

Global sensitivity analysis in PROMETHEE

Sándor Bozóki

Research Group of Operations Research and Decision Systems, Laboratory on Engineering and Management Intelligence, Institute for Computer Science and Control,
Hungarian Academy of Sciences (MTA SZTAKI);
Department of Operations Research and Actuarial Sciences, Corvinus University of Budapest, Hungary

The goal of multi-attribute (or multi-criteria) decision making is to rank a finite number of alternatives based on their performance with respect to multiple, often conflicting criteria. It is sometimes sufficient to find the overall best alternative, instead of the whole ranking. Tenders, ranking applicants or project proposals, environmental comparative studies are typical multi-attribute decision problems.

Sensitivity analysis is a key step in multi-attribute decision making. A global sensitivity analysis is proposed within the framework of the PROMETHEE methodology. Assuming that all the weights of criteria, representing their relative importance, can change simultaneously, within given intervals, the aim is to detect the possible rank reversals within an arbitrarily chosen subset of the alternatives. The global sensitivity analysis proposed determines the maximal length of the intervals (which can be relative or absolute, uniform or criterion-dependent) such that the relations of some, possibly all, pairs of alternatives do not change.

Global sensitivity analysis includes partial sensitivity analysis, when only one weight is allowed to change at a time, as a special case. Then we get the same results as in the module 'stability intervals' of decision support systems Visual Promethee, Decision Lab 2000 and PROMCALC & GAIA, the most popular implementations of PROMETHEE in the present and in the past.

A potential extension of the global sensitivity analysis includes the variability of the evaluations of the alternatives with respect to the criteria, too.