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METHODS FOR SIMULATION OF TAXATION PROCESSES

Zhamalova Gulchehra Babakulovna
Lecturer, Department of Information Technology,
Karshina Engineering and Economic Institute

ANNOUNCEMENT

In this article, the decision-making systems include not only informing general macroeconomic models, but also models related to certain aspects of the national economy, in particular the tax model.

Keywords: taxation, taxpayers, modeling of taxation processes, "large" tax systems, simulation models of taxation, mathematical models, statistical modeling.

АННОТАЦИЯ

В данной статье системы поддержки принятия решений включают не только общие макроэкономические модели, но и модели, относящиеся к определенным аспектам национальной экономической деятельности, в частности, к информатизации модели налогообложения.

Ключевые слова: налогообложения, налогоплательщик, моделирования процессов налогообложения, «зрелой» системы налогообложения, имитационная модель налогообложения, математические модели, статистического моделирования.

Introduction

The model of deductions in the taxation of profits. Let's consider the foreign experience of modeling taxation processes. Mathematical models of taxation used in foreign countries are very diverse. Let's start with the Canadian model T2. It is devoted to modeling changes in the rate of deductions from tax liabilities of capital asset costs (when paying income taxes). It is assumed that each firm independently maximizes discounts and minimizes tax charges (within the framework of current tax legislation).

The changes in the first year after the control action and in the "mature" system after a long period of time are analyzed. It is curious that the controlling effect is not a change in the tax rate, but a change in the rules for calculating depreciation charges, and this change applies only to newly acquired units of fixed assets (therefore, the new depreciation rates only gradually spread to the tax base).

The model of a "mature" taxation system uses such parameters as:
- Average past rate of capital gains,
- Exponential depreciation rate,
- The capital price index (taking into account, for example, the growth in time of the value of land plots in constant prices),
- The average coefficient (index) of inflation (for the national economy as a whole),
- The rate of deductions from the tax base of the costs of capital assets.

The impact of changes in the tax offset rate on investments on tax revenues is also modeled.
The model is based on the analysis of data provided in a sample of tax returns of 15,000 firms (out of 760000 firms in Canada).

Models of income from value added tax. In Romania and Hungary, in order to estimate the total revenue from value added tax, the tax base is first assessed based on macroeconomic indicators. It is believed that it is equal to:
(gross domestic product) + (imports) - (exports) - (fixed investments) - (change in inventories) - (value added by tax-exempt sectors) - NDS assessment for small businesses and private housing construction.
The forecast for the next year is carried out by multiplying the tax base of the previous year by a coefficient equal to the sum of the forecasts of the inflation index and economic growth for the next year.
The actual rate of NDS tax receipts is calculated by dividing the amount of net receipts by the tax base. For the purposes of forecasting, the tax rate is considered constant (or is predicted using time series theory).
The forecast of the volume of tax revenues is obtained by multiplying the forecasts of the volume of the tax base and the forecast of the actual rate of NDS receipts.
In Hungary, the Ministry of Finance has developed a model of the tax base and income from value added tax based on the intersectoral input-output model (21 industries).

The UK income tax model is based on a representative sample of 80,000 taxpayers (individuals) out of 25 million income tax payers. Tax declaration data is used.
Using considerations of demography, sociology, medical statistics and macroeconomics, a change in the tax base is predicted, while the structure of the model is determined by experts from representatives of the listed sciences, and the coefficients are estimated from sample data.

Knowledge of the tax base allows you to predict the initial (in the first year) change in tax charges when applying control actions. To assess further dynamics, it is necessary to take into account the reaction of taxpayers to changes in the taxation system (in the first approximation, a linear response with elasticity coefficients as multipliers before increments of variables). Forecasting for the long term is possible only by the method of scenarios, since it is necessary to predict, in particular, the dynamics of the population.

Simulation model of taxation. The development of simulation models of taxation processes in order to assess the impact of control actions on these processes, collecting and summarizing information about taxation processes based on computer systems is a rather science-intensive and time-consuming task. The main tasks that need to be solved when developing such a model are as follows:

- Analysis of the regulatory framework and practical implementation of taxation processes,
- Statement of the main tasks of assessing the control effects on the taxation processes,
- development and study of a system of mathematical models simulating the processes of taxation in the actual tax system,
- Solving the same problems for the future tax system, modified according to the decisions of the state authorities;
- Development of an interactive computer system and appropriate software tools that allow employees of tax services to solve their tasks of assessing the control effects on taxation processes.

In the future, it is advisable to develop models for the analysis of tax systems proposed by various organizations and individuals, as well as for assessing the impact of taxation processes on the statics and dynamics of micro- and macroeconomic characteristics).

We will formulate the basic requirements for conducting such research in the republic in the following conditions:

- The work should be based on an analysis of the current system of tax collection and other mandatory payments to the budget system of the republic.
- Mathematical models and corresponding computer developments designed to assess the control effects on taxation processes should allow calculating the volume of tax revenues at certain values of control effects - tax rates, benefits, fines,
- They should provide opportunities for analyzing modifications of the tax system (in particular, by changing rates, the system of benefits and penalties, rules regarding the time of making payments, as well as the introduction of new types of taxes),

- The final software product should be intended for use by specialists of the state tax service who do not have special knowledge in programming and mathematical modeling.

Work should be based on the analysis of the current system of collection of taxes and other obligatory payments to the national budget (the state budget and regional budgets), including:

a) The Main types of taxes: income tax on individuals, the value added tax, tax on profit (income), excise taxes (including alcohol, vodka and alcoholic beverages, wine, beer, tobacco products, automobiles, crude oil (including gas condensate), natural gas (gasoline, etc. goods).

b) Receipts to state extra-budgetary funds:

Pension Fund, Medical Insurance Fund, Social Insurance Fund, Employment Fund, taxes received by the territorial road fund, environmental funds, etc.

c) As well as other types of taxes and payments:

tax on transactions with securities, payments for the use of subsoil and natural resources (including payments for the right to use subsoil, water area and seabed areas, forest tax, water charges, deductions for the reproduction of mineral resources, etc.);

Land tax, property tax of enterprises and individuals, special tax, state duty (including in cases considered in the Constitutional Court, courts of general jurisdiction, arbitration courts, notary offices, registry offices and other organizations), license fees for the right to manufacture, bottling, storage and wholesale of alcoholic beverages, retail sale of alcoholic beverages and beer, transport tax, taxes received by the State Road Fund (including taxes on the sale of fuels and lubricants), other taxes, fees and other receipts, including: dividends on shares owned by the state, income from privatization, income from leasing state property.

From a theoretical point of view, to the above list of taxes and other mandatory payments to the budget system in the Republic, it is natural to add also export and import duties (as proposed by industrialists and entrepreneurs, taxes on monopolies, various types of rents, "inflation tax" caused by price increases, considered in economic theory.

In addition to variables related to control actions, i.e. describing the characteristics of tax systems - types and rates of taxes, benefits, penalties - the models should use variables describing the economic situation, in particular, the volume of output and fixed assets, the dynamics of the inflation index and interest on credit, etc. The methodology of mathematical modeling (in other words, the construction of simulation models) is fairly well reflected in the literature, in particular, in the

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monographs of N. N. Moiseev [1], T. Naylor [2], K. A. Bagrinovsky and V.P.Busygin [3].

Modern methods of econometrics should be actively used in the construction of models [4]. This means, in particular, approaches and results of statistics of objects of non-numerical nature, including statistics of interval data, advanced methods of analysis and forecasting of time series, planning expert surveys and processing expert responses, tested pseudo-random number sensors, optimization algorithms and other numerical methods, proven technologies for building dialog systems and databases necessary for them, i.e. all the necessary modern methods of mathematical modeling. The initial choice of the modeling object is determined, in particular, by the assessment of the availability of information about taxation processes. We are talking about the following types of income:

a) The main types of taxes:

- Personal income tax,
- Value added tax,
- Income tax (income),
- Taxes on resources,
- Property tax,

excise taxes (including on alcohol, vodka and alcoholic beverages, wines, beer, tobacco products, passenger cars, oil (including gas condensate), natural gas, automobile gasoline and other goods),

as well as:

b) Receipts to state extra-budgetary funds:

- Pension Fund,
- Health Insurance Fund,
- Social Insurance Fund,
- Employment Fund.

Next, it is natural to analyze the time series of various types of budget receipts. For each type of taxes and other budget receipts included in the model (in accordance with the above, the estimated number of types is about 10, when divided into local budget receipts - 20), it is proposed to build a time series of budget receipts. A joint analysis of 10 or 20 time series will allow us to compare the nature of their changes, which may make it possible to aggregate some of the types of taxes and receipts, as well as to compare theoretical and practical relationships between different types of taxes and receipts. Regional analysis is also of interest. The point and interval forecast of budget receipts at future points in time is of interest.

The next step is the application of the statistical modeling method (Monte Carlo method) in the development and study of the model of the receipt of taxes and other fees to the budget under the assumption (significantly facilitating modeling) the absence of links between parameters describing taxpayers. When constructing such a model, which we will temporarily call MONEPA (a model with independent parameters), the taxpayer is described by the parameters available in the current AIS, which take both quantitative and non-numerical (qualitative) character. For example, for an individual, a quantitative parameter is the amount of earnings, a non-numeric parameter is the presence or absence of a certain benefit.

The sequence of works is as follows. Looking through the database (for example, Kashkadarya region), we calculate its empirical distribution for each parameter. For quantitative parameters, empirical distributions are described by distribution functions (specifically, empirical distribution functions, Pike estimates, smoothed estimates (using nonparametric density estimates of the Parsen-Rosenblatt type), and other options are possible. Distributions of non-numeric parameters are described by frequency tables.

Having distributions for each parameter, we form a model taxpayer as follows. The parameters describing the taxpayer (legal entity or individual) are independently selected according to the corresponding distributions using a pseudorandom number sensor. Having modeled a sufficiently large number of taxpayers - say, 1,000,000 - we calculate the summary characteristics. The assumption of the possibility of using the independence hypothesis greatly facilitates modeling, but requires verification of compliance with reality.

The accuracy of the calculations can be estimated using considerations such as those used in bootstrap [4]. Or we will calculate the final values (per taxpayer) separately for each thousand, we will get a sample of 1000 vectors (since there are 1,000,000 tests in total), the distribution of which can be estimated by standard methods of applied statistics, in particular, calculate the sample mean square deviation, which describes the error of the final value.

The result of the described modeling procedure is the average budget receipts for taxes and fees of various types per conditional taxpayer, and the errors of these values. Multiplying them by the number of real taxpayers, we get estimates of real revenues. The errors of these estimates can also be calculated.

The model allows you to evaluate the results of the application of control actions, i.e. changes in the values of the parameters of the taxation system (tax rates, rules for assigning benefits, etc.). To do this, it is enough to repeat the simulation by changing the rules for calculating the amount of taxes and other budget revenues. When conducting extensive computational experiments with the MONEPA model, it is advisable to use the recommendations of the mathematical theory of experiment planning to reduce the volume of calculations [5].

Analysis of the existing mathematical apparatus and software in order to select the means to perform initial research work is a necessary stage of work.

The analysis of time series should be carried out on the basis of the corresponding probabilistic-statistical theory. The main tasks are trend selection and spectral analysis (selection of periodic waves).

Methods for estimating distribution functions (using empirical distribution functions, Pike estimates, smoothed by nonparametric estimates of the distribution function, constructed using nonparametric density estimates of the Parsen-Rosenblatt type, and other possible options) should be analyzed both from the standpoint of applied statistics and from the standpoint of computer science.

The choice of a sensor of uniformly distributed pseudorandom numbers should be made taking into account the discussion on sensors in the journal "Factory Laboratory" in 1985-1993, as a result of which the properties of a number of sensors were studied. In particular, in the work of Yu. N. Tyurin and V. E. Figunov [6], the advantages of the M-mixing Whip sensor are demonstrated, in which one initial sensor generates a random sequence, and the second, independently of the first, generates a random number in this sequence, and an element from the sequence of the first sensor with the number issued by the second sensor falls into the final sequence.

Assuming that the distribution functions are given in a nonparametric form, the transition from a uniformly distributed random variable X k to a random variable with a given distribution function F(x) occurs by calculating G(X), where G is the inverse function to F. Since when conducting extensive computational experiments with the MONEPA model (see above), it is advisable to use the recommendations of the mathematical theory of experiment planning to reduce the volume of calculations, it is necessary to analyze various statements of this theory and choose a procedure for planning a computational experiment.

Let's discuss the work of the next level of the order of execution. One of them is the development of a methodology and methodology for the formation of a surrogate database of taxpayers. In the countries of the European Union, the issue of adopting new rules for the presentation of statistical data for scientific research is being discussed, according to which it is not allowed to use data on real organizations. Instead of them, it is proposed to form so-called "surrogate databases" using special algorithms, which represent real databases quite well.

It should be noted that in the field of modeling of taxation processes, samples with data on real taxpayers continue to be used. For example, in the UK, the income tax model uses a sample that includes data on 80,000 taxpayers (out of 25 million). However, taking into account the European trends towards the transition to "surrogate databases" and the danger of information leakage to criminal structures in the Republic, it is necessary to work out the possibility of building such a "surrogate database". An option for presenting information for study may be a "truncated" database of real taxpayers, from which addresses, names, surnames and other information that allows identifying an element of the database used with a real individual or legal entity are excluded.

Conclusion

It is advisable to start work on the construction of initial models of taxpayers (legal entities and individuals) in order to assess the short-term and long-term changes in tax revenues caused by management influences (changes in tax rates, rules for granting benefits, etc.) An analogue is the Canadian T2 corporation tax model. Short-term changes as a result of the application of control actions can also be studied using the MONEPA model described above. When modeling long-term changes, it is necessary to take into account, as in model T2, such macroeconomic indicators as the average growth of capital for the year (in other words, profitability), inflation index, and in more detailed modeling (at the next stages of work) - the volume of fixed assets and working capital, wages, required loan amount and interest on loan payments, etc.

LITERATURE

1. Моисеев Н.Н. Математика ставит эксперимент.- М.: Наука, 1979.- 224 с.
2. Нейлор Т. Машинные имитационные эксперименты с моделями экономических систем. - М.: Мир, 1975. - 376 с..
3. Багриновский К.А.,Бусыгин В.П. Математика плановых решений.- М.: Наука, 1980. - 224 с.
4. Орлов А.И. Эконометрика.- М.: Экзамен, 2002. - 576 с.
5. Математическая теория планирования эксперимента/ Под ред. С.М.Ермакова. - М.Наука, 1983. - 392 с.
6. Тюрин Ю.Н., Фигурнов В.Э. О датчиках псевдослучайных чисел - Заводская лаборатория, 1990, т.56, No.3, с.72-75.
7. Якубов М.С., Жамалова Г.Б. «Интеллектуальные модели и методы поддержки принятия управленческих решений в налоговой службе». Современные концепции научных исследований. 72 я Международная

научная конференция. «Евразийское Научное Объединение» • № 2 (72) • Февраль, Москва 2021

8. Жамалова Г.Б. «Налоговая политика на макро и микроэкономическом уровнях, ее сущность и принципы разработки». International scientific and technical journal. Innovation technical and technology Vol.1, №4.
9. Жамалова Г.Б. «Информационное моделирование с применением искусственных нейронных сетей». ACADEMIC RESEARCH IN EDUCATIONAL SCIENCES VOLUME 1 | ISSUE 3 | 2020 ISSN: 2181-1385 Scientific Journal Impact Factor (SJIF) 2020: 4.804. www.ares.uz
10. Yakubov M.S, Jamalova G.B. «Adaptation of C-Average and Gustafson-Kessel algorithms for intellectual information processing in the tax unit services - tax inspection». ACADEMICIA An International Multidisciplinary Research Journal (Double Blind Refereed & Peer Reviewed Journal) ISSN: 2249-7137 Vol. 11, Issue 2, February 2021 Impact Factor: SJIF 2021 = 7.492 DOI: 10.5958/2249-7137.2021.00411.0
11. Тургунов А.М, Жамалова Г.Б. «Моделирование и реализация интеллектуальной поддержки управленческой деятельности в налоговой инспекции». «Экономика и социум» ISSN 2225-1545 №6(85) ч.2 2021 www.iupr.ru