Consumer Products Case Study

PROJECT OVERVIEW

Network and Inventory Optimization with Advanced Analytics

BACKGROUND

Our client, a specialized seafood company was facing tremendous pressure to reduce operational costs and free up working capital tied up in inventory investment. Under the mixed “Make & Buy” strategy, the company operates a supply network consisting of 7 plants and 6 distribution centers in North America (“Make”) and imports a large number of products in full containers from its suppliers in Southeast Asia (“Buy”). With declining market demand, increasing supply complexity and constraints, and a “one size fits all” inventory strategy, they had suffered from suboptimal inventory performance compared to relevant consumer goods industry benchmarks. Clarkston was engaged to develop an optimal approach for right-sizing inventory targets that would enable this client to achieve tangible inventory cost savings while maintaining or improving service levels.

CHALLENGES

The Clarkston team started the analysis based on the traditional safety stock calculation method set forth in “Crack the Code”, a well-known article regarding statistical inventory modeling published by MIT. This “MIT Model” has been widely adopted across industries, and many inventory optimization models and software packages employ the same or similar formulas. However, the Clarkston team quickly recognized that one significant limitation of the MIT Model could artificially inflate the safety stock requirements: the MIT Model does not take forecast accuracy into consideration and treats all demand variations – both predictable and random – as random. This limitation was particularly problematic for the client, as many of its products are heavily promotion-driven and seasonal, and much of the resulting demand fluctuations are anticipated and reflected in demand forecasts.

The concept of incorporating demand predictability into statistical safety stock calculations itself is not entirely new. Some supply chain professionals have attempted to use forecast accuracy measures (e.g., 1 – MAPE) while others have tried the standard deviation of forecast errors. However, before we started the project, there had not been a well-defined and -reasoned “new model” in the market that makes statistical sense. In addition, it was not clear in which cases the traditional model or the proposed new model should be used. Traditionally, a somewhat arbitrary threshold was often selected to segment products into “good”, “fair” and “poor” forecast-ability groups (e.g., forecast accuracy ≥90% is “good”). But in real-world applications, convincing clients that 89% forecast accuracy justifies a materially different model compared to 90% often proves to run counter to the client’s intuition.

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PROJECT OVERVIEW

COMPANY:

A Specialized Seafood Company

INDUSTRY:

Food & Beverage

EMPLOYEES:

2500-3000

REVENUE:

Over $1 Billion

PRIMARY OBJECTIVES:

- To develop an industry-first approach to set the stage to “crack the forecast accuracy code” that can:
  - Logically incorporate forecast-ability into the statistical safety stock calculations,
  - Rationalize the model selection decision process,
  - Quickly wrangle, cleanse, and analyze large volumes of historical data down to the SKU/location level

RESOLUTION:

- The Clarkston team invented a proprietary application of the root mean square error (“RMSE”) of actual versus forecast demand in place of the standard deviation of actual demand used in the traditional MIT Model. RMSE is a well-established statistical measure and its use reduces the amount of required safety stock calculated to achieve the same service levels when demand variations are already predicted by the demand forecast, such as promotional and seasonal products.
- Clarkston's data scientist expert employed the statistical scripting package R in place of a spreadsheet-based model to develop code that could quickly and simultaneously run both models at the SKU/location level and compare the results. Due to the size of the demand and supply data set, and number and types of computations involved, this was simply not feasible using a spreadsheet.
- The R code then exported results in a user-friendly spreadsheet format for client review and discussion, in which the minimum safety stock value between the two models was recommended as the optimal approach for a particular SKU.
- This data-driven safety stock model selection process proved to be both more objective and more intuitive.
- This approach also rationalizes and simplifies the forecast-ability-based classification process into two groups:
  - MIT Model Group (or the random demand error group), and
  - RMSE Model Group (or the better forecast-ability group)

KEY BENEFITS:

- Based on the analysis using Clarkston’s novel approach to inventory optimization and product classification, it was concluded that the client could support its customer service expectations with 27% less inventory.
- That level of inventory reduction would yield a one-time cash benefit of $24.9 million and a recurring expense benefit of $3.1 million.
- Clarkston also developed an easily transferable and adoptable version of the R code-based inventory optimization tool so that the client could reassess its inventory target periodically or when business changes dictate.

Ultimately, the client project was a success on more than one level. Beyond the immediate value delivered to them, perhaps more importantly and strategically, this was a pioneer project in which Clarkston implemented what we believe to be an industry-first statistical analysis that represents a significant improvement upon the traditional MIT Model.

CLARKSTON CONSULTING

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