A new forecasting method to address the big problem of planning intermittent demand
Intermittent or uneven demand—particularly for low-demand items like service parts—is especially difficult to predict with any accuracy. A new method, bootstrapping, may provide the answer.

Do any of these scenarios apply to your company?

- Sometimes, you miss out on business opportunities because you can’t accurately forecast demand and estimate inventory requirements for certain products.
- You’ve had to make unnecessarily large investments in inventory to cover unexpected orders and materials requirements.
- Shortened lead times and the pressure to increase customer-service levels, twin demands of the e-commerce era, have made efficient inventory management even more difficult.
- You know you need more powerful forecasting tools, but you’re not in the business of writing software and your midrange company doesn’t have huge MIS resources.

Most likely, if your products exhibit intermittent demand patterns, you’re acquainted with some or all of the above. You aren’t alone.

Intermittent demand—also known as irregular, sporadic or slow-moving—affects industries of all types and sizes: capital goods and equipment sectors, automotive, aviation, industrial tools, specialty chemicals, utilities and high tech, to name just a few. And it makes demand forecasting and planning extremely difficult. It can be much more than a headache; it can be a multi-million-dollar problem, especially for suppliers of service parts and for those who manage service parts inventories.

Identifying intermittent demand data isn’t hard. It typically contains a large percentage of zero values, with non-zero values mixed in randomly. But while companies have been wrestling with intermittent demand for years, few forecasting solutions have yielded satisfactory results, until recently. Why is this so?

**Traditional approaches**

Traditional statistical forecasting methods, like exponential smoothing and moving averages, work well when product demand data is normal, or smooth, but it doesn’t give accurate results with intermittent data. Many computerized forecasting tools fail because they work by identifying patterns in demand history data, such as trend and seasonality. But with intermittent demand data, patterns are especially difficult to recognize. These methods also tend to ignore the special role of zero values in analyzing and forecasting demand.

Even more importantly, traditional statistical forecasting methods assume that the probability distribution of to-
How does the new method of forecasting intermittent demand work in practice? Although the full architecture of this technology includes additional features, a simple example of bootstrapping demonstrates the usefulness of the technique.

The 24 monthly demand values for a service part item, found in Table 1, are typical of intermittent demand history. Let’s say you need forecasts of total demand for this item over the next three months because your parts supplier needs three months to fill an order to replenish inventory.

The bootstrap approach is to sample from the 24 monthly values, with replacement, three times, creating a bootstrap scenario of total demand over the three-month lead time.

You might randomly select months 6, 12 and 4, which gives you demand values of 0, 6 and 3, respectively, for a total lead-time demand (in units) of 0 + 6 + 3 = 9. You then repeat this process, perhaps randomly selecting months 19, 8 and 14, which gives a lead-time demand of 0 + 32 + 0 = 32 units. Continuing this process, you can build a statistically rigorous picture of the entire distribution of possible lead-time demand values for this part item.

Figure 1 shows the results of 25,000 such bootstrap scenarios, indicating (in this example) that the most likely value for lead-time demand is zero but that lead-time demand could be as great as 70 or more units. It also reflects all aspects of the new bootstrapping technology, including the real-life possibility that non-zero demand values for the part item occurring in the future could differ from those that have occurred in the past.

With the high-speed computational resources available today, bootstrapping methodology can provide fast and realistic forecasts of total lead-time demand for thousands or tens of thousands of intermittently demanded product items. These forecasts can then be entered directly into inventory control models to insure that enough inventory is available to satisfy customer demand. This also ensures that no more inventory than necessary is maintained, minimizing costs.
Early evaluators of the new intermittent demand forecasting technology have found that it increases customer service level accuracy and significantly reduces inventory costs.

- A nationwide retailer’s warehousing operation forecasted inventory requirements for 12,000 intermittently demanded SKUs at 95 and 99 percent service levels. The forecast results were almost 100 percent accurate. At the 95 percent service level, 95.23 percent of the items did not stock out (95 percent would have been perfect). At the 99 percent service level, 98.66 percent of the items did not stock out (99 percent would have been perfect).

- The aircraft maintenance operation of a global company got similar service level forecasting results with 6,000 SKUs. Potential annual savings in inventory carrying costs were estimated at $3 million.

- The aftermarket business unit of an automotive industry supplier, two-thirds of whose 7,000 SKUs demonstrate highly intermittent demand, also projected $3 million in annual cost savings.

If the challenge of forecasting intermittent product demand has indeed been met, it will be good news for midrange manufacturers. This new method, like most other commercially available forecasting applications today, is built around an automatic forecasting technology that makes it accessible to the non-statistician. Demand data that was once un-forecastable no longer poses an obstacle to achieving the highest customer service levels with the lowest possible investment in inventory.

Charles N. Smart is president of Smart Software, providers of forecasting and demand planning software. Contact him at 800 762-7899 or at csmart@smartcorp.com