



# Fuzzy Set-Theory Analysis of Deregulations Effects on the National Taxable Capacity

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**Abstract.** Two approaches to assessing the impact of changes in legislation on the tax potential of the country, implemented on the base of the weighted coefficients of influence factors, and verbal model based fuzzy inference are considered. On arbitrary examples of legislative initiatives, a comparative analysis of the results obtained with the application of both methods was carried out.

**Keywords:** Legislative initiative · Taxable capacity · Fuzzy set

## 1 Introduction

Adequate management of the taxation system (TS) is a dynamically complex problem, and the tax management is a weakly structured and, accordingly, difficulty formalizable procedure. At the current stage of the development of information and related technologies, any TS cannot exist in isolation from human. Therefore, its evaluation has not only an objective, but also a subjective component, because in the final stage the analysis of the influence of existing legislation and state administration on the level of TS development is carried out by the person himself. This is a quite important factor, which specifies the use of qualitative categories to evaluation the current level of TS, i.e. terms of linguistic variables (LV), which are the main structural units of the natural language of the agent of management [1]. Just this paradigm explains the necessity of using elements of fuzzy logic.

The basic leads towards optimal taxation are the foresight of the taxable capacity (TC), prevention, localization and elimination of damage from unbalanced decisions. At the same time, the estimation of the TC-level is always relative, and the desire to assign a numerical value to it is unacceptable from the point of view of further interpretation of complex results. TS and TC are complex concepts and cannot be viewed as a simple aggregate of their interrelated and/or interdependent components, since each of them is critically important. During integrated assessment of TC, the numerical description of assessment criterion is not possible. Therefore, it is necessary to develop such a model for integrated assessment of TC-level, so that it can unify approaches to the formation of TS.

## 2 Expert Estimation of Deregulations Effects on the TC

Realized in the state budget revenues TC depends on a large number of factors, i.e. within the framework of the state TS the forming of the TC is a multi-factor process. There are various ways of classifying these factors. Let us chose one generalized internal and seven external factors of influence (FI) [2]:  $x_1$  – *internal*, including regional legislative, socio-demographic, resource-source, infrastructure, innovation, environmental, investment factors, as well as the factors of the “shadow economy”, the smoothing of TC and tax culture;  $x_2$  – *legislative*, providing direct and/or indirect influence to TC;  $x_3$  – *the state form of government*, which directly influences to the formation of revenues of the state budget system;  $x_4$  – *macroeconomic*, characterizing the state of the global economy and foreign-economic activity;  $x_5$  – *political*, characterizing the political situation and implemented through relations between budgets of different levels;  $x_6$  – *inflationary* caused by rise in prices;  $x_7$  – *geographical*, defining the perspectives for the development of resource environment;  $x_8$  – *natural and climatic conditions*, specified by climatic conditions, availability and composition of natural resources, etc. Suppose that this list of FIs is agreed by the expert community, and its preliminary analysis is carried out on the base of two methods of examination: the comparative qualitative assessment of FIs by the method of experts’ preferences, and quantitative estimation of FI-parameters by setting the weights (or normalized values). Further, determining the goodness of fit of expert judgements and the generalized weights of FIs, a decision is made on the base of expert opinions to form weighted assessments of the effect of certain changes in the Tax Code on the TC.

Now, suppose that priority estimates  $r_{ij}$  ( $j = 1 \div 15$ ) for the declared FI  $x_i$  ( $i = 1 \div 8$ ) were obtained by independent questionnaire of 15 experts in the field of taxation. Each expert was individually suggested to rank the FI  $x_i$  by the principle: the most important factor should be designated by the number “1”, the next less important one is the number “2” and then the descending order of the expert’s preferences. The rank estimates obtained in this way are summarized in the form of Table 1.

To define the coordination degree of expert conclusions it is necessary to apply the Kendall’s concordance coefficient, which demonstrates the rank correlation of expert opinions. According to [3], this coefficient is calculated as following:

$$W = 12 \cdot S / [m^2(n^3 - n)], \quad (1)$$

where  $m$  is the number of experts;  $n$  is the number of FIs;  $S$  is the deviation of expert conclusions from the average value of the FIs-ranking, which is calculated as follows:

$$S = \sum_{i=1}^n \left[ \sum_{j=1}^m r_{ij} - \frac{1}{2}m(n+1) \right]^2, \quad (2)$$

where  $r_{ij} \in \{1, 2, \dots, 8\}$  is the rank of the  $i$ -th FI, which is defined by the  $j$ -th expert ( $j = 1 \div m$ ). On the base of data from Table 1 and formula (2) we have:  $S = 7424$ . Then, according to (1), the rank correlation of FI is characterized by the number  $W = 12 \cdot 7424 / [15^2(8^3 - 8)] = 0.7856$ , which indicates a rather high coordination degree of expert conclusions relative to FIs  $x_i$  ( $i = 1 \div 8$ ).