SIMPLE DECISION-MAKING USING FUZZY SETS

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One of basic tasks of prognostic studies is to identify expected and forecasted relations among the levels of gross domestic product, the means and factors influencing their achievement and some qualitatively defined goals. Considerable uncertainties of data and analyses have to be expected. For an introductory investigation of most appropriate relations among goals, aggregated indicators and means it is aimful to construct a simple procedure, which makes it possible to approximate the optimum solution. Below given procedure ~~it~~ is intended to help to identify the set of acceptable variants for which it will be efficient to prepare a detailed analysis and an adequate database.

For simplicity sake let us consider two fuzzy sets, both defined by expert procedures:

a fuzzy set of goals (expected needs),

a fuzzy set of means (e.g. labour, capital investment, residual factors).

The membership function of the set of goals is interpreted as weights of significance of each goal in a given context. The membership function of the second set indicates how distinguished is the contribution of the project as a mean for the fulfilment of above given goals. Obviously the number of membership functions for each mean is equal to the number of goals in the goal set.

The total contribution (efficiency) of the j-th mean (factor) E_j is expressed by the sum

$$E_j = \sum_i w_i c_{ij} \quad , \; i = 1, \ldots, n; \; j = 1, \ldots, m,$$

where w_i is the weight of the i-th goal,

c_{ij} is the contribution of the j-th mean (factor) for i-th goal.

A third fuzzy set of acceptable variants has its membership function computed as medium values of contributions for the goal fulfilment:

$$e_j = \left(\sum_i w_i \, c_{ij} \right) / \sum_i w_i \quad .$$

Values of the membership function e_j are interpreted as efficiences for m means contained in the fuzzy set of acceptable variants.

The computing is characterized by an example with two goals (weights) and three variants (contributions):

0.6			0.8			goals
0.6	0.7	0.2	0.3	0.4	0.8	means

$E_1 = 0.6 \times 0.6 + 0.8 \times 0.3 = 0.60 \quad E_2 = 0.74 \quad \underline{E_3 = 0.76}$

E_3 represents the best variant. The fuzzy set of acceptable variants has thus following membership function values:

$e_1 = 0.43 \quad e_2 = 0.53 \quad \underline{e_3 = 0.54}$

This procedure can be modified to more decision-making levels : goals - criteria - indicators - constraints - variants - changes etc., but experience reached so far indicates that a deeper intuitive insight into fuzziness of goals and means facing a society, an economy, a town or a firm is an important condition for succesful applications.

In this sense the procedure is being studied for approximate ranking of variants of further economic development.