



# *Business Forecasting*

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# *Business Forecasting*

## *Preface*

Increasing interest in forecasting highlights the need for a convenient guide to forecasting practices and achievements. This book is intended to provide such a guide.

New conceptions of the management function in private business have accentuated the importance of forecasting. For example, decisions depend more and more on expected sales, whose figures depend on the use of sales budgets, which are in turn based on sales forecasting. Management also applies this method in using cash budgets from which forecasts are made to economize cash funds.

The Federal government has made increasing use of forecasting, especially since the enactment of the Employment Act of 1946, and has given the business community helpful guidance and coordination.

In reality, forecasting is inevitable. Good business decisions are related to future expectations, and any looking to the future means that a forecast is involved, even though conclusions may be based only on past and present information. Using a quick appraisal of the past as an offhand guide means that forecasts are made but not carefully developed.

Improvement in forecasting techniques represents greater care in formulating assumptions and greater attention to the detailed development of their implications, frequently in quantitative form. After all is said and done, the casual forecast may sometimes come closer to the mark than one carefully developed; but on the average we can expect the latter to be more accurate. A check on the adequacy of forecasts points to this conclusion. The evaluation of forecasts is discussed in the final chapter.

A forecast is frequently said to rest on the judgment of the forecaster. His judgment counts most in the assumptions he makes and in the improvisations he uses to show the future conditions the assumptions predispose. Appropriate assumptions that are carefully developed produce the most promising forecasts. The assumptions which can usefully be made vary with the type of forecast required. For this reason separate

consideration is given to a number of different forecasts in the text; for example, the distinction between growth and short-term forecasting is illustrated.

I have presented actual forecasts when I thought they would help the reader. Methods can often be most effectively visualized when they are illustrated. In cases of growth, the reader may find that the forecasts stretch into the future. Since I take responsibility for the assumptions made, I believe that they have a reasonable degree of reliability, but it is probable that all forecasts will be improved by the reader's bringing into play current information.

Methodology is of prime importance in forecasting, and I have been concerned about it at every step. Methods used, however, depend upon the assumptions employed, and such methods are most readily grasped when illustrated by the actual forecast. I have been conscious of the reader's need to understand why one particular method has been used; if important alternative methods exist I have tried to explain why they have not been used. Although I have not found it desirable to develop methods in great detail, an attempt has been made to clarify the advantages of those procedures which seem most useful and suitable at the present level of our understanding. This book does not present a handbook of the details of minute mechanics for a limited set of methods.

Cases which describe current business practices dramatize the present uses of forecasting, and I have used them extensively. In studying these cases the reader can trace the assumptions and methods employed and see the ways in which forecasting analysis is applied. Most of the cases are concerned with sales rather than more general forecasting, but they graphically illustrate the direct business application of forecasting.

In writing this book I have used an outline which covers the major areas of business forecasting. These include growth of total industry and individual industries, short-term movements of total industry and individual industries, company sales, and several miscellaneous processes. Two chapters describe those economic indicators which are essential in carrying out forecasting procedures.

In checking the adequacy of forecasts, recent advances in weather analysis have been of great benefit. I have analyzed at some length the performance level of business forecasting as it relates to the new emphasis on the need for it. Since any appraisal of forecasts must be objective to be of value, I have been guided by the fact that the reader's needs will not be fulfilled by efforts to defend or deprecate current practices.

I am grateful for the assistance of so many persons that detailed acknowledgment is impractical. I do wish to give specific thanks to several individuals who read and commented on particular sections of the book. These include Professors Carl L. Moore, Eli Schwartz, John H. Urban,

and S. George Walters of Lehigh University; and Dr. Harlow D. Osborne of the National Income Division of the Department of Commerce. My wife contributed by rendering a measure of constant and generous assistance during the various stages of the book's development.

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# *Contents*

PREFACE	v
CHAPTER 1. The Forecasting Problem	1
2. Measurement of Total Expenditures	8
3. Forecasting the Growth of Total Industry	29
4. Forecasting the Growth of Major Expenditure Divisions	65
5. Forecasting Growth in Particular Industries	94
6. Indicators of Business Conditions	133
7. Short-term Forecasting of Aggregate Industry	157
8. The Commodity Price Forecast	198
9. Short-term Forecasting of Individual Industries	218
10. The Sales Forecast: Methods and Uses	237
11. The Sales Forecast: Company Practices	260
12. Forecasting Various Economic Processes	288
13. Checking the Adequacy of Forecasts	311
BIBLIOGRAPHY	349
INDEX	359



## CHAPTER 1

### *The Forecasting Problem*

Forecasts are indispensable in planning. All decisions involve planning, whether it be implicit or explicit. In earlier times relatively more decisions were made extemporaneously as problems arose. Extemporaneous decisions, in common with decisions made with more care, involve future action. They are satisfactory to the extent that future conditions are immediately obvious to the decision makers. Generally, future conditions are not immediately obvious, and to an increasing extent, therefore, explicit forecasts are made.

Forecasts are statements of expected future conditions; definitive statements of what will actually happen are patently impossible. Expectations depend upon the assumptions made. If the assumptions are plausible, the forecast has a better chance of being useful. As shown in the following chapters, much of the work on forecasting analysis in recent years has proceeded from careful statements of the assumptions to be employed. When the underlying assumptions are spelled out in some detail, the plausibility of forecasts can be more readily judged.

In order to make quantitative forecasts, mechanical methods must be formulated for drawing reliable conclusions from established assumptions. Methodology varies in accordance with the assumptions, the available information, and the ingenuity of the forecaster. Primary attention throughout this book is given to techniques employed in forecasting.

Forecasting assumptions and techniques vary with the kind of planning needed. The rapid strides made in planning in recent years are largely responsible for the increasing attention given to business forecasting. Decisions have become increasingly varied, so that diverse types of planning are required. Major needs for business forecasting can be identified, however, with two broad types of planning: for requirements growing out of short-term and out of long-term changes in demand. Short-term changes in demand are the more pressing, and major attention has been given to them.

Increasing interest is being displayed in long-term forecasting because it provides a rational basis for planning commitments for durable goods. The future requirement for durable goods must be estimated from expected demand for their services. Long-term forecasts develop a type of average expectation under stated assumptions. Such an expectation may be said to represent the growth potentiality. In modern forecasting the assumptions made are usually closely related to conditions of full employment or some approach thereto.

#### LONG-TERM FORECASTING BY GOVERNMENT

Forecasts of the demand for services of durable goods are needed by public bodies and by private business. Public bodies frequently must make decisions regarding various types of installations, notably, water-works and other public utilities, roads, and streets. These decisions may be reflected in budget estimates, and certainly the administration is going to be held accountable if the expenditure for installations falls substantially short of demand or grossly exceeds it. Frequently, make-shift adjustments from year to year produce quite unsatisfactory results in the absence of careful estimates of long-term requirements. The wrong-size power plant or pipeline, for instance, may prove expensive in future years.

Public responsibility to conserve natural resources calls for some understanding of the need for resources in the future as established by future demand for them. Therefore an intelligent resource policy must rest partly on forecasts of the demand. It was with this thought in mind that the President's Materials Policy Commission in 1952 made forecasts of various raw-material needs to 1975.<sup>1</sup>

Knowledge of the requirements for growth will lend substantial reassurance in the practice of fiscal policy. Current action to curtail or expand public construction can be most intelligently taken in the light of potential needs. If the needs are envisioned to be so great that no conceivable speeding up in depression would exhaust them, curtailment of public construction in prosperity would be called for only to the extent that new inflationary pressures should be avoided. If, on the other hand, forecasting indicates that potential needs are limited, care would be required to avoid exhausting useful projects in prosperity. The cost of delaying public works is clarified by forecasting.

An understanding of the expected demand for durable goods of various sorts gives public bodies a basis upon which to encourage private

<sup>1</sup> See *Resources for Freedom* (Washington: President's Materials Policy Commission, June, 1952), frequently called the "Paley Report." Forecasting material is scattered through the five volumes of the report.

industry to sight on workable goals, and thus enables them to provide leadership rather than blindly follow evanescent indications of current markets in the private economy. Frequently, private industry needs all the encouragement it can get in order to visualize the future in true perspective. The functions of government are generally accepted to include at least some degree of responsibility with regard to industrial leadership, as is surely indicated by the Employment Act of 1946.

Public bodies also frequently need forecasts of the demand for durable equipment and structures in order to provide more judicious control, although it must be admitted that even now many public bodies fail to recognize this need. For instance, in the late thirties the Interstate Commerce Commission reached unfavorable decisions regarding the value of many junior railroad securities by looking to the low level of railroad traffic of the thirties and ruling against giving any consideration to expected future levels of traffic. Railroad stocks thus declared worthless failed to give the owners the equity that true potentialities would frequently have accorded them.<sup>2</sup>

#### LONG-TERM FORECASTING BY PRIVATE BUSINESS

When orders are placed on the books, it is a costly mistake to have too much or too little capacity. With too much capacity, operations must proceed at uneconomically low rates. If capacity is too limited, some orders cannot be filled, and a very high rate of operation increases the per-unit cost. Of course, no businessman can expect to attain a capacity which is precisely commensurate with his order books at all times. What he can rationally hope for is a capacity which will satisfy most of the demand when times are good and which will not be bankrupting, because of idle plants, in less prosperous periods. To achieve these conditions he must know something about the long-term demand for his products. Satisfactory knowledge of long-term demand would lead him to point his capacity at levels which would not fall far short of peak demands and which would be out of relation to current demand only in depressed conditions arising from a temporary restriction in ordering.

As troublesome as the problem of too much or too little aggregate capacity is the problem of its distribution. If capacity is specialized and not readily convertible to different kinds of products, the appropriate level of aggregate capacity may become unprofitable because it is concentrated in the wrong products. A knowledge of the growth po-

<sup>2</sup> The Interstate Commerce Commission's decisions were founded on the absolute priority rule and on the major emphasis placed on earnings of the recent past. The cases are widely discussed in the literature. See, for instance, Harry G. Guthman and Herbert E. Dougall, *Corporate Financial Policy* (Englewood Cliffs, N.J.: Prentice-Hall, Inc., 1955).

tentialities of various types of products will help keep the distribution of capacity adjusted to the distribution of demand. If a company attains a better comprehension than its competitors of the growth potentiality of aggregate demand and of the distribution of the demand, the company's competitive position will be substantially enhanced.

Knowledge of growth potentialities will help keep down the cost of capacity, for such knowledge will make it possible to adopt the expedient of allocating increased expenditures to expansion in periods when costs are relatively low. In contrast, when current demand is relied upon as an indicator of expansion needs, capital building tends to be concentrated in periods when current demand and costs are relatively high. In addition, companies which take advantage of low costs when demand is low will be contributing significantly to the stabilization of the economy, for one of the principal deficiencies in demand during depressed periods is inadequate expenditure on capital building.

Improved knowledge of growth potentialities should be of some aid in developing sound labor relations. Labor will hold management in greater respect if convinced that management has an enlightened understanding of the growth of demand. Industrial objectives can be more intelligently stated. Added capital building in depressed periods will expand employment in trying times. If competitive positions are improved, labor demands ordinarily can be more readily met.

The above comments relate to the advantages which might be gained from accurate growth forecasting. No assumptions are made regarding the adequacy of past forecasting and the degree of accuracy which may be expected in the future. These questions are given detailed consideration in later parts of this book. The need for growth forecasting is so great that its use will be rewarding unless complete inaccuracy is to be expected.

#### SHORT-TERM FORECASTING BY GOVERNMENT

There is a great need not only for forecasting long-term potentialities but also for forecasting near-future developments. In short-term forecasting, as contrasted with long-term, indications of *actual* future levels are sought rather than an *average* expectation. In facing the immediate future, we must look toward the actual level of activity expected even though it may appear to be quite transitory.

Much attention has been given to the need for short-term forecasting by public bodies in carrying out fiscal and monetary policy. Control action must look not to the present and the past but to the future in which its effects will be felt. Costly mistakes may be made if control

action is taken solely on the basis of present levels of activity. For instance, in the fall of 1954, many persons called for positive inflationary action to assure adequate levels of activity in 1955;<sup>3</sup> such action would have resulted in serious harm since activity rose to high levels without the introduction of inflationary measures.

Even if the policy were not to guide current changes in economic activity, some knowledge of the short-term trend would be helpful. We can at least hope that government will not be a major interference, as would happen, for instance, if large deficits occurred in peak prosperity or large surpluses occurred in deep depression. Even without planned control, any government wishes to avoid action which would appear foolish in retrospect. Forecasting is required because action taken today will influence business activity tomorrow regardless of conscious intent.

In addition to actions implementing fiscal policy and monetary control, intelligent debt management is partially dependent upon near-future business conditions. The rates to be charged on government securities should take into consideration the tightness of the money market shortly after flotation, when the market must absorb a substantial portion of the securities. Again, the success of efforts to shift the proportion of outstanding debt in long- or short-term securities will be dependent to a large extent on the level of business conditions which follows the decision. Either short-term or long-term flotations may be chosen, within limits; a decision in favor of one or the other may create increasing pressure to take the opposite course in the near future. Long-term issues can be more advantageously chosen if the near future is expected to bring high levels of activity.

Alongside long-term forecasting, short-term public forecasts are needed to aid and influence private business. Public bodies can afford to give much more attention than private business to changes in the aggregate economic situation. Sales forecasting by business must be sighted narrowly on conditions in particular markets, but forecasts of changes in conditions in the broader economy would often be very helpful to the individual businessman. Without the forecasting studies made by public research bodies, forecasts of the broad market would be unavailable to many companies. The forecasts may provide reassurance at critical times and may circumvent some of the dangers of false hopes when the overall prospects are poor, for the markets in individual industries are closely related to the conditions in total industry. Particularly, aggregate forecasts may guide companies in following a sounder inventory policy, one which is less subject to rapid reversal.

<sup>3</sup> See, for instance, Arthur R. Upgren, "Policies for Economic Expansion," *Michigan Business Review*, 7:34-37, 1955.

## SHORT-TERM FORECASTING BY PRIVATE BUSINESS

In most types of private business a knowledge of near-future conditions is essential to the development of an effective inventory policy. Today's decisions determine tomorrow's inventories. If tomorrow's sales are implicitly assumed to equal those prevailing today and inventory levels have been appropriate and about constant, production schedules should remain unchanged. The outcome, however, would be unfortunate if the level of sales were to change greatly: a rapid increase in sales would result in an undesirable runoff in inventories, and a rapid decrease in sales would result in an undesirable inventory accumulation.

It is clear that production schedules should be geared to expected, rather than to actual, sales. There are many striking illustrations of the unhappy outcome which may result from uncritically anticipating a continuation of prevailing conditions. For example, in 1937 and again in 1949 many textile companies were faced with the necessity for a rapid curtailment of operations when retailers made drastic reductions in their inventories.<sup>4</sup> It is possibly even more serious to assume that a continuation of such rapid curtailment is needed or that inventory accumulation, once begun, should be continued with rising sales. An understanding of near-future prospects would make it possible to avoid some of the rapid vacillations which often occur in production scheduling.

The most important decisions on inventory levels are dependent upon expected sales. Nevertheless, there are times when expected price changes must be given independent consideration. For instance, if prices are expected to rise, as is likely with expanding sales, some businessmen will try to take advantage of the rise by earlier buying. Although such decisions frequently become self-defeating, they do represent a use to which forecasts are sometimes put. For the past thirty-five years most businessmen have resisted the temptation to rely heavily on expected price changes in formulating buying policies. Typically, businessmen will frankly tell you that they buy to service sales, not to speculate on price changes.

More important for businessmen is the need to know the future level of sales in setting their own administered prices. The raising of prices is avoided when near-future markets are not expected to be strong, and the lowering of prices is avoided when costs or sales levels are likely

<sup>4</sup> See, for instance, Robert P. Ulin, "1950 Production: More Sustained than in 1949," *Textile World*, February, 1950. The executives of many of the large textile companies, on their own testimony, "fly by the seats of their pants." In January, 1938, several officials in the industry assured the writer that, in spite of strenuous efforts to get operating schedules into line the preceding fall, inventories built up at their plants.

to rise materially. Future market conditions are thus of major importance in setting administered prices.

Many companies find it advantageous to set sales targets for the purposes of establishing controls and providing incentives. But sales targets will accomplish no such purposes unless they are realistically geared to the sales levels which will eventuate. If the targets are too low, they will be too easily met to provide any incentive or control, and if too high, they will be discouraging. A sales target may be of little value and even detrimental if not geared approximately to future sales levels.

The amount of cash required depends upon the level of operations and the level of sales, so that an intelligent financial plan necessitates forecasting. Some advance notice is usually needed to obtain additional funds on the best terms or to limit the funds held idle. It is to be noted that production scheduling poorly geared to prospective sales levels will complicate financial planning. If undesired inventory accumulation is induced, cash requirements will be unduly increased; if inventories are unintentionally run off, idle cash will be increased at the expense of inventories.

The most effective time to start expansion projects is at the beginning of a long rise in sales. Short-term forecasting cannot be expected to be of substantial aid in predicting the length of the rise, but it should help to spot the time when sales will begin to rise.

Short-term forecasting is needed in budget making. A budget set for the following year will be much more useful if geared to sales levels which will eventuate rather than merely to current sales levels. A budget distributed according to current sales levels may establish policy as to lines of emphasis, but will obviously require successive adjustments if sales levels change. The effectiveness of such successive adjustment is limited because a changed level of sales is likely to necessitate a relative shift in cost and expenditure distributions.

Sales and cash budgets have experienced increasing development through the use of sales forecasts. This has led to revolutionary developments in management controls, as explained in Chapter 11.

## FORECASTING NEED AND FORECASTING ABILITY

The main purpose of this book is to describe forecasting methods and to appraise the rational bases on which they are founded. Forecasting work can be placed in true perspective only by an appraisal of the adequacy of its results. That the need for forecasting has led to many ingenious efforts to produce forecasts is well known. These efforts have not been wholly successful. An appraisal is made in the final chapter.

## CHAPTER 2

### *Measurement of Total Expenditures*

The two following chapters are concerned with forecasting the growth of total industry and major types of expenditures which add up to the total. To facilitate the analysis we present here a brief statement on the standard measurements. These are measurements of "final" expenditure in the sense that the product counted is not resold in the year, or other time period, to which the measurement refers. Included are expenditures made by consumers for goods and services for personal use, expenditures by business for investments which increase total assets, and expenditures made by government which may be considered to be consumed in the combined interest of the total residents of the country. Summing the expenditures in these classifications provides an effective measure of total expenditure.

The development of a comprehensive measure involves many detailed problems, most of which are too technical to be analyzed here.<sup>1</sup> These relate principally to the procedures employed to obtain figures which will add up to a consistent total. In the over-all procedural pattern, receipts from final sales are balanced against the distributed use of the funds obtained, as illustrated in Table 2-1. The complexity of the economy is so great that some special adjustments are made to market figures, but the adjustments are of relatively minor importance.<sup>2</sup>

The total-expenditure figure most frequently employed follows the above description and is called "gross national product." Its movement

<sup>1</sup> The data generally used are the estimates made by the Department of Commerce. They are reported currently on annual and quarterly bases. The technicalities of developing the estimates are discussed in a basebook supplement; the most recent was issued in 1954. See *National Income: A Supplement to the Survey of Current Business* (Washington: U.S. Department of Commerce, 1954). Yearly data are brought up to date in the July issue of the *Survey of Current Business*. A new issue of the supplement probably will appear in 1958 or 1959 and can be expected to include revisions which will change previously reported figures to a minor extent.

<sup>2</sup> Most important are imputations for services which do not flow through the business economy. For instance, nearly \$20 billion of gross rent for owner-occupied houses is included in the gross-national-product estimate for 1955.



TABLE 2-1

INCOME AND PRODUCT ACCOUNT, 1955  
(In billions of dollars)

Employee compensation.....	223.0	Personal consumption expenditures	254.4
Unincorporated enterprise income.	39.2	Gross private domestic investment.	60.6
Rental income of persons.....	10.2	Government purchases of goods and	
Corporate profits.....	40.7	services.....	77.1
Personal interest income from private sources.....	10.9	Net foreign investment.....	-0.4
Business transfer payments.....	1.3		
Indirect business taxes.....	32.7		
Capital-consumption allowances...	31.6		
Total.....	389.8		
Less: subsidies minus current surplus of government enterprises.....	0.2		
Statistical discrepancy.....	2.1		
Gross national product.....	391.7	Gross national product.....	391.7

SOURCE: *Survey of Current Business*, July, 1957.

is shown in Chart 2-1. Product and expenditure, used in this sense, are the same because final sales represent the ultimate output, or product, of the economy. The total is called "gross" because it includes expenditures made to replace durable capital. Net product can be estimated by subtracting the amount of expenditures for capital replacement, but the difference between new and replacement expenditure is vague.<sup>3</sup> To the extent that investment does no more than keep capital intact it represents a replacement rather than an increase in assets. Except for capital replacement, gross national product is composed of net expenditures.

Notably, so-called "intermediate expenditures" are omitted. These represent production expenditures made in the process of preparing the product for market. For instance, automobile manufacturers usually buy some component parts from other manufacturers. These become an integral part of the assembled automobile, and only the consumer's expenditure for the completed automobile is included in gross national product.

Furthermore, there are many expenditures made in the economy which are unrelated to buying the product of the current period. A major example is the sale of already existing assets. Sale of an old house or of a stock certificate involves expenditure which is unrelated to current

<sup>3</sup> The best available estimate of replacement is derived from capital-consumption allowances set up by operating accounting systems, adjusted to a minimum extent by the Department of Commerce to conform to established concepts. Principally, the adjustment makes allowance for capital outlays charged to current expense.