



How to price an island

| By Michael Lieberman

snapshot

Michael Lieberman offers a cruise line example to illustrate how to use discrete choice to determine marginal value.

Aquatica Caribbean is a fictional cruise line based in Florida and incorporated in Bermuda. It is a mid-market vacation enterprise that emphasizes quality and easy fun at relatively affordable rates. Still, Aquatica Caribbean noticed its core demographic was over age 50 and decided to add a new feature, Pirate Cay, to attract more families.

Aquatica Caribbean cruise ships would make stopovers on this fake pirate hideout, where parents could disembark their floating hotel, enjoy a buffet lunch, perhaps explore the isolated atoll with their children, pretending they were shipwrecked or watching out for the royal navy during the heyday of rum-running.

The company purchased a deserted Bahamian island as the site for Pirate Cay. After the purchase Aquatica Caribbean needed to add significant infrastructure to Pirate Cay such as constructing a shopping hub, a water play area in what appears to be the remnants of a washed-away beach dwelling, a hub of youth activities supervised by Aquatica Caribbean counselors, barges and a sea charter dock for boating activities, a grouper game pavilion, fins and boats and a snorkeling lagoon.

What Aquatica Caribbean is not offering are overnight stays on Pirate Cay. The operational considerations alone would make overnights a much more complicated venture and would involve constructing accommodations that are up to the company's standards, expanded dining

facilities, a nightly fireworks show and overnight activities. More basically, where would the housekeeping and kitchen staffs sleep?

Aquatica Caribbean would like to determine the marginal value of Pirate Cay. How much could the company charge patrons who wished to pad around this private paradise? Would they be willing to shell out an extra fee?

In short, what is the value of Pirate Cay to company-wide revenue?

Many moving parts

While on the surface, pricing Pirate Cay might seem a simple exercise, in fact there are many moving parts to the questionnaire. For example, each tier of customer must be analyzed differently. Below is an example list of Aquatica Caribbean tiers given to us by the client.

- Tier 1: First-Time Adventurer
- Tier 2: Explorers Club
- Tier 3: Adventure Travelers
- Tier 4: Officers Club
- Tier 5: Captain's Circle

There are several major types of conjoint analysis, including traditional conjoint. The primary reason to deploy a traditional conjoint is in product design. There is also choice-based conjoint, also known as discrete choice. A discrete choice model is used when products exist and we are looking for choice and price functions for various brands. Discrete choice can also accommodate existing features, such as sea, mountains or land, and work them into the choice function.

Consumers do not make decisions in a vacuum. So, in order for Aquatica Caribbean to

quirks.com/articles/2017/20170105.aspx



Figure 1

Annual Number of Cruise Ship Passengers	20,335,000
Percent of Cruises in the Caribbean	37%
Aquatica Caribbean Cruises Market Share	12%

Base Aquatica Caribbean Annual Passengers	933,474
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Aquatica Caribbean Tiers		Annual Tier Visitors	Calculated Value of Pirate Cay	Estimated Added Value of Pirate Cay
First Time Adventurer	34%	317,381	\$69	\$21,899,303
Explorers Club	24%	224,034	\$78	\$17,476,635
Adventure Travelers	22%	205,364	\$54	\$11,089,672
Officers Club	14%	130,686	\$32	\$4,181,964
Captain's Circle	6%	56,008	\$0	\$0

Total Estimated Added Value of Pirate Cay	\$54,645,574
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Table 1

Aquatica Tier Membership		Calculated Value of Pirate Cay
Tier 1	First Time Adventurer	\$69
Tier 2	Explorers Club	\$78
Tier 3	Adventure Travelers	\$54
Tier 4	Officers Club	\$32
Tier 5	Captain's Circle	\$0

assess the true addition value of Pirate Cay, we suggested that other add-ons be shown in the survey. In addition to producing a better gauge on the value of Pirate Cay, Aquatica Caribbean would be able to test other potential options and produce a relatively robust price model for its cruise line in general.

Below are the other features that Aquatica Caribbean wanted included in the model.

- A Day of Adventure on Pirate Cay
- All the Magic Your Kids Can Learn!
- All You Can Yoga!
- Bowling Anyone?
- Complimentary alcoholic beverages
- Pirate Cay Action Adventure Water Day
- Price – five incremental additions with different combinations of extra activities

Look closely and you'll notice that Pirate Cay is included in two features. Given that we write the conjoint syntax windows, we are able to take multiple features but create one Pirate Cay variable. We are also able to do a variable for children's activities, free features, fishing, etc.

Estimate choice probabilities

A discrete choice model uses a multinomial logitistic regression technique that produces coefficients for each level of service and, in turn, likelihood percentages to estimate choice probabilities. The model outputs exponential utility scores that can be used to produce the desired output – in other words, optimal pricing, market share and choice measurements.

However, if we programmed a full design with each variable and price level, there would be literally thousands of attributes and levels. It is impossible to test all combinations, so we have to choose a subset.

The aim is to create a mathematically valid, smallest-manageable combination of potential profiles. These small number of are known as orthogonal designs. Rather than showing thousands of combinations, a much smaller number – typically less than 20 – could be shown, knowing that the statistical analysis at the end would be able to separate out the main effects from the design.

What we were looking for was a design that was balanced – each level in each attribute appears the same number of times – and one which was

orthogonal. We take a pair of levels, one from one attribute and one from another attribute, and the pairs appear the same number of times in the design.

In a choice exercise for the Pirate Cay study, respondents might see 12-16 options of combinations of features such as A Day of Adventure on Pirate Cay, Bowling Anyone? or complimentary alcoholic beverages. They are asked to select one and are then asked, "On a 1-to-10 scale, how likely would you be to take this Aquatica Caribbean cruise within the next 12 months?" There would be many scenarios run, different variations for higher tiers, and the prices would differ by tier, cruise length, Caribbean destinations or accommodation type.

The next step would be to calculate choice and price functions for each activity plus the base package. To accurately assess Pirate Cay, it is best to do this by tier, a stratified model. The base package, and then the base package plus one activity would each receive these functions via the discrete choice process.

Brand image

Equalization pricing is a method to determine the value of brand equity. Equalization pricing can be calculated for the aggregate dollar value of the brand image that interests us. It can also be deployed to determine marginal values of activities.

For the Pirate Cay study, we will employ equalization pricing – what

I call balancing – to determine the value of Pirate Cay for each tier of Aquatica Caribbean customer. We will then perform a Monte Carlo simulation to determine the added revenue, or “value” of Pirate Cay.

Balancing is performed like this: After calculating the model we produce a simulator. The simulator will have the base package with a price pinwheel and then the base package with Pirate Cay (and a price pinwheel), base package with All You Can Yoga, etc. The simulator has a drop-down to determine which tier is being tested and checkboxes to take an activity on or off the model. We have not included the prices in our examples because they differ by tiers.

The next stage is to experiment with the baseline tier package until it reaches an equal market share with the baseline tier package and Pirate Cay. The method is to check “baseline tier package” and “baseline tier package with Pirate Cay” only, leaving the other activities unchecked. We set the baseline tier package price (\$3,000 for two adults for three days, leaving from Miami and going to the Bahamas). Then

juggle the “baseline tier package with Pirate Cay” price wheel until it is at 50 percent with the baseline. The difference is the value of Pirate Cay. That is, the amount over baseline tier passengers would expect to pay for a visit to Pirate Cay (Table 1).

At first the results shown in the table might seem counterintuitive. Why would the less-expensive cruises have a higher marginal value for Pirate Cay than the more exclusive tiers?

The reason is that higher tiers have higher base prices and added luxuries (e.g., staterooms), tend to be older (fewer children) and are paying a premium and expect a more all-inclusive approach cruise. Seniors are not as likely to want to snorkel around a Pirate Cay.

Also, the model serves as a suggested price for Aquatica Caribbean for Pirate Cay. In a sense we are not just calculating a value but performing a pricing study as well.

Forecast model

The last step in the project is to fit the results into a forecast model to

formulate an idea of how much Pirate Cay is worth on an annual basis. We are going to use input from the Cruise Ship Industry Statistics, then filter by Aquatica Caribbean market share and then by tier. Pirate Cay operation costs are not included in our model.

A snapshot of results is shown in Figure 1. This chart shows the estimated added value of Pirate Cay to be about \$54.6 million. This is, in fact, a healthy return. However, given the original investment in the island, infrastructure improvements and operating costs, Pirate Cay will, in fact, not be profitable for several years.

However, with a rise in Aquatica Caribbean interest among younger cruisers with children, removing Pirate Cay from the itinerary would a strategic error for the company, particularly when competing with other family-oriented cruise lines such as Disney, Royal Caribbean and Carnival Cruise Lines. 

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