MARKETING SCIENCE

EDITOR ■
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The Markov Visitation

It often seems as if the basic tool of operations research in marketing is the Markov chain. There are few O.R. people who have looked into marketing who haven't attempted to apply the tool. The results have not been particularly satisfying, but efforts still continue. Most of those who have tried started by assuming 1) that consumers make a brand decision at each purchase, 2) that purchases occur at regular intervals and 3) if these assumptions are true, the Markov chain describes the situation very well. Experience never seems to verify the assumptions, however. Real people do not have fixed probabilities of switching from one brand to another, nor do they purchase at regular intervals, nor does the Markov process seem to be a very good description of buying behavior.

After recognizing that consumers refuse to conform to the rules of the Markov chain, researchers, quite wisely, begin changing the rules. Some decide that there are habit patterns that build up as the same brand is purchased successive times. Therefore, before we try to state the transition probabilities for switching brands, we ought to divide the population into groups which have different sequences of brand choices. That is, the probability that someone will buy Brand "A" next time will depend not only on what brand was bought last, but also on how many of the last several purchases were Brand "A".

Researchers have also invented a variety of ways to deal with variable purchase intervals, some as simple as using two chains which interweave. One assesses whether a purchase will be made in the next time interval and the second deals with the brand choice.

Product Choices and Differentiation

The strange thing about these attempts is that they leave us unsatisfied even though they often make for marked improvements in predicting buying behavior. I think the problem is likely to be due to another assumption which is believed by many to be self-evident. That assumption is that brands compete directly with each other. There is buried behind the use of the Markov chain the notion that product classes exist in which each brand is a substitute for each other brand in the mind of every consumer. Differences among the transition probabilities in the matrix are then taken to indicate consumer preferences among the several substitutable products.

Market researchers and marketing executives have not been so naive. They have recognized that competition in most consumer goods industries comes from various forms of product differentiation. These differences work by reducing the degree to which consumers perceive different brands as substitutes for each other. The process has been described as producing for the manufacturer a sort of monopoly among some people. It is for this reason, to the degree marketers are successful in product differentiation, that using sequences of brand choices has been more predictive than the simple Markovian matrix of switches from each brand to each other. It's also for this reason that the most successful applications of the Markov chain have taken place in markets with relatively little product differentiation; e.g., coffee and frozen orange juice.

Multiple Brand Use and Timing

Product differentiation has also created some other difficult problems for the Markovian analyst. It is not at all uncommon to find households using several brands in the same product class, each for a different purpose. For instance, almost half of the households in the United States *regularly* use more than one brand of toilet soap, the two-car family is becoming commonplace, most households regularly use several kinds of breakfast juice, and something in the vicinity of two out of five households *regularly* use more than one brand of analgesic.

The reasons for multiple brand use may be satisfaction of different household members or satisfaction in different kinds of situations. The toilet soap in the shower is frequently a brand different from the soap at the sink (which is a case of differentiated use situations). In many households, the wife uses Excedrin and the husband uses Bufferin (which is differentiation for individual family members). Either way, there is trouble in the Markov matrix.

Some help may be coming from attitude research problems. It has been a matter of concern to attitude researchers that people don't seem to buy what they say they are going to buy. It turns out, for example, that if the researchers ask people whether they will buy a car in the next year, forty percent of the people who say they intend to buy, finish the year with the same old car. For major appliances, more than half don't do what they say.

Krugman's Theory

Several years ago, while investigating television advertising, Herb Krugman suggested that this failure of attitude statements to predict behavior could largely be explained by accidental events in the marketplace. He suggested that people will tend to buy the brand that comes first to mind unless this action is frustrated by unavailability of the brand, conversations with friends about other brands, or a variety of sales promotion tactics which bring other brands to mind in the shopping situation.

This view provided a good way to sort out the effects of advertising from those of sales promotion. Basically, we could describe Krugman's theory with a transition matrix showing shifts from "first in mind" status to brand purchased. In this form, advertising is viewed as effecting changes in the brand's "first in mind" status (i.e., on the marginals of the matrix). Sales promotion, on the other hand,

affects the entries in the body of the matrix—the probabilities that "first in mind" leads to purchase of the brand.

This model is quite appealing for its simplicity and seems capable of being used as an intermediary operation in the usual Markov model. Used this way, prior purchases and advertising will affect each brand's "first in mind" status. After accounting for sales promotion effects in one transition matrix, a new set of marginals for the original Markov matrix emerges. That Markov matrix operation leads to a new distribution of prior purchases to start around again.

Where Next?

But after this model is built, we will still have trouble because of multiple brand use and timing. For these, we will need to build a model of use occasions. This will have to account for attributes of the product class and the individual brands within it. This accounting must deal not only with the choice of one brand over another, but also with the choice to use any brand in preference to nothing. It must have a means of accounting for the frequency with which appropriate conditions arise and allow for advertising effects inside the switching matrix to account for its franchise effect.

With all these components, there is a fair chance that we will get where we wanted to go with the Markov chain. Of course, it may just turn out there is no Markov chain left in the model, but that would be the price of progress.

Some further guidelines for building this model can be found in my paper, "Promises, Promises" which appears in the proceedings of the conference of the AMA Attitude Research Committee held last October at Las Croabas, Puerto Rico. The book is available from the American Marketing Association.

The Mailbag

The following letter is from a relative of mine. In that sense, it is not quite unsolicited. So that the reader will know the circumstances, I merely threatened to print a letter if he sent one. He did, and I have carried through on the threat.

To the Editor.

Marketing has been aching for your observations on engineering and precision for some time, and Galileo was a fine choice to show why. Two points are worth considering.

1. Marketing *is* engineering and probably always will be. As you note, applying theory—and some Finagle factors—is the job of the engineer. Applying Marketing Science is the job of Marketing. This doesn't make science undesirable, it just reiterates its relation to engineering—you use what's available—otherwise known as the state of art.

2. Theory not only rests on hard-to-measure things—it also rests on a *very few* hard-to-measure things. *All* of classical mechanics involves only space, time, and mass. I suggest that all of what will become classical marketing mechanics will rest on choosers (mass), choices (space), and time. Thus trier is a *derived*

unit representing a choice made by a chooser for the first time. Similarly repeater and switcher are derived units as are average purchase size and purchase cycle. Marketing Science, if such there is, has paid little or no attention to the Razor of William of Ockham—"do not needlessly multiply entities".

Congratulations on a fine start, and keep sniping!

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