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### The prospective buyer of consumer durables

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## SUMMARY

In this book, an empirical investigation is reported which aims at the specification of models of individual households' purchase behaviour for particular consumer durable goods, such as private passenger cars and television sets. In particular, the focus is on models which can be used for predicting whether or not a household will make a purchase of such a durable within a pre-specified period. The book consists of four parts, each of which describes a particular phase of the investigation.

### *Part I: Towards a conceptual model of individual households' purchase behaviour*

Chapter 1 contains an exposition of the aim of the investigation and its background. The aim of the investigation is to look for predictive models which enable prospective buyers of consumer durable goods such as private passenger cars or television sets, to be identified. Such models will provide marketing researchers with tools to: select samples of prospective buyers in testing the consumers' short-term reactions to changes in the marketing-mix instruments; evaluate market segmentation strategies; and obtain short-term market forecasts by aggregating the individual predictions obtained from a representative sample of the total population. The investigation concentrates on the construction of empirical models which enable test predictions to be made. These test predictions are indicative of the potential usefulness of the empirical models as prediction models.

In chapter 2 some models used in economics and psychology are discussed. As regards the models used in economics, the contributions of micro-economic theories of consumer behaviour and empirical demand studies to the explanation of individual purchase behaviour are reviewed.

The usefulness of the micro-economic theories is doubted because of the underlying model of man. These theories assume unbounded rational behaviour: the consumer strives for an optimal solution to his decision problem in order to maximize utility. Then, the outcome of the consumer's decision-making process follows in an unambiguous way from a particular decision-making procedure.

These assumptions exclude a proper treatment of phenomena which are essential to the understanding of individual purchase behaviour, for example, the consumer's information search behaviour and the influence of the consumer's expectations on purchase behaviour.

The usefulness of the results of empirical demand studies to the study of individual demand is appreciated in different ways. The findings provide useful working-hypotheses about potentially relevant variables in models of individual purchase behaviour. On the other hand, they do not provide a firm base for specifying such models, because it is usually not made clear how these variables relate to the consumer's decision-making process.

It is argued that starting out with the assumption of bounded rational behaviour provides a more fruitful basis for getting an understanding of purchase behaviour. This assumption has the following implications for the way consumer purchase behaviour is to be investigated: 1. the consumer is no longer assumed to be able to maximize his utility function; he is more likely to search for simple (or satisfactory) solutions to his decision problem; 2. the outcomes of the decision-making process no longer follow in an unambiguous way from any particular decision-making procedure; 3. the decision-making procedure may vary from consumer to consumer and from situation to situation, and it may change in the course of time. Primarily psychologists have been interested in the study of decision-making processes from this point of view.

The discussion of psychological models of consumer behaviour is confined to those models which enable the selection of explanatory variables to be based on an interpretation of their role in the decision-making process. The framework, for describing and interpreting bounded rational behaviour, underlying contemporary studies of buyer behaviour, conceives of the consumer as having aspiration levels and developing plans to achieve them. Both aspiration levels and plans are eligible for adaptations which are triggered by the scanner and the interrupt mechanisms, for example. Two classes of models providing further specifications are discussed.

The models specified by the so-called comprehensive theories of buyer behaviour are found less appropriate to the purpose of this study because they predominantly focus on purchase behaviour at the brand level, whereas this study focusses on the product class level.

Buying intention models are more appropriate in circumstances where it cannot be assumed that consumers have developed elaborated plans to purchase a certain durable far enough ahead to be of interest to the purpose of prediction. However, the predictive performance of buying intention models is limited because buying intention statements are conditional upon the absence of interrupting events in the prediction period. Due to the occurrence of interrupting events the consumer's time specification of his purchase may change and lead to advancement or postponement of the purchase.

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instances where it cannot plans to purchase a certain purpose of prediction. The model is limited because of the absence of interrupting events and lead to advan-

In chapter 3, a conceptual model of individual purchase behaviour is described. It is hypothesized that the prediction of purchase behaviour can be improved by taking into account variables which account for interrupting events, in combination with buying intentions. In particular, cognitive interrupting events are considered. Cognitive events arise because of the consumer's limited ability to acquire, process and evaluate information. It is hypothesized that an advancement or postponement of a purchase can be predicted to some extent, by taking into account variables which measure pieces of information which have not been correctly evaluated at the time of expressing the buying intention. Five groups of explanatory variables are considered: 1. Buying Intention; 2. Situation-variables which measure aspects of the person, of the household to which the person belongs and the environment, at a certain point of time; 3. Anticipation-variables which measure the consumer's expectations regarding the future values of the Situation-variables; 4. variables measuring changes in Situation-variables; and 5. variables measuring changes in Anticipation-variables. The relationship between purchase behaviour and these five groups of variables is represented more specifically in the form of a single-equation model.

#### *Part II: Measurement of individual households' purchase behaviour*

In chapter 4, the method of data collection is described. The data used in the main investigation have been collected by means of a longitudinal mail panel survey consisting of three measurements in a period of one year. The specification of this method is partly based on two preliminary studies.

A pilot study is reported which aims at the solution of four problems concerning the choice of:

1. The respondent (husband or wife).
2. The interview technique (personal interview of *mail questionnaire*).
3. The scale to be used for measuring buying intentions (McNeil-Stoterau-scale or *Juster-scale*).
4. The location of buying intentions questions in the questionnaire (after or *before* the questions about the respondent's evaluations of the present economic situation and expectations about the future economic situation).

The findings of this study either supported (problems 3 and 4) or failed to generate objections against (problems 1 and 2) the alternatives which are printed in italics.

Another preliminary study is reported which aims at examining the feasibility of a longitudinal mail survey in a panel. As regards the final response (the number of respondents participating in each of the measurements) and the total number of completed questionnaires, it is shown that longitudinal data collection is feasible. Re-interviewing removals (households who leave the panel) proves to be an effective strategy in ensuring a substantial final response.



In chapters 5 and 6 the field-work findings are presented. Chapter 5 deals with the quantitative aspects of the data obtained and with the effectiveness of the field-work operations aimed at gaining the sample elements' cooperation. It is shown that high response rates can be obtained notwithstanding an unusual questionnaire length. Since the response rates changed over time, although essentially the same set of devices was used, it is also investigated whether certain variables are indicative of future non-response. This proved to be the case for 'speed of response' but not for 'completion time' and the panel control variables. It is concluded that the use of a mail questionnaire in a longitudinal survey is quite feasible if it is carried out in an established panel and if panel drop-outs are kept in the sample in order to reduce cumulative non-response through time.

Chapter 6 deals with the qualitative aspects of the data obtained. It reports on the data processing operations aimed at the detection and correction of errors in data obtained from the individual respondents (i.e. individual response errors). A distinction is made between two types of individual response errors: 1. internal inconsistencies relating to errors in data which have been collected on one single measurement; and 2. temporal inconsistencies relating to errors in data which have been collected in successive measurements.

In single-measurement surveys many errors cannot be detected, and hence, not corrected without the help of accurate data from external records. Accurate external data records, however, are seldom available. The longitudinal measurement design provides a solution to this problem. It enables such errors to be detected by comparing the internally consistent data from a single measurement with those of a successive measurement (i.e. the detection of temporal inconsistencies). The large number of temporal inconsistencies found in ownership and purchase data suggest that the reliability of internally consistent data from a single-measurement survey may be too low to explain purchase behaviour satisfactorily.

The longitudinal measurement design also provides indications about the procedures to be used for correcting temporal inconsistencies. It is shown that the detection and correction procedures used in a two-measurement survey are highly effective for improving data quality. Also, the cost involved in improving data quality in a longitudinal mail panel survey is briefly discussed.

### *Part III: Analysis of individual households' purchase behaviour*

In chapter 7, the techniques of stepwise linear regression analysis and two-group discriminant analysis are used to arrive at numerical specifications of the conceptual model. In order to fulfil the assumptions underlying these techniques, particular attention is paid to the following four problems:

1. The heterogeneity of the sample
2. The functional form of the regression equation
3. The multicollinearity of the independent variables
4. The non-normality of the error term

The heterogeneity of the sample is dealt with in chapter 7. Further, the functional form of the regression equation is investigated. The linearity of the regression equation is tested. The multicollinearity of the independent variables is tested. The non-normality of the error term is tested. Before applying the regression equation, other technical conditions must be satisfied in order to reduce the bias of the regression coefficients. These variables to be used to test the conditions are listed in table 7.1. Households with a zero purchase are excluded from the regression equation.

In the regression analysis, the dependent variable is the purchase for which buy decisions are made. The purchase is measured in terms of the number of purchases per year.

Next, two-group discriminant analysis is used to test the predictive power of the regression equation. The predictive power is measured in terms of the percentage of correct classifications. It is shown that the usual discriminant analysis is not suitable for this purpose (i.e. the discriminant function is unsatisfactory). The discriminant function ascribed to the regression analysis is used to solve the problems mentioned above. The discriminant analysis is used in the chapter to test the predictive power of the regression equation.

In chapter 8 a discriminant analysis is used to test the predictive power of the regression equation. The discriminant analysis is used to test the predictive power of the regression equation. The discriminant analysis is used to test the predictive power of the regression equation.

ed. Chapter 5 deals with the effectiveness of the respondents' cooperation. It is notwithstanding an unusual period of time, although essentially unchanged whether certain variables are assumed to be the case for the panel control variables in a longitudinal survey and if panel drop-outs occur over time.

data obtained. It reports on the identification and correction of errors in individual response errors). The types of response errors: 1. inter-respondent errors have been collected on one variable relating to errors in data

are detected, and hence, not recorded in the original records. Accurate longitudinal measurement of such errors to be detected in a single measurement with a period of temporal inconsistency is found in ownership and purchase behaviour data from a longitudinal survey.

indications about the procedures. It is shown that the procedures used in the longitudinal survey are highly involved in improving data quality.

#### *purchase behaviour*

discriminant analysis and two-group discriminant analysis specifications of the underlying techniques, and the results of these techniques are discussed.

1. The heterogeneity of the population.
2. The functional form of the relationship to be specified.
3. The magnitude of the preliminary selected set of explanatory variables.
4. The incompleteness of the data (missing values).

The heterogeneity of the population is accounted for by the definition of segments. Further analyses concentrate on the segment containing most of the purchases made in the prediction period.

The linearity of the relationship between purchase behaviour and each of the candidate explanatory variables is obtained by means of appropriate transformations of the variables.

Before applying stepwise regression analysis as a reduction technique, three other techniques (AID, correlation analysis, and factor analysis) are tried out in order to reduce the preliminary selected sets of over 200 candidate explanatory variables to a manageable size. It is shown that AID and factor analysis could not be used to that end.

Households with missing values on one or more variables included in the regression equation are deleted from the analysis.

In the regression equations obtained this way the amount of explained variance, for which buying intention variables are mainly responsible, is low but not worse than that obtained from other cross-sectional studies on durable purchase behaviour.

Next, two-group discriminant analysis is applied as a technique for determining the predictive performance of the obtained regression equation in terms of the percentages of households correctly classified as buyers and as non-buyers. It is shown that the overall classificatory success is not very impressive. It is noted that the usual measure of evaluating the discriminatory success of a 2-by-2 classification (i.e. the overall classificatory success minus the proportional chance criterion) is unsatisfactory. The failure to predict purchase behaviour satisfactorily is ascribed primarily to the difficulties in finding satisfactory solutions to the four problems mentioned above. Since these problems are inherent in the use of linear regression and discriminant analysis, it is argued that another method of analysis is needed. In order to solve these problems a new method is introduced in the chapters 8 and 9 which requires relatively few assumptions to be made in advance.

In chapter 8 a new measure for evaluating predictive classifications is introduced, Standard Discriminatory Success (SDS). First, the SDS-measure for evaluating 2-by-2 classification tables is described. It is shown that this measure has certain advantages over the measures which are commonly used in two-group discriminant analysis. Second, the SDS-measure is generalized as to apply also to classifi-

cation tables of which the number of classified groups is greater than the number of actual groups, i.e. to 2-by-k classifications. It is shown that each split of a classified group into subgroups showing different proportions of buyers enlarges the value of SDS. It is noted that one should search for a classification function annex classification procedure which yields as many as possible classified groups with different purchase rates, if one aims at maximizing the discriminatory success.

Chapter 9 contains a description and several applications of the new method of exploratory analysis (which is called the index method). It is described how this method overcomes the problems relating to the fulfilment of the assumptions underlying the techniques such as linear regression and discriminant analysis.

According to the index method, a variable is selected as a relevant explanator of purchase behaviour if one of the following conditions is met:

1. Certain levels of the variable show a relatively high purchase rate, i.e. one which is greater than a certain upper threshold value. The set of these levels is called the upper class.
2. Certain other levels of the variable show a relatively low purchase rate, i.e. one which is smaller than a certain lower threshold value. The set of these levels is called the lower class.
3. Both an upper class and a lower class occur.

The variable is not considered to be a relevant explanator if none of these conditions is met.

A classification function (the NDIF index) is obtained by counting – per household – the number of variables on which the household has an upper class score (NFAC) and the number of variables on which the household has a lower class score (NINH), and by subtracting these two numbers (hence,  $NDIF = NFAC - NINH$ ). By means of this classification function, the households of a sample or segment can be divided into a number of groups showing highly different probabilities of being a prospective buyer.

With respect to each product investigated, it is shown that the discriminatory power of the index method is satisfactory and superior to that of two-group discriminant analysis. Also a sensitivity analysis of the index method is described. The index method seems to be a robust method because of its potential to deal with: large numbers of variables; interrelated and non-related variables; skewly and symmetrically distributed variables; nominal, ordinal and interval-scaled variables; and missing data. In particular, its potential to specify (reduced) indices containing relatively few explanatory variables which show high descriptive power is illustrative of the method's usefulness.

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#### *Part IV: Towards a prediction method*

Chapter 10 assesses the results of the investigation.

First, an interpretation is given of the models, which have been specified by means of the index method. It is shown that the variables occurring in the models and their relationship with purchase behaviour can be interpreted in the light of the framework provided by the conceptual model developed in chapter 3. Since it is plausible that they relate to various cognitive events, the variables are found indicative of future changes in the time specification of the household's purchase. It is also shown that all groups of variables specified by the conceptual model are important to each of the four products investigated. Apart from buying intentions, variables measuring changes over time in Situation and Anticipation play a dominant role. It is noted that the variables included in the indices differ between products. This finding supports the hypothesis that empirical specifications have to be specific to the product, although the conceptual model is more general. It is concluded that the conceptual model provides a useful framework for selecting the relevant explanatory variables as well as for interpreting their role in the numerical specifications obtained by means of the index method.

The numerically specified models are further qualified in terms of discriminatory power, simplicity and plausibility of the underlying assumptions.

Next, the methods used to obtain numerically specified models are evaluated. The usefulness of the method of longitudinal data collection is assessed in terms of the cost of data collection, the ability to collect reliable data at the level of individual households, and the representativeness of the data.

The usefulness of the index method is assessed in terms of robustness and ease of use.

The chapter ends with a review of the major conclusions. Overall, the research is considered to be successful in arriving at simple and implementable models of purchase behaviour. On the basis of their interpretability and their discriminatory power, it is hypothesized that these models will show a satisfactory predictive performance.

Finally, chapter 11 contains some suggestions for further research.