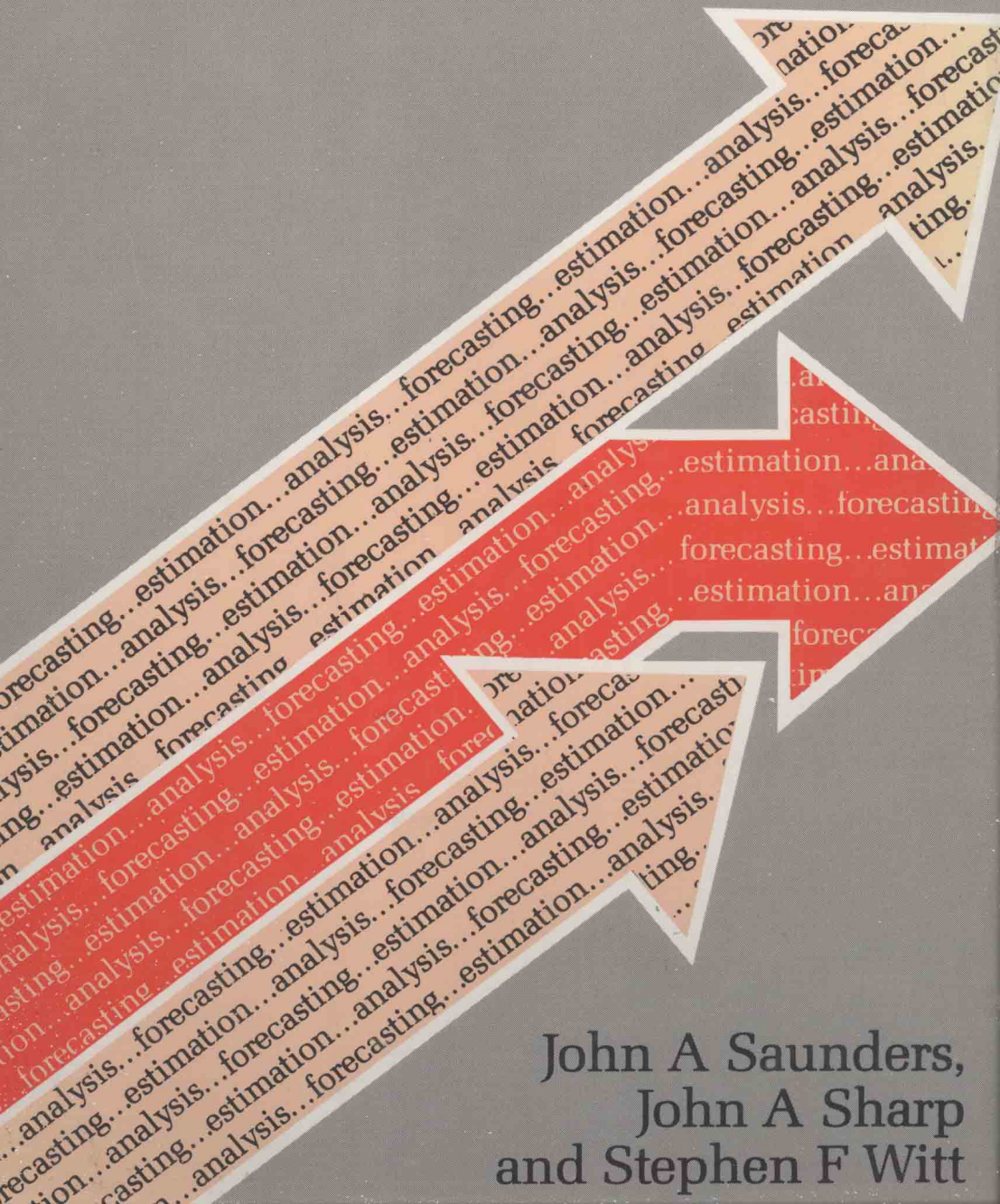


# PRACTICAL BUSINESS FORECASTING

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John A Saunders,  
John A Sharp  
and Stephen F Witt

# **Practical Business Forecasting**

**John A. Saunders, John A. Sharp and  
Stephen F. Witt**

**Gower**

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## Preface

Planning is generally recognized as one of the most important functions of the manager at all levels in the organization and every stage in his career. Planning creates a substantial need for forecasts. This book is intended primarily for those who use, or will use, forecasts and those who are involved in their preparation. It is directed to the concerns of managers and students of management rather than to the specialist. In forecasting, as elsewhere in management, Pareto effects apply. A small proportion of the available techniques is adequate to deal with the great majority of applications. This is reflected in this book. It does not attempt to deal with every technique of interest to the specialist forecaster. It confines itself to those methods that non-specialists can apply successfully.

The structure of the book is as follows. The first two chapters are concerned with topics of general relevance. Thus, from the overview of forecasting provided by the first chapter we move in Chapter 2 to the preparation of data for forecasting. The remainder of the book is concerned with different forecasting techniques and their applications. Chapters 3–9 are devoted to broad categories of forecasting techniques. Thus Chapter 3 deals with what are often referred to as time series analysis techniques or extrapolative and decomposition methods. Chapter 4 covers ratio models that are used for financial forecasting but which also have other applications. Chapters 5, 6 and 7 deal with forecasting for policy making. Regression methods which are particularly useful for these purposes are dealt with in Chapters 5 and 6. Chapter 7 deals with a problem that frequently arises in such applications. For a variety of reasons, from novelty of the product/service through to confidentiality, some of the data needed must be derived subjectively by managers, e.g.

the maximum potential demand for a product.

Chapters 8 and 9 are concerned with strategic forecasts; in particular, approaches to new product forecasting (Chapter 8), forecasting how one product will substitute for another and the forecasting of technological trends. The two latter applications make use of a variety of trend curve projection techniques, which are discussed in Chapter 9. Finally, Chapter 10 addresses an important question that arises once we admit that particular techniques may serve many different forecasting purposes. There are good theoretical, and even better practical, reasons for combining a number of forecasts of a variable derived in different ways to arrive at a 'composite forecast'. Chapter 10 considers how this can be done and the benefits it offers.

The reasoning behind the various forecasting techniques will be discussed but mathematical derivations of formulae will not be presented. It is assumed that the user of the book will have access to one or more of the many suitable computer packages that are available. Without such access it is difficult to make substantial use of many of the forecasting techniques discussed. Given the availability of such packages the reader does not need to be particularly concerned about the details of the calculations. On the other hand, he does need some idea of the validity of the different forecasting methods in particular situations and needs to be able to interpret and use the computer output. The book is intended to provide this knowledge.

Wherever possible, we describe applications of interest to managers and illustrate the use of computer packages for producing the necessary forecasts. Many of the examples described were run using two commercial forecasting packages: the Comshare ORION package and the Comshare SYSTEM W (WIZARD in the UK) package. Further details of these and other software are given in the Appendix.

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# 1 Introduction

Do we need to forecast? While it may seem somewhat paradoxical, it is worth drawing attention at the outset to the fact that forecasting is not always worthwhile. However the reader is entitled to expect two things at least: guidance as to when to dispense with forecasts altogether; discussion of when existing forecasting systems should be abandoned to avoid collapse of the management information system due to the strain of producing redundant forecasts. The second point will be covered later in this chapter, with the more general question of monitoring forecasts. For the moment we confine ourselves to the first.

## TO FORECAST OR NOT TO FORECAST

There are five common situations in which *not* forecasting a particular variable may be the most sensible course:

- 1 other readily available information allows the organization to function just as effectively without a forecast;
- 2 the forecast can be purchased from some external body;
- 3 the risk that the forecast is supposed to reduce can be insured/hedged against at low cost;
- 4 all the information the forecast provides is available through studying some publicly available variable;
- 5 experimentation is possible.

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### **The use of other information**

Forecasting is a natural activity for managers. It is noteworthy, however, that when we turn to the management (or, more usually, control) of hardware systems forecasts are little used. Thus an autopilot does not require a minute by minute forecast of the weather conditions it will encounter to fly a plane across the Atlantic. Instead it responds to changes in the surrounding conditions such as air pockets. It can do this because the altitude or direction of a plane can be changed very quickly. Conversely, a manager needs forecasts because organizations normally react rather slowly to change. It is, therefore, usually necessary to have reasonable forecasts so that action can be taken in advance. If the delivery time for the special steels used in products is 16 weeks and delivery of those products is either ex stock or in a shorter period than 16 weeks then it will be essential to have a forecast of changing patterns of demand. This will enable stocks to be held at a lower level. On the other hand, it would be unusual to forecast the needs for mild steel washers used on such products. It is more cost effective to keep a large stock and reorder whenever that stock drops below a specified high level. Thus instead of using a forecast, different information, namely the approximate stock level of the washers, provides an effective and cheaper way of managing the system.

### **Purchase of the forecast from some external body**

Managers are often unaware of the huge variety of different forecasts available from government bodies, industry associations, market research agencies, and so on. In general, forecasting is not the business of a manager's organization. It therefore makes sense to obtain what forecasts he can from organizations who specialize in forecasting. This point will be taken up in more detail in Chapter 2.

### **Insurance/hedging against risk**

In business it is often possible to insure against risks, e.g. export credit guarantees. Similarly, in commodity markets it may be possible to hedge against future price changes by buying/selling forward rather than attempting to forecast them. Even if the relevant variables can

be forecast, the preparation of the forecasts is expensive and their accuracy indifferent. If the variables concerned are peripheral to the main activities of the organization, paying the costs of hedging/insurance is likely to be far more efficient.

### **Studying some publicly available variable**

Economic theory suggests that prices determined by an efficient market are sometimes the best forecasts that can be obtained. Thus the price of IBM shares appears to be an excellent predictor of IBM's future profits. If this is true, there is no point in trying to devise systems to forecast IBM's profits. Substantial research may be needed to determine whether there is a market price that provides good predictions of a variable of interest to an organization. In large, free, financial markets like those of the USA, such information is often readily available. For a discussion of the efficient market hypothesis, see Dobbins and Witt (1983).

### **Experimentation**

Because the preparation of some forecasts, such as sales of a new product, can mean considerable expense and often poor results, it may well be cheaper to dispense with these forecasts and conduct an experiment instead. This might involve a selective launch to a particular region or customer group or a full scale launch that will rapidly be abandoned unless sales are promising. While such an approach is common in the marketing of consumer products, it is less widely applied in industrial marketing or in the provision of public services.

## **MANAGEMENT USES OF FORECASTS**

When is it worth setting up a forecasting system? The short answer is whenever the variables concerned are central to the main activities of the organization and the use of the forecasts is likely to provide significant benefits. Thus, where the forecasts are of key variables relating to the organization's 'markets' or to the main resources it uses then they are likely to be worthwhile. There is no point in

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producing forecasts that scarcely pay for themselves. Where key activities are concerned, however, savings of even a few per cent are often enough to justify the cost.

The typical accuracy achieved in forecasting can be very poor, e.g. errors of 50 per cent or more in medium term forecasting of foreign exchange rate changes or the costs of large projects with a life of ten years or over. On the other hand, in many sales forecasting applications for mature products errors may be only a few per cent even two or three years ahead, provided the stability of the market is little affected by competitor action.

Forecasting by managers fulfils five different broad purposes. These are:

- 1 resource allocation;
- 2 policy determination;
- 3 performance appraisal;
- 4 strategic planning;
- 5 contingency planning.

The purpose(s) to be fulfilled by a forecast determine which forecasting techniques are appropriate. Thus, forecasts intended for policy making must be able to represent the effects of policy changes on the variable of interest. Therefore they must embody some attempt to model causes and effects. For many resource allocation purposes, however, the variable of interest is outside the forecaster's control, e.g. forecasting commodity prices for planning raw material purchases, and therefore a method that successfully extrapolates or projects existing trends may be all that is required.

A consequence of this is that forecasts derived for one set of purposes may well be capable of meeting 'lower level' purposes. That is, forecasts intended for purposes later in the list may also meet part or all of the purposes earlier in the list. Of course, this usually means that the purposes later in the list require a greater effort. With this in mind the different purposes will now be examined in greater depth.

### **Forecasting for resource allocation**

The role of forecasts in resource allocation is obvious. Without a realistic appraisal of what is to be done and its resource implications any kind of management, whether of day-to-day operations or the long term future of the organization, would be impossible. A pension

fund, for example, must attempt to forecast both inflows of contributions and income from existing investments, since these constitute the source of new investments. Much of what is to be done is, however, conditioned by changes taking place in the environment in which the organization functions, so these changes must be forecast, too. The manager of a pension fund, for example, must consider the changing age structure of fund members and hence the changing proportion of those receiving pensions. Also, if the fund's pensions are to some extent adjusted for inflation, there will be a need for longer term forecasts of inflation. Equally, in a firm that sells ex stock, forecasts of future demand are needed to enable stocks to be built up ahead of periods of high demand and to be run down when demand is low.

The time series methods discussed in Chapter 3 and the ratio models of Chapter 4 are probably the main type of forecast used for resource allocation. Following our remarks above, however, that certainly does not mean they are the only suitable techniques. That question is addressed at the end of this chapter. Similar remarks apply to the other purposes considered below.

### **Forecasting for policy determination**

In some cases management can have a significant effect on the value of a variable, through decisions about advertising expenditure, and so on. In this case, a mere projection of past trends in the variable is of little use. What is desirable is some type of 'causal model' that will allow management to see what the impact of policy changes will be on the variable concerned. Inevitably, such a forecasting model will need to predict future values of the variable of interest on the basis of the values of a number of other variables. The principal tool for such forecasting is regression analysis which is covered in Chapters 5 and 6.

### **Forecasting for performance appraisal**

Forecasting for performance appraisal is perhaps even more common in organizations under the guise of budgeting. Until recent years this may not have been obvious, since the preparation of budgets was the province of the accountant. With the advent of computer

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'spreadsheet' packages, however, it has become an important activity of managers and its forecasting content has become much more widely recognized. Hence Chapter 4 of this book has been devoted to the topic of ratio models, which are the basis of financial planning models.

Similarly, an important tool for the achievement of corporate plans is trend curves (discussed in Chapter 9); for example, fitting S-shaped growth curves to technological advances.

### **Forecasting for strategic planning**

By strategic planning we mean those decisions that determine in the longer term the major goals of the organization and the technology and systems used to attain them. It is harder to systematize such forecasting. The variables to forecast are often less obvious and the necessary data more difficult to come by. Because of the complexity of such applications, a variety of approaches are appropriate. Trend curves (see Chapter 9), e.g. S-shaped market growth, are suited to projections of what will happen without major changes in the organization's policies. Regression models may be favoured for determining how the organization can best attack particular markets. Financial models of the type discussed in Chapter 4 will undoubtedly have their place in assessing the balance between the flow of resources into the organization and its usage of resources in developing itself. Finally, a number of 'subjective' techniques that rely on executive experience rather than other data sources may well be favoured for the more speculative aspects of strategy formulation. These are covered in Chapters 7, 8 and 10.

### **Forecasting unexpected events and contingency planning**

The oil price shocks of 1973 and 1979 provide examples of unexpected events that can have a great impact on organizations. Contingency planning against such eventualities may be warranted at two levels: the operational level of production planning or sales target setting so that business can continue 'as usual'; and the strategic level so that shifts of strategy can be introduced quickly and smoothly, e.g. the introduction of car engines that use less fuel.



## CLASSIFYING FORECASTS

Later we shall provide guidelines to determine which approaches to forecasting are best suited to particular applications. To this end, it is useful to classify the forecasts needed by management by:

- 1 which variables are forecast;
- 2 the time span of the decisions for which they are used;
- 3 whether they are of point events or time series;
- 4 the 'nature' of the time series;
- 5 the method(s) used to prepare the forecasts.

Of these categories, the variable forecast, the time span of decision, and the methods used will form the basis of the first stage of forecast method selection presented later in this chapter. The 'nature' category will be used in subsequent chapters for refining the selection of forecast method. We shall also refer from time to time to the distinction between the forecasting of time series and the forecasting of point events.

### Variables to be forecast

As far as the manager is concerned this is probably the most natural way of categorizing forecasts. The forecasting methods that are appropriate to determining wage costs five years hence are unlikely to be the same as those for forecasting journey times for delivery vehicles in the next week. What is to be forecast therefore affects technique selection. More importantly, a key step in establishing a solution to a manager's planning problem is to decide what variables need to be forecast. This can often be a rather more subtle question than first appears. In short term commodity purchasing, for instance, it is usually *changes* to prices that are most important. If the manager believes the price will shortly drop he can reduce his purchases temporarily to take advantage of the fall. Conversely, if he anticipates a rise in prices he will purchase more than immediately required. What the manager needs, then, is good forecasts of future price changes. This is by no means the same as forecasting future price levels. As Figure 1.1 shows, a forecasting method can deliver apparently accurate forecasts of price levels, and yet be more or less useless for predicting the real variable of interest, i.e. price changes. The margin of error between the forecast and the actual