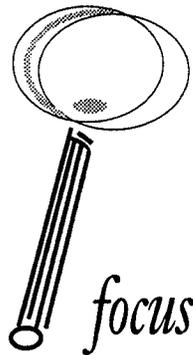# 1

An Introduction
to Financial Forecasting

focus

Learning Objectives

By the end of this chapter, you should be able to:

- Define a forecast precisely and differentiate a forecast from a model and a business plan.
- Identify the three critical factors to be evaluated in any forecasting situation.
- Describe identification, consistency, and sensitivity issues surrounding the role of assumptions in forecasting.
- Identify three basic forecasting techniques used by financial managers.

The major focus of this course will be the techniques that are commonly used by financial managers to forecast financial situations. The course also will deal with financial planning and financial modeling, because these are so closely related to forecasting.

A considerable portion of this course is devoted to quantitative forecasting techniques, but this is not because forecasting should be done only by relying on mathematics or statistics. In fact, quite the opposite is true.

This chapter will introduce you to financial forecasting, covering seven aspects of this field that are of interest to financial analysts.

WHAT IS A FORECAST?

To avoid confusion, it is important to define clearly what is meant by the term forecasting as it is used in this course. It is also important to distinguish forecasting from activities such as planning and modeling, which are related to forecasting but nevertheless are separate managerial functions.

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A forecast is a prediction about a condition or situation at some future time. Much of human activity is based on forecasts. When we go to a motion picture, we assume we will find the picture enjoyable-that is, we forecast an enjoyable experience. We routinely listen to weather forecasts on the radio to help us plan future activities. Forecasting is an important part of our lives.

Business decisions, and especially financially related business decisions, depend heavily on forecasts of future events. Decisions to lend money or borrow money depend on forecasts of future cash flow and future expected returns. For example, when John agrees to lend Mary some money, it is assumed that John expects to be repaid. This course is about the techniques financial managers use to predict the likely future values of financial variables such as revenues, expenses, and cash balances.

Some managers use the terms forecasting, planning, and modeling interchangeably to describe a large, involved process by which the firm decides what it wants to accomplish and how it intends to accomplish it. Other managers have much more specific, detailed processes in mind when they use these same terms. The differences in these terms, as expressed in the following paragraphs, will apply throughout the course.

As has been noted, forecasting is a process by which predictions are made about some future condition. Planning is a process by which a firm develops a scheme to accomplish something. A plan can be very broad in nature and may have nothing to do with forecasting. Suppose, for example, management has already decided to modernize one of the company's plants and wants to establish a planning group to plan the modernization. The group's job will be not to forecast the effect of the decision but to implement the modernization program.

The planning process frequently depends on forecasts. If the planning group had been charged with the review of the basic plant modernization decision, then it would have had to rely heavily on forecasting. The group would need to evaluate estimates (forecasts) of the cost of modernization, estimates of the increased productivity (lower operating expenses) it would make possible, and so forth. Planning usually involves forecasting.

When the planning process is complex, it is common to reduce the plan to a financial model, a simplified representation of a complex process. Because financial issues usually involve numbers, it is common for financial planning to be reduced to structured numerical models that are given such names as budgets, pro forma balance sheets, and income statements.

Why Do Firms Forecast?

Most organizations with sophisticated financial management operations spend considerable time and effort in forecasting, because they need to plan for an uncertain future.

The Need to Plan

Being lucky and in the right place at the right time play some role in business success, but not the leading role. More crucial to business success is the careful

evaluation of resources and alternatives, the selection of goals for the future, and a strategy for achieving those goals systematically. Successful business managers plan where they want their firm to be at some time in the future and take action to execute that plan. Business planning is a proven way to achieve profitability and growth.

Planning helps managers control their firm. Actual results can be compared with planned results, and necessary operational changes can be implemented quickly. Without a plan, a manager would have to make a subjective judgment as to the necessity of an operational change.

Dealing with Uncertainty

That the future is uncertain is certain. A single financial variable can have a variety of consequences. This is what defines risk, and risk is a strong reason for firms to forecast. Having good forecasting procedures generally improves the quality of predictions about financial variables.

Risk is a basic fact of business life, and no amount of forecasting will ever eliminate it. For some financial variables, no amount of effort will improve the quality of forecasts. For example, research suggests that it is not possible to forecast future values that are determined by supply and demand in rigorously competitive markets (e.g., interest rates and the prices of securities, commodities, and currencies). For more detailed discussion of this point, see Chapter 2. Even in these cases, though, forecasting and the related activities of modeling and planning can be of value, because good forecasting techniques permit a better understanding of the forces that affect fluctuations in a particular financial variable. This understanding may not reduce forecasting error, but it can improve the quality of decision making by providing a clearer picture of the risks involved and suggesting operating strategies that will minimize exposure to those risks.

To illustrate, let's examine 1980's oil prices. Contrary to most forecasts made in 1980, the price of petroleum did not rise to extraordinary levels but actually declined significantly. The Organization of Petroleum Exporting Countries (OPEC) was not able to maintain its pricing and production goals. Some firms, witnessing a decline in petroleum prices in the face of a forecasted rise, concluded that forecasting had no value. Other firms, recognizing the inherent uncertainty of petroleum prices, understood the risk-reduction benefits of forecasting and the related activities of modeling and planning. When actual petroleum prices began to differ appreciably from forecasted prices, these firms were able to react quickly with contingency plans. They understood that their forecasted prices of petroleum were the best estimates of an uncertain financial variable. Modeling helped them understand the forces that made petroleum prices volatile, and planning helped them develop strategies to deal with price fluctuations. Forecasting was viewed not as a process that could bring certainty to an uncertain world but as a way of understanding that uncertainty and preparing for it.

Businesses Re-evaluate Their Forecasting Activities

There was a marked rise in the use of sophisticated forecasting techniques during the 1970s and the early 1980s. This increased use of quantitative,

computer-based forecasting was part of a larger movement among U.S. businesses toward more sophisticated planning processes.[1] Because a great deal of these planning data and their related forecasts are proprietary and highly sensitive, it is not easy to assess the benefits of this movement objectively. But it is clear from such popular business publications as Business Week (see "The New Breed of Strategic Planner," Sept. 17, 1984) that serious reassessment of the benefits of computer-based forecasting has occurred in some influential business circles during the mid-1980s.

Not everyone was enthusiastic. In the business section of the December 27, 1985, New York Times, the article titled "Business Economists Face a Bleaker Outlook" was in many ways typical of businesses' critical attitude toward forecasting. According to this article, forecasting lost much of its appeal because people with backgrounds in statistics and economics who were hired to do forecasting oversold the reliability of forecasting techniques for making highly accurate estimates in an uncertain economic environment. In addition, computer-generated forecasts, especially those using sophisticated statistical procedures based on a large database of information, were automatically assumed to be more accurate than the forecasts prepared by a lone individual working with pencil and paper. Apparently, some forecasts by highly trained economists and statisticians were viewed as dependable estimates of the future. Management responded by making generous investments in equipment and inventory based solely on those estimates. Actual events differed considerably from those forecasted, however and, because it is difficult for companies to redeploy specialized equipment and inventory for other uses, many companies suffered grave losses during the 1981-1982 recession and then were surprised by the strength of the subsequent recovery. Such companies were not in a position to capitalize on major opportunities during the recovery. In a large number of firms, sophisticated financial forecasting did not seem to help senior managers cope with these situations. Because of this experience, enterprises such as the paper and tire industries reassessed the value of investing substantial resources in forecasting. Nevertheless, most senior managers do not see forecasting per se as unnecessary. Rather, they report that forecasting will continue to be well funded but that staff positions devoted purely to forecasting will decrease. Forecasting specialists are being transferred from specialized planning groups to line marketing and finance functions: increasingly, firms rely on outside vendors of forecasting services.

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[1] Many sources can be cited to demonstrate the rapid rise in the use of quantitative techniques during the 1980s to support corporate planning. Otto Eckstein, chairman of Data Resources, Inc., made the following statement in a January 1981 speech before the joint meeting of the New York City Chapter of the Institute of Management Sciences and the North American Society for Corporate Planning: "The use of quantitative analysis to improve corporate planning in an increasingly complex environment is mushrooming...61 percent of all corporate planning groups use the services of Data Resources, Inc., and our competitors provide services to additional units. Econometric models play a central role in this work, but unlike earlier product line forecasting applications, the models today are part of an elaborate system of databases, analytical software capable of producing planning analyses, and consulting support."

Three Critical Questions

Financial forecasting should be undertaken only after careful evaluation of the expected costs and benefits. In short, expenditures for financial forecasting should be scrutinized as closely as expenditures for inventory, equipment, or labor. In deciding whether to go ahead with a particular forecast, management needs to focus on three critical questions.

Estimating Accuracy of a Forecast

How much accuracy can reasonably be expected from this forecast? Before any forecasting process is undertaken, a business decision should be made as to how much accuracy can reasonably be expected from it. (Detailed information on predicting accuracy will be provided later in this course.) A business decision is exactly what is required in allocating expensive resources to any project. Whether or not they have had extensive training in statistics, economics, and computer science, managers should have detailed knowledge of the organization's business and the variable or variables to be forecasted. Their experience, knowledge, and foresight should enable managers to estimate the level of accuracy that might reasonably be achieved by employing sophisticated and expensive forecasting techniques as opposed to naive and inexpensive forecasting efforts. If senior management cannot make these assessments, a detailed study of the financial variable in question is recommended; until that study is done, no attempt should be made to forecast that variable's future behavior. (A naive forecasting technique is one in which simplistic or uninformed assumptions are made regarding a given variable. An example would be assuming that the value of the U.S. dollar relative to the Japanese yen will remain the same over the next 6 months. What this kind of variable requires is not a naive assumption about its stability but in-depth analysis using a financial model designed to assess the influences of all likely factors in the dollar yen relationship.)

The Cost-benefit Trade-off

What is the cost-benefit trade-off involved in obtaining a more accurate forecast? It is possible to obtain more accurate forecasts of some financial variables if more effort is expended. This effort could include talking to more people to collect more data or acquiring more sophisticated computer technology to speed up the forecasting process. The criterion for evaluating the cost-benefit trade-off involved in undertaking a forecast is common to any business decision: Do the benefits of the greater forecasting effort justify its extra cost? If it is likely that the benefit from the extra forecasting activity will exceed the extra cost, then the forecasting activity should be expanded. Otherwise, it should not be expanded. If senior management cannot answer this question with confidence, it should not commit additional resources to the forecasting activity. In this case, the resources would be more beneficially spent in a concentrated effort to better understand in what business the firm is engaged and the forces that affect it.

Meeting the Criteria for Timeliness

How does the forecast meet the three criteria for timeliness? Careful consideration of the timeliness of a forecast is just as important as an assessment of its accuracy and cost. The question of timeliness can be broken into three issues.

First, how timely is the forecast? As events change and new information becomes available, forecasts must be updated. Managers should always ask: How frequently will these forecasts need to be updated? Obviously, the cost of updating the forecast should be weighed against the potential benefit of increased accuracy.

Second, timeliness has to do with how far into the future the forecast should go. Does the decision to be made require a 1-year or a 10-year forecast? It is generally true that long-range forecasts are more difficult to make than short-range forecasts.

Third, the analyst will have to decide on the level of data detail necessary (e.g., whether to use monthly, quarterly, or yearly data). Another decision is how often to review the forecast.

Senior managers must think through these three aspects of timeliness. For example, how frequently are decisions based on forecasts of some financial variable actually made? If large expenditures for a new plant and equipment require the approval of an investment committee of senior managers that meets for this purpose once per quarter, then forecasts of relevant financial variables need to be updated quarterly. Frequently, major business decisions, such as investment in a new plant and equipment or entry into new markets, are based on aggregate forecasts; in other words, a long-range forecast of market growth and average profit margin is enough. In most cases, it does not make a lot of sense to forecast revenues and expenses month by month for 10 years and to update these forecasts frequently.

THE CRITICAL ROLE OF ASSUMPTIONS

Forecasting requires a willingness to make assumptions, which are the basic input in any forecast. An unwillingness to make assumptions about the future is the equivalent of an unwillingness to forecast. Any time a forecast is made, assumptions are made as well, whether or not the forecaster realizes it.[2]

Issues regarding assumptions will be clearer when examined in the context of the following simple forecasting situation. A financial analyst employed by a manufacturing company has been asked to forecast the firm's earnings per share for the years 1992 and 1993. Financial results for 1991 are complete, and the analyst has generated the forecasts listed in the spreadsheet in Exhibit 1-1.

Although analysts frequently disagree about the quality of a forecast in terms of its likely future accuracy, they agree that a good financial forecast should have two attributes. First, it should include a list of all the relevant and significant assumptions that were used in making it. Second, it should be internally consistent-that is, it should flow directly from the assumptions made.

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[2] The importance of assumptions in financial forecasting was recently emphasized in the *Guide for Prospective Financial Statements* (see the bibliography) prepared by the Financial Forecasts and Projections Task Force of the American Institute of Certified Public Accountants: "Assumptions are the essence of developing financial forecasts and the single most important determinant of such statements. The quality of the underlying assumptions largely determines the quality of financial forecasts."

E **xhibit 1–1**

Earnings-per-share Forecast (10% Sales Growth) XYZ Mfg. Corp.

	1991 Actual	1992 Forecast	1993 Forecast
Sales—10% annual increase	$7,666.00	$8,432.60	$9,275.86
COGS—15% of sales	1,149.90	1,264.89	1,391.38
Labor—8% annual increase	4,567.00	4,932.36	5,326.95
SG&A—18% of sales	1,379.88	1,517.87	1,669.65
Income before tax	569.22	717.48	887.88
Tax—34% of income	193.53	243.94	301.88
Net income	375.69	473.54	586.00
Common shares outstanding	420	420	420
Earnings per share	0.89	1.13	1.40

Identifying Relevant and Significant Forecasting Assumptions

In the earnings-per-share forecasting example (Exhibit 1-1), the analyst forecasted that earnings per share would rise from $0.89 in 1991 to $1.13 in 1992 and $1.40 in 1993. Are these earnings-per-share forecasts good forecasts?

The analyst assumes, for example, that sales in the next 2 years will grow at 10 percent annually and that labor negotiations with unionized workers will be settled next year without a strike for an 8 percent average wage increase. Based on these relatively optimistic assumptions, it is clear why this analyst foresees a large increase in earnings per share over the next 2 years.

Let's assume that you are a financial analyst at the same firm and that you forecast level earnings per share for the next 2 years. If you are unwilling to identify your assumptions, most people would agree that the first analyst's forecast is better than yours, even though your estimates are more conservative. Why? Because the first analyst has made it clear how the forecasts were derived. Anyone evaluating that forecast who does not believe that an 8 percent wage settlement next year is likely can change the forecast of earnings per share accordingly. A good forecast isn't one with which most people agree but one derived from an orderly process that most people can understand. (A simple spreadsheet EX1-1.WK1 of this information can be found on the accompanying disk.)

In forecasting $1.13 earnings per share in 1992, the original analyst makes six explicit assumptions:

1. Sales will rise over the next 2 years at 10 percent annually.
2. Cost of goods sold (COGS) in each year will be 15 percent of sales for that year.
3. Labor costs will rise 8 percent annually.
4. Selling and administrative expenses will be 18 percent of sales in each year.
5. Corporate taxes will be 34 percent of income.
6. The number of common shares outstanding will not change.

The analyst makes clear assumptions, making it easier for someone evaluating the forecasts to understand how the earnings-per-share estimates are derived.

The terms relevant and significant have been used several times now to describe the list of assumptions that accompanies a good forecast. What is meant by these terms?

Relevant Assumptions

An assumption is relevant if it is likely to occur and to have a direct impact on the financial variable being forecasted. This is why financial forecasting is considered a matter of judgment. The present case provides an example: To develop the earnings-per-share forecast of $1.13 in 1992, the financial analyst assumed that sales for 1992 would rise 10 percent over sales for 1991. This assumption is relevant to any earnings-per-share forecast and should be noted explicitly. Since there is a well-known relationship between this firm's sales and the general level of economic activity, the analyst is assuming a vigorous expansion of the U.S. economy during this same period. Should the analyst make an explicit assumption of a strong U.S. economy? There is no easy answer to the question: What is relevant?

The forecast can be criticized because a major assumption (growth of the U.S. economy) is not stated clearly but is left implicit in a stated assumption (growth in sales). Someone using this forecast for planning purposes may not be aware of the extent to which the forecasted increase in earnings per share is really a function of the growth of the overall economy-a financial variable over which the firm has no control. Although the forecast contains the best estimate of the likely earnings per share next year, it could lead to poor decisions by senior management if its risks are not explained properly.

In fact, many implicit assumptions are being made in this earnings-per-share forecast. For example, one implicit assumption is that the U.S. will not be involved in a nuclear war. The analyst did not list this assumption because its likelihood is very small, although attaining the forecasted returns clearly depends on it. Therefore, it is not relevant to the forecast. It should be clear that the number of assumptions an analyst makes in preparing any forecast is very large; a good forecast will identify only those that are genuinely relevant.

Significant Assumptions

An assumption is significant if it is likely to occur and if the magnitude of its impact on the financial variable under study will be large. For example, assume that the company in question is considering switching suppliers of heating oil for its main manufacturing plant. This switch may save a half cent per gallon. Clearly, this is relevant to any forecast of earnings per share, but even if we can reduce oil costs by a half cent per gallon, reported earnings per share would increase by less than one-tenth of a cent. Because this increase is not significant, the assumption should not be listed. Significance is very similar to the accountant's concept of materiality: Only those things that are important should be included.

In summary, assumptions underlying a forecast should be relevant and significant, and they should be identified clearly. By clearly identifying signif-

E **xhibit 1–2**

Earnings-per-share Forecast (9% Wage Increase) XYZ Mfg. Corp.

	1991 Actual	1992 Forecast	1993 Forecast
Sales—10% annual increase	$7,666.00	$8,432.60	$9,275.86
COGS—15% of sales	1,149.90	1,264.89	1,391.38
Labor—9% annual increase	4,567.00	4,978.03	5,426.05
SG&A—18% of sales	1,379.88	1,517.87	1,669.65
Income before tax	569.22	671.81	788.77
Tax— 34% of income	193.53	228.42	268.18
Net income	375.69	443.40	520.59
Common shares outstanding	420	420	420
Earnings per share	0.89	1.06	1.24

icant and relevant assumptions, an analyst conveys to the user of a forecast its rationale, its key elements, and its dependability as a basis for action.

The Absolute Requirement for Internal Consistency

The second mark of a good forecast is internal consistency. A forecast is internally consistent when it follows in a direct, logical manner from the assumptions stated. The forecast in Exhibit 1-1 is internally consistent with its six explicit assumptions. Given the completed 1991 financial results and the six assumptions listed, the earnings per share for 1992 for XYZ Manufacturing Corporation will be $1.13. The $1.13 earnings-per-share forecast follows logically from the assumptions made.

In forecasting, there is an absolute requirement for internal consistency. For users to have any faith in a forecast, they must be able to follow its logic. They may agree or disagree with its assumptions and conclusions, or they may want to modify them, but, if the analysis is not internally consistent, it is useless even as a starting point for discussion.

Sensitivity Analysis

The explicit identification of assumptions in forecasts provides an opportunity to perform sensitivity analysis. Sensitivity analysis is a process by which each assumption is adjusted and the impact of the adjustment on the forecast is examined. For example, the earnings-per-share forecast in Exhibit 1-1 assumes that wages will rise 8 percent in 1992 and 1993. Obviously, no one knows for sure how much wages will rise until the conclusion of collective bargaining with the workers' union. As part of a sensitivity analysis, the forecasting model could be rerun under the assumption that wages will rise 9 percent (Exhibit 1-2) and rerun again under the assumption that wages will rise 7 percent (Exhibit 1-3). The analyst would then examine the impact of each of these changes on the forecasted earnings per share.

Exhibit 1–3

Earnings-per-share Forecast (7% Wage Increase) XYZ Mfg. Corp.

	1991 Actual	1992 Forecast	1993 Forecast
Sales—10% annual increase	$7,666.00	$8,432.60	$9,275.86
COGS—15% of sales	1,149.90	1,264.89	1,391.38
Labor—7% annual increase	4,567.00	4,886.69	5,228.76
SG&A—18% of sales	1,379.88	1,517.87	1,669.65
Income before tax	569.22	763.15	986.07
Tax—34% of income	193.53	259.47	335.26
Net income	375.69	503.68	650.80
Common shares outstanding	420	420	420
Earnings per share	0.89	1.20	1.55

If wages increased 8 percent, as assumed in Exhibit 1-1, then earnings per share, which were $0.89 in 1991, would rise to $1.13 in 1992 and to $1.40 in 1993. A 9 percent wage increase, as assumed in Exhibit 1-2, would reduce the earnings per share to $1.06 in 1992 and $1.24 in 1993. Similarly, a 7 percent wage increase, as assumed in Exhibit 1-3, would increase earnings per share to $1.20 in 1992 and $1.55 in 1993. In this sensitivity analysis, the forecasted increase in earnings per share is shown to be fairly sensitive to the assumed increase in wage rates. A 1 percent smaller wage increase (7 percent versus 8 percent) adds an extra $0.07 ($1.13 versus $1.20) to earnings per share in 1992 and an extra $0.15 ($1.40 versus $1.55) in 1993. Likewise, a substantial drop in earnings per share is forecasted if wage rates should rise 9 percent.

This example demonstrates that the forecast of increased earnings per share is sensitive to the assumption of a wage rate increase. This information is helpful to management in two ways. First, when bargaining with the employees' union, management would know that the outcome of the negotiations-with even small changes in wage rates-could have a large impact on the financial performance of the firm. Second, since the forecasted increase in earnings per share is sensitive to the wage rate projections, management should attempt to get the best possible projection of future wage rates.

The financial analyst may decide that wage rate assumptions are so crucial to the earnings forecast that they warrant more precise estimation. This may lead the analyst to talk to people in the firm who are knowledgeable in labor relations to determine whether an 8 percent wage increase seems likely. In addition, the analyst may research current collective bargaining agreements to see whether an 8 percent increase is in line with typical wage settlements. In any event, sensitivity analysis has demonstrated to the financial analyst that this particular forecast is significantly dependent on the assumed rate of wage increase.

On the other hand, sensitivity analysis may reveal that the forecasted outcome is not sensitive to changes in some assumed variable. For example, if reducing the wage rate increase from 8 percent to 7 percent increased forecasted 1992 earnings per share only from $1.13 to $1.14, then the forecasted earnings would be shown to be very insensitive to the assumption of higher wages. Acknowledging the requirement that all assumptions have a significant impact on the forecasted value, the financial analyst would eliminate the assumed wage increase as an explicit assumption. Within limits, the increase in next year's earnings per share will not be significantly affected by the size of the wage settlement. The financial analyst should (1) indicate that the settlement is not important by removing it as an explicit assumption, (2) refrain from wasting any time trying to gather more information to improve the quality of the assumption, and (3) inform senior management that wage rate increases do not have a significant impact on the financial status of the firm.

In the past, performing sensitivity analysis was a time-consuming process; forecasting models were done by hand on paper spreadsheets. Recalculating the entire spreadsheet after making slight changes in each assumption often was not practical. Today, specialized and easy-to-use business software allows one to develop computerized forecasting models with comparative ease. Once the model is developed on a computer, assumptions can be changed and the model recomputed quickly. Advances in computers and business software have facilitated financial analysts' use of sensitivity analysis to identify only those assumptions that have a significant impact on a forecast. (The use of software in forecasting will be discussed more fully in Chapter 2.)

Varying Assumptions to Examine What-if Scenarios

Sensitivity analysis is similar to what-if analysis. Once a forecasting model has been developed and the forecasted variable estimated, the model provides a basis for considerable information about the firm. Typically, a forecasting model will have several significant assumptions related to variables such as expected growth in sales, expected cost of goods sold, and expected wage rates. The existence of the model permits the financial analyst to vary each assumption, thereby examining a range of possible scenarios. Such what-if analyses can be useful in many circumstances. For example, in most business forecasting situations, it is common for someone examining a forecast to question one or more of the assumptions. In the earnings-per-share forecast for XYZ Manufacturing, for instance, one manager might find the assumption of a 10 percent projected growth in sales to be pessimistic. To him, 12 percent or 14 percent would be more reasonable. Using what-if analysis, the financial analyst easily could increase the sales growth assumption to 12 percent (Exhibit 1-4) or 14 percent (Exhibit 1-5).

What-if analysis also is useful in reassessing assumptions over time. At the end of the first quarter, for example, it would be possible to make more accurate assumptions of the factors that affect that year's earnings per share.

E xhibit 1–4
Earnings-per-share Forecast (12% Sales Growth) XYZ Mfg. Corp.

	1991 Actual	*1992 Forecast*	*1993 Forecast*
Sales—12% annual increase	$7,666.00	$8,585.92	$9,616.23
COGS—15% of sales	1,149.90	1,287.89	1,442.43
Labor—8% annual increase	4,567.00	4,932.36	5,326.95
SG&A—18% of sales	1,379.88	1,545.47	1,730.92
Income before tax	569.22	820.21	1,115.93
Tax—34% of income	193.53	278.87	379.41
Net income	375.69	541.34	736.51
Common shares outstanding	420	420	420
Earnings per share	0.89	1.29	1.75

E xhibit 1–5
Earnings-per-share (14% Sales Growth) XYZ Mfg. Corp.

	1991 Actual	*1992 Forecast*	*1993 Forecast*
Sales—14% annual increase	$7,666.00	$8,739.24	$9,962.73
COGS—15% of sales	1,149.90	1,310.89	1,494.41
Labor—8% annual increase	4,567.00	4,932.36	5,326.95
SG&A—18% of sales	1,379.88	1,573.06	1,793.29
Income before tax	569.22	922.93	1,348.08
Tax—34% of income	193.53	313.80	458.35
Net income	375.69	609.13	889.73
Common shares outstanding	420	420	420
Earnings per share	0.89	1.45	2.12

A computerized forecasting model allows for easy revision of assumptions and recalculation of forecasts.

Three Basic Forecasts

The three basic forecasts used by financial managers are the qualitative, or judgmental, forecast; the time series forecast; and the causal forecast. Each is discussed in detail in the sections that follow.

The Judgmental Forecast
Although the last decade has witnessed much growth in mathematical and statistical forecasting, forecasting does not have to be quantitative. Many successful organizations make decisions based on forecasts derived mostly from judgment and experience. Mathematics and statistics only supplement sound business judgment.

The major difficulty in obtaining judgmental forecasts usually occurs when input is required from several executives of different rank in different parts of the organization. For example, a junior executive may have critical knowledge of a product but may be reluctant to speak up at a planning meeting if it means disagreeing with a senior executive. Additionally, people usually do not want to take extreme positions. When asked to give their best forecast of next year's sales for a particular product, managers who foresee unusually high or low sales growth tend to moderate their estimates to be closer to the group average.

Techniques have been developed to obtain the forecasts of knowledgeable individuals in a manner that eliminates bias. The most widely used is the Delphi technique, which will be discussed in detail in Chapter 3. Its use can improve qualitative forecasts in financial management.

The Time Series Forecast

A time series is the tracking of a particular variable over time. The annual salary of an individual over the last 20 years is a time series. Likewise, the average quarterly wholesale price of a gallon of no. 2 home-heating oil in the Chicago metropolitan area is a time series.

Time series forecasting assumes that basic forces underlying a time series (economic, political, or behavioral) are stable; analyzing the pattern of a time series in the past makes it possible to create a model that will predict its future movement. Time series analysis is particularly useful in studying variables that have predictable, recurring patterns, such as seasonal swings. Time series analysis will be examined in detail in Chapter 4.

The Causal Forecast

In time series analysis, the financial analyst does not explicitly identify the factors that cause the movement of a particular financial variable over time. When the analyst, using experience and judgment, sees changes in a time series that are caused by changes in one or more other variables, then an additional avenue of forecasting is open: causal forecasting.

Ideally, causal forecasting is used when the nature of the causal relationship is well-known, the relationship is stable over time, and the causal variables are relatively easy to predict. Under these circumstances, the time series of interest should be easy to forecast. For example, assume that a company that sells baby food wants to forecast sales for the next 5 years. A good forecast of the number of babies to be born in each of the next 5 years would be useful. Because the number of babies born in the United States can be forecasted with a high degree of accuracy (using Census Bureau data on age distribution of the population, average number of children born to each woman of child-bearing age, etc.), a highly accurate causal forecasting model should be possible. The statistical technique of multiple regression analysis is well suited to this type of forecasting. Regression analysis and causal forecasting models will be discussed in detail in Chapter 5.

⁇ Review Questions

1. A forecast is: 1. (d)
   (a) the process by which a firm develops a scheme to accomplish
       something.
   (b) the process by which financial managers decide how much
       debt financing to use in a business.
   (c) a simplified representation of some complex phenomenon.
   (d) a prediction about a condition or situation at some future time.

2. A model is: 2. (c)
   (a) the process by which a firm develops a scheme to accomplish
       something.
   (b) the process by which financial managers decide how much
       debt financing to use in a business.
   (c) a simplified representation of some complex phenomenon.
   (d) a prediction about a condition or situation at some future time.

3. Which of the following is not one of the three critical questions to   3. (b)
   ask in evaluating any forecasting situation?
   (a) How much accuracy can reasonably be expected from this
       forecast?
   (b) Has the computer software to be used in the forecasting pro-
       cess been identified?
   (c) Does the forecast meet the three criteria for timeliness?
   (d) What is the cost-benefit trade-off involved in obtaining a
       more accurate forecast?

4. In forecasting situations, assumptions: 4. (d)
   (a) are absolutely necessary.
   (b) can be altered to examine different possible future scenarios.
   (c) should be explicitly identified.
   (d) require all of the above.

5. An assumption is significant when: 5. (d)
   (a) it has been identified by the company president.
   (b) it has strategic, as opposed to operational, impact on the firm.
   (c) it is likely to occur and to have a direct impact on the financial
       variable under study.
   (d) it is likely to occur and the magnitude of its impact on the
       financial variable under study will be large.

6. An assumption is relevant when: 6. (c)
   (a) it is consistent with the forecast.
   (b) it has strategic, as opposed to operational, impact on the firm.
   (c) it is likely to occur and to have a direct impact on the financial
       variable under study.
   (d) it is likely to occur and the magnitude of its impact on the
       financial variable under study will be large.

7. When a forecast is internally consistent: 7. (a)
   (a) it is derived in a logical manner from the explicit assumptions
       made.
   (b) it focuses on the internal financial operations of the firm as
       opposed to its public financial statements.
   (c) it has been requested by the inside directors of the firm.
   (d) it concerns the operations of the firm within the United States
       as opposed to international operations.

8. Sensitivity analysis involves: 8. (b)
   (a) analyzing the personalities of key executives to determine their
       abilities to relate to individuals on an emotional level.
   (b) changing the value of an assumption to determine the impact
       of that assumption on the forecasted variable.
   (c) classifying various corporate forecasts based on their level of
       strategic importance.
   (d) analyzing cash flow variables as opposed to accrual accounting
       variables.

9. A time series is: 9. (d)
   (a) an operations research procedure used to determine the standard for how long a particular task should take to accomplish.
   (b) the forecast of an event that will occur next year.
   (c) a procedure used to determine whether sales should be forecasted on a monthly, quarterly, or annual basis.
   (d) the tracking of a particular financial variable over time.

10. The key assumption in time series forecasting is that: 10. (c)
   (a) unbiased forecasts can be obtained from knowledgeable managers through the use of the Delphi technique.
   (b) the causes of the changes in a financial variable can be identified.
   (c) the forces underlying a time series variable are stable over time.
   (d) the rate of growth of a financial variable is stable over time.