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CONSUMER BUYING INTENTIONS AND PURCHASE PROBABILITY: AN EXPERIMENT IN SURVEY DESIGN*

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Surveys of consumer intentions to buy are inefficient predictors of purchase rates because they do not provide accurate estimates of mean purchase probability. This is a consequence of the fact that intentions surveys cannot detect movements in mean probability among nonintenders, who account for the bulk of actual purchases and for most of the time-series variance in purchase rates.

Comparison of predictions from alternative surveys, one of subjective purchase probabilities and the other of buying intentions, indicates that purchase probabilities explain about twice as much of the cross-section variance in automobile purchase rates as buying intentions. Similar but not quite so conclusive differences are obtained from analysis of selected household durables. The probability variable predicts more accurately than the intentions variable largely because it divides nonintenders, and those who report that they "don't know" about their buying intentions, into subgroups with systematically different purchase rates.

1. INTRODUCTION AND SUMMARY

THIS report is a postscript to my *Anticipations and Purchases: An Analysis of Consumer Behavior*, a National Bureau study published in 1964. In that volume I developed the hypothesis that statements about buying intentions were essentially probability statements in disguise, and that the probability statements themselves might well be obtainable empirically. The results of the anticipations study also suggested that a survey of explicit purchase probabilities ought to be markedly superior for predicting future purchase rates

* This experimental survey owes its existence largely to the efforts of Milton Moss of the Office of Statistical Standards in the Bureau of the Budget. Moss was convinced of the need for and the potentialities of this kind of experimental research, and was indispensable in setting up the arrangements for implementing it.

The experimental design itself was the product of a joint effort involving the U. S. Bureau of the Census and the National Bureau of Economic Research. In particular, James Byrnes, then at Census and currently at the Federal Home Loan Bank Board, not only had operating responsibility for the experimental work but contributed greatly to its formulation and content. Others at Census who contributed to the project include Howard Matthews, Jack McNeil, Mitsuo Ono, and Murray Weitzman of the staff, and Scott Maynes, then at Census on leave from the University of Minnesota. In addition, of course, the Census Bureau supervised the entire field operation, including sample selection, training of interviewers, editing of responses, and preparation of basic data cards.

At the National Bureau, I am indebted to Gerhard Bry, Jacob Mincer, and Robert P. Shay, who read the manuscript and contributed valuable suggestions. Mincer, in addition, contributed importantly to the basic ideas underlying the design of the project. Ruth P. Mack and Geoffrey H. Moore of the National Bureau, and Albert G. Hart of Columbia University, also provided suggestions at various stages of the project. I am grateful to Paul A. Samuelson, W. Allen Wallis, and Theodore O. Yntema, who served as the reading committee of the National Bureau's Board of Directors.

Financial support for the project was provided through a general grant to the National Bureau by the Automobile Manufacturers Association, Inc., as well as by other funds of the Bureau. A grant of electronic computer time to the National Bureau by the International Business Machines Corporation was used for some of the statistical analyses in this report.

Statistical assistance was ably furnished by Richard Meyer and data processing by Martha Jones and Juanita Johnson. The manuscript was edited by James F. McRee, Jr., and H. Irving Forman drew the charts with his customary standards of excellence.

than a survey of intentions. This paper reports on a set of experiments designed to test these hypotheses. The experiments were conducted at the U. S. Bureau of the Census during late 1963 and 1964; further experimental work is now in process.

Surveys of consumer anticipations are widely used in both formal and informal models for predicting the demand for durable goods. The earliest systematic attempt to obtain anticipatory data from households started in 1945, when the Federal Reserve Board sponsored an investigation into consumer holdings of liquid assets. This survey, conducted annually by the Survey Research Center (SRC) at the University of Michigan, included questions about consumer plans or intentions to buy major durables like cars and applicances as well as questions designed to measure assets and saving. Starting in the early 1950's, the SRC began to experiment with more frequent surveys designed to measure consumer buying propensities through a battery of psychologically oriented questions about financial well-being and attitudes toward spending and saving. The SRC continued to report and analyze buying intentions data, but the main focus of its interest and attention centered around the more diffuse attitude measures. Beginning in 1959, the U. S. Bureau of the Census, initially in conjunction with the Federal Reserve Board and subsequently as a separate enterprise, began a survey of consumer buying intentions, using much the same survey design as had been pioneered by the SRC.

Surveys of consumer anticipations have by no means been confined to the United States, or to academic and governmental sponsorship. Among European countries, France, West Germany, and the United Kingdom have compiled survey data on consumer buying intentions and attitudes. In general, the design of these surveys has borrowed heavily from the methodology developed by the SRC in the late 1940's. In the United States, private (mainly market research) consumer surveys have proliferated; the only ones publicly available are those conducted by Albert Sindlinger and Co., reported by the National Industrial Conference Board, and by Consumers Union of the U. S., generally published in its *Consumer Reports*.

The basic idea behind surveys of consumer anticipations is that consumer purchases, particularly of items such as houses, cars, and appliances, are subject to fluctuations that are to some degree independent of movements in observable financial variables such as income, assets, income change, and so forth. Fluctuations in these postponable types of expenditures are thought to be more accurately foreshadowed by changes in anticipatory variables that reflect consumer optimism or pessimism, or by changes in anticipatory variables in conjunction with financial variables, than by financial variables alone. And the extent of consumer optimism or pessimism, it is hoped, can be directly measured by surveys of consumer anticipations—either of intentions to buy or of the more general indicators of financial well-being and attitudes.

The first part of this paper (Sections 1 through 5) discusses the accuracy of predictions based on the traditional surveys of consumer buying intentions and suggests a hypothesis to explain the unimpressive performance of these surveys. The hypothesis is that the basic predictors of purchase rates yielded by an intentions survey—the proportions of intenders ("yes" responses) and

nonintenders ("no" responses) in the population—are inefficient predictors because the mean purchase probabilities of intenders and nonintenders (especially the latter) are not constant over time. That is, the probability that a member of, say, the nonintender group will actually buy is not zero, nor does it remain constant. This is a serious drawback because the nonintender group typically accounts for a large fraction of total purchases and of the variance in purchase rates over time. A natural inference from this hypothesis is that a survey of purchase probabilities will, if it is feasible, be a better predictor of purchase rates than a survey of intentions to buy.

The last part of the paper (Section 6) analyzes the results of an experimental survey designed to provide an explicit measure of consumer purchase probability. The experimental design involved obtaining an essentially simultaneous measure of both purchase probability and buying intentions from identical respondents. Subsequently, information on actual purchases was obtained from the same respondents. The data show that:

1. The distribution of responses from the two survey designs is markedly different; a substantial number of nonintenders reported purchase probabilities higher than zero; and of the 10 per cent of the sample who reported "don't know" when asked about their buying intentions, every one provided an estimate of purchase probability.

2. The mean values of the probability distribution tends to be lower than the observed purchase rate, especially for automobiles, suggesting that the probability responses contain a downward bias.

3. Within the intender-nonintender classification, automobile purchase rates vary widely and systematically by purchase probability class; but within probability class, automobile purchase rates are essentially random for the different intender classes.

4. In a cross-section regression of automobile purchases on both buying intentions and purchase probabilities, intentions are significantly related to purchases before the probability variables enter the regression; but when probability is included in the regression, the intentions variables show no net association with purchases and appear to behave like random numbers. In contrast, the purchase probability variables are significantly related to purchases both before and after the inclusion of intentions variables.

5. A set of variables reflecting the initial expectations, attitudes, and financial position of respondents were much more strongly related to purchase probability than to either purchases or buying intentions. Thus from the viewpoint of explaining and understanding the purchase behavior of households, as distinct from predicting it, the purchase probability variable obtained from the experimental survey seems markedly superior to any of the existing alternatives.

The results of the experimental survey suggest that a reasonably good proxy for household purchase probability can be obtained from a survey of subjective purchase probabilities. The data indicate that a survey of buying intentions is simply a less efficient way of getting an estimate of purchase probabilities than a survey of explicit probabilities. Intentions seem to have no informational content that a probability survey does not also have, and the probability

survey is able to extract information that is not obtainable from intentions surveys.

The mean value of the distribution obtained from a survey of purchase probabilities can be viewed as a forecast of the purchase rate. The evidence suggests that it is likely to be a biased forecast (probably an underestimate), but the evidence also suggests that mean probability will be a better predictor than either the proportion of households reporting intentions to buy or any weighted average derived from the various intender categories.

2. PREDICTIONS BASED ON CONSUMER SURVEYS

There is by now a fair accumulation of data with which to assay the usefulness of anticipations surveys in predicting purchases of durables. These data have been intensively examined in a number of studies.[1] Despite some differences based on time periods, research methods, and the particular variables used to measure anticipations, it has generally been found that measures of both buying intentions and attitudes reduce the unexplained time-series variance in consumer purchases of durables after account is taken of the influence of such factors as income and income change. But neither intentions nor attitudes reduce unexplained variance to the extent that consistently reliable forecasts are obtainable either from survey variables alone or from survey variables in conjunction with observable financial variables.[2]

Numerous studies have investigated the explanatory power of anticipatory variables in cross sections, that is, in predicting differences among households during a particular period of time. Here any type of buying intention

[1] Extensive references to this literature, which deals both with time-series and cross-section analysis, are provided in my *Anticipations and Purchases: An Analysis of Consumer Behavior*, Princeton University Press for National Bureau of Economic Research, 1964. Among the major contributors and important works in the field are George Katona, *The Powerful Consumer*, New York, 1960; Eva Mueller, "Ten Years of Consumer Attitude Surveys: The Forecasting Record," *Journal of the American Statistical Association*, December 1963; Arthur Okun, "The Value of Anticipations Data in Forecasting National Product," in *The Quality and Economic Significance of Anticipations Data*, Princeton for NBER, 1960; and James Tobin, "On the Predictive Value of Consumer Intentions and Attitudes," *Review of Economics and Statistics*, February 1959. See also the *Reports of Federal Reserve Consultant Committees on Economic Statistics* in Hearings before the Subcommittee on Economic Statistics of the Joint Committee on the Economic Report, Congress of the U. S., 84th Congress, First Session, and *Consumer Survey Statistics*, Report of Consultant Committee on Consumer Survey Statistics, July 1955, organized by the Board of Governors of the Federal Reserve System. My own work in this field, besides *Anticipations and Purchases*, includes "Prediction and Consumer Buying Intentions," *Papers and Proceedings of the American Economic Association*, May 1960, and *Consumer Expectations, Plans, and Purchases*, Occasional Paper 70, New York, National Bureau of Economic Research, 1960.

Recent additions to the literature include F. Gerard Adams, "Consumer Attitudes, Buying Plans, and Purchases of Durable Goods," *Review of Economics and Statistics*, November 1964; Richard F. Kosobud and James N. Morgan (eds.), *Consumer Behavior of Individual Families Over Two and Three Years*, Survey Research Center, Ann Arbor, n.d.; and Irwin Friend and F. Gerard Adams, "The Predictive Ability of Consumer Attitudes, Stock Prices, and Non-attitudinal Variables," *Journal of the American Statistical Assn.*, December 1964.

[2] See the studies by Mueller, Okun, and *Consultant Committees Reports*, cited earlier. Mueller's results indicate that, for the period 1952–61, attitudes explain more of the time-series variance in durable goods purchases than either income or buying intentions. Intentions provide quite a weak explanation of purchases and provide no incremental explanation when attitudes are held constant. Okun's results, which relate to an earlier period (1948–55), indicate that intentions are significantly related to purchases of durables, while attitudes are much less useful and are hardly related to purchases at all. The *Consultant Committees Reports* came to basically the same conclusions as Okun, again for an earlier period than that covered by Mueller.

Some recent calculations that I have made suggest that the strong relation between the attitude index and purchases found by Mueller for 1952–61 deteriorates considerably when the data are extended to 1965. Other calculations, some of which are reported in *Anticipations*, indicate that the Census Bureau's quarterly buying intentions data provide quite good forecasts of purchase rates over the period 1959–65. On the whole, my judgment is that no one has yet shown that either consumer attitudes or buying intentions can do a consistently good job of predicting durable goods purchases.