Price-optimization method to increase online retailers' revenue, market share, and profit

September 19 2017, by Leslie Sheppard

Credit: AI-generated image (disclaimer)

How can online businesses leverage vast historical data, computational power, and sophisticated machine-learning techniques to quickly analyze and forecast demand, and to optimize pricing and increase revenue?

A research highlight article in the Fall 2017 issue of MIT Sloan

Management Review by MIT Professor David Simchi-Levi describes new insights into demand forecasting and price optimization.

Algorithm increases revenue by 10 percent in six months

Simchi-Levi developed a machine-learning algorithm, which won the INFORMS Revenue Management and Pricing Section Practice Award, and first implemented it at online retailer Rue La La.

The initial research goal was to reduce inventory, but what the company ended up with was "a cutting-edge, demand-shaping application that has a tremendous impact on the retailer's bottom line," Simchi-Levi says.

Rue La La's big challenge was pricing on items that have never been sold before and therefore required a pricing algorithm that could set higher prices for some first-time items and lower prices for others.

Within six months of implementing the algorithm, it increased Rue La La's revenue by 10 percent.

Forecast, learn, optimize

Simchi-Levi's process involves three steps for generating better price predictions:

The first step involves matching products with similar characteristics to the products to be optimized. A relationship between demand and price is then predicted with the help of a machine-learning algorithm.

The second step requires testing a price against actual sales, and adjusting the product's pricing curve to match real-life results.

In the third and final step, a new curve is applied to help optimize pricing across many products and time periods.

Predicting consumer demand at Groupon

Groupon has a huge product portfolio and launches thousands of new deals every day, offering them for only a short time period. Since Groupon has such a short sales period, predicting demand was a big problem and forecasting near impossible.

Applying Simchi-Levi's approach to this use case began by generating multiple demand functions. By then applying a test price and observing customers' decisions, insights were gleaned on how much was sold—information that could identify the demand function closest to the level of sales at the learning price. This was the final demand-price function used, and it was used as the basis for optimizing price during the optimization period.

Analysis of the results from the field experiment showed that this new approach increased Groupon's revenue by about 21 percent but had a much bigger impact on low-volume deals. For deals with fewer bookings per day than the median, the average increase in revenue was 116 percent, while revenue increased only 14 percent for deals with more bookings per day than the median.

Potential to disrupt consumer banking and insurance

The ability to automate pricing enables companies to optimize pricing for more products than most organizations currently find possible. This method has also been used for a bricks-and-mortar application by applying the method to a company's promotion and pricing, in various retail channels, with similar results.

"I am very pleased that our pricing algorithm can achieve such positive results in a short timeframe," Simchi-Levi says. "We expect that this method will soon be used not only in retail but also in the consumer banking industry. Indeed, my team at MIT has developed related methods that have recently been applied in the airline and insurance industries."

More information: The New Frontier of Price Optimization: sloanreview.mit.edu/article/th … -price-optimization/

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