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chase rates. Unless nonintenders' purchases are typically a consequence of unforeseen changes in circumstances, and hence nonintenders who subsequently purchase really had zero purchase probabilities at the time of the survey (which I find hard to believe), the inability of intentions surveys to measure changes in mean probability among nonintenders must be presumed to account in some part for the unimpressive forecasting record of these surveys.[10] Thus the most important potential gain from a survey of purchase probabilities is likely to be an estimate of the change over time in mean probability among nonintenders.

The objectives of a probability survey are, in principle, quite straightforward. An unbiased estimate of the future purchase rate is required, hence the survey should yield an estimate of mean probability which is on average equal to the observed purchase rate. While the distribution of probabilities is not known, there is a presumption that the true distribution is both continuous and relatively smooth—e.g., it would be surprising if there were sharp and irregular jumps from one probability level to the next. Whether a survey can be designed to yield unbiased estimates of the true distribution, or whether any operational survey will inevitably yield a mixture of true probabilities, wishful thinking, and unreasonably pessimistic appraisal, can only be determined empirically.[11]

Even if a survey of purchase probabilities yields an estimate of the true distribution of ex-ante probabilities, the mean of this distribution, while an unbiased estimate of the future purchase rate, will not necessarily constitute an accurate forecast. If important and unforeseen events occur during the forecast period, and if these events have a systematic rather than a random influence on behavior, a survey of purchase probabilities will not predict accurately by itself nor will any other ex-ante survey. The forecasting problem then becomes one of trying to construct a model which incorporates the prospective influence on purchase rates of presently unforeseen or imperfectly foreseen events, and the forecast becomes explicitly contingent on these events.

In sum, the evidence suggests that a survey of explicit purchase probabilities is worth serious investigation as a potentially superior source of information for predicting and explaining consumer purchase behavior. Although there may, and probably will, be biases in any measure of purchase probability obtained from surveys, there is neither empirical nor *a priori* evidence to suggest the direction or the extent of bias.

5. CRITERIA TO MEASURE THE GAIN IN ACCURACY

Before examining the evidence, it will be useful to set out the appropriate tests for determining whether or not a probability survey represents a significant improvement over an intentions survey. The only really conclusive test requires time-series evidence: Does a probability survey explain signifi-

[10] Most intentions surveys divide the high probability region of the distribution into several groups with more or less homogeneous purchase probabilities—definite intenders, probable intenders, and so forth. Thus changes in the mean value of the probability distribution above the nonintender cutoff point may be estimated with reasonable accuracy by changes in the proportion of definite, probable, and other intenders.

[11] By true probabilities I mean the probabilities that would be estimated by a highly qualified objective observer wholly familiar with all of the data relevant to the household's purchase decision. I view the probability judgments obtained from a household survey as estimates of these true probabilities.

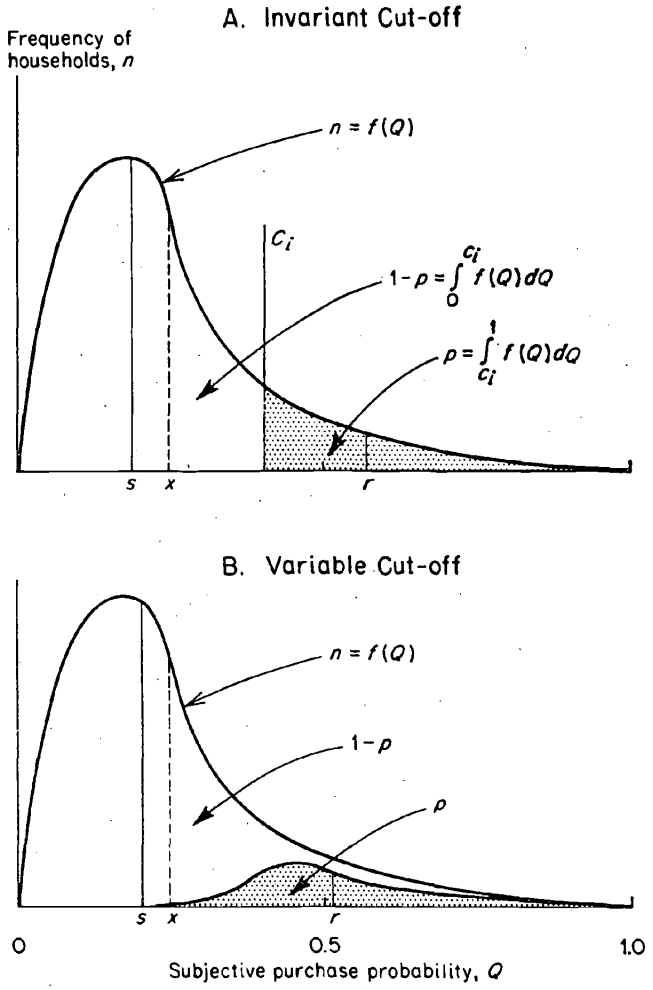

FIG. 1. Illustrative distributions of purchase probabilities.

cantly more of the time-series variance in purchases than an intentions survey, holding unforeseen events constant? However, time-series evidence cannot be used to make sensible decisions because time itself is not a free good. It would be at least five years, more likely ten, and possibly not less than twenty before enough evidence could be accumulated to warrant a satisfactory judgment about relative accuracy.

A less conclusive, but in my judgment satisfactory, basis for evaluation is analysis of cross-section results. If for each household the probability survey yields a judgment about purchase prospects that is either as accurate or more accurate than that yielded by an intentions survey, it must also be true that the probability survey will be a more accurate predictor of time-series movements in purchase rates. If the probability survey is more accurate for most households but less accurate for some, it is likely to be a better time-series predictor than intentions, although it is possible to conceive of circumstances in which it would be worse. For example, purchase probability might be a worse predic-

tor of cross-section differences linked to cyclically variable factors (e.g., optimism) but a better predictor of differences linked to cyclically stable factors (e.g., the size of durable goods stocks). In that case, the probability variable might provide better cross-section predictions but worse time-series predictions than intentions. I can see no reason to suppose that this unique combination of circumstances exists. Moreover, if cross-section differences are not used as the basis for gauging the adequacy of competitive survey designs, the only real alternative is reliance on intuition or personal judgment: as noted earlier, reserving decision until definitive time-series results become available is tantamount to avoiding the decision altogether.[12]

The characteristics of the cross-section data yielded by intentions surveys are well known: (1) intender purchase rates are always higher than those of nonintenders, but never approach unity for any intender classification; (2) the smaller the proportion of households classed as intenders, the higher the purchase rates of both intenders and nonintenders and the smaller the proportion of total purchases made by intenders; (3) the vast majority of households (from 70 to 99 per cent, depending on the commodity and the survey question) are always classified as nonintenders; (4) typically, a majority of actual purchases are made by households classified as nonintenders. These characteristics can be thought of as reflecting the fact that intenders have a higher mean purchase probability than nonintenders, that "definite" or "six-month" intenders have a higher mean probability than "probable" or "twelve-month" intenders, that for most products the great majority of households have purchase probabilities below 0.5, that nonintenders have a mean probability higher than zero, and that there is a continuous distribution of probabilities within any specified class of intenders or among nonintenders.

A survey of explicit purchase probabilities, if it is to represent an improvement over an intentions survey, must then be able to distinguish households with ex-ante probabilities of zero from those with probabilities that are low but greater than zero, and to reduce the variation in ex-ante probability within the several intender classes by facilitating the construction of more homogeneous classifications. And if the probability responses are unbiased estimates of the true but unobservable probabilities in the population, the mean of the distribution should on average be equal to the purchase rate.

If these objectives were realized, we would find that (1), fewer households report zero purchase probabilities than now report the absense of intentions to buy; (2) the observed purchase rate among zero-probability households is less than the purchase rate among nonintenders, and the observed purchase rate among households in the highest probability classification is greater than the purchase rate among any class of intenders; (3) the proportion of total purchases accounted for by zero-probability households is less than the proportion

[12] Whether and under what circumstances cross-section evidence yields valid inferences about behavior over time is not susceptible to easy generalization. This problem has a venerable history, probably dating from the time when it was first observed that the rising marginal propensity to save found in cross sections did not correspond to the constant marginal propensity found in time series. Results obtained in a recent empirical study (F. Gerard Adams, "Prediction With Consumer Attitudes: The Time Series Cross Section Paradox," *Review of Economics and Statistics*, November 1965), using data from the Michigan surveys of consumer attitudes, suggest that cross-section differences in attitudes may not measure the same type of phenomena as time-series differences. Despite the difficulties, I maintain that cross-section evidence will yield valid inferences about time-series behavior for the problem investigated in this paper.

accounted for by nonintenders (and in fact that all such purchases should be explainable by unforeseen changes in household circumstances); and (4) the cross-section correlation between purchase probability and actual purchases is higher than that between intentions to buy and actual purchases. Additional tests involving the influence of attitudes and expectations on purchases, holding either buying intentions or purchase probability constant, are discussed below.

6. EMPIRICAL EVIDENCE

I am aware of only three attempts to measure consumer purchase probabilities by means of surveys. One of these was an apparently unsuccessful experiment incorporated into a survey whose main focus was on consumer savings and asset holdings (Savings Study experiment).[13] The second was a pilot test predecessor of the experiment reported in this paper, and was conducted in November 1963 at the U. S. Bureau of the Census on a nonrandom sample of consumers from a Detroit suburb (Detroit experiment). The third study (QSI experiment), also conducted at the Census Bureau, was based on a random sample drawn from the 16,000-odd households included in the regular *Quarterly Survey of Intentions* in July 1964. All of these experiments use a forecast period of six months in which to contrast observed purchases with ex-ante purchase probability, although the QSI experiment will eventually have twelve months' purchase data as well.

Savings Experiment

The Savings Study experiment (97 households, high-income loading) suggests that the typical consumer can really distinguish only three classes of purchase probabilities, and seems to indicate that a probability survey does not provide any information not already obtained by the standard intentions surveys. This experiment, however, seems to me an intentions survey with a precoded response scale, not a survey of purchase probabilities. Respondents were not asked to indicate the probability that they would buy, but rather what kind of plans they had—certain, none, fifty-fifty, or anything in between. Specifically, they were asked whether they had any plans to buy a list of products between June and the end of the year, and then handed a flash card labeled "Plan-o-meter." The card contained a 10-through-0 scale with "certain" opposite 10, "fifty-fifty" opposite 5, and "no plans at all" opposite 0. Thus respondents lacking something called a "plan" would presumably have answered zero—defined as no plans at all—regardless of the level of their purchase probabilities.

The distribution of Savings Study experiment responses is trimodal, with peaks where the adjectives are provided. The proportion of zero responses ("no plans at all") seems to be about the same as what would typically be observed in a comparable sample for a buying intentions question with a six-month plan-

[13] R. Ferber and R. Piskie, "Subjective Probabilities and Buying Intentions," *Review of Economics and Statistics*, August 1965, pp. 322–5. Other experimental evidence using a precoded scale is discussed in Warren Bilkey, "A Physchological Approach to Consumer Behavior Analysis," *Journal of Marketing*, July 1953. Bilkey uses the principles of Lewinian vector psychology to set up a simple scale designed to measure both the respondents' "attraction toward" and "repulsion against" the attributes (including cost) of a specified product. The predictor variable is simply the algebraic difference between the two scale values. Bilkey's sample is quite small and nonrandom (less than 100 cases, mainly from a university staff). His results are hard to interpret, although they seem to indicate that further research along these lines is warranted.