

Multiproduct Inventory Planning Considering Consumer Choices and Substitution Effects

by Sandra Transchel, Kühne Logistics University, Hamburg, Germany

joint work with Marjolein E. Buisman and Rene Haijema, Operations Research & Logistics Group, Wageningen University

Abstract

In the retail industry both breadth and depth of an assortment are critical strategic decisions to satisfy the heterogeneous consumer needs in the long run and to foster store loyalty. While the breadth of an assortment specifies the number of different product categories (or product lines) in a store, the assortment depth defines the different SKUs (versions) of a product within a specific product category. Typical examples for different versions of a product within a product category are parallel offerings of, for example, national brands and private labels, or conventional and organic products. In both examples, the two product versions are very similar as they only differ in a few product features, which implies that when one version is out of stock or otherwise not available, some consumers may buy the other version instead.

Determining optimal inventory levels of multiple products within a product category considering stockout-based substitution is still a huge challenge not only in practice but also academic research has shown that this problem is not easy to tackle, not even for a simple two-product problem. In this paper, we develop an approach to solve the multi-product assortment and inventory planning problem with stockout-based substitution, specifically for vertically differentiated products. Demand and substitution rates are derived from a utility-based choice model. Compared to previous research, our approach considers substitution rates endogenously, derived from consumer choice model. Additionally, we consider multiple substitution attempts in case of stockout of a product where previous research was mainly focusing on a single substitution attempt. We show the benefits of an integrated assortment and inventory planning compared to a sequential approach where first the assortment is optimized and subsequently, optimal inventory levels are determined.

***Sandra Transchel** is Professor of Supply Chain and Operations Management and the Academic Director for the MSc in Global Logistics and SCM at the Kühne Logistics University (KLU). Before joining KLU, Sandra was Assistant Professor at Pennsylvania State University and Visiting Assistant Professor at Tuck School of Business at Dartmouth. Her research interests are in supply chain modeling and inventory control with the goal to better manage decision-making processes under uncertainty. The specific focus of her research is on managing perishable product supply chains, for example, food supply chains seeking to reduce the overall generated waste and reduce write-offs. Sandra's has been published in various leading journals such as Production and Operations Management, Operations Research, and European Journal of Operational Research.*

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1:00 - 2:00 pm

Location

6, rue Richard
Coudenhove-Kalergi
L-1359 Luxembourg
Building JFK
Room Nancy-Metz

Language

English

Registration

- Free seminar
- Registration to crea@uni.lu (please specify full name and institution)
- Lunch is planned for registered participants

Contact

crea@uni.lu
Tel: +352 46 66 44 628