A NEWSBOY PROBLEM CONSIDERING RESERVATION POLICY WITH FUZZY DEMAND

Liang-Hsuan Chen and Ying-Che Chen

Department of Industrial and Information Management
National Cheng Kung University
Tainan 701, Taiwan
{ lhchen; r3892106 }@mail.ncku.edu.tw

Abstract. *Reservation policies are usually adopted for marketing purposes in environments with uncertain demand. This paper examines reservation policy in newsboy-type inventory models with fuzzy demand. A discount rate is often used to motivate potential customers to use the reservation option. The willingness rate is defined as a function of the discount rate, and calculated as the proportion of potential customers who make reservations at the discount rate. Based on different types of customers, the corresponding willingness functions can be established. This paper suggests a procedure for finding the optimal discount rate and total order quantity to achieve the optimal total profit. Considering willingness functions due to various types of customer, numerical examples with two parameter sets are used to demonstrate the applicability of the proposed models. The results show that the newsboy model that considers reservation policy with fuzzy demand can achieve greater total profit than that obtained using the classical newsboy model.*

Keywords: Newsboy problem, Fuzzy demand, Single-period, Reservation

1. **Introduction.** Newsboy problems (also known as single-period problems, SPP) have been widely researched for several decades. They are applied to the stocking of fashion goods, perishable products, and seasonal items, such as Christmas trees, newspapers, magazines, and pop CDs. These products have a common property: a high/low value in the beginning/end of the selling period. In general, it is difficult for decision makers to determine the proper quantity to satisfy demand. If decision makers order beyond this optimal quantity, the remainder is usually sold at a discounted price. Conversely, insufficient ordering causes a shortage, which leads to unsatisfied demand, lost goodwill, and lower profits. Therefore, order quantity is an important factor for profit maximization in newsboy problems.

The model of Hadley and Whitin [1] for the newsboy problem has been given a number of extensions, most of which have been based on probabilistic frameworks. Some of these models help finding the optimal order quantity so as to maximize (minimize) total expected profits (cost) [1,2]. Other models have been developed to optimize various objectives, e.g., maximize the probability of achieving a given profit level ([3-5]). Considering the discounting structure, Khouja [6] used multiple discounts to sell excess inventory. Khouja [7] extended the multi-discount SPP to include a supplier offering an all-unit quantity discount. For newsboy-type products with increasing discounts, Khouja and Mehrez [8] extended Khouja's [6] model to include multi-product cases with budget constraints. Some researchers have discussed particular effects on newsboy-type problems, such as the advertising effect [9], the introduction of a reactive production [10],