Pareto Optimal Solution for MSLP Problems with Partial Uncertainty

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OUTLINES

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PREFACE

This Subject of Seminar :

(1). Has been accepted for publication in the

International Journal of Mathematics in Operational Research.

(2). It in the queue of Forthcoming Articles.

ABSTRACT

A study on MSLP problems with partial information on probability distribution is conducted.

A method is proposed to utilize the concept of dominated solution for the MLP problems, and find an POS without converting the MLP problem into its unique LP problem.

An algorithm is proposed along with a numerical example which illustrated the practicability of the proposed algorithm.

Comparison of results with existing methods shows the efficiency of the method.

KEYWORDS

MSLP problems, partial information, dominated solution for the MLP problems, and POS.

Mathematical Formulation of MSLP Problems

$$\text{Max } Z_i = \sum_{j=1}^{n} C_{ij}(w)x_j \quad ; i = 1, \dots, r$$

$$\text{Min } Z_i = \sum_{j=1}^{n} C_{ij}(w)x_j \quad ; i = r+1, \dots, s \tag{1}$$

$$\text{s.t. } L(w)x - l(w) \geq 0,$$

$$x \in X_0$$

POS of MSLP Problems

$$\text{Max/ Min } Z_i = \sum_{j=1}^{n} C_{ij} x_j ; i = 1, 2$$

$$\text{s.t. } Ax \geq b,$$

$$x \geq 0$$

POS of MSLP Problems

$$\text{Max } Z_1 = \sum_{j=1}^{n} C_{1j} x_j$$

$$\text{s.t. } Ax \geq b,$$

$$x \geq 0$$

POS of MSLP Problems

$$\text{Max } Z_1 = \sum_{j=1}^{n} C_{1j} x_j$$

$$\text{s.t. } Ax \geq b,$$

$$\sum_{j=1}^{n} C_{2j} x_j \leq l; l \in \mathbb{R}$$

$$x \geq 0$$

Solution Algorithm of the POS

STEP1 : Choose a preferred objective function (say, Z1), then determine the optimal value that can be attained by

LINGO software (name it O1).

STEP2 : For the solution O1, find the value of the second objective function Z2 (name it O2).

STEP3 : Consider the ordered pairs of the point solutions (O1, O2) as a point on the trade-off curve.

Solution Algorithm of the POS

STEP4 : For value(s) O of the second objective function Z2 that are better than O2, solve the optimization problem in STEPs(1-3) with the additional constraint; the value of Z2 is at least as good as O. Varying O = {(O2n-1, O2n); ∀n ∈ N} (over value(s) of O preferred to O) will give the DM other points on the trade-off curve.

STEP5 : In STEPs(1-3) just one endpoint of the trade-off curve can be obtained. If the DM determines the best value of Z2 that can be attained, he/she obtains the other endpoints of the trade-off curve.

Solution Algorithm of the POS

It should be noted that:

- **we can treat Z1 and Z2 as vectors of Zi, $i = 1, ..., r$ and Zi, $i = r + 1, ..., s$ respectively $\forall r, s \in N$, and**

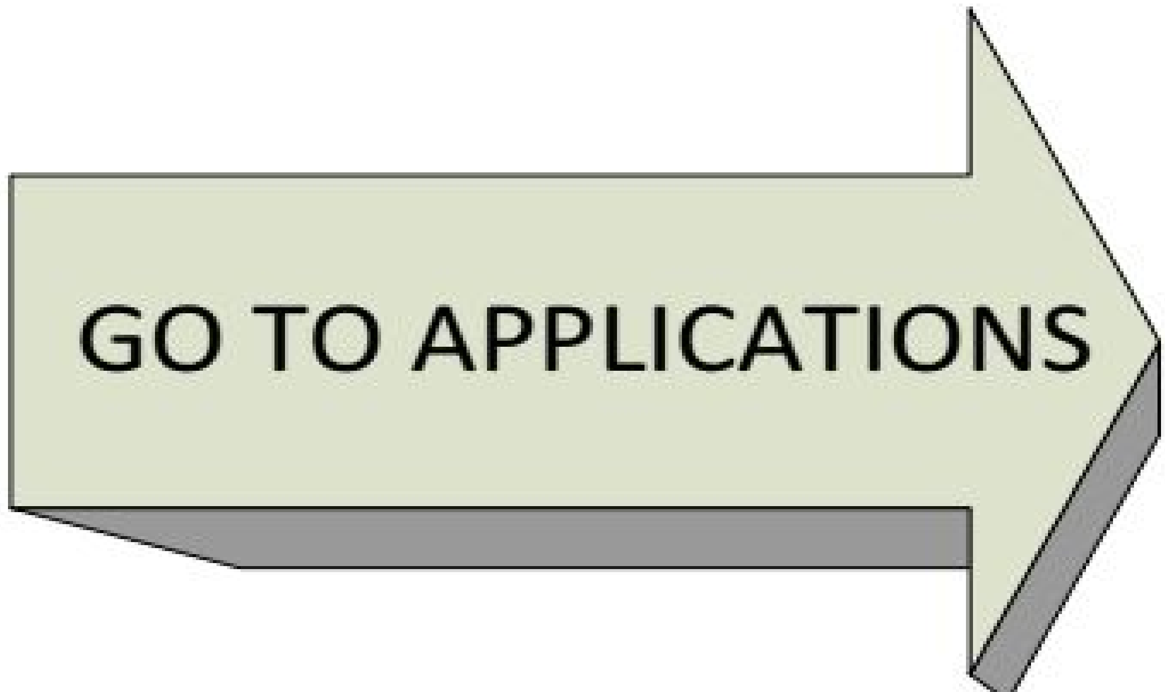
- **similar solution algorithm holds true for MLP problems with Zi; where $2 < i \in N$.**

APPLICATIONS

We present this example of the implementation of the research methodology in the problem statement within the framework of the MSLPI. The example is MSLPI.

It is a real life problem in the stochastic environment. It shows the application of our research methodology in the framework of the stochastic circumstance to transform the MSLPPFI into MLP problems and solving them.

APPLICATIONS



CONCLUSIONS

In this (Seminar) presentation; It shown how to find the POS for the MSLP problems where the parameters are random variables under uncertainty probability distribution. The POS has been provided in the illustrative example along with the solution method. The reciprocated results were obtained using a compromise approach and POSs. The results show that the proposed algorithm solution is applicable and practicable, providing the same feasible solution to the solved example and all $X^{CO} \subseteq X^{P}$.

Acknowledgments

THANK YOU!