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ANALYSIS AND DEVELOPMENT OF METHODS FOR SUPPORTING MANAGEMENT DECISIONS OF THE TAX INSPECTORATE BASED ON PROCESSING FUZZY INFORMATION

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Annotatsiya. Ushbu maqolada ekspert tizimidan foydalangan holda noaniq ma'lumotlarni qayta ishlashga asoslangan soliqqa tortish tizimida samarali boshqaruv qarorlarini qabul qilishni qo'llab - quvvatlashni tashkil etish usulini tanlash tahlil qilinadi.

Kalit so'zlar: soliq to'lovchi, fazzifikatsiya, defazzifikatsiya, xulosa, soliq to'lovchilarni taqsimlash metodologiyasi, klasterlash usullari, ko'p o'lchovli ma'lumotlar, klaster tahlilining algoritmlari va usullari.

Аннотация. В данной статье анализируется и обосновывается выбор метода организации поддержки принятия эффективных управленческих решений в системе налогообложения на основе обработки нечеткой информации с использованием экспертной системы с нечетким выводом.

Ключевые слова: налогоплательщик, фаззификация, дефаззификация, вывод, методология распределения налогоплательщиков, задача кластеризации, методы кластеризации, многомерные данные, алгоритмы и методы кластерного анализа.

Annotation: This article analyzes and substantiates the choice of a method for organizing support to make effective management decisions in the taxation system based on processing fuzzy information from using an expert system with fuzzy inference.

Key words: taxpayer, fuzzification, defuzzification, inference, taxpayer distribution methodology, clustering problem, clustering methods, multidimensional data, algorithms and methods of cluster analysis.

Introduction. The development of the republic's economy is associated with the need for financial support for programs and strategies adopted in various fields, from socio-economic to scientific and technical, which are financed from the state budget, as well as from local budgets. Today, the tax system is not only a means of replenishing the budget, but also the most important tool for regulating market relations. It is obvious that the development of the state economy is impossible without the corresponding development of the tax system. Thus, the strategic goal of the economic policy of the state in general and tax policy in particular is to create a stable tax system in the Republic that would ensure a sufficient amount of tax revenues to the budgets of all levels through the formation of effective mechanisms for taxation of all categories of taxpayers, taking measures to combat violations of tax legislation, as well as information support for the process of making managerial decisions in the process of functioning of the tax system.

Research Methodology. The main difficulty for tax inspectors is that most of the parameters that characterize a taxpayer have a high degree of uncertainty and are unclear. In this regard, when forming the correct set of solutions and choosing the best from them, the main attention is paid to the processing of fuzzy information.

Fuzzy information processing methods depend on the nature uncertainties reflecting the specifics of the subject area.

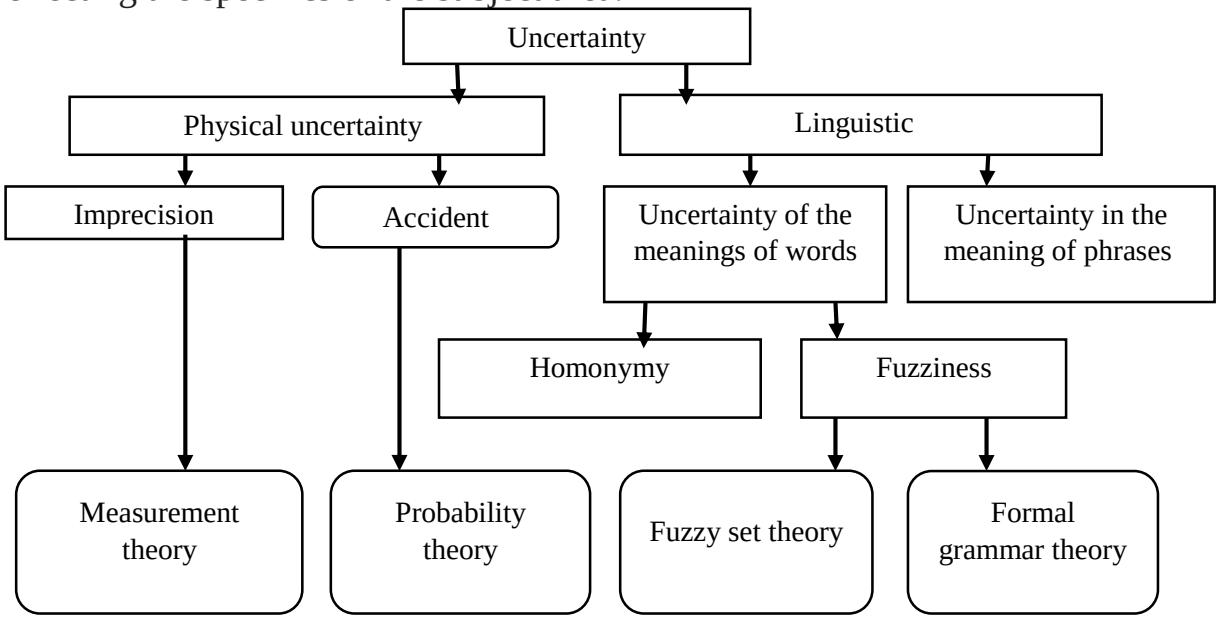

Figure 1. Types of uncertainty and associated solution methods.

Due to the fact that the main processed information is the assessment of the factors of the taxpayer's activity, which in turn is transformed into linguistic uncertainty, it is advisable to use the technology of fuzzy modeling, which makes it possible to develop correct decisions.

The proposed technology makes it possible to form new information from the data, which is of a qualitative and inaccurate nature. Which is the most promising in the field of applied research and decision making in the description of technical systems and business processes with uncertainty, where it is difficult to use traditional modeling methods [1,2].

A fuzzy model is understood as an information-logical model of a system, among the characteristics of which the type of uncertainty that occurs in the representation of the structure or description of the behavior of the system is distinguished. Among them are the following:

- fuzziness;
- ambiguity;
- incompleteness;
- inconsistency;
- ambiguity.

The subjectivity, uncertainty of the decision-maker can be modeled by the membership function of the analyzed factor using an admissible set of values. Fuzzy logic allows to form expert evaluations in some algorithmic form.

The main advantages of using fuzzy systems:

- operating with fuzzy input data;

- fuzzy formalization and comparison of parameters for assessing indicators;
- conducting qualitative assessments of input data and output results with appropriate handling of the degree of reliability of the data and their distribution;
- based on the principles of systems behavior, modeling complex systems and comparative analysis with a given degree of accuracy.

Analysis and results. As part of research on artificial intelligence methods, we have developed and widely used production systems for representing knowledge and drawing conclusions in expert systems. Fuzzy inference is realized on the basis of fuzzy production rules, which are close to logical models and allow to adequately represent knowledge of experts in the field of study.

The process of building a production model consists of three main stages:

- fuzzification - a procedure for finding the values of membership functions on the basis of ordinary initial data, in other words, an introduction to fuzziness;
- conclusion - the procedure for determining the degree of truth of conditions for each of the rules of the fuzzy inference system;
- defuzzification - the procedure for finding the usual value for each of the output linguistic variables (Figure 2).

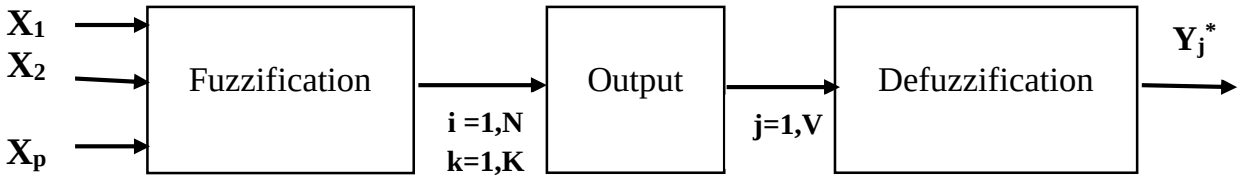

Figure 2. The structure of a fuzzy production model where, $X_1, X_2, \ldots, X_p$ - input variables; $\mathbf{Y_j}$ - output resulting variables.

The inference stage is a procedure for obtaining fuzzy inferences based on the application of fuzzy conditions. The components of this block are: a rule base, an inference mechanism and a set of membership functions for each variable, where the rule base is understood as a set of rules reflecting the logical relationships between input and output variables, and the inference algorithm allows the selection of rules.

A finite set of rules for fuzzy productions is a base of rules for fuzzy productions, the rules in which are consistent with each other regarding the linguistic variables used in them, in the form «If A, then B» (or «IF A THEN B»).

The defuzzification stage consists in obtaining for each of output variables of a quantitative value, which will subsequently be used by devices external to the system of fuzzy inference. To obtain numerical calculations, the center of gravity method was used:

$$y = \frac{\int_{min}^{max} x * \mu(x)dx}{\int_{min}^{max} \mu(x)dx}, \quad (1)$$

Where y – resulting variable; x – variable; $\mu(x)$ – variable membership function x; min ***and*** max – left and right boundaries of the interval of the crisp set of the output variable.

The stages discussed above are implemented using the Mamdani algorithm. To organize support for making effective management decisions in the taxation system, an expert system has been developed using a fuzzy inference system.

Creation of a methodology for the distribution of taxpayers by categories of attention.

In connection with the growing need to analyze large amounts of information, which has a subjective and objective nature and is associated with the solution of poorly formalized problems of various natures, an active growth of new scientific directions was required, among which is the method of data analysis [1].

Among the methods of intelligent data processing, clustering methods occupy a central place, they are the most promising and most interesting for the study of multidimensional processes and phenomena [3,4].

The task of clustering is to break down the investigated set X into several clusters (subsets), the objects in which are more «similar» to each other than to objects from other clusters, and the «similarity» in the metric space is determined through the distance [5.6].

In clustering algorithms with each object X ***the vector of its characteristics is identified*** $X_i = (x_1 ,...,x_d)$, where x_i , $i = 1,...,d$ ***presented as separate characteristics of objects,*** and through d the dimension of the space of characteristics is determined.

Subset $M = (X1, ..., X_n)$ ***consists of vectors of characteristics*** $X_i = (X_{i1,....,}X_{id})$ ***and is a cluster in which objects are close in relation to each other, the distance between which is defined as*** $D(X_i , X_j)$, where X_i ***and*** X_j clustering objects [7-8].

Requirements for identifying clusters:

- each cluster should contain objects with similar values of properties and attributes and be homogeneous;
- the set of objects should be distributed across all clusters;
- clusters should be mutually exclusive, in other words, each object should not belong to two clusters at the same time.

In large sets of multidimensional data, algorithms and methods cluster analysis are indispensable as tools for preliminary analysis [1]. For this reason, the method of cluster analysis was chosen in the work to distribute taxpayers by categories of attention. At the moment, there is no one-size-fits-all solution. clustering tasks are characterized by the specifics of the area under study.

Due to the fact that, data on the activities of taxpayers act as the clustering object, the corresponding requirements can be formulated that the method used must satisfy:

- ensuring a high dimension of the data space (taxpayers are described by a large number of factors, therefore, the method must be adapted to work with a large dimension);
- providing a large amount of data (information on the activities of taxpayers is updated every reporting period, thereby increasing the database, so the method must be scalable to work with a large amount of data);
- provision of a mixed type of measurements (the behavior of a taxpayer is assessed by quantitative and qualitative characteristics, therefore it should be possible to work with different types of measurements) [9].

Conclusion: The performed classification of clustering methods made it possible to determine the place in the classification of the information management system in the tax service. The analysis of clustering methods made it possible to determine the ways of solving the assigned research tasks and to confirm the possibility of using the fuzzy clustering method to solve the problem of distributing taxpayers according to the categories of attention.

References:

[1]. Leonenkov A.V. Fuzzy modeling in MATLAB and fuzzyTECH / A.V. Leonenkov. - SPb .: BHV Petersburg, 2005 .-- 736 p.
[2]. Shtovba S.D. Introduction to the theory of fuzzy sets and fuzzy logic Electronic resource .http: //matlab.exponenta.ru/fuzzylogic/book1/index.php
[3]. Zabolotnikova V.S. Analysis of clustering methods for effective management of processes in the tax service / V.S. Zabolotnikova, O. N. Romashkova // Fundamental research. - 2017. - No. 9-2. - P. 303-307
[4]. Vyatchenin D.A. Fuzzy methods of automatic classification: monograph / D.A. Vyatchenin. - Minsk: Technoprint Unitary Enterprise. - 2004 .-- 219 p.
[5]. Automatic classification: Classification methods [Electronic resource] - http://www.aiportal.ru/articles/autoclassification/methods-class.html
[6]. Sokal R.R. Cluster analysis and classification: preconditions and main directions / R.R. Sokal; ed. J. Van Raizina. - M .: Mir, 1990.
[7]. Kruglov V.V. Intelligent information systems: computer support for fuzzy logic and fuzzy inference systems / V.V. Kruglov, M.I. Length. - M .: Fizmatlit, 2002 .-- 554 p.
[8]. Levchenko T.A. Cluster structures: basic characteristics and generated effect / T.A. Levchenko, E.V. Tungusova // Fundamental research. - 2017. - No. 3. - P. 144-148.
[9]. Neisky I.M. Adaptive clustering technique factual data based on the integration of minimum spanning tree methods and fuzzy k-means: author. diss. ... Cand. those. Sciences: 05.13.17. - M., 2010 .-- 18 p.
[10]. Jamalova G.B. «Tax policy at the macro and microeconomic levels, its essence and principles of development.» International scientific and technical journal. Innovation technical and technology Vol.1, No. 4. 2020.
[11]. Turgunov A.M., Jamalova G.B. «Modeling and implementation of intellectual support for management activities in the tax inspectorate.» «Economy and Society» ISSN 2225-1545 No. 6 (85) Part 2 2021 www.iupr.ru
[12]. Yakubov M.S., Jamalova G.B. «Intellectual models and methods of support for making managerial decisions in the tax service.» Modern concepts of scientific research. 72nd International Scientific Conference. «Eurasian Scientific Association» • No. 2 (72) • February, Moscow 2021.