

This PDF is a selection from an out-of-print volume from the National Bureau of Economic Research

Volume Title: Anticipations and Purchases: An Analysis of Consumer Behavior

Volume Author/Editor: F. Thomas Juster

Volume Publisher: Princeton University Press

Volume ISBN: 0-87014-079-5

Volume URL: <http://www.nber.org/books/just64-1>

Publication Date: 1964

Chapter Title: Appendix A: Results from the Preliminary Regression Analysis

Chapter Author: F. Thomas Juster

Chapter URL: <http://www.nber.org/chapters/c1036>

Chapter pages in book: (225 - 263)

APPENDIX A

Results from the Preliminary Regression Analysis

Introduction

AS NOTED, an intensive investigation of the relation of durables purchases to initial-data variables and buying intentions preceded the empirical analysis in Chapter 7; this investigation focused on a somewhat different set of problems than those discussed in the text.

First, it seemed clearly desirable to construct a model that would explain purchases as a function of purely objective (nonanticipatory) variables, such as income, asset level, amount of debt, durable goods stock, number of children, and so forth. In order to evaluate the usefulness of consumer anticipations it is essential to demonstrate that they are not redundant to readily available objective factors; hence, the latter have first priority, so to speak. Secondly, it seemed desirable to investigate alternative ways of introducing anticipatory variables into the model. For example, test regressions were designed to find out how expected and actual income change influence purchase behavior. These can be treated as separate variables or combined into an "income surprise" construct (actual change minus expected change). The difficulty is that a variable purporting to measure income surprise may be related to purchases simply because actual change in income is so related. This would clearly be the case if expectations were a random variable, since surprise would then be actual change minus a random error. Thus it is necessary to know whether expected and actual changes are separately related to purchases in order to know whether surprise is simply a proxy for actual change or is a meaningful variable in its own right. The test regressions were also used to experiment with the scaling assigned to qualitative variables.

Finally, it is clear from the analysis in the text that extensive testing for interactions may well be fruitful. In some cases separate regressions were computed for intenders and nonintenders to see if the coefficients were uniform. In other cases the entire sample was used and interaction variables introduced. These interactions usually had the form ZX , where X is any initial-data variable, $Z = 1$ when standard intentions are zero, $Z = 0$ otherwise. If the equation to be tested is

$$P = b_0 + b_1X + b_2ZX,$$

the estimated regression coefficient of X is $b_1 + b_2Z$. When $Z = 0$, the estimated regression coefficient of X is thus b_1 ; when $Z = 1$, it is $b_1 + b_2$. Other interactions were introduced in the form of cross-product terms,

that is,

$$P = b_0 + b_1X + b_2Y + b_3XY.$$

Here the coefficient of X is $b_1 + b_3Y$; that of Y , $b_2 + b_3X$.

Testing for interaction tends to limit the usefulness of significance tests involving standard errors. There is bound to be a relatively large covariance between any variable and an interaction term involving the same variable, for example, between X and ZX . Thus, the standard error of X will rise substantially when ZX or XY is introduced into a regression along with X . In some cases it turned out that neither X nor ZX was statistically significant, although X was significant before adding ZX , and ZX had a larger coefficient than X .

In addition to the difference in focus, the regressions in this appendix are estimated from samples that eliminated all households which either purchased houses during the forecast period or reported intentions to buy houses at the beginning of the forecast period; these are the groups designated in Chapter 7 as H_{01} , H_{10} , and H_{11} . Most of the households in these three groups purchased very large numbers of durables and reported large numbers of buying intentions, and it seemed preferable to test the potentially explanatory variables without allowing their possible interrelations with house purchases or house-buying intentions to influence the results. In addition, a number of other households were excluded from the sample in both the Appendix A and Chapter 7 regressions, as indicated in the discussion of basic data sources contained in Appendix C.

Regressions were estimated for the same set of (nine) subgroups analyzed above. To repeat the notation, subgroups are designated by a letter and a subscript. The letter refers to the particular set of questions asked about intentions to buy; the subscript, to life-cycle stage. The designations for the nine groups are as follows:

Group A (definitely or probably—possibly plan to buy within twelve months)

A_1 —married, head between 25 and 34 years old

A_2 —married, head between 35 and 44

A_3 —married, head between 45 and 64

Group B (plan to buy within six months or later)

B_1 —married, head between 25 and 34

B_2 —married, head between 35 and 44

B_3 —married, head between 45 and 64

APPENDIX A

Group C (plan to buy within twelve months if income is higher, lower, as expected)

C₁—married, head between 25 and 34

C₂—married, head between 35 and 44

C₃—married, head between 45 and 64

Test regressions were run in several of these subgroups. Some variables were tested once or twice and then excluded; others were tested, then rescaled and tested again or tested in interaction. The results presented below are influenced by these tests; in effect, part of the data have been used to refine hypotheses.

Description and Analysis of Variables

The variables that seemed to have some promise as predictors of purchases are shown below, listed in the order of introduction into the regression. Many of these are identical to variables analyzed in Chapter 7; hence, the numerical designation in Chapter 7 is shown (X_1, X_2 , etc.), as well as the designation in this appendix (X_{1a}, X_{2a} , etc.).

		<i>Independent Variables</i>	<i>Scale</i>	<i>Designation in Chapter 7</i>
<i>Objective variables:</i>				
X_{1a}	Y	Normal family income, before tax (bracket mid- points)	\$000	X_1
X_{2a}	ΔL_{-1}	Change in liquid assets prior to forecast period	+1 = increase 0 = no change -1 = decrease	X_2
X_{3a}	ΔY_{-1}	Change in income prior to forecast period	+3 = large increase +1 = small increase 0 = no change -1 = small decrease -3 = large decrease	X_3
X_{4a}	ΔY_t	Transitory income during the forecast period	+1 = positive transitory 0 = no transitory -1 = negative transitory	X_9
X_{5a}	T	Education level of house- hold head	1 = college graduate 0 = otherwise	
X_{6a}	H	Housing status	1 = own home 0 = otherwise	
X_{7a}	S'	Desired stock adjustment	12 = maximum 0 = minimum	X_4
<i>Anticipatory variables:</i>				
	$\Delta \hat{Y}$	Expected change in income	5 = large increase 4 = small increase 3 = no change 2 = small decrease 1 = large decrease	
	$\Delta \hat{B}$	Expected change in general business conditions	Same as $\Delta \hat{Y}$	

APPENDIX A

	Independent Variables	Scale	Designation in Chapter 7
X_{8a}	\hat{E} Index of expectations, combining $\Delta\hat{Y}$ and $\Delta\hat{B}$	$2 = \Delta\hat{Y} \times \Delta\hat{B} \geq 20$ 1 = otherwise $0 = \Delta\hat{Y} \times \Delta\hat{B} \leq 2$	X_6
	Y_s Unexpected income developments	$(\Delta Y - \Delta\hat{Y}) + 5$ Maximum value = 9 Minimum value = 1	
	B_s Unexpected developments in general business conditions	$(\Delta B - \Delta\hat{B}) + 5$ Maximum value = 9 Minimum value = 1	
X_{9a}	$E - \hat{E}$ Index of surprises combining Y_s and B_s	$2 = Y_s B_s \geq 36$ 1 = otherwise $0 = Y_s B_s \leq 16$	
X_{10a}	O Opinion about current buying conditions	2 = good time to buy 1 = pro-con, other 0 = bad time to buy	X_6
X_{11a}	\hat{E}_5 Long-range financial expectations	2 = very optimistic 1 = moderately optimistic 0 = otherwise	X_7
X_{12a}	$O\hat{E}_5$		
X_{13a}	\hat{C} Expected change in prices	1 = expect decrease 0 = otherwise	
<i>Buying intentions variables:</i>			
X_{14a}	\hat{P} "Standard" intentions to buy durables	Weighted sum of items listed 6 = maximum 0 = minimum	X_{13}
X_{15a}	\hat{P}_c "Contingent" intentions to buy durables	Weighted sum of items listed 6 = maximum 0 = minimum	X_{14}
X_{16a}	$\hat{P}\hat{P}_c$		
<i>Interactions:</i>			
	$(Z = 1 \text{ when } \hat{P} = 0, Z = 0 \text{ when } P > 0; Z_1 = 1 \text{ when } E - \hat{E} = 2, Z_1 = 0 \text{ when } E - \hat{E} < 2)$		
X_{17a}	ZS'		
X_{18a}	ZY		
X_{19a}	$\hat{E}\hat{P}$		
X_{20a}	ZO		
X_{21a}	$Z_1\hat{P}_c$		

These variables fall roughly into four categories, which are noted in the list: objective variables, anticipatory variables, intentions to buy, and interactions. A few variables test interaction between variables in the same category, and these are analyzed with the category. All variables except Y_s , $E - \hat{E}$, and $Z_1\hat{P}_c$ are either initial-data variables (in the terminology of Chapter 7), buying-intentions variables, or interactions involving initial-data variables.

OBJECTIVE VARIABLES

The objective model, comprising the first seven variables, provides a bench mark against which to measure the performance of anticipatory variables. All seven are expected to have positive regression coefficients.

Income and income change prior to the forecast period need no explanation. Liquid-asset change is intended to reflect the influence of two factors. Windfalls prior to the forecast period ought to result in increased liquid-asset holdings, as should saving for the purpose of acquiring durables. Also, the inverse relation between purchases in $t-1$ and purchases in t may be reflected in liquid-asset accumulation or diminution. The transitory income variable departs from a pure forecast model, since the information was not obtained until the end of the period. This variable constitutes a partial test of the permanent income hypothesis, since it measures the influence of a (subjective) transitory income component on durable goods purchases, net of both past income change and "normal" income change during the forecast period.¹

The education variable is intended to measure the influence of long-run income expectations, since young households with more education, given current income, should have relatively favorable future earnings prospects. Thus, a higher level of education should be associated with less current saving among young households, and perhaps with a greater willingness to incur indebtedness and acquire durables. The home ownership variable is intended to reflect the possibility that owners have more needs for durables, both because of their living pattern and because they must ordinarily purchase most household equipment, whereas many renters have these items supplied by the landlord.

The stock adjustment variable consists of responses to a question about whether or not items in the household's stock of durable goods "need to be replaced." These responses presumably reflect unsatisfactory functioning of the durables stock in a mechanical sense, due to age or hard use, as well as dissatisfaction due to the availability of newer and technically more advanced models.² The variable is treated as a measure of the difference between actual and desired stock of durables, as discussed in Chapter 7.

Other objective variables were tested in preliminary regressions and discarded. These include assets, nonmortgage debt, number of children, house purchases prior to the forecast period, and stock of durable goods.

¹ The permanent income hypothesis predicts a higher propensity to save (counting additions to the stock of durables as saving) out of the transitory component of income than out of the permanent component. Our data test whether households with positive or negative transitory income buy more or less durables, holding income and income change constant. Thus a finding of no net association does not contradict the permanent income hypothesis, since the transitory component might have its full effect on saving in the form of financial assets.

² Similar questions have been included in past surveys by the Survey Research Center (Michigan University) and in surveys conducted by the Census Bureau. I am not aware of any published analysis of results.

The probable reason for the failure of some of these variables to show a significant relation to purchases is that they are balance sheet or "stock" variables that reflect the tastes and preferences of the household. Purchases are a "flow" variable, and constitute the most important way of adjusting any difference between actual and preferred asset structure. Hence, it seems likely that what James Tobin has called personality correlations have a strong influence on the observed relation between current purchases and debts, assets, or stock of durables. Some households with relatively small debts, large assets, and small stocks of durables are in that position precisely because of their preference structure; they have and will continue to purchase relatively few durables. The reverse is true for some households with large debts, small asset holdings, and large stocks of durables—they have a taste for durables, and have and will continue to purchase relatively many.

Consequently, one could argue that the *lack* of a significant relation in cross sections between purchases and assets, debts, and durable goods stocks could mean that the latter variables actually do exert an influence on purchases in the expected direction. If they did not, personality correlations would produce a negative statistical association between purchases and asset holdings and positive ones between purchases and debt or durable goods stock. In fact, small positive regression coefficients appear for both debt and stock of durables, while households with assets over \$10,000 make somewhat fewer purchases than others. But none of these relations is statistically significant.

An attempt was made to test the influence of durable goods stocks in groups stratified by a measure of personality. It is reasonable to assume that those with a taste for durable goods ought to own at least one durable in addition to a car or the basic household items—range, refrigerator, washing machine, and television set. Separate regressions were run on groups with only the basic items (or less) and those with more than the basic amount. The latter group showed a positive association between durables stock and purchases, net of all the important explanatory variables; those with the basic items only showed a negative association between stock and purchases. Neither coefficient was significant at the 5 per cent level.³ These results suggest that the behavioral relationship would probably show through if personality differences could really be eliminated. The positive coefficient for S in the second equation may be due to the heterogeneity of the group characterized by a stronger than mini-

³ The net regression coefficients are as follows, using the notation above and designating the stock of durables as S . Equation (1) includes the entire sample, (2) includes

APPENDIX A

mum preference for durables (i.e., to personality correlations *within* the group), and to the fact that ownership of some commodities (dishwashers, etc.) seems to be associated with a higher probability of purchase than nonownership because of its intercorrelation with the probability of a housing purchase (see Chapter 4, Tables 20 and 21). The third group is almost certainly more homogeneous with respect to taste than the second, and is less likely to purchase housing; and a negative association does turn up there.

ANTICIPATORY VARIABLES

The next six variables represent either attitudes, expectations, or surprises. The expectations index (\hat{E}) represents a combination of short-term expectations about income and general business conditions. The surprise index ($E - \hat{E}$) represents a similar combination of unexpected developments with respect to income and general business conditions. It was argued above (Chapter 6) that only extreme expected or actual changes exert an influence on purchase behavior. An index of expectations was therefore constructed that distinguished only between very optimistic, very pessimistic, and in-between views. A surprise index, reflecting the same emphasis on the extremes, was also constructed. It is hypothesized that both expectations and surprises have an influence on purchases. The relationship under test amounts to the following, where E is an index of actual change and \hat{E} is an index of expected change, both scaled to emphasize the extremes.

$$1.0 \quad P = b_0 + b_1\hat{E} + b_2(E - \hat{E}) + \dots + u$$

It is anticipated that b_1 and b_2 will both be positive. Thus, expected change enters the regression in two ways. Expectations themselves are associated with purchases; and surprises, holding expectations constant,

households with more than "basic" S , and (3) those with basic S or less (asterisk denotes coefficient significant at 5 per cent level, using t test).

NET REGRESSION COEFFICIENTS FOR INDEPENDENT VARIABLES

	Y	ΔL_{-1}	ΔY_{-1}	ΔY_t	S	S'	\hat{P}	R^2
(1)	+.0087*	+.178	+.090	+.769*	+.029	+.113*	+.287*	.199
(2)	+.0068*	+.165	+.076	+.847*	+.215	+.059	+.301*	.166
(3)	+.0084*	+.258	+.098	+.574*	-.060	+.182*	+.301*	.200

Equation 1 is not wholly comparable with the other two because it also included some other variables not shown, one of which accounted for about 2 per cent of the total explained variance.

APPENDIX A

are also associated with purchases. Note that this relation is equivalent to:

$$1.1 \quad P = b_0 + b_3E + b_4\hat{E} + \dots + u$$

If 1.0 is the true relationship, and if $b_1 \sim b_2$, testing 1.1 would show $b_3 > 0$ and $b_4 \sim 0$, even though expectations actually do have an impact on purchases. Testing equation 1.0 in a stepwise regression would show that for

$$P = a + b_1\hat{E} + \dots + u,$$

$b_1 \sim 0$; and that for

$$P = a + b_1\hat{E} + b_2(E - \hat{E}) + \dots + u.$$

$b_1 > 0, b_2 > 0$.

The next three variables can be construed either as attitudes or as judgments about the short- and long-term financial outlook for the household. Opinion about buying conditions (*O*) is obtained from responses to a question about whether "the present is a [good, bad, other] time for you to buy, *taking into account the financial situation in your household.*" A question asked respondents in the Survey of Consumer Finances is essentially the same as this one but uses a projective technique, i.e., "Is this a (good, bad) time for people *like yourselves* to buy household items?" The projective question has generally been interpreted as reflecting an evaluation of market conditions.⁴ The opinion variable is included in the attitude index, along with expected price developments, in the group of variables headed "Attitudes Towards Market Conditions." Katona and Mueller present evidence that what people mean when they say "it's a good time to buy" is that prices are low or not rising, discounts are available, etc.; when people say "it's a bad time to buy" they mean that prices are too high or will fall later, discounts are not available, etc. There are also substantial numbers of people who refer to present or prospective financial circumstances as the reason why it's a good (bad) time to buy, i.e., "people can't afford to buy now" or "times are good now," etc.; this is especially true for those with favorable opinions about buying conditions.⁵

The Katona-Mueller interpretation of this variable may well be correct when a projective technique is used to obtain responses. However, the

⁴ See George Katona and Eva Mueller, *Consumer Attitudes and Demand, 1950-1952*, Ann Arbor, Michigan University Survey Research Center, n.d.; and Katona and Mueller, *Consumer Expectations, 1953-1956*, Ann Arbor, Michigan University Survey Research Center, n.d.

⁵ Katona and Mueller, *Consumer Attitudes and Demand*, pp. 17-19, and *Consumer Expectations*, p. 34.

opinion variable from the CU data does not appear to reflect market conditions in this sense. Rather, the matrix of correlation coefficients indicates that O is most closely associated with factors such as recent changes in liquid assets and income, income expectations, and expectations about general business conditions. There is some relation between price expectations and opinion about buying conditions, but this relation is much weaker than the others. The O variable thus seems to constitute a kind of subjective weighting of the factors that influence short-term financial outlook, much as the buying intentions variable reflects a subjective weighting of factors associated with purchase probability.

The next variable—long-range financial prospects (\hat{E}_s)—represents another subjective judgment by the household. This variable was originally obtained on a nine-point scale, including three gradients of optimism and pessimism, no change, other, and an uncertain category. Preliminary tests indicated that the association between purchases and the original scale was quite weak, although generally in the appropriate direction. A truncated scale, differentiating only among very optimistic, moderately optimistic, and all other households, was more strongly associated with purchases and is used below.⁶

The last of the three financial prospect variables consists of the interaction between O and \hat{E}_s ; a cross-product interaction term is used. It seemed to me that optimism or pessimism regarding short-range prospects might as well be doubly reinforced by similar judgments about longer-range prospects. If so, those with favorable short-range prospects would tend to make relatively heavier purchases if their long-range prospects were also very favorable than if they were not, and vice versa.

The remaining variable in this category consists of expectations about price movements (\hat{C}). During the period covered by this study the common expectation (in this sample, at any rate) was that prices would either rise or remain the same; only about 10 per cent expected a price decline. The price variable was included in the preliminary regressions in a variety of ways; the only consistent evidence suggested that those anticipating a decline in prices might have purchased relatively more durables than the others. I would interpret this as evidence of bargain-hunting—those who expected price declines had been holding off purchases in the hope of lower prices; when the 1957–58 recession came to an

⁶ As noted in Chapter 7, the criteria actually consisted of extreme or moderate optimism on the April 1958 survey and either no change or a one-category shift in optimism on the succeeding one. It did not seem plausible that a meaningful judgment about long-range prospects could change radically during a six-month interval; hence, those households with a substantial shift were put into the "all other" category.

end (at about the time of the survey) these households decided to go ahead, either because they actually found lower prices, higher discounts, etc., or because they ceased to expect that prices would go any lower. This interpretation is suggested by two supporting pieces of evidence: first, the expectation of price declines is associated with relatively many buying intentions; second, this association is stronger in the older age groups, where one anticipates bargain-hunting in a sample of Consumers Union subscribers. Thus, the \hat{C} variable distinguishes only between those expecting price declines and all others.

BUYING INTENTIONS VARIABLES

The three variables included here have been discussed extensively in the text. They are "standard" intentions to buy durables (\hat{P}), "contingent" intentions to buy durables (\hat{P}_c), and the cross-product interaction term $\hat{P}\hat{P}_c$. \hat{P} represents responses to the relatively high-probability part of a multiple intentions question; \hat{P}_c responses to the relatively low-probability part of such a question. Also, these variables mean different things in the A, B, and C samples. For example, \hat{P} is associated with a considerably higher mean purchase probability in the A and B samples than in the C sample, while \hat{P}_c is associated with a much higher mean purchase probability in the A sample than in either B or C.⁷ The interaction variable $\hat{P}\hat{P}_c$ is designed to permit the influence of \hat{P}_c to vary with the level of \hat{P} . It is anticipated that the coefficient of the interaction variable will be negative and, hence, that the influence of \hat{P}_c on P will be stronger when \hat{P} is zero than when \hat{P} is positive.⁸ That is, it is anticipated that contingent intentions will be more closely associated with purchases when standard intentions are zero, less closely associated with purchases when standard intentions are positive.

INTERACTION VARIABLES

With two exceptions, these are designed to test the hypothesis that the effect of specified variables on purchases is different for (standard) intenders and nonintenders. Three variables were selected from the first two

⁷ See Chapters 2 and 3.

⁸ In a regression of the form

$$P = b_0 + b_1\hat{P} + b_2\hat{P}_c + b_3\hat{P}\hat{P}_c,$$

it is expected that b_1 and b_2 will be >0 , $b_3 < 0$. If so, there is some level of \hat{P} at which the net effect of \hat{P}_c is zero; at higher levels of \hat{P} the computed net effect of \hat{P}_c would be negative, a logically untenable outcome. However, the size of b_2 and b_3 is rather completely determined by what happens between $0 \leq \hat{P} \leq 2$, and in this zone the net effect of \hat{P}_c is generally positive.

categories that seemed, on preliminary analysis, to be strongly related to purchase behavior—normal income (Y), opinion about buying conditions (O) and stock adjustment (S'). Interaction variables of the form

$$P = b_0 + b_1\hat{P} + b_2[X] + b_3Z[X],$$

where $Z = 1$ when $\hat{P} = 0$,

$Z = 0$ when $\hat{P} > 0$

are introduced for the Y , O , and S' variables.

The last two interaction terms test for the existence of special relations between buying intentions and particular anticipatory variables. Data analyzed in connection with Chapter 6 suggest that buying intentions might be more closely associated with purchases for households with very favorable expectations about both income prospects and business conditions. Therefore, I introduce the three-way interaction $\Delta\hat{Y} \times \Delta\hat{B} \times \hat{P}$, anticipating that the coefficient will be positive; the variable actually used is $\hat{E} \times \hat{P}$, since \hat{E} is essentially a nonlinear version of $\Delta\hat{Y} \times \Delta\hat{B}$. The last variable tests for interaction between contingent intentions to buy (\hat{P}_c) and favorable surprises. The analysis in Chapter 6 suggests that the association between purchases and contingent intentions might be stronger for households experiencing unexpectedly favorable events than for others.⁹ Therefore, the interaction variable $Z_1\hat{P}_c$ is introduced, where $Z_1 = 1$ when $E - \hat{E} = 2$, $Z_1 = 0$ when $E - \hat{E} < 2$.¹⁰

Some systematic differences are predicted among groups asked different buying-intentions questions, and among groups asked the same intentions questions but whose life-cycle status differed. It should be observed that the net influence of both objective and anticipatory initial-data variables is relatively stronger when standard intentions are so defined that the probability cut-off point is relatively high. When this is the case interactions involving differences between intenders and nonintenders should have a stronger effect. In addition, it is anticipated that the regression coefficients of \hat{P} and \hat{P}_c will be consistent with predictions of the probability model as discussed in Chapter 7. Among life-cycle groups, expectational variables are expected to have more (and objective variables less) influence among younger households, simply because the future has a wider range of possible outcomes (and the past has less relevance) for the younger groups. In more technical terms, there should be greater variance in

⁹ See Chapter 6. I have also discussed this in "Some Interrelationships Among Expectational Variables and Durable Goods Purchases," unpublished paper read at December 1960 meeting of the Econometric Society.

¹⁰ $E - \hat{E} = 2$ for households that experience unexpectedly favorable developments with respect to both their own income and general business conditions.

APPENDIX A

wealth (including the discounted value of future earnings) among younger households, and wealth should be correlated with responses to expectational questions.

Basic Data

The regression data for the nine samples are presented in Tables A-1 through A-9; the subgroup designations are those discussed above in "Description and Analysis of Variables." Each table is identical in general format. The stub lists the variables in order of their introduction. The first four columns summarize net regression coefficients for objective variables, then for objective and anticipatory variables, and so on. Regression coefficients that are significantly different from zero at the

TABLE A-1
CORRELATION DATA RELATING AGGREGATE PURCHASES OF CONSUMER DURABLES TO OBJECTIVE, ANTICIPATORY, AND BUYING INTENTIONS VARIABLES, GROUP A₁^a

Independent Variables	Regression Coefficients for Independent Variables				Simple Correlations with	
	$X_1 \dots X_7^b$	$X_1 \dots X_{13}$	$X_1 \dots X_{16}$	$X_1 \dots X_{21}$	P	\hat{P}
Objective						
Y	.046*	.033*	.021	.041*	0.11	0.10
ΔL_{-1}	.137	.029	.012	.005	0.07	0.08
ΔY_{-1}	.000	-.025	-.043	-.039	0.03	0.07
ΔY_t	.354*	.282	.309*	.274	0.07	-0.04
T	-.146	-.117	-.137	-.147	0.00	0.00
H	-.084	-.077	-.021	-.022	-0.00	-0.04
S'	.089*	.089*	.002	-.073	0.08	0.19
Anticipatory						
\hat{E}		.517	.580	.577	0.06	0.00
$E - \hat{E}$		.332	.265	.087	0.01	0.00
O		.424*	.326*	.144	0.24	0.16
\hat{E}_s		.114	.002	-.003	0.07	0.17
$O\hat{E}_s$		.049	.059	.082	0.20	0.19
\hat{C}		.117	.010	.034	-0.01	0.05
Buying Intentions						
\hat{P}			.520*	.521*	0.30	1.00
\hat{P}_c			.147*	.132*	0.10	-0.03
$\hat{P}\hat{P}_c$			-.095*	-.089*	0.15	0.66
Interactions						
ZS'				.118	-0.01	-0.25
ZY				-.035*	-0.14	-0.55
$\hat{E}\hat{P}$				.001	0.28	0.91
ZO				.281*	0.08	-0.28
$Z_1\hat{P}_c$				.153	0.08	-0.01
Multiple R	.179	.290	.406	.420		
Multiple R^2	.032	.084	.165	.176		

For notes, see end of Table A-9.

APPENDIX A

TABLE A-2
CORRELATION DATA RELATING AGGREGATE PURCHASES OF CONSUMER DURABLES TO
OBJECTIVE, ANTICIPATORY, AND BUYING INTENTIONS VARIABLES, GROUP A₂^a

Independent Variables	Regression Coefficients for Independent Variables				Simple Correlations with	
	$X_1 \dots X_7^b$	$X_1 \dots X_{13}$	$X_1 \dots X_{16}$	$X_1 \dots X_{21}$	P	\hat{P}
Objective						
Y	.036*	.030*	.014	.011	0.11	0.17
ΔL_{-1}	.126	.071	.076	.075	0.07	0.03
ΔY_{-1}	.026	.003	-.024	-.024	0.06	0.07
ΔY_t	.625*	.621*	.592*	.577*	0.11	0.01
T	-.047	-.051	.031	.035	0.02	-0.00
H	.025	-.001	-.075	-.075	0.02	0.08
S'	.166*	.166*	.069*	.068	0.17	0.21
Anticipatory						
\hat{E}		-.252	-.111	-.054	-0.02	-0.02
$E - \hat{E}$		.254	.348	.264	0.05	0.01
O		.196*	.083	.040	0.12	0.25
\hat{E}_5		-.016	-.043	-.039	0.01	0.10
$O\hat{E}_5$		.062	-.006	.003	0.10	0.25
\hat{C}		.215	.131	.126	0.05	0.06
Buying Intentions						
\hat{P}			.452*	.525*	0.31	1.00
\hat{P}_c			.159*	.153*	0.16	-0.03
$\hat{P}\hat{P}_c$			-.041	-.040	0.23	0.66
Interactions						
ZS'				.004	0.00	-0.26
ZY				.000	-0.14	-0.56
$\hat{E}\hat{P}$				-.004	0.27	0.92
ZO				.064	-0.04	-0.31
$Z_1\hat{P}_c$				.050	0.09	0.03
Multiple R	.239	.267	.392	.393		
Multiple R^2	.057	.071	.153	.154		

For notes, see end of Table A-9.

5 per cent level are noted by an asterisk. The last two columns show zero-order correlations of all independent variables with both purchases and standard buying intentions.

The empirical results are summarized briefly below. Each category of variables is then analyzed in turn, and regression coefficients are presented net and gross of the different categories to the extent that this can be done. The sequence of variables was designed to permit measurement of the influence of anticipations net of objective variables, and of the influence of intentions net of both anticipations and objective variables. The influence of anticipatory variables (as a group) net of intentions, or of objective variables (as a group) net of either of the other two groups,

APPENDIX A

TABLE A-3
CORRELATION DATA RELATING AGGREGATE PURCHASES OF CONSUMER DURABLES TO
OBJECTIVE, ANTICIPATORY, AND BUYING INTENTIONS VARIABLES, GROUP A₃^a

Independent Variables	Regression Coefficients for Independent Variables				Simple Correlations with	
	$X_1 \dots X_7^b$	$X_1 \dots X_{13}$	$X_1 \dots X_{18}$	$X_1 \dots X_{21}$	P	\hat{P}
Objective						
Y	.047*	.042*	.039*	.041*	0.22	0.05
ΔL_{-1}	.131	.117	.098	.102	0.07	0.03
ΔY_{-1}	.141	.075	.082	.088	0.11	0.02
ΔY_t	.062	.045	.096	.119	0.02	-0.07
T	.081	.114	.157	.152	0.08	-0.07
H	-.494*	-.505*	-.496*	-.466*	-0.08	-0.04
S'	.100*	.100*	.033	-.022	0.10	0.25
Anticipatory						
\hat{E}		-.274	-.341	-.239	-0.02	0.04
$E - \hat{E}$		.255	.233	.308	0.01	-0.01
O		.075	.027	.097	0.15	0.16
\hat{E}_s		.041	-.012	.004	0.12	0.11
$O\hat{E}_s$		.317*	.311*	.315*	0.19	0.16
\hat{C}		-.166	-.148	-.177	-0.05	-0.05
Buying Intentions						
\hat{P}			.179*	.367*	0.19	1.00
\hat{P}_c			.087*	.090*	0.10	-0.11
$\hat{P}\hat{P}_c$			.014	.022	0.16	0.56
Interactions						
ZS'				.079	0.00	-0.23
ZY				-.004	0.03	-0.48
$\hat{E}\hat{P}$				-.019	0.14	0.91
ZO				-.097	0.02	-0.32
$Z\hat{P}_c$				-.058	0.03	-0.01
Multiple R	.274	.321	.361	.370		
Multiple R^2	.075	.103	.130	.137		

For notes, see end of Table A-9.

cannot be measured because of the computer program used.¹¹ However, the relation between regression coefficients and standard errors will convey an accurate impression of the net influence of individual variables unless interactions are involved.

¹¹ The program obtained total explained variance for the sum of all variables every time a new variable was added. Thus, incremental explained variance is calculated only in one direction, so to speak. $R^2_{1,234}$ can be compared with $R^2_{1,23}$, and $r^2_{14,23}$ can be estimated by a simple calculation. But $r^2_{12,34}$ or $r^2_{13,24}$ would be more difficult to compute. This is not a problem if one is interested in incremental explained variance for individual variables. However, incremental explained variance for groups of variables that precede others cannot be obtained; the computation is feasible only for groups that follow others in the sequence of introduction into the stepwise regression. For example, given the computer program, one cannot obtain the incremental variance explained by X_1, \dots, X_6 in an equation including X_1, \dots, X_{13} ; all that is known is the total variance explained by X_1, \dots, X_n or X_1, \dots, X_{n-6} , not the total explained by X_6, \dots, X_n .

APPENDIX A

TABLE A-4

CORRELATION DATA RELATING AGGREGATE PURCHASES OF CONSUMER DURABLES TO OBJECTIVE, ANTICIPATORY, AND BUYING INTENTIONS VARIABLES, GROUP B₁^a

Independent Variables	Regression Coefficients for Independent Variables				Simple Correlations with	
	X ₁ . . . X ₇ ^b	X ₁ . . . X ₁₃	X ₁ . . . X ₁₆	X ₁ . . . X ₂₁	P	\hat{P}
Objective						
Y	.056*	.054*	.050*	.047*	.16	0.10
ΔL_{-1}	.124	.102	.046	.041	.09	0.12
ΔY_{-1}	.127*	.116*	.110*	.112*	.12	0.07
ΔY_t	.123	.094	.089	.053	.03	0.03
T	.012	.034	-.039	-.043	.04	0.05
H	.009	-.102	-.102	-.092	.02	0.05
S'	.206*	.206*	.135*	.106*	.22	0.28
Anticipatory						
\hat{E}		-.013	-.013	-.012	.03	0.05
$E - \hat{E}$		-.010	-.008	-.007	-.03	-0.04
O		.248*	.187	.049	.10	0.12
\hat{E}_5		.090	.073	.074	.03	0.04
$O\hat{E}_5$		-.121	-.114	-.112	.05	0.12
\hat{C}		-.085	-.131	-.131	-.03	0.01
Buying Intentions						
\hat{P}			.334*	.419*	.29	1.00
\hat{P}_c			.055	.059	.08	-0.01
$\hat{P}\hat{P}_c$			-.015	-.016	.23	0.76
Interactions						
ZS'				.057	.05	-0.26
ZY				.005	-.08	-0.57
$\hat{E}\hat{P}$				-.000	.27	0.91
ZO				.308*	.02	-0.25
Z ₁ \hat{P}_c				-.017	-.01	-0.02
Multiple R	.296	.309	.376	.387		
Multiple R ²	.087	.095	.142	.150		

For notes, see end of Table A-9.

APPENDIX A

TABLE A-5
CORRELATION DATA RELATING AGGREGATE PURCHASES OF CONSUMER DURABLES TO
OBJECTIVE, ANTICIPATORY, AND BUYING INTENTIONS VARIABLES, GROUP B₂^a

Independent Variables	Regression Coefficients for Independent Variables				Simple Correlations with	
	$X_1 \dots X_7^b$	$X_1 \dots X_{13}$	$X_1 \dots X_{16}$	$X_1 \dots X_{21}$	P	\hat{P}
Objective						
Y	.040*	.035*	.028*	.030*	.16	0.14
ΔL_{-1}	.072	-.021	-.057	-.053	.04	0.11
ΔY_{-1}	-.064	-.096	-.090	-.094	-.03	0.01
ΔY_1	.055	.019	.038	.019	-.01	-0.00
T	.042	.047	.063	.060	.05	0.01
H	-.157	.203	-.083	-.066	-.02	-0.09
S'	.199*	.199*	.131*	.140*	.21	0.27
Anticipatory						
\hat{E}		.491	.392	.357	.06	0.07
$E - \hat{E}$		-.326	-.292	-.317	-.05	-0.04
O		.304*	.225*	.077	.14	0.18
\hat{E}_s		.069	.040	.022	.01	0.03
$O\hat{E}_s$		-.076	-.070	-.056	.06	0.11
\hat{C}		.087	.047	.066	-.00	0.01
Buying Intentions						
\hat{P}			.416*	.370*	.30	1.00
\hat{P}_c			.062*	.065*	.04	-0.05
$\hat{P}\hat{P}_c$			-.046*	-.049*	.19	0.71
Interactions						
ZS'				-.015	.00	-0.28
ZY				-.005	-.09	-0.52
$\hat{E}\hat{P}$				.009	.28	0.90
ZO				.259	.00	-0.32
$Z_1\hat{P}_c$				.010	-.02	-0.04
Multiple R	.268	.303	.380	.386		
Multiple R^2	.072	.092	.144	.149		

For notes, see end of Table A-9.

APPENDIX A

TABLE A-6
CORRELATION DATA RELATING AGGREGATE PURCHASES OF CONSUMER DURABLES TO
OBJECTIVE, ANTICIPATORY, AND BUYING INTENTIONS VARIABLES, GROUP B₃^a

Independent Variables	Regression Coefficients for Independent Variables				Simple Correlations with	
	$X_1 \dots X_7^b$	$X_1 \dots X_{13}$	$X_1 \dots X_{16}$	$X_1 \dots X_{21}$	P	\hat{P}
Objective						
Y	.051*	.050*	.044*	.047*	.21	0.15
ΔL_{-1}	.063	.041	-.006	-.007	.05	0.13
ΔY_{-1}	.071	.079	.077	.072	.06	0.06
ΔY_t	.408	.465*	.455*	.478*	.07	0.02
T	.016	-.039	-.032	-.019	.07	0.05
H	-.196	-.316	-.237	-.214	-.02	-0.03
S'	.179*	.179*	.127*	.144*	.14	0.24
Anticipatory						
\hat{E}		.311	.171	.066	.01	0.07
$E - \hat{E}$		.690*	.653*	.856*	.08	0.02
O		.249*	.182	.317*	.14	0.18
\hat{E}_t		-.052	-.046	-.053	.01	0.07
$O\hat{E}_t$		.019	-.018	-.070	.06	0.15
\hat{C}		.100	-.006	-.039	.03	0.12
Buying Intentions						
\hat{P}			.274*	.042	.27	1.00
\hat{P}_c			-.004	.007	-.05	-0.17
$\hat{P}\hat{P}_c$			-.036	-.045	.09	0.52
Interactions						
ZS'				-.042	-.02	-0.23
ZY				-.001	-.04	-0.50
$\hat{E}\hat{P}$				.017	.26	0.89
ZO				-.235	-.07	-0.35
Z,\hat{P}_c				-.076	-.02	-0.08
Multiple R	.286	.321	.372	.387		
Multiple R^2	.082	.103	.139	.150		

For notes, see end of Table A-9.

APPENDIX A

TABLE A-7
CORRELATION DATA RELATING AGGREGATE PURCHASES OF CONSUMER DURABLES TO
OBJECTIVE, ANTICIPATORY, AND BUYING INTENTIONS VARIABLES, GROUP C₁^a

Independent Variables	Regression Coefficients for Independent Variables				Simple Correlations with	
	$X_1 \dots X_7^b$	$X_1 \dots X_{13}$	$X_1 \dots X_{16}$	$X_1 \dots X_{21}$	P	\hat{P}
Objective						
Y	.047*	.038*	.017	.011	.13	0.18
ΔL_{-1}	.074	.016	-.016	-.020	.05	0.08
ΔY_{-1}	-.002	-.042	-.076	-.075	.03	0.12
ΔY_t	.297	.428*	.353*	.350*	.05	0.04
T	.039	-.040	-.046	-.042	.04	0.07
H	-.022	-.117	-.040	-.027	.02	-0.01
S'	.150*	.150*	.024	.043	.12	0.26
Anticipatory						
\hat{E}		.066	.165	.084	.02	-0.00
$E - \hat{E}$		-.197	-.021	.021	-.02	-0.06
O		.226*	.114	.095	.20	0.20
\hat{E}_5		.126	.063	.052	.11	0.08
$O\hat{E}_5$		.196*	.204*	.196*	.22	0.16
\hat{C}		.443*	.376	.420*	.05	0.01
Buying Intentions						
\hat{P}			.406*	.410*	.38	1.00
\hat{P}_c			.136*	.146*	.05	-0.10
$\hat{P}\hat{P}_c$			-.034	-.037*	.24	0.58
Interactions						
ZS'				-.081	-.11	-0.28
ZY				.035	-.16	-0.58
$\hat{E}\hat{P}$				.004	.36	0.89
ZO				.091	-.01	-0.29
$Z_1\hat{P}_c$				-.010	-.02	-0.07
Multiple R	.207	.309	.443	.449		
Multiple R^2	.043	.096	.196	.202		

For notes, see end of Table A-9.

APPENDIX A

TABLE A-8
CORRELATION DATA RELATING AGGREGATE PURCHASES OF CONSUMER DURABLES TO
OBJECTIVE, ANTICIPATORY, AND BUYING INTENTIONS VARIABLES, GROUP C₂^a

Independent Variables	Regression Coefficients for Independent Variables				Simple Correlations with \hat{P}	
	$X_1 \dots X_7^b$	$X_1 \dots X_{13}$	$X_1 \dots X_{16}$	$X_1 \dots X_{21}$	P	\hat{P}
Objective						
Y	.042*	.039*	.032*	.034*	.15	0.08
ΔL_{-1}	.087	.013	-.004	-.019	.05	0.08
ΔY_{-1}	.036	.006	-.031	-.022	.03	0.07
ΔY_t	.063	.117	.075	.070	.01	0.03
T	-.123	-.100	-.058	-.070	-.00	-0.03
H	.029	.027	.046	.050	.03	0.01
S'	.155*	.155*	.036	.018	.15	0.36
Anticipatory						
\hat{E}		.720*	.461	.280	.09	0.09
$E - \hat{E}$		-.005	-.034	.186	-.03	-0.03
O		.151	.032	.087	.14	0.22
\hat{E}_5		.054	.081	.048	.08	0.02
$O\hat{E}_5$		.124	.092	.084	.15	0.15
\hat{C}		.050	.016	.070	-.02	-0.02
Buying Intentions						
\hat{P}			.336*	.199*	.38	1.00
\hat{P}_c			.004	.006	-.03	-0.06
$\hat{P}\hat{P}_c$			-.006	-.002	.20	0.55
Interactions						
ZS'				.086	-.07	-0.26
ZY				.001	-.16	-0.51
$\hat{E}\hat{P}$				.010	.39	0.90
ZO				-.222	-.13	-0.31
$Z_1\hat{P}_c$				-.136	-.09	-0.08
Multiple R	.228	.279	.417	.430		
Multiple R^2	.052	.078	.174	.185		

For notes, see end of Table A-9.

TABLE A-9
CORRELATION DATA RELATING AGGREGATE PURCHASES OF CONSUMER DURABLES TO
OBJECTIVE, ANTICIPATORY, AND BUYING INTENTIONS VARIABLES, GROUP C₃^a

Independent Variables	Regression Coefficients for Independent Variables				Simple Correlations with	
	$X_1 \dots X_7^b$	$X_1 \dots X_{13}$	$X_1 \dots X_{16}$	$X_1 \dots X_{21}$	P	\hat{P}
Objective						
Y	.040*	.035*	.028*	.028*	.13	0.12
ΔL_{-1}	.003	-.102	-.136	-.134	.03	0.11
ΔY_{-1}	.140	.096	.042	.033	.07	0.13
ΔY_t	.390	.243	.325	.382	.05	-0.01
T	-.329*	-.338*	-.330*	-.345*	-.02	0.03
H	.308	.236	.225	.264	.05	0.04
S'	.148*	.148*	.020	.032	.13	0.39
Anticipatory						
\hat{E}		.668	.736*	1.016*	.07	-0.05
$E - \hat{E}$		.306	.140	.052	.01	0.09
O		.322*	.180	.140	.19	0.26
\hat{E}_5		.045	-.038	-.008	.08	0.09
$O\hat{E}_5$		.092	.123	.157	.13	0.13
\hat{C}		.093	.004	-.062	-.01	0.05
Buying Intentions						
\hat{P}			.297*	.485*	.32	1.00
\hat{P}_c			.066	.069	-.01	-0.12
$\hat{P}\hat{P}_c$			-.023	-.020	.13	0.45
Interactions						
ZS'				-.048	-.09	-0.25
ZY				-.005	-.15	-0.52
$\hat{E}\hat{P}$				-.020*	.25	0.86
ZO				.168	-.04	-0.36
$Z_1\hat{P}_c$				-.051	.01	0.02
Multiple R	.235	.296	.381	.399		
Multiple R^2	.055	.087	.145	.159		

NOTES TO TABLES A-1 THROUGH A-9

SOURCE: Basic data from Consumer Purchase Study, NBER.

* = coefficient > 1.96 times standard error.

^a

Sample Designation

- Buying Intentions Question*
- A Which of the following products do you *definitely* plan to buy within the next twelve months?
- B Which of the following products do you plan to buy within the next six months?
- C Which of the following products do you plan to buy within the next twelve months (if income is as expected)?

Subscript Designation

- Age-Marital Status*
- 1 Married; head of household, 25-34 years old.
- 2 Married; head of household, 35-44 years old.
- 3 Married; head of household, 45-64 years old.

^b In computing the regression coefficients, S' was added after the objective and anticipatory variables. The coefficient of S' , holding only the objective variables constant, was thus not computed. Tables 42-44 show that the anticipatory variables exert little influence on the S' coefficient; therefore, I assume that the S' coefficient net of objective variables (X_1, \dots, X_7) equals the observed S' coefficient net of objective and anticipatory variables (X_1, \dots, X_{13}). The incremental variance explained by S' net of both objective and anticipatory variables is added to the variance explained by the first six objective variables to get the variance explained by X_1, \dots, X_7 .

APPENDIX A

Empirical Results

SUMMARY

A summary of results from the multivariate regression analysis is provided by Tables A-10, A-11, and A-12. Table A-10 contains the means and variances for all variables, except for the interactions, in each of the nine

TABLE A-10
SUMMARY OF RESULTS FROM MULTIVARIATE REGRESSION ANALYSIS:
MEAN AND VARIANCE OF ALL VARIABLES
(variance shown in parentheses)

	<i>Subgroup:</i>								
	A ₁	B ₁	C ₁	A ₂	B ₂	C ₂	A ₃	B ₃	C ₃
<i>Independent variables</i>									
Objective									
<i>Y</i>	8,705 (2,237)	8,447 (2,256)	8,794 (2,299)	10,963 (3,677)	11,170 (4,836)	11,045 (3,884)	12,244 (6,631)	12,057 (6,506)	12,104 (6,057)
ΔL_{-1}	0.30 (0.52)	0.30 (0.51)	0.30 (0.53)	0.35 (0.48)	0.31 (0.50)	0.35 (0.44)	0.35 (0.47)	0.31 (0.47)	0.33 (0.45)
ΔY_{-1}	0.63 (1.52)	0.48 (1.66)	0.56 (1.56)	0.37 (1.00)	0.36 (0.81)	0.37 (0.92)	0.23 (0.84)	0.13 (0.90)	0.19 (0.84)
ΔY_t	+0.02 (0.15)	-0.002 (0.16)	+0.004 (0.12)	-0.007 (0.11)	+0.007 (0.12)	-0.02 (0.10)	-0.02 (0.15)	-0.02 (0.12)	-0.002 (0.14)
<i>T</i>	0.74 (0.19)	0.71 (0.21)	0.72 (0.20)	0.61 (0.24)	0.60 (0.24)	0.56 (0.25)	0.43 (0.24)	0.42 (0.24)	0.44 (0.25)
<i>H</i>	0.57 (0.24)	0.56 (0.25)	0.59 (0.24)	0.79 (0.16)	0.81 (0.15)	0.81 (0.15)	0.88 (0.10)	0.85 (0.13)	0.83 (0.14)
<i>S'</i>	1.17 (3.25)	1.24 (3.36)	1.26 (3.22)	1.31 (3.40)	1.43 (3.67)	1.41 (3.48)	1.23 (3.24)	1.18 (3.23)	1.33 (3.48)
<i>Anticipatory</i>									
\hat{E}	0.98 (0.03)	0.97 (0.04)	0.98 (0.02)	0.98 (0.04)	0.97 (0.03)	0.97 (0.04)	0.96 (0.05)	0.95 (0.05)	0.95 (0.05)
$E - \hat{E}$	1.07 (0.06)	1.06 (0.06)	1.05 (0.05)	1.05 (0.05)	1.06 (0.07)	1.06 (0.06)	1.08 (0.08)	1.07 (0.06)	1.07 (0.06)
<i>O</i>	0.67 (0.71)	0.53 (0.68)	0.68 (0.74)	0.78 (0.77)	0.76 (0.78)	0.74 (0.77)	0.81 (0.75)	0.85 (0.78)	0.93 (0.80)
\hat{E}_s	0.83 (0.60)	0.88 (0.62)	0.91 (0.60)	0.59 (0.47)	0.60 (0.47)	0.58 (0.52)	0.37 (0.33)	0.33 (0.31)	0.34 (0.31)
\hat{C}	0.12 (0.11)	0.11 (0.10)	0.10 (0.09)	0.12 (0.11)	0.14 (0.12)	0.15 (0.12)	0.17 (0.14)	0.17 (0.14)	0.16 (0.14)
<i>Buying Intentions</i>									
\hat{P}	0.73 (1.78)	0.92 (1.91)	1.72 (3.23)	0.74 (1.95)	0.92 (2.09)	1.73 (3.46)	0.70 (2.24)	0.94 (2.51)	1.86 (4.14)
\hat{P}_c	2.09 (4.12)	3.34 (5.22)	2.23 (3.91)	2.10 (4.08)	3.03 (5.17)	2.04 (4.12)	1.78 (4.27)	2.49 (5.66)	1.83 (4.20)
<i>Dependent variable</i>									
<i>P</i>	1.48 (3.10)	1.58 (3.07)	1.59 (3.19)	1.59 (3.39)	1.52 (3.29)	1.37 (3.05)	1.58 (3.36)	1.49 (3.58)	1.58 (3.69)
<i>Sample Size</i>	852	866	814	863	836	691	559	678	570

SOURCE: Basic data from Consumer Purchase Study, NBER.

APPENDIX A

subgroups. Table A-11 shows the net regression coefficients for the most consistently significant of the twenty-one variables. Table A-12 shows the proportion of variance in purchases explained by each of the four groups of variables.

The influence of life-cycle status is apparent in these data, as is the influence of differences in the buying-intentions variable associated with the variant questions. Table A-10 indicates that there are consistent differences among the means for life-cycle groups with respect to income (Y), income change (ΔY_{-1}), education (T), home ownership (H), opinion about current buying conditions (O), long-range financial prospects (\hat{E}_b), and price expectations (\hat{C}). Younger households have a lower income level, a more rapid rate of increase in income, more education, are less likely to own homes, have less favorable opinions about current buying conditions for durables, have more optimistic long-range financial prospects, and are more likely to expect rising prices.¹² The only marked difference in the variances is that older households show much greater variability in current family income than do younger households. Interestingly enough, young and old appear to report about the same number of standard buying intentions and purchases, although relative to income the young would report a great deal more of both. In addition, younger households generally report many more contingent buying intentions than others.

Net regression coefficients for the nine variables most consistently related to purchases are summarized in Table A-11. In the objective category, normal income, transitory income, and stock adjustment have the predicted signs in all subgroups; Y , ΔY_b , and S' are statistically significant (5 per cent level) in six, four and four of the nine subgroups, respectively. The data suggest, however, that S' is almost completely redundant to buying intentions when the latter is defined in the optimal way. Three of the four significant S' coefficients are found in the B subsamples, which contain the least efficient combination of \hat{P} and \hat{P}_c . In the C subsamples, which were asked what seems to be the best (most efficient) of the intentions questions, none of the S' coefficients come close to being significant.

¹² One interesting result is the behavior of O . The group means show very clearly that O —opinion about current buying conditions—tends to be *more* favorable among older than younger households, on the average. This fact is consistent with the proposition that O is primarily a judgment about the household's current financial position rather than a judgment about the prevalence of "bargains" in the market; older households are typically in a stronger current financial position than younger ones because they have relatively higher incomes, larger asset holdings, lower debts, etc. I interpret this as one additional piece of evidence that the opinion variable in the CU data is not as closely related to market conditions as to personal financial situation.

APPENDIX A

TABLE A-11
SUMMARY OF RESULTS FROM MULTIVARIATE REGRESSION ANALYSIS:
SELECTED NET REGRESSION COEFFICIENTS

Subgroup	Y	ΔY_t	S'	Independent Variables					
				\hat{E}	[O	ZO] ^a	\hat{P}	\hat{P}_c	$\hat{P}\hat{P}_c$
A ₁	+ .0021	+ .309*	+ .002	+ .580	[+ .224	+ .286]*	+ .520*	+ .147*	-.095*
A ₂	+ .0014	+ .592*	+ .069*	-.111	[+ .037	+ .069]	+ .452*	+ .159*	-.041
A ₃	+ .0039*	+ .096	+ .033	-.341	[+ .406	-.088]*	+ .179*	+ .087*	+ .014
B ₁	+ .0050*	+ .089	+ .135*	-.013	[- .063	+ .308]*	+ .334*	+ .055	-.015
B ₂	+ .0028*	+ .038	+ .131*	+ .392	[+ .022	+ .258]*	+ .416*	+ .062*	-.046*
B ₃	+ .0044*	+ .455*	+ .127*	+ .171	[+ .246	-.233]*	+ .274*	-.004	-.036
C ₁	+ .0017	+ .353*	+ .024	+ .165	[+ .290	+ .091]*	+ .406*	+ .136*	-.034
C ₂	+ .0032*	+ .075	+ .036	+ .461	[+ .173	-.231]	+ .336*	+ .004	-.006
C ₃	+ .0028*	+ .325	+ .020	+ .736*	[+ .297	+ .162]	+ .297*	+ .066	-.023

SOURCE: Tables A-1 through A-9, third column except as noted in a. All coefficients are net of each other and of eight other variables not shown, including ΔL_{-1} , ΔY_{-1} , H , T , $E - \hat{E}$, \hat{E}_5 , $O\hat{E}_5$, and \hat{C} .

^a Coefficient of O includes effect of interaction variable $O\hat{E}_5$; the coefficient shown is the value of $O + O\hat{E}_5$ when $\hat{E}_5 = 1$. Of the six statistically significant coefficients, two are due to a significant interaction between O and E_5 rather than to a significant net coefficient for O ; in both these cases O was significant before introduction of the interaction term. The significance level shown is for either O or ZO , whichever has the stronger relation to purchases.

Both ZO and O are net of the twenty variables included in the next-to-last regression. The interaction term ZO was the next to last variable added in the sequence; hence, the coefficients of these two variables, net of only those variables listed in the note, cannot be obtained.

* = Significantly different from zero at 0.05 level, using t test.

I conclude that S' adds little if anything to the explanation of purchases net of buying intentions, except where the intentions questions are relatively inefficient.

In the anticipatory category, the expectations index, \hat{E} , has the predicted sign in seven of the nine groups but is significant in only one; still, this variable has (absolutely) large positive coefficients in six groups and may well be quantitatively important for those (relatively few) cases where it takes on values different from the neutral classification. Opinion about buying conditions (O) has the right sign in all subgroups but one, and here the explanation is plainly the presence of interaction between intenders and nonintenders as represented by the ZO variable. O is statistically significant in three subgroups, although in two of these the significant variable is not O itself but an interaction between O and \hat{E}_5 . If $O\hat{E}_5$ were eliminated from the regression, O would become significant in the three groups as shown. Further, the ZO interaction is significant in three additional groups; consequently, either O or an interaction involving it shows a significant positive relation to purchases in six of the nine

groups. The ZO interaction has the predicted sign in six groups, behaves perversely in two (although not significantly so), and has little influence in the remaining group. It is also observable that ZO , which represents an interaction between intenders and nonintenders, is significant only when intenders are defined so as to include only households with relatively high purchase probabilities, i.e., those in the A and B groups; none of the ZO coefficients is significant in the C group. These results accord with predictions of the model.

The remaining variables that are consistently related to purchases are all measures of buying intentions—"standard" intentions (\hat{P}), contingent intentions (\hat{P}_c), and the interaction of the two. \hat{P} is clearly the strongest variable in the entire regression, being statistically significant in every subgroup, generally at the 0.01 level. Contingent buying intentions (\hat{P}_c) is not quite so strongly related to purchases as is \hat{P} , but it has the predicted sign in all but one group and is significantly related to purchases in five of the nine groups. The influence of \hat{P}_c differs considerably among the groups, varying according to the way in which contingent intentions are defined; this variable is much stronger in the A groups, for instance. Finally, the interaction $\hat{P}\hat{P}_c$ has the predicted (negative) association with purchases in all but one group and is statistically significant in two of the nine groups.

It is evident from Table A-12 (and also from Table A-11) that the relative importance of objective and anticipatory variables depends on life-cycle status. Sometimes this shows up in the regression coefficients (note the pattern of the \hat{P} and \hat{P}_c coefficients in Table A-11); more often it shows up as a difference in explained variance.

The data indicate that objective variables tend to explain relatively more of the variance in purchases for older households, while anticipatory variables are relatively more important for younger households. In Table A-12 the objective variables consistently explain more variance in the 45-64 age groups than in the other two groups; the anticipatory variables generally explain more variance in the 25-34 age groups than elsewhere, and the buying-intentions variables explain more variance in the two younger groups than in the 45-64 group.¹³

The wealth position of relatively young households is presumably highly variable in relation to current income and financial position. Younger households also show a great deal of variation in their expectations about

¹³ The B₁ subsample constitutes an exception to the first two generalizations; this sample shows a relatively high proportion of variance explained by objective variables and a relatively low proportion explained by anticipatory ones, compared to the other groups.

APPENDIX A

financial resources and commitments. These expectations are importantly related to wealth; and if wealth is an important determinant of current purchases of durables, anticipatory variables will explain a relatively large fraction of the variance in purchases. In contrast, variables reflecting financial position, being less closely associated with wealth for younger households, will explain a relatively small fraction of the variance in purchases.¹⁴ On the other hand, the wealth position of older households is presumably less variable relative to current income, since the

TABLE A-12
SUMMARY OF RESULTS FROM MULTIVARIATE REGRESSION ANALYSIS:
PROPORTION OF VARIANCE IN PURCHASES EXPLAINED
BY SPECIFIED GROUPS OF VARIABLES

SUBGROUP	<i>R</i> ² FOR GROUPS OF VARIABLES							
	<i>Objective</i>		<i>Anticipatory</i>		<i>Intentions to Buy</i>		<i>Interactions</i>	
	<i>R</i> ² _{1,α}	<i>R</i> ² _{1α}	<i>R</i> ² _{1,αβ}	<i>R</i> ² _{1β,α}	<i>R</i> ² _{1,αβγ}	<i>R</i> ² _{1γ,αβ}	<i>R</i> ² _{1,αβγδ}	<i>R</i> ² _{1δ,αβγ}
A ₁	.032	.032	.084	.054	.165	.088	.176	.013
A ₂	.057	.057	.071	.015	.153	.088	.154	.001
A ₃	.075	.075	.103	.030	.130	.030	.137	.008
B ₁	.087	.087	.095	.009	.142	.052	.150	.009
B ₂	.072	.072	.092	.022	.144	.057	.149	.006
B ₃	.082	.082	.103	.023	.139	.040	.150	.012
C ₁	.043	.043	.096	.055	.196	.111	.202	.008
C ₂	.052	.052	.078	.027	.174	.104	.185	.012
C ₃	.055	.055	.087	.034	.145	.065	.159	.015

SOURCE: Derived from Tables A-1 through A-9. The subscripts designate the following variables (see above for definitions):

- 1—Purchases
- α—Objective variables (*X*₁ . . . *X*₇)
- β—Anticipatory variables (*X*₈ . . . *X*₁₃)
- γ—Buying intentions variables (*X*₁₄ . . . *X*₁₆)
- δ—Interactions (*X*₁₇ . . . *X*₂₁)

present circumstances of these people must give a fairly accurate picture of prospective circumstances.¹⁵ Hence, forward-looking variables are relatively less important, and the current financial situation more important, for the explanation of current purchases among older households.

¹⁴ For purposes of the above discussion I define wealth as the capitalized value of permanent income. The most important component of wealth thus defined is the capitalized value of prospective earnings, rather than the current market value of real tangible assets.

¹⁵ Some kinds of uncertainties are important for older households, especially those bearing on prospective expenses, but their current financial situation is bound to provide a relatively more accurate picture of their future situation than would be true of younger households.

APPENDIX A

The same reasoning may also explain the differential association between intentions to buy and purchases, since this variable, while not measuring anticipations directly, is bound to reflect them. Thus, greater variance in buying intentions relative to current income is anticipated among a group of younger households; and differences in wealth among these households should be correlated with both intentions to buy and purchases.

Other factors in addition to wealth may also be relevant for an explanation of differences among age groups in the explanatory power of the intentions variable. One quite different possibility is that the durable goods purchases of older households are more likely to constitute replacement of existing stock than net additions to stock.¹⁶ Many of these replacement purchases will be "unplanned," in the sense that the household will replace whenever it becomes functionally necessary rather than on some predetermined schedule. Further, differences in mean income and asset level between young and old augur for a relatively weak plan-purchase relationship in the older groups. Many high-income households, particularly those with large assets, may not report "plans" to buy consumer durables because their budgetary position can absorb sizable expenditures without the necessity of their making explicit forward provision.

One of the most striking results in Table A-12 is the dominant importance of the anticipatory variables, especially buying intentions, in the explanation of differences in purchases among households. Table A-12 tends to understate the comparative importance of both anticipations and buying intentions relative to objective variables because the stepwise regression procedure does not permit estimation of the partial correlation between purchases and objective variables, holding the other variables constant, or purchases and anticipations, holding buying intentions constant. Even so, the cluster of intentions variables clearly accounts for the major share of total explained variance except in the 45-64 age groups, where the financial variables seem to be at least as important. In addition, the data suggest that, among anticipatory variables, a major share of the explained variance is due to "opinion about buying conditions" (*O*). This variable by itself contributes more than half of the total variance explained by anticipations, and interactions involving *O* are more important than any other single variable in this cluster.

¹⁶ This line of reasoning seems to suggest that *S'* should be somewhat higher for older households—with relatively large and obsolescent stocks of durables—than for younger ones. I do not think the conclusion follows; a durable that "needs replacing" to a thirty-three-year-old suburbanite and his wife might be perfectly satisfactory to their parents; Table A-10 indicates that the average level of "replacement needs" is actually lower for older than for younger households.

APPENDIX A

Table A-13 summarizes the proportion of variance explained by selected groups of the four most important variables: standard intentions, contingent intentions, opinion about buying conditions, and family income (\hat{P} , \hat{P}_c , O , and Y). The proportion of total variance explained by all twenty-one independent variables is shown in the last row.

The results indicate clearly that: (1) Standard buying intentions are the most important single variable by a wide margin, even in the older age group where this variable is relatively less important than in the younger groups. (2) Opinion about buying conditions and income have about the same influence, on the average, but the former is generally

TABLE A-13
PROPORTION OF VARIANCE IN PURCHASES EXPLAINED BY SELECTED COMBINATIONS OF VARIABLES

<i>R</i> ² or <i>r</i> ² for	<i>Subgroup:</i>								
	A ₁	B ₁	C ₁	A ₂	B ₂	C ₂	A ₃	B ₃	C ₃
\hat{P}	.089	.083	.144	.098	.092	.148	.035	.072	.102
\hat{P}_c	.010	.003	.003	.026	.002	.001	.011	.003	.000
O	.056	.009	.041	.015	.019	.019	.023	.019	.038
Y	.013	.027	.016	.012	.025	.022	.047	.044	.017
\hat{P}, \hat{P}_c	.101	.088	.152	.127	.095	.148	.051	.072	.103
\hat{P}, O	.126	.086	.161	.100	.100	.151	.050	.080	.116
\hat{P}, Y	.097	.102	.148	.101	.105	.162	.078	.102	.110
\hat{P}, \hat{P}_c, O	.137	.091	.171	.128	.103	.151	.065	.080	.118
\hat{P}, \hat{P}_c, Y	.106	.107	.156	.129	.108	.162	.089	.102	.111
\hat{P}, O, Y	.129	.104	.162	.103	.111	.164	.086	.107	.120
All 21 independent variables	.176	.150	.202	.154	.149	.185	.137	.150	.159

SOURCE: Basic data from Consumer Purchase Study, NBER.

more important for younger age groups; the latter, for older age groups. (3) Contingent buying intentions are most important for the A samples (due to the specifications of the intentions question), and also seem to be more important for the younger age groups generally. (4) The anticipatory variables account for a dominant share of the variance in purchases; the three best such variables account for between two-thirds and four-fifths of the total variance explained by all twenty-one independent variables.

Several points of interest should be noted. First, all three of the most important anticipatory variables have a common denominator—they represent essentially judgments about the net effect of a multitude of considerations on the likelihood of purchase. Standard and contingent buying intentions have been treated explicitly as judgments about purchase

probability, necessarily involving considerations of current financial position, needs, future prospects, etc. Opinion about buying conditions is the same kind of variable, for it is a proxy for the net influence of factors such as income, assets, debt, expectations, etc. A priori, however, every household reporting intentions to buy should have a higher probability of purchase than every household not so reporting. In contrast, households having a favorable opinion about buying conditions—i.e., those who think the present is a good time to buy durables—need not on a priori grounds have a higher purchase probability than all those having unfavorable opinions. Owing to their durable goods stock position, some households with favorable opinions are unlikely to purchase; some with unfavorable ones, quite likely. But the opinion variable is clearly different from variables such as income expectations, asset level, or debt in that the respondent is (implicitly) asked to evaluate the bearing of the relevant factors on his current financial situation. Thus, many respondents with favorable income prospects would—if asked—have indicated that these prospects were irrelevant to their current durable goods buying decisions because they had no assets and were already overburdened with debt. But the opinion variable, as well as the two intentions variables, essentially asks the household to weigh the factors relevant to their own purchase decisions.¹⁷ None of the other variables used in this analysis have the property that the respondent is (implicitly) asked to assign his (subjective estimate of) relative importance to a set of (unspecified) objective variables or expectations, and to indicate how all these considerations balance out.¹⁸

Below, I give a more detailed examination of the behavior of variables in each category. Where possible, regression coefficients for variables in each category are presented net of each other but gross of variables in other categories, then net of all variables in the full regression. On the whole I exclude variables representing interactions between intenders and nonintenders because these behave erratically and cause erratic movements in the coefficients of other variables.

¹⁷ It was noted above in Chapter 7 that the *Reports of the Consultant Committees on Economic Statistics* (Joint Committee on the Economic Report, 84th Cong., 1st sess.), found that, in time series data (1) buying intentions were clearly a useful predictor of durable goods purchases; and (2) expectations and attitudes were, on the whole, not useful, with the exception of a variable denoted "opinion about buying conditions." This is the variable constructed from responses to a question asked on the Survey of Consumer Finances, in which a projective technique is used—is this a (good-bad-other) time for *people like yourselves* to buy durable goods? (See note 4, above, and text discussion.)

¹⁸ This argument is developed more fully in Chapter 5, especially pp. 137–139.

APPENDIX A

OBJECTIVE VARIABLES

The first category comprises the seven objective variables in the model. Table A-14 presents regression coefficients for these variables net of each other (upper panel) and net of anticipations and buying intentions (lower panel). In the upper panel five of the objective variables are consistently related to purchases in all subgroups, although only normal income (Y), transitory income (ΔY_t), and stock adjustment (S') show consistently significant relationships. Y and S' are significant in all nine groups; ΔY_t , in three of the nine. There is some indication that ΔY_t is relatively more important for young households, although subgroups with significant relations between purchases and ΔY_t appear in each life-cycle group. Liquid-asset change (ΔL_{-1}) and income change (ΔY_{-1}) have positive

TABLE A-14
SUMMARY OF CORRELATION DATA FOR OBJECTIVE VARIABLES

Subgroup	R ² for Group	Net Regression Coefficients						
		Y	ΔL_{-1}	ΔY_{-1}	ΔY_t	T	H	S'
NET OF EACH OTHER ONLY								
A ₁	.032	+ .0046 ^a	+ .137	+ .000	+ .354 ^a	-.146	-.084	+.089 ^a
B ₁	.087	+ .0056 ^a	+ .124	+ .127 ^a	+ .123	+ .012	+ .009	+.206 ^a
C ₁	.043	+ .0047 ^a	+ .074	-.002	+ .297	+ .039	-.022	+.150 ^a
A ₂	.057	+ .0036 ^a	+ .126	+ .026	+ .625 ^a	-.047	+ .025	+.166 ^a
B ₂	.072	+ .0040 ^a	+ .072	-.064	+ .055	+ .042	-.157	+.199 ^a
C ₂	.052	+ .0042 ^a	+ .087	+ .036	+ .063	-.123	+ .029	+.155 ^a
A ₃	.075	+ .0047 ^a	+ .131	+ .141	+ .062	+ .081	-.494 ^a	+.100 ^a
B ₃	.082	+ .0051 ^a	+ .063	+ .071	+ .408 ^a	+ .016	-.196	+.179 ^a
C ₃	.055	+ .0040 ^a	+ .003	+ .140	+ .390	-.329 ^a	+ .308	+.148 ^a
NET OF ANTICIPATORY VARIABLES AND BUYING INTENTIONS								
A ₁		+ .0021	+ .012	-.043	+ .309 ^a	-.137	-.021	+ .002
B ₁		+ .0050 ^a	+ .046	+ .110 ^a	+ .089	-.039	-.102	+ .135 ^a
C ₁		+ .0017	-.016	-.076	+ .353 ^a	-.046	-.040	+ .024
A ₂		+ .0014	+ .076	-.024	+ .592 ^a	+ .031	-.075	+ .069 ^a
B ₂		+ .0028 ^a	-.057	-.090	+ .038	+ .063	-.083	+ .131 ^a
C ₂		+ .0032 ^a	-.004	-.031	+ .075	-.058	+ .046	+ .036
A ₃		+ .0039 ^a	+ .098	+ .082	+ .096	+ .157	-.496 ^a	+ .033
B ₃		+ .0044 ^a	-.006	+ .077	+ .455 ^a	-.032	-.237	+ .127 ^a
C ₃		+ .0028 ^a	-.136	+ .042	+ .325	-.330 ^a	+ .225	+ .020

SOURCE: Tables A-1 through A-9.

^a = Significant at 0.05 level.

coefficients in nearly all groups, although they are hardly ever significant. The coefficients of the other two variables, education level of husband and home ownership, are essentially random numbers; the only significant relations involving these variables both have the wrong sign.

There is no evidence that the regression coefficients for objective variables are systematically different among life-cycle groups, although it has already been pointed out that current financial variables are more strongly related to behavior for older households. Neither is there any evidence that the variant intentions groups show anything other than random differences in regression coefficients or consistency of relationships. Given the sampling procedure, this finding is to be expected.

After accounting for the influence of anticipatory variables and buying intentions, only Y , ΔY_t , and S' consistently show a net influence on purchases. As noted above, the other four variables behave in a completely random fashion as to sign, and the only statistically significant relations are those for T and H in groups C_3 and A_3 . However, both T and H have negative signs in these groups. The inclusion of the anticipations and buying-intentions variables strengthens the evidence that ΔY_t has a differential influence among life-cycle groups, and also indicates that the influence of Y is differential. ΔY_t is now significant (5 per cent level) in two of the three subgroups with the household head between twenty-five and thirty-four. On the other hand, Y is now significant in only one of the three groups in this life-cycle class, in two of three groups with head between thirty-five and forty-four, and in all three groups with head between forty-five and sixty-four years of age. The regression coefficients are also generally smaller for the younger groups than for the older ones. Thus normal income appears to be relatively more important for older households; transitory income, for younger households. Given that the correlation between wealth and current income is stronger for older households, these results are consistent with the proposition that wealth rather than current income is the important decision variable, with current income being strongly related to behavior only when it serves as a good proxy for wealth.

One of the most interesting results is the influence of buying intentions on the net relation between purchases and stock adjustment. In the upper panel, S' was significantly related to purchases in every group; in the lower panel, S' becomes nonsignificant (with one exception) unless the group was asked intentions question B. All the signs are still positive, but it seems clear that the net predictive value of S' can be substantially eliminated by substituting an adequate set of buying-intentions variables.

APPENDIX A

ANTICIPATORY VARIABLES

The upper panel of Table A-15 shows regression coefficients for anticipatory variables net of objective ones; the lower panel contains regression coefficients for the same variables net of both objective factors and intentions to buy. In the upper panel opinion about buying conditions (*O*) is

TABLE A-15
SUMMARY OF CORRELATION DATA FOR ANTICIPATORY VARIABLES

Subgroup	Incremental R^2 for Group	Net Regression Coefficients					
		\hat{E}	$E - \hat{E}$	<i>O</i>	\hat{E}_5	$O\hat{E}_5$	\hat{C}
NET OF OBJECTIVE VARIABLES							
A ₁	.054	+.517	+.332	+.424 ^a	+.114	+.049	+.117
B ₁	.009	-.013	-.010	+.248 ^a	+.090	-.121	-.085
C ₁	.055	+.066	-.197	+.226 ^a	+.126	+.196 ^a	+.443 ^a
A ₂	.015	-.252	+.254	+.196 ^a	-.016	+.062	+.215
B ₂	.022	+.491	-.326	+.304 ^a	+.069	-.076	+.087
C ₂	.027	+.720 ^a	-.005	+.151	+.054	+.124	+.050
A ₃	.030	-.274	+.255	+.075	+.041	+.317 ^a	-.166
B ₃	.023	+.311	+.690 ^a	+.249 ^a	-.052	+.019	+.100
C ₃	.034	+.668	+.306	+.322 ^a	+.045	+.092	+.093
NET OF OBJECTIVE VARIABLES AND INTENTIONS TO BUY							
A ₁		+.580	+.265	+.326 ^a	+.002	+.059	+.010
B ₁		-.013	-.008	+.187	+.073	-.114	-.131
C ₁		+.165	-.021	+.114	+.063	+.204 ^a	+.376
A ₂		-.111	+.348	+.083	-.043	-.006	+.131
B ₂		+.392	-.292	+.225 ^a	+.040	-.070	+.047
C ₂		+.461	-.034	+.032	+.081	+.092	+.016
A ₃		-.341	+.233	+.027	-.012	+.311 ^a	-.148
B ₃		+.171	+.653 ^a	+.182	-.046	-.018	-.006
C ₃		+.736 ^a	+.140	+.180	-.038	+.123	+.004

SOURCE: Tables A-1 through A-9.

^a = Significant at 0.05 level.

clearly the most powerful variable of the six, being statistically significant in the expected direction for seven of the nine subgroups. Moreover, where this variable is not itself significantly related to purchases, the reason is the presence of interaction between *O* and \hat{E}_5 . The interaction term has the expected sign in seven of the nine groups, although it is statistically significant in only two groups.

Of the other variables in this category, \hat{E}_5 appears to have very little

APPENDIX A

influence after allowing for interaction with O ; prior to the introduction of interaction, \hat{E}_5 was consistently positive, although not very strong. The price expectations variable (\hat{C}) is positive in seven of the nine groups although significant in only one. The expectations index (\hat{E}) and the surprise index ($E - \hat{E}$) are the most erratic of the anticipatory variables.

The greater importance of anticipatory variables, as a group, for the relatively young is accounted for largely by the differential influence of O and \hat{E}_5 . In this connection, it can readily be shown that even before allowing for the influence of intentions, O and \hat{E}_5 generally have more influence on behavior in younger households. The data in Table A-15 indicate that either O or $O\hat{E}_5$ is significantly related to purchases in every group, including all life-cycle classes. But the extent of the relationship is quite different, as shown by tabulation, below, of joint F ratios for the combined influence of O , \hat{E}_5 , and $O\hat{E}_5$ on purchases.

Sample	Life-Cycle Class		
	(1)	(2)	(3)
A	15.9	3.1	5.3
B	1.9	4.4	2.9
C	14.1	4.1	5.4
Mean	10.4	3.9	4.5

BUYING INTENTIONS VARIABLES

The variables involved are standard intentions (\hat{P}), contingent intentions (\hat{P}_c), and the interaction of the two. All three have the predicted signs in almost every case; \hat{P} is significant in all groups; \hat{P}_c in five of nine; and the interaction term, in two of nine groups (Table A-16). The relative importance of these variables is related both to life-cycle status and to the intentions question. For example, \hat{P}_c for the B group is a rather weak variable, as is $\hat{P}\hat{P}_c$; the reason is that contingent intentions for the B samples is based on responses to an extremely long-range question about buying intentions. Roughly 80 per cent of all households responded affirmatively to this question, many for several items. The \hat{P}_c variable for the C groups is almost as vague and long range. For the A groups, however, \hat{P}_c is a much more restrictive question, involving a high-probability cut-off relative to the other \hat{P}_c variants; hence, the influence of contingent intentions on purchases is quite strong in the A samples, as is the influence of the interaction term, $\hat{P}\hat{P}_c$. The standard intentions variable, on the other hand, seems to be somewhat more powerful in the C groups than in the other two. The probable reasons have been discussed above (Chapter 2) at some length.

APPENDIX A

As regards the life-cycle pattern, not only is the variance explained by \hat{P} and \hat{P}_c considerably larger for younger households, but the regression coefficient for both variables tends to be larger for the young. In addition, the interaction of \hat{P} and \hat{P}_c is stronger for the younger households. By any criteria intentions to buy are plainly more closely associated with subsequent purchases for relatively young households than older ones. The probable reasons have been discussed above—the weaker wealth-current income correlation for the young, the greater importance of unplanned replacement of existing stock for older households, and the less compelling necessity for financial budgeting among older households because their incomes and asset holdings are larger.

TABLE A-16
SUMMARY OF CORRELATION DATA FOR BUYING INTENTIONS VARIABLES

Subgroup	Incremental R^2 for Group	Net Regression Coefficients		
		\hat{P}	\hat{P}_c	$\hat{P}\hat{P}_c$
A ₁	.088	+ .520 ^a	+ .147 ^a	− .095 ^a
A ₂	.088	+ .452 ^a	+ .159 ^a	− .041 ^a
A ₃	.030	+ .179 ^a	+ .087 ^a	+ .014
B ₁	.047	+ .334 ^a	+ .055	− .015
B ₂	.057	+ .416 ^a	+ .062 ^a	− .046 ^a
B ₃	.040	+ .274 ^a	− .004	− .036
C ₁	.111	+ .406 ^a	+ .136 ^a	− .034
C ₂	.104	+ .336 ^a	+ .004	− .006
C ₃	.065	+ .297 ^a	+ .066	− .023

SOURCE: Tables A-1 to A-9.
* = Significant at 0.05 level.

Before leaving the buying-intentions variables, it is useful to take a somewhat closer look at the structure of these variables relative to each other, to purchases, and to the stock adjustment variable—replacement needs for durables. In the classification scheme used above, stock adjustment is an objective variable. It could be argued, however, that a household reporting a particular durable good “in need of replacement” is saying much the same as a household reporting that a particular durable will “possibly be purchased within a year.” The closeness of these relations can be seen from the zero-order correlation matrix involving the intentions variables and S' , the relevant parts of which are reproduced in Table A-17.

The interrelationships here are rather interesting. The P, \hat{P} relationship is about the same in the A and B groups, stronger in C, and generally

APPENDIX A

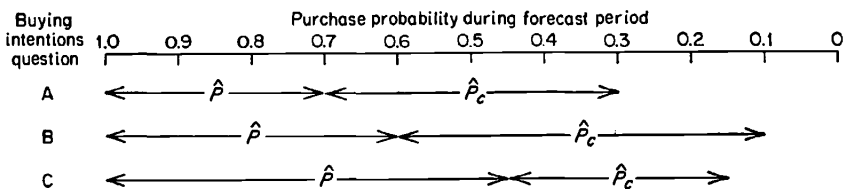
TABLE A-17
ZERO-ORDER CORRELATIONS AMONG PURCHASES, STANDARD AND CONTINGENT
BUYING INTENTIONS, AND REPLACEMENT NEED

Subgroup	P, \hat{P}	P, \hat{P}_c	P, S'	\hat{P}, S'	\hat{P}_c, S'	\hat{P}_c, \hat{P}
A ₁	.30	.10	.08	.19	.31	-.03
A ₂	.31	.16	.17	.21	.26	-.03
A ₃	.19	.10	.10	.25	.23	-.11
B ₁	.29	.08	.22	.28	.19	-.01
B ₂	.30	.04	.21	.27	.22	-.05
B ₃	.27	-.05	.14	.24	.17	-.17
C ₁	.38	.05	.12	.26	.20	-.10
C ₂	.38	-.03	.15	.36	.18	-.06
C ₃	.32	-.01	.13	.39	.13	-.12

SOURCE: Tables A-1 through A-9 and Consumer Purchase Study, NBER.

weaker for households in the oldest age class. The P, \hat{P}_c relation is quite weak except for the A groups, and tends to be somewhat stronger for households in the younger age groups. The P, S' relation should be random among the A, B, and C groups; it turns out to be somewhat stronger in the B samples than elsewhere, although not significantly so, and also to be random among life-cycle groups. The \hat{P}, S' relation is strongest for the C groups, weakest in the A samples, and generally stronger in the older age groups. On the other hand, \hat{P}_c, S' is strongest for the A groups, about the same for the other two, and apparently weaker for the oldest age groups. Finally, \hat{P}_c, \hat{P} is consistently negative but very weak throughout.¹⁹

¹⁹ The reader should bear in mind that the intentions variables in A, B, and C simply represent alternative ways of dividing up the households into groups with different average levels of *ex ante* purchase probability during the forecast period. Thus variant B divides the sample into those with a high probability of purchasing, those with anything less than high down to very low, and those with practically zero probability—corresponding to those reporting \hat{P}, \hat{P}_c , or neither. On the other hand, variant C divides the sample into those with anything down to a moderately high probability, those from moderate to quite low, and those with less than that. Variant A contains the classification that originally seemed to be the most useful, dividing the sample into those with very high probability, those with probability ranging from very high to fairly high, and those below that level. The following diagram is a rough quantification of the above adjectival distinctions.



APPENDIX A

The way in which the replacement need, standard intentions, and contingent intentions variables typically interrelate for the variant samples is seen most clearly from the data for life-cycle class 1 in Table A-18. Net of all other objective and anticipatory variables, S' is significantly

TABLE A-18
INTERRELATION OF REPLACEMENT NEED, STANDARD INTENTIONS, AND CONTINGENT INTENTIONS FOR SUBSAMPLE GROUPS A₁, B₁, AND C₁
(standard errors shown in parentheses)

	R^2	Regression Coefficients			
		S'	\hat{P}	\hat{P}_c	$\hat{P}\hat{P}_c$
Group A ₁					
X_{1a}, \dots, X_{13a}	.084	.089 (.032)			
X_{1a}, \dots, X_{14a}	.141	+.041 (.032)	+.334 (.048)		
X_{1a}, \dots, X_{15a}	.149	+.009 (.034)	+.350 (.045)	+.085 (.030)	
X_{1a}, \dots, X_{16a}	.165	+.002 (.034)	+.520 (.062)	+.147 (.034)	-.094 (.024)
Group B ₁					
X_{1a}, \dots, X_{13a}	.095	+.206 (.032)			
X_{1a}, \dots, X_{14a}	.138	+.148 (.032)	+.279 (.043)		
X_{1a}, \dots, X_{15a}	.141	+.137 (.033)	+.285 (.043)	+.042 (.026)	
X_{1a}, \dots, X_{16a}	.142	+.135 (.033)	+.334 (.073)	+.055 (.030)	-.015 (.018)
Group C ₁					
X_{1a}, \dots, X_{13a}	.096	+.150 (.034)			
X_{1a}, \dots, X_{14a}	.184	+.052 (.034)	+.326 (.035)		
X_{1a}, \dots, X_{15a}	.192	+.032 (.035)	+.338 (.035)	+.082 (.030)	
X_{1a}, \dots, X_{16a}	.196	+.024 (.035)	+.406 (.050)	+.136 (.040)	-.034 (.018)

SOURCE: Basic data from Consumer Purchase Study, NBER.

related to purchases in all three groups. The introduction of intentions reduces the coefficient of S' in all groups; S' is still significant only in group B. Adding \hat{P}_c further reduces the coefficient of S' , especially in group A; adding the interaction term increases both the \hat{P} and \hat{P}_c coefficients substantially while still further reducing that of S' . The net result is that S' seems to be completely redundant to the cluster of buying intentions variables (\hat{P}, \hat{P}_c , and $\hat{P}\hat{P}_c$) except in group B.

INTERACTION VARIABLES

On the whole, the interactions make for little if any improvement in the performance of the model, with one—possibly two—exceptions. Neither ZY , ZS' , nor $\hat{E}\hat{P}$ show any consistent relation to purchases. The explanation may be that the particular form chosen for these interaction terms is inappropriate—perhaps cross-product terms such as $\hat{P}Y$ and $\hat{P}S'$ would have provided a better fit. However, two cross-product terms involving \hat{P} were already included in the regression, and the problem of separating out the net effect would presumably become quite formidable if two additional ones had been included.²⁰

The other two interaction variables show some influence in the predicted direction. Opinion about buying conditions (O) appears to be somewhat more strongly related to purchases for nonintenders than for those reporting some intentions to buy. The coefficient of ZO has the predicted sign in only six of the nine groups, but it is statistically significant in three of these; all the significant coefficients have the predicted sign. This variable is more consistently related to purchases in the A and B groups, where households with standard intentions of zero are relatively numerous and presumably more heterogeneous with respect to *ex ante* purchase probability. The best illustration of the predicted relation occurs in the A_1 group. The relevant data are given in Table A-19.

In this group O is a very powerful variable when first introduced into the regression. The other two variables bearing on judgment about financial prospects— \hat{E}_5 and the interaction of O and \hat{E}_5 —are positively related to purchases but have little influence on the O coefficient. When the buying-intentions variables (\hat{P} and \hat{P}_c) are introduced, the influence of O declines somewhat; but it still retains a highly significant relation to purchases. However, when the ZO interaction is introduced, the net influence of O declines to a nonsignificant but positive number for intenders (where $Z = 0$). But for nonintenders (where $Z = 1$), the net influence of O is highly significant and is about as strong as when this variable was first introduced. Similar patterns are found in the B_1 and B_2 groups. As has been the case so frequently with expectational variables, the differ-

²⁰ Take the case of $\hat{P}\hat{P}_c$ and $\hat{P}S'$ for illustration. \hat{P}_c and S' are highly correlated as cross-section data go; roughly 5 to 10 per cent of the variance in \hat{P}_c is explained by S' . In every case where $\hat{P} = 0$, both cross-product terms would be zero, and where \hat{P}_c is zero, S' would frequently be zero also; the result is bound to be a very high correlation between the two cross-product terms. These kinds of factors influenced the decision to use the ZS' and ZY interaction variables, although the results might possibly have been better if cross-product terms had been used throughout.

APPENDIX A

ential influence of O on the purchases of intenders and nonintenders is apparently much stronger the younger the age of the household head.

The final variable to be discussed is $Z_1\hat{P}_c$, where $Z_1 = 1$, when $E - \hat{E} = 2$, $Z_1 = 0$ when $E - \hat{E} < 2$. This variable is intended to measure the differential effect of contingent buying intentions on purchases for households with agreeable surprises, compared to those with either no surprises or disagreeable ones, along the lines discussed in Chapter 6. It was noted above that \hat{P}_c is strongly related to purchases only in the A subgroups, where contingent intentions reflect "probable or possible

TABLE A-19
CONTRIBUTION OF SELECTED INTERACTION VARIABLES TO EXPLANATION OF
PURCHASES IN GROUP A₁
(standard errors shown in parentheses)

Variables Included in Regression	Incremental R^2 for Last Variable	Net Regression Coefficients					
		O	\hat{E}_s	$O\hat{E}_s$	\hat{P}	\hat{P}_c	ZO
X_{1a}, \dots, X_{10a}	.043	+.452 (.072)					
X_{1a}, \dots, X_{11a}	.005	+.450 (.072)	+.156 (.078)				
X_{1a}, \dots, X_{12a}	.000	+.410 (.104)	+.123 (.099)	+.049 (.089)			
X_{1a}, \dots, X_{14a}	.057	+.353 (.101)	+.032 (.096)	+.039 (.086)	+.334 (.045)		
X_{1a}, \dots, X_{15a}	.008	+.333 (.101)	+.017 (.096)	+.052 (.086)	+.350 (.045)	+.085 (.030)	
X_{1a}, \dots, X_{20a}	.005	+.135 (.135)	-.013 (.095)	+.090 (.086)	+.526 (.121)	+.142 (.034)	+.286 (.137)

SOURCE: Basic data from Consumer Purchase Study, NBER.

purchases over the next twelve months." The $Z_1\hat{P}_c$ coefficient is essentially a random number in other groups; and even in the A groups the relation is quite weak except in the youngest age group. Table A-20 summarizes these relations, presenting coefficients for the relevant variables in a stepwise regression.

Comparing the first two regressions shown for each subgroup, the coefficients of \hat{P}_c decline slightly when $Z_1\hat{P}_c$ is introduced. The coefficients of $Z_1\hat{P}_c$ decline with age, moving from a significant positive relation to practically zero. Net of all independent variables, the coefficient of $Z_1\hat{P}_c$ is about the same as the coefficient net of only the intentions variables in the A₁ group, smaller in the other two groups. It should be kept in mind, as discussed in Chapter 6, that this interaction variable is constructed from the rather unsatisfactory makeshift used to measure surprise.

APPENDIX A

TABLE A-20
REGRESSION COEFFICIENTS SHOWING THE INTERACTION OF CONTINGENT
INTENTIONS AND SURPRISES
(standard errors shown in parentheses)

	Regression Coefficients		
	\hat{P}	\hat{P}_c	$Z_1\hat{P}_c$
Group A ₁			
$P = f(\hat{P}, \hat{P}_c)$	+ .397 (.042)	+ .095 (.026)	
$P = f(\hat{P}, \hat{P}_c, Z_1\hat{P}_c)$	+ .398 (.043)	+ .086 (.029)	+ .143 (.074)
$P = f(X_{1a}, \dots, X_{21a})$	+ .521 (.121)	+ .132 (.034)	+ .153 (.081)
Group A ₂			
$P = f(\hat{P}, \hat{P}_c)$	+ .420 (.041)	+ .156 (.027)	
$P = f(\hat{P}, \hat{P}_c, Z_1\hat{P}_c)$	+ .418 (.042)	+ .148 (.030)	+ .090 (.070)
$P = f(X_{1a}, \dots, X_{21a})$	+ .525 (.129)	+ .153 (.036)	+ .050 (.078)
Group A ₃			
$P = f(\hat{P}, \hat{P}_c)$	+ .246 (.049)	+ .112 (.034)	
$P = f(\hat{P}, \hat{P}_c, Z_1\hat{P}_c)$	+ .246 (.051)	+ .112 (.038)	+ .006 (.093)
$P = f(X_{1a}, \dots, X_{21a})$	+ .367 (.138)	+ .092 (.042)	- .058 (.102)

SOURCE: Basic data from Consumer Purchase Study, NBER.

In my judgment, therefore, the finding of any significant coefficients for $Z_1\hat{P}_c$ is encouraging, and may indicate that an adequate measure of income surprise is related to purchases along the hypothesized lines. The evidence is obviously rather weak, and much more work needs to be done on this problem.²¹

Summary

There seems little doubt that the most powerful forward-looking variables related to purchases of durable goods are (1) the household's subjective estimate of purchase probability, as reflected by intentions to buy (\hat{P} and \hat{P}_c), and (2) the household's subjective estimate of whether its present and prospective financial position are good, bad, or indifferent from the viewpoint of durable goods purchases, as expressed by its opinion about buying conditions (O). These two variables, or interactions involving them,

²¹ This general line of inquiry has a high priority on the research agenda of the Expectational Economics Center conducted by Albert G. Hart at Columbia University. The Columbia group will have the use of substantially more complete data on these same households.

APPENDIX A

account for over half the total explained variance in purchases. The reason seems clear enough. With one exception, all the other variables involve either fairly specific judgments about future events, statements of fact about financial circumstances, or statements of fact about recent changes in financial circumstances.²² It has been argued above that the intentions variable is powerful in cross sections precisely because it enables households to be their own calculating machines, i.e., to reflect their own weighting of the idiosyncratic circumstances that lead to purchase decisions. The same argument holds for the opinion variable.

It also seems to be clearly established that both these anticipatory variables—and others in the same category—are more closely associated with the purchase decisions of relatively young households. Further, contingent buying intentions and opinion about buying conditions are both somewhat more closely associated with purchases for those households that do not report so-called standard intentions.

Other expectational variables that may prove useful for predicting purchases are long-range financial prospects (\hat{E}_s), especially for those with favorable opinions about buying conditions; the combination of income and business expectations (\hat{E}), especially for the very optimistic or very pessimistic; and the combination of unexpected income and unexpected business cycle developments ($E - \hat{E}$), especially for those with contingent buying intentions. The evidence here is a good deal weaker than for \hat{P} or O , but in my judgment it is strong enough to warrant additional investigation.

²² The exception is the stock adjustment variable (S'), which is strongly related to purchases by itself but appears to be largely redundant to an adequate set of buying-intentions variables.