Proceedings of the 9th Annual World Conference of the
Society for Industrial and Systems Engineering,
2020 SISE Virtual Conference
September 17-18, 2020

A Data-Driven Forecast Netting Approach via Linear Programming

IG Lee, D Won, and SW Yoon

Department of Systems Science and Industrial Engineering,
Watson college of Engineering and Applied Science
State University of New York at Binghamton
Binghamton, NY, USA

Corresponding author's Email: nnagarur@binghamton.edu

Abstract: This research proposes a data-driven forecast netting approach using a linear programming (LP) model to enhance the demand forecasting performance. The forecast netting is a commonly used technique to adjust the forecasted gross demand based on actual customer orders. Specifically, the forecast netting plays a critical role in determining the capital investment for demand planning, including capacity expansion and configuration, tool procurement, and outsourcing. Recently, along with the evolving trends of the manufacturing environment, there are high needs for the netting process to address shortening product life cycles, market instabilities, uncertainty, or rapid changes in customers' demand requests. In the forecast netting, there are two main issues to be considered. First, low forecast accuracy when the gross demand is overestimated. Second, high variation over the demand planning horizon. Thus, the main objective of this research is to improve the demand forecast accuracy and variation through the proposed netting method. Basically, the proposed method determines a weight that limits the amount of netted forecasts to prevent the demand overestimation with high volatility. The LP model is trained to learn the weight by minimizing the forecast error from the historical data and variation ahead of the time window. To control the trade-off between two terms, we also introduce a parameter to determine the relative importance among them. Experiments are conducted on real datasets collected from a firm in semiconductor manufacturing. The results show that our proposed method outperforms the conventional netting method regarding both the demand forecast accuracy and variation.

Keywords: Demand Forecast Netting, Decision-Making, Demand Planning, Parameter Optimization, Linear Programming