THE MANAGER'S GUIDE TO BUSINESS FORECASTING

How to understand and use forecasts for better business results

Michael Barron and David Targett

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Basil Blackwell

First published, 1985

Basil Blackwell Ltd
108 Cowley Road, Oxford OX4 1JF, UK

Basil Blackwell Inc.
432 Park Avenue South, Suite 1505,
New York, NY 10016, USA

British Library Cataloguing in Publication Data
Barron, Michael.
The manager's guide to business forecasting: how to understand and use forecasts for better business results.
1. Business forecasting.
I. Title. II. Targett, David.
338.5'44 HB3730

ISBN 0–631–14034–4

Library of Congress Cataloging-in-Publication Data

Barron, Michael.
The manager's guide to business forecasting.

Includes index.
1. Business forecasting. I. Targett, David.
II. Title.
HD30.27.B37 1985 658.4'0355 85–9090
ISBN 0–631–14034–4

Typeset by Freeman Graphic, Tonbridge, Kent
Printed in Great Britain by The Camelot Press Ltd, Southampton

Introduction

Does your organization use business forecasts? If so, are you satisfied that you are getting value for money? Have you any means of knowing whether or not you are getting value for money? Many organizations cannot answer the last question because they do not regularly appraise and monitor their forecasting system. When they do and problems are found, it is often because the forecasting process has not been properly managed, and much less often because of technical errors.

If your organization does not use business forecasts, what holds it back? Is it because forecasting seems too complex technically? Or is it because you feel unable to communicate with the technical experts who might be able to help?

This book covers both situations. Whether you are dealing with in-company experts or external consultants, its purpose is to explain what you need to know in order to use business forecasts effectively. This includes being able to communicate with technical experts and understand their jargon. It also includes the ability to judge their work and perhaps even to reject it as being of poor quality or little value.

The book does not attempt to turn managers into complete forecasting experts. Forecasting is a tricky business and even with the increasing number of excellent computer packages now available, experience and technical knowledge are still required. What we hope to do is give you the confidence to get involved. This is the best way to gain experience. If you want to do your own forecasting, either because you have your own microcomputer or because you work for a small organization where expert help is out of the question, the book provides the basic concepts essential for a more advanced technical study.

The first chapter gives a management context for business forecasting. By providing a nine-point checklist for managing a forecasting

system, it outlines the action a manager needs to take to make forecasts effective.

The next three chapters deal with techniques. A manager does not need to know the full mathematical and technical detail of every forecasting technique available. But he does need to know enough about the concepts and principles to be able to communicate with the experts. He may also need to understand the essentials of computer output. A manager who lacks this understanding may opt out of discussions with experts because he has no idea of the principles being discussed or because he is confused by the jargon. As a result, his expertise is lost to the forecasting project. Knowledge of the underlying concepts gives the manager the confidence to take part in such discussions. Chapters 2–4 try to achieve the delicate balance between too much and too little technical detail. Too little, and only a shallow understanding of the concepts results; too much, and the important concepts are obscured by the less important technicalities.

Chapters 5–7 are concerned with the management aspects of forecasting. These include relating forecasts to decisions and appraising forecasts, as well as implementing and monitoring them. These are all areas which definitely fall within the responsibility of the manager rather than that of the technical expert. Chapter 7 concerns the things a manager needs to do in order to make business forecasts work. When a manager, for whatever reasons, opts out of the forecasting process, these topics are, by default, left to the technical experts. Consequently the necessary action is frequently not taken and whole dimensions of forecasting systems can sometimes be ignored.

Chapters 8 and 9 are case studies, bringing together many of the ideas described in the book. The first case shows how a microcomputer can be used to assist a company with financial forecasting; the second illustrates how the setting up of a forecasting system can be based on the nine-point checklist. The final chapter deals with data sources for forecasting. It describes and lists sources of data and, where necessary, the means to access them. The chapter distinguishes between raw data (such as annual accounts or government statistics) and more refined data (including ready-made forecasts of the United Kingdom economy).

The whole book should be approached as an exploration of what a manager should know and what he or she can do to make a business-forecasting system of real practical value within an organization. It is intended to provoke thought, as well as to inspire action. The section on Further Reading indicates the directions in which an interest in forecasting can be developed.

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CHAPTER 1

The Context of Business Forecasting

The business world of the 1960s and earlier was more stable than it is at present. This view is not merely the product of nostalgic reminiscence: business and economic data of the period reveal relatively smooth series with steady variations through time. As a result, business forecasting was not the issue it is now. In fact, many managers claim to have done their forecasting on the back of the proverbial envelope. The situation is different today. Uncertainty is evident everywhere in the business world. Forecasting has become more and more difficult. Data, whether from companies, industries or nations, seem to be increasingly volatile. The rewards for good forecasting are very high; the penalties for bad forecasting or for doing no forecasting at all are greater than ever. Even the most non-numerate managers tend to agree that a second envelope is insufficient.

As a consequence, interest and investment in forecasting methods have been growing. Organizations are spending more time and money on their planning. Much of this increased effort has gone into techniques. Established techniques are being used more widely; new techniques have been developed. The specialist forecaster's role has grown. Unfortunately, the outcome of all this effort has not always been successful. Indeed, some of the most costly mistakes in business have been made because of the poor use of forecasting methods. Analysing these mistakes reveals that in the main they came about not through technical errors, but because of the way the forecasting was organized and managed.

While attention has rightly been given to the 'kitbag of techniques' of the practitioner (statistician, operational researcher etc.), the roles of non-specialists involved in the process (general managers, accountants, financial analysts, marketing experts and those who are to use the forecasts to take decisions) have been neglected. These roles are usually concerned with managing the forecasts. However, because

they have less technical expertise, the non-specialists have tended to hold back and not participate in planning and operating the forecasting system. Their invaluable (although non-statistical) expertise is thereby lost to the organization. Accordingly, the effectiveness of many organizations' forecasting work has been seriously weakened. The role of the non-specialist is at least as important as that of the practitioner.

The purpose of this chapter is to describe the role of managers and non-specialists in the forecasting process and to show what they can do to improve the forecasting performance of the organization. This chapter will also provide a context for the more detailed topics later in the book.

The Manager's Role in Managing Forecasts

Who Should Be in Charge?

In small organizations forecasting may be done by one person. The individual who needs the forecasts has to produce them. He has to cover all aspects of the work himself.

In larger organizations the question arises as to which department should take overall responsibility. There are three general possibilities:

User department

Managment services

Data processing unit

The third possibility, data processing, is perhaps the most popular, but probably the worst, candidate. The user department may well abrogate its responsibility to the 'experts' and as a result never become involved. While the members of the data processing unit will have plenty of technical expertise, they will know little of the wider issues and will be unable to integrate the forecasting system with the decision taking it is intended to serve. The most likely outcome is an isolated and little-used forecasting system.

The second possibility, management services, suffers from some of the problems of the data processing unit in being remote from the decision taking. Yet when the forecasts are for strategic decisions at board level this solution can be successful. Management services, perhaps in the form of a corporate planning unit, is then able to

devote itself entirely to the major decisions to be taken. It can make the link between the technicalities of forecasting and the decisions.

The first possibility, the user department, should be the best solution for non-board level decisions. However, it frequently does not work. The users feel they have insufficient technical expertise and therefore hand over responsibility to the technical experts in another department. As a result they have little involvement in the system which once again may lead to it being under-utilized. Bringing forecasting non-specialists into the process and maintaining their participation is a key factor for the future of business forecasting. The non-specialists are in the best position to forge the link between techniques and decisions.

Wherever responsibility rests, accountants usually play a part. Frequently the forecasts are financial and accountants are involved as members of the user department. Even when the forecasting is centred on, say, marketing or production control, there are likely to be financial aspects to be considered and financial expertise will be required.

In larger organizations, therefore, forecasting is generally a team activity. Typically, the team members will be a forecasting practitioner, a representative of the user department and a financial expert, although the exact composition inevitably depends upon individual circumstances. In small organizations the forecasting may be done by one person in whom must be combined all the team's expertise. That person is likely to be someone in a general management position.

In a team, the role of the practitioner is reasonably clear. The roles of the other team members include facilitating access to the user department and providing financial data, but, much more importantly, they must include responsibility for 'managing' the forecasts. This means ensuring that resources (the forecasts) are properly applied to objectives (the intended uses of the forecasts). In carrying this out, it is essential to view forecasting as a system and not just as a technique. While the specialist is considering the statistical niceties of the numbers being generated, the manager should be considering the links with the rest of the organization: what is the decision-taking system which the forecasts are to serve? is the accuracy sufficient for the decisions being taken? are the forecasts being monitored and the methods adjusted? and so on. In short the specialist takes a *narrow* view of the technique but the manager takes a *broad* view of the whole forecasting system. The role of managing the system frequently falls, often by default, to a manager in the user department. It is the most vital role in the forecasting process.

What Do You Need To Know?

The recommended broad view can be broken down into three distinct areas. They show the non-specialist knowledge with which a manager needs to be equipped in order to play an effective part in the system.

Being aware of the range of techniques available. A specialist may have a 'pet' technique. The manager should have a good general knowledge of the full spectrum of techniques so that he can make at least an initial judgement on whether they apply to his situation. Such knowledge will also increase his confidence and credibility when taking part in discussions with specialists.

Incorporating forecasts into management systems. This is the essence of the manager's role. A checklist of things which should be done to integrate a forecasting process with the rest of the organization will be described later in the chapter.

Being aware of past forecasting errors. Many organizations have made forecasting errors in the past. Most have one thing in common: they are sufficiently simple that, with hindsight, it seems remarkable that the mistakes could have been made. Yet the errors were made and they are a source of valuable information for the present.

These three areas will now be amplified. Practical examples will be used to pinpoint the nature of a manager's contribution in managing a forecasting system and to confirm the importance of this task.

The Main Forecasting Techniques

This review describes in outline different approaches to forecasting and provides some general awareness of the range of techniques available. The details will be given in later chapters. Forecasting techniques can be divided into three categories:

Qualitative

Causal modelling

Time series methods

Qualitative methods are based on judgement rather than records of past data. Popular opinion might suggest that qualitative methods are the

best. Stories abound of managers with 'instinct' who made predictions with astounding accuracy. On the other hand, the few surveys which have been done show that qualitative methods are, in general, inferior to quantitative ones. The reason for this anomaly may be psychological. There is a tendency to remember the successes of people and forget their failures. The man who predicted policitical revolution in Iran in 1979 is remembered, while the man who said that sliced bread would never catch on is forgotten. The opposite seems to be the case with systems: successes are forgotten, failures remembered.

Even so, some qualitative techniques have a successful record. These are the ones which convert judgements into forecasts in a thoughtful and systematic manner. They are different from the instant guesses which are often thought of as qualitative forecasts. More importantly, there are many situations where the qualitative approach is the only one possible. For new products, industries or technologies (developing and retailing microcomputer software, for instance) no past records are available to predict future business; in some countries political uncertainties may mean that past records are not valid. In these situations qualitative techniques provide **systematic** ways of making forecasts. Qualitative techniques will be the subject of chapter 2.

Causal modelling means that the variable to be forecast is related statistically to one or more other variables which are thought to 'cause' changes in it. The relationship is assumed to hold in the future and is used to make the forecasts. For example, the well-known econometric forecasts of national economies are based on causal modelling relating one economic variable to another. Policies, such as restricting the money supply, and economic assumptions, such as the future price of oil, are fed into the model to give forecasts of inflation, unemployment etc. A further example might be a company trying to predict its turnover on the basis of advertising expenditure, product prices and economic growth. The value of causal modelling is that it introduces, statistically, external factors into the forecasting. This type of method is therefore usually good at discerning turning points in a data series. Causal modelling will be the subject of chapter 3.

Time series methods predict future values of a variable solely from historical values of itself. They involve determining patterns in the historical record and then projecting the patterns into the future. While these methods are not good when the underlying conditions of

the past are no longer valid, there are many circumstances when time series methods are the best. They are used when:

1 Conditions are stable and will continue to be so in the future.
2 Short-term forecasts are required and there is not enough time for conditions to change more than a little.
3 A base forecast is needed onto which can be built changes in future conditions.

Time series methods are also usually the cheapest and easiest to apply and can therefore be used when there are many forecasts to be made, none of which warrants a large expenditure. This might be the case in forecasting stock levels at a warehouse dealing in large numbers of small-value items. Time series methods will be the subject of chapter 4.

Developing A System

The key word is *system*. Forecasting should not be viewed as a number-generating technique but as a system. The technique is just one part of the forecasting process which includes many other factors to do with the generation and use of forecasts within an organization. The process should specify how judgement is to be incorporated, how the effectiveness of the forecasts is to be measured, how the system should be adjusted in response to feedback and many other aspects. In addition, a broad view leads to consideration of the links between the forecasting system and other management systems in the organization. Lack of thought about the nature of these links is often the reason why forecasts may be accurate yet ineffective.

Gwilym Jenkins, father of one of the most sophisticated modern forecasting techniques, suggested some guidelines for the development of a forecasting system.

1 *Analyse the decision-making systems* to be served by the forecasts. This involves listing and describing all decisions and actions influenced by the forecasts, the people involved and the links between them. For instance, forecasts of car sales may be required by the manager of an assembly line at a car plant. Primarily, the forecasts will help decide the speed and mix of the line (the total volume produced and the split between different variants of the model). But other decisions will be influenced by the forecasts: the ordering of steel, the production of

sub-assemblies, the buying of components and the setting of stock levels for example. Forecasts for the assembly line should not be made without a thorough analysis of their impact on other areas. The analysis may reveal fundamental flaws in decision systems or organizational structure which must be sorted out before any forecasts stand a chance of being effective. This is a lengthy but essential process.

2 *Define what forecasts are needed.* This comprises determining forecast variables, frequencies, time horizons and accuracy levels. In the car assembly example it might imply forecasting total demand and variant mix weekly for eight weeks ahead. No more than a medium level of accuracy would probably be required because stocks provide a balancing factor. Defining the forecasts like this prevents the generation of needless forecasts (over-accurate, too frequent, covering too great a time horizon). It can only be done after the decision process has been analysed because, for instance, the ordering of steel may require a greater time horizon than is strictly necessary for the assembly line alone. Some important aspects of the link between forecasts and decisions will be the subject of chapter 5.

3 *Develop a conceptual model* of the forecasting method. This suggests the ideal forecasting method and includes all the factors which might be suspected of affecting the variable being forecast. It indicates the historical patterns which might influence the future, causal variables and whether volatile conditions might point to the use of a qualitative method. In the car assembly example the factors might include seasonal patterns, the economic environment, marketing activity levels, stock levels and price changes. The development of a conceptual model causes thought to be given to the realities of a situation. It should prevent a blind rush into inappropriate statistical techniques.

4 *Ascertain the data available* (and those not available). This will indicate the ways in which the actual forecasting method might fall short of the ideal. It might be impossible to split advertising and promotional expenditures or difficult to measure stock levels accurately. Both these factors would affect the car production forecasting method by limiting the variables that could be included. Sources of data will be the subject of chapter 10.

5 *Develop the actual method* for making forecasts. This is the technique part of the system, involving the selection of a suitable technique

based on the forecasts, accuracy required and the data and resources available. In many organizations it is the only part of the system given any real consideration. The chosen method for car demand might be a causal model (relating demand to an economic variable, perhaps personal disposable income, and marketing variables, perhaps relative price and promotional expenditure) but with an allowance for seasonal effects. Chapters 2 to 4 deal with techniques and their relative advantages.

6 *Test the method's accuracy.* At this stage several techniques might be on the shortlist. They must be compared on the basis of past data and the best chosen for use. The tests involve some statistical ideas to be described in chapter 6.

7 *Decide how to incorporate judgements* into the forecasts. Quantitative forecasting models work on the assumption (not always explicitly recognized) that many of the conditions of the past will continue to prevail in the future. This is true for causal modelling just as for time series modelling. The influence of the economic environment on car demand, for example, may be assumed to apply as in the past. Other factors, such as political circumstances, may mean that the future is radically different from the past. It may not be possible to quantify these factors. Qualitative views about such changes should be allowed to influence the forecast. Of course, a remarkably large number of people believe strongly that they have special insights denied to other managers. It is not being suggested here that free rein should be given to the making of instinctive and arbitrary changes.

A systematic method for incorporating judgement should be developed. This may lean on one of the qualitative forecasting methods. It will certainly require people to be accountable for the changes they make. In the car example the plant manager may take the view that industrial problems are brewing at a rival car maker and that demand may increase as a consequence of the rival's inability to supply. There should be a means of testing his view and, if it seems valid, of allowing it to influence the forecast. If a forecasting method does not allow for such changes then the decision takers may disregard the forecasts and go their own way. The whole system may then lose credibility and fall into disuse. Chapter 7 goes into more detail on ways of incorporating judgements into forecasts.

8 *Implement the forecasting system.* This means ensuring in the initial stages that the system is being properly used, correcting problems

and answering queries. It is essential that when the system is first used, the designers of the system are available for advice and to check that its operation is understood. Chapter 7 gives more details.

9 *Monitor the performance* of the forecasting system. The operation of the system should be checked continually to verify that all is happening according to the specification, both in terms of the use being made of the system and in its statistical performance. Tests of the accuracy of the forecasts should be made with a view to changing the technical structure of the model as conditions change, and improving the accuracy (rather than allocating blame or giving praise). This topic will also receive further attention in chapter 7.

The checklist provides the context in which to view the later chapters. In particular, the final case study, in chapter 9, demonstrates specifically how the checklist can be the basis for tackling a forecasting problem.

To reiterate, a broad view of forecasting must be taken. The reason for discussing forecasting as a system and giving a nine-point checklist is that forecasting seems to fail in organizations far more often because of poor management of the forecasting process than because of technical errors. Some examples of errors which have occurred are the subject of the next section.

Forecasting Errors – Famous Mistakes

The history of business forecasting is crowded with expensive mistakes. Some cases are presented here with the positive purpose of learning from others. The mistakes are a guide to the surprisingly simple and usually non-technical things that can and do go wrong.

Chartering Oil Tankers

In his book *Practical Experiences with Modelling and Forecasting Time Series* Gwilym Jenkins cites the case of an oil company which lost enormous sums of money by taking too superficial an approach to forecasting. A time series approach was adopted which was unsuited to the circumstances.

Figure 1 shows the spot prices for chartering oil tankers for the years 1968–71. Analysing the series and detecting an upwards trend in 1969 and early 1970, it was assumed that the trend would continue,

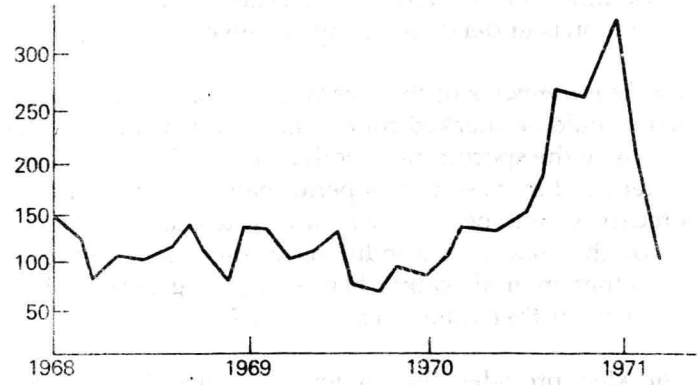

Figure 1.1 Spot price for chartering tankers, 1968–71.

at least in the short term. The company could therefore save money by current rather than future chartering. Accordingly, charter contracts were taken out. The spot price continued to rise; more contracts were arranged. No doubt other oil companies, noticing what was happening, became involved. The spot price rose to great heights. When the chartering activity came to a halt in early 1971, the spot price fell to its pre-1970 level. Contracts taken out at this time would have been at about one-third the price of just a few months earlier. The cost to the company of the over-priced contracts has been estimated at £250 million.

Two mistakes had been made. First, the company's intervention in the spot market affected the market mechanism and thus the price. This occurred because the company was very large and because the supply of oil tankers is, in the short term, fixed. This is a conceptual error, which with the benefit of hindsight can be seen with some clarity. The second mistake was more technical. A deeper analysis of the series would have revealed that it had the appearance of a 'random walk': the step from one spot price to the next seemed to be a random one. If it was random, then by definition there was no pattern in the movement of the spot prices. This would mean that time series analysis was inapplicable. The basis of time series analyses is that they determine patterns in historical data and project them into the future. If there are no patterns, then time series analysis will fail. Worse still, any patterns determined in subsets of the data will be spurious and may lead to false conclusions.