Should revenue management be called displacement optimisation?

Steven Pinchuk

Received (in revised form): 10th July, 2007

Revenue Management, Harrah's Resorts, One Harrahs Court, Las Vegas, NV 89119, USA
Tel: +1 702 682 8648; E-mail: spinchuk@harrahs.com

Steven Pinchuk *is the Corporate Vice President of Revenue Management (RM) for Harrah's Casinos & Hotels. Harrah's Entertainment is the world's largest Casino Hotel Company. He is in charge of all RM and distribution at Harrahs. He has held senior positions with numerous travel and travel-consulting companies in many industries.*

ABSTRACT

KEYWORDS: dynamic pricing, market based pricing, dynamic market based pricing, pricing, displacement optimisation, revenue management pricing

Revenue Management (RM) should optimise profits instead of managing revenues. Existing systems are not determining the optimal prices; instead they are determining the displacement price threshold based on historical or preset prices. In the future, RM should optimise profits based on pricing that incorporates many consumer oriented factors including price elasticity.

Journal of Revenue and Pricing Management (2007) **6,** 264–268. doi:10.1057/palgrave.rpm.5160093

OUR GOAL

Revenue Management (RM) has come a long way since its inception. It is a powerful and proven tool that we should be proud to have helped develop. RM's application increases profits substantially when it is properly applied. RM should, however, be called 'Displacement Optimisation' (DO) because we are really just determining what demand to accept and reject based on a displacement process, which is described below. DO uses preset or historical prices and not true dynamic market-based optimal pricing (DMBOP) to determine what we should charge the various demand segments for each of our products. We are not determining optimal demand based on optimal pricing. Wouldn't we rather say that we are making all the optimal decisions required to practise true 'Profit Optimisation?'

The future of RM will be to truly integrate DMBOP into RM calculations. Studies from McKinsey and Gartner have found that a 1 per cent increase in pricing leads to a 9 per cent (McKinsey) to 11 per cent (Gartner) increase in profits. How can DMBOP be incorporated into RM's existing DO process? The journey towards including DMBOP in RM had to begin with the present day RM foundation that we have created using DO. Einstein said 'If I have seen farther than others, it is because I was standing on the shoulders of giants'. DMBOP requires standing on the shoulders of the pioneers of RM's DO.

TODAY'S PROCESS

Today's RM process is not optimising the true profit opportunity for the supply it is focussed on because DMBOP is not being used for each date being yielded. Since DMBOP is not being included in today's RM's displacement analysis we are not assuring that the market is being charged what it will pay.

The DO steps were the lowest hanging fruit and were much easier and quicker to accom-

plish than DMBOP. In the path to profit optimisation, DO was the obvious first step. DO uses known price points and their associated historical demand to determine who to let buy the product and who to reject. The only question for DO is how much demand there is for each demand segment for each product at the known price points. Today's forecasts generally use historical demand merged with recent observation, they do not focus on the demand expected from all the price points that the market would pay. The remainder of the DO process can be confined to pretty straight forward, albeit complex, math.

The DO process (Illustrated below, letters correspond to black letter boxes in diagram) needs to be reviewed so we understand how prices are used in DO and then we can discuss how DMBOP could be added to the DO process.

(a) Unconstrained price-insensitive demand forecasts (because they only forecast demand for a few predetermined price points) are used to determine the amount of total demand for each product from each market segment that wants that product at historical or preset prices.

    1. Each market demand segment has a *predetermined* price/rate based on either the *preset price* for that segment or the *historical rate paid* by that segment for that product

(b) The demand for each product, and the preset price for the products or the historical prices for each forecasted segment, is fed into an optimisation model for each product.

(c) The optimisation model uses DO to create a hurdle price, which is used to determine what demand to accept and reject, in order to optimally utilise all the constrained supply and create optimal revenues given the demand forecasts and the preset or historical prices.

    1. The key criteria in the DO optimisation model are assuring that supply is not given to demand that will pay less for the supply than another segment of demand would pay based on preset or historical prices.
    2. *This is DO and not true price optimisation*. Almost all optimisation models are based on revenues today and not on profits. Few models net variable costs from prices or rates before inputting them into the optimisation models. The question to ask in determining what costs to net from prices should be what costs are incurred by selling the product to one buyer versus selling it to another. Even after we add DMBOP to the RM process, this 'profit' calculation must be consistently applied before inputting the prices into the optimisation model so we are optimising on profit (Figure 1).

Future opportunities given today's RM process

The result of this DO process is to allocate the constrained supply to the demand that will pay the highest preset or historical prices. Prices are preset for the various demand segments and products. They are not dynamically calculated based on the current price elasticity theory (PET) of the market for the product being sold. We need to add DMBOP to our DO model.

DYNAMIC MARKET-BASED OPTIMISATION PRICES (DMBOP)

DMBOP is an application of economics' PET and will require a staggering amount of data and real-time analysis, which in turn will require real-time processing power that we may not even possess today. Economics professors have taught generations of students about PET; however, most of the time the lesson came with the caveat that 'although the theory is sound, actually modeling PET in day to day transaction based markets has proven to be very difficult'. Now that RM has the foundation of DO in place, it is time for us to turn our energy to including PET into DMBOP and RM models.

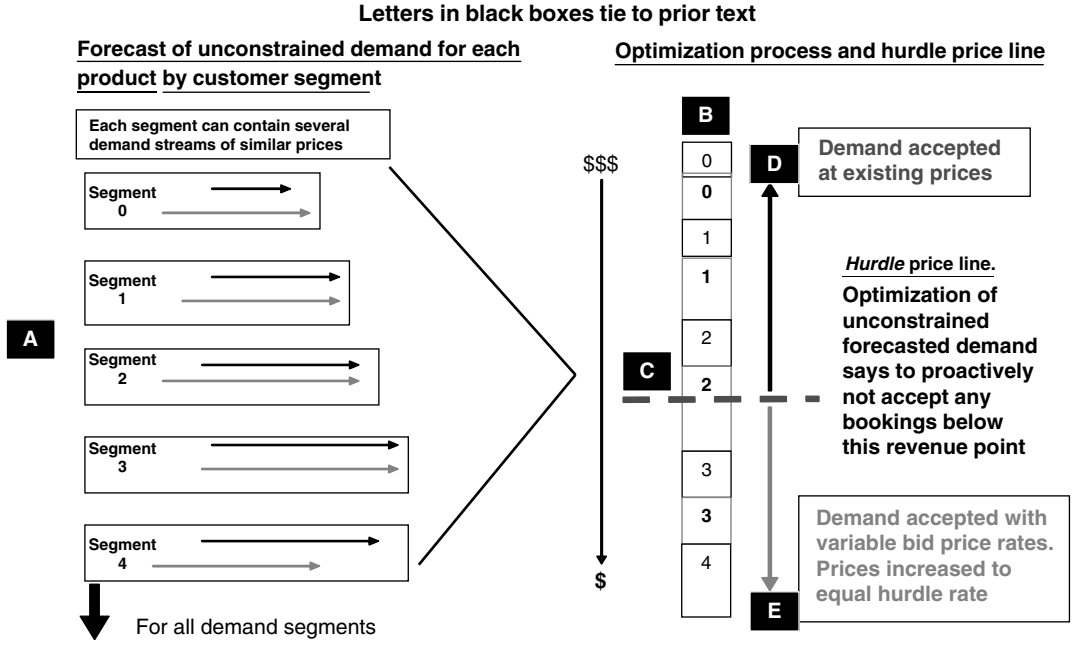

Figure 1: Displacement optimisation process

DO must be calculated first and be used as the foundation to allow us to assure that we do not throw away the profit gains we have proven are attainable using DO. DMBOP is a new and far more complex step in RM and we must assure that as we develop DMBOP we do not throw away the significant profits gains we have already attained with DO.

Ways to add DMBOP to current DO RM models

There are several possible ways to add DMBOP to our current DO RM models. Look at the updated diagram below that has numbers in the black text boxes that correspond to the numbers in the following text. The goal of this approach is to keep the DO model process intact while adjusting it to implement DMBOP.

There are several possible ways to integrate DMBOP into the DO models used today. Look at the numbers in the black text boxes in the second example below:

1. The forecasts can be price sensitive so different demand is forecasted to result from different prices, and multiple price points are forecasted.
2. Or, after the DO process, the prices can be adjusted to reflect DMBOP influences.

Both of these approaches have pros and cons that will be discussed below (Figure 2).

PRICE-SENSITIVE FORECASTS

This approach would produce the optimal prices and potentially the optimal profits. Forecasts would have to be run for each demand segment assuming a range of prices. The price-sensitive forecast models would have to understand the price elasticity for the product at the time the model is run, since the PE will change dynamically as competitors adjust prices, Demand and supply changes based on existing purchases, given the substitution effects of other products and the cannibalisation effect of demand shifting between different demand segments and products would have to be captured as best as possible. These changes then need to be placed into the price-sensitive demand forecasts for each product and each demand segment.

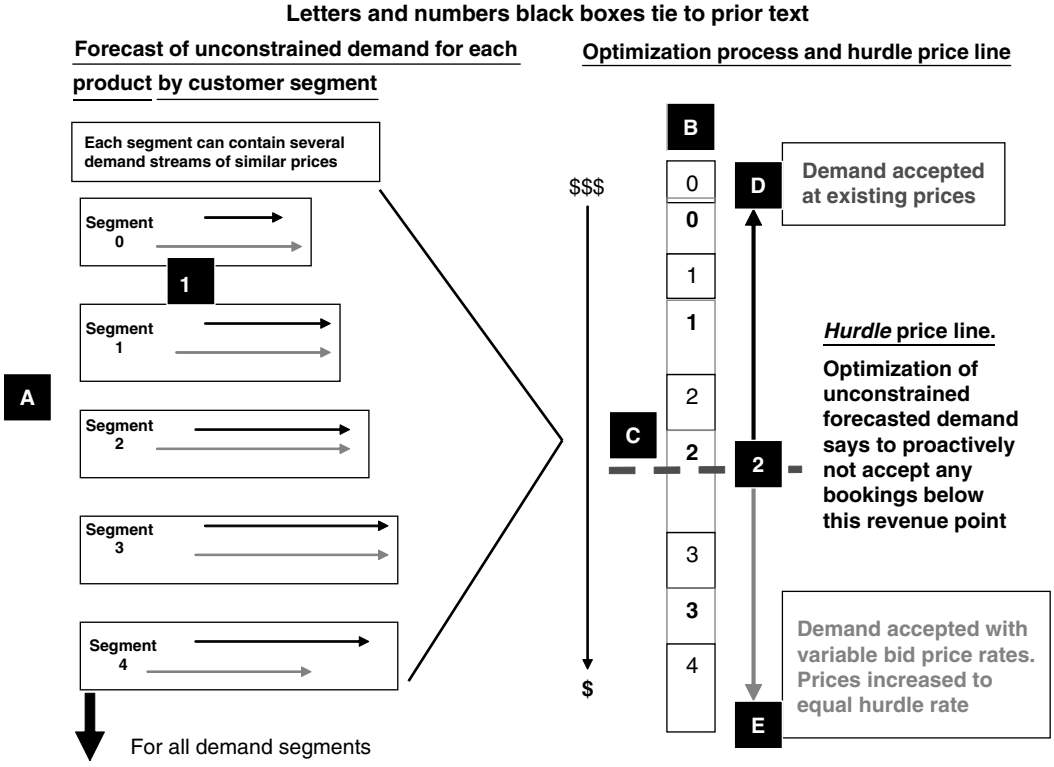

Figure 2: Displacement optimisation process with areas of possible changes

This is the PE that economics talks about when professors use the phrase, 'And if we had perfect market knowledge'. It would be very difficult to calculate given all the interacting considerations. Like many decision support tools, exact results, however, would not be needed to add tremendous value to the calculations and the results of using PET in forecasting and optimisation. The results of the numerous price elastic forecasts would all be input into the optimisation model and the results would be a hurdle price that is based on optimal pricing instead of historical or preset prices.

Observations on the market reactions to the prices, how many people accepted them and how many refused to buy at the DMBOP, would need to be captured and analysed in a feedback loop to verify if the price-sensitive forecasts appear to be valid. If the analysis of the observations appears to indicate that there is too much price sensitivity (more people are saying no than expected) or that there is too little price sensitivity (fewer people are saying no than expected), the demand forecasts would need to be updated and re-optimisation would be needed to create a new hurdle price and its products demand segment-specific resulting prices for each demand segment.

Price sampling would be very useful in determining the PET. After a predetermined number of bookings, a higher or lower price could be offered for every *n*th request to test the PET to see if there is room for higher prices or if lower prices would give the demand expected if it is perceived that there is price sensitivity. Care must be taken to assure that the price charged will create just enough demand to sell the remaining supply. Matching competitor prices may result in too low of a price point where more demand is generated than there is supply. We want to find the price point where just enough demand is generated to sell the remaining supply.

The price-sensitive demand forecast approach is a very worthwhile long-range goal. I believe that it will, however, be the final step in integrating DMBOP into the RM DO models.

Adjusting the prices from the DO process to reflect DMBOP influences

Adjusting the prices that are the result of the DO that uses forecasts that are not price sensitive will be an intermediate step based on the comparative ease of implementing this step versus truly price-sensitive demand forecasts for numerous price points.

In this approach, the DO model calculates prices using forecasts that are not price sensitive. Models are then used to adjust these DO-based prices using the same factors listed above — competitive prices, demand and supply changes based on existing purchases, the substitution effects of other products and the cannibalisation effect of demand shifting between different demand segments and products. Processes would need to be built to gather the available data and determine whether the DO-based prices can/should be adjusted up or down to come closer to the DMBOP. This is a case where the devil will certainly be in the detail. Again, we need to find the right price point so demand equals supply and we are not selling our products at a price that is lower than we could charge and still have enough demand to buy all of our remaining supply.

Next steps

We need to determine if

- There are other ways to include DBMOP into DO-based RM systems
- We are better off incorporating DBMOP into new RM models instead of incorporating them into existing DO-based RM system models
- We can incorporate DMBOP into (1) demand forecasts and (2) into adjustments to the prices calculated in the DO RM models used today
    - What data do we have?
    - What data would we optimally like to have?
    - How can we incorporate either data set into forecasts or adjusting DO-based prices?