MODELLING AND ANALYSIS OF INVENTORY SYSTEMS UNDER INFLATION AND STOCK DEPENDENT CONSUMPTION

By

RAKESH GUPTA

Thesis submitted to the
Indian Institute of Technology, Delhi
for the Award of the Degree of
DOCTOR OF PHILOSOPHY

CENTRE FOR MANAGEMENT STUDIES
INDIAN INSTITUTE OF TECHNOLOGY DELHI
May, 1987

CERTIFICATE

The thesis entitled 'Modelling and Analysis of Inventory Systems under Inflation and Stock Dependent Consumption' by Mr.Rakesh Gupta to the Indian Institute of Technology,Delhi, for the award of the degree of Doctor of Philosophy, is a record of bonafide research work carried out by him. He has worked under my guidance and supervision and has fulfilled the requirements for the submission of this thesis, which has attained the standard required for a Ph.D. degree of this Institute. The results presented in this thesis have not been submitted elsewhere for the award of any degree or diploma.

(PREM VRAT)
Professor of Industrial Engineering
Department of Mechanical Engineering
Indian Institute of Technology,Delhi
New Delhi-110016.

ACKNOWLEDGEMENTS

I wish to express my deepest sense of gratitude to Dr.Prem Vrat, Professor of Industrial Engineering, Department of Mechanical Engineering, I.I.T.,Delhi for motivating and inspiring me to take up the present study. I have learnt a great deal under him because of his frank discussions and painstaking efforts. At every stage of my work I have freely encroached upon his time, and, but for his keen interest, invaluable guidance and intellectual stimulation, this study would not have taken its present shape.

My sincere thanks are due to the organizational heads and colleagues of I.I.T.Delhi, DCM Engineering and Electronics Division, Delhi and N.B.C.C. Ltd., in which I served during the course of this research for their co-operation and providing necessary help; specially to Dr.Sushil Agarwal, Mr.D.R.Sen, Dr.A.V.Chaturvedi and Mr.S.Baliga.

I record sincere gratitude to Dr.J.D.Agarwal of his valuable help, advice, co-operation and encouragement.

My sincere thanks are also due to various officials from different libraries, who spared much of their time for contributing useful information for the present study.

I am specially grateful to my father Prof.Kanti Swarup for his valuable suggestions and active association, throughout the study.

I am extremely thankful to my wife Mrs. Alka Gupta and other family members for their patience, understanding, co-operation and constant inspiration, without which this study could not have been completed.

Sincere thanks are also due to Mr.Tilak Raj for his painstaking efforts and impressing typing and to Mr.A.Vohra and Mr.Naresh Madan for their excellent and neat drawings.

Rakesh
(RAKESH GUPTA)

Dated: 12/5/87

ABSTRACT

The main emphasis of the thesis is to develop a methodology for modelling and analysis of Inventory Management (IM) aspects under initial stock dependent consumption rate with different functional relationships, inflationary price behaviour and for perishable products.

Initially, the study introduces the subject, presents an overview of the problem of IM and brings out the relevance and advantages of the research problem. A comprehensive review of the literature is reported and inherent limitations of such models are broughout.

In first phase an attempt has been made to give new dimension to inventory management aspects. Firstly an inventory model under inflationary price behaviour with constraint system has been developed and extended to variable rate of inflation. It also provides inventory model with quantity discounts for a deterministic demand rate without permitting shortages. Second phase of the study presents inventory models for stock dependent consumption rate under different functional relationships. Inventory models for the determination of EOQ where backlogging is allowed, with continuous and discrete quantity discounts and multi item constraint system are also developed.

In phase third two models are developed for perishable products, one under quantity discounts without shortages and second is the integrated model for perishable products with initial stock dependent consumption rate.

Lastly a sensitivity analysis of inventory models developed is dealt with. A empirical study with ratio analysis of inventory situation of three different indian industries is presented with a view to highlight the impact of the various situational parameter on inventory system.

An extensive bibliography on the subject is included at the end. A substantive portion of this research study has been published by the author.

CONTENTS