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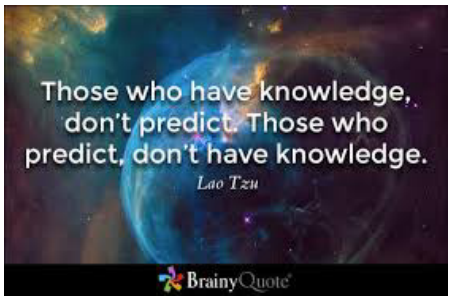
The Final Forecast Numbers: Reconciling Change & Chance



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This chapter describes, first, the use of forecasting models to establish the credibility of demand forecasts, and second, the application of such information to supporting approval of recommended forecasts. The process requires not only preparing forecast scenarios but establishing credibility with accepted performance standards, evaluating the reliability of forecast scenarios using rolling forecasting simulations, and reconciling sales force and customer inputs where appropriate. A rigorous adherence to this process will allow you to recommend with confidence final forecast numbers for how much of what product will be needed in what place, at what time, and at what price. It also allows for you to package and present the forecast for approval.

The forecaster's checklist presented in this chapter allows for measurement of a specific forecast relative to generic standards. Use of the checklist by both demand forecasters and managers in the preparation and subsequent review of the forecast can greatly simplify and speed forecast evaluation.

Establishing Credibility

One of the most perplexing problems that demand forecasters face is how to tell a good forecast from a bad one at the time it is presented for approval. Certainly, after the forecast time period has elapsed, anyone can look back and determine how closely the forecast predicted the actual results. Yet the demand forecaster wants to be confident that the forecast is reasonable and credible at the time it is prepared.

Standards of performance for demand forecasting are necessary for establishing forecasting credibility

Setting Down Basic Facts: Forecast Data Analysis and Review

To be satisfied that basic facts have been adequately researched, a demand forecaster should expect to be able to produce tables and charts of historical data. The data should be adjusted to account for changes in geographic boundaries, organizational changes, product groupings, and customer segmentations, or other factors that will distort analyses and forecasts. If appropriate, the data should be seasonally adjusted to give a better representation of trend-cycle patterns. Outliers or other unusual data values should be explained and replaced, if this is warranted (see Chapter 2). It may be useful to indicate the National Bureau of Economic Research (NBER) reference dates for the peaks and troughs of business cycles that affect the company. This provides the demand forecaster with an indication of the extent to which a client's data are impacted by the national business cycles. Knowing this relationship will be helpful when the demand forecaster reviews the assumptions about the future state of the economy and assesses how these assumptions are reflected in the forecast.

The practice of forecast evaluation requires placing primary emphasis on the forecasting process rather than on the numbers. Meticulously following an effective forecasting process will lead to delivery of the best possible forecast.

Tables and plots of annual or period-to-period percentage changes provide an indication of the volatility of the historical data and can be useful later in checking the reasonableness of the forecast compared to history. If possible, ratios should be developed between the forecast series and other stable data series that are based on company or regional performance and shown in tables or plots. Once again, these ratios provide reasonableness checks. If some major change is expected in the forecast period, these ratios should help identify the change.

As much data as is feasible must be available for the demand forecaster's review. Most planning purposes involving 12–24 month budget cycles require a minimum of three seasons of history available (e.g., 36 months or 12 quarters). It may not be necessary to show this much history when presenting the demand forecast for review, but it is necessary to have such data available to analyze the impact of business cycles. Ideally, data going back several recessions should be available, though in many demand forecasting circumstances, data this old may no longer be relevant. Data covering several recessions (see Chapter 7) is desirable because this will reflect the timing, impact, and duration of the economic cycle on the business data.

Documentation of history is an important step that can serve as reference material for all future forecasts and forecasters.

Establishing Factors Affecting Future Demand

The next segment of the checklist is concerned with the factors likely to affect future demand and, therefore, the demand forecast. Assumptions have to be made about forward-looking factors for income, habit, price of a company's product, price of competing goods, availability of supply, and market potential. In addition, the forecaster should check to see that there is logical time integration between historical demand and the short- and long-term forecasts. Time plots are very useful here. In addition, related forecast items require logical time integration. The demand forecast should also be reasonably related to forecasts produced by other organizations in the company (if the demand forecasting function is not centralized in one organization) such as forecasts of economic conditions, revenues, and expenses.

Assumptions should be made about forward-looking factors influencing demand and the time integration between historical demand and the short- and long-term forecasts.

The next segment of the checklist deals with the causes of changes in past demand trends or levels.

Determining Causes of Change and Chance

The first step toward determining causes of change and chance is to identify the trend in the data. Regression analysis is, as we've seen, an excellent tool for this (see Chapter 10). A straight-line fit against time, as a starting point, will provide a visual indication as to whether the trend is linear or nonlinear. The series and its fitted trend should be plotted on a scale of sufficient breadth to clearly identify deviations from trend. The reasons for the deviations should then be identified and root causes documented for future reference (see Chapter 11). These explanations must be specific. Was there any unusual competitive activity? Was there a change in promotion dates or prices? Did the deviation correspond to a regional or national economic pattern? What was the source of explanation—the demand forecaster or someone else? Finally, how certain is the demand forecaster that the reason or explanation stated is correct? Is the forecaster reasonably certain of the cause, or is there insufficient evidence to be confident that the true cause has been or can be identified? Documenting this is particularly helpful to a new forecaster and improves agility.

As noted, a record of demand forecasts and actual performance for at least the previous three years should be available. This allows the demand forecaster and manager to know how well the organization has done in the past and to gauge the possible reaction of management to changes in the forecast. It is also possible to determine from these data if any or all of the demand forecasters on the staff have a tendency to be too optimistic or too pessimistic over time.

A record of forecast performance with actuals is useful in gauging the possible reaction of planners and managers to changes in the forecast and reduce the tendency of organizations to over- or underestimate demand.

Preparing Forecast Scenarios

After forecasting models have been developed, the demand forecaster reaches the stage where actual forecasts are produced, tested, and approved. This effort begins with the generation of scenarios from the models that have survived the selection process.

In addition to creating projections from models, the demand forecaster needs to create scenarios that provide estimates of the reliability of the forecast in terms of prediction limits around the forecast at specified levels of uncertainty. Alternatively, reliability can be expressed as the likely percentage (amount) of deviation between a forecast and actual performance. For example, suppose that new car purchases for the year are forecast to be 1 million ± 70000 at a 90% confidence level. Another way of stating this is that, in a particular forecasting model, the average annual deviation (absolute value) between what is forecast and the actual new car sales is approximately 7%.

Demand forecasters should always test the validity of their models by simulating a forecast over a holdout period and generating scenarios from the models over time periods for which the actual results are known. In this way, it is possible to establish the likely forecast accuracy.

Historical Fit	Percentage Error
Year 1–Year 10	−8.7
Year 2–Year 11	−1.2
Year 3–Year 12	5.7
Year 4–Year 13	3.8
Year 5–Year 14	−2.3
MAPE	4.3
MdAPE	3.8

Figure 12.1 Summary of one-year-ahead forecast errors from a hypothetical model with data for 15 years. (Percentage error = 100 x (actual – forecast)/actual))

Figure 12.1 illustrates how a forecaster could summarize forecast errors in a model with actual data from Year 1 through Year 15. A projection from the model for Year 11 is generated, based on the historical data Year 1 to Year 10. The actual data through Year 10 show that the projection is 8.7% higher than the Year 11 actual value.

An additional year of actuals is then added to the model, and Year 12 is predicted. This time the projection is only 1.2% greater than the actual. This process can be continued and some typical performance can then be calculated. In this hypothetical example, the Mean Absolute 1-year-ahead forecast Percentage Error (MAPE) for five periods is 4.3%.

It might also be useful to consider the Median APE (MdAPE = 3.8%) as well to ensure that a very large miss in one year does not unduly distort the average value and that the distribution of APEs is not skewed. With this approach, the demand forecaster might expect the typical 1-year-ahead prediction to be within 4% of the actual value, on average.

Analyzing Forecast Errors

Another checklist item requires analysis of the reasons for the differences between previous forecasts and actual results. This form of results analysis—where a forecast error is defined by convention as Actual minus Forecast—is useful for uncovering problem areas, identifying the need for new or improved methods, and determining the quality of the prior forecasts (see Chapter 11).

At this time, the demand forecaster or manager is looking for a pattern of overforecasting or underforecasting. The key to identifying the reasons for forecast deviations is to have written records of basic assumptions that can be reviewed.

These assumptions should then be tested for specificity against the standards shown on the checklist. Do the assumptions relate only to the future time periods? Has the demand forecaster used an assumption that states a positive assertion of facts that may hold true during the forecast period? Was the direction of expected impact stated? Presumably, the assumptions are both positive and negative in terms of their impact on the series being forecasted. Do the assumptions indicate the amount or rate of expected impact, the timing of the initial impact, and the duration of the expected impact?

Accompanying each assumption should be a rationale indicating why the assumption is necessary. The source of an assumption might be the demand forecaster, company economists, industry associations, government publications, online blogs, or newspaper or journal articles. The demand forecaster may be absolutely certain that the assumption will be proven correct. On the other hand, the demand forecaster may indicate that it is necessary to make the assumption but that considerable doubt exists as to whether it will prove to be accurate.

Taming Uncertainty: A Critical Role for Informed Judgment

Statistical approaches can provide a framework of knowledge around which analytical skills and judgment can be applied in order to achieve agility in supporting a sound demand forecasting process.

To quote from Butler et al.'s *Methods and Techniques of Business Forecasting* (1974), "IN ACTUAL APPLICATION OF THE SCIENTIFIC APPROACHES, JUDGMENT PLAYS, AND WILL UNDOUBTEDLY ALWAYS PLAY, AN IMPORTANT ROLE. THE USERS OF ECONOMETRIC MODELS HAVE COME TO REALIZE THAT THEIR MODELS CAN ONLY BE RELIED UPON TO PROVIDE A FIRST APPROXIMATION—A SET OF CONSISTENT FORECASTS WHICH THEN MUST BE 'MASSAGED' WITH INTUITION AND GOOD JUDGMENT TO TAKE INTO ACCOUNT THOSE INFLUENCES ON ECONOMIC ACTIVITY FOR WHICH HISTORY IS A POOR GUIDE." This still sounds true today.

Informed judgment plays a critical role in the determination of the final forecast numbers and, later on, in the determination of when a forecast should be revised.

The complete chapter can be found in

Change & Chance Embraced

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