

# Optimal pricing and ordering policy for an integrated inventory model with quadratic demand when trade credit linked to order quantity

Nita H. Shah

*Department of Mathematics, Gujarat University, Ahmedabad, India*

Ajay S. Gor

*Pramukh Swami Science & H.D. Patel Arts College,  
North Gujarat University, Kadi, India, and*

Chetan A. Jhaveri

*Institute of Management, Nirma University, Ahmedabad, India*

## Abstract

**Purpose** - The purpose of this paper is to study integrated inventory system and pricing and ordering strategy for vendor-buyer supply chain system. Here, the vendor offers a trade credit to the buyer when the buyer's order quantity exceeds a given pre-specified quantity. Therefore, to incorporate the concept of vendor-buyer integration and trade credit linked, the authors analyze the model to determine the optimal strategy for an integrated vendor-buyer inventory system under the condition of credit linked to the order quantity when demand is quadratic.

**Design/methodology/approach** - A mathematical model for integrated inventory system is developed when demand rate is increasing function of the time and decreasing function of the retail price. By analyzing the total channel profit function, the authors developed some useful results to characterize the optimal solution and provide an iterative algorithm to find the retail price, buyer's order quantity and the number of shipments per production run from the vendor to the buyer.

**Findings** - By developing a solution algorithm, the optimal retail price, order quantity and number of shipments from the vendor to the buyer are provided. Numerical examples and sensitivity analyses are presented to validate the proposed model. Through extensive numerical analyses, it is observed that a longer credit term increases profits of the player for the entire supply chain. The vendor should establish the threshold for allowing trade credit comprehensively to ensure the greatest benefit for both players.

**Originality/value** - Most of the research articles available in the literature considered the constant demand or linearly changing demand. In this paper, a mathematical model is developed considering time dependent quadratic demand. Very few researchers have investigated joint optimal policy in vendor-buyer supply chain system, considering trade credit is linked to order quantity, and still there are not many findings on the benefit of integrated policy and trade credit.

**Keywords** Pricing, Inventory, Inventory based ordering systems, Supply chain management, Vendors, Suppliers, Integrated inventory model, Trade credit, Order-linked trade credit, Quadratic demand

**Paper type** Research paper

