Volume Title: The Quality and Economic Significance of Anticipations Data

Volume Author/Editor: Universities-National Bureau

Volume Publisher: Princeton University Press

Volume ISBN: 0-87014-301-8

Volume URL: http://www.nber.org/books/univ60-1

Publication Date: 1960

Chapter Title: The Value of Anticipations Data in Forecasting National Product

Chapter Author: Arthur Okun

Chapter URL: http://www.nber.org/chapters/c6606

Chapter pages in book: (p. 407 - 460)

The Value of Anticipations Data in Forecasting National Product

ARTHUR M. OKUN

COWLES FOUNDATION FOR RESEARCH IN ECONOMICS AT YALE UNIVERSITY

The forecaster of economic activity has access to a variety of series which supply a continuing record of the anticipations of a number of groups in the economy. The present paper seeks to ascertain the value of such data and the requirements for their efficient use in prediction. It explores certain theoretical issues, reviews the empirical record of the aggregative time-series relationships between some of the anticipations data and subsequent realizations, and analyzes the findings of cross-section studies in which the predictive value of anticipations data has been appraised at the level of the individual firm or household.

Since the focus of the study is the problem of forecasting the gross national product and its components, the analysis is restricted to anticipations data which fit fairly neatly into established income and product accounts. Consequently data which may throw light on financial trends, employment levels, and the level of sales and production of particular industries are ignored. It is to be hoped, however, that the task of relating the latter variables to the GNP framework will receive a high priority in future research.

Observations on the Characteristics of Anticipations Data

Data on economic variables are the raw materials from which forecasts are constructed, and each forecaster will select his own preferred set of raw materials and processes. Expressed anticipations may be poor predictors in their raw state and yet be valuable when transformed so as to eliminate bias. If, for example, some group in the economy typically overestimates its prospective income or expenditure, an appropriate adjustment may be made. Expectational data can be useful provided they bear some discernible systematic relationship to forthcoming trends. Also, anticipations relating to one economic variable may provide insight into the future

NOTE: The paper was written as part of the project in Research on Short-Term Economic Forecasting, conducted at the Cowles Foundation for Research in Economics at Yale University and financed by the Rockefeller Foundation. The author is indebted to Professor Thomas F. Dernburg of Purdue University and to Mrs. Wilma Heston for their valuable assistance with the empirical material presented in this study.

behavior of another variable. Suppose survey data showed that businessmen expected Congress to lower the tax rate on corporate profits a year hence. Even if the economic analyst felt that such legislation was highly unlikely, he might find the anticipation a valuable indicator of the probable course of business spending. Thus, indirect uses of an anticipations variable may prove fruitful even when the series is not helpful in its presumptive primary use. Furthermore, anticipations data should be utilized as complements, rather than substitutes, for nonexpectational data. The objective is to enlarge the fund of information on which forecasts are based, and the forecaster must apply his ingenuity and analytical skill to find useful combinations of the various available series.

Because anticipations have many possible uses, it is exceedingly dangerous to render an over-all judgment on the predictive value of any expectational variable. Any investigator rash enough to declare that a series has no value is stating merely that he has discovered no fruitful use. He may find himself embarrassed in short order by the research of a more ingenious or more fortunate economist. On the other hand, a favorable verdict may be upset by a demonstration that equally good results can be obtained without reliance on that series. The appraisal of the predictive value of data is inherently a risky business. Any evaluation should be advanced, and interpreted, as tentative and resting on a pragmatic foundation.

DEFINITION OF ANTICIPATIONS

Anticipations data are here taken to consist of series which are forecasts of an economic magnitude directly expressed by decision-makers in operating units in the economy, and which are not usually recorded in the normal course of economic activity. Series on new orders, contract awards, and commitments are excluded by this definition since these are records of bona fide transactions.

Information on anticipations is necessarily collected by direct interview or mail response to questionnaires and is subject to all the problems of sampling error and response errors inherent in the survey technique. It seems highly unlikely, however, that the potential value of anticipations data would be nullified by limitations associated with the collection process. Data on nonexpectational variables have been successfully collected through surveys. The general agreement of results in independent efforts to collect anticipations data on similar variables suggests that usable measures of economic anticipations can similarly be obtained.

ANALYTICAL CONSIDERATIONS

In appraising the predictive value of anticipations data it is useful to distinguish among various types of anticipations. Some concern variables which are *internal*, relating directly to the future experience of the respondent, such as the flows of his receipts or outlays. Other expectations are

external, and record his forecasts of the experience of other producers or consumers or his views on the outlook for the economy as a whole.

One must be skeptical of the direct predictive value of external expectations, despite the statistical appeal of relying on a consensus view. If each individual forecast is slightly superior to a random guess, and if there is a fair amount of independence among the individual predictions, the consensus view obtained from a large sample becomes highly reliable. Unfortunately, neither condition is likely to be fulfilled: the amateur may not be better informed than the naïve model, and the views are likely to exhibit strong interdependence. Forecasting business activity is a technical, complex task; and there is nothing to suggest that a consensus of the views of amateurs would improve on the resources available to the professional analyst. But when the external variables are close to the direct experience of the respondent, he may be able to contribute to their prediction. For example, a businessman's own insight or expert advice from his professional staff may supply him with some ability to forecast the course of activity in his industry.

Expectations about external variables may have profitable indirect uses by providing insight into the probable economic behavior of groups expressing particular expectations. However, plausible cases can often be made for conflicting hypotheses on the probable effect of a particular external anticipation. For example, firms expecting inflation may wish to accumulate inventories for speculative purposes; on the other hand, their present inventories may reflect these price expectations so that, unless inflation materializes, they will reduce their inventories. Thus the role of a priori reasoning is sharply limited, and one must hope for assistance from empirical research.

A far stronger analytical case can be made for the direct predictive value of certain internal anticipations. Expectations about purchases or sales of goods and services by the respondent are the chief internal anticipations considered in this paper. The predictive value of such anticipations depends on:

1. Whether the respondent has an articulated plan of action which he reports accurately in the survey
2. Whether he has the power to fulfill his plan
3. Whether, and how, he is likely to revise his plan voluntarily in the light of later information about the economic environment.

Existence of Plans. All firms have selling and buying plans of some sort. They must forecast, at least for the near future, their expected sales volume, production needs, and input requirements. Households are also likely to make tentative advance decisions about major purchases, other than those of an emergency nature, and about the probable supply of labor services. How much a knowledge of the various expectations will contribute to

forecasting will depend on the range, timing, and definiteness with which plans are formulated. Survey data on anticipations and realizations can supply evidence on the extent and character of such planning.

Feasibility of Fulfillment. The ability to realize internal expectations differs considerably with the variable in question. When a household predicts its income, its anticipation implies a compound estimate of: (1) the supply of factor services; (2) the likelihood of their finding employment; and (3) the returns which they will earn. Obviously, the latter two components are external expectations not subject to the household's control. The ability of households and firms to carry out buying plans is likely to be greater but still limited. Excess demand for goods or the unavailability of expected means of financing may frustrate purchase intentions. Otherwise, purchasers presumably have the power to acquire the specific items on their shopping lists; but, because buyers cannot control prices, they can fulfil intentions only by permitting their dollar outlays to diverge from the expected level whenever there are unforeseen movements in prices. Alternatively, buyers can maintain their proposed dollar outlays when prices vary by making substitutions for certain items on their shopping lists. Thus, purchasers can make binding decisions either on amounts they will spend or on the quantity and quality of commodities they will acquire, but not on both.

Where markets have any imperfection, firms can realize their expected physical volume of sales by permitting their prices to vary. Or they can maintain their planned prices, allowing physical sales to diverge from plans. Actual prices and quantities can both correspond with plans only if the firm has accurately forecast demand. Since firms typically treat price as the decision variable, any error in the projection of demand will be initially reflected in a divergence of physical sales from expectations. If data were available on the anticipations of both buyers and sellers of a product, knowledge of the dynamics of supply-demand adjustment in the particular market would be relied on for estimates of the changes in prices, output, and inventories resulting from any disparate expectations. Lacking such a complete record of plans, the analyst will usually find the plans of sellers most helpful in forecasting the short-term course of prices, since producers are price-makers. Plans of buyers will normally assist most in the prediction of sales volume at a given level of prices.

Revision of Plans. Even when the fulfillment of internal anticipations is feasible, buyers and sellers may wish to alter their plans. If the actions of any economic unit were exclusively determined by conditions of preceding periods and if its reported intentions reflected the full impact of the predetermined variables affecting behavior, its feasible intentions would be regularly fulfilled. Over the short-run, actions would be insensitive to contemporaneous events and could be considered exogenous. However, such a pattern of behavior is implausible. Plans are made on the basis of

assumptions about the future environment. To a large extent, these assumptions are forecasts of external variables and may well prove wrong. Hence, intentions are subject to change even though the cost of reconsidering and revising plans will produce some inertia in tentative decisions. The possibility of plan-revision detracts from the predictive value of internal anticipations. However, survey data can provide information on the assumptions about external variables underlying intentions. With such information, the forecaster can evaluate the likelihood that plans are based on excessively optimistic or pessimistic expectations. Even when the underlying assumptions of respondents seem wide of the mark, intentions data may be helpful if they are interpreted as revealing a single point on a schedule relating actions to possible states of the environment. The forecaster must then estimate how the economic units are likely to revise their plans when the environment deviates from their expectations. This is not easy, but it holds promise as one means by which insight into the future can be increased.[1]

Consumer Expenditure

In the past twenty years, there have been many quantitative explorations designed to explain and forecast aggregate consumer expenditure in terms of nonexpectational variables. Disposable personal income was generally used as an explanatory variable. Many studies also incorporated predetermined flow variables, such as lagged income and lagged consumption, and various balance-sheet magnitudes of the household sector. Anticipations data are further potential explanatory variables. Their usefulness as predictors depends on their ability to complement the nonexpectational variables in explaining the observed variation in consumer spending.

THE ROLE OF DURABLE GOODS EXPENDITURE

In the intentions data collected from consumers, plans to buy durable goods receive primary emphasis. Most individual durable goods involve a substantial expenditure, are infrequently purchased by any single household, and provide considerable latitude in the timing of their acquisition. These characteristics provide analytical support for the belief that many households plan their purchases of durables well in advance and are able to offer accurate information about their decisions in interviews.[2]

[1] For other theoretical explorations, from which the discussion above has benefited, see "Report of Consultant Committee on General Business Expectations," *Reports of Federal Reserve Consultant Committees on Economic Statistics*, 1955, pp. 506-508 and 675-676; Irwin Friend, "Critical Evaluation of Surveys of Expectations, Plans and Investment Behavior," pp. 189-190, and Franco Modigliani and Kalman J. Cohen, "The Significance and Uses of *Ex Ante* Data," both published in *Expectations, Uncertainty, and Business Behavior*, Mary Jean Bowman, ed., Social Science Research Council, 1958.

[2] See the discussion in George Katona, *Psychological Analysis of Economic Behavior*, McGraw-Hill, 1951, pp. 64-69.

Households could perhaps report on other prospective purchases that have a lower unit cost and are made on a recurring basis; for example, the decision to move to a larger apartment must be made some months prior to the move. The major reason that plans to buy durable goods stand almost alone in studies of household intentions is the belief that spending on durables is highly volatile and accounts for a significant portion of the variation in aggregate consumer expenditure that cannot be accounted for by nonexpectational variables.

If a high level of durable goods purchases, relative to income and other variables, were normally associated with an offsetting low level of spending on nondurables, ability to forecast the propensity to buy durables would supply no insight into the prospective behavior of total consumer demand. Thus, in terms of the objectives of forecasting national product, the keen interest in durables is predicated on the hypothesis that a high level of durables spending is associated with a low level of personal saving, relative to the nonexpectational explanatory variables.[3] This proposition may be put formally as follows. Consider personal saving (S) and durable goods expenditures (D) as functions of disposable income (Y) and other nonexpectational variables ($X_1, \ldots, X_n$), and let u_1 and u_2 represent the error terms in the respective relationships. Then,

$$S_t = S(Y, X_1, \ldots, X_n) + u_{1t} \tag{1}$$

$$D_t = D(Y, X_1, \ldots, X_n) + u_{2t} \tag{2}$$

The ability to forecast durables perfectly would mean that the value of u_2 for some period t could be specified without error at some time prior to t. The assistance that such knowledge can give in the specification of the saving function depends on the degree of relationship between u_1 and u_2. It would be nil if u_1 and u_2 were independent. However, the analytical hypotheses cited above suggest a negative relationship between u_1 and u_2 which, if linear, would take the following form:

$$u_{1t} = -au_{2t} + u_{3t} \tag{3}$$

The relative amount of explained variation in u_1 contributed by the foreknowledge of u_2 depends on the relative size of the variances of u_1 and u_3, the respective errors before and after durables spending is taken into account. This procedure is equivalent to the use of consumer expenditure on durable goods as an added independent variable in the saving function. If equation 2 is used to eliminate u_{2t} from equation 3, and if the resulting

[3] See the paper by F. Thomas Juster in this volume; and John B. Lansing and Stephen B. Withey, "Consumer Anticipations: Their Use in Forecasting Consumer Behavior," *Short-Term Economic Forecasting*, Studies in Income and Wealth, Vol. 17, Princeton University Press for National Bureau of Economic Research, 1955, p. 387.

expression is substituted for u_{1t} in equation 1, the following relationship is obtained:

$$(4) \qquad S_t = S(Y, X_1, \ldots, X_n) + aD(Y, X_1, \ldots, X_n) - aD_t + u_{3t}$$

Quarterly data from 1948-55 support the hypothesis of a negative relation between the propensity to save and the propensity to purchase durable goods. The regression of personal saving, deflated by population (N) and the consumer price index (P), on disposable income and durable goods spending, both similarly deflated, yields:

$$(5) \qquad S/NP = 0.419\,Y/NP - 1.19\,D/NP - 274 \text{ (in 1947-49 dollars)}$$

The coefficient of determination (R^2) is 0.72. The inclusion of durables as a variable leads to a substantial improvement over the usual saving-income relationship. It eliminates 60 per cent of the unexplained variation, and the standard error of estimate (adjusted for degrees of freedom) is lowered from \$23 to \$15.[4] The estimate of the regression coefficient of durables in equation 5 is significantly different from zero but not from minus unity. Thus the results are consistent with the hypothesis that an excess of spending on durables is simply additive to total consumer expenditure. The findings suggest that efforts to predict the propensity to buy durables are potentially capable of contributing substantially to the success of forecasts of economic activity. However, sizable unexplained variation is evident in the other components of consumer spending. Also in the twelve observations provided by annual data for 1929-40 the inclusion of durables fails to aid the explanation of personal saving. Obviously the durables component is not the sole contributor to the variability of consumer behavior. Nevertheless, during the postwar years, any information by which durables expenditures could have been successfully forecast would have materially improved the forecasts of aggregate consumer spending.

EVIDENCE ON BUYING INTENTIONS

Criteria of Predictive Ability. Data on intended purchases of household appliances and of new automobiles are reported in the Survey of Consumer Finances (SCF) and periodic surveys conducted by the Survey Research Center (SRC). These intentions run substantially below realized purchases. Therefore an aggregative "blow-up" of survey buying plans is a hopelessly

[4] The expenditure and income data are taken from the *National Income Supplement, 1954*, and from the July 1956 issue, *Survey of Current Business*, Dept. of Commerce. Years before 1948 were omitted because of the prevalence of excess demand for consumer durables during the immediate postwar period. The saving-income relationship for quarterly data for 1948-55 is:

$$S/NP = 0.248\,Y/NP - 242 \text{ with } r^2 = 0.32$$

The durables–income relationship derived from the same data is:

$$D/NP = 0.143\,Y/NP - 27$$

poor forecaster of total purchases. However, the intentions data can have predictive value so long as they bear some stable relationship to purchases. A one-to-one relationship is not a requirement nor is it necessarily superior to, say, a two-to-one relationship.

In a number of appraisals of the predictive value of intentions data, the direction and magnitude of change in intentions to buy from one year to the next were compared with the change in actual purchases.[5] The technique of comparing pairs of adjacent years has the merit of not requiring a one-to-one relationship, but it has other drawbacks. It ignores potentially useful information from earlier years with the result that, under certain conditions, one unsuccessful survey may produce two poor forecasts. Suppose that intentions decline markedly from one year to the next, and yet purchases rise. If, in the following year, intentions recover at all, the technique of paired comparison implies a further rise in purchases even if plans to buy are still below the level of the initial observation. Usually it would seem preferable to attach some weight to the relative levels of plans and purchases during the first year.[6] Another questionable feature of the technique is the emphasis on direction of change which is frequently associated with paired comparisons. The nature of the survey data creates no presumption that the intentions expressed by households are more likely to distinguish a possible 5 per cent increase in durables spending from a possible 5 per cent decrease than from the alternative possibility of a 15 per cent increase. Nor is it clear in terms of the objectives of general business forecasting that one discrimination is more vital than the other.

The whole body of evidence from time-series data can be utilized efficiently through the technique of regression analysis, the technique adopted here to appraise the predictive value of the data on intentions to buy durable goods.

Car Intentions and Purchases. All of the annual SCF surveys provide data on new car buying plans. However, since the volume of new car purchases was supply-determined well into 1948, 1949 is the first year when buying plans might be expected to have predictive value, and the first year to be considered here. SCF surveys covering 1949-55 yield seven observations on plans to buy. The periodic surveys of June and October 1954 and June and October 1955 provide four more for a total of eleven. The periodic survey of September–October 1953 and the mid-year SCF survey of July 1949 report car purchase intentions without indicating whether the reference is

[5] See George Katona and Eva Mueller, *Consumer Expectations, 1953-56*, Survey Research Center, University of Michigan, 1956, pp. 57-60; Irving Schweiger, "The Contribution of Consumer Anticipations in Forecasting Consumer Demand," *Short-Term Economic Forecasting*, pp. 466-470; and see also "Report of Consultant Committee on Consumer Survey Statistics," pp. 302-307.

[6] If, however, there is reason to believe that the relationship between intentions and purchases is changing, it would be wise to rely most on recent observations. Also, if there is evidence of serial correlation in the relative levels of intentions and purchases, use of ratios of observations from succeeding years might eliminate this problem.

to new or used cars. With the latter observations "all car" intentions total thirteen.[7]

Survey respondents are classified into four groups: (1) "definitely will buy," (2) "probably will buy," (3) "may buy, but undecided," and (4) "do not expect to buy." The treatment of the two middle groups presents what has been called the "cutting-point" problem.[8] To what extent should they be included among intended purchasers? All studies to date have bracketed group 2 with group 1. But group 3 has been variously treated. It has been added to the number of prospective purchasers, it has been added with a half weight to this category, and it has been added to the number of prospective nonpurchasers.[9] All three methods were tried by the author. By a trivial margin, the inclusion of "may buy" respondents among the intenders with half weight yielded the best results; so, for lack of a better criterion, it is the method employed here.[10] However the percentage of respondents in the "may buy" category proved sufficiently well-behaved over the sample data to render the cutting-point problem insignificant for present purposes.

The SCF reports percentages of spending units in the various intentions categories while the periodic surveys report in terms of families. However the data on car intentions from the latter source have been rendered comparable with those of the annual surveys by use of a technique suggested by the Survey Research Center.[11] When the percentage of spending units classified as "intenders" (those who definitely or probably will buy, plus half of those who may buy) is multiplied by the number of spending units in the economy, a measure of planned automobile purchases is obtained. Thus the intentions variables are:

M = fraction of spending units intending to buy a new car times number of spending units (in millions)

A = fraction of spending units intending to buy any car, new or used, times number of spending units (in millions).

The intentions series are desired in order to predict the aggregate number of new cars purchased by households over the subsequent year. The best available series for measuring actual purchases is that on new passenger car registrations, even though it includes government and

[7] Data on intentions are taken from the various SCF reports as published in the *Federal Reserve Bulletin* and from the tabulations on periodic surveys from Katona and Mueller, pp. 54, 62.

[8] Lansing and Withey, p. 416.

[9] Katona and Mueller, p. 94.

[10] There is evidence from re-interview data that spending units which express a greater degree of certainty in their plans are more likely to fulfill their intentions. See Lansing and Withey, pp. 418, 435-436 (Tables 23, 24, 53, and 55); and Robert Ferber, *Factors Influencing Durable Goods Purchases*, Bureau of Economic Research, University of Illinois, 1955, pp. 44-46.

[11] Katona and Mueller, p. 59 note.

business acquisitions.[12] The monthly series on registrations was cumulated for twelve months commencing with the month of the survey. For the SCF surveys, annual data were used.[13] The dependent variable is:

P = new passenger car registrations for twelve months beginning with the month of the survey.

Following are the results of regression estimates of P on M covering 1949-55 and June and October 1954 and June and October 1955 and of P on A for the same dates and for the same dates plus July 1949 and September–October 1953:

Eleven observations:

(1) $P = 0.79M + 2.72$ (millions of autos); $r^2 = 0.40$

(2) $P = 0.59A + 1.75$; $r^2 = 0.49$

Thirteen observations:

(3) $P = 0.47A + 2.50$; $r^2 = 0.38$

Although these relationships are not statistically significant, they indicate that over this period nearly half of the variation in new car purchases is accounted for by the intentions data.

If the forecaster uses the intentions data to predict the number of new car purchases, he must presumably make a separate and independent projection of the dollar value per auto in order to forecast consumer expenditure on new cars. Alternately, he can rely on the SCF series on the median planned expenditure of those who plan to buy new cars. This series can be used in conjunction with the data on the number of planned purchases (i.e., the variables A and M defined above) to form a measure of intended consumer expenditures on new cars.[14] The intentions variables are then:

B = A times median planned expenditure on new cars
N = M times median planned expenditure on new cars.

The Department of Commerce supplies annual estimates of consumer spending on new cars which are employed below as the measure of the

[12] These are compiled by R. L. Polk Co. and reported monthly in *Survey of Current Business*.

[13] When intentions data are taken from periodic or mid-year surveys as well as from the annual SCF surveys, there is some overlap in the series of realized purchases for the subsequent year. Thus some of the observations of actual purchases are interdependent.

[14] Median planned expenditure is not recorded in the published reports on the periodic surveys. The figure employed here in these cases was the reported median planned expenditure for the annual SCF closest in time to the periodic survey. Revised estimates for median planned expenditure in 1952-55 surveys were published in the March 1957 *Federal Reserve Bulletin*. The revisions have not been incorporated into the calculations. Casual inspection suggests that they would have produced only negligible differences in the results.

actual expenditure series, denoted by Q.[15] Following are the estimated regressions of Q on N and Q on B:

Eleven observations:

(4) $Q = 3.82+0.73N$ (billions of dollars); $r^2 = 0.66$

(5) $Q = 3.40+0.44B$; $r^2 = 0.67$

Thirteen observations:

(6) $Q = 3.37+0.45B$; $r^2 = 0.66$

These results may be compared with those obtained by relating consumer car expenditure to current aggregate disposable income (Y) for corresponding periods of one year, with the intentions data ignored.

Eleven observations:

(7) $Q = 0.062Y-4.18$ (billions of dollars); $r^2 = 0.66$

Thirteen observations:

(8) $Q = 0.057Y-2.95$; $r^2 = 0.66$

The intentions data perform just as well as disposable income in explaining consumer expenditures on new cars, yielding almost identical correlation coefficients. While this merely offers the forecaster an alternative as good as one already open to him, there is some appeal in the alternative. Disposable income must itself be predicted and is subject to error, while the intentions data are known once survey results are available.

The most interesting possibility raised by the findings is that the intentions data and disposable income employed jointly may yield better results than either taken alone. Multiple regression estimates, which employ both Y and one of the intentions series (B or N) as independent variables, are as follows:

Eleven observations:

(9) $Q = -3.00+0.039Y+0.45N$ (billions of dollars); $R^2 = 0.82$

Thirteen observations:

(10) $Q = -2.35+0.035Y+0.28B$; $R^2 = 0.81$

[15] Commerce's estimate of consumer expenditure on "new cars and net purchases of used cars" (Table 30, line 61 of the *National Income Supplement, 1954* and the July issue of *Survey of Current Business*) was used for the annual surveys. A quarterly series was constructed from the quarterly data on consumer spending for "automobiles and parts" (Table 51, line 3), using the annual data to eliminate the portion of the Commerce quarterly series covering purchases of car parts and accessories. These quarterly series, cumulated for four quarters beginning with the quarter starting closest to the date of the survey, were used as the estimates of the dependent variable for the periodic surveys. The data employed in equations 1 through 6 may be found in Appendix Tables A-1 and A-2.

The multiple regressions produce a marked improvement over the results of the simple regression equations. The income or intentions data, taken separately, leave unexplained about a third of the variance of car expenditure over the sample period. When the variables are employed together, the unexplained portion is reduced by nearly half, and amounts to less than a fifth of the variance.

Certain theoretical considerations suggest the use of income change, rather than the level of income, as a supplement to the intentions variable in explaining actual purchases. The intentions variable presumably reflects the income expectations of households. When realized income during the forecast period exceeds anticipated income, actual expenditure is likely to be high relative to intentions. Thus, the level of actual spending on cars would be related to (1) intended purchases reported at the start of the period and (2) the difference between realized and expected disposable income. In the absence of a direct measure of expected income, the level of income prevailing at the time of the survey may serve as a proxy, so that unexpected income change is approximated by actual income change. The second independent variable is then:

ΔY = disposable income during year of forecast minus disposable income (seasonally adjusted at annual rates) in quarter preceding year of forecast.

The estimated regression of Q on N and ΔY for the eleven available observations is:

(11) $Q = 3.25 + 0.143\Delta Y + 0.67N$ (billions of dollars); $R^2 = 0.79$

The income-change variable does supplement the intentions measure in the sample. By a trivial and highly inconclusive margin, however, its performance is not so good as that of income level (equation 9).

Table 1 shows the success of these alternative methods of forecasting car purchases compared with that of naïve models for the calendar years 1950-55. The naïve forecast is that car purchases in the year ahead will equal those of the preceding year, so the percentage error here is simply the percentage change in purchases. For both the number of car registrations and the level of expenditure, the naïve forecasts are distinctly inferior to "predictions" based on the regression equations utilizing SRC buying plans and/or an income variable. The regressions incorporating both an income and intentions variable are most successful. The results are somewhat suspect since the estimates of regression coefficients were derived from a sample which included the observations of plans and purchases for the periods covered in the table. Nonetheless, the results are encouraging. While good fits over a small sample cannot guarantee good forecasts, the evidence suggests that intentions data for car purchases deserve a place of importance in forecasts of consumer spending on this item.

TABLE 1

Comparison of Forecasts of Car Purchases Based on Buying Plans, Income, and Naïve Models, 1950-1955
(*percentage error*[a])

YEAR	REGISTRATIONS		NEW CAR EXPENDITURES			
	Naïve ($P_t = P_{t-1}$)	*Regression on M* (*Eq. 1*)	*Naïve* ($Q_t = Q_{t-1}$)	*Regression on Y* (*Eq. 7*)	*Regression on Y and N* (*Eq. 9*)	*Regression on ΔY and N* (*Eq. 11*)
1950	+24	−1	+23	+16	+11	−18
1951	−25	+3	−16	−11	+6	+6
1952	−22	−21	−9	−30	−15	−4
1953	+27	−3	+25	−5	−5	0
1954	−3	+1	−5	−13	−6	+7
1955	+23	+16	+28	+13	+13	+13
Average absolute percentage error (1950-55)	21	8	18	15	9	8

[a] Computed as [(actual-predicted) ÷ actual].

Plans and Purchases of Major Household Durable Goods. Data on the percentage of spending units planning to buy major household items are supplied by the SCF surveys. Comparable data are not available from the periodic surveys. Widespread excess demand did not persist so long after the war for household goods as for cars. Hence, the first observation of the series here considered is drawn from mid-1947. Eleven observations are provided by the annual surveys of 1948-55 and the mid-year surveys of 1947-49. Intended purchases are again measured by summing the percentages of respondents who respond "definitely will" or "probably will" buy and half of those who state "may buy." For comparison with actual flow data, the intentions are converted into dollars by use of data on median planned expenditure.[16] Thus, the intentions variable is:

H = fraction of spending units intending to buy furniture or major household equipment times number of spending units times median planned expenditure.

This intentions variable is tested for its ability to predict actual consumer expenditure on major household durables (W) for a one-year period beginning with the quarter in which the survey was held.[17] In the

[16] Revised estimates of median planned expenditure for 1952-55 SCF surveys have not been incorporated. Some calculations suggest that they would lead to a more favorable appraisal of buying intentions. For the mid-year surveys, median planned expenditure was not reported. The figure employed here is the mean of the figures given for the adjacent pair of annual surveys.

[17] An annual series of consumer expenditure on major durable household goods is obtained by summing lines 27, 28, and 81 of Table 30 in *National Income Supplement, 1954*, and the July 1956 issue of *Survey of Current Business*. Quarterly data from line 4

regressions below, its performance is compared with that of aggregate disposable income (Y) for the sample of eleven observations:

(1) $W = 0.98H + 4.9$ (billions of dollars); $r^2 = 0.41$

(2) $W = 0.027Y + 2.3$; $r^2 = 0.83$

(3) $W = 0.024Y + 0.19H + 2.5$; $R^2 = 0.84$

In these data, planned expenditure is a fair, though inferior, substitute for the knowledge of disposable income in the year ahead. It does not add to the information obtained from an accurate forecast of income.[18]

Buying Plans and Total Consumer Expenditure on Durable Goods. It is also possible to test the ability of plans to buy household durables and cars, taken together, to aid in the explanation of total consumer expenditure on durable goods. For the seven annual SCF surveys from 1949 to 1955, a combined intentions series can be obtained as a sum of planned expenditure on new cars (N, as defined above) and major household durables (H). Approximately two-thirds of total consumer durables spending is accounted for by the items thus covered.[19] A measure of planned expenditure in relation to income is obtained by dividing the combined buying plans by aggregate disposable income. The resulting variable $[(N+H)/Y]$ is employed in an attempt to explain residuals, for the calendar year following each survey, from an estimated linear regression of durables expenditure on disposable income.[20] The residuals are positively related to $[(N+H)/Y]$ over the sample of seven observations. Of the variance of the residuals, 37 per cent is explained by the ratio of planned spending to income.

This finding, like the results on car intentions, points toward a favorable appraisal of the predictive value of the intentions data. However, the correlation coefficients and standard errors of estimate indicate that a substantial amount of variability in consumer durable spending cannot be foretold by the intentions series alone or in combination with disposable income. Furthermore, the results are not statistically significant. While statistical significance could not reasonably be expected with so few observations, one must concede the possibility that chance alone could have produced the encouraging pattern of relationships observed above. Fortunately, the evidence supplied by cross-section data buttresses the

[18] Juster finds a superior time-series record of prediction for household durables with intentions data taken from Consumers Union mail surveys.

[19] Excluded are such items as jewelry, watches, tableware, lamps, rugs, eyeglasses, books, sporting equipment, and durable toys.

[20] The durables–income regression equation is that described in footnote 4. Annual residuals were taken as the mean of the quarterly residuals for each calendar year.

---

of Table 51 are used to interpolate the annual series to obtain the figures required in conjunction with the three mid-year surveys. Data on which estimates of H and W are based are available in Tables A-1 and A-3.

time-series findings, thus increasing one's confidence that the observed relationships are not attributable purely to chance.

EVIDENCE FROM CROSS-SECTION DATA

When identical spending units are interviewed twice, the durable goods purchases reported in the second interview can be compared with the intentions expressed in the first interview. In such comparisons, the "objective" characteristics of families should be held constant as they can be through the use of multiple regression techniques. If, for example, upper-income families report more intentions and make more purchases, one must determine whether the intentions data add anything to the information supplied by the income variable. The criterion of predictive value is whether, among households with identical financial and demographic characteristics, there is a larger percentage of buyers among those which had planned to buy than among those which had planned not to buy. By this criterion, intentions data were found to have substantial predictive value in several studies of SCF re-interview samples.

In their tabulations of the 1948-49 re-interview sample, Lansing and Withey showed that, within any economic group, those expressing intentions to buy consistently purchased more frequently than nonplanners. In a multivariate regression analysis of the 1952-53 re-interview sample, Tobin found that planned expenditure on durables was a highly significant supplement to financial and demographic variables in explaining actual expenditure by a household. Using the same data but a different set of explanatory variables, Klein and Lansing reached the same conclusion. In this volume, Eva Mueller reports the results of a panel study conducted from 1954 to 1957. In each of four separate periods, plans to buy augment her other variables significantly.[21]

Skepticism has been expressed on the relevance of findings from cross-section data to an appraisal of the aggregative predictive value of anticipations data.[22] This matter can be clarified by formal analysis. Suppose that, at the beginning of year t, an entire population is interviewed about its plans to purchase some homogeneous durable good, and a fraction (p) of the population reports intentions to buy, while the remaining fraction $(1-p)$ plans not to buy. Re-interviews at the end of the year establish that a fraction (r) of those planning to buy made purchases and that a fraction

[21] James Tobin, "On the Predictive Value of Consumer Intentions and Attitudes," *Review of Economics and Statistics*, 1959; Lansing and Withey, pp. 417-440 (see also Albert G. Hart's comment on the Lansing-Withey paper in the same volume, pp. 496-497); L. R. Klein and J. B. Lansing, "Decisions to Purchase Consumer Durable Goods," *Journal of Marketing*, October 1955, pp. 109-132; and see also Ferber, pp. 42-51.

[22] George Katona, "Federal Reserve Committee Reports on Consumer Expectations and Savings Statistics," *Review of Economics and Statistics*, February 1957, p. 41; see also Schweiger, pp. 459-460.

(s) of the "nonintenders" also bought the item. Then, of the entire population, the fraction making purchases (x) is given by the identity:

$$(1) \qquad x_t \equiv r_t p_t + s_t(1-p_t) \quad \text{or, alternatively,} \quad x_t \equiv s_t + (r_t - s_t)p_t$$

If the census of intentions and realizations is conducted each year, a set of observations on x, r, p, and s will be obtained and r and s can be interpreted as random variables with population means, R and S, respectively. If the intentions data are to have predictive value at the microeconomic level, R must exceed S; that is, the probability of purchase by a planner must exceed that for a nonplanner. If intentions are to have predictive value in the aggregate, x and p must be positively related over time, so that plans and purchases for any year tend to move together.[23]

In the special case where r and s are both independent of p, the condition that intentions data have predictive value on a cross-section basis ($R > S$) is both necessary and sufficient to insure that they have predictive value in the aggregate. In fact an estimate of the linear regression of x on p will yield a slope coefficient which has an expected value of precisely $(R-S)$.[24]

More generally, the analysis shows that, when $R=S$, x and p can be positively related only if p is positively related to s and/or r. If the intentions data have no predictive value at the household level, they may still have predictive value in the aggregate if either the probability of fulfillment by intenders or the probability of purchase by nonintenders varies directly with the volume of plans to buy in the whole economy. In such a situation, intentions to buy stimulate purchasing, but they are no more likely to influence those who express the intentions than those who do not. Expectations are somehow symptomatic of the atmosphere but do not supply any evidence about the individuals who express them. Such a mode of behavior,

[23] To avoid unnecessary complexity, the discussion abstracts from the other explanatory variables which would be employed in both cross-section and time-series analyses. Also ignored is the mathematical possibility of a perverse relationship between plans and purchases, such that $R < S$ and x is negatively related to p.

[24] The proofs of the above propositions may be outlined in the following way. If a positive relationship between x and p exists, the expected value of M_{xp} will be positive, where M_{xp} is the sample convariance of x and p computed from a random sample of N years. Now,

$$\begin{aligned} M_{xp} &= \frac{1}{N}\left(\sum_{t=1}^{N} x_t p_t\right) - \bar{x}\bar{p} \\ &= \frac{1}{N}\left(\sum_{t=1}^{N} s_t p_t\right) - \bar{s}\bar{p} + \frac{1}{N}\left(\sum_{t=1}^{N} [(r_t - s_t)p_t(p_t - \bar{p})]\right) \\ &= (\bar{r}-\bar{s})M_{pp} + \bar{p}M_{rp} + (1-\bar{p})M_{sp} + M_{rpp} - M_{spp} \end{aligned}$$

If r and s are both independent of p, the expected values of M_{rp}, M_{sp}, M_{rpp}, and M_{spp} are all zero; therefore the expected value of M_{xp} is given by: $E(M_{xp}) = (R-S)M_{pp}$, which is positive if, and only if, $R > S$.

In an estimated regression of x on p, the estimated slope coefficient ($\hat{a}$) equals M_{xp}/M_{pp}. Therefore,

$$E(\hat{a}) = E(M_{xp})/M_{pp} = (R-S)$$

though not inconceivable, is highly unlikely where voluntary economic decisions are concerned.[25]

If intentions data have predictive value at the microeconomic level, they can fail to have a predictive value in the aggregate only if p is negatively related to s and/or r. In such a case, the probability of purchase by either intenders or nonintenders would vary inversely with the volume of buying plans so as to nullify the higher probability of purchase by the intenders. Here, an individual unit is discouraged from buying by the purchase plans of other households. Unless there is excess demand, and the volume of actual purchases is exclusively determined by supply, this mode of behavior seems equally implausible. In short, the analysis suggests that re-interview findings have a direct bearing on the aggregative predictive value of expectational data. Therefore the positive results obtained by Lansing–Withey, Klein–Lansing, Mueller, and Tobin strongly reinforce the time-series evidence on the usefulness of intentions data.

OTHER EXPECTATIONAL VARIABLES

The SCF and SRC surveys also provide information on households' expectations for their own incomes and financial welfare, the state of business conditions, and the movement of prices. Available too, are data on attitudes. The latter are not specifically forward-looking; they relate to the respondent's evaluation of his present financial situation relative to the recent past and his evaluation of current market conditions. Nobody has seriously suggested that these expectations are likely to have direct predictive value, but they may provide insight into the future course of consumer spending and saving as indirect predictors. Some of the information supplied by series on the other expectations and attitudes of households will undoubtedly overlap that contained in the intentions data. One would expect the volume of purchase plans reported to be influenced by consumers' appraisals of current and prospective buying conditions and their economic prospects. However, a knowledge of the underlying expectations and attitudes might aid the forecaster in estimating the volume of plans that will be fulfilled and the volume of unplanned purchases.

One plausible view is that plans to buy are predicated upon certain assumptions about personal income prospects and the business outlook. If these assumptions are unduly optimistic, the ratio of actual to planned purchases will be low; if they are unduly pessimistic, the planned purchase

[25] Suppose that, in an annual autumnal survey, individuals were asked whether they expected to contract Asian flu in the coming year. Presumably in 1956 almost all would have said no. A year later, however, some would have said yes, either pessimists or people who preferred to say yes even though they really thought the chance was less than fifty-fifty. In comparison with 1956, the 1957 survey would display predictive value in the aggregate; yet it might well have none on a cross-section basis. The population can sense the presence of flu viruses in the atmosphere and still be totally unable to predict who will be stricken.

ratio will be higher and the level of unplanned purchases will be high. At a given level of intended purchases and with a given set of beliefs held by the forecaster about other sectors of the economy, the more bearish consumers are, the more bullish the forecaster should be about the consumer sector. The 1948-49 SCF re-interview sample provides evidence in support of this position. Of all spending units which had in early 1948 reported no plans to buy a car during the year, about one-third received more income than anticipated. This group accounted for nearly two-thirds of the unplanned purchases of new cars. The one-fifth of the nonintenders who received less income than expected during 1948 accounted for only 4 per cent of the unplanned purchases. Similarly, the fulfillment of plans to buy was substantially greater for those spending units which received more income than anticipated than for those which received less.[26]

But a diametrically opposite interpretation can be placed on the attitude and expectation responses of households. Adherents to this view would argue that the prospect implied by these data is, in effect, additive to the level of the intentions data. Optimism about general business, personal financial prospects, and market conditions is treated as reinforcing the expansionary implications of a high level of intentions to buy. As Lansing and Withey argue (page 408), "All the data—consumers' ability to buy, their willingness to buy, and their expected purchases—should form a consistent picture. To the extent that this internal consistency appears in fact, one can have confidence in the conclusions drawn."

It is thus argued that, for any given level of intended purchases, the more optimistic consumers are, the higher will be the level of actual purchases. If it can be established that plans made by optimistic households have a higher probability of fulfillment, the forecaster can weight the plans by the degree of optimism expressed by respondents in other questions, just as he may weight the plans by the degree of certainty attached to the intention by the respondent. Of the households reporting no plans to buy, some may simply have no articulated plans at the time of the survey, others may be particularly negligent or cautious in failing to mention purchases which have a strong likelihood of being made. In that event, one might hope to gain information about the probable level of purchases by nonplanners from responses on the related expectation and attitude queries.

The theoretical arguments are inconclusive. While differing on the proper use, both sides agree that other expectations data can be profitably employed in conjunction with buying intentions. The empirical record, however, does not support this contention. The Consultant Committee on Consumer Survey Statistics appraised the predictive performance of data on expectations and attitudes by comparing the responses obtained in the SCF surveys through 1954 with aggregate time-series data on the ratio of expenditure on durables to disposable income and the ratio of liquid

[26] Lansing and Withey, Table 43, p. 428.

saving to disposable income.[27] No evidence of predictive value was found, and the authors concluded that these queries, "unlike questions on intentions to buy, do not appear . . . to distinguish between the kinds of favorable attitudes that encourage buying of durable goods, other physical assets, and liquid saving."[28]

Recent calculations by the author confirm these results. Using the additional observations available for SCF and periodic SRC surveys conducted in 1955 and 1956, the author made various attempts to relate expectation and attitude responses to the durables spending–disposable income ratio (D/Y) and the personal saving–disposable income ratio (S/Y) for subsequent periods of varying length. None of the expectation series displayed any real explanatory value. Slightly encouraging results were obtained from one of the attitude series, the evaluation of durable goods markets ("good time to buy"). This series was also singled out by the Consultant Committee as a possible exception to the otherwise negative results. Eleven survey observations of this question, covering 1953-56, show a slight positive correlation with D/Y and a negative correlation with S/Y for the quarterly period following the survey. Ten per cent of the variance of D/Y and 24 per cent of variance of S/Y are explained by the responses on "good time to buy."[29]

Katona has argued that, "Instead of testing the predictive value of each attitude separately, the relation of clusters of attitudes should be studied."[30] To study such clusters, he and Miss Mueller constructed an experimental index of consumer attitudes which covers responses to eight questions: two on buying plans for cars and houses, three on external expectations about price movements and business conditions, one on personal financial anticipations, and two attitude series relating to the respondent's current financial situation and his evaluation of current market conditions.[31] The eight series are individually indexed and given equal weight in forming the combined index.

In mimeographed releases and publications on the periodic survey, Katona and Mueller have shown the index in conjunction with quarterly data on the ratio of durables spending to disposable income. Sometimes the charts have been headed, "Do consumer attitudes lead durable goods sales?" Since D/Y was used as the measure of durable goods sales, this implied the reasonable a priori hypothesis that a favorable level of consumer attitudes should be associated with a high rate of durables spending relative to income in the period following the survey.

The question they pose can be investigated by drawing on observations

[27] "Report . . . on Consumer Survey Statistics," pp. 308-316.

[28] *Ibid.*, p. 312.

[29] The independent variable is the percentage of favorable responses minus the percentage of unfavorable responses with noncommittal answers ignored.

[30] Katona, "Federal Reserve Board Committee Reports . . . ," p. 41.

[31] Katona and Mueller, pp. 91-105.

from eleven surveys dating from late 1952 to late 1956.[32] In this sample, the attitude index displays ability to forecast the durables–income ratio for one and two quarters following the survey. However, an index consisting of only the two plans-to-buy components predicts just as well—in fact, a trifle better; while an index of the remaining six components performs less well. Shown below are the proportions of variance (r^2) explained in nine simple regression estimates, employing as dependent variables (1) the durables–income ratio for the quarter following the quarterly period of the survey (D_1/Y_1); (2) the durables–income ratio for the second quarter following the survey quarter, (D_2/Y_2); and (3) the mean of the durables–income ratio for those two quarters, $[0.5(D_1/Y_1 + D_2/Y_2)]$:[33]

Dependent Variable	*Attitude Index*	*Plans to Buy*	*Attitude Index Excluding Plans to Buy*
D_1/Y_1	0.28	0.30	0.20
D_2/Y_2	.13	.23	.05
$0.5(D_1/Y_1 + D_2/Y_2)$	.29	.31	.19

In this sample of data, clusters of attitudes added nothing to the predictive value of intentions to buy.

One might also expect the index of consumer attitudes to suggest the future course of total consumer spending in relation to income, and thereby to offer insight into those variations of the personal saving–disposable income ratio that are not associated with durables spending. In the sample of eleven observations, the attitude index assists in forecasting S/Y for the first quarter following the survey but does not explain any portion of S/Y for the next quarter. In the prediction of S_1/Y_1, it is once again the two plans-to-buy components which account for the success. The inclusion of other attitudes in the total index detracts from the predictive value of plans to buy. The portions of the variance of S_1/Y_1 explained by the alternative expectation variables are:

Attitude index	0.28
Plans to buy	.35
Attitude index, excluding plans to buy	.16

Miss Mueller reports that, for the same eleven surveys, the index constructed of the two plans-to-buy components is inferior to both the total attitude index and the attitude index excluding plans to buy in explaining D/Y for a two-quarter period.[34] The explanation for the divergence of her

[32] Data for surveys from 1952 to 1955 are taken from *ibid.*, p. 100. For the three 1956 periodic surveys, some data were available in mimeographed SRC releases; other required data were supplied to the author by the SRC through the kind cooperation of Ernest Lilienstein.

[33] All estimated slope coefficients are positive, corresponding in sign with a priori beliefs.

[34] See her paper in this volume.

results from those presented above lies in the timing of D/Y. When a survey is taken in the first month of a quarter, Miss Mueller uses D/Y for that same quarter and the next quarter. The D/Y variable used in this paper starts uniformly with the quarter following the quarterly period of the survey. While this leads to differences in dating for a number of surveys, the difference is particularly important in the case of the October 1954 survey. In that survey, plans to buy were very high while other attitude variables were near their mean. In the last quarter of 1954, D/Y was rather low; in the first and second quarters of 1955, it was extremely high. Hence, when the survey data are compared with D/Y for I and II 1955, intentions are excellent predictors while other attitudes are very poor. However, when the relevant period is taken to be IV 1954 and I 1955 as in Miss Mueller's study, intentions overpredict D/Y.

In the final analysis, the divergent results produced by the alternative techniques of dating suggest that eleven times-series observations cannot yield conclusive findings on the relative forecasting value of intentions and other anticipations, particularly since the various expectation measures are themselves closely correlated in aggregative data. However cross-section results are relevant and these point uniformly toward a negative evaluation of consumer anticipations data other than plans to buy. For example, Tobin's study of the 1952-53 re-interview sample of the SCF reveals that, unlike intentions data, the information on other expectations and attitudes —whether taken singly or in combination—fails to supplement the financial and demographic explanatory variables.[35] Tobin's substantive conclusions are equally applicable to the empirical findings in Miss Mueller's analysis of the Center's re-interview panel. In none of the four periods under study did she obtain a statistically significant relationship between durables purchases and an attitude index (excluding plans to buy) when intentions were taken into account. These are powerful tests based on samples of about seven hundred households. When the estimated regression coefficients of an attitude index are uniformly insignificant, grave doubts are cast on the existence of the hypothesized relationship at the level of the household. And a variable which has no predictive value at the microeconomic level is most unlikely to forecast successfully in the aggregate.

Katona is undoubtedly on firm ground in arguing that little has as yet been proved about the predictive value of intentions, and of other expectations and attitudes.[36] Additional empirical research, on both the aggregative and microeconomic levels, would be most welcome. Nevertheless, at

[35] In their study of the same data, Klein and Lansing reach the same general conclusion, although they find some slight value in the evaluations of personal financial situations ("better off"); see pp. 119-120, 128-131. For a bit of negative evidence on "better off" from the 1948-49 re-interview sample, see Table 45 of Lansing and Withey, p. 429. The series on evaluation of market conditions ("good time to buy"), which showed some promise in time-series evidence, had no predictive value in the cross-section studies.

[36] Katona, "Federal Reserve Board Committee Reports . . . ," p. 43.

this point it appears that the burden of proof falls on those who would contend that the predictive value of intentions data can be materially augmented by information on attitudes and other expectations. The empirical record to date obliges the forecaster to weigh heavily the SRC intentions data; on the basis of currently available evidence, he cannot have equal confidence in other measures of consumer expectations and attitudes.

Investment Expenditure

NONFARM RESIDENTIAL CONSTRUCTION

During the past decade, between 20 and 30 per cent of gross private domestic investment has consisted of nonfarm residential construction. Expenditure on new housing has not been a particularly volatile component of capital spending, but it has moved erratically. For example, it rose in 1950 along with other components of investment but fell by 13 per cent in 1951 while plant and equipment spending, GNP, and disposable income continued to rise. In 1954, housing rose by 13 per cent while the rest of private capital formation declined, and in 1956 it fell by 8 per cent despite the boom in plant and equipment spending.

As this record of variation suggests, poor results would have been obtained in recent years from techniques which predict residential construction on the basis of time-series relationships of that component to disposable income, GNP, or other large aggregate flows.[37] Also, because of the frequent turning points, techniques which extrapolate recently observed trends in the housing sector would not have predicted accurately. Instead the forecaster can use "objective" series on family formation; the existing stock of housing; financial variables relating to mortgage markets; and building permits, contract awards, and the number and value of housing starts. He also may consider two expectation series: one, compiled by *Fortune*, records the plans of homebuilders; the other, reported by the SRC, covers the plans of prospective home buyers.

The potential relative contribution of buyers' and builders' plans is a matter of analytical interest. The predictive value of buyers' plans is likely to depend on the rapidity and flexibility with which builders adjust their output to current demand. For built-to-order homes, output is directly determined by demand. Also, builders of large developments may be able to respond rapidly to surprises in demand by adjusting the total number of homes to be included in the project as well as by revising the schedule of

[37] The author has found that expenditures on new housing and on household durables have not moved together as fractions of disposable income in recent years. However, residential building and consumer spending on cars, both expressed as ratios to disposable income, exhibit a surprisingly close relationship in quarterly data for 1948-56, with $r^2=0.61$. A variety of theoretical reasons could be advanced to account for this pattern.

construction. In these cases, buyers' plans should be more heavily weighted. However, lags in the adjustment of supply are likely to be widespread. Product differentiation and the lengthy planning period preceding the start of construction make it difficult for builders to recognize and respond to shifts in demand. Therefore, the plans of the builders might be the dominant consideration over the short run.[38]

The survey data on both buyers' and builders' expectations may be readily employed in conjunction with data on the number and value of housing starts. The latter series perform admirably in forecasting nonfarm residential construction for a few months ahead. This is not surprising since the construction of any house is a fairly lengthy operation. In any short period the bulk of construction activity is done on units started in the previous period. The pattern of typical progress in the construction of a house has been determined by field studies and is used by the Departments of Labor and Commerce to estimate the expenditure on residential construction for any month. They apply weights to the value of work started in that month and each of several previous months. The pattern is such that an average of about half of all nonfarm residential construction expenditure in a given quarter is attributable to dwelling units started in the immediately preceding quarter. Another 10 per cent of expenditure is typically associated with starts in earlier quarters. Consequently, only about 40 per cent of expenditure is on units begun in the current quarter.[39] Knowledge of the value of work started in recent months is thus an excellent indicator of residential construction expenditure in the next quarter. Quarterly forecasts made on this basis would have been highly successful from 1950 to 1956.[40] However, the forecaster cannot be satisfied with such a short lead. He may attack the problem of longer range prediction by attempting to forecast the value of work started and, in pursuing this objective, he may turn to the anticipations data supplied by *Fortune* and SRC.

Both of the anticipations series relate to the probable number of new housing starts rather than to their prospective value. Data on the value and

[38] There is no inventory component of unsold new houses in the national product accounts. Thus all production of housing shows up as new residential construction. This contrasts with the treatment of consumer durable goods. For example, excessive optimism in the production decisions of refrigerator manufacturers would be reflected initially in higher inventory investment with no change in the consumer durables component.

[39] See *National Income Supplement, 1954*, p. 125; and *Techniques of Preparing Major BLS Statistical Series*, Dept. of Labor, Bull. 1168, December 1954, pp. 8-15, and 19-21. Quantitative information on the activity patterns has been kindly supplied to the author by Arnold E. Chase, Chief, Division of Construction Statistics, Bureau of Labor Statistics.

[40] In calculations made by the author, data on the value of contract awards for residential construction did not equal the value of starts series in predictive ability. It should, of course, be recognized that the official estimates of actual expenditure are derived from the value of starts series.

number of starts indicate that the value per dwelling unit has risen substantially in recent years, both because construction cost has risen and because people are buying "more house." The upward movement has been fairly steady with value per unit rising by substantially more than construction prices. From 1950 to 1956, annual increases in value per unit remained in the narrow range of 5 to 8 per cent, except for a rise of only 1 per cent in 1952. During this period, ability to forecast the number of starts accurately would have insured reasonably successful forecasts of the value of activity, and it seems likely that this condition will prevail in the future.

Data on buying intentions for houses are of the same character as the purchase plans for consumer durables. The annual SCF surveys from 1948 to 1955 and periodic surveys of June and October 1954, and June and October 1955, present twelve observations on the percentages of respondents planning to buy houses in the following year. In recent surveys intentions to buy new and old houses have been combined. Intended purchasers are again defined as those respondents reporting they "will" or "probably will" buy and half of those stating they "may buy." The percentage of intended purchasers is multiplied by the number of spending units (or in the case of the periodic surveys, the number of families) in the economy to form the intentions variable (J). The latter is used in an attempt to explain a dependent variable (S), which is the number of new housing starts in the twelve-month period beginning with the month of the survey.[41] The estimated regression of S on J is:

(1) $S = 641 + 0.15J$ (thousands of dwelling units); or $r^2 = 0.39$

The standard error of estimate is slightly over 100,000 dwelling units, a sizable margin of error. However, aggregate disposable income for each period, deflated by construction prices, explains only 32 per cent of the variance and is unable to assist the intentions series when both are employed as potential explanatory variables.

Data on the plans of homebuilders are compiled by *Fortune* through interviews with between three and four hundred building firms, stratified by size, in thirty-five or more cities. Each builder is asked what percentage change he expects in his housing starts relative to the previous year. The percentage estimates are combined, weighted, and applied to the level of starts in the previous year in order to obtain a prediction on new housing starts for the calendar year.[42] The survey is conducted early in the year, and results are presented in the "Business Roundup" section of the April 1959 *Fortune*. The results are thus available at approximately the same time as the SCF data on buying intentions, and only slightly after

[41] See Tables A-1 and A-4 for data.

[42] A detailed discussion of the techniques employed in the homebuilding survey may be found in "Report . . . on General Business Expectations," pp. 582-584.

reliable estimates are made available for the fourth quarter of the preceding year.

There are six observations on the predictive value of the survey covering 1951 to 1956. Each time the homebuilders overestimated starts in the year ahead, indicating a possible bias which might be corrected. However, three of the errors amount to only 2 or 3 per cent while three are substantial. In the three bad years (1953, 1955, and 1956), respondents were re-interviewed in late summer.[43] Like homebuilders in the aggregate, the respondents in the sample were not fulfilling their plans. "Tight money" was the primary reason offered. According to the builders, the high cost and lack of availability of mortgage funds affected adversely both the ability of households to acquire homes and the ability of the builders to finance work in progress with construction loans. Restrictive monetary policy might well have surprised builders (as well as other groups in the economy) in 1953 and in 1955. However, in order to accept the "tight money" explanation in 1956, one must assume that, as of the start of the year, the builders anticipated a substantial relaxation in financial markets and reported their housing plans accordingly. It is particularly difficult to form a judgment here. One must wait for more observations to learn whether the homebuilders' survey continues to predict effectively in years of easy money and whether it contains any useful information in years of tight money.

The relation of buyers' plans and sellers' plans to the actual number of housing starts for the years 1951-56 is shown in Table 2. Also included are the results which would have been obtained with two alternative naïve models: one projecting housing starts for the year ahead at the seasonally adjusted annual rate for the last quarter of the preceding year, the other predicting the same level as the whole of the previous year.[44] The percentage error of forecast of the second naïve model is simply the percentage change in housing starts from one year to the next. The hits and misses of the homebuilders' survey stand out in the comparison. It is the best of the four predictions in 1951, 1952, and 1954 but the poorest in 1955 and 1956. The buying plans, as utilized in equation 1 of this section, overpredict badly in two of *Fortune*'s three lean years (1953 and 1956) and underpredict seriously in 1954.[45] The average absolute percentage errors

[43] Re-interview results are presented in "Business Roundup," *Fortune*, October 1953, September 1955, and September 1956.

[44] The first series is based on revised data presented in *Survey of Current Business*, March 1957, p. 20. The seasonally adjusted series omits the small number of publicly financed dwelling units started; the predictor was adjusted upward to allow for the omission.

[45] The performance shown in the table for SRC data in 1956 is actually the percentage error of the October 1955 periodic survey in predicting starts from October 1955 through September 1956. The figure on housing intentions in the 1956 SCF includes all of the "may buy" respondents. If adjusted to the concept of intentions used here, it would also have yielded an excessively high forecast of 1956 housing starts. The six observations of consumer surveys used as predictors here were included in obtaining the estimated regression equation by which the "forecasts" are made.

TABLE 2

Comparison of Forecasts of Housing Starts Based on Anticipations Data and Naïve Models, 1951-1956
(*percentage error*[a])

YEAR	REGRESSION ON SRC BUYING PLANS	"FORTUNE" SURVEY OF HOMEBUILDERS	NAIVE MODEL	
			Based on Fourth Quarter of Previous Year	*Based on Whole of Previous Year*
1951	−5	−3[b]	−11	−28
1952	+5	−2[b]	+10	+3
1953	−11	−9	−5	−2[b]
1954	+11	−2[b]	+12	+10
1955	+5[b]	−9	−5[b]	+8
1956	−14	−20	−8	−19
Average absolute percentage error (1951-56)	8.5	7.5	8.5	11.7
Root-mean-square percentage error (1951-56)	9.3	9.9	8.9	14.8

[a] Computed as [(actual-predicted) ÷ actual].
[b] Best (or tied for best) of the four predictions for any given year.

and root-mean-square errors summarize the performance of the four methods. Both measures point to the ability of the anticipations series and of data from the most recent quarter to improve on the full-year naïve model. However, differences in the average error of the three superior predictors are trivial and the rank order is different for the two measures of performance.[46]

Neither the buying plans nor the sellers' expectations display any consistent ability to improve on the information contained in the latest data on housing starts in these six years. The survey data on buying plans were superior to aggregate disposable income in predicting housing starts in the available observations. Since the income variable commands attention in any forecast of housing, data on buying intentions presumably also deserve careful scrutiny. The fact that SRC data on buying intentions have not consistently surpassed the fourth-quarter naïve model means only that buying plans, taken alone and employed in a particular manner, do not contain more information than the most recent data on housing markets. However, there may be more profitable ways to use the buying plans than in the simple regression technique applied above. They might be combined with the recent rate of starts, or used in conjunction with certain demographic or financial variables. Such explorations might be guided by microeconomic evidence on fulfillment of home buying plans but, because

[46] The change in rank order is attributable to the heavier weight given to large deviations by root-mean-square error.

home-buyers change their place of residence, there have been no re-interview studies on this matter to date. The three years of successful prediction by the homebuilders' survey are impressive and this anticipations series might be complemented by other variables. On the basis of the inconclusive evidence from time-series data, survey results on both buying and building intentions deserve inclusion among the various pieces of evidence that must be weighted and combined by the forecaster of GNP when he considers residential construction.

OTHER FIXED INVESTMENT

Valuable information on future expenditure on new plant and equipment is supplied by two surveys of business investment plans, one conducted jointly by the Securities and Exchange Commission and the Department of Commerce and the other by the McGraw–Hill Publishing Company. The surveys project gross fixed investment by nonfarm business for the calendar year. The Commerce–SEC annual survey is conducted between late January and early March; results are presented in the March issue of *Survey of Current Business*. Results of the McGraw–Hill survey appear a few weeks later in *Business Week*. In recent years, McGraw–Hill has also made a preliminary survey of investment intentions in the fourth quarter of the preceding year. In addition to their annual endeavor, SEC and Commerce compile investment plans for each quarter early in the preceding quarter and again at the start of the quarter in question.

The Commerce–SEC intentions data are expressly designed to forecast the series of actual new plant and equipment expenditure by United States business, which is reported on a quarterly basis. The series is not a component of the official national product accounts. It covers the bulk of the sum of two components, "producers' durable equipment" and "other new construction" (i.e., other than residential nonfarm). The items in producers' durable equipment and other new construction excluded from plant and equipment expenditure are farm equipment and construction, construction by private nonprofit institutions, capital outlays charged to current expense, and equipment and construction expenditures by independent professionals. However, even after allowing for these items, the totals are unequal, and no official reconciliation is available. Fortunately the discrepancy is neither large enough nor volatile enough to cause serious trouble. The ratio of plant and equipment spending to the two GNP entries has remained between 72 and 76 per cent since 1951 and the dollar difference between these magnitudes has not changed by more than $1.1 billion in any pair of successive years. Therefore accurate forecasts of plant and equipment spending would provide reasonably accurate predictions of the sum of producers' durables and other construction.

Predictive Performance of Investment Intentions. The predictive record of the Commerce–SEC survey has been outstanding. The survey was

initiated in 1947, and the past decade of experience has been carefully analyzed under Commerce–SEC auspices.[47] The post-mortems show that, in every year except 1950, the anticipations data were better predictors than a model projecting expenditures at the level of the previous year or a model projecting expenditures at the level of the fourth quarter.[48] The average absolute error and root-mean-square error over the period are much smaller for planned expenditure than for either naïve model. Table 3 summarizes these findings. Similarly, the intentions series was generally superior in predictive ability to extrapolations of the recent rate of change in plant and equipment outlays and to "causal" explanations such

TABLE 3

Comparison of Forecasts of Plant and Equipment Expenditure based on Anticipations Data and Naïve Models, 1947-1956 and 1948-1956
(*percentage error*[a])

PERIOD	COMMERCE–SEC ANTICIPATIONS	NAIVE MODEL	
		Based on Whole of Previous Year	*Based on Fourth Quarter of Previous Year*
1947-56:			
Average absolute percentage error	5	13	n.a.
Root-mean-square percentage error	8	17	n.a.
1948-56:			
Average absolute percentage error	3	11	8
Root-mean-square percentage error	6	14	10

n.a. = not available.

[a] Computed as [(actual-predicted) ÷ predicted].

Source: Figures are calculated from Murray F. Foss and Vito Natrella, "Ten Years' Experience with Business Investment Anticipations," *Survey of Current Business*, January 1957, p. 17, Table 1; and *Survey of Current Business*, June 1956, pp. 6-7; and June 1957, p. 3. See also Natrella, "Forecasting Plant and Equipment Expenditures from Businessmen's Expectations," *Proceedings of the Business and Economic Statistics Section of the American Statistical Association*, 1955-56, p. 127, Tables 2 and 3.

[47] See Irwin Friend and Jean Bronfenbrenner, "Plant and Equipment Programs and their Realization," *Short-Term Economic Forecasting*, pp. 53-98; and two articles by Murray F. Foss and Vito Natrella, "Ten Years' Experience with Business Investment Anticipations" and "Investment Plans and Realization," in *Survey of Current Business*, January and June 1957, respectively. All cited deviations between actual and anticipated outlays are derived by comparisons of (1) the actual percentage change in outlays from year to year with (2) the anticipated percentage change over the estimated outlays of the previous year as of the time of the survey. This standard technique of evaluation is designed to abstract from the effects of subsequent revisions in the estimates of actual investment for the preceding year.

[48] Since no quarterly data for 1946 are available, the naïve model based on the fourth quarter could not be tested for 1947.

as the linear regression of investment on lagged profits used in the Klein–Goldberger econometric model.

The Commerce–SEC record is marred by the presence of two bad years, 1947 and 1950, when actual expenditures exceeded anticipations by 17 per cent and 15 per cent, respectively. The outbreak of the Korean war in mid-1950 accounts for much of the discrepancy in that year. The deviation in 1947 is not so easily explained, but the survey was new, capital goods prices rose rapidly during the year, and supply shortages may have eased more rapidly than purchasers of capital goods anticipated.[49] In 1953 and 1955, the level of actual expenditures exceeded anticipations by 5 per cent and 6 per cent, respectively. In both cases, the survey predicted very small increases over the outlays of the previous year while actual outlays rose 7 per cent each time. In four of the remaining six years, anticipations came within 1 per cent of realized spending; in the other two, the deviations were 3 per cent.

While the McGraw–Hill anticipations have been valuable, the survey did not equal the Commerce–SEC endeavor in predictive performance during the 1948-56 period. Aggregate capital outlays were underpredicted by 26 per cent and 18 per cent in 1948 and 1950 respectively, and overpredicted by 9 per cent in both 1949 and 1951. During the 1952-56 period, however, the average absolute error was only 4 per cent. The anticipations of the McGraw–Hill sample have predicted excellently the outlays of the participating firms: annual errors have been no larger than 4 per cent except for a 10 per cent understatement in 1950.[50] Since the McGraw–Hill sample consists principally of large firms and is not stratified by size, the fluctuations it records are not perfectly representative of investment behavior in the aggregate.

McGraw–Hill's preliminary surveys are of particular interest, since results are reported in November or December, just when GNP forecasting reaches its seasonal peak of activity and long before annual Commerce–SEC anticipations data become available. Anticipated expenditures in the preliminary survey have usually been lower than those reported in the final survey, but the differences have typically been quite small. 1956 is an exception. The preliminary survey predicted an increase of 13 per cent over 1955, while the final survey envisaged a rise of 30 per cent. Outlays actually rose by 22 per cent. Further experience with the survey may indicate how the apparent tendency to underestimate future outlays can be corrected. On the other hand, because the capital budgeting activities of reporting firms are likely to be concentrated in the last quarter, there may be a sharp discontinuity in the relative predictive abilities of surveys conducted before and after the start of the new year.

[49] Foss and Natrella, "Ten Years' Experience . . . ," p. 17; and Friend and Bronfenbrenner, p. 61.

[50] See Tables 2 and 4 in the paper by Dexter M. Keezer, *et al.*, in this volume.

Commerce–SEC quarterly anticipations data have provided valuable assistance in forecasting plant and equipment outlays over a very short-term period. Two reports are available. One is published just before the quarter in question begins, the other just before the quarter ends. From mid-1952 to mid-1956, the first anticipation as published in adjusted form has predicted outlays with a mean absolute error of 2.6 per cent; the second anticipation has diverged from actual outlays by an average of 2.0 per cent.[51] The quarterly series was especially helpful in signaling the downturn in capital spending of late 1953 and the subsequent upturn of early 1955.

Actual capital outlays of business exhibit a marked seasonal pattern with spending particularly low in the first quarter and high in the fourth quarter. Since the reported anticipations do not accurately reproduce this pattern, outlays in the first quarter are significantly overestimated and those of the fourth quarter are substantially underestimated. Since mid-1952, the Commerce–SEC staff has removed these biases by applying a seasonal correction, with a resulting substantial improvement in predictive success.[52] This is an excellent illustration of the proposition that survey respondents who forecast inaccurately can provide the basis for accurate predictions if the response errors follow a determinable systematic pattern.

The average errors in the adjusted quarterly anticipations are only slightly smaller than those for annual planned outlays, and the former do not improve so much relatively on the performance of naïve models. Presumably plans become more definite as the time horizon contracts, but the shorter period covered by the quarterly data increases the difficulty of estimating the precise time of a prospective expenditure because of uncertainty about equipment deliveries, the progress of construction work, and the scheduling of accounting charges.

Techniques for Improving Predictive Ability. There are wide deviations between the intended and realized capital outlays of individual firms. In samples of McGraw–Hill respondents, actual capital spending was within 20 per cent of anticipated outlays in only 39 per cent of all cases for 1949 and 51 per cent for 1954.[53] For 1949 and again for 1955, only about a fourth of the manufacturing firms in the Commerce–SEC sample fulfilled their plans within a 20 per cent range of error. Since large firms were typically the more accurate forecasters, three-fifths of all outlays in 1955 were made by firms in this category.[54] Clearly, the anticipated outlays do not represent fixed and rigid commitments from which firms are unable to deviate. The anticipated outlays definitely have predictive value at the

[51] Foss and Natrella, "Ten Years' Experience . . . ," p. 19.

[52] *Ibid.*, pp. 18-19; and Friend and Bronfenbrenner, pp. 62-63.

[53] See Table 2 in Robert A. Levine's paper in this volume.

[54] Foss and Natrella, "Ten Years' Experience . . . ," p. 20; and Friend and Bronfenbrenner, p. 65.

microeconomic level, but they leave large unexplained residuals.[55] The intentions have been successful aggregative predictors because these residuals have canceled out in the past. The success of the intentions as aggregative predictors is hardly surprising; all aggregative economic relationships that display any stability over time perform far better than their microeconomic counterparts, profiting from a cancellation of the relatively large individual deviations from the cross-section relationship.

It may be purely fortuitous, however, that anticipations reported early in the year are unbiased (or nearly unbiased) predictors of annual capital outlays. Spending plans have a systematic seasonal bias in quarterly projections and a downward bias in annual projections made before the start of the year. The absence of bias in the annual data must stand simply as an empirical generalization. Systematic errors have been discovered for firms in particular size strata: relatively small firms tend to underpredict while very large firms seem inclined to overpredict slightly.[56] Levine suggests a technique whereby anticipated outlays would be classified by size of the reporting firms and each dollar of planned spending in classes which tend to underpredict would be weighted more heavily. And in 1957, the Commerce–SEC survey began to correct for the typical understatement of small manufacturing firms by adjusting their anticipated outlays upward.[57] There is also apparently a bias associated with the size of the anticipated investment program of the firm. Businesses contemplating programs which are large as a fraction of their existing fixed assets tend to overstate their outlays, although they are relatively good predictors. Firms anticipating small percentage additions to fixed assets tend to underestimate their outlays. Apart from these modest qualifications, research efforts have discovered no systematic bias in the annual anticipations. The forces responsible for deviations between actual and planned outlays by individual firms seem equally capable of operating in either direction.

Some influences are random from firm to firm and can be relied on to cancel out in the aggregate in any period. Other forces, however, may influence the capital spending of many firms in the same direction. Economic developments subsequent to a survey may thus produce deviations of outlays in the aggregate from anticipations. For example, when the business outlook changed suddenly and drastically in 1950, plant and equipment expenditure rose markedly above anticipated levels. The survey data faithfully registered the level of investment demand for the state of economic conditions assumed by respondents, but they cannot supply an unconditionally accurate forecast of investment spending. Fortunately, the

[55] See Friend and Bronfenbrenner, *op. cit.*, p. 67; and Robert Eisner, "Expectations, Plans, and Capital Expenditures: A Synthesis of Ex Post and Ex Ante Data," *Expectations, Uncertainty, and Business Behavior*, pp. 170-171.

[56] Friend and Bronfenbrenner, *op. cit.*, pp. 69-70; and the papers by Foss and Natrella, and Levine in this volume.

[57] See the paper by Foss and Natrella in this volume.

factors responsible for deviations from plans can be analyzed *ex ante* as well as *ex post*. This involves treating capital expenditure as a function of intentions expressed at a point in time and of the subsequent course of the nonexpectational variables that influence the realization of intentions.[58] The latter influences must be identified and their paths must be predicted and used in conjunction with anticipations data. The procedure suggested is obviously more complicated than the one-input production process by which the anticipations data are directly converted into forecasts of outlays. The forecaster renders his job more difficult and extends his risks by making his forecast of effective investment demand depend on his beliefs about other variables. However, the level of investment does depend on the course of other economic variables, and the forecaster cannot afford to ignore the interdependence.

The Influence of Other Variables. Two nonexpectational variables which appear to have a significant influence on the realization of spending plans are: (1) the prices and availability of capital goods; and (2) the sales and earnings experience of the prospective investing firms.

PRICES AND AVAILABILITY OF CAPITAL GOODS. It has been suggested that, to a considerable extent, "anticipated outlays . . . reflect a planned physical volume of investment valued at prevailing prices, and hence do not sufficiently take account of price factors."[59] To gather further evidence on this matter, the 1956 Commerce–SEC questionnaire asked respondents to give the assumptions about future capital goods prices which underlay their spending intentions. Only about a third of the firms were allowing for a change (almost unanimously, a rise) in prices. Another third had not considered the possibility of price changes, and the remaining third expected no change.[60]

Because firms tend to project current prices into the future and because the short-run price-elasticity of demand for capital goods is apparently low, higher prices typically raise dollar spending above anticipated levels. Levine finds that, when the McGraw–Hill intentions data are interpreted as forecasts of spending in constant dollars, their predictive accuracy is considerably improved.[61] In the absence of independent evidence, prices reigning at the survey date can serve as a fair approximation to the mean assumed level of prices underlying the intentions data. If the forecaster expects a change in capital goods prices, he should alter his estimate of capital outlays in the same direction.

[58] See Friend, "Critical Evaluation," p. 190; and Franco Modigliani and H. M. Weingartner, "Forecasting Uses of Anticipatory Data on Investment and Sales," *Quarterly Journal of Economics*, February 1958, pp. 36-39.

[59] Friend and Bronfenbrenner, p. 63; see also, O. J. Firestone, "Investment Forecasting in Canada," *Short-Term Economic Forecasting*, pp. 234-235.

[60] Murray F. Foss, "Business Expectations for 1956," *Survey of Current Business*, March 1956, p. 20.

[61] Robert Levine, "Plant and Equipment Expenditures Surveys: Intentions and Fulfillment," unpublished Cowles Foundation Discussion Paper, 1956, p. 121.

Changing prices of capital goods are, however, likely to be associated with variations in the availability of investment goods operating in the opposite direction. Spending intentions for plant and equipment are obviously predicated on certain expectations about how fast construction will progress and when equipment will arrive. When excess demand is present in capital goods markets, intentions can be frustrated by the failure of deliveries. Conversely, potential demand not recorded as planned expenditure can be activated by the evaporation of shortages. For 1949 and 1955 manufacturers were asked in the Commerce–SEC surveys to explain discrepancies between realized and anticipated outlays. Easing of the supply situation was the most frequent explanation offered by those who had spent more than anticipated in 1949, and was cited by 17 per cent of the group. Of those who had spent less than anticipated 10 per cent attributed their deviations principally to supply shortages.[62] In 1955, 38 per cent of firms which had spent less than planned and 7 per cent of those exceeding anticipations pointed to supply conditions as a principal reason. During the 1956 boom in capital spending, supply shortages must have been an even more important source of frustration of intended spending. In both 1949 and 1956, the aggregative predictive performance of anticipations was excellent, presumably because unanticipated changes in capital goods prices and in supply shortages operated in opposite directions to a nearly equal extent.[63] However, one cannot rely on always having so precise a cancellation.

If spending intentions were 30 per cent above the outlays of the preceding year, it would be safe to predict an increase in real investment and a rise in capital goods prices. However, the reported quantitative increase in dollar outlays might require adjustment. The forecaster would then presumably have to consider the productive capacity of capital goods producers and the nature of their pricing policies. If he concluded that capital goods production could expand by only 15 per cent and that prices, being sticky, were unlikely to rise by more than 5 per cent, he would have grounds for marking down the projected 30 per cent increase in outlays. If alternatively he concluded that production could expand by approximately 30 per cent and that prices would nevertheless rise substantially, he should revise the reported anticipations upward.

THE INFLUENCE OF SALES AND EARNINGS. According to either an accelerator or a profitability theory of investment demand, actual capital outlays will deviate from anticipations as a result of unforeseen changes in the demand for the output of firms. The accelerator theory specifies that the rise in physical sales engendered by higher demand will put additional pressure on capacity and induce a more rapid expansion of productive facilities. The profitability approach suggests that higher sales produced

[62] Friend and Bronfenbrenner, p. 87.

[63] Foss and Natrella, "Investment Plans and Realization," pp. 12-13, and 24.

by rising demand increase the prospective return from additional capital goods and thus encourage more investment. Manufacturers' explanations for deviations between realized and intended investment support the theoretical belief that unanticipated changes in sales lead to a revision of investment plans. For the recession year of 1949, nearly half of the firms which invested less than they planned and a sixth of those which invested more offered as their principal reason unanticipated changes in sales or net earnings. The same explanation was offered by about two-fifths of firms exceeding plans and a fourth of those spending less than planned in 1955 when, in general, sales and earnings were more favorable than expected.[64]

Time-series data for manufacturing also confirm this theory. Sales anticipations of firms have been compiled in the annual Commerce–SEC surveys since 1948 in order to show the assumptions about demand underlying the capital spending intentions. It is thus possible to relate percentage deviations between realized and planned investment to percentage errors in sales forecasts. Here, the accelerator view emphasizes changes in the *real* volume of sales as a determinant of investment. The profitability argument suggests that changes in the *dollar* volume of sales, reflecting price movements due to shifts in demand, will also stimulate capital outlays. Most analysts would prefer to test both physical sales and dollar sales (and also capital-goods prices). But with a handful of observations, one must choose between the two.

Modigliani and Weingartner adopted the accelerator model and studied the relationship of relative deviations between actual and anticipated real investment, on the one hand, and deviations between actual and expected real sales, on the other. Since all Commerce–SEC data are registered in current dollars, they had to impute certain naïve price expectations to participating firms and to deflate actual spending by admittedly imperfect price indexes. Despite these difficulties, they found that, with annual observations for all manufacturing for 1948-55, deviations in the forecast of real sales were statistically significant in explaining real investment deviations, accounting for 72 per cent of the variance. The regression estimates indicate that each 1 per cent excess of realized over expected sales is associated with a 1.5 per cent increment of real capital outlays over anticipations. The intercept suggests that, in the event of a zero sales error, real investment would exceed anticipations by a trivial 0.5 per cent.[65]

Alternatively, one might follow the profitability view and test the percentage deviation between actual and expected dollar sales as an indirect predictor of investment. In nine time-series observations on manufacturing as a whole for 1948-56, undeflated percentage deviations in sales display a statistically significant relationship with percentage investment deviations,

[64] *Ibid.*, p. 13; and Friend and Bronfenbrenner, p. 87.
[65] Modigliani and Weingartner, pp. 39-47.

likewise undeflated. The sales errors explain 77 per cent of the variance of the investment deviations.[66] The slope coefficient estimated by the author is 1.0, indicating that each 1 per cent addition to dollar sales relative to the expected level is associated with a 1 per cent increment in capital outlays relative to anticipations; the intercept of 1.5 suggests that, when sales expectations are accurate, actual investment tends to exceed slightly the anticipated level.

Both approaches indicate that the major portion of investment deviations by manufacturers can be accounted for by unanticipated changes in sales. The findings are, however, based on a handful of time-series observations. Additional evidence may be sought in microeconomic data. Several attempts have been made to study the relationship between investment deviations and sales deviations, both undeflated and expressed in percentages, on a cross-section basis. Levine reports that no significant relationship could be found in 1954 McGraw–Hill data. Friend and Bronfenbrenner find very low correlations in Commerce–SEC data for 1947-49; and Foss and Natrella report similar results for 1955. They do not, however, report their estimated slope coefficients.[67] Eisner finds a low but significant correlation coefficient of 0.17 for McGraw–Hill data of 1950. His slope coefficient for all firms in his sample is about 0.7, not much below the unity value estimated from the time-series data.[68]

The other sets of data which produced low correlation coefficients might also yield fair-sized slopes. Capital outlays are more volatile and more sensitive to random influences than are sales at the level of the firm. Consequently the variance of percentage investment errors is higher than that of sales errors. In the aggregate, however, the investment errors of firms appear to show more cancellation. Thus, sales errors may explain only a trivial portion of the investment errors at the microeconomic level and yet explain a substantial fraction of aggregative investment errors.

When firms experience declines in sales which they attribute to a worsening of their competitive position, they tend to invest more than anticipated in an attempt to catch up with their rivals by lowering costs or improving their product lines. Such distress investment may account in part for the large residuals and low correlations found in microeconomic studies of investment deviations and sales deviations.[69] Deterioration of general business conditions does not appear to stimulate distress investment.

[66] Foss and Natrella, "Investment Plans and Realization," p. 16.

[67] Friend and Bronfenbrenner, p. 94; Foss and Natrella, "Investment Plans and Realization," pp. 16–17; and Levine, p. 115.

[68] Eisner, Table 4, p. 176. Eisner works with actual and planned investment as fractions of gross fixed assets. His slope estimate of 0.047 per cent of gross fixed assets is equivalent to about 0.7 per cent of investment.

[69] Friend and Bronfenbrenner, pp. 83 and 94.

The assembled body of evidence clearly suggests that unexpected changes in sales affect the realization of investment plans. However, there is an obvious need for further quantitative research on the nature of the relationship. When firms are able and willing to adjust their outlays, investment will be more sensitive to sales surprises. For example, sales disappointments are more likely to reduce planned investment in new projects than outlays on projects already in progress.[70] Thus the fraction of aggregate anticipated outlays which consists of carry-over projects may be an important determinant of the relationship between the fulfillment of investment plans and the course of sales. The flexibility of investment plans may depend on the initial expectations of firms. For example, Eisner finds that firms which were optimistic about sales at the beginning of 1950 expanded capital outlays above anticipations more vigorously when sales experiences proved even more favorable than initially expected.[71]

Existing knowledge about the investment–sales relationship can probably be utilized only crudely. When the forecaster expects a future level of GNP (or corporate profits) which seems inconsistent with the sales expectations of firms, the intentions on capital outlays should be adjusted. In this manner, the forecaster is relying on the anticipations data but endeavoring to improve on their accuracy by considering the induced effects of probable changes in sales.

Expectations of Capital Goods Producers. Expectations of producers of capital goods are compiled in a semiannual survey conducted by *Fortune* and summarized in the "Business Roundup" section of the June and December issues.[72] Respondents are asked to project their sales of capital equipment to private firms in constant dollars for the four quarters following the survey. The industries covered by the survey account for about three-fifths of the production of producers' durable equipment. Because of the absence of a reliable quarterly price-deflator for producers' durables and the difficulty of isolating the behavior of industries not covered by the survey, precise calculations on its predictive record are not feasible. However, it is clear that the survey did well in 1952-54, forecasting the downturn of late 1953 and the upturn of early 1955 and indicating with approximate accuracy the magnitudes of change. In both 1955 surveys and in the June 1956 survey, the producers were insufficiently optimistic about investment demand. They predicted substantial rises in sales but not so large as the increases which eventuated. On the whole, the anticipations data recorded by this survey have supplied forecasters with a valuable complement to the data on purchase intentions for plant and equipment.

[70] Foss and Natrella, in this volume.

[71] Eisner, p. 176.

[72] See details in "Report . . . on General Business Expectations," pp. 590-594. The author is indebted to Sanford Parker and Todd May of *Fortune* for further information on this survey.

Inventory Investment. Inventory investment is a small, highly volatile and exceedingly important component of GNP. Fluctuations in the volume of nonfarm inventory investment accounted for a dominant share of the movement in GNP during the 1948-49 and 1953-54 recessions. Thus far the behavior of inventories has defied successful explanation by non-expectational variables.

Inventory changes are even difficult to measure *ex post.* Small errors in the recorded volume of total inventories may produce large relative errors in the estimate of inventory change. Moreover, the national product accounts record the value of change in the physical volume of inventories, excluding revaluations of an existing stock due to price changes. Data on the book value of inventories as shown in the balance sheets of firms must usually be adjusted to eliminate the effects of price movement. As more detailed information on stocks becomes available the Department of Commerce often revises the estimates of past inventory investment—sometimes extensively. Thus the forecaster of inventory investment does not have reliable benchmarks on recent trends and current levels of stocks on which to base his projections. This is an extremely serious handicap.

As a component of national product, inventory investment is unique. Except for imputed output, all other components record a flow of final goods and services from sellers to buyers. Inventory accumulation is a residual consisting of the portion of total output which is not acquired by a final user and remains in the hands of sellers or processors. To some extent the excess of production over sales will reflect a planned increment desired by sellers to adjust to recent or expected change in sales. However, inventory investment may also reflect divergencies between producers' actual and expected sales volume, and the empirical data obviously do not permit a breakdown of the actual inventory change into planned and unplanned segments.

Inventory expectations of business firms are reported in quarterly surveys conducted by *Fortune* and by Dun and Bradstreet. Inventory anticipations can shed light directly only on planned accumulations of stocks for some assumed course of sales. However, the surveys include information on sales expectations which may be used as indirect predictors of the probable trend of unplanned as well as planned accumulation. They have been employed in this manner in an ingenious empirical exploration conducted by Modigliani and Sauerlender. According to their highly tentative findings, the change in inventories over a quarterly period is positively related to the expected change in sales over that period and is also positively, but less closely, related to the actual change in sales. The latter finding suggests that production plans in the aggregate are adjusted quite rapidly when sales change.[73]

[73] Franco Modigliani and O. H. Sauerlender, "Economic Expectations and Plans of Firms," *Short-Term Economic Forecasting*, pp. 333-350.

The inventory anticipations data of *Fortune* and Dun and Bradstreet are most directly relevant to the prediction of the monthly series on the book value of manufacturing and trade inventories, which covers 90 per cent of all nonfarm inventories. One would expect that when revaluations due to price changes are taken into account, the changes in the book value series over quarterly periods would correspond closely to the nonfarm inventory investment component of GNP, but attempts by the author to effect such a reconciliation yielded disappointing results. A perfect ability to forecast both price changes and the book value of manufacturing and trade inventories would still leave a substantial margin of error in the prediction of the inventory component of GNP.[74]

Nevertheless, it is instructive to consider briefly the performance of the inventory anticipations. Each quarter, *Fortune* obtains projections on inventories in constant prices for six months and one year ahead from a sample of about two hundred manufacturers. These are blown up into an estimate of aggregate inventory change for manufacturers.[75] Because the projections for one year ahead eliminate the serious problem of allowing for unrepresentative seasonal patterns in the sample, these longer-term predictions have received most emphasis recently in "Business Roundup." Also, in recent quarters, emphasis was placed on quantitative reports by respondents regarding any undesired excess (or deficiency) of their current inventories relative to the present level of sales.

The absence of a reliable quarterly price deflator precludes quantitative appraisal of the predictive record of the survey. But since its inception in mid-1953, the survey has apparently surpassed naïve models in forecasting. The expectations were particularly successful in forecasting the magnitude and timing of inventory disinvestment in 1954 and the relative stability of stocks during most of 1955. Actual increases in inventories during 1956 exceeded the rises expected by manufacturers.

Various aspects of the Dun and Bradstreet quarterly surveys have been thoroughly analyzed by Millard Hastay.[76] For inventory expectations, he uses regression techniques employing diffusion indexes which summarize responses on the actual and expected directions of change. The survey variables perform extremely well in forecasts of the Commerce series on the book value of manufacturing and trade inventories for fourteen quarters, 1949-52. The dependent variable is inventory change over a full year, including the two quarters preceding the survey. The inclusion of two quarters already elapsed undoubtedly contributes to the excellent fit of the data. Multiple correlation coefficients obtained are in excess of

[74] Cf. "Report of the Consultant Committee on Inventory Statistics," *Reports of Federal Reserve Consultant Committees on Economic Statistics*, pp. 445-447.

[75] See "Report . . . on General Business Expectations," pp. 585-590.

[76] Millard Hastay, "The Dun and Bradstreet Surveys of Businessmen's Expectations," *Proceedings of the Business and Economic Statistics Section of the American Statistical Association*, 1954, pp. 93-123, and his paper in this volume.

0.95 for all manufacturers and traders combined, as well as for durable goods manufacturers and for nondurable goods producers taken separately. The results are less satisfactory when the regression equations are used to predict quarterly inventory change, 1953-55. The general pattern of fluctuation is reproduced, but inventory change is consistently overestimated.[77]

From survey data presented in *Dun's Review*, one can construct diffusion indexes of inventory expectations for all manufacturers and traders for twenty-six quarters over the period 1949-56. The author employed the series as the independent variable in a rather crude model where the dependent variable was the change in Commerce's book value of stocks in the two quarters following the survey. The diffusion index explained 60 per cent of the change in inventories, surpassing the performance of naïve models. Residuals were strongly autocorrelated, however, being positive in the early years and negative in the later ones. It is particularly hard to judge how changing prices influence the results.

At present, in forecasting inventory investment, the analyst has little on which to rely with confidence. The achievements of the Dun and Bradstreet data and those of the *Fortune* survey, while encouraging, are inconclusive. With existing evidence, one cannot render a verdict on the usefulness of anticipations data in forecasting inventory investment. Further experience and experimentation are required to form a judgment. The success of capital spending intentions as predictors leads one to hope that expectations data on stocks and sales, properly collected and interpreted, can similarly assist in forecasting inventories.

[77] See "Report . . . on General Business Expectations," pp. 539-548.

Appendix A

TABLE A-1

Data on Household Buying Intentions, 1947-1956

SURVEY DATE	MILLIONS OF SPENDING UNITS OR FAMILIES (1)	PERCENTAGE OF SPENDING UNITS PLANNING TO BUY				MEDIAN PLANNED EXPENDITURE	
		New Car (2)	*Any Car* (3)	*Household Durables* (4)	*All Houses* (5)	*New Cars* (6)	*Household Durables* (7)
		%	%	%	%	$	$
1947 July	48.0			25.00			220
1948 Jan.–Feb.	49.0			24.60	6.05		240
1948 July	49.9			22.50			245
1949 Jan.–Feb.	50.8	9.55[a]	14.72[a]	27.10	6.00	1,990	250
1949 July	51.6		16.30[a]	24.50			270
1950 Jan.–Feb.	52.5	8.90	14.95	26.40	7.05	1,920	290
1951 Jan.–Feb.	52.2	5.30	9.70	24.55	6.30	1,970	300
1952 Jan.–Feb.	53.0	5.55	10.65	21.35	5.40	2,300	290
1953 Jan.–Feb.	53.9	7.45	12.60	29.15	7.20	2,500	300
1953 Sept.–Oct.	48.3[b]		11.70				
1954 Jan.–Feb.	54.0	6.50	11.85	24.95	5.40	2,500	300
1954 June	48.9[b]	8.60	14.70		7.50		
1954 Oct.	49.1[b]	10.40	18.05		8.45		
1955 Jan.–Feb.	54.2	7.70	13.00	26.10	7.60	2,700	250
1955 June	49.7[b]	8.80	15.50		7.15		
1955 Oct.	50.1[b]	9.10	16.00		7.95		
1956 Jan.–Feb.	55.0	7.00	13.15	26.15	7.50	2,810	290

[a] Adjusted for change in classification of respondents in later periods.

[b] Families.

Source: Reports on the January-February Surveys of Consumer Finances in the *Federal Reserve Bulletin*, Board of Governors of the Federal Reserve System, and George Katona and Eva Mueller, *Consumer Expectations, 1953-1956*, Survey Research Center, University of Michigan, 1956, pp. 54, 62, and 76. March 1956 revisions of estimates of median planned expenditures have not been included. All intentions percentages are sum of "will buy," "will probably buy," and one-half of "may buy."

TABLE A-2

Data on Intended and Realized Car Purchases, 1949-1956

SURVEY DATE	INTENDED				REALIZED		
	Spending Units Planning to Buy		*Planned Expenditure*		*New Car Registrations*		*Actual Expenditures on New Cars*
	New Car (M) (1)	*Any Car (A)* (2)	*New Car (N)* (3)	*Any Car (B)* (4)	*Per Month* (5)	*Per Year (P)* (6)	*(Q)* (7)
	(*thousands*)		(*billions*)		(*thousands*)		(*billions*)
1949 Jan.–Feb.	4,851	7,478	$9.65	$14.88	403	4,836	$7.9
1949 July		8,411		16.15	459	5,508	8.7[a]
1950 Jan.–Feb.	4,673	7,849	8.97	15.07	527	6,324	10.2
1951 Jan.–Feb.	2,767	5,063	5.45	9.97	422	5,064	8.8
1952 Jan.–Feb.	2,942	5,645	6.77	12.98	347	4,164	8.1
1953 Jan.–Feb.	4,016	6,791	10.04	16.98	478	5,736	10.8
1953 Sept.–Oct.		5,851[b]		14.63	459	5,508	10.2[a]
1954 Jan.–Feb.	3,510	6,339	8.78	16.00	461	5,532	10.3
1954 June	4,305[c]	7,388[b]	10.76[d]	18.47	552	6,624	12.4[a]
1954 Oct.	5,206[c]	9,063[b]	14.06[d]	24.47	579	6,948	13.7[a]
1955 Jan.–Feb.	4,173	7,046	11.27	19.02	597	7,164	14.4
1955 June	4,474[c]	7,904[b]	12.08[d]	21.34	576	6,912	13.5[a]
1955 Oct.	4,659[c]	8,216[b]	13.09[d]	23.09	527	6,324	12.5[a]
1956 Jan.–Feb.	3,850	7,230	10.82	20.32	496	5,952	12.0

[a] Derived by adjusting cumulated quarterly data on consumer spending for "automobiles and parts," *National Income Supplement, 1954*, and the July 1957 issue, *Survey of Current Business*, Dept. of Commerce, Table 51, line 3 in the four quarters starting closest to the survey date. Annual data were used to eliminate the portion covering purchases of car parts and accessories.

[b] Includes $20,000 for the intentions of secondary spending units.

[c] Includes $10,000 for the intentions of secondary spending units.

[d] Median planned expenditure is that of the nearest annual survey (see text).

Source: *Col. 1*—The product of Table A-1, cols. 1 and 2. *Col. 2*—The product of Table A-1, cols. 1 and 3. *Col. 3*—The product of Table A-1, cols. 1, 2, and 6. *Col. 4*—The product of Table A-1, cols. 1, 3, and 6. *Col. 5*—The monthly average of new passenger car registrations for twelve months folllowing the survey, "Monthly Business Statistics," *Survey of Current Business*. *Col. 6*—Present table, col. 5 times twelve. *Col. 7*—Consumer expenditure on "new cars and net purchases of used cars," *National Income Supplement, 1954*, and the July 1957 issue, *Survey of Current Business*, Table 30, line 61.

TABLE A-3

Data on Intended and Realized Purchases of Household Durables, 1947-1956
(*billions of dollars*)

Survey Date	*Intended* (*H*)	*Realized* (*W*)
1947 July	2.6	7.5
1948 Jan.–Feb.	2.9	7.6
1948 July	2.8	7.2
1949 Jan.–Feb.	3.4	7.3
1949 July	3.4	7.8
1950 Jan.–Feb.	4.0	9.0
1951 Jan.–Feb.	3.8	8.7
1952 Jan.–Feb.	3.3	8.7
1953 Jan.–Feb.	4.7	9.0
1954 Jan.–Feb.	4.0	9.1
1955 Jan.–Feb.	3.5	10.2
1956 Jan.–Feb.	4.2	10.6

Source: *Intended expenditures*—The product of Table A-1, cols. 1, 4, and 7. *Realized expenditures*—Consumer expenditure on major durable household goods. *Annual series*—The sum of lines 27, 28, and 81 of Table 30, *National Income Supplement, 1954*, and the July 1957 issue, *Survey of Current Business*. *Mid-year* surveys—The cumulated quarterly data on consumer spending on "furniture and household equipment," Table 51, were used to interpolate annual data.

TABLE A-4

Data on Intended and Realized Purchases of Houses, 1948-1956

	INTENDED	REALIZED	
SURVEY DATE	*Planned Purchases of Houses* (*J*) (*1*)	*Monthly Starts* (*2*)	*Starts in Year Following Survey* (*S*) (*3*)
	(*thousands*)		
1948 Jan.–Feb.	2,965	78	936
1949 Jan.–Feb.	3,048	85	1,020
1950 Jan.–Feb.	3,701	116	1,392
1951 Jan.–Feb.	3,289	91	1,092
1952 Jan.–Feb.	2,862	94	1,128
1953 Jan.–Feb.	3,881	92	1,104
1954 Jan.–Feb.	2,916	102	1,224
1954 June	4,058	111	1,332
1954 Oct.	4,572	114	1,368
1955 Jan.–Feb.	4,119	111	1,332
1955 June	3,897	104	1,248
1955 Oct.	4,357	96	1,152
1956 Jan.–Feb.	4,125	93	1,116

Source: *Col. 1*—The product of Table A-1, cols. 1 and 5. *Col. 2*—Average number of monthly new housing starts in the twelve months following the survey from "total number of new dwelling units started," *Monthly Labor Review*, Dept. of Labor, Table F-6 or Table F-5 (before December 1954). *Col. 3*—Present table, col. 2 times twelve.

Appendix B

Further Experience with Anticipations Series, 1957–58

The years 1957 and 1958 provide further observations on the predictive value of the anticipations data considered in this paper. This appendix is designed to review the information obtained in the period since the body of the paper was written.

Automobiles. Demand for new cars was weak in the period from 1956 to 1958, with registrations falling from over 7 million new cars in 1955 to just below 6 million in both 1956 and 1957 and then to about $4\frac{2}{3}$ million in 1958. Predictions derived from a naïve persistence model are thus too high for both 1956 and 1958. Predictions of registrations derived from SCF new car buying plans (M, as defined in text) do better, but still overpredict 1958 purchases considerably. Disposable income consistently overpredicts expenditure on new cars for 1956–58 when utilized in the regression equation of Q on Y shown in the text. When the dollar volume of SCF new car buying plans (N) is used with income to estimate new car expenditure, forecasts are somewhat more accurate, but still uniformly too high. Only the regression equation utilizing income-change (ΔY) and buying plans (N) performs well; it achieves a high degree of accuracy for 1956–58. These results are shown in Table B-1, which parallels Table 1 of the text.[1]

TABLE B-1

Comparison of Forecasts of Car Purchases Based on Buying Plans, Income, and Naïve Models, 1956–1958

(*percentage error*[a])

	REGISTRATIONS		NEW CAR EXPENDITURES			
YEAR	*Naïve* ($P_t = P_{t-1}$)	*Regression on M* (*Eq.* 1)	*Naïve* ($Q_t = Q_{t-1}$)	*Regression on Y* (*Eq.* 7)	*Regression on Y and N* (*Eq.* 9)	*Regression on ΔY and N* (*Eq.* 11)
1956	−20	+3	−20	−13	−9	+2
1957	+1	−1	+8	−13	−11	+4
1958	−29	−18	−26	−47	−32	−4

[a] Computed as [(actual-predicted)+actual].

[1] After the regression estimates of the paper were computed, the Dept. of Commerce revised expenditure data on new cars systematically upwards for years since 1950. Expenditure data for 1956–58 taken from the July 1959 *Survey of Current Business* have been adjusted downwards by the author to accord with the unrevised data for earlier years which were utilized in the regression estimates. These adjustments are necessarily crude and hence the percentage errors shown in the table should be taken as approximate.

Household Durables. Expenditures on major household durables (*W*, as defined in the text) showed little variation from 1956 to 1958 and would thus have been predicted very accurately by naïve forecasts. Spending fell by about 1 per cent or $100 million from 1956 to 1957 and again from 1957 to 1958. The simple regression on income (equation 2 of the relevant section in the text) also is accurate with errors of about 0 and 4 per cent in 1957 and 1958, respectively.[2] On the other hand, the regression on SCF buying plans (equation 1 of the text) underpredicts expenditure on major household durables by about 10 per cent in both 1957 and 1958. Results obtained from the use of both SCF intentions and income (equation 3) are slightly inferior to the use of income alone. These observations are consistent with the indications in the text that SCF buying plans for major household durables have not demonstrated significant predictive value in aggregate time-series data.

Residential Construction. Private housing starts fell by 10 per cent from 1956 to 1957 and rose by 15 per cent from 1957 to 1958. Plans to buy homes reported in the SCF survey of early 1957 incorrectly pointed to strong demand for housing. A forecast of starts for 1957 derived from the regression on plans shown in the text would have been 20 per cent too high. In 1958, however, the forecast of housing starts based on the same estimated regression equation is almost perfectly accurate, coming within 1 per cent of the mark. The *Fortune* homebuilders' survey predicted well in both years, running 4 per cent too high in 1957 and about 5 per cent too low in 1958. Its 1957 performance is equaled by the fourth-quarter naïve model, but a naïve forecast based on 1957 IV misses the sharp upswing of 1958. The 1957 and 1958 results thus provide additional evidence of the predictive value of the *Fortune* survey of builders.

Plant and Equipment Outlays. The Commerce–SEC survey of plant and equipment spending extended its impressive predictive record in 1957–58. The annual survey for 1957 indicated a $6\frac{1}{2}$ per cent increase in outlays over 1956. Realized spending was up by over 5 per cent, thus deviating from plans by merely 1 per cent. In 1958, the annual anticipations pointed to a 13 per cent decline in outlays. Actual expenditure fell by 17 per cent or 4 per cent more than plans.

Investment deviations for manufacturing were positively related to errors in sales forecasts for 1957 and 1958, as in previous years. In 1957, capital spending by manufacturing firms expanded by 7 per cent in comparison with a planned increase of 10 per cent. The negative investment deviation of 3 per cent was associated with a 6 per cent overprediction of sales, as manufacturers expected an 8 per cent increase in sales and experienced a rise of only 2 per cent. In 1958, manufacturers planned a reduction of capital outlays of 17 per cent and actually cut back invest-

[2] Again, data for recent years have been adjusted in an attempt to eliminate the effects of systematic Commerce revisions for earlier years.

ment by 28 per cent. Their sales, meanwhile, fell by 8 per cent in contrast with an expected decline of 2 per cent.

First anticipations in the quarterly Commerce–SEC survey predicted well in 1957–58 and called the turning points of 1957 IV and 1958 IV accurately. First anticipations were consistently too high during these eight quarters, however, and their mean deviation of 4 per cent did not match their accuracy in the 1952–56 period. Second anticipations, while generally also too high, had a mean deviation of 2 per cent, equaling their performance for earlier years.

Inventory Investment. The *Fortune* inventory survey had moderate success during 1957–58. Business first reported expected liquidation of stocks in the May 1957 survey, with mild decumulation scheduled over the succeeding four quarters. Similar reports were obtained in the surveys of August and November 1957. Actually, inventory investment turned negative in 1957 IV. At no time did firms predict the massive liquidation of inventories that marked the first three quarters of 1958. In August 1958, they accurately anticipated a cessation of disinvestment in 1958 IV and a return to positive inventory change in 1959 I.

COMMENT

ELMER C. BRATT, Lehigh University

I am in substantial agreement with Okun's paper, and will comment principally on the procedural problem of the use of anticipatory data in a gross national product model. Initial entry of anticipatory data in the form of *ex ante* magnitudes which may be adjusted to obtain estimates of *ex post* values might well be considered an ideal solution. The chief difficulty with this procedure is not the unreliability of forecasts based on anticipations but uncertainty about the weight given the forces over which the decision maker has no control. If anticipations data made clear what related industrial and general business movements were assumed, forecasters could check the assumptions with an analytical model to evaluate their validity. However, we are far from attaining such a model.

Pragmatically, initial entry in the GNP table will involve anticipatory or analytical figures, depending on which are most readily adjusted. Let us consider in this light the various expenditure groups Okun covers.

The use of survey data as the initial entry for consumer durable goods is impractical. Not only does the Federal Reserve figure not become available until March, too late for the model which is usually set up in the fourth quarter of the preceding year, but also expenditures for durable goods are vitally dependent upon disposable income. The relationship to savings should not be expected to be of forecasting value. Generally expenditures for durable goods will be positively related to personal savings because both tend to be positively correlated with disposable income.

Immediately after the war the relationship between disposable income and durable goods sales was vitiated by shortages. One of the most serious mistakes made in postwar forecasts was the assumption that demand would not spill over to nondurable goods; that total expenditures would be held down by unavailability of durable goods. Since then, income changes have proved a good but not infallible guide to the pattern of demand. The acceleration of durable goods sales and disposable income (i.e. second differences) was in the same direction from 1950 until 1956, when disposable income began to accelerate slightly while advance in the sale of durable goods slowed down. Durable goods expenditure and disposable income in current dollars rose together in 1953 and 1955. A slight decline in durable goods was paired with a slight rise in disposable income in 1954, an occurrence readily explained by the recession. The improved position of consumer stocks, especially of automobiles, accounts for divergent movements in 1956.

Under these conditions it seems wise to adopt the recommendation of the Task Force on Consumer Survey Statistics and use consumer durable goods expenditure expected in relation to disposable income as a point of departure. The first adjustment is for the condition of stocks in consumers' hands. This is difficult to estimate, and the Survey Research Center correctly notes that no simple satiation rules apply. Some indication is given by the price of second-hand goods. It is also important to make adjustments, partially qualitative, for changes in replacement demand, models available, dealer margins, and the use of consumer credit. Finally, total adjustments are checked with the indications given by survey data. Okun's conclusion that there is some correlation between the survey indications and the residuals from a regression on disposable income provides some support for this approach.

In the case of residential construction, we must also start with an analytical estimate. It has long been known that disposable income is of little help in forecasting housing starts over the short run. Important assistance is provided by data on household formation. The reference is to total household formation; nonfarm household formation has not been very helpful in recent years because of dynamic factors, such as migration. Contrasting the movement in household formation from March of year one to March of year two with change in starts between the calendar years—in effect assuming starts move with household formation nine months later—we find the direction of movement has been the same each year from 1952 to 1957.

Using a similar lead, total household formation moved with the total deflated dollar value of housing put in place except for a minor variation in 1953. Despite a slight decline in net household formation in 1953 and a leveling of general business activity, a slight increase occurred in housing construction values. The difference may be partly due to the timing of the

effect of household formation. In any case, the value per house should be determined separately.

The relationship described must be looked at in terms of family formation because some hope exists for forecasts of various types of families coming into being. Therefore, in dealing with residential construction, the chief explanatory variables are disposable income, number of households, and the changing size of husband-wife families. Apparently the *Fortune* housing survey figure involves a great deal of momentum, that is, the plans of contractors seem to be principally dependent on the amount of construction they have been doing. The use of these figures remains in an experimental stage.

The survey figures on plant and equipment expenditures can be effectively filled in the model initially, especially since preliminary McGraw–Hill figures become available in the fall. It is important, however, to make adjustments based on analytical estimates. Allowance must be made for the expected movement in investment by new companies, an important factor which is reflected poorly if at all in the surveys. Projective analysis of total activity with respect to turning points is also indicated. Unless or until experience proves otherwise it is prudent to assume that the surveys will reflect the influence of general business conditions most poorly at such times. Particular attention should be given to the firmness of current programs, credit availability, and shifts in the formation of new companies. If a recession occurs, it is important to develop some estimates of the extent to which continued investment in construction projects started in better times actually represents unplanned investment.

Inventory investment is difficult to deal with because of the difficulty of separating the planned and unplanned components. The initial figure in the GNP model is most often best obtained by using a lagged relation to sales—inventories can be expected to increase as sales have increased in the recent past. If a turning point is imminent, the method will breakdown because of unplanned inventory accumulation or run-off. Inventory estimates must then be developed from the pattern of market adjustment expected in various areas. The available breakdown on inventories and sales is rather unsatisfactory, but it may help to indicate the extent and character of unplanned inventory change. Near turning points the most important aggregative method of segregation is through the difference in movement of finished-goods and raw-materials inventories; the latter are generally accepted as planned.

As suggested, the most workable model assumes that inventory investment is planned except when turning points, shortages, or other contingencies intervene. Better information on planned inventories may be forthcoming from surveys of inventory anticipations, and the *Fortune* survey certainly should not be ignored. However, such surveys must still be looked on as experimental.

Currently the use of surveys on expectations is founded largely on the record such data have achieved when applied to actual forecasting. Nevertheless, their principal potential value for forecasting is not the extent to which they provide independent forecasts. Careful analysis, along the lines suggested by Hart and Hastay and perhaps cruder formulations, is essential to an understanding of intentions, anticipations, and outlook variables. Even a rough segregation of the part of anticipated changes which is due to intentions from the part dependent upon influences over which the decision maker has no control would represent a major step forward. Also, we need sharper theoretical formulations to explain the relation of intentions to economic change. Economic changes could be employed more effectively in economic analysis if better understood in terms of the measurable aspects of prevailing expansionary and contractionary movements. We would then have a firmer basis for introducing the outlook effect. These problems are of vital importance in practical forecasting work.

GEORGE KATONA, Survey Research Center, University of Michigan

There is apparently some disagreement about the function of survey data on consumer attitudes, expectations, and intentions. Therefore it appears useful to recapitulate the position of the Survey Research Center.[1]

When we ask consumers, in sample interview surveys, whether during the next year they expect to buy a car, expect prices to go up, or expect good or bad times for the country as a whole, we are not interested in their forecasts but in their general "sentiment." We want to find out whether they feel more or less confident, optimistic, or secure than they did six or twelve months earlier when other representative samples were asked the identical questions. We collect this information because we postulate that consumer demand depends on willingness, as well as on ability, to buy.

A conclusion that consumer willingness to buy has increased or decreased is justified if successive surveys disclose consistent and significant changes in several relevant attitudes and expectations. Having observed changes in the state of confidence of the universe (from which the sample was drawn), we expect that concomitant changes in the behavior of the universe are taking place.

Studies of the origin of changes in consumer attitudes indicate that the relative importance of financial factors (ability to buy) and psychological factors (willingness to buy) varies from time to time. Sometimes attitude

[1] For a further statement, see George Katona, *Psychological Analysis of Economic Behavior*, McGraw-Hill, 1951; George Katona and Eva Mueller, *Consumer Attitudes and Demand, 1950-52*, Survey Research Center, University of Michigan, 1953; George Katona, "The Predictive Value of Data on Consumer Attitudes," *Consumer Behavior, Volume II*, New York University Press, 1955; and George Katona and Eva Mueller, *Consumer Expectations, 1953-56*, Survey Research Center, University of Michigan, 1956.

changes conform with changes in income and business activity. At other times, however, attitudes change autonomously. For instance, in June and October 1954, following a slight recession and at a time of stable personal incomes, changes in economic attitudes and expectations indicated an improvement in consumer willingness to buy. Divergence between income and attitude trends appeared also in 1949, 1951, and 1957.

The primary reason for collecting data on psychological factors influencing behavior is to improve the diagnosis of the prevailing situation.[2] Psychological data have predictive value only if we assume that nothing "new" will take place during the forecast period. Government and business action may have consequences which will contradict the indications derived from consumer attitudes. In addition, consumer sentiment may undergo changes (though past findings indicate that the attitudes and expectations of broad groups of people, unlike those of individuals, rarely change abruptly except under the impact of major events).

Expectations relating to the respondent's own financial situation or actions, and expectations regarding the economy as a whole, both reflect the respondent's sentiment. (Okun presents a different view in his paper.) There are situations in which personal financial expectations are favorable in spite of a general *malaise*; then general business expectations often provide valuable additional information about what influences behavior. Expressed intentions to buy differ from personal expectations only insofar as there are some people who at the time of a survey have already placed an order for a new car, or who have discussed the question with their families and are firmly resolved to proceed with the purchase within a short time. But the question—"Do you people expect to buy a car during the next twelve months?"—was intentionally formulated to elicit affirmative answers not only from "planners" but also from people who evaluate the prospect of purchase optimistically.

In order to validate data on consumer attitudes or expectations, the behavioral concomitants of changes in attitudes and expectations need to be analyzed separately for each available observation. This procedure, based on a small number of independent observations, has been carried out graphically by the Survey Research Center. It is also possible to experiment with more rigorous tests which consider all available observations jointly by comparing changes in attitudes, expectations, and intentions, with (1) changes in aggregate consumer behavior (especially purchases of durable goods) at the time of the survey (i.e. both shortly before and after) and (2) changes in aggregate consumer behavior after the survey.

Tests comparing expressed attitudes, expectations, and intentions with

[2] George Katona, "Federal Reserve Board Committee Reports on Consumer Expectations and Savings Statistics," *Review of Economics and Statistics*, February 1957, p. 41; and George Katona, Appendix C to *An Appraisal of Data and Research on Businessmen's Expectations*, Board of Governors of the Federal Reserve System, September 1955, pp. 177 ff.

recent past and subsequent behavior "can be carried out at the aggregate as well as at the individual level. Both kinds of tests are needed and are useful."[3] To make individual tests, one must interview the same sample at least twice, and preferably several times. If only two interviews are available, one can test the rate of fulfillment of expressed intentions to buy. In attempting to test differences in subsequent behavior of people who are initially optimistic and pessimistic, however, a timing problem arises. Among the optimists, some may have bought durable goods shortly before the measurement of attitudes and may not buy any for some time thereafter. Expenditures on automobiles may show a negative serial correlation because many more people buy a car every two or every three years than every year. When three consecutive interviews with identical people (panels) are available, it is easier to solve the timing problem, as well as to test the predictive value of changes in attitudes. Extended panel studies, moreover, may enable us to make several individual tests, rather than one, to test hypotheses about differential effects in different circumstances.

Even if panel studies are available, individual tests face difficulties. Aggregative tests may yield statistically significant correlations while individual tests conducted at the same time show only small differences between attitude groups (in the expected direction).[4] Most demographic, inventory, and personality variables vary so little in the aggregate over short periods that they can be considered noise or nuisance variables in short-run prediction. In small sample re-interview studies there may be so much noise from other variables that it becomes difficult to tell whether the important predictive variables do or do not have the expected relation to behavior. (This difficulty is increased by the fact that attitude data collected from individuals are more affected by reporting errors than are group data.)

The Survey Research Center, being greatly interested in the re-interview both for individual tests and for other methodological reasons, has carried out two re-interview surveys in connection with the SCF (in 1948-49 and 1952-53). Both studies were used for investigating the validity of expressed intentions to buy.[5] Neither is suitable for constructing an index of attitudes and for carrying out individual tests with attitudes or expectations other than intentions to buy. First, the SCF (in contrast to the periodic surveys conducted by the Center) includes too few of the crucial expectations

[3] Katona and Mueller, *Consumer Expectations, 1953-56*, p. 2.

[4] Cf. Okun's statement, made in reference to the SEC–Commerce Department surveys, that "All aggregative economic relationships that display any stability over time perform far better than their microeconomic counterparts." See also Eva Mueller, "Effects of Consumer Attitudes on Purchases," *American Economic Review*, December 1957.

[5] J. B. Lansing and S. B. Withey, "Consumer Anticipations: Their Use in Forecasting Behavior," *Short-Term Economic Forecasting*, Studies in Income and Wealth, Vol. 17, Princeton University Press for the National Bureau of Economic Research, 1955; and L. R. Klein and J. B. Lansing, "Decisions to Purchase Consumer Durable Goods," *Journal of Marketing*, October 1955.

questions.[6] Secondly, there is too long an interval—one year—between the two interviews. Finally, people who in the course of the year changed their residence are excluded. Consequently since movers purchase more durable goods on the average than nonmovers, the crucial variable, expenditures on durable goods, is underrepresented.

The Survey Research Center has endeavored for many years to carry out panel studies characterized by (1) several successive interviews with the same representative sample, (2) interviews conducted at six-month intervals, and (3) interviews including as many movers as possible. This was made possible in 1954 through a grant by the Ford Foundation. Data collection for the panel was finished in the spring of 1957. The results of the first attempts at carrying out individual tests using a comprehensive index of consumer attitudes have been presented to this Conference by Eva Mueller. As stated by Miss Mueller, the work on individual tests is far from completed.

Okun refers, with approval, to a statement of mine written a few years ago which said that no definite judgment is as yet possible about the relative predictive value of buying intentions and other attitudes. He goes on, however, to say that on the basis of currently available evidence the forecaster cannot have the same confidence in measures of consumer attitudes as he may have in intentions data. I believe that this is an incorrect conclusion. I submit Miss Mueller's calculations (in this volume) on the relations between attitudes and aggregates sales of durable goods (rather than the sales–income ratio) as one important piece of evidence.

A second piece of evidence became available in 1957. According to the June 1957 periodic survey of the Survey Research Center, data on buying intentions (especially for automobiles) were about as frequent at that time as a year earlier. But data on attitudes and expectations toward personal finances, business conditions, and market conditions showed a substantial and statistically significant decline during the first half of 1957. The Center published these findings in July 1957 under the title "Consumer Optimism

[6] For instance, the 1952-53 SCF re-interviews contain only two clearly usable attitude questions—"Are you better or worse off than a year ago?" and "Is this a good or bad time to buy durable goods?" Neither of them refers, however, to expectations. A further question asks about one-year income expectations. This question is insensitive to changes in feelings and attitudes (see Katona and Mueller, *Consumer Attitudes and Demand, 1950-52*, pp. 69ff.) and has therefore been excluded from our attitude surveys. The question used in those surveys—"Do you think that a year from now you people will be better off financially, or worse off, or just about the same as now?"—differs from the income expectation question, even though it is the least sensitive component of our index. It is not possible to construct a comprehensive index of attitudes from the 1952-53 survey questions. It is therefore to be regretted that Okun refers to Tobin's study of the 1952-53 re-interviews to support his notions about the function of "other expectations and attitudes." Since the 1952-53 SCF surveys did not contain sufficient data (except on intentions to buy), Tobin's analysis of "other expectations and attitudes" is entirely inconclusive on this point.

Weakening."[7] Thus changes in consumer attitudes rather than in buying intentions proved early indicators of forthcoming purchase trends. It does not follow, of course, that this will always be the case. Studies of the predictive value of consumer attitudes and intentions will have to continue.

ROBERT EISNER, Northwestern University

It may be useful to analyze further the theoretical basis for Arthur Okun's interesting consideration of observed relationships between deviations of realized from planned investment and deviations of realized from expected sales. Working from the acceleration principle, if we assumed instantaneous adjustment of capital stock to sales, both anticipated and realized, we would write:

$$K_t^e = b(S_t^e) \tag{1}$$

and

$$K_t = b(S_t) \tag{2}$$

where K equals capital stocks, S equals sales, the superscript e indicates that the variable is expectational, and b is the desired capital to sales ratio which, it is presumed, businessmen also realize. The subscript t indicates the end of the time period for the stock variable, K, and the interval over which the volume or rate of flow is measured for flow variables like S (and I, below). Subtracting equation 1 from equation 2 and then dividing by equation 1 gives the following result:

$$\frac{K_t - K_t^e}{K_t^e} = a'\left(\frac{S_t - S_t^e}{S_t^e}\right) \tag{3}$$

where a', of course, equals one.

But the slopes which Okun reported related not to the percentage deviation of capital stocks but to the percentage deviation of actual from anticipated *investment*. If depreciation or capital consumption is unaffected by the deviation between actual and expected capital stocks (as may reasonably be assumed, at least as an approximation), we can substitute $I_t - I_t^e$ for $K_t - K_t^e$, where I denotes gross capital expenditures. Hence, since a' equals one we can, after substituting and multiplying both sides by K_t^e/I_t^e write

$$\frac{I_t - I_t^e}{I_t^e} = \frac{K_t^e}{I_t^e}\left(\frac{S_t - S_t^e}{S_t^e}\right) \tag{4}$$

Thus the long-run slope would equal K_t^e/I_t^e, which is of course far above the values, in a rather wide neighborhood of unity, noted by Okun.

[7] "Consumer Optimism Weakening," mimeographed report issued by the Foundation for Research on Human Behavior and the Survey Research Center, University of Michigan, July 1957.

Offering a rough estimate based on the 1950 investment to 1949 gross fixed asset ratio of 0.088 which Okun culled from my own study, this slope would have an order of magnitude of ten or eleven.

But if we are concerned not with the ultimate adjustment of capital stock to a change in sales but with the adjustment of capital stock within a specified period, equation 4 does not carry us very far. For the crucial question becomes the dynamic one of speed of adjustment and, in large part, the estimate of distributed lags in the investment function or the partial accelerator coefficients of the Hicksian Trade Cycle model.[1] Slope coefficients of the variety noted by Okun which had a value of unity, for example, would then reflect merely the fact that roughly one-eleventh of the total adjustment took place in the time period defined.

My estimates indicate slopes of the regression of $(I_t - I_t^e)/K_{t-1}$ on $(S_t - S_t^e)/S_{t-1}$ of 0.047 for all firms and the interestingly higher 0.093 for firms which had expected an increase in sales.[2] These may be converted to approximately 0.7 and 1.4 in Okun's regression. In the course of further work with more recent McGraw–Hill surveys, I hope to secure a number of more reliable estimates, for different years and different categories of firms, of this important adjustment relationship with which Okun is concerned.

EVA MUELLER, Survey Research Center, University of Michigan

Arthur Okun refers repeatedly to the "divergence" between the results of his aggregative test and mine. In part this divergence is due to differences in what he and I consider the most appropriate forecasting period. Okun relates attitudes and buying plans to purchases in the two quarters following the quarter in which a survey was made, even if the survey was completed at the beginning of a quarter. In the "October 1954" survey, for instance, most of the interviews were completed by the middle of October. Yet Okun relates attitudes as of that time to purchases in the first half of 1955, ignoring the crucial fourth quarter of 1954. In my calculations, where surveys were taken at the beginning of a quarter, purchases in the current and the following quarter were used as the dependent variable.

Yet this timing problem is not the real issue here. Coefficients of determination below 0.40, based on only eleven time-series observations, are far from being statistically significant. And the same holds for small differences between several coefficients of that order of magnitude. Hence where D/Y is used as the dependent variable, no conclusions can be

[1] Cf. L. M. Koyck, *Distributed Lags and Investment Analysis* (North-Holland, Amsterdam, 1954) and my own "Expectations, Plans and Capital Expenditures: A Synthesis of Ex Post and Ex Ante Data," *Expectations, Uncertainty, and Business Behavior*, Mary Jean Bowman, ed., Social Science Research Council, 1958, and "A Distributed Lag Investment Function," *Econometrica*, January 1960.

[2] Eisner, Chap. XII, Table 4.

drawn about the relative forecasting value of attitudes versus buying plans or of Okun's selection of a forecasting period versus mine.

The real point of difference between Okun's tests and those of the Survey Research Center is that in our opinion the relation of attitudes to D or ΔD is a more valid test of the forecasting value of attitudes than the relation of attitudes to D/Y (see the discussion in my paper). When D or ΔD is used as the dependent variable in the aggregative test, consumer attitudes (excluding buying plans) consistently explain a much larger part of the variance than buying plans. Moreover the tests based on D and ΔD yield higher correlation coefficients and also larger differences between the coefficients of determination for consumer attitudes and for buying plans than do any of the tests using D/Y. To be sure, with only eleven observations even relatively large coefficients of determination must be regarded as highly tentative.

Regarding the cross-sectional test, Okun's statement that "cross-section results are relevant and these point uniformly toward a negative evaluation of consumer anticipations data other than plans to buy" is hardly warranted. The data presented in my paper show a weak (and hence statistically not significant) relationship between attitudes and spending for three separate periods of time—consistently in the expected direction. Taking one period at a time, the probability that this relationship could have arisen by chance is too great to permit a conclusion (at conventional confidence levels) that attitudes of individuals influence their spending. However, the repetition of the relationship in three periods considerably reduces the likelihood that this is a chance occurrence. In statistical terminology, in guarding against an error of Type I (mistaken rejection of the null hypothesis), we must not fall into an error of Type II (mistaken acceptance of the null hypothesis). The best available evidence at the microeconomic level suggests that consumer attitudes other than plans to buy do have some influence on subsequent discretionary spending, although further studies are needed to substantiate present findings.