APEM journal

Advances in Production Engineering & Management
Volume 14 | Number 1 | March 2019 | pp 112–124
https://doi.org/10.14743/apem2019.1.315

ISSN 1854-6250
Journal home: apem-journal.org
Original scientific paper

A multi-product pricing and inventory model with production rate proportional to power demand rate

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ABSTRACT

This paper deals with an economic lot size model when demand follows a power law and changes with time, owing to the fact that this kind of pattern is suitable for so many real situations. Production rate is presumed to be proportional to demand rate. Also since that demand is price sensitive in reality, we suppose that demand decreases linearly with price. With regard to these points, in this article a joint pricing and inventory model is presented where demand depends on time with a power pattern and price linearly, production rate changes pro rata with demand rate and multiple items are considered. The principal consideration of the study is to satisfy the demand and optimize the profit for all items in the system, simultaneously. Setup, holding, backlogging and production costs are involved in the inventory system. The aim is to maximize total profit function and achieve optimum values of scheduling period, reorder point and price. Employing mathematical modelling and optimization methods, the existence of the optimal solutions is proved, and then a simple heuristic algorithm is presented to maximize total inventory profit and determine the best values of variables. A numerical analysis is carried out to illustrate the applications of the proposed models.

ARTICLE INFO

Keywords:
Pricing model;
Inventory model;
Economic production quantity (EPQ);
Backordered shortages;
Power demand pattern

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Article history:
Received 14 August 2017
Revised 15 February 2019
Accepted 24 February 2019

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APEM journal

Advances in Production Engineering & Management
Letnik 14 | Številka 1 | Marec 2019 | Strani 112–124
https://doi.org/10.14743/apem2019.1.315

ISSN 1854-6250
Spletna stran: apem-journal.org
Izvirni znanstveni članek

Model oblikovanja cen in zalog z več izdelki s stopnjo proizvodnje, sorazmerno z eksponentno stopnjo povpraševanja

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POVZETEK

Prispevek obravnava ekonomski model velikosti serije, pri katerem se povpraševanje eksponentno spreminja s časom, kar je značilen vzorec za mnogo resničnih situacij. Domneva se, da je stopnja proizvodnje sorazmerna s stopnjo povpraševanja. Ker je povpraševanje odvisno od cene, domnevamo, da se povpraševanje linearno zmanjšuje s ceno. V zvezi s temi točkami je v prispevku predstavljen skupni model cen in zalog za več artiklov, pri katerem je povpraševanje eksponentno odvisno od časa, cena linearno, stopnja proizvodnje pa je sorazmerna s stopnjo povpraševanja. Glavna naloga študije je zadovoljiti povpraševanje in optimizirati dobiček za vse artikle v sistemu hkrati. Stroški postavitve, zadrževanja, zaostankov in stroškov proizvodnje so vključeni v sistem zalog. Cilj je maksimirati funkcijo skupnega dobička in doseči optimalne vrednosti obdobja načrtovanja, točke naročila in cene. Z uporabo metod matematičnega modeliranja in optimizacije se dokaže obstoj optimalnih rešitev, nato pa je predstavljen preprost hevristični algoritem, ki maksimira skupni dobiček in določi najboljše vrednosti spremenljivk. Za ponazoritev uporabe predlaganih modelov je izvedena številčna analiza.

PODATKI O ČLANKU

Ključne besede:
Model cen;
Model zalog;
Gospodarna količina proizvodnje (EPQ);
Pomanjkanje ponaročil;
Eksponentno povpraševanje

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Zgodovina članka:
Prejet 14. avgusta 2017
Popravljen 15. februarja 2019
Sprejet 24. februarja 2019