CIO 2019

13th International Conference on Industrial Engineering and Industrial Management

XXIII Congreso de Ingeniería de Organización

Organizational Engineering in Industry 4.0

BOOK OF ABSTRACTS

Gijón, 11th-12th July 2019

Book of Abstracts

"13th International Conference on Industrial Engineering and Industrial Management" and "XXIII Congreso de Ingeniería de Organización (CIO2019)"

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Tel. 985 10 95 03 Fax 985 10 95 07
http: www.uniovi.es/publicaciones
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I.S.B.N.: 978-84-17445-38-6
DL AS 1875-2019

Imprime: Servicio de Publicaciones. Universidad de Oviedo

13th International Conference on Industrial Engineering and Industrial Management
XXIII Congreso de Ingeniería de Organización
Gijón, Spain, July 11-12, 2019

Discrete EOQ and POQ

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Abstract This paper examines the EOQ and POQ determination in the discrete domain. Main contributions are a simple and exact round off rule that can be applied to EOQ and POQ, a simplified version for the power of two approach and a novel determination of the upper bound of the cost increase involved in this approach.

Keywords: EOQ; POQ; discrete order size; rounding rule

1 Introduction

The economic order quantity (EOQ) proposed by (Ford W. Harris, 1913) is probably one of the most influential concept in the modern operations management. EOQ is a very important concept in inventory management and can be found in almost every modern text-book, e.g. (Axsäter, 2006), (Silver, Pyke and Peterson, 1998) and (Nahmias and Olsen, 2015). The aim of the original paper is well known: determining how many units have to be ordered to achieve the minimum inventory cost. Main assumptions include considering constant demand and a complete knowledge of every relevant cost being also constant all of them; but it is also necessary to accept that the order quantity can be represented by real number, probably a reasonable decision for the examples originally presented by Harris involving thousands of units.

A number of different models have appeared in the literature considering different assumptions and techniques. However, the question of rounding up or

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rounding down EOQ emerges in practice but literature has paid little attention to this topic. For example, (Silver, Pyke and Peterson, 1998) recommend simply rounding to the nearest integer but frequently it is not possible when available options are determined by the units in a cartoon or in a pallet.

EOQ can be also expressed as a time supply, that is, the period of time whose demand will be satisfied also known as periodic order quantity (POQ). This concept is the basis of a well known heuristic in inventory and production management, and share the same rounding problem that EOQ. (Muckstadt and Sapra, 2010) present a discrete approach based on power of two time supplies.

This paper focuses on a discrete quantity EOQ model and its aim is to provide a general rounding rule that can be applied to both order quantity and time supply.

2 Conclusions

This paper focuses on the discrete EOQ determination while minimizing inventory costs. This function is convex and it has been derived a convenient expression to compute de cost difference between any two order quantities. As a result, the discrete EOQ can be obtained just rounding off the continuous EOQ using the geometric mean of the limits.

Previous results have been extended to the discrete POQ determination so that the geometric mean rounding rule also applies. Additionally, this derivation has been applied to the power of two approach providing a novel derivation of the upper bound of the cost increase involved in the power of two approach.

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