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### The Value of Anticipations Data in Forecasting National Product

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The Value of Anticipations Data in Forecasting National  
Product

Arthur M. Okun

October 8, 1957

Prepared for Conference on the Quality and Economic  
Significance of Anticipations Data  
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In this paper, the anticipations data are related to the problem of forecasting Gross National Product, and individual sections of the paper are devoted to particular components of GNP. As a result there is a strong tendency to slight anticipations data which may throw important light on trends in financial markets, employment levels, and on the level of sales and production of particular industries, simply because these data do not fit neatly into the framework of the income and product accounts. The task of relating such variables to the GNP framework is challenging and deserves a high priority in research. Moreover, for many purposes, forecasts of these variables are as keenly desired as predictions of GNP. These problems are ignored here merely to restrict the already broad scope of this study.

#### Potential Uses 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. Anticipations data lend themselves to processing in a variety of ways. First, the forecaster is free to eliminate any bias that he judges to be present in the series: if the evidence suggests that, in reporting its expectations, some group in the economy typically overestimates its prospective income or expenditure, an appropriate adjustment may be made. The expressed anticipations may be poor predictors in their raw state and yet be valuable when transformed so as to eliminate bias. Expectational data can be useful so long as they bear some systematic relationship to forthcoming trends and the nature of that relationship is determined. Secondly, anticipations relating to one economic variable may provide insight into the probably future behavior of some other variable. As a hypothetical example, 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. There are many less extreme cases where anticipations data might be applied to the forecast of some variable other than the one for which it was primarily intended by the person expressing the expectation. Such auxiliary uses of an anticipations variable may prove very fruitful even when the series is not helpful in its presumptive primary use. Thirdly, anticipations data are efficiently utilized as complements, not substitutes, for non-expectational economic data. The task is to enlarge the fund of information on which forecasts are based. In pursuing this task, the forecaster must apply his ingenuity and analytical skill to find useful combinations of the various available series.

These considerations point to the variety of ways in which anticipations data may be employed in forecasting. Because of the multitude of possible uses, it is exceedingly dangerous to render an overall judgment concerning the predictive value of any expectational variable. Any investigator rash enough to declare that a series has no value in forecasting 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 concerning any series 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 various types of data is inherently a risky business. Any evaluation should be advanced, and interpreted, as being tentative and as resting on a pragmatic foundation.

### The Character of the Data

In an assessment of the pragmatic foundations for the usefulness of anticipations data, it is necessary to consider the nature of the data that are to be appraised. In the discussion below, anticipations data are taken to consist of series which are forecasts of an economic stock or flow, which are expressed by operating units in the economy, and which are not usually recorded in the normal course of economic activity. The last proviso excludes various series on new orders, contract awards, and commitments, since these are part of the records of bona fide transactions.\*

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\* It should be emphasized that no invidious comparisons are intended by this definition. Obviously, new orders and related series may have much to contribute to economic forecasting.

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In effect, the above definition restricts the scope of the term anticipations data to information derived from direct questions about economic expectations asked of persons holding decision-making positions in producing or consuming units. Such information 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. However, these limitations are not peculiar to the collection of expectational data. Survey data on non-expectational variables have been widely and profitably employed in economics and in other behavioral sciences. It seems highly unlikely that the potential value of anticipations data would be nullified by limitations associated with the collection of the information. Furthermore, the general agreement of results in independent efforts to collect expectational data on similar variables suggests that usable measures of economic anticipations

have been collected by survey methods.

#### Some Analytical Considerations

Given that the anticipations of various economic units can be determined with reasonable accuracy, one should review the analytical reasons for believing that such anticipations are likely to have predictive value. In this connection, it is useful to distinguish among various types of anticipations. Some of the expectations concern variables which are internal, relating directly to the future course of the economic experience of the respondent. Expectations concerning flows of receipts or of outlays by the particular reporting unit fall into this category. On the other hand, some expectations series are external, recording the respondent's forecasts of the experience of other units or his views on the outlook for the economy as a whole.

On a priori grounds, one must be skeptical of the direct predictive value of external expectations. It would be astonishing if businessmen's or consumers' forecasts of general business conditions presented direct evidence on the future course of GNP. 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.\*

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\* On more limited matters, such as the probable course of activity in his industry, the businessman may have a direct contribution to offer because of his insight or because of expert advice from his professional staff.

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In one sense, there is a statistical appeal to giving some weight to 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 stipulated above is likely to be fulfilled: the amateur may not be better informed than the naive model, and the views are likely to exhibit strong interdependence. Nevertheless, expectations about external variables may have profitable auxiliary uses in giving the forecaster some insight into the probable economic behavior of the groups which express particular expectations. However, in many instances, plausible cases can be made for conflicting hypotheses regarding the effect of outlook anticipations on subsequent behavior. For example, firms expecting a period of strong inflation may wish to add to their inventories for speculative purposes; on the other hand, their present inventories may reflect these price expectations so that, unless the inflationary trends materialize, they will wish to reduce their inventories. Here 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 internal anticipations. Expectations regarding purchases or sales of goods and services by the responding economic unit are the chief internal anticipations considered in this paper. The predictive value of such expressed anticipations depends on whether the respondent has an articulated plan of action which he reports accurately in the survey; whether he has the power to fulfill his plan; and whether, and in what manner, he is likely to revise the plan voluntarily in

the light of later information about the economic environment.

There can be little doubt that firms have selling plans and various buying plans of a more or less specific variety. The requirements of rational decision-making force business management to think ahead in terms of its expected volume of sales, its production needs, and its input requirements, at least over a short-term horizon. Households are also likely to make tentative decisions somewhat in advance regarding any major purchases, other than emergency outlays, and any forthcoming changes in the supply of labor services.

Internal anticipations cannot be realized if the opportunity locus of the economic unit excludes the planned action. In the inflationary spurts of the past decade, unsatisfied excess demand for goods and services has caused frustration of buying plans against the will of prospective purchasers. The unavailability of expected means of financing planned purchases would have the same effect. Apart from these factors, buyers presumably have a wide range of power to fulfill intentions to acquire a bundle (or unit) of commodities. However, buyers are normally price-takers and cannot control prices: in order to acquire the specific items on their shopping lists, they have to permit their dollar outlays to diverge from the expected level whenever there are unforeseen movements in prices.

Where markets have some imperfection, firms can realize their expected physical volume of sales by permitting their prices to vary; alternatively they can maintain their planned prices, but then physical sales may diverge from plans. Actual prices and quantities can both correspond with plans only if the firm has accurately forecast the demand for its products. Since firms are typically price-makers and treat price as the decision variable, any error in the projection of demand will be ini-



tially reflected in a divergence of physical sales from expectations. Ideally, one should like to have data on the anticipations of both buyers and sellers of a product. When the plans appeared incompatible, 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 the disparate expectations. In the absence of such a complete record of plans, it would appear that, because of the usual control of prices by producers, the plans of sellers are likely to be particularly helpful in forecasting the short-term course of prices, while those of buyers can aid most in the prediction of the volume of sales at a given assumed level of prices. If, however, excess demand is present in markets, buying intentions probably can supply only minor assistance in quantitative forecasting.

Even when the fulfillment of internal anticipations is feasible, buyers and sellers may wish to deviate from their expected actions in light of more recent information about the environment. Presumably, the possibility of plan-revision detracts from the predictive value of data on internal anticipations. 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 complex set of pre-determined variables **affecting behavior**, its feasible intentions would be regularly fulfilled. In such a case, behavior would correspond with previously reported intentions simply because behavior was insensitive to contemporaneous events. Over the short-run, actions could be considered exogenous. However, it seems quite unreasonable to expect such a pattern of behavior. Plans are made on the basis of certain assumptions about the state of the world in which

the planned actions are scheduled. To a large extent, these assumptions are forecasts of external variables. If they prove erroneous, the motivation for revising plans is clear. Intentions are undoubtedly subject to change; yet, they seem likely to have substantial predictive value. Survey data can provide information on the assumptions about external variables underlying the reported intentions. With such information, the forecaster can evaluate the likelihood that plans are based on expectations which are excessively optimistic or pessimistic. The cost of reconsidering and revising plans can be expected to produce some inertia in tentative decisions. But, 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 the way in which economic units are likely to revise their plans when the state of the environment deviates from their expectations. This is not an easy task but it does hold promise as one means by which insight into the future course of the economy can be increased.\*

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\* For other theoretical explorations, from which the discussion above has benefited, see "Report of Consultant Committee on General Business Expectations" in Reports of Federal Reserve Consultant Committees on Economic Statistics (Washington, 1955), pp. 506-508, 675-76; Irwin Friend, "Critical Evaluation of Surveys of Expectations, Plans and Investment Behavior" (unpublished paper presented at the Conference on Expectations, Uncertainty and Business Behavior, 1955), pp. 1-2; Franco Modigliani and Kalman J. Cohen, "The Significance and Uses of Ex Ante Data" (unpublished paper, 1956).

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### Consumer Expenditure

In the past twenty years, the literature of economics has contained the results of a multitude of quantitative research explorations designed to explain and to forecast aggregate consumer expenditure in terms of non-expectational variables. In these studies of the consumption function, disposable personal income is generally included as an explanatory variable; many studies have also incorporated certain pre-determined 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; the usefulness of the anticipations data as predictors depends on their ability to complement the non-expectational variables in explaining the observed variation in consumer spending. This section attempts to survey the available analytical and empirical evidence concerning the ability of anticipations data to serve in this capacity. Buying intentions are considered first and in most detail; then other expectational data are reviewed.

#### Intentions data: the role of durable goods

In the intentions data collected from consumers, plans to buy durable goods receive primary emphasis. Most individual durable goods are items which involve a substantial expenditure, which are infrequently purchased by any single household, and which (unlike large medical outlays) generally present to the consuming unit considerable latitude in the timing of acquisition. These characteristics provide strong analytical reasons for the belief that many households may plan their purchases of durable goods well in advance of the date of purchase and may be able to offer accurate information in

interviews regarding the probable course of their future behavior.\* It is

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\* See the discussion in George Katona, Psychological Analysis of Economic Behavior, (New York, 1951), pp. 64-69; F. Thomas Juster, Expectational Data and Short-term Forecasting (unpublished Ph.D. thesis, Columbia University, 1956), pp. 63-66.

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quite possible that households could report on the prospective trend of some purchases that have lower unit cost and are made on a recurring basis; e.g., the decision of an apartment occupant to assume tenancy of larger quarters must be made some months prior to moving. Yet, plans to buy durable goods hold a virtually monopolistic position in studies of household intentions, largely because of the belief that spending on durable goods is highly volatile and accounts for a significant portion of the variation in aggregate consumer expenditure that cannot be accounted for by the non-expectational variables. If a high level of durable goods purchases, relative to income and other variables, was normally associated with an offsetting low level of spending on non-durable goods and services, then a perfect 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 intentions to buy 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 non-expectational explanatory variables.\*\* This may be

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\*\* See Juster, op. cit., 19-27; John B. Lansing and Stephen B. Withey, "Consumer Anticipations: Their Use in Forecasting Consumer Behavior," in Short-Term Economic Forecasting (Studies in Income and Wealth, XVII; Princeton, 1955), p. 387.

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put formally in the following way. Consider personal saving (S) and durable goods expenditure (D) as functions of disposable income (Y) and other non-expectational variables ( $X_1 \dots X_n$ ) and let  $u_1$  and  $u_2$  represent the error terms in the respective relationships. Thus,

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

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

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:

$$3) u_{1t} = -a u_{2t} + u_{3t}$$

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.

The procedure under discussion is equivalent to the use of consumer expenditure on goods as an added independent variable in the saving function. In equation 2) is used to eliminate  $u_{2t}$  from equation 3) and if the resulting expression is substituted for  $u_{1t}$  in equation 1), the following relationship is obtained:

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

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:

$$5) \frac{S}{NP} = .419 \frac{Y}{NP} - 1.19 \frac{D}{NP} - 274 \text{ (in 1947 - 49 dollars).}$$

The coefficient of determination ( $R^2$ ) is .72. The inclusion of durables as a variable leads to a substantial improvement over the usual saving - income relationship which excludes durables, it eliminates sixty per cent of the unexplained variation in the saving - income relationship. The standard error of estimate (adjusted for degrees of freedom) is lowered from 23 to 15 dollars.\*

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\* The expenditure and income data are taken from the 1954 edition of National Income and from the July 1956 issue of Survey of Current Business. Years prior to 1948 were omitted because of the prevalence of excess demand for consumer durables during the immediate post-war period. The saving-income relationship for quarterly data of 1948-55 is:

$$6) \frac{S}{NP} = .248 \frac{Y}{NP} - 242 \text{ with } r^2 = .32.$$

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

$$7) \frac{D}{NP} = .143 \frac{Y}{NP} - 27.$$

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It is interesting that 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 consumer durables is simply additive to total consumer expenditure. These findings suggest that the efforts to predict the propensity to buy durables are potentially

capable of contributing substantially to the success of forecasts of overall economic activity. At the same time, the findings do point to sizeable unexplained variation 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. This bit of evidence may serve as a further reminder that the durables component is not the sole contributor to the variability of consumer behavior. Nevertheless, during the post-war years, any information by which durables expenditure could have been successfully forecast would have materially improved the forecasts of aggregate consumer spending. It must therefore be asked whether survey data on the intentions of households to buy durables contain information which might be utilized profitably to forecast total spending on durable goods.

Empirical findings: time-series data

The Survey of Consumer Finances has produced an annual series of intentions to purchase automobiles and household appliances. In addition, since 1953, a number of periodic surveys conducted by the Survey Research Center have added to the available intentions data. The material below attempts to evaluate the success of the intentions data in forecasting aggregate purchases of these durable items, as recorded in the national income accounts. It is immediately obvious that an aggregative "blow-up" of plans to buy reported by respondents in the surveys is a hopelessly poor forecaster of total purchases. Intended purchases of household appliances and, to a lesser extent, of new automobiles run substantially below realized purchases. These facts do not detract from the potential predictive value of the intentions data: the usefulness of plans to buy in forecasting

depends on the extent of their relationship to realized purchases. A one-to-one relationship is certainly not a requirement nor is it necessarily superior to, say, a two-to-one relationship.

In a number of published appraisals of the predictive value of intentions data, the direction and magnitude of change in intentions to buy from one year to the next are compared with the change in actual purchases.\* Because of its

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\* See George Katona and Eva Mueller, Consumer Expectations, 1953-56 (Ann Arbor, Mich., 1956), pp. 57-60; Irving Schweiger, "The Contribution of Consumer Anticipations in Forecasting Consumer Demand," Short-Term Economic Forecasting, pp. 466-70; "Report of Consultant Committee on Consumer Survey Statistics," pp. 302-7.

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concentration on changes, **this technique** has the merit of departing sharply from the search for a one-to-one relationship between plans and purchases. However, there are limitations in any method that restricts itself to adjacent years in the consideration of the **intentions - purchase** relationship. The technique of paired comparisons ignores potentially useful information from earlier years. In particular, one unsuccessful survey may well produce two poor forecasts, if the method is strictly followed. Suppose that intentions of one year are markedly below those of the year preceding, and yet purchases rise. If, in the next year, intentions rise to a level intermediate between that of the first and second year, the technique of paired comparisons implies a prospective further rise in purchases for the third year on the evidence of the increase in plans to buy over the second year. Thus, the fact that plans to buy are lower than in the first year is ignored.



Usually, it would seem preferable to attach some weight to the relative levels of plans and purchases during the first year.\* Furthermore, there are compelling

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\* If, however, there is reason to believe that the relationship between intentions and purchases is changing over time, 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.

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reasons to question the emphasis on direction of change which is sometimes associated with the technique of paired comparison. The limitations and potentialities of survey data create no presumption that intentions of households are likely to discriminate a forthcoming 5% increase in durables spending from a possible 5% decrease more successfully than from the alternative possibility of a 15% increase. Nor, incidentally, 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, and it is this technique which is adopted below to appraise the predictive value of the data on intentions to buy durable goods.

Because of the small number of observations available, results that could be established as statistically significant at the customary five per cent level were not anticipated and were, in fact, not obtained. Furthermore, as expected, 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 or even by disposable income and intentions. In samples of 3,000 (or, for the periodic surveys, of about half that size), sampling error alone would be responsible for a considerable amount of unexplained variation in spending even if the intentions of the entire population were perfectly correlated with subsequent purchases. Furthermore, it is unreasonable to expect that the intentions of all households would approach perfect accuracy in foreshadowing the movement of durables spending. Despite these limitations, the results are encouraging, particularly in the case of autos. They indicate that, over the period of observation, intentions were positively related to the volume of purchases in the succeeding year both for autos and household items, and that, in the case of autos, the knowledge of the Survey Research Center's data on plans to buy was complementary with disposable income in explaining purchases.

#### Auto intentions and purchases

Respondents in each of the annual Surveys of Consumer Finances have been asked whether they expected to purchase an automobile during the subsequent year. In addition, responses on buying plans for autos were obtained in several periodic surveys conducted since 1953. During the early post-war years, new automobiles were clearly in excess demand. Since output was supply-determined well into 1948, there is no reason to expect buying plans to have predictive value, and hence the intentions series considered here takes 1949 as the first observation. The seven Surveys of Consumer Finances covering 1949-1955 yield observations on plans to buy. In addition, the intentions recorded in the periodic surveys of June and

October 1954 and June and October 1955 are included. In all, there are thus eleven observations on intentions to purchase new cars. In two further surveys, the periodic survey of September - October 1953 and the mid-year Survey of Consumer Finances of July 1949, responses on intentions to buy any auto (whether new or used) are reported, but no breakdown is offered. These two additional observations bring the total for "all car" intentions to thirteen. 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\*: should they be included among the intended purchasers? All studies to

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\* Lansing and Withey, op. cit., p. 416.

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date have lumped together groups one and two as prospective buyers; but the third category ("may buy") has been treated in three different ways: it has been grouped with classes 1 and 2 and included among prospective purchasers; it has been added to the class of prospective non-purchasers; and it has been added with one-half weight to the group of prospective buyers.\* All three of

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\* Katona and Mueller, op. cit., p. 94

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these methods were tried by the author in the regressions reported on below; the alternative methods produced a photo finish. By a trivial margin, the inclusion of "may buy" respondents with one-half weight yielded the best results,

and, for lack of a better criterion, it is generally employed in this study as the measure of intended purchases.\* Nevertheless, what seems important

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\* There is some 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, op. cit., pp. 418, 435-36 (Tables 23, 24, 53, and 55); and Robert Ferber, Factors Influencing Durable Goods Purchases (Urbana, Ill., 1955), pp. 44-46.

is that the percentage of respondents in the "may buy" category is sufficiently well-behaved over the sample data to render the cutting-point problem insignificant for the purposes of this inquiry.

The Surveys of Consumer Finances report percentages of spending units in the various intentions categories. The periodic surveys report the results in terms of families rather than spending units, but the data on auto intentions have been rendered comparable with those of the annual surveys by use of a technique suggested by the Survey Research Center,\*\*and applied by the author.

\*\* Katona and Mueller, op. cit., p. 59 note.

When the percentage of spending units classified as "intenders" is multiplied by the number of spending units in the economy, a measure of planned auto purchases is obtained. The percentage of intenders is here taken to be those spending units reporting in the survey that they definitely or probably will buy plus one-half of those reporting that they may buy. Thus the intentions

variables are:

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

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

These 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 the data on new passenger car registrations,\* even though these registrations include govern-

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\* These are compiled by R.L. Polk Co. and reported monthly by the Department of Commerce in Survey of Current Business.

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ment and business acquisitions. The monthly series on registrations is cumulated for twelve months commencing with the month of the survey. For the Survey of Consumer Finances, annual data are used.\*\* The dependent variable is:

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\* \* It should be noted that when intentions data are taken from periodic or mid-year surveys as well as from the annual Surveys of Consumer Finances, there must be some overlap in the series on realized purchases for the subsequent year. Thus, some of the observations of actual purchases are interdependent.

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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 the eleven dates mentioned above and of P on A for the same dates and for

13 dates (including July 1949 and September-October 1953):\*

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\* Data on intentions are taken from the various reports on the Surveys of Consumer Finances as published in the Federal Reserve Bulletin and from the tabulations on periodic survey from Katona and Mueller, op. cit., pp. 54, 62. The Survey Research Center's estimates of the number of spending units and families in the United States were used to adjust the data for the periodic surveys.

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Eleven observations:

1)  $P = .79M + 2.72$  (millions of autos);  $r^2 = .40$ .

Eleven observations:

2)  $P = .59A + 1.75$ ;  $r^2 = .49$ .

Thirteen observations:

3)  $P = .47A + 2.50$ ;  $r^2 = .38$ .

Although these relationships are not statistically significant, they indicate that over this period of observation 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. There is, however, an alternative method open to the forecaster. The Survey of Consumer Finances offers a 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 autos. The intentions variables are then:

$B = A \times \text{median planned expenditure on new cars.}$

$N = M \times \text{median planned expenditure on new cars.}$

With these variables one would attempt to predict consumer expenditure on new automobiles for the year following the survey. The Department of Commerce supplies annual estimates of consumer spending on new autos which are employed below as the measure of the actual expenditure series, denoted by  $Q$ .\*

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\* Median planned expenditure is not recorded in the published reports on the periodic surveys. The figure employed here in those cases was the reported median planned expenditure for the annual Survey of Consumer Finances 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. These revisions have not been incorporated into the calculations. Casual inspection suggests that they would have produced only negligible differences in the results. The dependent variable is Commerce's estimate of consumer expenditure on "New cars and net purchases of used cars" (Table 30, line 61 of the 1954 edition of National Income and of the July 1956 issue of Survey of Current Business). These estimates are for annual periods, only, but 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 auto parts and accessories. These quarterly series, cumulated for four quarters beginning with the quarterly period starting closest to the date of the survey, were used as the estimates of the dependent variable for the periodic surveys.

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Following are the estimated regressions of  $Q$  on  $N$  and  $Q$  on  $B$ :

Eleven observations:

4)  $Q = 3.82 + .73 N$  (billions of dollars);  $r^2 = .66$

5)  $Q = 3.40 + .44 B$ ;  $r^2 = .67$

Thirteen observations:

6)  $Q = 3.37 + .45 B$ ;  $r^2 = .66$

It is interesting to compare these results with those obtained by relating consumer auto expenditure to current aggregate disposable income (Y) for corresponding periods of one year, with the intentions data ignored. For the sample of eleven periods:

$$7) Q = .062Y - 4.18 \text{ (billions of dollars); } r^2 = .66$$

For the sample of thirteen observations:

$$8) Q = .057Y - 2.95; r^2 = .66$$

It is impressive that the intentions data perform just as well as disposable income in explaining consumer expenditures on new autos, yielding almost identical correlation coefficients. Nevertheless, this means merely that the intentions data offer the forecaster another alternative as good as one already open to him. There is some appeal in the new alternative: disposable income must itself be predicted on the basis of the forecaster's entire set of beliefs concerning the economy and is subject to error, while the intentions data are known once survey results are available. The really interesting possibility raised by the findings above 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, suggest that such complementarity did exist in the sample data:

For eleven periods,

$$Q = -3.00 + .039Y + .45N \text{ (billions of dollars); } R^2 = .82.$$

For thirteen periods,

$$Q = -2.35 + .035Y + .28B; R^2 = .81.$$



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 one-third of the variance of auto expenditure over the sample period; when these variables are employed together, the unexplained portion is reduced by nearly half, and amounts to less than one-fifth of the variance of expenditure on new cars. These results are most encouraging. While good fits over a sample cannot guarantee good forecasts, the evidence to date suggests that the intentions data for auto purchases deserve a place of importance in forecasts of consumer spending on automobiles.

#### Plans and purchases of major household durable goods

Less encouraging results emerge from the aggregative time-series evidence on the predictive value of Survey Research Center intentions data on major household durable goods. In the available data, the series on planned expenditure is positively related to actual expenditure on these items over the year period following the survey. However, in the sample data, the dollar volume of buying plans is distinctly inferior to disposable income as a single independent variable and adds virtually nothing to the income variable when both are employed.

Data on the percentage of spending units planning to buy major household items are supplied for the Surveys of Consumer Finances. 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 autos. Hence, the first observation of the intentions series here considered is drawn from the mid-year survey of 1947. In all, 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 reporting that they "definitely will" or "probably will" buy and half of those stating they "may buy." For comparison with actual flow data, the intentions are converted into a dollar estimate of planned expenditure by use of data on median planned expenditure.\* Thus, the

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\* Revised estimates of median planned expenditure for 1952-55 surveys, published in the March 1957 Federal Reserve Bulletin have not been incorporated in these estimates. Some calculations suggest that the revised estimates would lead to a somewhat more favorable appraisal of buying intentions. For the midyear 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.

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intentions variable is:

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

The intentions variable is tested for its ability to predict consumer expenditure on major household durables (W) for a one year period beginning with the quarter in which the survey was held.\*\* Its performance as an

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\*\* An annual series of consumer expenditure on major durable household goods is obtained by summing lines 27, 28 and 81 of Table 30 in the 1954 edition of National Income and the July 1956 issue of Survey of Current Business. Quarterly data from line 4 of Table 51 are used to interpolate the annual series to obtain the figures required in conjunction with the three mid-year surveys.

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explanatory variable is compared with that of aggregate disposable income (Y).

Regression estimates of W on H, W on Y, and W on both H and Y yield

the following results for the sample of eleven observations:

1)  $W = .98H + 4.9$  (billions of dollars);  $r^2 = .41$ .

2)  $W = .027Y + 2.3$ ;  $r^2 = .83$ .

3)  $W = .024Y + .19H + 2.5$ ;  $R^2 = .84$ .

In this sample of data, planned expenditure is a fair, though inferior, substitute for the knowledge of disposable income in the year ahead. Intentions do not add information to an accurate forecast of income for the purpose of predicting expenditures on household durables.\*

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\* Juster (op. cit.) finds the a superior time-series record of prediction for household durables with intentions data taken from Consumers' Union mail surveys.

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#### Buying plans and total consumer expenditure on durable goods

A further test of the predictive value of buying intentions may be applied by appraising the ability of plans to buy household durables and autos, taken in combination, to aid in the explanation of total consumer expenditure on durable goods. The meager evidence available from time-series data is rather encouraging on this score. For the seven annual Surveys of Consumer Finances from 1949 to 1955, a combined intentions series can be obtained as a sum of planned expenditure on new autos (N, as defined above) and on major household durables (H). Approximately two-thirds of total consumer durables spending are accounted for by the items covered in the combined series.\*\* A measure of

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\*\* In the excluded third are such items as jewelry, watches, tableware, lamps, rugs, eyeglasses, books, sporting equipment, and durable toys.

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planned expenditure in relation to income is obtained when the combined buying plans are divided by aggregate disposable income. The resulting variable  $(\frac{N + H}{Y})$  is employed in an attempt to explain residuals, for the year following each survey, from an estimated linear regression of durables expenditure on disposable income.\* These residuals are the portion of durables spending

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\* The durables-income regression equation is that described on page 13 above. Annual residuals were taken as the mean of the quarterly residuals for each calendar year.

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unexplained by disposable income. They are positively related to  $(\frac{N + H}{Y})$  over the sample of seven observations. Thirty-seven per cent of the variance of the residuals are explained by the ratio of planned spending to income.

This finding, like the results on auto intentions, points toward a favorable appraisal of the predictive value of the intentions data. However, the time-series evidence is drawn from exceedingly small samples of observations, ranging from seven to thirteen. The findings are -- virtually, by necessity -- inconclusive. There is a fair possibility that chance alone could have produced the encouraging pattern of relationships observed in the time-series data. Fortunately, evidence supplied by cross-section data buttresses the time-series findings discussed above, 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 at two points in time, the durable goods purchases of the household, reported in the second interview, can be compared with the intentions expressed in the first interview. The predictive value of intentions data at the micro-economic level can then be investigated. 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, it is necessary to 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 are found to have substantial predictive value in three studies of re-interview samples of the Survey of Consumer Finances.\* These studies do not

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\* The three studies are: Lansing and Withey, op. cit., pp. 417-40, (see also Albert G. Hart's comment on the Lansing-Withey paper in the same volume, pp. 496-97); L.R. Klein and J.B. Lansing, "Decisions to Purchase Consumer Durable Goods," Journal of Marketing XI (October 1955), 109-32; and an unpublished analysis of the 1952-53 reinterview sample by James Tobin. Also, cf. Ferber, op. cit., pp. 42-51.

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supply any consistent rule for the quantitative application of intentions data in forecasting. In the **Klein-Lansing** study, each extra dollar of planned expenditure increases estimated actual spending on durable goods by **twelve cents**.

Tobin's investigation of the same data with a different set of explanatory variables leads to the conclusion that spending is raised by thirty cents for each dollar of planned expenditure. Nevertheless, the cross-section analyses agree that intentions to buy durable consumer goods have predictive value at the micro-economic level.

Reinterview data on the expectations, "objective" characteristics, and subsequent behavior of individual economic units are a potentially powerful supplement to the handful of observations available from aggregative time-series data. However, skepticism has been expressed concerning the relevance of findings from such data to the problems of aggregative prediction \* To

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\* George Katona, "Federal Reserve Committee Reports on Consumer Expectations and Savings Statistics," Review of Economics and Statistics XXXIX (February 1957), 41. See also Schweiger, op. cit., pp. 459-60.

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what extent do findings from cross-section data provide evidence regarding the aggregative predictive value of anticipations data? This is a crucial issue and it deserves consideration. Perhaps, some formal analysis can assist in clarifying the matter.

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 the item. By reinterviews at the end of the year, it is found that a fraction  $r$  of those planning to buy did in fact make purchases and that a fraction

s of the "non-intenders" bought the item. Then, of the entire population, the fraction making purchases (X) is given by the identity:

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

If the census of intentions and realizations is conducted each year, a set of observations of  $x$ ,  $r$ ,  $p$ , and  $s$  will be obtained. Then,  $r$  and  $s$  can be interpreted as random variables with population means,  $R$  and  $S$ , respectively. The requirement for the predictive value of the intentions data at the micro-economic level is that  $R$  exceeds  $S$ . The condition under which intentions have predictive value in the aggregate is that  $x$  and  $p$  are positively related over time, so that plans and purchases for any year tend to move together.\*

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\* To avoid unnecessary complexity, this discussion abstracts from the other explanatory variables which would be employed in both cross-section and time-series analyses.

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Does the fulfillment of this condition depend on the relative magnitudes of  $R$  and  $S$ ?

In the special case where  $r$  and  $s$  are both independent of  $p$ , the answer is an unqualified "yes": the condition that intentions data have predictive value on a cross-section basis (i.e., that  $R > S$ ) 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  $(R-S)$ \*\*

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\*\* 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 covariance of  $x$  and  $p$  computed from a random sample of  $N$  years. Now,

$$2) M_{xp} = \frac{1}{N} \cdot \sum_{t=1}^N x_t p_t - \bar{x} \bar{p} =$$

$$\frac{1}{N} \cdot \sum_{t=1}^N s_t p_t - \bar{s} \bar{p} + \frac{1}{N} \cdot \sum_{t=1}^N [(r_t - s_t) p_t (p_t - \bar{p})] =$$

$$(\bar{r} - \bar{s})M_{pp} + \bar{p}M_{rp} + (1-\bar{p})M_{sp} + M_{rpp} - M_{spp}.$$

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:

$$3) E(M_{xp}) = (R-S)M_{pp}, \text{ which is positive if, and only if, } R > S.$$

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

$$4) E(\hat{a}) = \frac{E(M_{xp})}{M_{pp}} = (R-S).$$

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 conceivably have predictive value in the aggregate. The requirements are that either the probability of fulfillment by intenders or the probability of purchase by non-intenders 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 initially expect not to buy. Expectations are somehow symptomatic of the atmosphere



without supplying any evidence concerning the individuals who express the particular expectations. Such a mode of behavior seems most implausible. With some strain, one might conceive of a situation meeting these requirements. Suppose that in an annual autumnal survey, individuals were asked whether they expected to contract Asian flu in the coming year. Presumably in the fall of 1956 negative responses would have been obtained with virtual unanimity. In the 1957 survey, however, positive replies would have been given by some respondents, who were pessimists or who preferred to supply positive answers even when their subjective probability estimates were less than one-half. The 1957 survey would display predictive value in the aggregate and yet 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. It seems highly unlikely that such conditions could ever apply to voluntary economic behavior.

If intentions data have predictive value at the micro-economic level, they can fail to have 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 intenders and/or non-intenders would vary inversely with the volume of buying plans so as nullify the higher probability of purchase by the intenders. Here, an individual unit is discouraged from buying by the purchase plans of other households. Except for cases of unsatisfied excess demand where the volume of actual purchases is exclusively determined by supply conditions, this mode of behavior seems equally implausible. The analysis suggests that reinterview findings have a direct bearing on the aggregative predictive value of expectational data. The positive conclusions

about the usefulness of intentions data in the Lansing-Withey, Klein-Lansing, and Tobin studies offer powerful reinforcement to the time-series evidence presented in preceding sections.

#### Other Expectational Variables

In addition to the data on plans to buy, the Surveys of Consumer Finances and the periodic surveys of the Survey Research Center provide information on the expectations of households concerning their own incomes and financial welfare and concerning the state of business conditions and the movement of prices in the future. Also collected are certain series of attitudes, which are not specifically forward-looking; these 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 household anticipations of outlook variables or even of income prospects are likely to have direct value in the prediction of those variables. The potential usefulness of these data in forecasting is limited to the insight they may provide into the future course of consumer spending and saving. In the terminology adopted above, these are taken as auxiliary, rather than direct, predictors.

If the other expectations and attitudes of households are to be employed to forecast household budgetary patterns, then one must ask what additions these series offer to the information contained in the intentions data. Some of the information will undoubtedly overlap: one would expect the volume of purchase plans reported to be influenced by consumers' appraisals of current and prospective buying conditions and their own economic prospects. However, the beliefs about

the future and attitudes toward the present associated with the plans might aid the forecaster in estimating the volume of plans that will be fulfilled and the volume of unplanned purchases that will be made.

One plausible view is that plans to buy are predicated upon a certain degree of optimism; and that unjustified optimism about income prospects and the business outlook will be reflected in a low level of actual purchases relative to planned purchases. Similarly, it would be inferred that, if income and price trends prove more favorable than anticipated by households in the aggregate, the planners are more likely to purchase and the level of unplanned purchases is likely to be high. In this view, the forecaster should expect a particularly high level of consumer spending relative to income and assets, when the level of intended purchases is high and the other expectations and attitudes of households are especially pessimistic. 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 reinterview sample of the Survey of Consumer Finances provides a bit of 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 in 1948 than anticipated; this group accounted for nearly two-thirds of the unplanned purchases of new autos. On the other hand, about one-fifth of those units which did not expect to buy received less income than expected during 1948; this group accounted for only 4% of the unplanned purchases. Similarly, the fulfillment of plans to buy was substantially greater for those spending units which received income in excess

of their anticipations than for the group which received less than their expected income.\*

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\* Lansing and Withey, op. cit., p. 428, Table 43.

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Alternatively, a diametrically opposite interpretation can be made of the attitudinal and expectational responses of households. This view would argue that the prospect implied by these data is, in effect, additive to the level of the intentions data. A favorable outlook on business conditions, optimistic views about personal financial prospects, and a favorable appraisal of market conditions are factors which are treated as reinforcing the expansionary implications of a high level of intentions to buy. A Lansing and Withey argue, "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." Ibid, p. 408.

Thus, the hypothesis which emerges takes the following form: for any given level of intended purchases, the level of actual purchases is likely to be higher, the more optimistic consumers are. Households reporting intentions to buy are more likely to fulfill their plans if they are optimistic and/or households which do not report plans are more likely to make unintended purchases if they have favorable attitudes and expectations. 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 choose to weight the plans by the degree of certainty attached to the intention by the respondent.

Furthermore, in the case of households reporting no plans to buy, it can be argued that some may simply have no articulated plans at the time of the survey and others may be particularly negligent or cautious in failing to cite as intentions purchases which have a strong likelihood of being made. In that event, one might hope to gain information about their probable level of purchases from responses on the related expectational and attitudinal queries.

The theoretical arguments are interesting and inconclusive. Both views agree that other expectational data can be profitably employed in conjunction with buying intentions but differ on the proper use. The empirical record, on the other hand, reveals no profitable uses of these variables in prediction. Taking data from the annual Surveys of Consumer Finances and from periodic surveys through 1954 the Consultant Committee on Consumer Survey Statistics appraises the predictive performance of the responses on expectational and attitudinal questions.\* These responses are compared with aggregate time-series

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\* The survey data considered relate to short-term and longer-term expectations concerning general business conditions and the price level, internal income-anticipations, and evaluations of current market conditions and of the household's own financial situation.

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data on the ratio of expenditure on durables to disposable income and the ratio of liquid saving to disposable income.\*\* No evidence of predictive value is found.

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\*\* "Report of Consultant Committee on Consumer Survey Statistics," pp. 308-16.

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and the authors conclude that these expectational and attitudinal 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."\*

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\* Ibid, p. 312.

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Recent calculations by the author confirm these results. Using the additional observations available from surveys conducted by the Survey Research Center in 1955 and 1956, the author made various attempts to relate expectational and attitudinal 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 expectational series displayed any explanatory value. Slightly encouraging results were obtained from one of the attitudinal series, the evaluation of durable goods markets ("good time to buy"). This series had also been singled out by the Consultant Committee as a possible exception to the otherwise negative results. Eleven survey observations of this question, covering 1955-56, 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."\*\*

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\*\* The independent variable is percentage of favorable responses minus percentage of unfavorable responses with non-committal answers ignored.

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Katona has criticized the relevant portion of the report of the Consultant Committee, arguing that, "Instead of testing the predictive value of each attitude separately, the relation of clusters of attitudes should be studied."\* In order

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\* Katona, "Federal Reserve Board Committee Reports," p. 41.

to study clusters of attitudes, Katona and Mueller have advanced an experimental index of consumer attitudes.\*\* The index covers responses to eight questions:

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\*\* Katona and Mueller, op. cit., pp. 91-105.

two on buying plans for autos and houses; three on external expectations concerning price movements and business conditions; one on personal financial anticipations; and two attitudinal series relating to the evaluation of current personal financial situation and of current market conditions. The eight series are individually indexed and given equal weight in forming the attitudinal index. Observations on the attitudinal index are available from eleven surveys dating from late 1952 to late 1956.\*\*\*

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\*\*\*Data for surveys from 1952 to 1955 are taken from Ibid., p. 100. For the three 1956 periodic surveys, some data were presented in Business Week and in mimeographed releases of the Survey Research Center; other required data were supplied to the author by the Survey Research Center through the kind co-operation of Mr. Ernest Lillienstein.

In these eleven observations, the proposed attitudinal index shows some ability to forecast both the saving-income ratio and the durables-income ratio for the quarter following the survey. However, an index consisting of only the two plans to buy components of the attitudinal index predicts just as well -- in fact, a trifle better; while an index of the remaining six components (i.e., excluding intentions to buy) does not perform so well. Following are the proportions of variance explained ( $r^2$ ) in the six simple regression estimates:\*

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\* All estimated slope coefficients correspond in sign with a priori beliefs: positive with D/Y; negative with S/Y.

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Dependent Variable	Attitudinal Index	Independent Variable	
		Plans to Buy	Attitudinal Index, excluding plans to buy
D/Y	.28	.32	.20
S/Y	.28	.33	.16

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

These findings are reinforced by Tobin's analysis of the 1952-53 reinterview sample of the Survey of Consumer Finances. The comprehensive analysis of expenditures on durable goods 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.\*

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\* In their study of the same data, Klein and Lansing find some slight value in the evaluations of personal financial situations ("better off"); see "Decisions to Purchase Consumer Durable Goods," pp. 119-20, 128-31. For a bit of negative evidence



on "better off" from the 1948-49 reinterview sample, see Table 45 of Lansing and Withey, op. cit., 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.

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In light of the evidence on the value of anticipations data in forecasting consumer expenditure, one must agree with the conclusions of the Federal Reserve Consultant Committee: "Buying intentions, properly interpreted, appear to have predictive value ... There is so far no convincing evidence that ... [other expectations and attitudes] make an independent contribution to ability to predict, however interesting these attitudes may be for other purposes."\*

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\* "Report of the Consultant Committee on Consumer Survey Statistics," pp. 293-94.

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More recent evidence from surveys conducted in 1955 and 1956 and the results of Tobin's study of reinterview data have added weight to the above conclusions of the Committee. Prof. Katona is undoubtedly still on firm ground in arguing that "very little has as yet been proved" concerning the predictive value of intentions, on the one hand, and of other expectations and attitudes, on the other.\*\*

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\*\* Katona, "Federal Reserve Board Committee Reports," p. 43.

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Additional empirical research, on both the aggregative and micro-economic levels, should be most welcome in an effort to approach more conclusive proof. Nevertheless, at 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. If, in the next Survey of Consumer Finances, the latter group of variables and the intentions data offer conflicting omens concerning the prospects for consumer spending, the empirical record to date would oblige the forecaster to follow the lead of the intentions data.

Investment Expenditure

Nonfarm residential construction

In the years of the past decade, between twenty and thirty 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; yet it has caused difficulties for forecasters because it has displayed an erratic pattern of variation. For example, after rising in 1950 along with other components of investment, expenditure on new housing fell by 13% in 1951, while plant and equipment spending, GNP, and disposable income continued to rise substantially. In 1954, it rose by 13% while the rest of private capital formation declined. Again in 1956, housing exhibited non-conformist behavior, falling by 8% despite the boom in plant and equipment spending. As this record of variation should suggest, poor results would have been obtained in recent years from techniques which predicted residential construction on the basis of time-series relationships of that component with disposable income, GNP, or other large aggregate flows. Also, because of the frequent turning-points in the volume of new housing expenditure, techniques which extrapolate recently observed trends in the sector would not have predicted accurately. The forecaster may seek additional assistance from "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 expectational series: one, compiled by Fortune, records the plans of homebuilders; the other, reported by the Survey Research Center,

covers the plans of potential home-buyers. The survey data may be readily employed in conjunction with the series on the number and value of housing starts.

Data on the number and prospective value of dwelling units started in previous months perform admirably in forecasting nonfarm residential construction for the next few months. This is hardly surprising. There is a sizeable period of operation in the construction of any house. Therefore, in any short period of time, the bulk of construction activity is done on units started in previous periods. There is regularity in the distribution of the total cost of dwelling units over the months in which work is in progress. The pattern of typical progress in housing construction has been determined by field studies and is employed by the Departments of Labor and Commerce to estimate the expenditure on residential construction for any month. The expenditure estimate for any month is derived by application of a set of weights to the value of work started in that month and each of several previous months. The pattern of activity on housing under construction is such that about one-half of all nonfarm residential construction expenditure in a given quarter is attributable to dwelling units started in the immediately preceding quarter. Another ten per cent of expenditure is normally associated with starts in earlier quarters, so that starts in the concurrent quarter are usually responsible for only about forty per cent of quarterly expenditure.\* It is thus

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\* See 1954 edition of National Income, p. 125; and Department of Labor, "Techniques of Preparing Major BLS Statistical Series" (Bulletin No. 1168,

December 1954), pp. 8-15, 19-21. Quantitative information on the activity patterns has been kindly supplied to the author by Arnold E. Chase, Chief, Division of Construction Statistics, U.S. Department of Labor.

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obvious why knowledge of the value of work started in recent months supplies some foreshadowing of residential construction expenditure in the next quarter. Quarterly forecasts made on this basis would have been highly successful in the period from 1950-56.\*\* However, the forecaster cannot be satisfied with

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\*\* 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.

a one-quarter lead. He may attack the problem of predicting expenditure on residential construction for longer periods in the future by attempting to forecast the value of work started. In pursuing this objective, he may turn to the anticipations data supplied by Fortune and the Survey Research Center.

Both of the anticipations series relate to the probable number of new housing starts in the future rather than to the prospective value of starts. A separate forecast of the value per dwelling unit is required in order to obtain a prediction of the value of work started from a projection of the number of starts. Actual data on the value and number of starts indicate that the value per dwelling unit has moved upward substantially in recent years. Buyers of new houses are paying more, on the average, both because construction cost has risen and because they are buying "more house." The upward movement has taken the form of a fairly steady trend with value per

unit rising by substantially more than construction prices. Because value per unit moved rather steadily over this period, the ability to forecast the number of starts accurately would have insured reasonably successful forecasts of the value of activity. On the whole, it appears that the task of forecasting expenditure on residential construction can be identified with the problem of predicting the number of starts. Unless value per dwelling unit fluctuates erratically, foresight concerning starts is both a necessary and sufficient condition for accurate prediction of new housing expenditure.

Data on buying intentions for houses are of the same character as the purchase plans for consumer durables which were analyzed above. The annual Surveys of Consumer Finances 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 (new or old) in the following year. As above, intended purchasers are defined as those respondents reporting they "will" or "probably will" buy and one-half of those stating they "may buy." The percentage of intended purchasers is multiplied by the number of spending units\* in the economy to form the intentions variable (J). This series on plans to buy all houses 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. The estimated regression of S on J is:

$$1) S = 641 + .15J \text{ (thousands of dwelling units); } r^2 = .39$$

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\* For periodic surveys the multiplier is the number of families.

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The standard error of estimate is slightly in excess of one hundred thousand dwelling units, which is a sizeable margin of error. However, aggregate disposable income for each period, deflated by construction prices, does not do quite as well, explaining only 32% of the variance. Also, the income variable is unable to assist the intentions series when both are employed as potential explanatory variables. The performance of this regression equation in "hindcasting" starts for the calendar years 1951 to 1956 is discussed below, where it is compared with the predictive record of naive models and of the Fortune survey.

The data on the plans of homebuilders are compiled by Fortune through interviews with between three and four hundred building firms, stratified by size, in 35 or more cities. Information is collected on the expectation of each builder concerning the percentage change in his housing starts relative to the previous year. These estimated percentage changes are then combined, weighted, and applied to the level of starts in the previous year in order to obtain a prediction of new housing starts for the calendar year.\* The survey

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\* A detailed discussion of the techniques employed in the homebuilding survey may be found in "Report of Consultant Committee on General Business Expectations," pp. 582-84.

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is conducted early in the year, and results are presented in the "Business Roundup" section of the April Fortune. The results are thus available at approximately the same time as the data on buying intentions of the Survey of Consumer Finances, and

only slightly after 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. In each case, the plans of homebuilders have overestimated starts in the year ahead, indicating a possible bias which might be corrected to improve the performance of the anticipations. However, three of the errors are very small, amounting to two or three per cent; on the other hand, three errors are substantial. The empirical record consists of three hits and three misses. In the three bad years (1953, 1955, and 1956), respondents were reinterviewed in late summer. Like homebuilders in the aggregate, the respondents in the sample were not fulfilling their housing plans. In each case, "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 again when it was resumed in 1955. However, in order to accept the explanation of respondents that "tight money" upset plans seriously 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 on that assumption.\* It is particularly

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\* Reinterview results are presented in "Business Roundup," Fortune, Oct. 1953, Sept. 1955, and Sept. 1956.

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Percentage Errors in Forecasts of Housing Starts based  
on Anticipations Data and Naive Models

$$\text{(Percent error of forecast = } \frac{\text{Actual} - \text{Predicted}}{\text{Actual}})$$

Year	Predictor			
	(1) Regression on SRC Buying Plans	(2) <u>Fortune</u> Survey of Homebuilders	(3) Naive Model (based on fourth quarter of previous year)	(4) Naive Model (based on whole of previous year)
1951	-5	-3*	-11	-28
1952	+5	-2*	+10	+ 3
1953	-11	-9	- 5	- 2*
1954	+11	-2*	+12	+10
1955	+ 5*	-9	- 5*	+ 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

\* signifies best (or tied for best) of the four predictions for any given year.

difficult to form a judgment here: one must wait eagerly for more observations to learn whether the homebuilders' survey continues to predict so effectively in years of easy money and whether, on the other hand, 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 over the years from 1951-56 is shown in the accompanying table. Also included are the results which would have been obtained with two alternative naive models: one projects housing starts for the year ahead at the seasonally adjusted annual rate for the last quarter of the preceding year;\*

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

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the other forecasts housing starts at the level of the whole of the previous year. The percentage error of forecast of the latter naive model is thus 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 best of the four predictions in three years but worst in the two most recent years. The buying plans, as utilized in equation 1) of this section, also overpredict badly in two of Fortune's three lean years (1953 and 1956) and underpredict seriously in 1954.\*\* As summaries of the performance of the four methods, the average

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\*\* The performance shown in the table for data of the Survey Research Center 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 Survey of Consumer Finances, 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. In general, it should be noted that the six observations of consumer surveys used as predictors here were included in obtaining the estimated regression equation by which the "forecasts" are made.

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absolute percentage error and root-mean-square errors are presented. Both measures point to the ability of both surveys and of data from the most recent quarter to improve on the full-year naive model. Other than that, the findings are inconclusive: differences in average error of the other three predictors, are trivial and the rank order is different for the two measures.\*

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

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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. On the other hand, the three years of successful prediction by the homebuilders' survey are encouraging. Results of this survey in the future merit consideration as one piece of evidence regarding trends in residential construction. There is a similar bright side to the record of the buying plans. In the available observations, the survey data on purchase intentions are superior to aggregate disposable income in predicting housing starts. The income variable certainly commands attention in any analysis of probable future trends in the housing sector. Data on buying intentions, therefore, presumably also deserve careful scrutiny. There may well be more profitable ways to use the data on buying plans than the simple regression technique employed above. One would hope for micro-economic evidence on this score; but, unfortunately, because homebuyers change their place of residence, there have been no reinterview studies of the fulfillment of home-buying plans. On the basis of the inconclusive evidence

from time-series data, survey results on purchase intentions, like those on the plans of builders, 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 the future course of expenditure on new plant and equipment is supplied in two surveys of business investment plans, one conducted jointly by the Securities and Exchange Commission and the U.S. Department of Commerce and one by the McGraw-Hill Publishing Company. These surveys project gross fixed investment by nonfarm business for the calendar year. The Commerce-SEC annual survey is conducted in February and 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 with results appearing in November or December. In addition to their annual endeavor, SEC and Commerce compile investment plans for each quarter early in the preceding quarterly period 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 U.S. business, which is reported on a quarterly basis. Expenditure on plant and equipment is not a component of the official national product accounts; it covers the bulk of the sum of the two components, "producers' durable equipment" and "other new construction" (i.e., other than residential nonfarm). Unfortunately, there is no official series providing

a reconciliation of plant and equipment spending with the above two components of Gross Private Domestic Investment. The items in producers' durable equipment and other new construction which are excluded from plant and equipment expenditure are: farm equipment and construction, construction by private non-profit institutions, capital outlays charged to current expenses, and equipment and construction expenditures by independent professionals. Allowing for these items, one is still left with an unexplained residual discrepancy between the plant and equipment series, on the one hand, and the sum of producers' durables and non-residential construction, on the other. Despite the lamentable difficulty of reconciliation, the difference between the two GNP entries and expenditure on plant and equipment is neither large enough nor volatile enough to cause serious trouble. The ratio of plant and equipment spending to the larger total has remained in the range between 72 and 76 per cent since 1951. The dollar difference between the two magnitudes has not changed by more than 1.1 billions in any pair of successive years over this period. Accurate forecasts of plant and equipment spending would provide 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 there is now a decade of experience on record. This record has been carefully analyzed in post-mortems performed under Commerce-SEC

auspices.\* As these post-mortems show, in each of the ten years with

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\* See Irwin Friend and Jean Bronfenbrenner, "Plant and Equipment Programs and their Realization," Short-Term Economic Forecasting, pp. 53-98; 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.

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the exception of 1950, the anticipations data are better predictors than a model which projects expenditures at the level of the previous year. An alternative naive model projecting expenditures at the level of the fourth quarter would also have fared consistently worse than the series on anticipated expenditures since 1948.\* The average absolute error and root-mean-

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\*\* Since no quarterly data for 1946 are available, the naive model based on the fourth quarter cannot be tested for 1947.

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square error over the period are much smaller for planned expenditure than for either naive model, as is shown in the accompanying table.

Similarly, extrapolations of the recent rate of change in plant and equipment outlays would usually have been no match for the intentions series in predictive ability. Nor could an equally good record be found for "causal" explanations of these outlays, such as the linear regression of investment on lagged profits which is used in the Klein-Goldberger econometric model.

Percentage Errors in Forecasts of Plant and Equipment Expenditure\*

$$\text{Error of forecast} = \left( \frac{\text{Actual} - \text{Predicted}}{\text{Predicted}} \right)$$

	(1) Commerce-SEC Anticipations	Predictor (2) Naive model based on fourth quarter of previous year	(3) Naive model based on whole of previous year
<u>1947-56</u>			
Average absolute percentage error	5	13	n.a.
Root-mean-square percentage error	8	17	n a.
<u>1948-56</u>			
Average absolute percentage error	3	11	8
Root-mean-square percentage error	6	14	10

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

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The Commerce-SEC record is marred by the presence of two bad years, 1947 and 1950, in which actual expenditures exceeded anticipations by 17% and 15%, respectively. The outbreak of the Korean war in mid-1950 accounts for much -- although not the whole -- of the large discrepancy in that year. The large deviation in 1947 is not

so easily explained, but one should note the facts that the survey was new and that capital goods prices rose rapidly during the year and the possibility that supply shortages eased at a more rapid rate than purchasers of capital goods had anticipated.\* In 1953 and 1955, the level of actual expenditures exceeded anti-

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\* Foss and Natrella, "Ten Years' Experience," p. 17; and Friend and Bronfenbrenner, op. cit., p. 61.

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cipations by 5% and 6%, respectively; in both cases, the survey predicted very small increases over the outlays of the previous year while actual outlays rose 7% each time. In four of the remaining six years, anticipations came within one per cent of realized spending, while in the two remaining cases, the deviations were three per cent.

The record of the McGraw-Hill annual survey is very similar to that of the Commerce-SEC intentions for the 1949-56 period over which comparisons can be made. McGraw-Hill intentions data yielded an underestimate of 1950 investment outlays of ten per cent, a smaller underestimate than that of Commerce-SEC but nonetheless sizeable. In 1956, outlays were overestimated by about six per cent. In the six other years, the deviations range up to four per cent.\*\* Except for 1950, the

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\*\* Data for 1949-54 are taken from Robert A. Levine, Plant and Equipment Expenditures Surveys: Intentions and Fulfillment (unpublished Cowles Foundation Discussion Paper, 1956), p. 14. Figures for 1955-56 were calculated from Business Week.

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predictive errors in McGraw-Hill data display little relationship to those of Commerce-SEC data. A series constructed by averaging results of the two surveys would have benefited from opposite signs of deviations in two years and would have produced errors no larger than 3% for any year but 1950.

In recent years, the preliminary surveys of McGraw-Hill have also performed well. 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. An exception is the anticipated level for 1956: the preliminary survey predicted an increase of 13% over 1955, while the final survey envisaged a rise of 30%; outlays actually rose by 22%. The preliminary survey is 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. Further experience with the survey could provide a basis by which its apparent tendency to underestimate future outlays might be corrected. On the other hand, because the capital budgeting activities of reporting firms are likely to be concentrated in the last months of the year, there may be a sharp discontinuity in the relative predictive abilities of surveys conducted before and after the start of the new year.

Commerce-SEC quarterly anticipations data have provided valuable assistance in forecasting plant and equipment outlays over a very short-term period. Two reports on anticipated expenditure are collected for each quarter: results of the first anticipation are published just before the quarter begins; information on the second anticipation is presented 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%; the second anticipation has diverged from actual outlays

by an average of 2.0%.\* The quarterly series was especially helpful in

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\* Foss and Nagrella, "Ten Years' Experience," p. 19.

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signalling the downturn in capital spending of late 1953 and the subsequent upturn of early 1955.

The nature of the adjustment applied by the Commerce-SEC staff to reported quarterly intentions is of substantial analytical interest. The actual capital outlays of business exhibit a marked seasonal pattern with spending particularly low in the first quarter and high in the fourth quarter. The reported anticipations, however, do not accurately reproduce this seasonal pattern. Hence, outlays of the first quarter are significantly overestimated and those of the fourth quarter are substantially underestimated by the unadjusted intentions data. Since mid-1952, these biases have been removed by the application of a seasonal correction, with a resulting substantial improvement in the predictive success of the quarterly intentions.\*\* This is an ex-

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\*\* Ibid., pp. 18-19; Friend and Bronfenbrenner, op. cit., pp. 62-63.

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cellent illustration of the proposition that respondents who forecast inaccurately can provide the basis for accurate predictions if the errors in their forecasts follow a determinable systematic pattern.

The average errors in the adjusted quarterly anticipations are slightly smaller than those for annual planned outlays, but the quarterly intentions do not improve as much relatively on the performance of naive models. On the

whole, the quarterly data do not demonstrate much superiority in the ability of firms in the aggregate to forecast capital outlays one quarter in advance over their ability to predict these outlays for a full year. Presumably, plans become more definite as the time-horizon shortens, but the shorter time-period covered by the quarterly data accentuates the task of estimating the precise time of a prospective expenditure because of uncertainty concerning equipment deliveries, the progress of construction work and the scheduling of accounting charges.

Techniques for improving predictive ability

Micro-economic data on the realization of the investment plans of individual firms provide insight into the foundations for the aggregative predictive success of the intentions data and also suggest possible techniques by which the intentions data might be supplemented with other information to yield more accurate forecasts.

There are wide deviations between the intended and realized capital outlays of individual firms. In a sample of McGraw-Hill respondents for the years 1949-54, actual capital spending was within twenty per cent of anticipated outlays in only 44% of all cases.\* For 1949 and again for 1955, only about one-fourth of manu-

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\* Levine, op. cit., p. 105.

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facturing firms in the Commerce-SEC sample fulfilled their plans within a range of twenty per cent error; but since large firms were typically the more accurate

forecasters, three-fifths of all outlays in 1955 were made by firms within this range of error.\* It is clear from this record that the anticipated

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\* Foss and Natrella, "Ten Years' Experience," p 20; and Friend and Bronfenbrenner, op. cit. p. 65.

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outlays do not represent fixed and rigid commitments from which firms are unable to deviate. The anticipated outlays clearly have predictive value at the micro-economic level, but they leave large unexplained residuals.\*\* The intentions

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\*\* See Ibid, p. 67; and Robert Eisner, "Expectations, Plans, and Capital Expenditures: A Synthesis of Ex Post and Ex Ante Data," unpublished paper presented at the Conference on Expectations, Uncertainty, and Business Behavior, 1955, pp 26-30

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have been successful aggregative predictors because these residuals have cancelled out in the past. There is no paradox here: all aggregative economic relationships that display any stability over time perform far better than their micro-economic counterparts, profiting from a cancellation of the relatively large individual deviations from the cross-section relationship. It is hardly surprising that aggregate actual and anticipated spending are closely related despite the frequency of large deviations by individual firms.

It may be purely fortuitous, on the other hand, that anticipations are unbiased (or nearly unbiased) predictors of capital outlays for the annual surveys. As noted above, reported spending plans have a systematic seasonal

bias in quarterly anticipations and a downward bias in annual projections made prior to 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.\*

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\* Friend and Bronfenbrenner, op. cit., pp. 69-70; Foss and Natrella, "Ten Years' Experience," p. 21; Levine, op. cit., p. 105, Table 1.

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Levine has suggested a technique whereby anticipated outlays would be classified by size of the reporting firms and each dollar of planned spending in size-strata which tend to underpredict would be weighted more heavily.\*\* Apart from this

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\*\* Ibid, pp. 119-21.

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modest qualification, research efforts have discovered no systematic biases in the anticipations. The forces which are responsible for deviations between actual and planned outlays by individual firms are capable of operating in either direction.

Some of these influences are random from firm to firm and can be relied on to cancel out in the aggregate in any period of time. Others, however, do not have random effects at any point in time. All firms operate in the same economic environment and their fortunes are linked together. Economic developments subsequent to the survey may influence the capital spending of many firms in the same direction, thus producing deviations of outlays in the aggregate from anticipations. The anti-

ceptions data, taken alone, cannot supply an unconditionally accurate prediction of investment spending. When the business outlook changed suddenly and drastically in 1950, plant and equipment expenditure rose markedly above anticipated levels. Similar effects could be generated by endogenous economic changes. The survey data provide reliable evidence on the probability that capital outlays will be an autonomous destabilizing influence, and they also faithfully register the level of investment demand for the state of economic conditions assumed by respondents. However, as indicated in further detail below, capital outlays are sensitive to contemporaneous economic events and will diverge from anticipated levels as a result of changes in business conditions. There is a bright side to this: the factors responsible for such deviations from plans can account for them, ex ante as well as ex post. The relevant influences must be identified and their paths must be predicted and used in conjunction with the anticipations data. Formally, this involves treating capital expenditure as a function of intentions expressed at a point in time and of the subsequent course of those non-expectational variables which influence the realization of intentions.\* In such a way, one can hope to derive an accurate

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\* See Friend, "Critical Evaluation of Surveys," p. 4.

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structural relationship for fixed investment. 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 he extends his risks by making his

forecast of effective investment demand depend on his beliefs about other variables in the economy. However, the level of investment does, in fact, depend on the course of other economic variables, and the forecaster cannot afford to ignore the interdependence.

#### The influence of other variables

The post-mortems of survey data have shed light on the influences of many non-expectational variables on the realization of spending plans. Two factors which appear to have significant effects are: 1. prices and supply conditions in markets for capital goods; and 2. the sales and earnings experience of the prospective investing firms. These will be considered in turn.

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."\* In an attempt to gather

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\* Friend and Bronfenbrenner, p. 63; see also, O.J. Firestone, "Investment Forecasting in Canada," Short-Term Economic Forecasting, pp. 234-35.

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further evidence on this matter, the 1956 Commerce-SEC questionnaire asked respondents to specify the assumptions about future prices of capital goods which were underlying their reported spending intentions. Only about one-third of the firms were allowing their estimates for a change (almost unanimously, a rise) in prices. Another third had not considered the possibility of price changes; and the remaining third were projecting outlays at prevailing prices

because they expected no change.\*

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\* Foss, "Business Expectations for 1956," Survey of Current Business, March 1956, 20.

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Because of this tendency and because the short-run price-elasticity of demand for capital goods is apparently very low, higher prices tend to raise 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.\*\* In the absence of inde-

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\*\* Levine, op. cit., p. 121.

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pendent 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, on the basis of his insight or his econometric model, the forecaster expects a change in capital goods prices, he is well-advised by existing evidence to alter his estimate of capital outlays in the same direction.

Spending intentions for plant and equipment are obviously predicated on expectations concerning the rapidity of progress in construction and the speed of delivery of equipment. When excess demand is present in capital markets, either at the time of the survey or later during the year, the assumptions may be quite wide of the mark. Intentions can be frustrated by the failure of deliveries; or, alternatively, potential demand that is not recorded as planned expenditure can



be activated by the evaporation of shortages and bottlenecks. For 1949 and 1955, manufacturers were asked by Commerce-SEC to explain discrepancies between realized and anticipated outlays. Easing of the supply situation was the most frequently mentioned explanation offered by the group which had spent more than anticipated in 1949. This reason was cited by 17% of the group. Ten per cent of those who had spent less than anticipated attributed their deviations principally to supply shortages.\* For 1955, 38% of those

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\* Friend and Bronfenbrenner, op. cit., p. 87.

firms which had spent less than planned and 7% 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 bottlenecks operated in opposite directions to nearly equal extents.\*\* However, one cannot rely on

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\*\* Foss and Natiella, "Investment Plans and Realization," pp 12-13, 24.

the precise cancellation of these two forces. If spending intentions for 1958 were 50% above the 1957 level, it would be safe to predict a rise in real investment and a substantial rise in capital goods prices. However, it would be most rash to place any confidence on the projected 50% increase in dollar outlays.

In making a quantitative forecast under such conditions, the forecaster would presumably wish to pay considerable attention to the productive capacity of capital goods producers and to the nature of their pricing policies. If, on the basis of such considerations, he concluded that the ceiling output of capital goods permitted only a 15% expansion of production and that prices, being somewhat sticky, were unlikely to rise by more than 10%, he would have grounds for marking down the projected 50% rise in outlays.

On analytical grounds, the subsequent course of demand for the products of reporting firms would be expected to have an important influence on the fulfillment of investment intentions. Time-series data confirm this theoretical belief. Sales anticipations of firms have been compiled in the annual Commerce-SEC surveys since 1948; the sales forecasts of various manufacturing industries are published to show the assumptions about demand underlying the capital spending intentions. Using errors in sales forecasts as an auxiliary predictor, one finds that, "for manufacturing as a whole there is a high positive correlation between the relative size of the deviation in investment anticipations and the relative size of the deviation in sales expectations; the coefficient of correlation for the years 1948-56 is .88."\*

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\* Foss and Natrella, "Investment Plans and Realization," p. 16.

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Manufacturers' explanations for deviations between realized and intended investment also suggest that unanticipated changes in sales lead to a revision of plans for capital spending. For the recession year of 1949, nearly one-half of those firms which invested less than planned and one-sixth of those whose outlays exceeded

plans offered as their principal reason unanticipated changes in sales or in net earnings. The same reasons were offered by about two-fifths of firms exceeding plans and one-fourth of those spending less than planned in 1955;\*

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\* Ibid., p. 13; and Friend and Bronfenbrenner, op. cit., p. 87.

in general, sales and earnings experiences were more favorable than expected in 1955.

In the handful of nine time-series observations, each one per cent excess of realized over expected sales is associated, on the average, with an additional one per cent excess of capital outlays relative to anticipations. This stands as a highly tentative quantitative hypothesis which one would like to test by use of cross-section data. Presumably, the hypothesis would be supported if a slope coefficient of approximately unity is found in an estimated regression of the percentage deviations of investment from plans of individual firms on the percentage errors in their individual sales forecasts. Several attempts have been made to study the relationship between investment-deviations and sales-deviations 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 similarly poor results for 1955. However, Eisner finds a low but significant correlation coefficient of .20 for McGraw-Hill data of 1950.\*\* No slope

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\*\* Ibid., p. 94; Foss and Natrella, "Investment Plans and Realization," pp. 16-17; op. cit., p. 115; and Eisner, op. cit., p. 35, Table 18.

coefficients are reported in any of these studies, but Eisner presents data from which the implied slope may be calculated. The calculations show that, despite the low correlation coefficient, the slope is only slightly below unity.\*

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\* Eisner works with actual and planned investment as fractions of gross fixed assets. The standard deviation of the investment error, so defined, is 5.5%; the standard deviation of the percentage error in sales forecasts is 15.8% (p. 35). Since  $a = \sigma_1/\sigma_2$ , the implied slope is 0.07 per cent of gross fixed assets. Since the mean ratio of investment to gross fixed assets was 8.8% (p. 31), the slope can be approximated as 0.8 per cent of investment.

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The other sets of data which produced low correlation coefficients might also yield fair-sized slopes. Capital outlays are more volatile and more subject to random factors than are sales at the level of the firms; the variance of percentage investment errors is higher than that of sales errors. But, in the aggregate, 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 micro-economic 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, presumably in an attempt to catch up with their rivals by lowering costs or improving their product lines. Such distress investment obviously may account in part for the large residuals and low correlations found in micro-economic studies of investment deviations and sales deviations.\*\* Deterioration of general business

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\*\* Friend and Bronfenbrenner, op. cit., pp. 83, 94.

conditions does not appear to stimulate distress investment.

When the evidence is assembled, it suggests quite clearly that unexpected changes in sales are likely to affect the realization of investment plans. At the present state of knowledge, this information can probably be utilized only in a rather crude way. When the forecaster's beliefs about all sectors of the economy imply 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 to some degree. In this manner, the forecaster is relying on the anticipations data and, at the same time, endeavoring to improve on the accuracy of the anticipated level by taking account of the induced effects of probable changes in sales on capital outlays.

Expectations of producers of capital goods are compiled in a semi-annual survey conducted by Fortune\* and summarized in the "Business Roundup" section

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\* See details in "Report of Consultant Committee on General Business Expectations," pp. 590-94. The author is indebted to Messrs. Sanford Parker and Todd May of Fortune for further information on this survey.

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of the June and December issues. 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. It is clear that the survey did very 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 during this boom period in equipment outlays. 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.

#### Inventory investment

Inventory investment is a very small, highly volatile, and exceedingly important component of Gross National Product. Fluctuations in the volume of nonfarm inventory investment accounted for a dominant share of the movement in GNP during the two recession periods of the past decade. Thus far, the behavior of inventories has defied successful explanation by non-expectational variables; and, as will be indicated below, expectational data have not as yet supplied a solution to this knotty problem.

Inventory changes are not only hard to forecast; they are difficult to measure ex post. Inventory investment is estimated by comparisons of total stocks at two points in time. Small errors in the recorded volume of total inventories may therefore produce very large relative errors in the estimate of inventory change. Moreover, in the national product accounts, the relevant concept is the value of change in the physical volume of inventories; it excludes revaluations of an existing

physical volume due to price changes. Data on the book value of inventories as shown in the balance sheets of firms usually must be adjusted to eliminate the effects of price movements. As more detailed information on stocks becomes available to the Department of Commerce, estimates of past inventory investment are frequently -- sometimes extensively -- revised. 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.

The unique nature of the inventory investment component of national product helps to explain the difficulties it creates. 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 remains in the hands of sellers and is not acquired by a final user during the period. To some extent the excess of production over sales will reflect a planned increment of stocks desired by sellers to adjust to recent or expected changes in sales. However, inventory investment will also reflect divergences between the volume of sales expected by producers and the actual volume of their sales: goods designed for sale which are not bought remain on the shelves of sellers as part of their inventories. Obviously, the empirical data on stocks do not permit a breakdown of actual inventory change into planned and unplanned components.

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 auxiliary predictors to project the probable trend of unplanned as well as planned accumulation. They have been employed in this manner in one ingenious empirical exploration conducted by Modigliani and Sauerlender. According to their very 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.\*

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\* Franco Modigliani and O.H. Sauerlender, "Economics Expectations and Plans of Firms," Short-Term Economic Forecasting, pp. 333-50.

The inventory anticipations data of Fortune and Dun and Bradstreet are most directly relevant to prediction of the monthly series on the book value of manufacturing and trade inventories. This series covers 90% of all nonfarm inventories in the economy. One would expect, therefore, that, when revaluations due to price changes are taken into account, the changes in the book value series over quarterly periods would correspond to the nonfarm inventory investment component of GNP. Attempts by the author to effect such a reconciliation have yielded disappointing results. It is not evident that the ability to forecast both price changes and the book value of manufacturing and trade inventories would insure successful prediction of the inventory investment component of GNP.\*\*

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\*\* Cf. "Report of the Consultant Committee on Inventory Statistics," Reports of Federal Reserve Consultant Committees on Economic Statistics, pp. 445-47.



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 in the future from a sample of about 200 manufacturers. These are blown-up into an estimate of aggregate inventory change for manufacturers.\* Because the projections for

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\* See "Report of Consultant Committee on General Business Expectations," pp. 585-90.

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one year ahead eliminate the serious problem of allowing for unrepresentative seasonal patterns in the sample, these longer-term predictions have received most emphasis in recent published reports in "Business Roundup." Also, in recent quarters, emphasis has been 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. However, since its inception in mid-1953, the survey has apparently surpassed naive 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.\*\* In the case of inventory expectations,

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\*\* 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.

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he uses regression techniques employing diffusion indices which summarize responses on the actual and expected directions of inventory changes. These survey variables perform extremely well in forecasts of the Commerce series on the book value of manufacturing and trade inventories for fourteen quarters from 1949 to 1952.\* Multiple correlation coefficients obtained are in excess

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\* Ibid. pp. 99-100, 122.

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of .95 for all manufacturers and traders combined as well as for durable goods manufacturers and for non-durable goods producers taken separately. The results are less satisfactory when the regression equations are used to predict inventory change from Dun and Bradstreet data for quarters from 1953-55. The general pattern of fluctuation in inventory-changes is reproduced, but inventory change is consistently overestimated.\*\*

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\*\* See "Report of Consultant Committee on General Business Expectations," pp. 539-48.

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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 somewhat encouraging, are most inconclusive. Nevertheless, the anticipations data recommend themselves to the forecaster if only

because he is in such dire need of assistance from some quarter. Obviously, the problem of predicting inventories demands extensive further study. The potential contribution of anticipations data deserves thorough exploration in attempts to develop an effective technique for predicting inventories.

On the basis of the evidence recited in this paper, it is impossible to render a verdict -- favorable or unfavorable -- concerning the usefulness of existing series of anticipations data in forecasting inventory investment and residential construction. In the case of consumer expenditure on durable goods and capital outlays by business, the evidence points toward a favorable appraisal. The record of the past decade suggests that consumer buying intentions and business investment intentions supplement the information contained in non-expectational data. This paper has offered a few very tentative proposals concerning ways in which the intentions data might be used for forecasting purposes in conjunction with non-expectational variables. It is hoped that these suggestions may stimulate further experimentation and research.