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Are You Awash in the Sea of Competitive Price Intelligence? Let Analytics Be Your Life Raft

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ABSTRACT

Now, more than ever, your guests have access to an ocean of price intelligence on the Web and are using your rates in context of your competitors to make their buying decisions. As a result, your competitor's rates can have a direct impact on the demand for your hotel. So you collect the data on your competitors' rates. But, hotel pricing is hard enough without struggling to account for your competitor's price strategy. Over-react to your competitors pricing and you can trigger a price war, under-react and be caught in a spiral of decreasing demand for your hotel. This paper describes how to leverage analytics with your competitor rate data to make better pricing decisions for your hotel.

INTRODUCTION

Adoption of pricing technology and analytics by the hospitality industry is relatively low. Many hotels still use a lot of reports and spreadsheets for managing revenue and forecasting, if they use anything at all. At the same time, Internet distribution is relatively mature, and this has placed a strong focus on the competitive nature of pricing in the industry. Hotel customers can easily shop around and are able to use a hotel's rates in context of their competitors to make their buying decisions. As a result, most hotels that are actively managing their pricing use a competitive pricing shop mechanism as a primary tool to assist them in pricing. However, simply following the lead of our competitors in pricing can lead to significant loss in revenue. Further, revenue management systems have not always made good use of the competitive pricing information that is available, either.

The purpose of this paper is to discuss the importance of competitor pricing, and to present methods for incorporating competitive pricing into demand modeling for supporting optimized pricing and revenue management decisions.

HOW ARE WE IMPACTED BY COMPETITIVE PRICING?

Price is an important factor in determining customer demand for a product and it plays a central role in hotel revenue management. When customers consider reserving a room at our hotel, they could also be aware of competing hotels that offer similar products or services. A competitor's price (cross-price) has the potential to impact the own-brand demand in two ways. From our perspective, changes to a competitor price could signal that competitor's intent to acquire or relinquish market share from us. Therefore, competitor price could have a direct impact on our demand as consumers shop across brands to find the lowest price. In addition, competitor price might have a secondary, indirect effect on demand through changes in price a revenue manager makes in response to changes in competitor prices. For example, we might lower price to acquire market share from a competitor whose price is expected to rise or stay the same. In addition, from the customer's perspective, competitor price can influence perceptions of the fair or desired market price (reference price). For example, a customer might purchase from us if the customer expects the competitor price to be higher, but might pass us by if they expect the available prices from competitors to be lower. In this context, competitor price could be an important factor in the customer's reference price for our hotel.

HOW MUCH SHOULD COMPETITORS INFLUENCE OUR PRICING?

As stated earlier, your competitors pricing and the competitive position of your hotel is important. However, one must be careful – competitors' pricing is often driven by factors that should not be influencing our own. If we follow the competitors lead, not only are we letting our competitor price our hotel, but we might be following strategies that do not even apply to our specific demand-price situation.

For example, consider a competitor hotel that is not as vigilant in their Revenue Management practices as you are at your hotel. If our competitor leaves their prices too low when they don't need to be, they might sell out their entire inventory much too early and end up denying higher priced bookings that come along later. If we allow the competitor to lead our pricing, we will end up doing the same thing – and both us and our competitor forfeit revenue as a result. Similarly, if one of our competitors takes a large group booking, they could end up raising their transient rates, simply because they are now low on available rooms. From the competitor's perspective, it is the correct action for them to take, but this might not be the correct action for our hotel.

So, the question becomes, how much should our competitors influence our pricing?

Most revenue managers are taught the basic principle of revenue management – to compare demand and availability. However, when a revenue manager uses competitive prices in a manual environment, they tend to

rationalize “if I am competitive, then I will get my fair share of demand, and if I am not, then I won’t.” The reality is that while our demand is impacted by competitor pricing, it is also dependent on a variety of other factors like time of year, day of week, and so on. In addition, the degree to which we are competitive or not competitive is also relevant. So the question is not only “are we priced higher or lower?”, but “how much higher?” or “how much lower?”

Consider the real-world example in the Figure 1. Here we have four 4-star hotels, four 3-star hotels, and four 2-star hotels. Just by focusing on the 3-star hotels, we see some interesting differences in strategy. The fourth 3-star hotel has chosen to be closely competitive with the 2-star hotels, whereas the first hotel has chosen to be competitive with the 4-star hotels.

Just imagine the revenue managers at the other two hotels trying to figure out where to price themselves: “should I price high with the second hotel and the 4-stars, or go low with the first hotel and the 2-stars?” In fact, there is a significant range of prices available between the two – but will the revenue manager even consider those options, and if he does, how does he choose? In the end, the correct way to choose pricing has not changed in the face of competitive effects – the revenue manager should still be evaluating demand vs. available capacity. The presence of competitive pricing information simply reiterates a fact that we all recognize already; that demand is impacted by price. Furthermore, the availability of competitive pricing also reminds us that relative pricing has an important impact on demand.

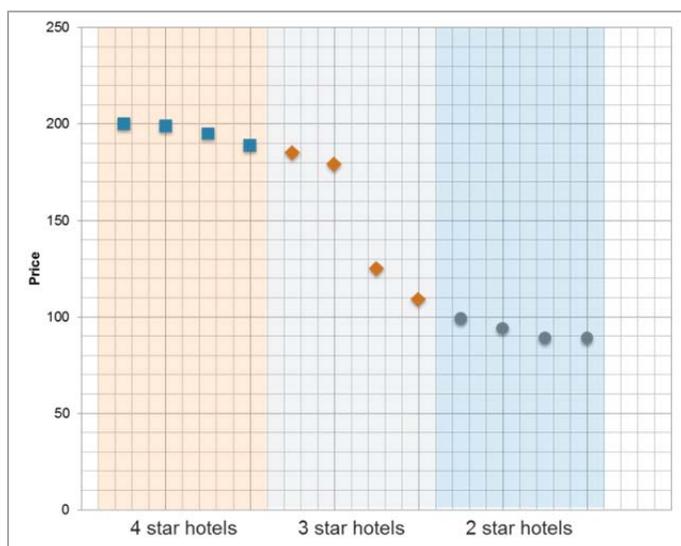


Figure 1. Hotel Prices for a Range of Hotels in a City.

USE OF COMPETITIVE DATA BY REVENUE MANAGEMENT SYSTEMS

Some revenue management systems use competitive pricing, but many do not. Even when revenue management systems use competitive price intelligence, they often use the information incorrectly; in the same way that it would be used manually – restricting available price choices rather than analyzing the impact of competitive pricing on demand. However, the strength of a revenue management system is that it should be used for analyzing data at a level of complexity that users can’t do for themselves. Trying to understand not only how customers react to our pricing, but to HOW our prices are positioned relative to competition is something that revenue management and price optimization analytics CAN do. To summarize: revenue management systems can benefit from competitive price information by:

- Estimating the impact of our own price on our demand (i.e. price elasticity)
- Adjusting this affect based on our price position relative to competition

Adopting price elasticity into a revenue management system does impact the way a revenue manager works with the system. Suddenly, everything is connected in a way that it wasn’t before – unqualified price changes impact qualified rate availability recommendations, demand forecasts have to be thought of as relative to price position, and so on.

This level of inter-connectivity in decisions can make a revenue manager feel like when they first start really thinking about length of stay effects, and suddenly realize just how important shoulder days can be to true revenue maximization. It can take a user a while to get used to this degree of connectivity, even if the effects themselves are quite intuitive.

THE ANALYTICS OF COMPETITIVE PRICING – THE SAS MODEL

Competitor prices have been incorporated into our demand model in three places. First, historical competitor prices are used as an additional instrument in the calibration of our own price elasticity, in order to control for price endogeneity. Second, competitor prices are added to the demand model as additional controls to adjust estimates of our demand as well as to more accurately estimate our own price elasticity. Finally, future competitor prices are used to adjust the future reference price calculation in order to refine future demand forecasts. A more detailed description of each of these uses of competitor price is given below.

COMPETITOR PRICE AND PRICE ENDOGENEITY

In situations where revenue managers actively adjust own-brand price in response to changes in expected future demand, standard modeling techniques can lead to significantly biased estimates of the own-brand price elasticity. An intuitive understanding of this problem can be had by considering the following example. Suppose a revenue manager increases price in response to an expectation that future demand would increase. In this situation, it would appear in the observed data that price and demand were positively correlated. In turn, this would lead to the incorrect conclusion that consumer demand increases in response to increased price. This situation leads to a problem known as price endogeneity, a situation that makes it difficult to separate the effect of price on the consumer's decision to purchase from the effect of the revenue manager's decision to change price in response to expected demand.

One way to separate these confounding effects of price on demand is to apply a two stage modeling strategy known as the instrumental variables technique. In this method, a pricing model is first estimated using additional variables called price instruments that can affect the revenue manager's price decisions. Since revenue managers are likely to change their own-brand price in response to competitor prices, these competitor prices are a natural choice as own-brand instruments. As such, in the employed methodology, each of the competitor prices is used as instruments in the first stage own-brand pricing model. Since the expected price resulting from this model is free of the modeling error, it serves as a useful proxy for the observed price in the own-brand demand model. Therefore, the predicted price from the first stage model is used instead of the observed price in the own-brand demand model. If the price instruments accurately capture how the revenue manager changes price, this methodology effectively eliminates the bias in estimated price elasticity that would result if price endogeneity were ignored.

COMPETITOR PRICE ELASTICITY

The second way in which competitor price is used is as additional controls in the demand model. This use facilitates two concurrent objectives: accurate estimation of our price elasticity and assessment of the level of competition the other brands exert upon our demand. The existence of a limited number of competitor brands ensures that the inclusion of all of the individual competitor cross-price ratios into the demand does not unduly increase the parameters in the model.

In order to understand how the competitor prices are used in the demand model, it is necessary to briefly review how our own price is used in the demand model, since the competitor prices are added in a similar method. First, our price is transformed into a ratio of the observed (our) price and the reference price. The value of one is then subtracted from this ratio in order to produce the "correct" sign $[(\text{Price}_{\text{our}}/\text{Price}_{\text{reference}}) - 1]$. This transformed price ratio measures the proportional change in our price with respect to the reference price. For example, a price ratio of zero implies that the price equals the reference price; a negative price ratio implies the price is less than the reference price, and a positive price ratio implies a price greater than the reference price. By using the price ratio in place of price, the resulting price elasticity accounts for changes in price with respect to the own-brand reference price.

Competitor cross-price ratios are then constructed in a similar manner. Competitor reference prices are calculated and used to construct a competitor cross-price ratio; one for each competitor. The effect of these cross-price ratios measure how a proportion change in a competitor price in relation to its own reference price changes our demand. For example, a positively signed, cross-price effect implies that an increase in a competitor price relative to the reference increases (decreases) our demand. This is indicative of a strong competitor effect since consumers evidently respond to increased competitor prices by increasing their demand for our hotel. Alternatively, a zero or statistically insignificant cross-price effect implies that increases or decreases in the competitor price have no effect on our demand. This would occur if consumers do not consider the competitor price when deciding to purchase from our hotel.

By including separate competitor cross-price ratios into the demand model, two distinct pieces of information can be derived. First, the cross-price ratio provides efficient controls for the own-brand price ratio effect. In general, control

variables are added to a model when the effect of interest is thought to depend on additional factors. For example, the effect of price on demand often depends on the season, and ignoring the season effect in the model could produce an unrealistic estimate for the price effect. If season were not included in the model, an explanation of the demand variance sought after by modeling demand would only be accounted for by the price term. This would force the price term to account for all of the demand variance, which might be incorrect. However, by including the season variable as a so-called control, the demand variance is correctly shared across the effects of price and season. In other words, inclusion of the control variable allows one to correctly discern the unique contribution of price to demand.

Inclusion of the competitor cross-price effects as additional controls acts in the same manner as including the season effect. Some of the demand variance which would have been (incorrectly) attributed to our price is now correctly attributed to changes in the competitor prices. The model structure takes care of estimating the precise proportion of variance attributed to both the own-brand and competing brand prices effects. In so doing, the cross-price effects produce more accurate estimates of the true effect on demand of our own pricing.

USE OF COMPETITOR PRICE IN CALCULATING THE REFERENCE PRICE

In addition to historical competitor pricing, competitor price are often available for a short time window into the future beyond the current date. This enables the third use of competitor prices - to adjust future reference price for the purpose of forecasting future demand. Here we take advantage of our cross-price ratio effect model a second time, by using the cross-price effects estimated in the own-brand demand model to calculate a weighted average competitor price. This weighted average is then used as an offset to adjust future, own-brand reference price. Competitors are given more weight if their cross-price effect is both statistically significant and positively signed. Note that competitor prices are not used to adjust our historical reference price, because it is assumed that the observed price for our hotel already incorporates information about the competitor vis-à-vis changes in our price that a revenue manager makes in response to competitor prices.

USE OF COMPETITOR PRICE IN ACCOUNTING FOR COMPETITIVE PRICE STRATEGY

While the inclusion of competitive prices directly into demand modeling provides a robust means for incorporating this information into revenue management decisions, this method is still limited by the short-term nature of revenue management modeling. It is not generally able to capture the potential for long-term customer or competitive responses to our pricing. Therefore, in addition to including competitive price information into our demand model, we can also use future competitive prices during optimization for competitive price positioning. This is done by optimizing over the price points which would lead to a desired competitive ranking.

Consider, for example, a high-end hotel whose competitors are clearly deemed to be inferior products in the market relative to this hotel. While it could maximize short-term revenues to be at or below the prices offered by the competitors, in the long term, such a practice could lead to undesired competitive response (for example, reduction in competitors' prices to recapture lost share) or even impact customers' impressions of our hotel negatively (assuming that some customers relate price equity with service equity). By restricting optimization to consider price points that are at or above the competition, we can help ensure that these long-term consequences are avoided, while maximizing revenue over the available choices. This approach accounts for long-term needs while flexing to daily changes in demand, availability, and competitive pricing. This sort of restriction is not necessary for all cases, but can be critical to successful pricing for some types of hotels.

CONCLUSION

While competitive price information is readily available, and clearly recognized in the industry as an essential element of proper revenue management, revenue management analytic approaches and systems often do not take full advantage of this information. By incorporating the use of competitive price information directly into our demand model, we:

- Avoid a problem common to price-elastic demand models (for example, price endogeneity),
- Improve the estimation of our own price elasticity,
- Account for competitive price impacts on demand, and
- Improve forecasts of future demand

We can further use competitive price information during the optimization of revenue management controls and pricing, by using future competitive price information to avoid undesired competitive or perceptual responses.

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