

“Good Consumership” in Household Appliance Purchasing

Donald H. Granbois, *Indiana University*

Patricia L. Braden, *University of Michigan*

Measuring consumer purchase intentions for durable goods has typically been undertaken to facilitate forecasting changes in the level of aggregate consumer expenditures. Work on intentions measurement began shortly after World War II with the Quarterly Survey of Consumer Buying Intentions administered by the Survey Research Center of the University of Michigan [9, 11]. In the early 1960's, Juster studied the problem of the poor predictive power of the standard verbal intentions measure and found that “non-intenders” made the bulk of purchases. His work provided evidence that subjective purchase probabilities were much better predictors of actual purchase rates [10], although disappointing results have been found in time series studies of the performance of mean purchase probabilities as lead indicators of changes in aggregate demand [13].

Cross-sectional, “diagnostic” research exploring determinants of variations in the predictiveness of purchase intentions or subjective purchase probabilities has been less frequently undertaken, despite the insights into the nature of the consumer decision process such studies can provide. Differences in verbal intentions fulfillment and in the predictive accuracy of subjective purchase probabilities across products and between husbands' and wives' responses have been reported [5, 6, 15]. Such findings are probably more relevant than purely predictive time series studies, both for refining consumer theory, where the role of exogenous or classification variables is of interest, and for applied marketing management as a guide for evaluating segmentation strategies.

The present study is another example of cross-sectional research on the predictive accuracy of subjective purchase probabilities. It differs from previous studies in its orientation toward decision process variables, and explores the nature of the relationship between pre-

dictive accuracy and the extent of information search undertaken by consumers. This relationship has been studied by Pratt [15] and Hill [8].

Pratt's study of 5,000 households showed how longitudinal study of consumer purchase intentions, information search behavior, and purchase behavior could reveal the extent to which the fulfillment of purchase intentions for appliances was affected by new learning growing out of the information search process. The major thrust of Pratt's discussion was on the diagnostic value of fulfillment rates of *brand* purchase intentions and the implications of such research for marketing management's evaluation of appliance brands' promotion programs. However, he also showed that *generic* intentions fulfillment varied with the specific brand the respondent intended to buy, a phenomenon he explained in terms of the different degrees of purchase commitment characterized by intenders of different brands [15].

The present study deals only with *generic* products and therefore relates more closely to Hill's work, which examined the relationships among the extent of information search, the proportion of generic plans fulfilled and the proportion of major purchases preceded by a plan. In a unique study of 300 inter-generationally linked families, he found both plan fulfillment and pre-purchase planning for major purchases to be positively associated with extent of information search, leading him to conclude that these behaviors together comprise a "good consumership" pattern [8].

However, an alternative explanation for Hill's findings could be that both predictive accuracy and information search vary systematically with situational variables and product characteristics. If situational and product variables were found to accurately forecast both predictive accuracy and information search, then a positive association would appear to be the result of their concomitant variation with product and situation, and not indicative of a behavioral syndrome characterizing certain consumers. On the other hand, a strong association between predictive accuracy and extent of information search in the absence of linkages between these measures and situational and product determinants would tend to lend support to the "good consumership" interpretation.

Three sets of relationships need to be examined to determine which of these alternative explanations is correct: the relationship between extent of information search and predictive accuracy of subjective purchase probabilities; the relationships between situational and product variables thought to determine extent of information search and measures of information search; and the relationships between situational and product variables and predictive accuracy.

These relationships guided the design and analysis plan of the

longitudinal field study of major appliance purchase behavior reported here [1]. A secondary purpose of the study was to compare purchase rates and the predictive accuracy of subjective purchase probabilities in the present study with comparable measures in three other studies: an earlier field study in the same market, in which an identical probability instrument was used [4]; Pratt's field study, in which a verbal intentions question was used [15]; and a behavioral laboratory study using the probability instrument [5, 6]. These comparisons provide a rough assessment of the stability of purchase rates over time, between two research settings (field and laboratory), and between two instruments (verbal intentions and subjective purchase probability). They also permit a comparison of a predictive accuracy score suggested by the Bayesian literature computed from the laboratory and field applications of the subjective probability instrument. The specific variables and the nature of the hypothetical relationships follow.

Extent of Information Search

The degree of shopping and information seeking preceding major durables purchases has been of interest since Katona and Mueller's well-known study [12] and has more recently been studied by Hill [8], Granbois and Willett [4], and Newman and Staelin [14]. Hill found a composite score of information seeking and conferring within the family to be positively associated with percent of plans fulfilled on time and percent of actions preceded by a plan in his panel study of major purchases [8]. Several individual search measures suggested by these earlier studies were therefore hypothesized to be positively related to the predictiveness of purchase probabilities. These measures are number of: store visits, stores visited, brands considered, optional features considered, types of information sources used and amount of discussion with persons outside the family.

These variables were also combined into an Index of Information Search Activity, using weights derived from a principal components analysis. Specific measures for each variable and details of the construction of the index are shown in the Appendix. Length of Planning Period and Amount of Discussion Within the Family were expected to vary directly with predictive accuracy.

Situational and Product Characteristics

Previous research has suggested several situational factors and product characteristics with which information search may vary. Engel, Kollat and Blackwell discuss these in the framework of the perceived value of information to consumers, with the general prediction that the

greater the perceived value of information, the more likely search is to occur [2: 378-379]. Following their discussion, it was hypothesized that shopping and information seeking would be greater when: the family had not previously owned the product; previous owners were dissatisfied with their past experience with the product; the product was socially visible; expected length of use of the product was long; or expected price was high.

These determinants also appeared to be possible moderators of predictive accuracy. Heald found that intentions data were more predictive of first acquisition purchases than of replacement purchases [7:10-11]. Dissatisfied owners might be expected to be less likely to find an acceptable model than satisfied owners, and plans for higher-priced items might be expected to be more susceptible to postponement due to unanticipated intervening events. Predictive accuracy was hypothesized to be higher for first-time buyers than for purchasers of replacements and to vary inversely with satisfaction and expected price. No basis was found for specifying hypotheses for the remaining two determinants.

Predictive Accuracy

Both the extent to which households complete purchase plans and the degree to which they refrain from "unplanned purchases" affect the predictive accuracy of purchase intentions data. One advantage of measuring purchase plans with a subjective probability instrument is that the resulting data facilitate calculation of a single objective measure of predictive accuracy, such as the scoring rules found in the Bayesian literature on evaluating individual probability assessments and assessors [16, 17]. Given the subjective probability assignment and the outcome, a score can be computed for each individual plan. This is more satisfactory than measures such as "percentage of plans fulfilled", which require aggregating over several decisions for each respondent. An earlier behavioral laboratory study used the "likelihood" scoring rule to investigate possible differences in predictive accuracy across product type and between husbands' and wives' subjective probabilities [6]. The present study used the same scoring rule.

Using the likelihood rule, an individual's score is the subjective probability assigned to the event that occurs [16]. In the present application, if a product purchase occurred, given a subjective probability of .7, the score assigned was .7. If no purchase occurred, the score was .3 (that is, 1.0-.7). Thus, higher scores indicate greater predictive accuracy; high scores are assigned both to consumers with high subjective purchase probabilities who make a purchase and to those with low purchase probabilities who refrain from purchase.

Data Collection

A mail questionnaire seeking subjective purchase probabilities for seven major household appliances was used to identify 368 Indianapolis area families who indicated the chances were 3 out of 10 or greater that they would purchase one of the products during the following six months and who agreed to participate in a panel study. A joint home interview with husband and wife determined details of the purchase plan and shopping and information-seeking behavior for the product with the highest purchase probability. Four follow-up telephone and mail questionnaires directed to wives at ten-week intervals determined the amount and kind of shopping and deliberation activity in the following period. When a purchase occurred, a terminal telephone interview determined details of the purchase. Since subjective probabilities were gathered from husbands and wives independently during the joint interview, the predictive accuracy scores presented here are based on the average of the husbands' and wives' scores for each couple. Neither the means nor the variances of husbands' and wives' purchase probabilities were significantly different at the .05 level.

Results

By the completion of the study, approximately one-third of the panel families (129) had purchased the durable, one-third (128) were still considering its purchase, and one-third (111) had either decided against such a purchase or had dropped from the panel. Total panel mortality was 49.

Predictive Accuracy and Information Search Table 1 presents results of significance tests relating predictive accuracy as measured by the likelihood scoring rule and each measure of information search activity. For categorical variables, chi-square tests were used; otherwise, correlation analysis was used. All of the basic measures of information search were related to predictive accuracy except the number of store visits and the number of types of information sources used by family members (Table 1). As expected, predictive accuracy was greater when more stores were visited, and when more discussions with others and within the family were reported. The Index of Information Search showed a weak positive association with predictive accuracy. Contrary to the hypothesized positive relationships, the number of brands and number of optional features considered, and the length of the planning period varied inversely with predictive accuracy.

Effects of Situational and Product Variables Relationships between situational and product variables and the various measures

Table 1: Results of Significance Tests Relating the Measures of Information Search Activity and Predictive Accuracy

Measures of Information Search Activity	Predictive Accuracy
Store visits	n.s.
Stores visited	0.025 (0.1291)
Brands considered	0.005 (-0.1475)
Optional features considered	0.10 ^a
Sources used	n.s. ^a
Discussion with others	0.01 ^a
Index of information search activity	0.10 (0.0937)
Length of planning period	0.0001 (-0.2577)
Family discussion	0.01 ^a

^aResults were computed using a chi-square test of association. All other results were computed using a t-test of the null hypothesis of zero correlation. Correlation coefficients are shown in parentheses.

Note: n = 368

of information search are summarized in Table 2. Clearly, product characteristics were much better predictors of information search than were the situational variables, although product characteristics were not uniformly related to all search measures. Satisfaction with a previously owned product was not related to any of the search measures, and the three significant relationships with previous ownership (optional features, sources, and discussion with others) were positive, contrary to expectations. The effects of product characteristics can be summarized based upon three factors. Social visibility of the product was positively related, as expected, to the number of stores visited, optional features considered, types of information sources used, and the index. Number of years of expected use was positively related, as expected, to optional features considered. Expected price was posi-

Table 2: Results of Significance Tests Relating Situational and Product Variables to Measures of Information Search Activity^a

Measures of Information Search Activity	Situational Variables		Product Characteristics		
	Previous Owner of Product	Dissatisfaction with Previous Purchase	Social Visibility of Product	Expected Length of Use	Expected Price
Visits	n.s.	n.s.	n.s.	n.s. ^a	0.005 ^a (0.1461)
Stores	n.s.	n.s.	0.01	n.s. ^a	0.0001 ^a (0.2192)
Brands	n.s.	n.s.	n.s.	n.s. ^a	n.s. ^a
Optional features	0.0005	n.s.	0.025	0.0001	0.025
Sources	0.005	n.s.	0.001	n.s.	0.0001
Discussion with others	0.0005	n.s.	n.s.	n.s.	n.s.
Index of information search activity	n.s.	n.s.	0.05	n.s. ^a	0.0005 ^a (0.1883)
Length of the planning period	n.s.	n.s.	n.s.	n.s. ^a	0.10 ^a (-0.0878)
Discussion within family	n.s.	n.s.	n.s.	n.s.	0.01

^a Results were computed using a t-test of the null hypothesis of zero correlation. Correlation coefficients are shown in parentheses. All other results were computed using a chi-square test of association.

tively related, as expected, to every measure except number of brands and number of discussions with others.

Expected price was by far the best predictor of information seeking, in direct opposition to Newman and Staelin's finding that price was not significantly related to an index of information seeking [14]. Results here suggested that each individual measure of information seeking may be related to a different subset of product characteristics so that reliance on an aggregated index may disguise important relationships. Despite an attempt to avoid arbitrary weighting of index components, the resulting index was not as useful as analysis of individual measures of information seeking. The predictive accuracy score was weakly associated with only one situational or product variable. The expected length of use of the product appeared to be inversely related to predictive accuracy ($\alpha = .10$), however, this correlation was very low ($r = -0.0878$).

Since predictive accuracy and information search were not at all strongly related to situational and product variables, but were, as predicted, related to each other, the general conclusion seems to be that Hill's interpretation is supported. Both deliberate information search and ability to predict major purchasing behavior (planning such purchases in advance and refraining from impulsive purchasing) may indeed be part of a "good consumership" pattern. Consumers showing this behavior conform closely to the ideal of the rational, problem-solving consumer implied in current consumer behavior models and normatively prescribed in home economics texts and consumer information literature. Similarly, it follows that consumers who tend to exhibit little information seeking may also tend to buy without plan and to deviate from purchase plans as part of a more general pattern of somewhat impulsive, unpredictable behavior.

Comparison of Predictive Accuracy with Earlier Studies A test of the families' initial intentions to purchase revealed a significant difference between the mean initial odds for purchasers ($x = .721$) and nonpurchasers ($x_{\text{undecided}} = .549$ and $x_{\text{no purchase}} = .521$). The mean odds given at the joint interview by purchasers significantly exceeded the mean odds for those who terminated without purchase ($\alpha = 0.0001$). Families who remained undecided also exhibited a significantly lower mean for their initial intentions than purchasers ($\alpha = 0.0001$). There was no significant difference between the mean odds for undecided families and those terminating without purchase.

The overall purchase rate of .351, based on all purchases occurring up to 40 weeks from the initial interview, represented a substantial discrepancy from the expected rate of .601 based on mean subjective

purchase probabilities. Similarly, the mean predictive accuracy score of .537 must be judged quite low, since the range of expected scores for the likelihood scoring rule is from .500 to .820 [6].

In cross-sectional research, the absolute level of predictive accuracy is of less interest than its variability and association with other variables, but the poor performance here can be partly attributed to the product category involved, major household appliances. Findings from a behavioral laboratory study where couples originated a list of major expenditures for the coming year and assigned a subjective purchase probability to each planned item suggest that the discrepancy between actual and planned purchase rates is greater for appliances than most other product categories, and predictive accuracy based on the likelihood rule is lower than any other category. The discrepancy between actual and expected rates for appliances was -18.9 percent, compared with a comparable difference of -10.6 percent for all products [5]; mean predictive accuracy scores of .521 and .641 were found for appliances and all products, respectively [6].

These results are remarkably consistent with those of three other studies available for comparison, as shown in Table 3. Despite the span of years represented, ranging from Pratt's 1960 study to the early 1970's when the latter two studies were conducted, and, the differences in research settings involved, differences in actual purchase rates, expected rates, and predictive accuracy scores are quite small. All three field studies dealt with appliances, and the behavioral laboratory findings reported here are those based on appliance plans only. However, Pratt's study included responses for a predetermined list of 36 items, while both Indianapolis panels followed a single planned item per family. The use of the subjective probability scale resulted in a purchase rate no different from that in Pratt's study, where a verbal intentions question was used. The predictiveness of the two approaches cannot be compared, however, since the expected purchase rate in Pratt's study was not reported.

Summary and Conclusions

The study further investigated the "good consumership" hypothesis, which predicts that consumers exhibiting relatively high information search in major purchases will also score relatively high on measures of intentions fulfillment and low on "unplanned purchases" of major products. Earlier research on information search and intentions fulfillment had suggested somewhat similar sets of situational and product correlates of these measures, therefore an alternative interpretation of the information search-predictive accuracy linkage was investigated: these variables might be correlated because of their concomitant

Table 3: Comparative Findings of Four Longitudinal Studies of Appliance Purchase Planning

Study Setting	Sample Size	Instrument	Expected Purchase Rate	Actual Purchase Rate	Mean Predictive Accuracy Score	Publication Source
National panel	5,000	verbal intentions	not available	37%	--	(15)
Indianapolis panel	167	subjective probability	not available	37%	not computed	(4)
Behavioral laboratory, mail follow-up	77	subjective probability	57%	38%	.521	(5, 6)
Indianapolis panel	368	subjective probability	60%	35%	.537	present study

variation with situational and product variables. Besides the addition of these variables, the study differed from Hill's in that respondents were more nearly representative of all current buyers of the products investigated, in contrast to his use of inter-generationally linked families, and a subjective probability instrument was used, rather than verbal intentions questions. This enabled the use of a single predictive accuracy score as an indicator of both "fulfillment" and "planfulness." Two innovations in the study were its longitudinal design, incorporating several relatively closely spaced waves of interviews, which permitted the calculation of aggregate measures of information search less affected by memory bias than measures obtained in a single retrospective interview, and the use of principal components analysis to construct an index measure of information search.

As expected, information search and predictive accuracy were found to vary together. Contrary to expectations, however, three of the measures used to indicate search: number of brands, number of optional features, and length of planning period, were *inversely* related to predictive accuracy. Although these measures have been assumed to serve as indirect measures of information search; one interpretation of this finding could be that number of alternative brands and features and length of planning period do not indicate search behavior at all. Consideration of a small number of brands and features may be, instead, an indicator of high commitment to purchase. This interpretation is consistent with the inverse relationship found here, and is consistent with the earlier findings of the smaller panel study in the same market, where tendency to purchase was found to vary inversely with number of brands considered [4].

Similarly, length of planning period may vary with the degree of indecision and/or family conflict over the proposed purchase. If this interpretation is correct, then longer planning periods might be expected to relate to *lower* predictive accuracy, as was found here. Clearly, more detailed investigation of the various possible dimensions of the information search process is needed.

Since no relationships were found between predictive accuracy and situational and product variables, and only a few relationships were found between these variables and information search, the findings are more consistent with Hill's "good consumership" interpretation than with the "concomitant variation" explanation. Future researchers should not be discouraged from continuing to explore situational and product variables as a result of the study, however, for several reasons: only appliances were included here; product characteristics were scaled subjectively by respondents; objective (researcher-scaled) measures might give different results; and past ownership and satisfaction were measured very simply; more comprehensive measures

such as purchase histories and detailed measures of experiences and satisfaction should be explored.

Of special interest for future research was the unexpected indication that previous owners scored *higher* on three measures of information search than those with no ownership experience. Since expected price was strongly related to several measures of search, the effects of previous ownership and satisfaction can best be learned by selecting for study, products within a very narrow range of price variation, so that the potentially confounding effects of price are controlled.

One troubling conclusion of the study is the overall low level of correlations found; statistical significance tests should not be allowed to detract from the observation that the relationships interpreted here are fairly weak. This is by no means unique to the present research; Hill, for example, based his "good consumership" hypothesis on correlations ranging from .14 to .36 [8]. Still, the conclusion must be that the relationships explored here need considerable further investigation.

A potentially useful direction for further tests of the notion that predictiveness and information search are found together is to search for consumer characteristics such as socioeconomic, life cycle and personality measures that distinguish "good consumers" from other consumers. A modest start in this direction was provided by Hill [8].

The somewhat discouragingly low absolute predictiveness of the subjective purchase probability instrument, as indicated by the low purchase rate and mean predictive accuracy score, can be partly attributed to the study's concentration on appliances. Remarkable consistency was shown between this study's results and comparable measures from three other appliance studies varying in timing and research setting. Some perspective in interpreting these findings is provided by Foote [3], who investigated the substantial number of "unplanned actions" and "unfulfilled plans" uncovered in Hill's study. Follow-up interviews revealed that many unfulfilled plans were merely postponed, and later carried out, or were canceled because "satisfactory substitute actions occurred"; unplanned actions in nearly all cases disclosed "a prior policy or tendency to act appropriately when specific precipitating events occur." [3] Foote's conclusion that such behavior portrays "reasonableness", not "rationality", suggests the inclusion in future studies of somewhat more subjective "reason why" and "general policy" questions to aid in the interpretation of objective measures of plans and subsequent behavior.

Appendix

Measures used for each variable were as follows:

Subjective Purchase Probability

For a specified list of products, respondents were asked to "please circle the number from 0 through 10 that gives the 'odds' or 'chances' out of 10 that your family will purchase the item new within the next six months." Even-numbered odds were provided descriptive labels as follows: 10-certain we will; 8-very likely we will; 6-likely we will; 4-some chance we will; 2-little chance we will; 0-certain we won't.

Circumstances of Purchase

Questions and response categories were:

- (1) Previous ownership. "Do you now, or have you ever owned a _____?" (yes, no)
- (2) Dissatisfaction with Previous Purchase. "How would you rate your satisfaction with the old one?" (very satisfied, satisfied, unsatisfied, very unsatisfied)
- (3) Social Visibility. "How often would you expect visitors in your home to notice your new _____?" (very often, often, occasionally, less than occasionally, usually not)
- (4) Expected Length of Use. (derived from number of years previously-owned product was used)
- (5) Expected Price. "The maximum price I expect we would pay for a new _____ is \$ _____."

Measures of Information Search Activity

- (1) Number of Store Visits, Number of Stores Visited. "Have you visited any stores to look at new _____'s?" (if yes) "Which stores?" "How many times did you visit _____?"
- (2) Number of Brands, Options, Information Sources. (Counts made from fill-in questions on self-administered questionnaires.)
- (3) Amount of Discussion With Others. "Have you talked with others about different new _____'s?" (a lot, a little, not at all)
- (4) Length of Planning Period. "About how many months ago did the idea of buying a new _____ first come up?"
- (5) Discussion Within Family. "How often does the family discuss the possible purchase of a new _____?" (very often, often, occasionally, not too much, almost never)
- (6) Index of Information Search Activity.¹ Each information search variable was standardized to eliminate differences in the units of measurement and to allow the maximum variance of the set of information search characteristics to be extracted across the 3c3 households. A table showing latent vectors as linear combinations of the standardized variables was constructed, and the coefficients of the principal components and proportion of the total variance explained by each component were examined. All the components appeared to represent interpretable dimensions removing nontrivial proportions of the total variance and were therefore included in the construction of the index.

To develop an index value for each case, factor loading, ∞ , of a given variable, i , in each component, j , was multiplied by the standardized value of the input variable, x , and summed over all variables, $i = 1, \dots, 6$, for that component. The sum was weighted by the proportion of variance explained by the latent root, λ , of the j^{th} component. The procedure was repeated for every j^{th} component, $j = 1, \dots, 6$, and the weighted component value was summed across components.

Footnote

¹The authors gratefully acknowledge the assistance of Professor John Castellan, Department of Psychology, Indiana University, for his assistance in devising the procedure for calculating the Index of Information Search Activity.

References

1. Braden, Patricia L. *A Longitudinal Examination of Information Search During Major Household Economic Decisions*. Unpublished doctoral dissertation, Indiana University, 1973.
2. Engel, James F.; Koliat, David T.; and Blackwell, Roger D. *Consumer Behavior* (2nd ed.) New York: Holt, 1973.
3. Foote, Nelson. "Unfulfilled Plans and Unplanned Actions." *Advances in Consumer Research*, Vol. 1, edited by Scott Ward and Peter Wright, 529-31. Urbana, Ill.: Association for Consumer Research, 1974.
4. Granbois, Donald H. and Willet, Ronald P. "An Empirical Test of Probabilistic Intentions and Preference Models for Consumer Durables Purchasing, *Marketing and the New Science of Planning*, edited by Robert King, 401-8. Chicago: American Marketing Association, 1968.
5. Granbois, Donald H. and Summers, John O. "On the Predictive Accuracy of Subjective Purchase Probabilities." *Proceedings of the 3rd Annual Conference of the Association for Consumer Research 1972*, edited by M. Venkatesan, 502-11.
6. Granbois, Donald H. and Summers, John O. "Primary and Secondary Validity of Consumer Purchase Probabilities." *Journal of Consumer Research* 1 (March, 1975): 31-38.
7. Heald, G. J. "The Relationship of Intentions to Buy Consumer Durables with Levels of Purchase," unpublished working paper, London Graduate School of Business Studies, 1969.
8. Hill, Reuben. "Judgment and Consumership in the Management of Family Resources." *Sociology and Social Research* 47 (July 1963): 446-60.
9. Juster, F. Thomas. *Anticipation and Purchases: An Analysis of Consumer Behavior*. Princeton: National Bureau of Economic Research and Princeton University Press, 1964.
10. Juster, F. Thomas, "Consumer Buying Intentions and Purchase Probability: An Experiment in Survey Design." *Journal of the American Statistical Association* 61 (September 1966): 658-96.
11. Katona, George, "Predictions and Consumer Buying Intentions." *American Economic Review* 50 (May 1960): 604-17.
12. Katona, Georgia and Mueller, Eva. "A Study of Purchase Decisions." *The Dynamics of Consumer Reaction. Consumer Behavior*, Vol. I, edited by Lincoln Clark, 30-87. New York: New York University Press, 1954.
13. McNeil, John. "Federal Programs to Measure Consumer Purchase Expectations, 1946-73: A Post-Mortem." *Journal of Consumer Research* 1 (December 1974): 1-10.
14. Newman, Joseph W. and Staelin, Richard. "Prepurchase Information Seeking for New Cars and Major Household Appliances." *Journal of Marketing Research* 9 (August 1972): 249-57.
15. Pratt, Robert W., Jr. "Understanding the Decision Process for Consumer Durable Goods." *Marketing and Economic Development*, edited by Peter D. Bennett 244-60. Chicago: American Marketing Association, 1965.
16. Roberts, Harry V. "Probabilistic Prediction." *Journal of the American Statistical Association* 60 (1965): 50-62.
17. Winkler, Robert L. "Scoring Rules and the Evaluation of Probability Assessors." *Journal of the American Statistical Association* 64 (September 1969): 1,073-78.