuality there may be no relationship at all between the variables. Instead, the variables are both dependent on other common latent variables in the market place (Granger & Newbold, 1974).

It would seem that opponents of discounting room rates view lodging markets as more representative of a static system rather than a dynamic one. This means that the recommendation for managers not to discount room rates may be supported by the assumption that a linear

deterministic trend component, which is constant over time, influences the series, as opposed to a unit root (Juselius, 2007). A linear deterministic trend component implies that there is a permanent known shock to a system that has a mean other than zero, and that the data is stationary.

However, proponents of discounting room rates seem to view lodging markets as dynamic systems where random shocks that are both known and unknown seem to influence the balance between room supply and demand. These random shocks to a system generate a stochastic trend that may vary over time (Hendry & Juselius, 2000) thereby influencing the variables to “*wander away*” from one another; but may be mean reverting over the long run of time. However, if the variables are integrated of some order, as exposed by unit root tests, then they should become closer to unity (i.e. a zero mean and a constant variance) as time passes. Evidence of integration between variables indicates that some form of a linear combination exists between the variables (Hendry & Juselius, 2000). This unity relationship will be further discussed in research question Q<sub>2</sub>.

Data that contains a unit root means that points of observation are not free from the influence of the previous observation (Croes & Semrad, 2009) and are integrated at least once (Juselius, 2007). In order to remove a unit root from a series, the variables are differenced at least once and are expressed as  $\Delta Y_t = Y_t - Y_{t-1}$  thereby removing the stochastic trend and transforming the series to stationary (Hendry & Juselius, 2000). The condition of stationarity is important to achieve if using an autoregressive model, such as that used in a later statistical procedure of this study that includes the use of the ordinary least squares (OLS) to estimate the slope coefficients. This is because the use of OLS with non-stationary data may yield invalid estimates, again resulting in a spurious regression (Granger & Newbold, 1974).

### *Anticipated Results of the Unit Root Tests*

It is anticipated that in this study the time series data set will be found to be non-stationary in its level form, a data trait indicative of dynamic industries due to random shocks observed (Levins et al., 2005). Therefore, it is expected that the series will be integrated of some order  $I(d)$  due to the possibility that the variables, discounting room rates and hotel financial performance, are influenced by at least some of the same latent variables in the market place. Hence, it is expected that the series may contain a unit root but that stationarity may be achieved after differencing the data. This may provide evidentiary support that the constant room price adjustments observed in lodging markets is a rational price setting approach used by managers.

A rational price setting approach refers to the presence of a unit root that may provide support for the adoption of the rational expectations theory to explain managers' expectation formation process of future room rates. In other words, under the principles of the rational expectations theory, managers' best expectation of a current room rate would be the value of yesterday's room rate charged (Jeffrey et al., 2002; Muth, 1961). The premise of the rational expectations theory infers that time period  $t_2$  would include some relevant information from time period  $t_1$ , and time period  $t_1$  would provide some relevant information from time period  $t$  (Banerjee et al., 1994). This backward looking process to project future room rates carries past market information forward indicating that points of observation are not free from influence of the previous data observation, and therefore contain a unit root. This process will be further discussed in research question number  $Q_4$  with the application of the cobweb model.

### *Cointegration Analysis: Assessing Q<sub>1a</sub> and Q<sub>1b</sub>*

After the assessment and resolution of a unit root in the time series, it is possible to proceed to the first step of a cointegration analysis by performing a simple regression analysis to determine if a relationship exists between the variables. Based on the preliminary research of Croes et al., 2010 and Croes and Semrad (forthcoming), it is anticipated that the results of the simple regression analysis will provide evidence that the coefficient of determination accounts for a significant amount of variability in the dependent variable (i.e. hotel financial performance) by regressing the information available in the independent variable (i.e. discounting room rates) on hotel financial performance. If the coefficient of determination reveals that there is a significant association between the variables, the relationship will be further investigated in terms of the long and short-term relationships between the variables in research questions Q<sub>2</sub> and Q<sub>3</sub>.

If the results of the cointegration analysis provide support of a statistically significant relationship between the variables as indicated in H1<sub>a1</sub>, then the next research question (Q<sub>1b</sub>) regarding the expected negative value sign of the correlation coefficient becomes critical to investigate. If we recall that discounting room rates is defined as the offering of a room price that is below the rack rate (Croes et al., 2010; Croes & Semrad, forthcoming), then it is anticipated that the correlation coefficient will possess the expected negative value sign that would indicate an inverse relationship between the variables. This means that the relationship between room supply and consumer demand may fall within accordance of the traditional neoclassical economic theory whereupon the price of a product and its consumer demand is interrelated. This means that the lower the price of a product, the higher the quantity demanded could become, and vice versa (Chen & Schwartz, 2008).

When applied to the lodging industry, hotel managers may respond with discounting room rates during times of low or uncertain demand with the expectation that a lower room price may stimulate an increase in consumer demand thereby absorbing some of the excess room supply. This is based on the notion that, with the reduction of price, more rooms will be sold and more consumers could enter the market (Jeffrey & Barden, 2000; Jeffrey et al., 2002).

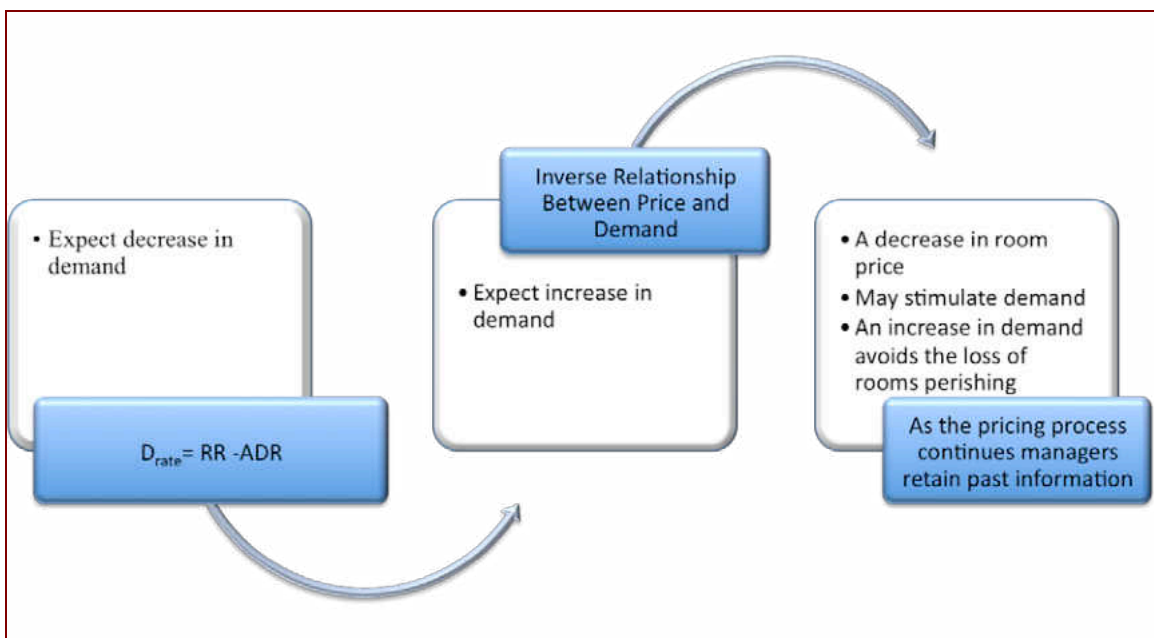


Figure 2. Inverse Relationship Room Price and Consumer Demand

Recent research departs from the expected inverse relationship between a product's price and consumer demand pertaining to the selling of room nights as depicted in Figure 2 (Canina & Carvell, 2005; Canina & Enz, 2006; Canina & Enz, 2008; Enz, 2003; Enz & Canina, 2007; Enz et al., 2009; Enz et al., 2004).

However, based on the wide application of discounting rooms it would seem that hotel managers depend upon this inverse relationship to matriculate in order to compensate for times

of decreased consumer demand. Acceptance of this relationship between product price and consumer demand provides incentives for hotel managers to reduce current prices with the expectation of higher prices in the future (Choy, 1985; Finch et al., 1998; Hanks et al., 2002; Schwartz & Cohen, 2004). This means that managers could reduce room prices in periods of excess room supply and may then raise room prices in periods of excess consumer demand thereby providing an indication of the desire to maintain market equilibrium.

Thus far, the anticipated research findings for research questions  $Q_1$ ,  $Q_{1a}$ , and  $Q_{1b}$  regarding the expected non-stationary properties of the time series data set, the empirical relationship between discounting room rates and hotel financial performance, as well as the anticipated inverse relationship between the variables may provide a provocative research interest to further examine the relationship. A cointegration analysis and an error correction model will be used to assess the long and short-term relationships between discounting hotel room rates and hotel financial performance.

#### Research Questions 2 and 3: Hypotheses and Methods

The use of the rational expectations theory in time series analysis implies that the variables are integrated (Turnovsky, 1970). This means that the series has retained some past effects making it non-stationary where future anticipations will be dependent upon the accumulation of past influences that are used to formulate future expectations (Banerjee et al., 1994). In other words, the relationship between discounting room rates and hotel financial performance (i.e. actual earnings) is convergent over the long run of time (Muth, 1961).

Thus, it is expected that the constant room price adjustments used by managers to set variable pricing schedules will result in the time series data set being non-stationary. If this is the

case, then the series must be differenced  $d$  times to achieve stationarity and the series will be  $I(d)$  (Banerjee et al., 1994). This integration of the variables that is anticipated to be revealed by the unit root tests indicates that there is preliminary evidence of a long-term relationship that prevents the variables from diverging; thereby resulting in a long run equilibrium relationship (Nelson, 1975). Therefore, the constant room price adjustments observed in the lodging industry are expected to lead to a sequence of room rates over time that will converge to equilibrium at  $X_t$  and will be cointegrated of  $I(d,b)$  represented as  $X_t \sim CI(d,b)$  where  $X_t$  is  $I(d)$  and there exists a linear combination  $\beta$  at  $X_t$  of  $I(d-b)$  where  $b > 0$ .  $\beta$  is referred to as the integrating vector.

To test for cointegration, each variable should be examined based on the following equation:

$$\Delta y_t = \alpha + \rho y_{t-1} + \beta t + \sum \tau_t \Delta y_{t-1} + \varepsilon_t \quad (\text{Equation 3})$$

where  $(y_t)$  is the relevant time series variable,  $(t)$  is a linear deterministic trend and  $(\varepsilon_t)$  is an error term with a mean of zero and a variance that is constant. Engle and Granger (1987) define the relationship between the independent and dependent variables as cointegrated when the non-stationarity of one variable corresponds to the non-stationarity of another variable indicating that a linear stationary combination exists between the variables, which are integrated of one order less than the variables themselves.

The Granger Representation Theorem requires that if a non-stationary series is transformed into one that is stationary through differencing of the data, then the linear combination between the variables, or the error correction representation of influencing latent variables, must be  $I(0)$  (Juselius, 2007). This means that discounting room rates and hotel financial performance may drift apart over the short run of time; however, the deviations that

move the variables from equilibrium are stochastically bound; and, at  $X_t \sim CI(d,b)$ , the deviations will begin to diminish over time and the error terms that associate the variables will be stationary.

In order to determine if the variables are cointegrated, which would indicate that they should become close to unity (i.e. equilibrate) over the long run of time, a cointegrated vector autoregression (VAR) will be used. In a cointegrated VAR, each variable will be lagged to reduce the chance of autocorrelation in the error terms. The trace statistic which is derived under the hypothesis that there are less than or equal to  $r$  cointegrating vectors will be calculated using maximal-eigenvalue statistics to determine the appropriate amount of lags to use in the VAR at the 5% level of significance.

It is important to accurately assess the amount of lags required to avoid losing some information about the long run behavior of the relationship between discounting room rates and financial performance. Therefore, the Akaike (1974) and the Schwartz Bayesian criteria (1978) will also be used in order to determine the amount of lags needed to reduce autocorrelation of the residuals. Additionally, as suggested by Johansen (1995; 1991; 1988) and Johansen and Juselius (1992; 1990) a maximum likelihood estimator will be adopted in the VAR as opposed to the OLS estimator that is inconsistent when there are residual autocorrelations. The use of the VAR will determine if the variables follow the same long run trends in their  $I(d)$  form thereby increasing the level of valid statistical inference of the model as supported by the rational expectations theory.

According to a cointegration analysis, a relationship between the variables is evidenced when the coefficient is less than one ( $d < 1$ ) thereby indicating that the variables will converge to



equilibrium (Banerjee et al, 1994). This means that there is a long run equilibrium position between the variables denoted as  $\beta x_t = \beta_0$ .

When the variables are in a state of equilibrium, there is no incentive for hotel managers to change room prices and adjust the steady state position. However, when new exogenous shocks influence the steady state position between room prices and hotel financial performance managers depend upon the inverse relationship of price and demand between the variables and may respond with room price adjustments (discounting) to try and correct for disequilibria. A position of disequilibria is denoted as  $\beta x_t - \beta_0 \neq 0$ .

The standard empirical measure of an equilibrium state between the variables, therefore, is an examination of the consistency or rationality of market expectations over time. This means that variables may drift apart in the short run but cannot diverge over the long run as the variables should return to unity, or cointegrate to equilibrium under observation of the rational expectations theory (Hoover, 2003; Muth, 1961). However, if the coefficient is larger than one ( $d > 1$ ), then the variables will diverge, or overshoot, and will not move to equilibrium over time (Banerjee et al., 1994).

Based on the wide application of discounting hotel room rates in the lodging industry during times of decreased consumer demand, it would seem that hotel managers depend upon this relationship to matriculate in order to correct for periods of disequilibria. Therefore, research question number three and its supporting hypotheses will be examined through use of a cointegrated VAR approach.

Q<sub>2</sub>: Is there a long-term cointegrating relationship between discounting of hotel room rates and hotel financial performance?

H2<sub>0</sub>: There is not a long-term cointegrating relationship ( $d > 1$ ) between discounting of hotel room rates and hotel financial performance.

H2<sub>1</sub>: There is a long-term cointegrating relationship ( $d < 1$ ) between discounting of hotel room rates and hotel financial performance.

It is expected that  $d < 1$  which would provide evidence that a vector integration between the variables at  $X_t \sim CI(d, b)$  exists over the long run of time. However, indication of this vector integration is not enough to assume that Granger causality is evident (i.e. lagged levels of  $\Delta X_{\text{discounting}}$  granger-causes, or has a directional cause, on lagged levels of  $\Delta Y_{\text{performance}}$ ) (Banerjee et al., 1994; Croes et al., 2010; Granger & Newbold, 1974). This means that causality of the cointegration may not be captured by a cointegration analysis (Engle & Granger, 1987), which may then increase the likelihood of committing a type II error. In other words, a causal directional link ( $\Delta X_{\text{discounting}} \rightarrow \Delta Y_{\text{performance}}$ ) may not be found to be statistically significant but that the causal relationship may still exist.

The reason one cannot assume Granger causality (1969) is due to the unit root that non-stationary data sets contain (Juselius, 2007). So, the stochastic shocks in a dynamic system may have a residual effect on the dependent variable (i.e. hotel financial performance) that does not decay rapidly over time in the time series thus potentially accounting for some of the variance in the  $\Delta Y_{\text{performance}}$  resulting in spurious causality (Banerjee et al., 1994). Therefore, a Granger-causality test may be used to determine if the inclusion of past values of discounting room rates does or does not assist in the development of managers' anticipated hotel financial performance.

In other words, establishing Granger causality analyzes the significance of the lagged residuals of the independent variable on the dependent variable and vice versa in a regression

model (Juselius, 20007). If hotel financial performance is better predicted by including the past values of discounting room rates, then by not including these values then it is possible to say that discounting room rates Granger-cause hotel financial performance. And, vice versa, if the past values of hotel financial performance may be used to better predict discounted rates than using only the use of past discounted values, then hotel financial performance is said to Granger-cause discounting room rates. Granger causality analysis that reveals that a bidirectional relationship exists ( $\Delta X_{\text{discounting}} \leftrightarrow \Delta Y_{\text{performance}}$ ) may provide evidence that either the variables are not stationary or that the unity force between the variables is not stationary in its level form (Hoover, 2003).

In order to determine if the VAR model is correctly specified, further statistical assessment is required to understand the association between the variables over time through use of an error correction mechanism (Banarjee et al., 1994; Hendry & Juselius, 2000; Juselius, 2007). If the variables are integrated of  $I(d)$ , they may be assumed to cointegrate over time; but, to be certain that a position of equilibrium exists between the variables, a closer examination of the adjustment coefficient,  $\alpha$ , is necessary (Hoover, 2003). If the model is actually equilibrium correcting, i.e. discounting room rates corrects for decreases in hotel financial performance, then increases in consumer demand may increase a room rate and decreases in consumer demand will decrease a room rate; but the  $\alpha$  should draw the variables back to equilibrium over the long run of time. In order for this adjustment process to occur, the  $\alpha$  must carry the plausible negative value sign that would push and pull the coefficient,  $\beta$ , back to a position of equilibrium,  $\beta_{x_t} = \beta_0$ .

If the  $\alpha$  does not possess the expected negative value sign, then the model is not equilibrium correcting to the equilibrium error ( $\chi_{1, t-1} - \chi_{2, t-1}$ ) (Juselius, 2007). This means that

the room price adjustment process would push the variables further away from equilibrium over time and may result in an explosive relationship (Hendry & Juselius, 2000). In addition to the examination of the expected negative value sign of the  $\alpha$ , it is also necessary to further examine the error terms of the anticipated linear combination between the variables to further determine if the model is correctly specified (Juselius, 2007). That is, if the residuals are stationary over time a long-term cointegrating relationship is evidenced. However, if the residuals show evidence of a random walk, they provide support that the variables will diverge indicating that an equilibrium relationship does not exist (Hendry & Juselius, 2000).

The findings from a cointegration analysis are considered to be powerful because they describe the existence of a stationary, or equilibrium, long run relationship between time series variables that individually are non-stationary and may be observed to drift away from one another over time. However, if the results of the cointegration indicate that  $d < 1$ , then some linear combination of the series generates an equilibrium relationship that possesses time invariant linear properties (Banerjee et al., 1994).

The stationarity conditions of the time series data set that are assessed in relevance to research Q<sub>1</sub> will provide indication for the amount of adjustment time that will pass if the variables are to converge to an anticipated equilibrium. In this study, the adjustment time indicates the length of time (time horizons) that will pass before points of convergence emerge between discounting room rates and hotel financial performance (Juselius, 2007). Points of convergence refer to the degree to which managerial expectations are considered rational and are related to the availability of more information from the lodging market of the hotel's location.

The cointegration method that was used to assess research Q<sub>2</sub> may be applied in order to investigate the adjustment time of hotel managers' expectation formation process. Cointegration

does not imply, however, that in the short run errors or deviations in the equilibrium relationship do not occur in systematic patterns, or are not serially correlated. Instead, cointegration indicates that in the long run the data set should be mean-reverting to equilibrium (Johansen & Juselius, 1990; Kulendran & Witt, 2001; Lim & McAleur, 2001; Webber, 2001).

So, just as research question number Q<sub>2</sub>, H<sub>20</sub> and H<sub>21</sub> pertained to the long-term relationship between the variables, discounting room rates and hotel financial performance, Q<sub>3</sub> and its supporting hypotheses will pertain to the short-term relationship between the variables through use of an error correction model. The error correction model has had meager application in tourism and hospitality research. To date, the procedure has primarily been used in tourism demand studies pertaining to the relationship between tourism and economic growth (Croes, forthcoming). However, there exists an absence of the application of the error correction model in assessing the relationship between discounting room rates and hotel financial performance in the lodging industry.

Assessing the short-term relationship between discounting room rates and hotel financial performance may capture adjustments in financial performance that did not depend on the level of discounting room prices, but on the extent to which room prices deviated from the equilibrium relationship with hotel financial performance. The results of this test will bear significant implications for hotel managers in assessing how far actual room rates charged deviate from the expected room rates projected.

Q<sub>3</sub>: Is there a short-term relationship between discounting of hotel room rates and hotel financial performance?

H3<sub>0</sub>: There is not a short-term relationship between discounting of hotel room rates and hotel financial performance.

H3<sub>1</sub>: There is a short-term relationship between discounting of hotel room rates and hotel financial performance.

According to Engle and Granger (1987), if a series is integrated at vector  $x_t$  and are cointegrated of  $I(d,b)$  denoted  $X_t \sim CI(d,b)$  then  $x_t$  is  $I(d)$  and there exists a non-zero vector  $\alpha$  where  $\alpha' x_t \sim I(d-b)$ ,  $d \geq b > 0$ , then a long run relationship exists between the variables. If a long run relationship exists then, there must also exist an error correction mechanism that would provide the anticipated short run dynamics between the variables that would lead to the equilibrium relationship. If  $y = \beta z$  is a steady position, then  $y_t - \beta z_t$  is the error and may be useful as an explanatory variable for the next direction of movement for  $y_t$ . If  $y_t - \beta z_t$  is positive, then  $y_t$  may be too high for  $z_t$  and may begin to fall despite the anticipated positive trend. The error correction mechanism is signified as  $(y_{t-1} - \beta z_{t-1})$  and calculates the extent of an adjustment in a given period to the deviations from long run equilibrium (Banerjee et al., 1994). If vector  $x_t$  has an error correction representation, then it may be expressed as

$$\Delta LY_t = \alpha_1 + \alpha_2 \Delta LX_{\text{discounting}} + \alpha_3 (LX_{\text{discounting}}^{t-1} - \alpha_4 LY_{t-1}) \quad (\text{Equation 4})$$

$$\Delta LP_{\text{performance } t} = \alpha_1 + \alpha_2 \Delta LY_t + \alpha_3 (LY_{t-1} - \alpha_4 LP_{t-1}) \quad (\text{Equation 5})$$

$$\Delta LP_{\text{performance } t} = \alpha_1 + \alpha_2 \Delta LX_{\text{discounting}} + \alpha_3 (LX_{t-1} - \alpha_4 LP_{t-1}) \quad (\text{Equation 6})$$

where  $\Delta$  signifies the first differencing operator (defined as  $\Delta X_t = X_t - X_{t-1}$ );  $\alpha_1 \Delta LX_{\text{discounting}}$ ,  $\alpha_1 \Delta LY_t$  and  $\alpha_1 \Delta LP_{\text{performance } t}$  denote the long run relationships, while  $\alpha_3 (LT_{t-1} - \alpha_4 LY_{t-1})$ ;  $\alpha_3 (LY_{t-1} - \alpha_4 LP_{t-1})$ ; and  $\alpha_3 (LT_{t-1} - \alpha_4 LP_{t-1})$  refer to the error correction, or short run deviations from equilibrium. The error correction model is a linear transformation of an autoregressive distributed lag model (ADL). Therefore, an ADL is used to produce the error correction representations with parameter restrictions of  $(\alpha_2 + \alpha_3 + \alpha_4) = 1$  in order to describe the extent of the short run adjustment to disequilibrium in the regression (Juselius, 2007).

A position of disequilibria is denoted as  $\beta x_t - \beta_0 \neq 0$ . During a state of disequilibria the adjustment coefficient,  $\alpha$ , from the error correction will activate adjustment forces that pull the variables back to a position of  $\beta x_t = \beta_0$  over the long run of time (Hoover, 2003). The adjustment speed will depend upon the length of  $\alpha$  and the size of the equilibrium error. An error correction model is applied within this study based on the assumption that if hotel managers depend upon the use of discounting room rates to achieve equilibrium over the long run, then there should also be a short-term relationship between the variables. The error correction is anticipated to indicate that hotel financial performance depends upon the rate of change in hotel room price (discounting) and potentially on the deviation from the equilibrium relationship between the variables as indicated by the error correction adjustment process.

#### Research Question 4: Hypotheses and Methods

Recent research that examines the relationship between discounting hotel room rates and hotel financial performance criticizes managers' ability to form an accurate projection of future market conditions and potential earnings (Canina & Enz, 2006; Canina et al., 2005; Cross et al.,

2009; Enz, 2009; 2003; Enz & Canina, 2007; Enz et al., 2009; 2004). The criticism stems from research that interprets constant room rate price adjustments as a managerial reaction to potential room perishability. Uncertain demand conditions and the absence of knowledge with which to accurately price rooms to match future demand conditions that are yet unknown contribute to that reaction (Hanks et al., 2002). The research claim regarding interpretation of constant room rate adjustments supports the notion that most hotel managers set room prices in accordance with the observed pricing strategy of their direct competitors; and that they do not synthesize market information to form expectations regarding future room rates and demand (Canina et al., 2005).

This study does not share the same interpretation regarding managers' constant price adjustments as the aforementioned discounting studies. Rather, this study views the constant price adjustments as an expression of managers' primary focus to maximize room revenues in a dynamic industry. In order to achieve room revenue maximization, managers adopt a variable pricing schedule to increase their revenues in the short run (Chatwin, 2000; Vinod, 2004). The price variability of rooms over time is based on an operational perspective where it is better to sell a room at a discount and make some profit over the marginal cost associated with the room sale than to have the profit of the room perish all together (Kalnins, 2006).

A variable pricing schedule that is based on low marginal costs such as those of the lodging industry provides managers with the incentive to carry past discounted rates forward with the expectation of charging higher prices in the future as the market regains equilibrium (Croes et al., 2010). This means that managers may discount rooms as the available room supply is expected to exceed demand (i.e. low season) and adjust rates to premium prices when room demand becomes inelastic (Avinal, 2004; Kalnins, 2006).



When taking into account the marginal cost associated with room sales, the current room price, and the price elasticity change for rooms over time, the ratio between supply and demand for hotel rooms seems to depend on both the expected price and the past room rates charged (Brannas et al., 2002). The information from the managers' previous expectations are carried forward to help them generate more accurate future expectations for room prices while simultaneously acquiring more information regarding market conditions (Croes & Semrad, forthcoming).

The adjustment process of room rates over time seems to indicate a rational price setting process that was initially assessed in the unit root tests of  $Q_1$ , where managers use all available past information to project a future optimal room rate that may allow them to maximize room revenues under conditions of uncertain consumer demand (Chatwin, 2000; Corgel, 2004; Croes & Semrad, forthcoming; Lasselle et al., 2005; Muth, 1961). This is evidenced by a cobweb price setting behavior (Carlson, 1968) where adjustment lags are made to room rates when a disturbance or shock to the market occurs (e.g. seasonal demand schedules) in order to maximize room sales.

The cobweb model assumes that the expected hotel room price equals the actual room price from the previous fiscal period; that available room supply would be a function of expected room price; and, that room prices would be adjusted to consumer demand thereby resulting in a clearing of the market (Carlson, 1968; Chatwin, 2000; Corgel, 2004). This means that the cobweb model assumes that the available room inventory ( $Q_t^s$ ) is time dependent on the previous time period ( $P_{t-1}$ ) (Croes & Semrad, forthcoming).

The cobweb model may be expressed as the following (Carlson, 1968):

$$Q_t^d = a + bP_t \text{ and } (Q_t^s) = c + dP_{t-1} \quad (\text{Equation 7})$$

where  $a$ ,  $b$ ,  $c$ , and  $d$  are parameters that are specific to individual markets. An assumption of the model is that room price adjustments will result in consumer purchase of the entire available room inventory. This assumption is recognized as:

$$Q_t^d = Q_t^s \quad (\text{Equation 8})$$

However, the assumption that a price adjustment will result in consumers purchasing the entire available room inventory is not a likely consistent outcome of all room price adjustments made over time. Therefore, a first order difference equation is required to relate the number of rooms sold in the current period to the number of rooms sold in the previous period to account for the available rooms that were not sold (i.e. random error) (Carlson, 1968; Muth, 1961; Turnovsky, 1970). In other words, the current value of a variable in one time period is expressed as a function of its own past value and some random error (Croes et al., 2010).

$$P_t = \frac{d}{b} P_{t-1} + \frac{c-a}{b} \text{ or } P_t = f(P_{t-1}) \quad (\text{Equation 9})$$

This seems to suggest that managers' expectation formation process for future room rates that will match future demand conditions may be based on a backward looking thought process to forwardly project future expectations of room price and hotel financial performance that coincides with the theoretical premise of the rational expectations theory (Muth, 1961).

Based on the theoretical framework of the cobweb model and the rational expectations theory, research question four and its supporting hypotheses include the following:

Q<sub>4</sub>: Is the lodging managerial expectation formation process of room rate price setting based on a backward looking model where expected and current room rates are dependent upon past rates charged?

H<sub>40</sub>: The lodging managerial expectation formation process of room rate price setting is not based on a backward looking model where the expected and current room rates are not dependent upon past rates charged.

H<sub>41</sub>: The lodging managerial expectation formation process of room rate price setting is based on a backward looking model where the expected and current room rates are dependent upon past rates charged.

The use of the rational expectations theory in conjunction with the cobweb model may not only capture the dynamics of the industry but may also provide evidentiary support that the substantial room price variability observed over time is not a result of managers' lack of knowledge to set room rates in accordance with uncertain demand (Canina et al., 2006; 2005; Enz et al, 2004; Enz & Canina 2008). Instead, it is a sequence of rational expectations of how room price will influence the hotel's future level of occupancy, revenue, and profit (Croes & Semrad, forthcoming).

So, while the cobweb model may display what appears to be a random structure that deviates from the expected systematic, or stable, financial performance of a hotel over time, the deviations in performance are actually rhythmic. This means that the deviations between the variables should be near to either -1 or +1 and over time should adjust via a VAR approach that draws the variables closer to vector integration through an error correction adjustment process

(Bnarjee et al., 1994; Croes et al., 2010; Croes & Semrad, forthcoming; Hoover, 2003; Juselius, 2007).

It is anticipated that the proposed theoretical framework may provide support regarding managers' ability to synthesize market information using both the past and the current periods to develop expectations regarding future room rates that will sell in a dynamic market place. It is also anticipated that the constant room price adjustments observed in the industry are not a reflection of managers' lack of knowledge to set room rates. Nor are the constant price adjustments an indication that managers price solely in response to the pricing of their competitors. Rather, it is a rational price setting process that is used to account for volatile consumer demand patterns (as indicated by non-stationary data properties, i.e. unit root) where the past seems to matter and serves as a component that allows managers to use all available market information to arrive at optimal future room rates.

#### Limitations of the Study

The study will use an econometric case study analysis to assess a practical lodging industry concern regarding the pricing of hotel rooms. Importantly, the findings will be empirically supported through a rigorous statistical assessment. The high explanatory power of the statistical techniques used in this study, specifically the use of the error correction model, suggests that the study will hold high internal validity for the hotels under investigation (Juselius, 2008). However, the results of this study are anticipated to have limitations regarding the external validity of the findings, which is a frequent criticism of econometric case study designs.

The important concept here is that econometric case study 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. 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 & Witt, 2001). However, researchers are often advised to take a cautionary approach regarding the inference of a timing context to which a causal relationship is established (Juselius, 2008). This means that the observed variables in a finite time horizon may appear to be strictly exogenous; yet, the same variables under observation at another time may be endogenous due to different environmental conditions (Banerjee et al., 1994).

The recommendation to proceed with caution regarding causal inferences is not exclusive to econometric case study research designs. However, 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 averages may not always detect. However, it also presents a limitation regarding the reliability of generating consistent results over time due to changing market conditions; as well as the level of external validity of econometric case studies.

The aforementioned limitation is a frequent criticism from reviewers regarding the value of econometric case study designs. However, it is important to remind the readers of this study about the nature of the theoretical proxy adopted, the rational expectations theory. In the rational expectations literature, econometric implementation of a model is typically done by constructing

a variable (in this case a room rate) that equals the difference between some quantity realized at date  $t$  and the optimal forecast of that quantity at  $t - 1$  (Dickson, 2009).

From the perspective of a hotel manager, given a superior optimal room rate forecast, errors (residuals) should be orthogonal to all market information available at the time the room rate forecast is made (Perakis & Sood, 2006). Therefore, the influence of undetected latent factors in the market place may not be recognized before period  $t$  but may still provide critical information for price setting in the lodging industry. Thereby, the model of this study and the methodology becomes not only a valuable price setting tool for hotel managers, but also provides evidence pertaining to the increased level of external validity that the model of this study may have when compared to that of others.

A limitation pertaining to the use of the rational expectations theory as the theoretical proxy in econometric modeling is the assumption that the model is true or correctly specified, which means that the variables (discounting room rates and hotel financial performance) express a non-recursive relationship, are not correlated with some error -  $\epsilon_i$ , and that there are not residual autocorrelations (Dickson, 2009). The misspecification of the model may create spurious evidence of convergence between the variables (Juselius, 2008; Narayan, 2003). For this reason, a Maximum Likelihood estimator will be used as suggested by Johansen and Juselius (1990) as opposed to the Ordinary Least Squares estimator that is inconsistent when there are residual autocorrelations. A Durban Watson test and a Bruesh-Godfrey LM test will then be used to check for left over residual autocorrelations.

Limitations pertaining to data specifics that may be exclusive to the current investigation may be the sensitivity of the robustness criteria to which alternative market place latent variables have influenced the time series data set of the hotels under examination (Durlauf & Quah, 1998).

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 these market conditions of the industry will influence the findings of this study. Although, the results generated by the statistical techniques that will be used to determine the relationship between discounting hotel room rates and hotel financial performance are considered relatively invariant to change (Kulendran & Witt, 2001). 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., 1994).

This presents another limitation of the current investigation in that it would be difficult to control for market conditions, or to apply unique market characteristics to that of another location (e.g. Orlando, FL compared to Las Vegas, NV). This is due to the inability for one to reject a set of variables from the market place as non-robust criteria, or not significant (Mukherjee et al., 1998). Market conditions are known to show a high level of multi-collinearity (Perakis & Sood, 2006) where exclusion or neglect to acknowledge all of the market conditions or some of the conditions may substantially degrade the explanatory power of the statistical tests proposed in this study's methodological framework.

## Summary

This study attempts to explain discounting as a rational phenomenon. Rationality, according to the rational expectations theory, implies that the relationship between discounting and actual earnings must be convergent over the long run of time (Muth, 1961). This is because the use of the rational expectations theory implies that the time series should be integrated of some order; and, that the series will remember its past (i.e. hold memory between period observations) (Hoover, 2003).

Therefore, hotel managements' expectation formation process of room rates would demonstrate "memory" where the best expectation of today's room price would be the value of yesterday's room rate charged (Jeffrey et al., 2002). However, the time order of stochastic shocks to the system may induce deviations that display a random structure from the expected systematic performance of the hotel (i.e. random walks) that may induce a cobweb pricing behavior (Hoover, 2003). The distribution of these deviations will be near to either -1 or +1 and over time the error correction adjustment process will bring the variables closer to equilibrium.

The use of a cointegrated VAR approach and an error correction model examines the consistency or rationality of managers' expectations over time. This means that variables, discounting and hotel financial performance, may drift apart in the short run but cannot diverge over the long run as the variables should return to unity, or cointegrate to equilibrium under observation of the rational expectations theory (Hoover, 2003).



## CHAPTER FOUR: RESULTS

### Introduction

The methodological procedures that were used in the study empirically assessed the stationarity conditions of the time series data set, the relationship between discounting hotel room rates and hotel financial performance, and determined whether the rational expectations theory in combination with the cobweb model may be used to provide some explanation regarding the managerial expectation formation process of room price setting in the lodging industry. The current chapter reveals the results that were generated from the statistical procedures, namely a cointegration analysis and an error correction model, for each of the study's research questions and the supporting hypotheses. The chapter begins with a brief description of the secondary time series financial data sets that were used for statistical analyses. The chapter then proceeds to the findings pertaining to the stationarity conditions of the time series' strands for each variable under investigation. Using a cointegration analysis and an error correction model the long and short-term relationships between the variables are then discussed.

### Data Analysis

Based on the econometric case study research design of this study and the difficulty in obtaining financial proprietary data required to test the model, a solo independently owned property was employed for data analysis. The use of only one hotel property is a deviation from the original dissertation proposal which indicated that three hotels under the same management and located in the same geographic location would be used. Unfortunately, access to this data was not granted. Therefore, the results of the study are based on two secondary financial data sets that were provided by a midscale independently owned leisure hotel in the Orlando, Florida

market that is located on Walt Disney World property. Both of the data sets were for the same years and reflected the same data points. However, one data set included forecasted values and the other included actual values reported. The hotel property consists of 657 total hotel rooms.

The raw data set consisted of 1,232 daily observations for the hotel under investigation. In order to condense the amount of time periods that would be examined, the raw data set was aggregated to include monthly data as opposed to daily data. The aggregation of daily data into monthly financial periods reduced the time periods under investigation to 42 observations. A midscale independently owned leisure hotel was selected because it serves a variety of market segments, has multiple operating departments, and was willing to provide the necessary financial data that is required to test this study's model.

The use of an econometric case study research design for a single hotel property will not allow the results of this study to be generalized from one context to the next. However, the model that is tested in this study and the theoretical proxies used may be applied and tested to that of different cases. 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 & Witt, 2001). When done correctly, the results generated by an econometric case study design possess a high level of explanatory power and are relatively invariant to change over time (Banerjee et al., 1994). These points have been elaborated on extensively in the research design section of the previous chapter three.

The researcher of this study engaged in multiple, in-depth individual and group meetings over a two week time interval with the hotel property's general manager, director of revenue, area director of sales and marketing, and the director of e-commerce transient sales in order to gain an understanding of how hotel room rates at this property are determined. The property

under investigation does not currently use a revenue management system to set room rates. Discounting as a pricing strategy is commonly used at this property to boost occupancy rates during times of forecasted low demand.

The hotel property that agreed to participate in this study requested anonymity. The data was therefore de-identified and a confidentiality and indemnification agreement was signed between the researcher and the appropriate hotel employees to guarantee that no breach of agreement would occur. Therefore, the name of the hotel property that participated in this study will not be released in the current or forthcoming chapter.

Discounting in this study is defined as the offering of a rate that is below the premium rate. It is a short-term pricing strategy that is defined as the percentage value of the ratio of actual room rates and premium room rates. For purposes of this study, the premium room rate was recognized by extracting the forecasted best available room rate (BARR) from the forecasted data set and then dividing that rate by the actual rate charged from the actual monthly data set. The Discounted Room Rate Formula below provides the calculation for the discounting variable.

$$D_{rate} = ARR/BARR \quad \text{(Equation 10)}$$

*Where  $D_{rate}$  is the discounted room rate; BARR is the best available forecasted room rate, ARR is the actual room rate charged provided to each traveler.*

Hotel financial performance is the total room's revenue contributed by travelers and is measured by revenue per available room (RevPAR). The RevPAR Formula below calculates total RevPAR of travelers.

$$RevPAR = ADR * Occ_{rate} \quad \text{(Equation 11)}$$

*Where RevPAR is the revenue per available room; ADR is the average daily rate; and  $Occ_{rate}$  is the occupancy rate*

The study followed a sequence of steps in applying the statistical procedures, estimating the empirical results, and drawing statistical inferences. The first steps that were initiated involved standardizing the data for the two variables (discounting room rates and hotel financial performance) into a consistent form. The discounting variable was calculated using Formula 1 and the hotel financial performance variable (RevPAR) was converted into its natural logarithmic form.

Conversion of the variables into a consistent elasticity parameter was done for two reasons. The first reason is to standardize the data, or to reduce the data into a single unit of analysis in the log form for RevPAR and a decimal value for discounting; and, the second reason is to obtain a parameter elasticity that is more comprehensible when interpreting the results from the data assessments. The next steps involved testing the time series strands for each variable for a unit root and then the long and short-term relationships between the variables. These steps will be discussed in the forthcoming sections as they correspond to the relevant research questions that are specific to the statistical procedures that were used for data assessments.

### Research Questions and Supporting Hypotheses

The following sections briefly review the statistical procedures that were used to assess each of the research questions and the supporting hypotheses. The results for each of the research questions are reported. The theoretical and practical implications of these results are discussed in the forthcoming chapter five.

#### Research Question 1 and Supporting Hypotheses

The first set of hypotheses that were addressed and associated with research question

number one (Q1 and Q1<sub>a</sub>) pertained to if the examined time series data set demonstrated persistent trends of the past; and, if the variables possessed an empirical relationship. The formal research questions and their supporting hypotheses are restated in Table 2 and Table 6.

Table 2. Research Question 1

Research Question 1	Q <sub>1</sub> : Do the time series under investigation demonstrate persistent trends of the past?
Null Hypothesis	H1 <sub>0</sub> : The time series under investigation do not demonstrate persistent trends of the past.
Alternative Hypothesis	H1 <sub>1</sub> : The time series under investigation do demonstrate persistent trends of the past.

Q<sub>1</sub>: H1<sub>0</sub>, H1<sub>1</sub>

The statistical analyses that were used to assess Q<sub>1</sub>: H1<sub>0</sub>, H1<sub>1</sub> included a series of unit root tests in the level form data, the first difference form, and tested for a drift and a time trend. Time series that demonstrate a persistent trend of the past are said to contain a unit root. Determining if the presence of a unit root exists in each of the time series variables is also necessary in order to proceed with a cointegration analysis that is assessed in research question two (Q<sub>2</sub>). The augmented Dickey-Fuller (ADF) and the Phillips Perron (PP) unit root tests were used to assess Q1. The time series for each variable (discounting and hotel financial performance) were tested in both their level and first difference forms for unit roots. The results of the ADF and PP unit root tests in the level form and first difference order for the discounting variable are presented in Table 3.

Table 3. Unit Root Tests: Discounting Room Rates

Discounting Room Rates	Test Statistic	1% Critical Value	5% Critical Value
ADF Test Results			
Level Form	-1.995	-3.634	-2.952
First Order of Difference	-8.13	-3.641*	-2.955*
PP Test Results			
Level Form	-6.458	-18.356	-13.044
First Order Difference	-47.013	-18.288*	-13.012*

\* Indicates that the test statistic is significant at the 1% and 5% levels of significance, ( $p < .001$ )

As observed in Table 3, the ADF test statistic for discounting room rates ( $t = -1.995$ ) was compared to the critical values of -3.634 at the 1% and -2.952 at the 5% level of significance. The test statistic for the level form data of the discounting variable was less than the critical values and thus the unit root test's null hypothesis that the series strand followed a unit root was not rejected, ( $p = .2888$ ). The PP unit root test in the level form of the discounting data indicated a similar finding when comparing the test statistic of -6.458 to the critical values of -18.356 at the 1% level of significance and -13.044 at the 5% level of significance ( $p=.3601$ ).

In order to achieve stationarity, a condition necessary for cointegration analysis, the discounting variable was differenced once and the ADF and PP unit root tests were conducted again. The ADF test statistic for discounting room rates ( $t = -8.130$ ) was compared to the critical values of -3.641 at the 1% level of significance and -2.955 at the 5% level of significance. The test statistic when using the first order difference form for the discounting variable was greater than the critical values at the 1% and 5% levels of significance. Thus, the null hypothesis that the variable time strand contained a unit root was rejected, ( $p<.001$ ). The PP test supports the results

of the ADF. The test statistic ( $t = -47.013$ ) for the discounting variable exceeds the 1% critical value of -18.288 and the 5% critical value of -13.012

The results of the ADF and PP unit root tests in level and first difference forms for the hotel financial performance variable are presented in Table 4. The unit root tests for the level form data indicated that the variable, hotel financial performance, appeared to be stationary in its level form. The ADF test for hotel financial performance indicated that the variable did not contain a unit root when compared to the critical values at the 1% and 5% levels of significance, the test statistic -3.663 was greater than the critical value of -3.634 at the 1% level ( $p < .001$ ). The results from the PP test indicated that the test statistic ( $t = -21.809$ ) exceeded the critical values -18.356 and -13.044 at the 1% and 5% levels of significance ( $p < .001$ ). This may be an indication that the null hypothesis of the series containing a unit root may be rejected.

The hotel financial performance data was then differenced once, as recommended by Banerjee et al. (1994), to help reduce the likelihood of committing a Type I error that may later contaminate the study's findings through the generation of spurious results. That is, differencing the data once helps to ensure that past events are not influencing current observations in the time series. In other words, that the data is not retaining memory and that each point of observation is free from influence of the prevailing data point.

The variable time strand for hotel financial performance achieved stationarity in its first difference form as it did in its level form. The ADF test statistic ( $t = -8.036$ ) was compared with the 1% critical value (-3.641) and the 5% critical value (-2.955) ( $p < .001$ ). The estimated statistic for the PP test ( $t = -44.814$ ) was greater than the 1% critical value of -18.788 and the 5% critical value of -13.017 ( $p < .001$ ). Therefore, the null hypothesis of the series containing a unit root process may be rejected at both the 1% and 5% levels of significance for both the ADF and PP

test results for both the level form and first order difference of the hotel financial performance variable.

Table 4. Unit Root Tests: Hotel Financial Performance

Hotel Financial Performance	Test Statistic	1% Critical Value	5% Critical Value
ADF Test Results			
Level Form	-3.663	-3.636*	-2.952*
First Order of Difference	-8.036	-3.641*	-2.955*
PP Test Results			
Level Form	-21.809	-18.356*	-13.044*
First Order Difference	-44.814	-18.288*	-13.012*

\* Indicates that the test statistic is significant at the 1% and 5% levels of significance as observed by the MacKinnon approximate p-value, ( $p < .001$ )

Thus far, the ADF and PP unit root tests that were performed determined if a unit root existed within each time strand in the level and first difference forms. It was observed that both variables achieved stationarity in their first difference forms thereby providing evidence that the time series observations are free from dependence upon the previous time period (Juselius, 2008). To proceed to the testing of research question Q1<sub>a</sub> regarding the nature of the empirical relationship between the variables, discounting room rates and hotel financial performance, both a trend and a drift were included in the unit root tests for each variable in order to avoid a Type I error of rejecting the unit root tests' null hypothesis. The results of those unit root tests are presented in Table 5 and reveal that both variables were stationary at the 1% and 5% critical values when including a trend and a drift in the equation ( $p < .001$ ).



Table 5. Unit Root Tests: Discounting Room Rates and Hotel Financial Performance, Trend and Drift

Variable	Test Statistic	1% Critical Value	5% Critical Value
ADF Test Results			
Discounting, Trend	-8.028	-4.233*	-3.536*
Hotel Financial Performance, Trend	-7.929	-4.233*	-3.536*
Discounting, Drift	-8.13	-2.426*	-1.685*
Hotel Financial Performance, Drift	-8.036	-2.426*	-1.685*

\* Indicates that the test statistic is significant at the 1% and 5% levels of significance ( $p < .001$ )

Three equations were used to determine if a unit root process was present in the time series variables' strands.

$$\Delta y_t = \alpha_1 y_{t-1} + \varepsilon_t \quad (\text{Equation 12})$$

$$\Delta y_t = \alpha_0 + \alpha_1 y_{t-1} + \varepsilon_t \quad (\text{Equation 12})$$

$$\Delta y_t = \alpha_0 + \alpha_1 y_{t-1} + \alpha_2 t + \varepsilon_t \quad (\text{Equation 13})$$

All three of the equations consider the order of lagged values, or the order of autoregressive processes, through two information criteria that remove any serial correlation in the residuals: the Akaike Information Criteria (AIC) and the Schwartz Bayesian Information Criteria (SBIC).

These information criteria revealed that neither of the variables was sensitive to the choice of lag length in the series. The difference among the three equations is the presence of a constant (drift)  $\alpha_0$  and  $\alpha_2 t$ , deterministic trend (time trend). The unit root tests utilized three null hypotheses based on the previous three equations:

$$H_0: \alpha_1=0 \quad (\text{Equation 15})$$

$$H_0: \alpha_1 = \alpha_2 =0 \text{ (testing for the time trend)} \quad (\text{Equation 14})$$

$$H_0: \alpha_1 = \alpha_0 =0 \text{ (testing with the constant term)} \quad (\text{Equation 15})$$

Equation 1 revealed that both variables were stationary in their first difference form (see Tables 3 and 4) and that the null hypothesis of a unit root may be rejected. Without establishing the condition of stationarity, one cannot proceed to a cointegration analysis. Therefore, it becomes necessary to reduce the likelihood of committing a Type 1 error by introducing Equation 2, which considers a trend, and Equation 3, which considers a drift.

Unit roots for each variable were examined using Equation 2. The ADF test for the discounting variable with a time trend revealed the test statistic ( $t=-8.028$ ) exceeded the 1% critical value of -4.233 and the 5% critical value of -3.536. The financial performance variable's test statistic ( $t=-7.929$ ) also exceeded the 1% and 5% levels of significance, -4.233 and -3.536, respectively. The presence of a unit root when considering a time trend was significant for both variables ( $p<.001$ ); and, therefore, the null hypothesis of a unit root may again be rejected for each series.

The results of the ADF unit root tests for each variable were then conducted with consideration for a drift, as represented in Equation 3. Again, both of the variables' series did not contain a unit root when including a drift in the equation. The discounting variable's estimated test statistic ( $t= -8.130$ ) was greater than the 1% critical value of -2.426 and the 5% critical value of -1.685 ( $p<.001$ ). The hotel financial performance variable's estimated test statistic ( $t=-8.036$ ) was greater than the 1% critical value, -2.426, and the 5% critical value -1.685 ( $p<.001$ ). The results from these additional unit root tests that include a trend and drift provide evidentiary

support that both series are stationary in their first difference form. Therefore, we may firmly reject the null hypothesis of unit roots in the series.

Q<sub>1a</sub>: H<sub>1ao</sub>, H<sub>1al</sub>

Table 6. Research Question (Q<sub>1a</sub>) and Supporting Hypotheses

Research Question 1 <sub>a</sub>	Q <sub>1a</sub> : Is there an empirical relationship between hotel room rate discounting and hotel financial performance?
Null Hypothesis	H <sub>1ao</sub> : There is no significant relationship between hotel room rate discounting and hotel financial performance.
Alternative Hypothesis	H <sub>1al</sub> : There is a significant relationship between hotel room rate discounting and hotel financial performance.

After determining if the time series data set under investigation demonstrated persistent trends of the past as evidenced by the ADF and PP unit root tests, the study proceeded to address Q<sub>1a</sub>: H<sub>1ao</sub>, H<sub>1al</sub>. This assessment involved the first step of the Engle Granger two-step procedure for cointegration analysis. The variables were regressed in their level form to determine if an empirical relationship existed between the variables. The results of the standard regression analysis did not reveal a statistically significant relationship between the variables, discounting room rates and hotel financial performance ( $F_{1,43}=2.71$ ,  $p=.108$ ). Only .06 of the variance in the hotel financial performance variable was explained by discounting room rates. The residuals were also tested for autocorrelation using a Durbin Watson (DW) test. The DW value was relatively low at a .999. The results for the regression analysis are presented in Table 7.

Table 7. Regression Analysis Results: Discounting and Hotel Financial Performance, Level Form

Residuals	Coefficient	t	P> t
Discounting	0.7377	1.65	0.108
Constant	3.478	11.5	0.001

$R^2 = 6\%$ , F statistic = 2.71

The residuals from the standard regression were then calculated and tested for a unit root in level form data using the ADF and PP unit root tests. This assessment is done for several reasons. The first reason is to determine if the variables are integrated of some order,  $I(d)$ . The second reason is to determine if a linear combination exists between the variables. If a linear combination exists between the variables, then the third reason for testing the residuals stationarity condition is used in a later statistical analysis, the Johansen and Juselius procedure (1990), which determines if there is a long-term cointegrating relationship between the variables. The results of the unit root tests for the residuals are presented in Table 8.

Table 8. Unit Root Tests: Residuals

Residuals	Test Statistic	1% Critical Value	5% Critical Value
ADF Test Results			
Level Form	-3.765	-3.634	-2.952
PP Test Results			
Level Form	-19.533	-18.356	-13.044

\* Indicates that the test statistic is significant at the 1% and 5% levels of significance as observed by the MacKinnon approximate p-value. ( $p < .001$ )

As observed in Table 8, the ADF estimated test statistic ( $t=-3.765$ ) for the residuals in its level form exceeds the 1% critical value of -3.634 and the 5% critical value of -2.952 ( $p<.001$ ).

The results of the PP unit root test indicate similar findings. The estimated test statistic ( $t = -19.533$ ) is greater than the 1% critical value  $-3.634$  and the 5% critical value of  $-13.044$  ( $p < .001$ ). Therefore, the null hypothesis of the residuals' series containing a unit root may be rejected and the variables are thus considered to be integrated of some order,  $I(d)$ .

An assumption of two of the statistical analyses that are used later in this study (i.e. the cointegration analysis and the error correction model) which assess the long and short-term relationships between the variables requires that the residuals achieve stationarity in their level form. This would mean that although the variable discounting was non-stationary in its level form, when it was regressed on hotel financial performance the residuals should form a stationary series in their level form, or an integrated process with hotel financial performance.

According to the results of the ADF and PP unit root tests for the residuals, this assumption was satisfied. Thus, discounting and hotel financial performance are said to be integrated of order one,  $I(1)$ , and a substantive long-term equilibrium relationship between the two variables exists. An integrated process between the variables provides empirical support that a cointegrating long run relationship exists. It does not provide information regarding the amount of cointegrating relationships or the direction of those relationships between the variables. Therefore, this long-term relationship will be further assessed at later steps in the ensuing methodological procedures.

The statistical values that are presented in Table 7 and that were generated by the standard regression analysis in the level form data between discounting and hotel financial performance may be of concern to most in that the findings are not statistically significant. In observation of the coefficient exceeding  $.10$  and the standard regression model's F value not being significant, the results of the standard regression may be ambiguous. Specifically, the

results may be ambiguous due to the residuals indicating that the two series are I(1). As suggested by Hendry and Juselius (2000), a time trend may be added to the regression model as an additional independent variable to re-test the significance of the relationship between the variables.

Of additional concern, regarding the value of the coefficient and the F value of the standard regression is the potential for outliers in the time series data set. A review of the variable, hotel financial performance, revealed that there was one data point that was observed in the 27th time period that posted an extreme value that was severely lower than the other values in the series. After confirming with the hotel property's revenue management department that the deep deficit reported was not a data entry error, a robust regression with a time trend was used to circumvent the outlying data point by accounting for the large residual. This was done through a series of weighted least squares and iteration processes.

Each of the iteration processes that were generated by the robust regression model applied a new set of weights that were determined based on the values of the residuals (i.e. the larger the residual the smaller the weight). The iteration process continued until the parameter estimates in the model were small enough to the point where the large residual value from the outlying 27<sup>th</sup> data point of hotel financial performance was no longer resisting the series trend. This procedure is typically adopted in time series analysis rather than removing an observation from a series and violating the assumption of continuous data points in an OLS time dependent regression (Juselius, 2008). The robust regression, which was used to treat the outlier, included a time trend as an independent variable the results of which generated six iterations of weighted least squares. The coefficient of determination improved to 18% of the variance in the model ( $F_1$ ,

$t_{41}=3.96, p \leq .01$ ) thereby providing additional evidence that an empirical relationship exists between the variables.

This completes the assessment for research question set number one. What has been observed thus far is that the variable, discounting, contained a unit root in its level form but through differencing rendered stationarity; the variable, hotel financial performance, was stationary in its level form as well as in the first difference form; both variables were stationary when considering a time trend and a drift; the first step of the Engle Granger two step procedure revealed an ambiguous model that was corrected by adding a time trend as an independent variable; a weighted least squares iteration process was used to correct a large residual value in the hotel financial performance time strand; and, the residuals from the standard regression between discounting and hotel financial performance were stationary in level form and the variables were integrated of  $I(1)$ ; thus, providing evidence of a long-term relationship between the variables.

#### Research Question 2 and Supporting Hypotheses

The use of the rational expectations theory in this study implies that the variables are integrated. This means that the series under investigation should retain some past effects making it non-stationary where future management anticipations would be dependent upon the accumulation of past influences that are used to formulate future expectations (Banerjee et al., 1994). In other words, the relationship between discounting room rates and hotel financial performance should be convergent over the long run of time (Muth, 1961). Research question two assessed this relationship between the variables.

Table 9. Research Question (Q<sub>2</sub>) and Supporting Hypotheses

Research Question 2	Q <sub>2</sub> : Is there a long-term cointegrating relationship between discounting of hotel room rates and hotel financial performance?
Null Hypothesis	H <sub>20</sub> : There is no long-term cointegrating relationship ( $d > 1$ ) between discounting of hotel room rates and hotel financial performance.
Alternative Hypothesis	H <sub>21</sub> : There is a long-term cointegrating relationship ( $d < 1$ ) between discounting of hotel room rates and hotel financial performance.

The results of the ADF and PP unit root tests for the residuals from research question one indicated that the variables, discounting and hotel financial performance, were integrated of I(1). This test result was a preliminary indication of a long-term relationship between the variables. However, the standard regression in the level form data generated a low coefficient of determination (.06) and a DW value of only .999. A robust regression with a weighted least squares approach was used to improve these values and to manage an extreme outlier.

However, based on the regressions' values, it would seem that even as the data was rigorously tested for stationarity that the past information compressed within the variables' series may still be influencing the results that were generated regarding the relationship between the variables. Therefore, an autodistributed lag model (ADL) ( $Y = x + x_{t-1} + y_{t-1}$ ) was used in order to incorporate a combination of each of the variables in the form of residuals to enhance the coefficient of determination. The results of the ADL model are presented in Table 10.

Table 10. ADL Model: Discounting and Hotel Financial Performance ( $t-1$ )

Variable	Coefficient	t	P> t
Discounting	.7108	1.02	.314
Discounting ( $t-1$ )	-.2144	-.30	.765
Hotel Financial Performance ( $t-1$ )	.4867	3.48	0.001
Constant	1.714	3.02	.005

$R^2 = .30$ , F statistic = 5.32



A DW test was conducted using the lagged operator of the variables. It generated an acceptable value of 1.90 (Juselius, 2008). The results from Table 10 exhibit that the overall regression model has improved with the introduction of the lagged operator of the variables. However, examination of the level of significance of the variables reveals that the ADL model does not adequately explain the changes in the variables as indicated by the  $t$  values' levels of significance. This issue will be addressed through the execution of an error correction model performed in a later step of the methodological procedures.

Autocorrelation may occur when lagging variables and the DW test may not necessarily generate an accurate or reliable value if there is autocorrelation of the residuals. However, the individual variables are not significant in the ADL model. Therefore, the Breusch Godfrey (BG) test will be conducted to determine autocorrelation at a later step in the assessment of the relationship between the variables.

In order to proceed with the assessment of the long-term relationship between the variables, it was necessary to test for endogenous effects of the independent variable (discounting room rates). Testing for endogenous effects examines the length of lags (time horizon) that the independent variable maintains its position as the explanatory variable. The AIC (.0703) indicated that the series strand for discounting might hold memory for a maximum lag length of four time period observations. The SBIC (.2216), which is the more robust value, indicated that the explanatory variable, discounting, was not sensitive to the lagging order. The ADF test was conducted three more times. The first time using a lagged operator of four ( $Lx_t = x_{t-4}$ ) as suggested by the AIC, the second time using the lagged operator of four with consideration for a trend, and the third using the lagged operator of four with consideration for a drift. The results of these tests are included in Table 11.

Table 11. Endogenous Effects: Lagged Operator Four

Discounting	Test Statistic	1% Critical Value	5% Critical Value
ADF Test Results			
$Lx_t = x_{t-4}$	-3.155	-3.668	-2.966*
$Lx_t = x_{t-4}$ (trend)	-3.244	-4.270	-3.552
$Lx_t = x_{t-4}$ (drift)	-3.155	-2.453*	-1.696*

\* Indicates that the test statistic is significant at the 1% and/or 5% levels of significance as observed by the MacKinnon approximate p-value, ( $p < .05$ )

The test statistic (-3.155) for the  $Lx_t = x_{t-4}$  was greater than the 5% level of significance of -2.966 ( $p=.05$ ); as well as the test statistic (-3.155) for the  $Lx_t = x_{t-4}$  (drift) was greater than both the 1% critical value of -2.453 and the 5% critical value of (-1.696) ( $p<.05$ ). The test statistic for  $Lx_t = x_{t-4}$  (trend) did not exceed the critical values at the 1% or 5% levels of significance. The important statistical value from Table 11 is the lagged operator four with a drift. The lagged operator of four time observations (as suggested by the AIC) with the incorporation of a drift in the unit root processes may capture auto correlated omitted variables which would appear by default in the error term. Rejecting the null hypothesis of potential drifts in the unit root process assists to ensure that the regression model is not mis-specified.

Based on the AIC (.0703), the vector autoregressive rank (VAR) model used a lag operator of four to determine the vector rank relationship between the variables, discounting and hotel financial performance. A vector rank relationship indicates the amount of long-term relationships between the variables (Juselius, 2008). In other words, there is a meaningful equilibrium relationship between the variables over the long run of time that either moves from a unidirectional or bidirectional process.

The null hypothesis of the VAR model is that there is no rank (relationship) at the zero maximum rank row. However, the estimated value of the Trace statistic (20.3915) is greater than

the 5% critical value of 15.41. Thus, the null hypothesis of no rank is rejected. The Trace statistic indicated that the maximum amount of cointegrating vectors was one. This means that there is one moving process towards a cointegrating relationship between the variables, discounting and hotel financial performance. The results of the VAR model are presented in Table 12.

Table 12. VAR Model Results

Maximum Rank	Trace R = 0	Trace R = 1	Critical Values Trace (5%)
1	20.3915	1.0717	3.76

\* 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.

The findings from the VAR model confirm what was found after regressing the variables in their level form and assessing the stationarity conditions of the residuals' series. The residuals' series did not contain a unit root in its level form and therefore demonstrated a general long-term relationship between the variables. The variables were found to be integrated of order I(1) which provided evidentiary empirical support that the variables may cointegrate over time but did not provide indication regarding the movement process (unidirectional or bidirectional) to equilibrium.

The Trace statistic supported the long run relationship that was indicated by the integrated process between the variables and specified a unidirectional movement path to an equilibrium position. However, to be certain that a position of equilibrium exists between discounting room rates and hotel financial performance, a closer examination of the adjustment coefficient,  $\alpha$ , was necessary (Hoover, 2003). In order to determine if the VAR model was correctly specified, further statistical assessment was required to understand the association

between the variables over time through use of an error correction mechanism (Banarjee et al., 1994; Hendry & Juselius, 2000; Juselius, 2007).

### Research Question 3 and Supporting Hypotheses

In order to be certain that the variables converge to an equilibrium position the model must be equilibrium correcting, i.e. discounting room rates corrects for decreases in hotel financial performance through a transitory cobweb pricing behavior ( $-\alpha$ ) that attains equilibrium over the long run of time. In order for this cobweb pricing behavior to occur, the  $\alpha$  must carry the plausible negative value sign that would push and pull the coefficient,  $\beta$ , back to a position of equilibrium,  $\beta\chi_t = \beta_0$ . If the  $\alpha$  is not does not possess the expected negative value sign, then the model is not equilibrium correcting to the equilibrium error ( $\chi_{1, t-1} - \chi_{2, t-1}$ ) (Juselius, 2007). Research questions three ( $Q_3$  and  $Q_{3a}$ ) assess the specification of the VAR model and the short-term relationship between the variables.

Table 13. Research Question (Q<sub>3</sub> and Q<sub>3a</sub>) and Supporting Hypotheses

Research Question 3	Q <sub>3</sub> : Is there a short-term relationship between discounting of hotel room rates and hotel financial performance?
Null Hypothesis	H3 <sub>0</sub> : There is no short-term relationship between discounting of hotel room rates and hotel financial performance.
Alternative Hypothesis	H3 <sub>1</sub> : There is a short-term relationship between discounting of hotel room rates and hotel financial performance
Research Question 3 <sub>a</sub>	Q <sub>3a</sub> : If an empirical relationship exists, does the correlation coefficient carry the expected negative value sign that would indicate an inverse relationship between room rate discounting and hotel financial performance?
Null Hypothesis	H3 <sub>a0</sub> : The correlation coefficient does not carry the expected negative value sign that would indicate an inverse relationship between room rate discounting and hotel financial performance.
Alternative Hypothesis	H3 <sub>a1</sub> : The correlation coefficient carries the expected negative value sign that would indicate an inverse relationship between room rate discounting and hotel financial performance.

In research question one, the variables were found to be integrated of I(1) and the residuals from the Engle Granger two step procedure were stationary in their level form. The integrated process between the two variables means that a linear combination exists between discounting and hotel financial performance that results in a long-term cointegrating relationship. The ADL model revealed that past information compressed within the time series strands seems to matter and improved the regression model. The VAR model and Trace statistic generated evidence of one cointegrating vector relationship.

If a long run relationship exists between the variables, as indicated by the above processes, then there must also exist an error correction mechanism that would provide the anticipated short run dynamics between the variables that would lead to an equilibrium position. Therefore, evidence of a long-term equilibrium relationship between the variables generally provides evidence of a short-term relationship. In order to assess the short-term relationship between

discounting room rates and hotel financial performance an error correction model was used.

Hendry and Juselius (2000) posit that error correction mechanisms are a way of capturing adjustments in the dependent variable (hotel financial performance) that did not depend on the level of the explanatory variable (discounting room rates) but rather on the extent to which the independent variable deviated from the equilibrium relationship with hotel financial performance. The error correction model's ability to account and explain for change in the dependent variable is the reason why the insignificant results of the  $t$  values as previously discussed in the ADL model were not of immediate concern. The error correction model includes within the regression a calculation for the extent of an adjustment in a given time period to the deviations from the long run equilibrium relationship (Banerjee et al., 1994).

The following equation was used to assess the short-term relationship between the variables:

$$\Delta y_t = \alpha_0 + \alpha_1 \Delta x_t + \alpha_2 \mu_{t-1} + \varepsilon_t \quad (\text{Equation 16})$$

where  $\alpha_0$  is the constant,  $\alpha_1 \Delta x_t$  is the short-term elasticity,  $\mu_{t-1}$  is the error correction term, and  $\varepsilon_t$  is the White noise error. The results of the error correction model are as follows.

$$\Delta \text{Financial Performance} = .057 + .98 \Delta \text{Discounting} - .599 \mu_{t-1} + \varepsilon_t \quad (\text{Equation 17})$$

(2.00)\*                      (1.98)\*                      (-5.51)\*

\* R-square=0.29; F=18.01\*; DW= 1.90; Breusch-Godfrey LM test=0.288 (p=0.5912); Breusch-Pagan test = 2.20 (p=.1376);  $t$ -values are shown in parentheses; (\*) denotes significance at the 5% level.

The results from the error correction model indicated that there is a positive short-term relationship (0.98) between hotel financial performance and discounting, which seems to reveal that discounting is an effective pricing strategy in the short run. The estimated adjustment

coefficient for discounting is a  $-0.599$  ( $t = -5.51$ ;  $p < 0.001$ ), and because  $d/b < 1$  there is a clear convergence to the mean, or in other words an equilibrium relationship. The adjustment coefficient carries the expected negative value sign that is required to generate a cobweb-pricing pattern. The adjusted  $R^2$  is 0.29, an F-statistic of 7.76 ( $p < 0.001$ ) and a Durbin-Watson (DW) of 1.89. In addition to the DW, a Bruesch-Godfrey LM test for autocorrelation was conducted. The results indicate that the null hypothesis of no serial correlation may be rejected (Chi-square is 0.288 with a p-value of 0.5912). Finally, a Breusch-Pagan/Cook-Weisberg test for heteroskedasticity indicated a statistical estimate of 2.20, with a p-value of 0.1376 thereby failing to reject the null hypothesis of no heteroskedasticity. The elimination of potential heteroskedasticity of the error terms was through iteration processes with a weighted least squares approach as previously eluded.

The error correction term is statistically significant suggesting that hotel financial performance adjusts to discounting room rates with one lag; that more than half of the all the discrepancy (60%) between the long and short-term financial performance is corrected for within in one month. From the regression analysis it is noted that in the short run discounting hotel room rates is approximately, .98, the value sign is positive and significant with a  $t$  statistic of 1.91. In other words, the effects of discounting room rates dilute from the series almost immediately after the first month (98%) in the hotel property under review. The long run elasticity is approximately .74. This means that the results of the error correction model reveal that in the short-term there is empirical evidence that discounting works to correct for equilibrium deviations.

Thus far, the nature of the relationship between the variables has been assessed in terms of the long-term relationship (integrated process and vector integration) and a short-term

relationship (error correction model). The integrated process revealed that there was a long-term equilibrium relationship between the variables. The VAR model indicated that the moving process to equilibrium was unidirectional. And, the error correction model revealed that the error correction term carried the expected negative value sign and an accelerated adjustment speed that would draw the variables back to equilibrium at times of disequilibria. What has not yet been assessed is the directional cause of the relationship between the variables. In order to assess this aspect of the relationship a Granger causality test was used.

The null hypothesis for the Granger causality test is that discounting room rates does not Granger-cause hotel financial performance. The independent variable (discounting) Chi-squared statistic of 5.9637 was not significant ( $p=.113$ ). Therefore, the null hypothesis cannot be rejected. This means that discounting hotel room rates does not Granger-cause hotel financial performance. However, the dependent variable (hotel financial performance) Chi-squared statistic is 9.3818 is significant ( $p<.05$ ). Therefore, the null hypothesis may be rejected and it may be said that hotel financial performance Granger-causes discounting hotel room rates. The assessment for research question set three and the supporting hypotheses is now complete.

#### Research Question 4 and Supporting Hypotheses

Research question number four uses the combination of the results generated from the previous statistical analyses in order to determine the managerial expectation formation process of hotel room rates. The question and its supporting hypotheses are restated in Table 14.



Table 14. Research Question (Q<sub>4</sub> and Q<sub>4a</sub>) and Supporting Hypotheses

Research Question 4	Q <sub>4</sub> : Is the lodging managerial expectation formation process of room rate price setting based on a backward looking model where expected and current room rates are dependent upon past rates charged?
Null Hypothesis	H <sub>40</sub> : The lodging managerial expectation formation process of room rate price setting is not based on a backward looking model where the expected and current room rates are not dependent upon past rates charged.
Alternative Hypothesis	H <sub>41</sub> : The lodging managerial expectation formation process of room rate price setting is based on a backward looking model where the expected and current room rates are dependent upon past rates charged.

The adjustment process of room rates over time seems to indicate a rational price setting process that was initially assessed in the unit root tests of research question one and supported by convergence of the variables in research question two. A rational price setting process infers that hotel managers use all available past information to project a future optimal room rate that may allow them to forwardly project room rates. The ADL model demonstrated that price adjustment lags were made to room rates when a disturbance or a shock to the market occurred (i.e. seasonal demand schedules).

Application of the managers' rational price setting process, which is based from the rational expectations theory (Muth, 1961), to the cobweb model (Carlson, 1968) assumes that the expected hotel room rate equals the actual room rate from the previous fiscal period; that the available room supply would be a function of the expected room rate; and, that the room rates would be adjusted to consumer demand thereby resulting in a clearing of the market (Carlson, 1968; Chatwin, 2000; Corgel, 2004). This means that when the rational expectations theory is used in conjunction with the cobweb model, it is assumed that the available hotel room inventory is time dependent on the previous time period.

The cobweb model assumes that a room rate adjustment will result in consumers purchasing the entire available room inventory. This is not a likely supposition that would practically occur in the lodging industry. Therefore, a first order difference equation of the cobweb model relates the number of rooms sold in the current period to the number of rooms sold in the previous period to account for the available rooms that were not sold (i.e. random error) (Carlson, 1968; Muth, 1961; Turnovsky, 1970). That equation as referenced in the previous chapter would be denoted as follows:

$$P_t = \frac{d}{b} P_{t-1} + \frac{c-a}{b} \text{ or } P_t = f(P_{t-1}) \quad (\text{Equation 181})$$

In other words, the current value of a variable in one time period is expressed as a function of its own past value and some random error (Croes et al., 2010). The unit root that was observed in the discounting variable; the integrated I(1) process that was revealed between the variables; the convergence between discounting and hotel financial performance; and, the equilibrium correcting model verified by the error correction mechanism provides support that managers' expectation formation process coincides with the theoretical premise of the rational expectations theory (Muth, 1961). This means that managers' expectation formation process for future room rates that will match future demand conditions may be based on a backward looking thought process to forwardly project future expectations of room rates and hotel financial performance. The following chapter five will provide a discussion regarding the theoretical and practical implications for the empirical results that were generated by the statistical analyses performed in the study.

## CHAPTER FIVE: CONCLUSIONS AND IMPLICATIONS

### Introduction

The last chapter provides a comprehensive discussion regarding the study and its empirical findings. The chapter begins with a summary of the study that reviews the purpose, the methods used to assess the research hypotheses, and a brief review of the current hospitality research claims pertaining to the use of discounting in the lodging industry. Each research question and its supporting hypotheses are then separately discussed in terms of the study's expected findings and the supporting or opposing hospitality literature. The significance and the contribution of the study and the research is provided and then followed with suggestions for future research. The chapter concludes with a brief summary.

### Summary of the Study

The central focus of this study was to provide an empirical explanation regarding the efficacy of the managerial expectation formation process as it contributes to the understanding of discounting room rates as a rational strategic phenomenon in the lodging industry. 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 et al., 1998). In recognition of this operational based perspective, the lodging industry is identified 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, et al., 2009; Hanks et al., 2002; Jang, 2004). Yet, empirical foundation for this industry practice is lacking in extant hospitality literature. Of critical importance to this study, then, 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. Moreover, 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 literature and that are rooted in deterministic perspectives.

A review of hospitality literature reveals that, although the lodging industry commonly incorporates discounting as a pricing strategy, recent research implies that high occupancy levels at discounted room rates do not necessarily lead to an increase in hotel financial performance (Canina & Enz, 2006; Chan & Wong, 2006; Enz, 2009; Enz & Canina, 2007; 2008; Enz et al., 2009; Enz, et al., 2004). The contrast between what is practiced and the recommendations from pricing strategy studies has led to lack of consistent agreement in current lodging literature regarding how discounting of hotel room rates relates to hotel financial performance (Croes et al., 2010; Cross et al., 2009).

Herein lays the origin of this study: *what is the nature of the empirical relationship between hotel room rate discounting and hotel financial performance?* There is limited research regarding this relationship as well as the internal process that a hotel manager uses to determine

an accurate room rate that corresponds to seasonal lodging market demand conditions. The available hospitality literature that investigates this relationship seems devoid of salient theoretical principles that could provide explanation of the practical cognition of hotel managers' price setting behavior in the lodging industry.

Most of the available literature that assesses this relationship adopted methods that used descriptive statistic analyses to draw an association between the variables from the presupposition of a deterministic marketplace. The results that were produced from such studies are without representation of random fluctuations that may occur between room supply and demand and the effects that those fluctuations may have in the development of future short and long-term relationships between the variables. Thus, the available literature on the relationship between discounting and hotel financial performance has widely focused on the development of normative economic expectations regarding what managers should avoid doing with regards to the application of discounting room rates as a viable pricing strategy.

What seems to emerge, then, as the recommendation for managers is the adoption of an ADR that is used as a constant price over time as opposed to the use of room rate adjustments that may correspond with the rise and fall of consumer demand over time. This takes the perspective that the market is static rather than dynamic thereby placing restrictive value on a dynamic pricing schedule that uses variable room rate adjustments to compensate for the economics of price change. In adopting a deterministic perspective and normative economic recommendations for lodging managers, one may fail to grasp that a hotel's business cycles are characterized by short-term sales variations that may not be best represented by linear correlative perspectives that may assume static pricing behavior.

Assumptions of linearity between room rates and consumption patterns in the lodging industry would presuppose that lodging market conditions remain relatively stable over time. This condition is not a likely characteristic of a dynamic system. Therefore, the recent recommendation that hospitality literature makes to managers regarding the adoption of a constant ADR may reveal a distortion of the stochastic demand patterns of room night sales. This would assume that there is a stable room consumption pattern that generates perpetual market equilibrium (Baker & Riley, 1994; Brown & Dev, 1999).

If the lodging industry were a static system as opposed to a dynamic one, there would be an absence of time horizons that present unfavorable market conditions, there would be no representation of a downward slope for room demand, managers' level of room demand would remain certain, and the hotel may seem to perform optimally throughout the course of the year (Jeffrey et al., 2002). These are not traditional characteristics or qualities of the lodging industry. Therefore, this study endeavors to recognize the difference between long and short-term financial goals of hotel managers. In the short run, managers are concerned with determining the optimal room price that will sell in current market conditions to avoid a room from remaining vacant while incurring high fixed costs of operation (van der Rest & Harris, 2008). In reference to low demand periods, a short-term hotel management goal may be to compensate for the elastic nature and the excess available room capacity by adjusting the price with the expectation that a price decrease may inversely affect room demand and therefore short run profits.

However, over the long run, managers may aggregate financial periods and integrate market conditions where normal costs become the forefront and a 'normal value' (i.e. ADR) is calculated as the room rate, *ceteris paribus*, with cyclical effects removed and a trend path assumed that would maximize future hotel financial performance (Uner et al., 2008). This study

sought to forward a methodological framework supported by the rational expectations theory and the cobweb model that could account for the dynamics of the industry while empirically assessing both the short and long-term relationships between the variables: discounting room rates and hotel financial performance.

In order to examine these relationships, the statistical assessments that were employed in the study considered the use of error terms as opposed to that of average room rates. The study called for the critical attention regarding the use of statistical residuals based on its research claim that pricing decisions formed from averages may prove to be less than optimal for fluctuating demand conditions in the lodging industry. The use of statistical residuals is based on the assumption that error terms might provide more information that could facilitate an explanation regarding the pricing strategies of managers. The study was framed with the rational expectations theory in order to explain the synthesizing process that managers may use to structure their expectation formation of future room rates that fall within accordance to the dynamic market conditions.

An econometric case study research design was used in conjunction with a cointegration analysis and an error correction model in order to assess the empirical nature of the relationship between the variables by accounting for the erratic variations of room demand over time as induced by random error fluctuations. A non-deterministic system was assumed and supported through the analysis of the stationarity conditions of the time series data set under investigation. The reason for including residuals within the model pertains to the assumption that every dependent variable has both a structural behavior and an irregular (erratic) behavior. The benefit of incorporating the erratic behavioral component is the information that it may supply regarding

the stochastic shocks that influenced the variables to drift away from an equilibrium position (Mukherjee et al., 1998).

The cointegration analysis examined the long run deviations from the unity relationship between discounting room rates and hotel financial performance as was implied by the rational expectations theory for the hotel that was under investigation. Points of convergence between the variables referred to the degree to which managerial price setting expectations are considered rational and are related to the availability of more information from the lodging market of the hotel's location as was supported by the order of integration process between the variables. The cointegration analysis did not account for the short run errors or deviations from market equilibrium. Therefore, through the examination of the short-term relationship, an error correction model was used to determine if the model was equilibrium correcting.

The study's methodological procedures followed a rigorous sequence of steps in order to properly apply the statistical analyses required to test the following research questions. The high explanatory power of the statistical techniques, specifically the error correction model, suggests that the study should hold high levels of internal validity for the hotel under investigation (Juselius, 2008). The error terms were treated as a variable within the study's model in order to provide an indication that the estimated model was reasonably specified and to ensure that the theoretical proxies used may be validated through the assessment process of alternative future hotel cases.

Q<sub>1</sub>: Do the time series under investigation demonstrate persistent trends of the past?

Q<sub>1a</sub>: Is there an empirical relationship between hotel room rate discounting and hotel financial performance?



Q<sub>2</sub>: Is there a long-term cointegrating relationship between discounting of hotel room rates and hotel financial performance?

Q<sub>3</sub>: Is there a short-term relationship between discounting of hotel room rates and hotel financial performance?

Q<sub>3a</sub>: If an empirical relationship exists, does the correlation coefficient carry the expected negative value sign that would indicate an inverse relationship between room rate discounting and hotel financial performance?

Q<sub>4</sub>: Is the lodging managerial expectation formation process of room rate price setting based on a backward looking model where expected and current room rates are dependent upon past rates charged?

### Conclusions

The following sections discuss the findings and conclusions for each of the research questions and their supporting hypotheses. The anticipated and actual findings are compared to one another and also discussed referenced within the context of existing hospitality literature. The theoretical and practical implications of the research findings are discussed in a later section.

### Research Question 1

Q<sub>1</sub>: Do the time series under investigation demonstrate persistent trends of the past?

As previously mentioned, the purpose of this study is to explain the managerial expectation formation process of price setting as it contributes to the understanding of discounting hotel room rates as a rational strategic phenomenon in the lodging industry.

Research question one was specifically linked to a fundamental concept of this research purpose; that is, to provide explanation regarding the “*managerial expectation formation process*” of price setting in the lodging industry. In order to provide this explanation, the time series under investigation was assessed via unit root tests (ADF and PP) to determine if the series contained persistent trends of the past.

The managerial expectation formation process pertains to *how* lodging managers form a room rate that they expect will sell in *tomorrow’s* market conditions that are *today* still unknown. This study attempts to explain discounting as a rational phenomenon that is demarcated according to the rational expectations theory. Under the rational expectations theory, hotel managers are considered to be rational optimizers who would like their expectations for future room rates to be as precisely priced as what the market would tolerate. This means that hotel managements’ expectation formation process of room rates should demonstrate “*memory*,” or dependence from one time observation to the next, where the best expectation of today’s room price would be the value of yesterday’s room rate charged (Jeffrey et al., 2002).

This rational expectation formation process of appropriate room rates that coincide with anticipated room demand seems to be fundamental to successful hotel management operations (Pan, 2007). Value of expectation involves how price will affect the firm’s future levels of occupancy, revenue, and profit. Because the competitive structure of the lodging industry is mainly induced by the short-term inelasticity of supply, pricing appears volatile. Consequently, a hotel manager needs to form expectations of the prices that are likely to be obtained while focusing on probable levels of future demand. This may be difficult to accomplish when considering the incidence of constrained supply compounded with the perishable nature of the

hotel room night product (Finch et al., 1998; Jeffrey et al., 2002; Schwartz, 1998; Schwartz & Cohen, 2003; van der Rest & Harris, 2008; Wheaton & Rossof, 1998).

Therefore, hotel managers may reduce current room rates with the expectation of higher prices in the future (Choy, 1985; Finch et al., 1998; Hanks et al., 2002; Schwartz & Cohen, 2004). This managerial activity reduces prices in periods of excess supply and tends to raise prices in periods of excess demand thereby providing a degree of automatic price stabilization and market equilibrium (Avinal, 2004). For these reasons, current supply and demand of hotel rooms will depend both on expected prices and on prices previously projected to prevail in the current market period. A higher expected future price will raise the current price. A higher expectation of pricing today based on the expectations of the past will raise the room rate and hence depress demand thereby decreasing the current price of a room night (Corgel, 2004; Croes et al., 2010). The application of the rational expectations theory may capture this expectation formation process of lodging managers in the form of a persistent trend, or time dependent observations, that the time series may hold.

A review of literature revealed little about the use of the rational expectations theory as applied to the expectation formation process of room rates in the lodging industry. The theory describes economic situations in which the outcome of product sales depends partly upon what managers expect to happen (Muth, 1961) in a market. This theory plays a central role in the determination of hotel business cycles according to future expectations of room demand and price limitations that are appropriate to match those demands. The observation of a persistent trend in the time series data set will also play an important precursor condition if the variables are to converge to equilibrium as anticipated under the rational expectations theory. Therefore, the following research hypotheses were tested for each variable time strand.

H1<sub>0</sub>: The time series under investigation do not demonstrate persistent trends of the past.

H1<sub>1</sub>: The time series under investigation do demonstrate persistent trends of the past.

The results of the ADF and PP tests revealed that the discounting time series strand contained a unit root in its level form data (Table 3). The test statistic was less than the 1% and 5% critical values ( $t = -1.995, -3.634, -2.952, p = .2888$ ). Thus, the general null hypothesis for unit root tests would not be rejected. However, for purposes of this study and in accordance with the hypotheses noted above, the null hypothesis is rejected and the discounting time strand is said to contain a unit root. However, the results of the ADF and PP tests also revealed that the time series strand for hotel financial performance was stationary in its level form at both the 1% and 5% critical values ( $t = -3.663, -3.636, -2.952, p < .001$ ) (Table 4). Hence, we failed to reject the null hypothesis.

Evidence of the unit root in the discounting time strand is indicative of a series that holds memory and is non-stationary in its level form. This is a typical data trait of dynamic industries, such as that of the lodging industry, which is affected by stochastic shocks to the system (Hendry & Juselius, 2000; Juselius, 2007). Data that contains a unit root means that points of observation are not free from the influence of the previous observation (Croes & Semrad, 2009; Juselius, 2007). In order to remove a unit root from a series, the variables are differenced at least once thereby removing the stochastic trend and transforming the series to stationary (Hendry & Juselius, 2000). Both time series strands were transformed to the first order difference and were then found to be stationary (Tables 3 and 4). The unit root tests were also found to be stationary when conducted with a trend and drift for both variables (Table 5).

Based on industry practice that sets future room rates from past observation of performance; and, the theoretical framework of this study, it was anticipated that both variables would be found to be non-stationary in their level form. Hence, it was expected that both series would contain a unit root but that stationarity would be achieved after differencing the data. These results would have (in their preliminary form) provided evidentiary support that the constant room price adjustments observed in lodging markets is a rational price setting approach used by managers. This is because a rational price setting approach refers to the presence of a unit root that may then provide support for the adoption of the rational expectations theory to explain managers' expectation formation process of future room rates.

In other words, under the principles of the rational expectations theory, managers' best expectation of a current room rate would be the value of yesterday's room rate charged (Jeffrey et al., 2002; Muth, 1961). The premise of the rational expectations theory infers that time period  $t_2$  would include some relevant information from time period  $t_1$ , and time period  $t_1$  would provide some relevant information from time period  $t$  (Banerjee et al., 1994). This backward looking process to project future room rates carries past market information forward indicating that points of observation are not free from influence of the previous data observation, and therefore contain a unit root. This process will be further discussed in research question number Q<sub>4</sub> with the application of the cobweb model in conjunction with further discussion on the rational expectations theory. Based upon the results of the unit root tests for the discounting variable there is contrary evidence to the recent hospitality literature that disregards discounting as a viable pricing strategy in the lodging industry.

Opponents of discounting room rates view the constant price adjustments of room rates witnessed in the lodging industry as management's reaction to the concern of rooms perishing

due to the stress of temporal variations of demand; and that their understanding of projected earnings are at best, uncertain (Hanks et al., 2002). Under this perspective the lodging industry is described as a system of moves and countermoves of a competitive dynamic process where hotels are inherently dependent upon what their competitors do (Canina et al., 2005). This implies that managers appear to lack an understanding of future market conditions, which may cause them to fall short of expectations regarding projected earnings from room night sales. The recommendation to managers based on this interpretation of constant room rate adjustments is to maintain room rate averages over time while focusing on adding value to the core product through the development of supporting services, as well as to maintain price integrity in order to address uncertainty of the future demand conditions in the market (Canina et al., 2005; Carroll & Siguaw, 2003; Kimes, 2010; Kimes, 2009).

However, discounting proponents view the lodging industry as a dynamic system where it is assumed that expected price equals actual price from the previous fiscal period; that supply is a function of expected price, and that actual price adjusts to demand so as to clear the market (Carlson, 1968; Corgel, 2004). This formulation generates either convergent or divergent sequences resulting in the rise and fall of perishable product prices to regain market equilibrium (Carlson, 1968; Jeffrey et al., 2002). In periods where the relative slopes of demand and supply are offset, market equilibrium becomes discordant with supply and demand functions (Nelson, 1975). Such offsets are captured in hotel seasonality levels of occupancy resulting in price fluctuations of room rates (Corgel, 2004).

This process would seem to imply that the time series data strand of a hotel's discounted rates should '*hold memory*,' reflecting constant disturbances within the lodging market (Croes & Semrad, 2009). For example, a hotel manager may carry a past room rate that was set based on

specific market conditions (i.e. decreased demand) forward to the next fiscal period to assist in reducing his level of uncertainty regarding the appropriate price that would sell under current market conditions.

Room rate adjustments, therefore, seem to account for the oscillations in the market conditions where the time order of stochastic shocks to the system may induce deviations between supply and demand that display a random structure from the expected systematic performance of the hotel (i.e. random walks) (Hoover, 2003). However, the room rate adjustment process over time is the foundation of the dynamic setting that is standard in the lodging industry. In the short run, it seems that managers understand that analyzing the dynamics of room supply and demand is useful under the condition of seasonal shifts (Kalnins, 2006; Mak, 2004; Schwartz & Cohen, 2004). Therefore, the seasonal shifts may cause a disturbance or shock to the lodging market that may or may not lead to equilibrium stability so managers depend upon the use of past information to project future room rates thereby demonstrating a persistent trend from the past.

However, of particular interest in the discussion of the results from research question number one is that the dependent variable, hotel financial performance, did not contain a unit root in its level form and was found to be stationary. The Granger-causality test revealed interesting findings pertaining to this result that are discussed in the study's implications. However, the findings from the next research question (Q1<sub>a</sub>) are of critical importance to continue the investigation of this study pending the stationarity results of the dependent variable, which may suggest that the variables are not integrated. In order to determine if the variables possessed an empirical relationship, the integrated process of the variables was determined next.

### Research Question 1<sub>a</sub>

Q<sub>1a</sub>: Is there an empirical relationship between hotel room rate discounting and hotel financial performance?

The results of the standard regression analysis of the variables, discounting and hotel financial performance, did not reveal a statistically significant relationship ( $F_{1,43}=2.71$ ,  $p=.108$ ). Only .06 of the variance in the hotel financial performance variable was explained by discounting room rates (Table 7). However, the residuals that were generated from this statistical assessment were then tested for a unit root and were found to be stationary in their level form ( $t = -3.765, -3.634, -2.952$ ,  $p < .001$ ). This finding provided empirical evidence that the variables possessed an integrated process of I(1) (Table 8). Thus, giving indication that a linear combination exists between the variables that could suggest a substantive long-term equilibrium relationship between the two variables.

However, the statistical values of the coefficient and the standard regression model's F value were of concern regarding the specification of the model. Both of these values were not statistically significant and the coefficient exceeded .10. Due to these values, particularly the F value, the time series variable strands were reviewed for outlying data observations. It was found that the variable time strand for hotel financial performance contained a severe outlier.

Based on the assumptions of a continuous time series analysis a robust regression was used to circumvent this data point through a weighted least squares iteration process. A time trend was also added to the model as an additional independent variable to improve the model fit. After these processes were incorporated into the study's methodological procedures, the regression model improved and the coefficient of determination indicated that 18% of the variance in the



dependent variable could be accounted for by discounting room rates ( $F_{1, 41}=3.96, p \leq .01$ ). The hypotheses that were tested for research question 1<sub>a</sub> were as follows:

H1<sub>ao</sub>: There is no significant relationship between hotel room rate discounting and hotel financial performance.

H1<sub>a1</sub>: There is a significant relationship between hotel room rate discounting and hotel financial performance.

Based on the findings of the residuals being stationary from the standard regression analysis, and the robust regression with a time trend added, the null hypothesis was rejected. It was found that a statistically significant relationship exists between the variables, discounting and hotel financial performance. This was an expected result that was based upon the wide application of discounting hotel room rates in the lodging industry.

This statistically significant relationship seems to suggest that hotel managers depend upon this relationship to matriculate in order to compensate for times of decreased room demand. Acceptance of this relationship between product price and consumer demand provides incentives for hotel managers to reduce current prices with the expectation of higher prices in the future (Choy, 1985; Finch et al., 1998; Hanks et al., 2002; Schwartz & Cohen, 2004). This means that managers would discount room rates in periods of excess room supply and would tend to raise room rates in periods of excess consumer demand thereby providing an indication of the desire to maintain market equilibrium.

However, recent research departs from the expected inverse relationship between a product's price and consumer demand pertaining to the selling of room nights. The findings from the recent hospitality research tends to criticize the lodging industry's wide application of

discounting room rates to stimulate increased room sales during times of depressed consumer demand. This criticism is based on the research claim that hotels that discount room rates more than their competitors may have higher occupancy levels but generate lower RevPAR values (Canina & Carvell, 2005; Canina & Enz, 2006; Canina & Enz, 2008; Enz, 2003; Enz & Canina, 2007; Enz et al., 2009; Enz et al., 2004).

Consequently, there is implication of the existence of a negative relationship between discounting room rates and hotel financial performance. The results from research Q1 and Q1<sub>a</sub> do not seem to support this research claim. Instead, it appears that discounting may positively influence hotel financial performance. Therefore, further statistical assessment is required to determine the long and short-term relationships between the variables.

#### Research Question 2

Q<sub>2</sub>: Is there a long-term cointegrating relationship between discounting of hotel room rates and hotel financial performance?

The results that were generated from research questions Q1 and Q1<sub>a</sub> provided empirical evidence (i.e. an integrated process of I(1) and a statistically significant relationship between the variables) that there may be a long-term cointegrating relationship. Therefore, an ADL model was used to incorporate a combination of each of the variables in the form of residuals to enhance the coefficient of determination and to build a VAR model to test the following research hypotheses.

H<sub>20</sub>: There is no long-term cointegrating relationship ( $d > 1$ ) between discounting of hotel room rates and hotel financial performance.

H2<sub>1</sub>: There is a long-term cointegrating relationship ( $d < 1$ ) between discounting of hotel room rates and hotel financial performance.

The results that were presented in Table 10 indicate that the overall regression model improves with a coefficient of determination of .30 when introducing the lagged operator of the variables. This result provided further empirical support for Q1 that the past of each variable was influencing the future behavior of each time variable strand. Using a lagged operator of four, as suggested by the AIC (.0703), the VAR model determined that a unidirectional vector rank relationship existed between the variables over the long run of time. This relationship was evidenced by the Trace statistic (20.3915), which was greater than the 5% critical value of 15.41 (Table 12). Therefore, the null hypothesis that there is not a long-term cointegrating relationship between discounting hotel room rates and hotel financial performance may be rejected.

The use of the rational expectations theory in time series analysis implies that the variables should be integrated (Turnovsky, 1970), and that the series has retained some past effects making it non-stationary where future anticipations will be dependent upon the accumulation of past influences that are used to formulate future expectations (Banerjee et al., 1994). In other words, the relationship between discounting room rates and hotel financial performance (i.e. actual earnings) should be convergent over the long run of time (Muth, 1961). Points of convergence refer to the degree to which managerial expectations are considered rational and are related to the availability of more information from the lodging market of the hotel's location. The results from research questions Q1, Q1<sub>a</sub>, and Q2 fall within the parameters of the rational expectations theory.

It was anticipated that the constant room price adjustments used by managers to set variable pricing schedules would result in the time series data set being non-stationary. This expectation was not entirely supported, as the hotel financial performance variable was stationary in its level form. However, in the first order difference, both variables achieved stationarity and the residuals did not contain a unit root in the series strands' level form. This finding suggested an integrated process (Banerjee et al., 1994). The integration of the variables revealed by the unit root tests indicated that there was preliminary evidence of a long-term relationship that prevented the variables from diverging, thereby resulting in a long run equilibrium relationship (Nelson, 1975).

Therefore, the constant room price adjustments observed in the lodging industry were expected to lead to a sequence of room rates over time that would converge to equilibrium at  $X_t$  and would be cointegrated of  $I(1,0)$  represented as  $X_t \sim CI(1,0)$  where  $X_t$  is  $I(1)$  and where there exists a linear combination  $\beta$  at  $X_t$  of  $I(1-0)$  where  $b > 0$ .  $\beta$  is referred to as the integrating vector. This result suggests that discounting room rates and hotel financial performance may drift apart over the short run of time; however, the deviations that move the variables from equilibrium are stochastically bound; and, at  $X_t \sim CI(1,0)$ , the deviations will begin to diminish over time and the error terms that associate the variables will be stationary.

The standard empirical measure of an equilibrium state between the variables, discounting and hotel financial performance, therefore, is an examination of the consistency or rationality of market expectations over time. This means that variables may drift apart in the short run but cannot diverge over the long run as the variables should return to unity, or cointegrate to equilibrium under observation of the rational expectations theory (Hoover, 2003;

Muth, 1961). However, if the coefficient is larger than one ( $d > 1$ ), then the variables will diverge, or overshoot, and will not move to equilibrium over time (Banerjee et al., 1994).

When the variables are in an observed state of equilibrium, hotel managers do not have the incentive to change room rates and jeopardize the steady state relationship. However, as new exogenous shocks influence the steady state position between room rates and hotel financial performance, managers depend upon the inverse relationship of price and demand between the variables and typically respond with room rate adjustments (discounting) to try and correct for disequilibria. To be certain that a position of equilibrium exists between the variables, a closer examination of the adjustment coefficient was necessary (Hoover, 2003).

If the model is actually equilibrium correcting, i.e. discounting room rates corrects for decreases in hotel financial performance, then increases in consumer demand may increase a room rate and decreases in consumer demand could decrease a room rate; but the adjustment coefficient should draw the variables back to equilibrium over the long run of time. In order for this process to occur, the adjustment coefficient must carry the expected negative value sign that would push and pull the  $\beta$  back to a steady state position of equilibrium. The cointegration method that was used to assess research Q<sub>2</sub> may be applied in order to investigate the adjustment time of hotel managers' expectation formation process. Cointegration does not imply, however, that in the short run errors or deviations in the equilibrium relationship do not occur in systematic patterns, or are not serially correlated. Instead, cointegration indicates that in the long run the data set should be mean-reverting to equilibrium (Johansen & Juselius, 1990; Kulendran & Witt, 2001; Lim & McAleur, 2001; Webber, 2001). Therefore, the short run relationship was analyzed next.

### Research Question 3 and 3<sub>a</sub>

Research questions 3 and 3<sub>a</sub> are discussed in this section together due to the assumption of the expected negative value sign that an error correction mechanism should carry.

Q<sub>3</sub>: Is there a short-term relationship between discounting of hotel room rates and hotel financial performance?

Q<sub>3a</sub>: If an empirical relationship exists, does the correlation coefficient carry the expected negative value sign that would indicate an inverse relationship between room rate discounting and hotel financial performance?

Assessing the short-term relationship between discounting room rates and hotel financial performance captured the adjustments in financial performance that did not depend on the level of discounting room prices, but on the extent to which room prices deviated from the equilibrium relationship with hotel financial performance. This was a necessary step to take particularly after the ADL model did not reveal statistically significant  $t$  values. According to Engle and Granger (1987), if a series is integrated at vector  $x_t$  and are cointegrated of  $I(d,b)$  denoted  $X_t \sim CI(d,b)$  then  $x_t$  is  $I(1)$  and there exists a non-zero vector  $\alpha$  where  $\alpha' x_t \sim I(d-b)$ ,  $d \geq b > 0$ , then a long run relationship exists between the variables. If a long run relationship exists, there must also exist an error correction mechanism that would provide the anticipated short run dynamics between the variables that would lead to the equilibrium relationship.

During a state of disequilibria the adjustment coefficient,  $\alpha$ , from the error correction will activate adjustment forces that pull the variables back to a position of  $\beta x_t = \beta_0$  over the long run of time (Hoover, 2003). The adjustment speed depends upon the length of  $\alpha$  and the size of the equilibrium error. An error correction model was applied within this study based on the

assumption that if hotel managers depend upon the use of discounting room rates to achieve equilibrium over the long run, then there should also be a short-term relationship between the variables.

H3<sub>0</sub>: There is no short-term relationship between discounting of hotel room rates and hotel financial performance.

H3<sub>1</sub>: There is a short-term relationship between discounting of hotel room rates and hotel financial performance.

H3<sub>a0</sub>: The correlation coefficient does not carry the expected negative value sign that would indicate an inverse relationship between room rate discounting and hotel financial performance.

H3<sub>a1</sub>: The correlation coefficient carries the expected negative value sign that would indicate an inverse relationship between room rate discounting and hotel financial performance.

The results from the error correction model indicated that there was a positive short-term relationship (0.98) between hotel financial performance and discounting. This result seems to reveal that discounting is an effective pricing strategy in the short run. Thus, the null hypothesis for research question three may be rejected. This finding is in stark contrast to recent hospitality literature that has produced descriptive results that indicate discounting is not a viable pricing strategy for hotel managers to use during times of decreased demand.

Descriptive studies provide evidence that regardless of a hotel's location and price position that the majority of the hotels that used discounting as a pricing strategy posted higher annual occupancy levels but that the annual percentage differences in RevPAR, financial

performance, were lower than the competitive set. And, vice versa, hotels that held higher annual ADRs had lower occupancy levels but a higher annual RevPAR value (Canina & Enz, 2006; Canina et al., 2005; Carroll & Siguaw, 2003; Chan & Wong, 2006; Enz, 2003; Enz & Canina, 2009; Enz et al., 2004; Kimes, 2010; Kimes, 2009).

The estimated adjustment coefficient for discounting is a  $-0.599$  ( $t = -5.51$ ;  $p < 0.001$ ), and because  $d/b < 1$  there is a clear convergence to the mean, or in other words an equilibrium relationship. The adjustment coefficient carries the expected negative value sign that is required to generate a cobweb-pricing pattern. Hence, the null hypothesis for  $Q3_a$  may also be rejected. The adjusted  $R^2$  is 0.29, an F-statistic of 7.76 ( $p < 0.001$ ). The error correction term was statistically significant suggesting that hotel financial performance adjusts to discounting room rates with one lag; that more than half of all the discrepancy (60%) between the long and short-term financial performance was corrected for within one month.

From the regression analysis, it was noted that in the short run discounting hotel room rates is approximately, .98, the value sign is positive and significant with a  $t$  statistic of 1.91. In other words, there is an almost one to one relationship between discounting room rates and hotel financial performance, i.e. a 10% decrease from the BARR will result in the increase of revenues by 9.8% in the short run. The long run elasticity was approximately .74. This means that the results of the error correction model reveal that in the short-term there is empirical evidence that discounting works to correct for equilibrium deviations.

The error correction was anticipated to indicate that hotel financial performance depends upon the rate of change in hotel room price (discounting) and potentially on the deviation from the equilibrium relationship between the variables as indicated by the error correction adjustment process. What was not assessed in the error correction or the VAR models was the directional



cause of the relationship between the variables. In order to assess this characteristic of the relationship a Granger causality test was used.

The Chi-squared statistic for the discounting variable ( $\chi^2 = 5.9637$ ,  $p = .113$ ) was not statistically significant. Therefore, it cannot be said that discounting Granger-causes hotel financial performance. However, when examining the Chi-squared statistic for hotel financial performance ( $\chi^2 = 9.3818$ ,  $p < .05$ ) it may be said that hotel financial performance Granger-causes discounting room rates. This test result is interesting regarding the direction of the relationship between the variables and will be discussed further in the practical implications section of this chapter. The results that were produced for research questions 2, 3, and 3a provide empirical support for research question 4 regarding the theoretical model that incorporates the cobweb model, the rational expectations theory, and the theoretical proxies that may be applied within this study and perhaps to future research regarding the relationship between discounting room rates and hotel financial performance.

#### Research Question 4

Q<sub>4</sub>: Is the lodging managerial expectation formation process of room rate price setting based on a backward looking model where expected and current room rates are dependent upon past rates charged?

The results from research question number four incorporated the cumulative findings that were generated from all of the previous statistical analyses in order to formally assess the managerial expectation process of hotel room rates. The supporting hypotheses for research question number four are as follows:

H4<sub>0</sub>: The lodging managerial expectation formation process of room rate price setting is not based on a backward looking model where the expected and current room rates are not dependent upon past rates charged.

H4<sub>1</sub>: The lodging managerial expectation formation process of room rate price setting is based on a backward looking model where the expected and current room rates are dependent upon past rates charged.

The results from research question number one seemed to indicate that the adjustment process of room rates over time is a rational price setting process that was initially assessed in the unit root tests, where managers use all available past information to project a future optimal room rate that may allow them to maximize room revenues under the conditions of uncertain consumer demand (Chatwin, 2000; Corgel, 2004; Croes & Semrad, forthcoming; Lasselle et al., 2005; Muth, 1961). This finding does not support the recent research trend of discounting opponents in hospitality literature that criticizes managers' ability to form an accurate projection of future market conditions and potential earnings (Canina & Enz, 2006; Canina et al., 2005; Cross et al., 2009; Enz, 2009; 2003; Enz & Canina, 2007; Enz et al., 2009; 2004).

The criticism from discounting opponents stems from their interpretation that the constant room rate adjustments that may be observed in the lodging industry are a managerial reaction to potential room perishability that is coupled with uncertainty of future demand conditions and the absence of knowledge with which to accurately price rooms to match demand conditions that are yet unknown (Hanks et al., 2002). The perspective then, based on this criticism, is that managers set room prices in accordance with the observed pricing strategy of

their direct competitors; and that they do not synthesize market information to form expectations regarding future room rates and demand (Canina et al., 2005).

The results of the previously assessed research hypotheses may allow one to draw different interpretations pertaining to the constant room rate adjustments used by managers in the lodging industry. However, the results from this study seem to indicate that the constant room rate adjustments may be an expression of managers' primary focus; that is, to maximize room revenues in a dynamic industry. In order to garner the highest room revenue maximization possible for a given time period, managers may implement a variable pricing schedule to increase their revenues in the short run (Chatwin, 2000; Vinod, 2004). A variable pricing schedule may be conceptualized by a cobweb model (Carlson, 1968). The implementation of a variable pricing schedule is based on an operational perspective where it is better to sell a room at a discounted rate and earn some profit over the marginal cost associated with the room sale rather than to have the profit of the room perish all together (Kalnins, 2006).

In the lodging industry, a variable pricing schedule is based on low marginal costs. For example, in the case under review, the marginal cost that is associated with an individual room unit is US\$31. This means that the hotel property stands to make a substantial earning for a room sale that is sold at, above, or even below a market average rate for a room night. *Vis a vis*, managers may choose to carry past discounted room rates forward with the expectation of charging higher prices in the future as the market regains equilibrium (Croes et al., 2010). Research question number two provided empirical support for this long run equilibrium relationship between the variables via the evidence of a cointegrated vector.

Thus, managers may discount rooms as the available room supply is expected to exceed demand (i.e. low season) and then may adjust rates to premium prices as the economics of price

change over time (Avinal, 2004; Kalnins, 2006). This pricing process may be evidenced by a cobweb price setting behavior (Carlson, 1968) where adjustment lags are made to room rates when a disturbance or shock to the market occurs (e.g. seasonal demand schedules) in order to maximize room sales.

When taking into account the marginal cost associated with room sales, the current room price, and the price elasticity change for rooms over time, the ratio between supply and demand for hotel rooms seems to depend on both the expected price and the past room rates charged (Brannas et al., 2002). The information from the managers' previous expectations are then carried forward to help them generate more accurate future expectations for room prices while simultaneously acquiring more information regarding market conditions (Croes & Semrad, forthcoming).

The amalgamation of the cobweb model and the rational expectations theory assumes that the expected hotel room price equals the actual room price from the previous fiscal period; that available room supply would be a function of expected room price; and, that room prices would be adjusted to consumer demand thereby resulting in a clearing of the market (Carlson, 1968; Chatwin, 2000; Corgel, 2004). This means that the cobweb model assumes that the available room inventory ( $Q_t^s$ ) is time dependent on the previous time period ( $P_{t-1}$ ) (Croes & Semrad, forthcoming), which is indicative of a rational price setting approach.

However, an assumption of the room rate adjustment process when using the cobweb model combined with the rational expectations theory is that the adjustment in room rates would result in the complete consumption of the available room inventory, which is not a likely outcome of all room rate adjustments made over time in the lodging industry. Therefore, a first ordered difference equation is required in order to express the current value of a variable in one

time period as a function of its own past value and some random error (Croes et al., 2010). This means that the number of rooms sold in the current time period is related to the number of the rooms sold in the previous time period in order to account for the rooms that were not sold (Carlson, 1968; Muth, 1961; Turnovsky, 1970). The error correction model that was used to test the associated hypotheses of research question number three accounted, in part, for the first order difference of the equation.

The aggregation of the statistical results that were produced (i.e. evidence of a unit root, a long-term cointegrating relationship, and a short-term error correcting relationship) seems to suggest that managers' expectation formation process for future room rates that will match future demand conditions may be based on a backward looking thought process to forwardly project future expectations of room price and hotel financial performance thereby coinciding with the theoretical premise of the rational expectations theory (Muth, 1961). Based on the theoretical framework of this study and the empirical results that were generated from the statistical procedures used, the null hypothesis for research question number four ( $H_{40}$ ) is rejected.

Moreover, the use of the rational expectations theory in conjunction with the cobweb model may not only capture the dynamics of the industry but may also provide evidentiary support that the substantial room price variability observed over time is not a result of managers' lack of knowledge to set room rates in accordance with uncertain demand (Canina et al., 2006; 2005; Enz et al, 2004; Enz & Canina 2008). Instead, it is a sequence of rational expectations of how room price will influence the hotel's future level of occupancy, revenue, and profit (Croes & Semrad, forthcoming). So, while the cobweb model may display what appears to be a random structure that deviates from the expected systematic, or stable, financial performance of a hotel over time, the deviations in performance are actually a rhythmic synthesized process of market

information from past and current times. Hence, hotel managers appear to be using a backward looking model to forwardly project optimal room rates to match uncertain consumer demand.

### Implications

The implications from this study contribute to the considerable hospitality management literature regarding the efficiency and rationality of discounting in the lodging industry. The contributions arise through the empirical assessment of the effect that discounting hotel room rates may or may not have on hotel financial performance. The principles of the rational expectations theory in combination with a cointegration analysis, as well as an error correction model, neither of which is otherwise appropriated as assessment tools in the lodging industry, were used to determine the nature of the relationship between the variables.

The implementation of an econometric case study research design and the statistical procedures used may serve as a contribution to developing the hospitality management literature's methodological assessments that could account for the data distortion that stochastic shocks may have on hotel financial performance. Through the consideration of short-term room sales variations that characterize sales patterns in the lodging industry overtime, such accounts may provide a more thorough understanding of hotel business cycles and effective room pricing strategies for those cycles.

Previous discounting studies in the hospitality management literature seem to delineate a consistent correlative association between room rates and consumer demand over time. Such a linear correlative perspective between the variables require relatively stable market conditions, a condition that is not evident in the price setting process or consumption trends in the lodging

industry (Finch et al., 1998). The wide conformation or assumption of this correlative association between the variables presents the problem of generating spurious research results.

Such results may contaminate the recommendations that hospitality researchers make to lodging managers regarding the efficacy of their pricing strategies, specifically those strategies used during times of decreased room demand. The omnibus expectations and the robustness of the results generated by the research design and the statistical tests used in this study may prevent such forms of contamination. The resistance of contamination from spurious results in this study may be due to the use of error terms in the statistical model that allow for the decomposition of orthogonal ties to latent market place factors that the use of average room rates “smoothes out” or compresses within time series information.

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 & 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.

The contention of this study represents the lodging industry as a dynamic system that displays cyclical lag times between room supply and consumer demand – in opposition to its characterization as static. The stationarity conditions of the discounting unit root tests that were rejected reveal this dynamic and non-deterministic representation. Even though the discounting time strand was non-stationary by itself, the parity condition between it and hotel financial performance held a stationary relationship.

The implication of this stationary relationship is a theoretical one. The combination of the variables, discounting and hotel financial performance, possessed an integrated process between themselves that over the long run of time brought the variables close to unity in the form of equilibrium. The transposition from a state of non-stationarity to a position of equilibrium that is evidenced by vector integration between the variables falls within accordance of the expected converging behavior for the variables under the premise of the rational expectations theory.

This is a significant finding from this study. Most of the discounting studies in the extant hospitality literature neglect the adoption of theoretical frameworks that could allow for one to draw a salient conceptual finding regarding managers' price setting process in the lodging industry. Yet, these studies criticize and recommend avoidance of one of the most well renowned pricing strategies for perishable product inventories in dynamic systems, that is, discounting. The normative recommendation from these studies is completely devoid of a realist approach



regarding the financial consequences that are related to the failed movement and consumption of a perishable product inventory.

The normative recommendation calls for lodging managers to abandon dynamic pricing schedules and to adopt flat rates in the form of a constant ADR. Such a severe industry paradigm shift is only based on descriptive statistical analyses. The results of which should not allow one to draw inferential statistical conclusions regarding the empirical relationship between discounting and hotel financial performance. Therefore, the rational expectations theoretical foundation that was tested in application to the price setting process observed in the lodging industry is conceived, is supported, and is recommended from this study for future hospitality researchers.

Furthermore, the results of the unit root tests indicated that the constant room rate adjustment process that is observed over time in the lodging industry is not an expression of managers' lack of ability to set appropriate future room rates; and, is not only their adoption and reflection of the pricing strategy of their direct competitors - but, is an expression of managers' ability to synthesize all available market information. The term "*all*" refers to information that is available from the past and the current time periods thereby allowing managers to forwardly project future room rates they believe will sell in uncertain demand conditions.

In other words, lodging managers are not operating from a "*guess and check*" approach. They are not operating on the assumptions of linearity, determinism, or normative expectations. They are not only behaving in an adaptive response way to external market factors and forces. They are, however, behaving in accordance with a rational price setting approach regarding lodging managements' expectation formation process of hotel room rates that may be supported by the theoretical framework of the cobweb model and the rational expectations theory. That

when the two are used together represent a backward looking model to forwardly project optimal room rates that may maximize room sales and avoid the loss of sales for a perishable room inventory product. It would appear then that managers are not without knowledge to set room rates but are with knowledge regarding declaration that the past matters to the formulation of their future expectations.

The practical findings from this study are far more robust with regard to the interpretation of the results generated by an econometric case study research design juxtaposed to those results of descriptive statistical studies previously discussed. There are two findings in this study that are of particular interest regarding the price setting process and behavior of lodging managers. The first pertains to the stationarity conditions of the hotel financial performance time strand in the level form data. The second refers to the movement of the directional cointegrating relationship between the variables (i.e. Granger-causality). The latter finding will be discussed first as it may provide interesting insight regarding the stationarity properties of the time series strand for hotel financial performance.

The results from the Granger causality test suggested that the lagged operator of the variables possessed a unidirectional relationship of the causality that led to the long-term cointegration between the variables. The statistical sequence of the methodological procedures used in this study ensured that causality between the variables was not assumed. This is of particular importance when unit root tests indicate that data is not stationary. This means that the stochastic shocks to the dynamic system may have had a residual effect on hotel financial performance that did not decay rapidly over time in the series, and thus may account for some of the variance in the model. Interestingly, the results of the Granger causality test revealed that discounting room rates does not Granger-cause hotel financial performance. However, the

Granger causality test did reveal that hotel financial performance Granger-causes the discounting of hotel room rates.

In other words, the pricing behavior or managerial decision making process that occurs seems to indicate that hotel managers assess the bottom line figures of hotel financial performance and then decide whether to implement a discounting pricing strategy or not to implement this strategy. This pricing behavior supports the use of discounting room rates as a short-term rather than a long-term pricing strategy. Under the use of a short-term pricing strategy, discounting would be implemented when management is not satisfied with the values of hotel financial performance. Managers do not, however, implement discounting of hotel room rates as a long-term or extended time period pricing strategy and then wait to observe the cumulative effect on financial performance. Instead, the manager examines the financial performance values and decides whether or not to discount and how much those discounted room rates should be in order to correct for periods of disequilibria. The finding that hotel financial performance Granger-causes the discounting of hotel room rates also provides further empirical support that the constant room rate adjustment process observed in the lodging industry is not only due to managers observing and then mocking the pricing strategies of the hotel's direct competitors, but is evidence that the managers are using an internal synthesizing price setting approach that may function as a check and balance system for the internal operations of the hotel.

With regard to the stationary condition of the hotel financial performance time strand the Granger causality test and the unidirectional relationship from hotel financial performance to discounting room rates provides some indication why this test result was different than what was to be expected. If hotel managers are gauging room rates from the backwards movement process

of performance to rates and not rates to performance it would make sense that the variable, hotel financial performance, should remain stationary. This may be due to managers' understanding of the equilibrium price point that is required to cover the hotel's high fixed costs of the operation and the marginal costs that are associated with each room unit sale.

In other words, managers strive to maintain a consistent level of performance to cover all fixed costs by using room rates from the past that worked to guarantee the payment of those costs. If managers risk pricing above the rates that covered operational costs, they may risk a decrease in the rooms' department productivity and hence jeopardize the financial stability of the hotel. Therefore, managers adjust rates down to move more product after observing dwindling hotel financial performance values as opposed to observing a favorable performance and then adjusting room rates up to try and continuously increase that performance.

An additional explanation that may provide some insight regarding why the hotel financial performance time strand was stationary in its level form pertains to the long-term financial and/or operational goals of hotel management. Generally, managers strive to reach long-term goals over a designated time period (e.g. annual goals and/or monthly goals). Financial performance benchmarks are then dispersed over the course of that designated time period to keep the rooms department on track in the short run for reaching those long run goals.

Therefore, the most rational way to achieve the long-term financial goals of the hotel is to adjust the short-term pricing behavior. Consequently, we then observe a non-stationary discounting time strand and a stationary hotel financial performance time strand. In other words, the financial performance long-term goals remain consistent over time and managers price with accordance to reach that consistent goal. Thus, the scope of the price setting process for managers is the incentive to reach the long-term financial goal not to over perform in the short

run. This price setting process that the Granger causality test provided evidence for seems counterintuitive regarding the maximization of hotel financial performance.

There is a simplistic significance of the research applied in this study whereupon it deviates from normative thought in its movement to a realist approach. The methodological sequence of the statistical assessments that were used capture and address the lodging industry's dynamic characteristics in order to provide managers with a rational "*how to*" set room prices as opposed to "*what they should not do*" regarding the use of discounting as a pricing strategy. The use of statistical residuals as opposed to room rate averages in the error correction model indicates that discounting room rates works in the short-term to correct for market disequilibria. The practical implication of the error correction model is its prediction power of the price position for the next time observation regarding the impact effect of discounting on hotel financial performance.

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. An important contribution of this line of research may be in reference to the use of statistical residuals over the use of room rate averages. As previously discussed, 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 market factors influencing hotel financial performance other than the independent variable (Banerjee et al., 1994) such as latent place market factors. The use of room rate averages may otherwise suppress such critical data through the aggregation of actual room rates charged over time. The methodology of this study may be carried forward as a potential viable means to assist hotel managers with a more accurate method to price room rates.

Finally, the findings from this study may prove important in filling the gap between empirical assessment and lodging industry practice by advancing a consistent understanding of the effects of discounting room rates on hotel financial performance. Such consistency is currently lacking in both the lodging literature and the industry. The next section will discuss potential future research studies that may emerge from this primary investigation.

### Suggestions for Future Research

The study revealed a lack of consistent agreement regarding the relationship between discounting room rates and hotel financial performance. The results from the current study produced opposing findings from that of current mainstream hospitality literature regarding the nature of the relationship between discounting and hotel financial performance. However, the descriptive statistical studies that claim discounting room rates are not an effective pricing strategy have been confirmed multiple times using the methodological blueprint of the original Enz et al., (2004) discounting study.

This study and its methodological framework are only in its preliminary form and require confirmatory findings to support the theoretical framework that was forwarded. The high explanatory power of the statistical techniques used in this study, specifically the use of the error correction model, suggests that the study would hold high internal validity. Therefore, it is anticipated that future studies that follow the methodological framework and apply the theoretical proxies under similar or different conditions would most likely produce similar results as the statistical procedures applied did more than assess the common hotel industry trends of seasonality. However, again these findings require further confirmatory analyses.

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 data set given that a cointegrated relationship is invariant to changes (Juselius, 2008; Kulendran and Divisekera, 2007). However, in order to determine if this assumption is correct it is necessary to expand this research beyond a single property econometric case study research design. Specifically, it may be of interest to future researchers to include different hotel competitive sets that are located in different geographic locations and are of different price positions to learn if the findings hold reliable.

More research should also be conducted in order to determine the benefits of using statistical residuals as opposed to room rate averages to assess historical financial information. Future research in this area may prove important in filling the gap between empirical hospitality assessment and lodging industry practice. An important contribution of this line of research may then 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 lead researchers and practitioners to gaining a further understanding of other factors that may be influencing financial performance (Banerjee et al., 1998).

It may also be of interest to future researchers to further explore the results of the Granger causality test and the stationary properties of the hotel financial performance variable in this study through a qualitative research design. This qualitative research assessment may be conducted in the form of small focus groups or structured interviews that probe the opinions of hotel managers and the decision making process they use to decide if they should discount room rates or not. In other words, how do managers decide or chose to engage in the use of discounting as a pricing strategy?

Furthermore, it may also be of interest to future researchers to assess through a mixed methods approach the counter intuitive long-term incentive process of the unidirectional causality relationship between the variables. This causality relationship indicated that managers first examine hotel financial performance in order to then determine if they should engage in room rate discounting. However, the reciprocal effect of that relationship between the variables does not seem to occur. This means that hotel managers seem to price room rates to achieve a long-term financial objective/incentive.

Yet, there does not seem to be a short-term objective/incentive that would assist in maximizing hotel revenues although then the adjustment process that helps managers achieve the long-term incentive. The quantitative evidence of this price setting behavior was generated by the Granger causality test and the stationary feature of the times series data strand for performance. It would be interesting to gather qualitative data regarding managers' interpretations of these results.

### Summary

The chapter provided a broad review of the study and a discussion of its findings, including reference to supporting or opposing hospitality literature, conclusions, theoretical and practical implications, and recommendations for future research. The study is among the first to examine the expectation formation process of managers in the lodging industry through the assessment of an econometric case study research design. The study is also among the first to explain the use of discounting room rates as a rational price setting approach that is supported by both a theoretical framework as well as methodological procedures that may test that theoretical framework. Further discussion and empirical evidence is required to validate the results of this study. It is anticipated that future research will also find that the rational expectations theory in



conjunction with the cobweb model may be an accurate representation of a backward looking model that lodging managers use to forwardly project optimal room rates under conditions of uncertain demand.

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