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Barreiros Porto, Rafael

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## Marketing

# The commercial cycle from the viewpoint of operant behavioral economics: effects of price discounts on revenues received from services

*O ciclo comercial visto pela economia comportamental operante: Efeitos dos descontos nos preços  
sobre a receita recebida de serviços*

*El ciclo comercial desde la perspectiva de la economía conductual operante: efectos de los  
descuentos de precio en los ingresos de servicios*

Rafael Barreiros Porto \*

Universidade de Brasília, Brasília, DF, Brazil

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## Abstract

The relationship between supply and demand generates commercial cycles. Operant behavioral economics explain that these cycles are shaped by three-term bilateral contingencies – situations that create supply and demand responses and which, in turn, generate reinforcing or punitive consequences that can maintain or mitigate these. Research shows how the commercial cycle of a company occurs and investigates how price discounts affect basic and differentiated service revenues according to seasonality. Based on a longitudinal design, two time-series analyses were performed using the ARIMA model, while another was carried out using a Generalized Estimating Equations divided into seasonal combinations. The results show, among other things, (1) that a company handles most of the marketing context strategies and programmed consequences of services used by consumers, creating a new commercial situation for the company, (2) the effects of price discounts on sophisticated services have a positive impact and produce higher revenues during the low season, while those related to basic services have a greater impact and produce greater revenue during the high season; and (3) the seasonality of the greatest purchasing intensity exerts a more positive influence on revenues than the seasonality of demand characterized by heterogeneous reinforcements. These findings are useful for the administration of price discounts to generate maximum revenue and make it possible to have a better understanding of the way the commercial cycle of a company functions.

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**Keywords:** Commercial cycle; Behavioral economics; Revenue; Price discount; Seasonality; Service marketing

## Resumo

As relações entre oferta e demanda geram ciclos comerciais. A economia comportamental operante explicita que eles são formados por contingências bilaterais de três termos – contextos criadores de condições às respostas do ofertante e demandante que, por sua vez, geram consequências reforçadoras ou punitivas capazes de mantê-las ou atenuá-las. A pesquisa demonstra como ocorre o ciclo comercial de uma empresa, averigua o efeito dos descontos de preço na receita de serviços básicos e diferenciados com diferentes sazonalidades. Com delineamento longitudinal, fizeram-se duas análises em séries temporais com modelo ARIMA e outra com Equações de Estimativas Generalizadas divididas em combinações de sazonalidades. Os resultados demonstram, dentre outros, que a empresa manipula boa parte dos contextos de marketing e das consequências programadas de uso de serviço pelos consumidores da empresa, cria um novo contexto comercial para ela; os efeitos dos descontos em serviços sofisticados são positivamente maiores na receita durante em baixa temporada, enquanto dos serviços básicos são positivamente maiores em

\* Correspondence to: Universidade de Brasília, Campus Universitário Darcy Ribeiro, 70910-900 Brasília, DF, Brazil.

E-mail: [rafaelporto@unb.br](mailto:rafaelporto@unb.br)

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alta temporada; e a sazonalidade de maior intensidade de compra exerce maior influência positiva sobre a receita do que a sazonalidade de heterogeneidade de reforços daqueles que compram. Os resultados auxiliam a gestão de desconto na geração da máxima receita e permitem compreender o comportamento do ciclo comercial de uma empresa.

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*Palavras-chave:* Ciclo comercial; Economia comportamental; Receita; Desconto em preço; Sazonalidade; *Marketing* de serviço

## Resumen

Las relaciones entre oferta y demanda generan ciclos comerciales. La economía conductual operante explica que éstos se forman por contingencias bilaterales de tres términos - contextos que crean condiciones para las respuestas de oferta y de demanda que, por su parte, dan origen a consecuencias que refuerzan o punen, y que son capaces de mantenerlas o mitigarlas. El estudio demuestra cómo se produce el ciclo comercial de una empresa y averigua el efecto de los descuentos de precios en los ingresos de servicios básicos y diferenciados en distintas estacionalidades. Por medio de diseño longitudinal, se llevaron a cabo dos análisis en series de tiempo con modelo ARIMA y otro con ecuaciones de estimación generalizadas divididos en combinaciones de estacionalidad. Los resultados muestran que el ofertante maneja los contextos de marketing y las consecuencias programadas de la utilización de servicios por los demandantes, creando un nuevo entorno comercial para él; los efectos de los descuentos en servicios sofisticados son positivamente más altos en los ingresos durante la temporada baja, mientras que descuentos de servicios básicos son más altos y positivos en temporada alta; y la estacionalidad de mayor volumen de compras ejerce una influencia más positiva en los ingresos que la estacionalidad de heterogeneidad de refuerzos de los que compran. Los resultados contribuyen a la gestión de descuentos para generar mayores ingresos y permiten comprender el comportamiento del ciclo comercial de una empresa.

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*Palabras clave:* Ciclo comercial; Economía conductual; Ingresos; Descuento en precios; Estacionalidad; *Marketing* de servicios

## Introduction

The differentiations of services are at the core of any debate about the exclusivity, luxury and sophistication that a company can offer consumers (Brun & Castelli, 2013; Veríssimo & Loureiro, 2013). However, in general, these services charge higher prices since they offer consumers greater benefits (Kohli & Suri, 2011). On the other hand, the supply of basic services that succeed in attracting a demand are less expensive and make it possible to match supply in relation to other competitor service suppliers (Abrate, Fraquelli, & Viglia, 2012). Between one extreme and another of a company's service portfolio, if the price discounts are well applied (Yao, Mela, Chiang, & Chen, 2012), these can increase more than proportionally the number of consumers as compared to the non-implementation of such actions. A company that offers a range of market products (Elmaraghy & Elmaraghy, 2014) that include differentiated and basic services, combined with an adequate discount policy, can increase their revenue and, in turn, their financial profits.

However, each service provided by the same company can involve different consumers. These may face restrictions as regards paying the contract price offered and depend on a price discount to be able to make purchases (Kohli & Suri, 2011). This, in turn, has a different impact according to the season surrounding the company offerings. Thus, the demand for a service tends to oscillate (Hanssens, Parsons, & Schultz, 2003), with low and high moments and with or without a heterogeneous structure. In order to meet demand, supply is therefore controlled by the availability of the number of services, their differentials, periods when these are offered and prices given to them. Thus, revenue

management (Talluri & Ryzin, 2005) ends up controlling the cash flows from the services and these can appeal to a larger segment of consumers, thereby ensuring profits.

In the hospitality industry, managers of hotels, resorts, flats and guesthouses experience this routine on a daily basis (Menezes & Silva, 2013). During the low season, reduced prices are usually offered to generate sufficient accommodation occupancy rates and thereby boost income, though this is not necessarily the case for all habitation units, especially as heterogeneity exists between different consumers. Price variations attract a certain group of consumers more than another and these may or may not be effective in generating the maximum possible revenue.

In addition to Service-Dominant Logic (SDL) in marketing (Lusch & Vargo, 2014), where interaction between the consumer and the company is essential in order to attain better company performances, the consumers and the companies co-create and co-produce the services offered. By means of knowledge and ability, manager can operationalize the supply of services, in the hope of generating greater revenues and profits for the company, which they will only do if consumers pay for their services. This research uses a theoretical framework that is both coherent and complementary to SDL. It is coherent because it meets all the basic SDL requirements and it complements SDL because it adds behavioral aspects to the consumer-company relationship, bringing together empirical findings on an individual analysis level with elements on an organizational and contextual level.

One of the difficulties in managing maximum revenue is how to recognize, during different periods of time, when a discount policy for each service will generate greater or less income

for enterprises and how long these effects will last. This is at the heart of the working ability of a marketing professional (Theodosiou, Kehagias, & Katsikea, 2012), which may or may not be efficient and effective (Keh, Chu, & Xu, 2006). This research shows what can be done in such a situation. The specific objective of this research was to evaluate the effect that price discounts have on revenue derived from differentiated and basic services during different seasons. In general terms, the aim of this study was to show how the commercial cycle of a company operates from an operant economic-behavioral viewpoint, with the investigation of what marketing professionals actually do to stimulate sales of services. Thus, this work serves as an aid to service managers who aim to increase their income and adjust their prices to meet the demand for each one of their services.

### Operant behavioral economics: explaining the relationship between the supply and demand of products/service pricing

An area known as behavioral economics has researched a wide variety of firm-related issues, both from a cognitive (Angner & Loewenstein, 2010) and an operant viewpoint (Madden, 2000). Both adopt the premise of actors having bounded rationality (Simon, 1972). However, the latter concentrates more on the relationship experiences between the behavior and consequences to consumers, entrepreneur, investors and managers when they are individual economic units – which can include aggregated data (Pindyck & Rubinfeld, 2009) – than on their thought processes, with greater emphasis on the former. The operant perspective supports the relevance of a neoclassical analysis to understand economic behavior, but not in an acritical way. On the contrary, this shows that, even without taking into account rational assumptions, the micro-economic phenomena can be explained by means of the evolutionary relationships between behavior and its environment in a single behavioral theoretical framework (Foxall, 2015).

In actual terms, the theories involved in this area are concerned with describing and explaining how environments create the necessary conditions for these economic unit behavior patterns to occur and the consequences of these relationships (Franceschini & Ferreira, 2013). In addition, these investigate consumer patterns, expenses, savings, investments, brand choices, the contexts that can affect these (e.g. price discounts, income) as well as the consequences of the relationships of time and space between behavioral patterns and their contexts; which may or may not be mediated by the social environment (Foxall, 2010; Foxall, Oliveira-Castro, James, & Schrezenmaier, 2007; Franceschini & Ferreira, 2013; Madden, 2000).

In spite of the fact that this economic area has mathematically and empirically shown the relationships that exist between the above-mentioned concepts (Pindyck & Rubinfeld, 2009), there is no integrated model that can explain why and how these are related. On the other hand, by using an operant approach, combined with traditional Darwinian principles, a behavioral analysis represents a solid basis (Oliveira-Castro & Foxall, 2005). It uses concepts and findings produced through experimental research, usually conducted in laboratories, testing

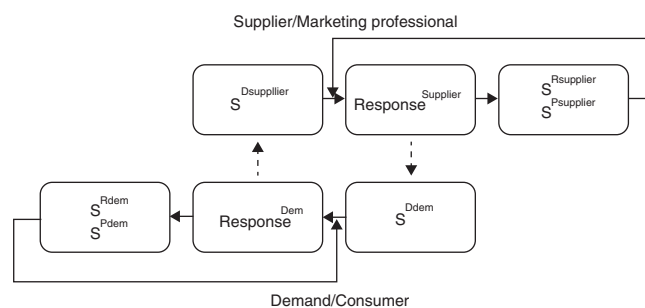


Fig. 1. Bilateral contingencies (Foxall, 1999), adapted by the author.

both human as well as infrahuman subjects [e.g.: monkeys, rats (Baum, 2005)], that translate and specify economic concepts into behavioral operations. This has made it possible to explain and integrate innumerable economic phenomena in a more substantial and parsimonious manner.

The conceptual model most often used is described by Skinner (1974) as being a 3-term contingency, that specifies the conditions (Term 1) for which a response (Term 2) produces one or several consequence(s) (Term 3). This model was duly complemented and contextualized to illustrate the relationship between individual economic units (e.g. consumer, family, company) by Foxall (1999) – as can be seen in Fig. 1. This involves a 3-term bilateral relationship, in that the top contingency refers to the supplier (sup) or marketing professional and the lower one refers to the demand (dem) or consumer.

Foxall (1999) states that relationships of economic exchange are necessary and sufficient in themselves to ensure that marketing activities exist within a company. Thus, in the lower section of Fig. 1, consumer behavior (e.g. purchase response) is preceded by a context formed by discriminant stimuli –  $S^{Ddem}$  (e.g. availability of product or service for a price) and includes consequences (e.g. utility of the product or service acquired – utilitarian), which can be reinforcers ( $S^{Rdem}$ ) or punishments ( $S^{Pdem}$ ). The former increases the possibility of the same consumer purchase response on future occasions when for example the product ends or the services terminate, while the latter reduces these chances. Vella and Foxall (2011) also suggest that the consumer reinforcers can be utilitarian and informational, in that the former is mediated by the use of the product or service itself, such as comfort and convenience (Foxall, 2010) while the latter consists of social reinforcers, such as luxury (Yeoman & McMahon-Beattie, 2006), sophistication (Liu, 2010), exclusivity (Brun & Castelli, 2013), among others.

However, the consumer purchase responses themselves function as discriminant stimuli –  $S^{Dof}$  (contexts, also known as the relationship between environmental events) – for the offeror (e.g. money received), since, as these are relationships of exchange, the consumer pays (e.g. hands over money or uses credit, etc.), which is characterized as a monetary exchange. The discriminant function for the offeror (e.g. money received) occurs because of this exchange (Vella & Foxall, 2011), but at the same time, this encourages him to operate his firm directed toward maintaining or creating new stimuli for the consumer (e.g. creating new settings where consumers can buy products, maintain or create new

products or services, etc.). When the offeror do this, reinforcers –  $S^{Rof}$  (profit) or punishment –  $S^{Pof}$  (for example, financial loss) consequences are generated for him.

The consumer's payment response, in the aggregate, functions as a discriminant stimulus for the offeror, generating revenue for the company ( $S^{Dof}$ ). This discriminant stimulus serves as the situation for the supplier's subsequent behavior, enabling him to be remunerated and/or extract profit from his business. The situation or context has multiple dimensions, a temporal dimension being one of these. There are periods of the year when a greater number of consumers buy products and periods when fewer consumers buy them. If higher payments are made during each cycle, the company would grow in commercial terms, and monetary exchange would therefore be the source of a company's financial growth.

In turn, there are also periods when a company will attract consumers who seek different reinforcers (e.g. exclusivity), creating a situation where the offeror works to provide consumers with new and distinct offers (Evans, 2003; Smith, 1956). If properly done, this will produce income and a positive reinforcer in the form of profits (or punishment as loss) for the supplier at the end of his behavioral chain. This profit (or loss) can feed back into the system.

The supplier response can generate profits for the offeror and can create a situation for future consumer purchases depending on how well he carries out his marketing activities. That is to say, this depends on how successfully he offers his products or services, which can generate reinforcers that are increasingly adapted to suit each demand, as well as pricing each product and making it possible to increase sales. Vella and Foxall (2013) characterize these as reinforcement and punishment control ( $S^{Rdem}$  and  $S^{Pdem}$ , respectively) and consumer situation (or scenario) control ( $S^{Ddem}$ ). Thus, the effectiveness of a marketing professional's performance, or that of a supplier as a whole, can be measured by the way he generates reinforcers and reduces company punishments and, at the same time, generates more attractive situations, allocates reinforcers and reduces the punishment process for the consumer.

This makes the work of the offeror (commercial administrator or marketing professional) extremely technical, with the capability of being effective or otherwise. Each task performed (operant supplier responses) with these aims has functional features (Catania, 1973), but which vary as regards topography: frequency of emission (how often is the same functional task undertaken), force or magnitude (degree of effort, or how much technique or technology is needed to perform a functional task), duration (the time it takes to perform an operational task) and period of latency (the time it takes to issue the first functional response). Depending on how effectively these characteristics are employed, the result of the work serves as a source for the demand context ( $S^{Ddem}$ ) and, if this leads to an increase in the number of consumers and their shopping rates (demand response frequency or magnitude), revenues will increase ( $S^{Dof}$ ).

The variety of products/services that a company offers is directly associated with their consumer acceptance (Elmaraghy & Elmaraghy, 2014). This acceptance is reflected in shopping rates. Companies offering the greatest variety of products/

services meet the demand for a wide variety of features at the same time and thereby tend to increase their revenue ( $S^{Dof}$ ). This occurs because of the availability ( $Response^{of}$ ) of differentiated sophisticated products/services offered by a business (magnitude of a response that generates a high level of reinforcement to meet demand) aimed at creating temporary monopolies by providing customers with exclusive or singular products (a type of  $S^{Rdem}$ ) (Brun & Castelli, 2013). This can avoid the need to reduce prices ( $response^{of}$ ), and, in turn, a fall in revenue (reduction of  $S^{Dof}$ ) if the same number of clients is maintained (aggregated  $response^{Dem}$ ), when local competitors reduce their prices ( $Response^{of.alternative}$ ) (Becerra, Santaló, & Silva, 2013). In turn, by offering basic services ( $Response^{of}$ ), offering minimum quality (magnitude of response that generates low or average reinforcement for demand), ensures a constant demand if priced at a lower value (low or average  $S^{Pdem}$ ).

In this way, both the differentiated services offered and the basic services offered are market strategies that can increase revenues, by means of monetary exchanges with consumers, though these attract different aspects as regards this increase in revenue. The first charges a much higher price (or does not make a significant price reduction when there are competitors), while the second aims to become more competitive in attracting a higher demand for a lower price. By using both tactics together, a company will manage to increase the intensity and variety of demand. These strategies can produce different effects on revenue and, sometimes, one can represent a better option than the other so as to increase it. These are the focus points of this research study.

In addition, the same company with its portfolio of service can offer more than one type of differential, while maintaining one basic service. This means that the type of influence a company makes is far from clear. Thus, this research aims to examine a basic non-differentiated service (low reinforcers for demand) and two types of service differentials (consumer services that offer high differential and concurrent reinforcers for the demand). This can characterize discriminative stimulus (Catania, 1998) for consumers: when present, this indicates a reinforcer that is different from when another stimulus is present (which indicates another reinforcer).

For each day that a product or service is offered, there is an associated programmed punishment for the consumer (e.g. to pay the price). The marketing professional can increase or reduce this and his task is effective if his pricing makes it possible to increase subsequent revenue. Traditionally, the price discounts (Yao et al., 2012) make it possible to reduce the consequences of a demand punishment ( $S^{Pdem}$ ), making a purchase behavior more likely to occur. Thus, the exact level of discount that makes it possible to increase more than proportionally the demand without reducing revenue, is essential so that a commercial cycle can occur. This level of discount can be designed to have an immediate response or a delayed response (Hanssens & Dekimpe, 2012). The present research examined the effectiveness and duration of these discounts on different types of market offers, with the aim of generating more income.

However, the payments made to a company by a wide variety of consumers can occur with greater intensity at different

periods. This is characterized as temporal commercial contexts that consumers generate in benefit of the supplier (intensity of response<sup>dem</sup> of aggregated purchases over time and the period of greatest number of varied reinforcers ( $S^{Rdem\_varied}$ ) associated with responses<sup>dem</sup>).

Depending on these contexts, conditions are created that make it either easier or more difficult to obtain an increase in revenue ( $S^{Dof}$ ). These are dimensions of the market segmentations – heterogeneity and consumer intensity (Evans, 2003; Smith, 1956). Thus, characteristics of seasonality, low and high season (Nadal, Font, & Rosselló, 2004) and commercial working days and weekends (Jeffrey & Barden, 2000) are temporal situations that can interfere in the effect that discounts (punishment reduction) have on each service (Hanssens et al., 2003). This is an issue covered and is also present in this research study.

In the language of operant behavioral economics, the purpose of this research is to test the effect of the supplier's response in generating future commercial contexts over time, in a way that is favorable to the offeror (greater revenue), reducing the financial punishment associated with the degree of reinforcers programmed by the supplier for consumers (basic and differential service discounts) within distinct temporal demand contexts. That is to say, this research aims to test the commercial cycle of the Model shown in Fig. 1 during periods when there is a variation in the intensity of demand responses and the heterogeneity of reinforcers allocated to these responses.

This proposal offers a complement to the Service Dominant Logic (Lusch & Vargo, 2014), by providing a general contextualization for matters previously described, and the use of behavioral terms to explain this phenomena. The area of marketing is often criticized for not using theoretical arguments to explain its phenomenon (Hunt, 2010), even though there is a good deal of empirical evidence to show how marketing phenomenon can be useful to organizations and consumers alike.

Key evidence, including the effect that sales discounts have on sales and service demands, has been well documented (Line & Runyan, 2012; Yoo, Lee, & Bai, 2011). It is known that companies that describe themselves as service leaders implement more pricing strategies and that these produce greater customer perception as regards revenue, profit and brand awareness (Indounas, 2015). In addition, the higher the level of price discounts, the greater perception a customer has as regards savings, purchase intention and quality (Hu, Parsa, & Khan, 2006, chap. 2).

However, these studies offer no explanation as to why these occur and, in particular, their effectiveness in generating revenue for a company as a result of the interaction between services and pricing. Enz, Canina, and Lomanno (2009) are among the only researchers who tested the effects that pricing has on the revenue of a hospitality service company, using actual data, over a period of time. They found that there is price-revenue inelasticity in this type of service and that the best strategy to increase revenue is to maintain high prices, even though these do not lead to a high demand (high occupancy rate). These authors also found that price discounts encourage increased occupancy rates, but do not increase revenue and macro-economic data have little effect on revenue.

In spite of this study, various aspects related to service pricing remain open, including issues related to the moderating effects of the price-revenue relationship, longitudinal studies with actual prices on a daily basis, the allocation of differential price strategies so that the same company can offer consumers different benefits, control the role that seasonality plays over shorter periods of time (monthly and daily) and employ objective metric to evaluate performance, which are rarely used in this area, etc. By showing how the commercial cycle occurs using an operant approach, marketing capabilities, which originate in the technical abilities of the professionals involved in this activity, can be explained and these limitations overcome. Marketing professionals do not carry out their work in a vacuum or without a purpose in observance. However, there is still very little theoretical knowledge available to explain the nature of their objectives. The present study therefore aims to remedy this lack of information.

## Method

This *ex post facto* research study was conducted<sup>1</sup> using a longitudinal design. Every day, the researcher registered data from a medium-size company belonging to the hotel sector located in the Central West region of Brazil. This firm represents over 150 collaborators, including the general manager and a manager for each one of its departments. Secondary company data was obtained by means of a regional operational and commercial system of sales information, prices, and accommodation occupancy rates, among others. Once the general management had given their authorization, the data was organized and arranged so that a daily temporal series of analyses could be conducted.

With regards to the town researched, business tourism and events occur with greater frequency than leisure activities (Lemes, 2009). The hotel chosen for the purpose of this research reflected this type of demand characteristic during commercial working days for this consumer segment. However, in addition to these, there was also leisure tourism at the weekends.

Data used included information about the hotel since its inauguration in that town, as well as a sampling of the hotel services during 120 consecutive calendar days. The power of the multiple regression sampling test (average effect  $f^2 = 0.15$ ) with 3 predictors (price discount factors) came to around 95.2%. That is to say, even with a reduced sample size, this was enough to dismiss the incidence of a Type II Error in this research study.

The discounts were calculated in percentages based on the price paid for each room divided by the prices shown on the list of daily rates. This was subtracted by one and multiplied by one hundred. Since the price of the rooms varied, a Principal Components Analysis was conducted so as to show the factors involved, as can be seen in Table 1. This shows that the different discounts implemented by the hotel chain are based on three factors.

<sup>1</sup> This research study has received financial support from the Brazilian National Council for Scientific & Technological Development – CNPq.

Table 1  
Factor loadings for price discount factors.

	Discount on non-differentiated services (standardized in relation to other hotels)	Discount on sophisticated differentiated services (presidential suites)	Discount on differentiated services that are environmentally friendly
Cronbach's alpha	0.76	0.63	0.84
Discount on a superior suite	0.91		
Discount on a standard double room	0.90		
Discount on a deluxe room	0.80		
Discount on a standard single room	0.57		
Discount on a presidential suite-cer		0.78	
Discount on a presidential suite-pan		0.68	
Discount on a presidential suite-mat		0.66	
Discount on a presidential suite-exe		0.55	
Discount on a presidential suite-ama		0.36	
Discount on a double green suite			0.88
Discount on a deluxe green suite			0.82
Discount on a deluxe green suite			0.72
Discount on an anti-allergic green suite			0.71
Discount on a single green suite			0.68
KMO = 0.73			
Total variance explained = 58%			

Source: Prepared by the author of this article.

These discounts take into account the levels of accommodation differentials. The “Discount on non-differentiated services”, with  $\alpha = 0.76$ , average = 22.6% and standard deviation = 8.2%, consists of rooms that are similar to those of other hotels of the same level (standard single and double rooms, deluxe and master suites) with standard services and reception. The factor “Discount on sophisticated differential services”, with  $\alpha = 0.63$ , average = 19.5% and standard deviation = 22.7%, consists of customized presidential accommodation with reception and exclusive happy hour services available, as well as tea-service, bath robes and slippers, and may include a Jacuzzi.

The third and final factor “Discounts for differentiated services that are environmentally friendly, with  $\alpha = 0.84$ , average = 8.8% and standard deviation = 10.5%, consists of discounts for hotel rooms that value well-being and harmony as part of the accommodation they offer their guests, with 100% of their floors established as no-smoking areas, with fragrant atmospheres and including special amenities, such as anti-allergic rooms and the use of ecological materials.

Thus, these three factors constitute the discount factors covered by this study, each one measured on the basis of an average percentage. The average price of the service rates for non-differential rooms was equivalent to US\$ 207.75 (standard deviation = US\$ 62.65). The rate for a room with sophisticated differential features was equivalent to US\$ 1450.00 (standard deviation = US\$ 497.05), and in the case of a room with differentiated and environmentally friendly services, the price was equivalent to US\$ 186.50 (standard deviation = US\$ 53.26).

The total daily income (revenue) was calculated on the basis of the sum total of the number of times each service or item was sold multiplied by the price paid by each one per day. This was subdivided in partial daily revenue, namely: revenue derived from non-differentiated services, revenue from sophisticated

differentiated services and revenue from differentiated environmentally friendly services using the same formula used for the total revenue, though restricted to these services alone. The hotel chain's revenue averaged US\$ 25,616.90 per day, with a standard deviation equal to US\$ 16,373.40.

In this research study, the sum total of daily revenue was averaged out by the average monthly revenue. In this way, values equal to one are included in the average monthly revenue, above (below) one are higher (lower) than the monthly average monthly. The relative daily revenue, a dependent variable in this study, showed an average equal to one and a standard deviation equal to 9.6. The overall occupancy rate was measured by the number of rooms occupied divided by the total number of rooms available on a daily basis, which was also sub-divided into different types of accommodation.

A descriptive data analysis is shown in Table 2. As can be seen, this shows that there was a reasonable overall occupancy rate. In addition, the rooms with the highest occupancy rates were those without differential features, in spite of the high standard deviations. The greater variance revenues were those offering sophisticated differentiated services, while those offering smaller discounts were those that provided differentiated and environmentally friendly services.

In all, this article presents three statistical analyses. The first aims to show the effect of each discounts on accommodation service provided (reducing monetary punishments associated with different degrees and types of reinforcers that the supplier programs for the consumer) in the composition of revenues (composition of  $S^{\text{Dof}}$ ).

The second aims to show the effects that types of seasonality (intensity of responses<sup>dem</sup> for aggregated purchases over time and the period of the greatest number of varied reinforcers ( $S^{\text{Rdem\_varied}}$ ) associated with responses<sup>dem</sup>) have on the total revenue ( $S^{\text{Dof}}$ ).

Table 2  
Descriptive data analysis.

Descriptive data	Average	Standard deviation	Minimum	Maximum
General occupancy rate (%)	51.7	29.0	8.1	99.6
Occupancy rate of non-differential rooms (%)	50.9	28.3	0.8	100
Occupancy rate for rooms with sophisticated differential (%)	35.2	0.3	0.0	100
Occupancy rate of environmentally friendly accommodation (%)	34.9	0.3	0.0	100
Total revenue (relative)	1.0	0.6	0.1	2.6
Revenue for differential services (relative)	1.0	0.6	0.1	2.4
Revenue for sophisticated differential services (relative)	1.0	1.9	0.0	11.4
Revenue for environmentally friendly diff. services (relative)	1.0	1.0	0.0	3.2
Discounts for non-differential services (%)	22.5	8	0	43
Discounts for sophisticated diff. services (%)	19.5	22.7	0	95
Discounts for environmentally friendly diff. services (%)	8.8	10.5	0	70

Source: Prepared by the author of this article.

The third analysis, derived from the two previous analyses, was to establish the everyday effects that discounts of each service (reducing monetary punishments associated with different levels and types of reinforcers programmed by the supplier for the consumer) had on total revenue ( $S^{Dof}$ ), in accordance with seasonal demand dimensions (intensity of purchase responses<sup>dem</sup> aggregated over time and the period of the greatest number of varied reinforcers ( $S^{Rdem.varied}$ ) associated with responses<sup>dem</sup>). The analytical unit of each analysis is based on daily revenue.

In the first analysis, an autoregressive integrated moving average – ARIMA model was used for each composition of revenue. This was necessary as the revenue data (partial and total) were shown to be auto-correlated (*Durbin–Watson* varied between 0.8 and 1.3, the reference value being = 2) and non-stationarity (the Augmented *Dickey–Fuller* tests were non-significant for  $p > 0.05$  for two partial revenues). However, it was necessary to integrate the ARIMA model by the first difference. The normality assumptions of the independent variables (the *Kolmogorov–Smirnov* tests were non-significant for  $p > 0.05$ ) and homoscedasticity were met (White LM Test were all significant for  $p \leq 0.05$ ). The models that better adapted to the data are described in Table 3 of these findings. For revenue derived from non-differential services ( $S^{of}$  from the low magnitude response<sup>of</sup>), the best model was the one with = 1; difference = 0 number of auto-regressive terms.

For revenue earned from non-differentiated services ( $S^{of}$  derived from low magnitude responses<sup>of</sup>), the best model was the one with auto regressive term of = 1; difference = 0; and a moving average term number of = 0. In the case of revenue derived from differential sophisticated services ( $S^{of}$  derived from a high magnitude response<sup>of</sup>), the best model was the one with a number of auto regressive term of = 1; difference = 1; and a moving average term of = 0. For revenue derived from differentiated environmentally friendly services ( $S^{of}$  derived from an alternative high magnitude response<sup>of</sup>), the best model was the one with a number of auto regressive terms of = 0; difference = 1; and a moving average term of = 0.

In the second analysis (Table 4), in order to demonstrate the aggregated effect of consumer purchase responses in terms

of revenue, the ARIMA Model was also used (number of auto regressive terms = 2; difference = 0; a moving average term of = 7), the explicative variables being the seasonal dimensions (high season versus low season and commercial working days versus weekend days) were dichotomized and treated as event variables. An average of the total relativized revenue was used as a dependent variable. It was seen that the monthly seasonality (Nadal et al., 2004) measures the period of higher intensity of purchase response<sup>dem</sup> and the weekly seasonality measures the period of the greatest number of varieties/types of reinforcers available to consumers, since during commercial working days hotel guests generally consist of business or event tourists and, during weekends, of guests who had considered the previous two options, as well as leisure tourists (Lemes, 2009).

In the third analysis (Fig. 3), in order to demonstrate the overall effects of the commercial cycle on revenue, the variable seasons were used as environmental variables that interact with discount strategies. For this, a sample separation for each season dimension combination was used and the effects of the three service discount factors were tested for the total revenue, by means of a Generalized Estimating Equation. Thus, in each seasonality combination, there is an equation with independent discount variables [ $Y_{tssea} = \log B(\text{Disc}_{1tssea}) + \log B(\text{Disc}_{2tssea}) + \log B(\text{Disc}_{3tssea})$ ]. A log-linear model was used, with a matrix work structure AR(1), considered to be the best for these data (lower QIC).

The four combinations of the two dimensions of seasonality involved in this third analysis were as follows: (1) low season demand during weekends (LSWE), when there is a low number of consumers with high heterogeneity of reinforcers available to meet demand; (2) low season during commercial working days (LSWD), which presents a low number of consumers with low heterogeneity of reinforcers available to meet demand; (3) high season during weekends (HSWE) that present a high numbers of consumers with low heterogeneity of reinforcers available to meet demand; and (4) high season and commercial working days (HSWD) that present a high number of consumers with low heterogeneity of reinforcers available to meet demand.

## Results

### *The effect of discounts for each service on the composition of revenue*

Table 3 shows findings related to the impact caused by reducing monetary punishments associated with different levels and type of reinforcers, which are programmed by the offeror to consumers, in relation to the composition of the commercial context (revenues) received by the offeror.

The partial revenues earned lagged in one day, from differentiated services and from sophisticated differentiated services, had a positive effect on the current revenue, which indicates an upward trend in their predicted value. Thus, the previous  $S^{Dof}$  increase (previous commercial context) tends to generate an increase in the subsequent  $S^{Dof}$  (subsequent commercial context). However, the partial revenues derived from environmentally friendly services do not present the same effect. That is to say, the previous context in this case did not generate the subsequent context.

All the explanatory variables (discounts for each service, which are also known as offeror's responses) had a positive influence on their respective revenues, with greater impact for services that offered advanced differentials, environmentally

friendly differentials and those without differentials in relation to other hotels, respectively. That is to say, discounts on services offering advanced differentials had a far greater impact than those given for other services. The effects of these discounts were temporary – lasting only on the day they were implemented (very short-term temporal discrimination<sup>of</sup>). These did not, therefore present long term effects.

However, in the case of non-differential services and environmentally friendly differential services, the effects of a discount occur one day later (short latency purchase response<sup>dem</sup> to generate subsequent  $S^{Dof}$ ). This is due to the fact that clients only settle their accounts when they check out of the hotel. Such delays are not observed in the case of differential sophisticated services, since payments are made before the client occupies the room.

Due to the non-stationary nature of the data for ARIMA models for differential services, an integration order equivalent to one was allocated to this. As a result, the non-stationary effects were corrected. The adjusted residuals of the (Ljung–Box) models were higher than  $p > 0.05$ , which shows there was no significant autocorrelation between them. The data was better adjusted for services with sophisticated differentials ( $R^2$  stationary = 98.2%) and the data for the other relationships were reasonably well-adjusted. These can be more easily visualized in Fig. 2, represented by Graphics A, B and C.

Table 3  
Effects of each discount on the (partial) revenue.

Variables			Estimate	Standard error	Ljung–Box	$R^2$ stationary
DV: Revenue from non-differential accommodation	Constant		0.74*	0.09		
	Autoregressive	Lag 1	0.55*	0.08		
	Delayed		1		28.6**	64%
Factor: Discount for non-differential accommodation	Current effect	Lag 0	0.45*	0.15		
DV: Revenue from sophisticated differentiated accommodation	Constant		−0.13*	0.05		
	Autoregressive	Lag 1	0.30*	0.10		
	Order of integration		1		19.7**	98.2%
Factor: discount for sophisticated differentiated accommodation	Current effect	Lag 0	0.78*	0.15		
DV: Revenue from environmental friendly differentiated accommodation	Constant		−0.02	0.05		
	Order of integration		1			
	Delayed		1		26.4**	53.8%
Factor: discount for environmentally friendly differentiated accommodation	Current effect	Lag 0	0.62*	0.29		

Source: Prepared by the author of this article.

\*  $p \leq 0.01$ .

\*\*  $p > 0.05$ .

Table 4  
Effects that types of seasonality have on revenue (total).

Variables		Delay	Estimate	Error standard	Ljung–Box	$R^2$ stationary
DV: Total Revenue Relative	Autoregressive	Lag 1	1.24*	0.03		
		Lag 2	−0.99*	0.03		
		Lag 2	−0.26*	0.10		
	Moving average	Lag 3	−0.47*	0.10		
		Lag 4	−0.70*	0.09		
		Lag 7	−0.32*	0.10	8.00**	78.7%
Season	Low season = 0; High season = 1	Lag 0	1.02*	0.12		
Days of the week	Weekends = 0; Commercial working days = 1	Lag 0	0.21*	0.08		

Source: Prepared by the author of this article.

\*  $p \leq 0.01$ .

\*\*  $p > 0.05$ .

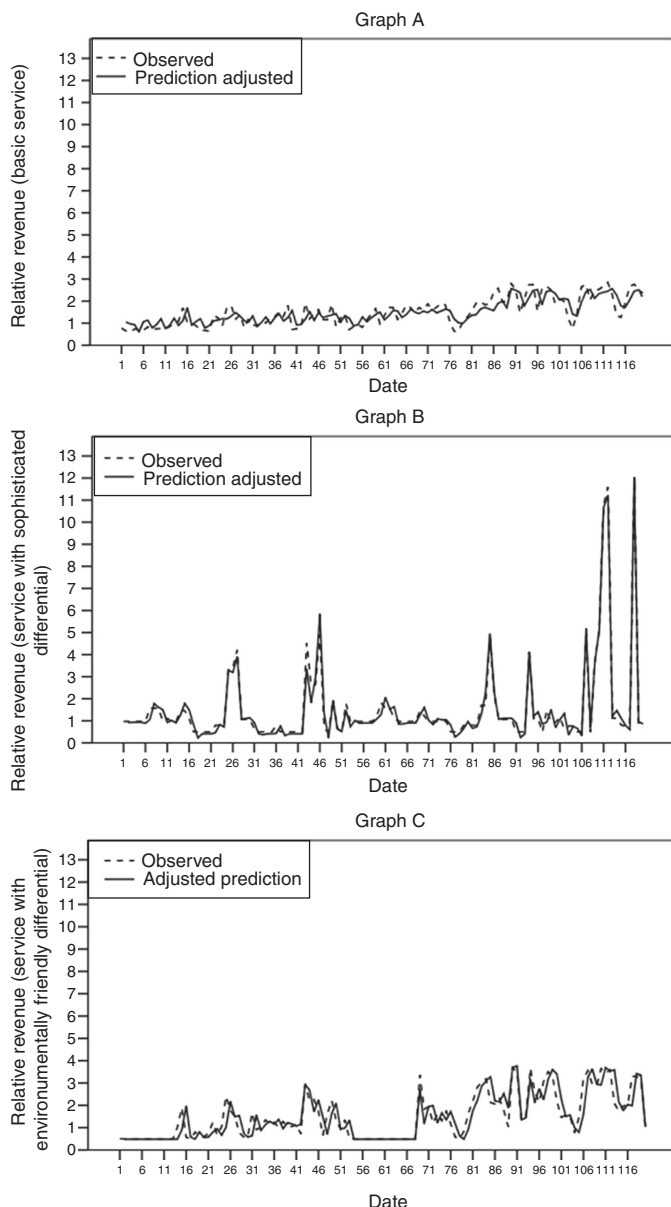


Fig. 2. Adjustment for the discount prediction for each services that make up the sales revenue.

Source: Prepared by the author of this article.

Graph A shows the adjustments made for partial revenues for non-differential services over time (during consecutive days), based on the predicted discounts. Graph B shows the adjustments made for partial revenues for sophisticated differential services, while Graph C shows the adjustments made for revenues for environmentally friendly differential services.

#### *The effects that types of seasonality exert on revenue*

The non-stationarity corrected in the ARIMA model for the effects that discounts have on each type of services, show that these are due to the seasonality in the revenue data. Thus, all the partial revenue data was aggregated into total revenue and existing seasonalities tested. Table 4 shows the effects of the intensity

of purchase response<sup>dem</sup> over time on revenue ( $S^{Dof}$ ) and the effects created by the greatest number of varied reinforcers available to consumers ( $S^{Rdem\_varied}$ ) over time on revenue ( $S^{Dof}$ ).

With regards to the hotel researched, the low season (LS) occurs in the month of January and the high season (HS) during the rest of the year. There were higher peaks in room occupancy during commercial working days (WD) rather than at weekends (WE). Thus, both the seasonality dimensions had a current effect (latency response<sup>dem</sup> aggregated to generate subsequent  $S^{Dof}$ ) on revenue and, together with the lagged revenue, showed a 78.7% stationary explanatory variance. In addition, the seasonal effect (intensity of purchase response<sup>dem</sup> aggregated over time) is much stronger on revenue, almost five times greater, than during weekdays (period of greater number of varied reinforcers ( $S^{Rdem\_varied}$ ) associated with purchase responses<sup>dem</sup>).

#### *The effect of discounts of each service on revenue in different seasonal demands*

Fig. 3 shows the effects of reducing monetary punishments associated with different degrees and types of reinforcers that the offeror programs for the consumer, in a subsequent commercial context by the offeror (revenue) in temporal context combinations of demand. Every reduction made of the punishments programmed by the offeror for each service has a positive impact on revenue, bearing in mind the delay of one day for non-differential services and for environmentally friendly services, as found in the first analysis. Combining both seasonal demands, we find the dimensions of service demand responses (average occupancy rate LSWE=20.3%, LSWD=38.8%, HSW=41.1% and HSWD=72.3%).

Implementing a price discount strategy for non-differential services is similar during all the seasonal periods, being greater in periods of high season and during commercial working days (HSWD). Thus, a discount of 10% in the cost of these services generates a total income of around 2.8 times the average revenue of a company. While the same proportional increase in discounts generates 2.61 times the average revenue obtained at weekends during the high season (HSWE). This strategy does not significantly affect revenue in the low season and during commercial working days (LSWD).

A price discount strategy for sophisticated differential services is implemented more often in the low season during commercial working days (LSWD) and, thereafter, during the low season at the weekends (LSWE). Thus, a discount of 10% in the price of these services generates a total income of around 3.31 times the average revenue of a company. Meanwhile, the same proportional increase in discounts generates 1.44 times the average revenue during commercial working days in the high season (HSWD). This strategy produces no significant impact during the high season and at weekends (HSWE).

The implementation of a price discount strategy for environmentally friendly differentials is greater during commercial working days in the high season (HSWD) than at any other period. Thus, a 10% price discount for these services generates total revenue of around 2.45 times the average income of a company. Meanwhile, the same proportional increase in discounts

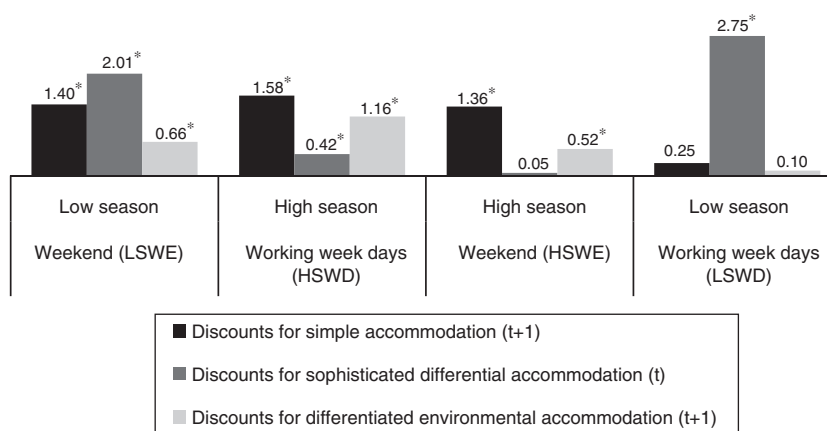


Fig. 3. Effect of discounts for each service (Estimates) on revenue (total) for seasonal demand.  $*p \leq 0.01$ .

Source: Prepared by the author of this article.

generates 1.64 times a company's average revenue during the high season at weekends (HSWE). This strategy shows no significant effects in the low season during commercial working days (LSWD).

## Discussion

These findings show that the effects that discounts have on revenue depend on the service differentials involved, the policy a company uses to charge its customers and the seasonality of demand. The operant economic-behavioral theory explains these findings.

### *How the commercial cycle is explained by the three-term bilateral contingency*

On the whole, these findings show how a commercial cycle occurs from an operant behavioral economy viewpoint (Foxall, 1999; Vella & Foxall, 2013). This research shows how service differentials (the offeror's response when programming different levels of reinforcers to consumers) generate different impacts in the subsequent revenue of a company (subsequent commercial context for an offeror derived from aggregated purchase responses from consumers), depending on the price discounts allocated to these purchases (offerors response when programming reduced monetary punishments to consumers). In general terms, this creates a commercial cycle. Thus, the effort involved in offering consumers different discriminative stimuli that release different levels of reinforcements and reduce monetary punishments, generates a variety of customer purchase charges that, if aggregated, generate new commercial discriminative stimuli for the offeror. This, in turn, creates favorable situations for the growth of the company itself and enables the offeror to provide new customer responses.

Thus, the behavior of the offeror controls a good deal of the behavioral contexts of the company's customers and the offeror is effective when establishing monetary punishment associated with the magnitude of the reinforcers released through services, which, in turn, return to create new commercial contexts on

the part of the offeror. However, the consumers do not directly control the release of the offeror's reinforcers (profit) or punishments (losses). This release depends on the low financial cost of the offeror's own response with existing resources to perform his role as the person who controls and regulates demand. If the offerors themselves are effective, they can appropriate the reinforcers – profits (Vella & Foxall, 2011).

This supports the assumptions contained in the Service Dominant Logic (Lusch & Vargo, 2014). The use by service managers of specialized abilities and knowledge forms the basis of a fundamental unit of exchange, which provides consumers with a context and projects reinforcers. The consumers reciprocate by paying more money. So, this interaction between a consumer and the company is explained through a functional relationship of dependence between one and the other, so that both parties can obtain mutual benefits. The managers implement pricing strategies and offer services in an attempt to encourage these mutual benefits.

### *The effects obtained by releasing reinforcers (services) and reducing punishments (discounts) for the consumer*

Consumers did not generalize the offeror's discriminative stimuli (Catania, 1998). That is to say, a company's services had different purchasing rates (in this case, occupancy rates). Each reinforcer (types of service) programmed by the offeror generates distinct responses to demand. However, the effects obtained by reducing monetary punishments (discounts) and the time it takes to generate new commercial contexts for the offeror, are much the same (greater generalization).

Thus, sophisticated services are shown to be discriminative stimuli that indicate social reinforcers that represent sophistication (Liu, 2010), luxury (Yeoman & McMahon-Beattie, 2006), and exclusivity (Brun & Castelli, 2013; Veríssimo & Loureiro, 2013), as well as more utilitarian reinforcers, providing greater comfort and convenience (Foxall, 2010) for the consumer. This represents greater costs and efforts for the businessman or manager but, if priced right, also greater profits, since this is a generalized utilitarian reinforcer (Vella & Foxall, 2011).

This research shows that offering clients discounts on these services is the best way to create a high impact on revenue. Discounts that reduce the size of the punishment consumers have to pay (Oliveira-Castro, 2003; Porto & Silva, 2013; Rossiter & Foxall, 2008), make it easier to obtain reinforcers that are utilitarian and socially mediated by other consumers. At the same time, these create a discriminative stimulus (revenue) that release reinforcers – profit (Talluri & Ryzin, 2005; Vella & Foxall, 2011).

A similar explanation can be given for the other discounts given on other services. This is corroborated by the same positive effect obtained through discounts given on environmentally friendly differential and basic services, which can be characterized as a form of consumption that promotes a sense of well-being (Lima & Partidário, 2002), or hedonic in the first case and maintenance in the second case (Foxall, 2010). Services that have sustainable features identify a company that adopts environmental management (Felix & Santos, 2013) and which promotes positive feelings. Discounts make choices easier for consumers who seek reinforcers related to their well-being, in particular attracting those who could stay in non-differential hotel rooms, due to the similarity in prices.

Non-differential services, on the other hand, represent basic conditions of hospitality (João, Merlo, & Morgado, 2010). In this research study, these are priced lower in relation to sophisticated services, thus, discounts related to these services have proportionally less impact on revenue. However, discounts given on this type of accommodation can create greater competitiveness in relation to other hotels of the same size (Abrate et al., 2012) and therefore function to attract more consumers who seek basic hotel services.

Policies involved in how clients are requested to settle their accounts relates to response latency (Catania, 1973) from the offeror himself, so as to create new commercial contexts for the company (Vella & Foxall, 2011), indicating greater generalized reinforcers (Kanfer, 1960) – profit. This research study shows that this effect is delayed by one day for services that involve a lower magnitude of revenue to the offeror and has an immediate effect in the case of those of larger magnitude.

In addition, the duration of the effect of a discount – the time it takes for an operant response (Catania, 1973) – on revenue is short (lasting only on the day of the discount). Revenue returns to similar levels when the price goes back to normal, which is qualified as a *business as usual* strategy (Hanssens & Dekimpe, 2012). This is because a temporary discount strategy creates incremental and temporary revenue. The non-stationarity found in non-differential services, which would mean that revenue did not return to the same level, is due to seasonality, which is corrected in the ARIMA model by the method of difference (integration in the time series).

#### *How seasonality affects revenue*

The seasonality found is due to the demand for hotel accommodation services. Studies about the effects of seasonality have not had much of a theoretical basis (Koenig-Lewis & Bischoff, 2005), but the findings of this study can help explain how

discounts for each service (differential or otherwise) have a major and positive impact on revenue depending on the seasonality of demand. It was shown that creating revenue for a company by means of a commercial cycle depends on an adjustment being made to aggregated consumer purchase responses, be this either to attract different segments (consumer heterogeneity), or to attract more consumers from the same segment (number/consumer intensity) (Evans, 2003; Smith, 1956).

These combinations of seasonal demands derive from the periodicity of aggregated purchases. These create contexts that either increase or decrease the effectiveness of the responses to the programmed reinforcers and punishments that the offerors make available to consumers. Thus, during periods when there is a low level of consumer purchases, discounts on sophisticated differential services have more power to generate greater revenue than during periods of high intensity of purchases and also represents the only discount strategy that has a significant effect on the LSWD.

From a consumer's point of view, since this type of service involves greater punishments (higher prices) and high utilitarian and social reinforcers (Foxall, 2010), a price discount generates an increase in revenue due to an increase in hotel occupancy rates. This is what occurs, especially during periods when there is a low volume of consumers (low season), a period that is more beneficial to demand than to supply (Parker, 2013).

In the case of discounts for non-differential services, these are generated as the result of greater income being obtained when there is a high intensity of consumers, but with slightly less impact than the discount capacity for sophisticated differentials due to the fact that there are a smaller number of consumers. These also have a reasonable impact on the LSWE. Again, from a consumer's point of view (Foxall, 2010), since these services offer basic hospitality reinforcers and are offered at low prices (low level of punishment), reducing these increases the aggregated consumer purchase response, but not as much in relation to services that offer greater reinforcers. Analogically speaking, but from the view of the offeror (Vella & Foxall, 2013), these services are designed to generate greater revenues since they attract a higher intensity of consumer purchases while involving less punishments for the consumer. Reducing prices would not have such an effect in increasing revenue, because these already represent low levels of punishment. However, during the high season, these would attract proportionally a greater number of consumers, which would make this worthwhile to the offeror.

And finally, discounts for environmentally friendly services create less impact than the two services described above, but create a much greater positive impact as regards HSWD. These differentials in services attract people who seek hedonistic reinforcers (Foxall, 2010) or those that promote a sense of well-being (Lima & Partidário, 2002). Reducing their prices does not make as much difference as other services, probably because there was still not a great demand for these at the time and place this research was conducted, for consumers who are aware of these reinforcers (Peattie, 2010), leading to low room occupancy rates, even though these cost less.

This research study offers a counterpoint and specification to the research conducted by Enz et al. (2009), who did not find

strong macro-economic factors in the hospitality service company revenues. It is possible that this was because they did not investigate shorter seasonal periods or the interaction that exists between seasonality and pricing strategies for each service, for which the present study has obtained results.

## Conclusion

This research shows that (1) a commercial cycle for services can be explained by behavioral economics, in particular by a three-term bilateral contingency; (2) price discounts have a positive and distinct impact with regards to the composition of a company's revenue; (3) the effects that discounts have on revenue are very short-term – only lasting as long as the day on which they are implemented; (4) there is a delay of one day before it is possible to establish what effects discounts have had on daily revenue from some of the services, due to check-out procedures (payments are received only after the services have been used); (5) the effects that discount have on revenue are greater for services that are more differential than for those that are less differential; (6) revenue data shows non-stationary effects, which requires their elimination from the ARIMA forecast; (7) non-stationarity is due to seasonality, and this has two dimensions related to demand – the number of purchases made and the heterogeneity of the reinforcers of the buyers; (8) seasonality that represents the period of purchasing intensity, exerts a much more positive effect on revenue than the season, which represents the period with the greatest or lesser heterogeneity of reinforcers of those who buy these services; (9) the effects that discounts have on revenue for non-differential services are similar during working days at the high season and during weekends at the low season; (10) the effects of discounts on differential and sophisticated services are greater during the low season; and (11) the effects of discounts on environmentally friendly and differential services are greater during the high season and on commercial working days.

Service managers, especially those involved in tourism, can evaluate and adjust their price discount policies by establishing if there is a particular trend in their company's revenue over time and, if so, to control these to ascertain the real effects of these discounts. These are price strategies that attract demand in the short-term and that need to be used continually in order to generate ongoing effects on revenue. However, these have a different effect on a company's revenue depending on the service differentials and the seasonal periods of demand. Discounts create a greater impact on sophisticated differential services than on those with few differentials, so that a good strategy would be to generate the most revenue in periods when demand is low. In the absence of differentials (basic services), these discounts have little impact, but even so are still positive and similar to almost all other periods of the year, except for commercial working days during the low season.

The effectiveness of discounts can be ascertained in order to establish better pricing strategies and to enhance the value of the company by commercializing its products or services. This research study can therefore help business, marketing and/or controller managers to better evaluate the right periods to

implement price discount policies. Using only the data related to a service (hospitality) and only a small amount of data collected during the low season represent a limitation in the case of this research. However, this study used up-to-date information provided by the company analyzed. In addition, the findings are generalized for situations when clients pay on the same day or immediately after using the services. In this way, the findings could be similar to other researches within these contexts.

## Conflicts of interest

The author declares no conflicts of interest.

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