Introduction to Demand Forecasting for Inventory Management (part 5)

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All demand forecasts are done to make material flow effective with the least costs/resources and with the maximum "margin generated" on sold items.

The type of procedures used in demand forecasting (quantitative or qualitative), depends not only on historic sales data themselves, but also tasks given and resources and information systems available.

In this part we consider the interaction of forecasting procedures with levels of management decisions covering the plan-graph based demand, sales and the operation planning ordering environment. Also qualitative collaborative forecasting procedure for supply chain management can be considered.

The general principle is that the nature of the forecast must be matched with the nature of the decision. Hence, various factors influence the form of forecasting system such as:

- variety of sources
- levels of aggregation
- assumptions about the market
- level of management involvement
- nature of the techniques used
- frequency of forecasts
- availability of past data
- budget, legislation, goal or other restrictions
- competitors' actions and new product introductions
- information from clients
- economic changes, special promotions, product, technology changes

Let us consider the nature of decisions at different levels.

Forecasting for Strategic Business Planning

Forecasts here are highly aggregated estimates of general business trends over the long term. The forecasts are usually stated in very general terms (such as total sales dollars or some output measure such as total tons, board feet, or engineering hours). Substantial managerial judgment is therefore required in preparing and reviewing such forecasts. Causal models and the statistical tools of regression and correlation analysis can be also used.

There are a variety of strategic decisions:

- constructing a new plant
- developing more supplier capacity
- expanding internationally
- capital-expansion projects
- proposals to develop a new product line
- merger or acquisition opportunities

Forecasting for Sales and Operations Planning

This type of forecasting provides the basis for plans that are usually stated in terms of planned sales and the associated output of product families (in dollars or some other aggregate measure). The plans extend forward for a few months up to a year for each of the product lines they cover.

One important input into the forecasts for S&OP is data on customer plans and current demand from sales and marketing and additionally, from communication with customers.

This information can be augmented with current data on inventory balances, demand levels and product mix preferences using programs like CRM and vendor-managed inventories.

Management insight and judgment are also important to use and develop the plans.

Forecasting for Master Production Scheduling (MPS) and Control

The flow of forecast information to the MPS is frequent and detailed. Demand management supports the decisions made in the master production scheduling is by providing detailed forecasts on continuous basis. The result of the MPS decisions is a statement of how many of a finished product or component is to be made and when to do this.

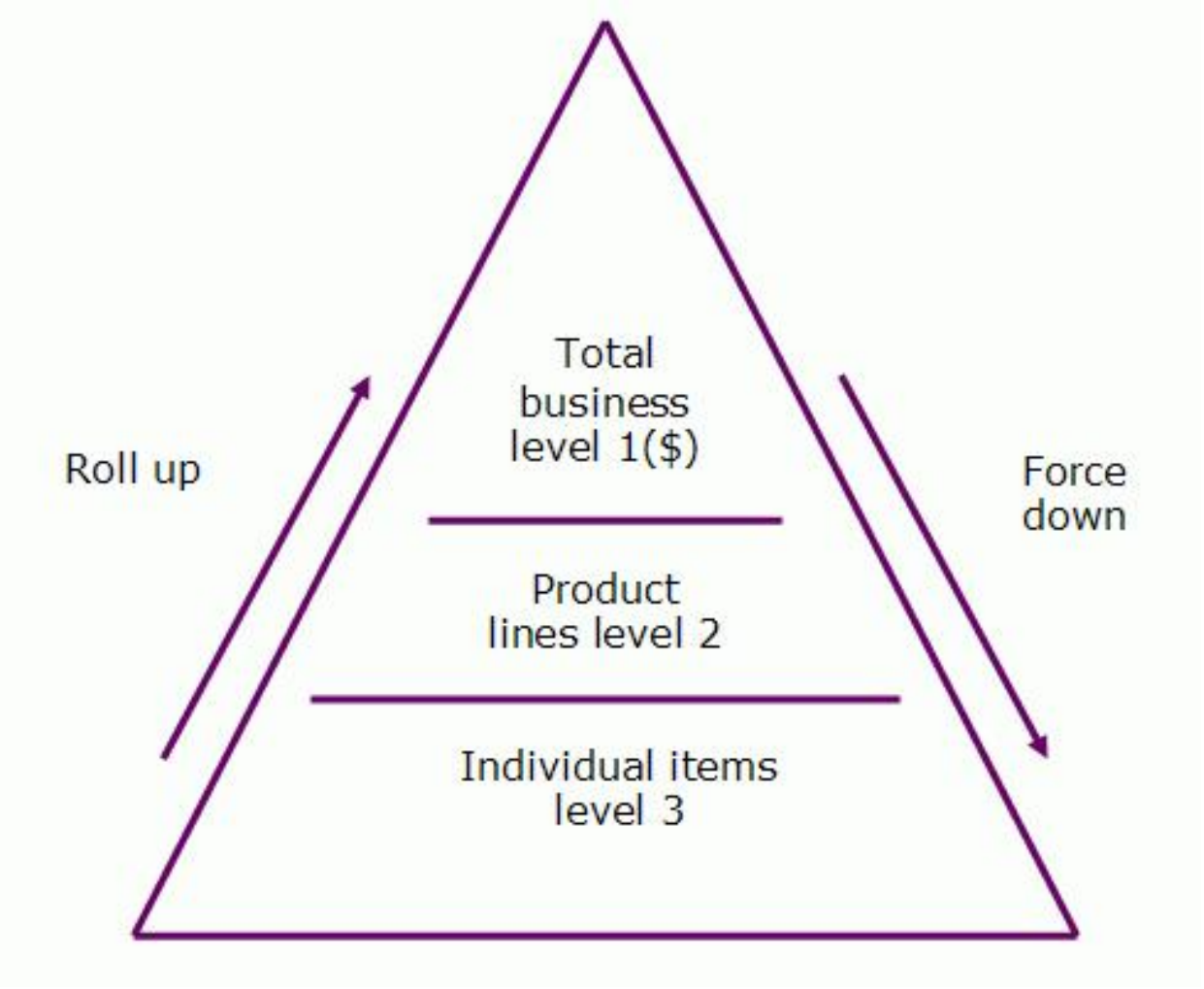
In certain instances however, we simply have no past data and have to use judgment. For example, when a new product is introduced, a future sales promotion is planned, a new competitor appears or, new legislation affects the business.

Pyramid Forecasting

As we know from statistics, aggregation (by periods, by product, by planning horizon, by component combinations) gives more stable forecasts. Aggregating individual products into product lines, geographical areas, or customer types, must be done in ways that are compatible with planning systems. One procedure for reconciliation forecasts from different levels and sources is pyramid forecasting.

Figure 1 below is from a paper written by Newberry and Bhame, and provides the basic framework for collaborative pyramid forecasting. The procedure used in implementing the approach often begins with individual product item forecasts at level 3, which are rolled up into forecasts for product lines shown as level 2. We then aggregate forecasts for product lines into a total business forecast (in dollars) at level 1. Once the individual item and product line forecasts have been rolled up and considered in finalizing the top management forecast (plan), the next step is to force down (constrain) the product line and individual item forecasts, so they're consistent with the plan.

Figure 1. Pyramid forecasting



If there is substantial disagreement in each stage, reconciliation could occur or, an error might be discovered. If dollar forecasts are required at level 2, prices at level 3 can be used to calculate an average price. To roll up to the level 1 dollar forecasts, the average prices at the line level are combined with the line roll-up fore casts. The next task is to make the line and individual item forecasts consistent with this amount.

Determining the appropriate level of aggregation and reconciling various forecasting approaches (perhaps with pyramid forecasting) are important steps making the collaborative modifications in forecasts.

Collaborative planning, forecasting and replenishment (CPFR)

Many firms, including Wal-Mart and Campbell Soup, use a specific process called collaborative planning, forecasting, and replenishment (CPFR) for the shared supply chain. This allows a supplier and its customers to collaborate on demand forecasting (and also then the production and purchase planning).

CPFR uses a cyclic and iterative approach to derive consensus supply chain forecasts. It implies agreement on specific objectives (such as inventory reductions, lost sale elimination, lower product obsolescence to be gained through collaboration, resource requirements) This early exchange of information between trading partners thus provides for reliable, longer-term future views of demand in the supply chain.

Forecast development may also follow preexisting company procedures and a simple forecast procedure, such as a moving average, is commonly used within CPFR. Simple techniques are easily used in conjunction with expert knowledge of promotional or, pricing events that may then modify forecast values accordingly. Retailers with order forecasts and supplier's sales forecasts are then electronically posted with the latest forecasts to work towards deriving a "consensus" forecast.

Once the corresponding forecasts are agreed, the order forecast then becomes an actual order and the replenishment process starts.

Conclusion

Developing a forecasting system is not easy. However, it must be done because forecasting is fundamental to any planning effort. Several approaches should be used. Regression analysis or multiple regression analysis is best suited for these problems. But economic factors, product trends, growth factors, and competition, as well as a myriad of other possible variables need to be considered and the forecast is adjusted to reflect the influence of each.

In the short run, a forecast is needed to predict the requirements for materials, products, services, or other resources to respond to changes in demand. Forecasts permit adjusting schedules and varying labor and materials. Short-and intermediate-term forecasting (such as is required for inventory control, staffing and material scheduling) may be satisfied with simpler modeling, such as exponential smoothing, with perhaps an adaptive feature or a seasonal index.

All the changing conditions may imply that past data becomes less relevant to forecasting and we need to use more expert opinion, collaborative forecasting and qualitative procedures. Also we may need to change the forecasting method, the frequency of forecasting and model testing

We could also make the smoothing constant larger in an exponential smoothing model to be more responsive to any changes.

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