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# The Two-Criterial Dynamic Lot Size Problem

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The dynamic lot size model with time-constant costs is studied. The criterion of minimizing the sum of set-up and holding costs is complemented by another objective consisting in the minimization of the stock. It is shown that solutions which are efficient with respect to these two objectives can be derived from parametric one-criterial models with combined objective functions. A complete set of efficient solutions which are distinct in their objectives is covered by this approach.

## 1. The problem

Most of the textbooks in Operations Research touch in one or another way lot size models or their dynamic extensions [2], [3], [7], [9]–[11]. Generalizations of the models in multi-stage processes and multi-item systems have been also investigated [1], [4]–[7], [12]. Models of this type are widely used in practice to determine the size of production by minimizing the sum of size-independent fixed costs and size-depending holding costs. It follows usually from the application of such models that the size of production lots will raise, and, that the period of production will be moved away from the period in which the demand actually must be satisfied. The greater the distance between the periods of producing and selling the items, the more probable are changes in the demand structure and the more complicated will it be to respond flexibely to disturbances.

It was this situation sketched here that suggested to study multi-criterial lot size models. The economical criterion of minimizing the costs can be complemented by another one, which might be treated as minimizing the difference between the periods of producing and selling the items. More concretely, it finds its expression in the minimization of the stock. Then a two-criterial lot size model can be formulated and solutions which are efficient with respect to the costs and to the stock are to be found. The decision maker will then choose that solution which suits best his individual conception on the relationsship between costs and time.

In the paper the model will be described and it will be shown that the efficient solutions can be found by applying the stability results for the one-criterial problem [8] to the model with combined objective functions.

The one-criterial lot size model can be introduced as follows: The process of production and stock-holding is considered for one item and $T$ periods. The production figures $x_t \geq 0$ for $t^{th}$ period, $t = 1, 2, \ldots, T$, have to be chosen such that the given deterministic demand $d_t \geq 0$ is satisfied for all $t$ and that the total sum of set-up costs and holding costs is minimal. The fixed set-up costs arising if $x_t > 0$ are denoted by $c > 0$ and the per-unit per-period linear holding costs are denoted by $h > 0$. If the stock at