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Conjoint analysis is often used to assess how buyers trade off product features with price. Researchers can test the price sensitivity of potential product configurations using simulation models based on conjoint results. Most often, a simulation is done within a specific context of competitors. But when a product is truly new to the market and has no direct competitors, price sensitivity for that new product can be estimated compared to other options such as buying nothing.

The common forms of conjoint analysis measure contrasts between levels within attributes. The worths of levels are estimated on an arbitrary interval scale, so the absolute magnitudes of utilities have no meaning. Also, each attribute's utilities are determined only to within an arbitrary additive constant, so a utility level from one attribute cannot be directly compared to another from a different attribute. To a trained conjoint analyst, an array of utilities conveys clear meaning. But that meaning is often difficult for others to grasp. It is not surprising, then, that researchers look for ways to make conjoint utilities easier to interpret.

The Monetary Scaling Trap

One common attempt to make conjoint utilities more understandable is to convert them to monetary or "dollar equivalents." This is a way of removing the arbitrariness in their scaling. To do this, price must be included as an attribute in the conjoint design. Note again that we cannot attach a monetary value to a *single* level (such as the color green), but must express the value in terms of differences between two colors: "green is worth $5 more than yellow." But, if the attribute is a binary (present/absent) attribute such as "has sunroof" versus "doesn't have sunroof," the expressed difference is indeed the value of having the feature versus not.

The idea of converting utilities to dollar values can be very appealing to managers. But in our experience what begins with much promise usually turns out to be a poor use of conjoint data. Some approaches to converting utilities to dollar equivalents are flawed. But even if computed reasonably, the results often seem to defy commonly held beliefs about prices and have limited strategic value for decision-making.

We'll review a common technique for converting conjoint utilities to a monetary scale, and then we'll suggest what we believe is a better approach.

Computing Dollar Equivalents from Utilities

Imagine the following utilities for a single respondent for two attributes:

Feature X   2.0
Feature Y   1.0

$10   3.0
$15   1.0

For this respondent, a $5 change in price (from $15 to $10) reflects a utility difference of 2.0 (3.0 - 1.0). Therefore, every one utile change is equal to $2.50 in value (5 dollars/2.0 utiles). It then follows that Feature X, being worth one utile more than Feature Y, is also worth $2.50 more *for this respondent.*

We hesitate to illustrate this type of analysis for fear of proliferating its use, because it is a potentially misleading use of conjoint data. Moreover, there is one practical problem that must be overcome if there are more than two price levels. Unless the utility is linearly related to price, referencing different price points results in different measures of utiles per dollar. A common solution is to analyze the utility of price using a single coefficient. As long as the price relationship is approximately linear, this seems to remedy this immediate problem.

Another problem arises if price coefficients are positive for some respondents, rather than negative (as expected), due to random noise in the data and some cases of relative price insensitivity. Such reversals would suggest willingness to pay *more* for *less* desirable features. One work-around is to compute dollar values of levels using average (across respondents) utilities, which rarely display reversals. Another approach to the problem is to ignore it, assuming that the reversals are just due to random noise. A more useful way to avoid reversals is with an estimation method that enforces utility constraints. Our CVA, latent class, ACA/HB, and CBC/HB programs can constrain utilities so that lower prices always have higher utilities.

More complication arises if the price coefficient for a respondent is extremely small in absolute value, approaching zero. In that case, the dollar equivalents for incremental features become very large, approaching infinity. A typical way to handle this is to characterize the centers of the distributions using medians rather than means.

Finally, this type of analysis assumes that the conjoint method has accurately captured respondents' price sensitivity. We have long stressed that ACA alone often will understate people's price sensitivity. CVA and CBC usually do a better job of reflecting accurate price sensitivity.

However, even after taking the appropriate steps to compute reasonable dollar equivalents, the results are potentially misleading. Even when accurate price sensitivity has been estimated for each individual, an examination of average values will often suggest that respondents are willing to pay much more for one feature over another than is suggested by market prices. This often

causes managers to disbelieve the results. However, we'll demonstrate later that such outcomes are to be expected when the monetary value of levels is computed in this way.

There are a number of fundamental problems with analysis based on average dollar values. First, it attempts to ascertain an average willingness to pay for the market as a whole. Firms usually offer products that appeal to specific targeted segments of the market. The firm is most interested in the willingness to pay among its current customers, or among buyers likely to switch to its products, rather than in an overall market average. Second, this approach does not reference any specific product, but instead considers an average product. We should expect that a respondent's willingness to pay for an additional feature depends upon what specific product is being enhanced (e.g. a discount or a premium offering). Third, and most fundamental, this approach assumes no competition. Because product purchase usually constitutes a choice among specific alternatives, the competitive context is a critical part of the purchase situation. To illustrate the fallacy of interpreting average dollar values, without respect to competitive offerings, consider the following illustration.

Economics on Gilligan's Island

Though perhaps loath to admit it, many have watched the popular 1960s American TV program "Gilligan's Island." The program revolved around an unlikely cast of characters who become marooned on an uncharted desert island. Each episode saw the promise of rescue. And when it seemed that the cast was finally going to make it off the island, the bumbling Gilligan always figured out some way to ruin the day.

One colorful pair of characters was the ultra-rich Mr. Howell and his wife. Now, imagine that one day a seaworthy boat with capacity for two passengers pulls into the lagoon and offers passage back to civilization for a price to be negotiated. What is the dollar-value of rescue versus remaining on the island for Mr. and Mrs. Howell? Mr. Howell might pull out his checkbook and offer the crew millions of dollars. Under the assumption of no competition, the dollar equivalent utility of rescue is astronomically high. However, it might be much lower for other islanders of more limited means, and the average dollar value for all of them would have little relevance to the captain of the boat in negotiating a price. What would matter is the dollar value of the potential customers, and no one else.

Now, assume that just as Mr. Howell and the first crew are preparing to shake on the deal, a second equally seaworthy ship pulls into the lagoon and offers its services for a fixed $5,000. Ever the businessman, Mr. Howell will choose the $5,000 passage to freedom.

What has happened here? Is the utility of getting off the island for Mr. Howell suddenly different? Has his price sensitivity changed? No! The amount Mr. Howell would be projected to pay under the assumption of no competition is indeed very different from the amount he *will* pay given the appearance of another boat.

If the first boat crew were to have administered a conjoint interview to Mr. Howell and computed his willingness to pay under the first method reviewed in this article, they would have concluded that he was willing to pay very much more than $5,000. But, how meaningful is that

information in light of the realities of competition? The realistic problem for the boat captain is to figure out what price the market will bear, given the existence of competitive offerings.

We can illustrate this point using another example. What is your willingness to pay for a color monitor for your laptop computer versus a monochrome screen? Assume we conducted a conjoint analysis including monochrome versus color monitors. If we computed your willingness to pay for color over monochrome, we would likely find that the incremental value of color over monochrome is worth a thousand dollars or more. But, how meaningful is this information to a laptop manufacturer given the fact that laptops with color monitors are readily available on the market at quite inexpensive prices?

Price Sensitivity Simulations in Competitive Context

For most marketing problems involving competition, the best strategic information results from carefully defined market simulations. If a firm wants to assess the incremental demand resulting from offering specific features for its product, or improving its degree of performance, it should be estimated within a realistic competitive context. It should also be based on specific objectives. For example, the objective may be to determine how much more may be charged for a product or service by offering a new feature without any net loss in market acceptance.

This approach involves simulating a realistic competitive scenario with a conjoint market simulator. Assume four products (A through D) representing the current relevant products in the marketplace. Further assume that the firm is interested in offering an additional feature for product A, and wants to estimate what new price can be charged while maintaining the same share of preference. We first simulate a base case with products A through D placed in competition with one another, where A does not include the new feature. We record its share of preference (say, 15%). We then conduct another simulation in which we improve A by offering a new feature (and hold the competition B through D constant). The share of preference for A should increase (say, to 20%). We then perform additional simulations (again holding competition constant) raising the price of the new product A until its share of preference again drops to the original 15%. The difference in price between the more expensive improved Product A that captures 15% and the old Product A that captured 15% reflects the incremental monetary value that the market will bear for the new feature, given the competitive context and the objective of maintaining share constant.

Market simulations conducted using *individual-level* utilities are best for this analysis. Individuals have different preferences, and the company producing product A is most concerned with retaining current product A customers and attracting new buyers among those most likely to switch. The company does not care so much about individuals who are extremely unlikely to buy its offerings. Market simulations based on individual utilities support such complex market behavior, focusing the "willingness to pay" analysis on a relevant reference product and critical individuals rather than the market whole. Such market simulations can also reveal complex competitive relationships between products, such as degree of substitution (cross-effects) and differences in each product's price sensitivity.

Conclusion

The common practice of converting differences between attribute levels to a monetary scale is potentially misleading. The value of product enhancements can better be assessed through competitive market simulations. If the market simulations are conducted using individual utilities, such simulations focus the price/benefit analysis on the customers that are most likely to purchase the firm's product(s) rather than on an overall market average. They provide strategic information based on a meaningful context that enables better decisions, while avoiding pitfalls of other ways of summarizing data. Of course, the success of the simulation approach hinges on a number of assumptions, including:

       a) the conjoint method produces accurate measures of price sensitivity,
       b) the relevant attributes have been included in the simulation model,
       c) the relevant competitive offerings are reflected in the simulation model.