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# A comparative study of heuristic algorithms on Economic Lot Scheduling Problem

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## Abstract

The Economic Lot Scheduling Problem (ELSP) has been well-researched for more than 40 years. As the ELSP has been generally seen as NP-hard, researchers have focused on the development of efficient heuristic approaches. In this paper, we consider the time-varying lot size approach to solve the ELSP. A computational study of the existing solution algorithms, Dobson's heuristic, Hybrid Genetic algorithm, Neighborhood Search heuristics, Tabu Search and the newly proposed Simulated Annealing algorithm are presented. The reviewed methods are first tested on two well-known problems, those of Bomberger's [Bomberger, E. E. (1966). A dynamic programming approach to a lot size scheduling problem. *Management Science* 12, 778–784] and Mallya's [Mallya, R (1992). Multi-product scheduling on a single machine: A case study. *OMEGA: International Journal of Management Science* 20, 529–534] problems. We show the Simulated Annealing algorithm finds the best known solution to these problems. A similar comparison study is performed on various problem sets previously suggested in the literature. The results show that the Simulated Annealing algorithm outperforms Dobson's heuristic, Hybrid Genetic algorithm and Neighborhood search heuristics on these problem sets. The Simulated Annealing algorithm also shows faster convergence than the best known Tabu Search algorithm, yet results in solutions of a similar quality. Finally, we report the results of the design of experiment study which compares the robustness of the mentioned meta-heuristic techniques.

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**Keywords:** Economic Lot Scheduling Problem; Time-varying lot size; Simulated annealing; Tabu search; Neighborhood search

## 1. Introduction

The Economic Lot Scheduling Problem (ELSP) deals with the production assignment of several different products on a given single production facility to minimize the total cost. A typical ELSP as described in Maxwell (1964) has the following features:

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