
UNLIMITED SINGLE ITEM LOT SIZING PROBLEM: APPROXIMATION PROCEDURES THROUGH DIMENSIONAL ANALYSIS

Joao Luis de Miranda ^{1,2 *}, Miguel Casquilho ², Mariana Nagy ³

¹ESTGD/VALORIZA, Portalegre Polytechnic University, Portugal

²CERENA/IST, Lisboa, Portugal

³"Aurel Vlaicu" University of Arad, Romania

ABSTRACT

The Unlimited Single Item Lot Sizing Problem problem, alias Economic Lot Size (ELS), is often used as sub-problem of more complex Optimization problems because it allows very fast solution approaches. In addition, the ELS mathematical substructure can be found in many real world problems, either in a deterministic mode —e.g., in batch scheduling, capacity expansion, facility location problems—, or in stochastic approaches to production-distribution networks with inventory considerations, prices evolution, and treatment of unsatisfied demands. An extensive study of unlimited single item ELS instances is carried out, and optimal estimates for the ELS problem are treated through dimensionless ratios and convenient quotients: in one hand, by correlating the objective function 's optimal value and the instance parameters; in the other hand, through approximation procedures that first estimate the optimal binary variables and, thereafter, the production and stocking levels. The related results are presented, namely, in what regards the application of dimensional analysis to the ELS instances at hand; key points are also analyzed, such as the better modes to constrain the solutions space, either applying specific cuts, or supported on specific structures for the optimal solution. Finally, further developments are outlined and discussed, including the potential extension of dimensional analysis and associated approximation procedures to other Optimization problems, as well as to real world industry contexts.

Keywords Unlimited Single Item Lot Sizing · Dimensional analysis · Objective function 's optimal value · Optimal binary solution · Approximation procedures

References

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*Corresponding Author's E-mail: jlm.estgp08@gmail.com

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