Chapter 9
The Use of Fractal Analysis in Assessing the Reliability of Taxpayers Information

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ABSTRACT
Tax authorities often have to make decisions under conditions of incomplete information about the actual situation. The incompleteness and uncertainty of information may arise from the actions of the two sides with distinct interests. One side is the tax authority (local, regional, or national level), and the other is the taxpayers (organizations or individuals). This largely explains the interest of tax authorities in the creation of software capable of providing quantitative and qualitative analysis of the declarations submitted by taxpayers to identify suspicious declarations for their additional inspection. The purpose of this chapter is to carry out a comparative pre-forecast analysis of the time series enterprise performance indicators and time series of its tax payments.

INTRODUCTION
Information provided to tax authorities by the taxpayer is the subject of research in this chapter. The authors propose a model of controlling the reliability of the information provided to tax authorities by the taxpayer. Specificity of the model consists in using a fractal analysis of time series of tax payments. Also, when constructing the model, a phase analysis of the time series is used.

The study was carried out with the aim of developing methodical and information support of tax authorities, whose decision support systems are currently limited to the use of statistical methods.

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METHODOLOGY AND BACKGROUND

The authors proposed the use of models, tools and methods of fractal analysis, methods of nonlinear dynamics, namely R/S analysis, phase analysis. In addition, the methods of comparison, statistical analysis and graphical interpretation were used in the work. The model proposed by the authors will allow the tax authorities to improve the quality of control over the reliability of the initial information of taxpayers.

The proposed approach can be used for all groups of taxpayers, especially for legal entities. As practice shows, employees of tax authorities almost always have to make decisions in conditions of incomplete information about the actual state of affairs of taxpayers. Due to inconsistencies between the interests of taxpayers (legal entities and individuals) on one hand and tax authorities (local, regional or state level) on the other, there is incompleteness and uncertainty of information coming to the tax authorities. This largely explains the interest of tax authorities in the creation of software products that can provide quantitative and qualitative analysis of declarations submitted by taxpayers for the purpose of identifying questionable declarations for their additional verification (D.G. Chernik et al., 2000).

As noted in D.G. Chernik et al. (2000), for today such programs are already actively being created and used. The basis of the algorithm for such a program is the recommendations of experts. Based on their rich experience and specific evidence they define the degree of suspiciousness granted by the declaration. The problem of tax evasion exists even in countries with well-developed, established taxation systems, and therefore it is widely discussed in the economic literature.

Cowell and Gordon (1995) compare the various available strategies of audit when collecting an indirect tax. They modeled tax evasion in the following way. The taxpayer company makes a choice between taxable activity in the legal market and activities in the shadow sector of the economy. During the inspection of a firm, if the fact of its activity in the shadow sector is revealed, then the missing tax and a fine is imposed on it. One possible strategy is to randomly check any firm with a certain fixed probability. An alternative policy is the decision-making, depending on the available information about each taxpayer. Cowell and Gordon consider a simple form of such a policy: the probability of verification depends on the declaration according to the “cut off” rule, i.e. firms declaring income less/no less than a certain amount, are always checked/never checked (Maksishko N.K. et al., 2008).

Chander and Wilde (1992) analyze the interaction of tax inspectors (auditors) and taxpayers, given the possibility of corruption emergence. In the model proposed by them (called the CW-model), the taxpayer has a high or low income with a certain probability and, depending on real income, he is obliged to pay taxes.

Vasin A.A. and Panova E.I. (1999) consider a model similar to the Chander and Wilde model and they solve a similar problem of comparative analysis. However, there are a number of differences between these approaches.

The CW-model determines the probability of audit check by Nash’s equilibrium strategies of the players, while the probability of re-verification is fixed. In fact, the inspection leadership controls both indicators.

The main difference of the CW-model from the Nash’s equilibrium strategies is the consideration of optimal rules of check instead of fixed probabilities, when conducting a comparative analysis of the net tax charge, depending on the size of fines and tax rates.

If take into account the fact that it is easier to change the inspection rules than the rates of taxes and penalties established by the legislation, the considered approach seems justified.
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