

A NEWSBOY SUPPLIER SELECTION PROBLEM WITH RETURN POLICY BY USING KKT AND GA

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Abstract. A newsboy problem model in which a vendor has limited resource is developed. It is assumed that suppliers will either sell products to the vendor outright or offer products to the vendor with various return policies. The common market can be supplied by any combination of the products. In the return policy, the supplier, at the end of the selling season, buys back from the vendor (at a certain percentage of the original cost) the unsold products. The purpose of this study is to investigate how the vendor should replenish the products with return policy, constrained resources and changing procured price. Two numerical examples are provided. The optimal solution of the one with two variables and budget constraint is derived using KKT (Karush-Kuhn-Tucker) conditions. While the other example with four variables and various defective rates, budget and service level constraints is solved using GA (genetic algorithm). The solution procedure developed can be extended to problems with larger number of constraints and variables. For cases with few (less than three) decision variables, analytical KKT method is used to derive the optimal solution. As the number of constraints and decision variables increases, GA is used to derive the heuristic solutions

Keywords. KKT, GA, Constrained newsboy model, Supplier selection

1 Introduction

This study investigates a single order problem where a buyer has the option of purchasing goods outright from the suppliers and/or obtaining the items with a return-policy agreement from some other suppliers. A return policy allows a buyer to return the unsold items for a partial refund. This will entice the buyer to order a larger quantity, resulting in an increase in the joint profit. Commodities such as style or catalogue goods are examples where return policies are used (Emmons and Gilbert [1]; Mantrala and Raman [2]). The fixed priced "catalogue goods" are sold to the customers through catalogue advertisement during a particular selling season.

Return policy is an important strategy to coordinate supply chain. Pasternack [3] modeled a return policy and derived a global optimization in a single period with uncertain demand. He demonstrated that a return policy where