Modeling and forecasting of tax revenue to the budget for profit in the Repiblic of Uzbekistan

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ABSTRACT

The article analyzes the indicators of the income tax on the budget for the years 2005-2020 and develops proposals for its improvement. The mathematical model of this process was analyzed and, in order to carry out the task laid down, the indicators of the profit tax deduction of the country to the budget for the years 2030 were determined.

CCS CONCEPTS

• **Budget, income tax revenue to the budget, mathematical modeling, forecasting**;

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1 INTRODUCTION

The Decree of the President of the Republic of Uzbekistan "On the Action Strategy for the further development of the Republic of Uzbekistan" analyzes the large-scale modifications implemented in the country throughout the years of liberation and defines the Action Strategy for 2017-2021. Paragraph 3.1 of the third of these five priorities, entitled "Priorities for Economic Development and Liberalization", is dedicated to "further establishment macroeconomic stability and conserving high rates of economic growth", which includes a number of objectives, including "reducing the tax burden and simplifying the tax system, continue the policy, recover tax administration and inflate appropriate incentives" [1]. In this regard, it is advisable to analyze the indicators of tax incomes to the budget in the field of tax policy in the Republic of Uzbekistan for the years of independence until 2017 and beyond, as well as economic and mathematical modeling of these processes.

2 LITERATURE REVIEW

G. Oz-Yalaman [2] the article seeks to answer the key question of whether the change in tax revenues is related to changes in financial availability for countries around the world, using comprehensive data from 137 countries for the period 2011 to 2017. This was done using the global Findex database and panel data method. The author's empirical marks show that there is an important and positive connection among financial availability and tax revenue, which is one of the defining factors of tax revenue. The results are reliable for various sources of taxation, such as corporate tax revenues, income tax revenues, and direct tax revenues. Politicians around the world can take advantage of these opportunities to increase tax revenues by considering ways to increase access to financial services.

Joseph Mawejje, Rachel K. Sebudde [3] the study provides calculations of tax ability and efforts in a group of 150 republics around the world. The analysis consuming stochastic boundary methods is created on a new set of government income data from the International Center for Taxation and Development and covers the 20-year period from 1996-2015. The results of the authors of the article show that despite the significant differences in the results of some countries, countries that work closer to the tax capacity have higher incomes, a larger share of non-agricultural products, a larger share. gross domestic product trade, more investment in human capital improvement, developed financial sectors, stable domestic conditions (with low inflation), low urbanization of the population and low levels of corruption.

Stuart Bretschneider, Wilpen Gorr [4] the article discusses the factors that contribute to the rigid error in forecasting state sales tax revenues. The article expands the authors 'understanding of the government forecasting process by expanding the present model accustomed explain the accuracy of the forecast, including a number of complex interactions related to the potential political and political use of revenue forecasts. The empirical analysis of the survey, based on survey data, is used to prove that forecasting leads to at least partial political manipulation. In addition, institutional reforms related to "good governance" practices affect forecast inaccuracies.

Saeid Mahdavi [5] tax transformations in unindustrialized countries must contain changes in the level of tax revenues and / or their composition. In this regard, in this article identified models of full tax revenues and their constituents and estimated them using an instable group of developing countries during 1973-2002. The general conclusion is that some variables affect both the level and composition of total tax revenues, while others distress its components in contradictory directions, making their net effect on income levels statistically insignificant. According to the authors of the article, this difference underscores the need to choose policy instruments, given how they may affect certain types of taxes.

Akif Musayev, Selin Uzelaltinbulat, Samira Mammadova, Latafat Gardashova, Aygun Musayeva [6] proposes a methodology for assessing the influence of variations in the legal framework of the tax scheme on tax profits. Correction of time series of tax incomes and

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their modeling on the appropriate computer was carried out using indeterminate numbers based on the expert opinion. A two-way verification methodology was used to ensure that the available data was as reliable and accurate as possible. An indeterminate regression relationship corresponding to the time series of gross domestic product (GDP) tax revenues was constructed as an uncertain regression relationship corresponding to the time series of familiar tax revenues.

Article Juan Carlos Suarez Serrato, Owen M. Zidar [7] explores the details about the national corporate tax construction — tax rates, basic rules, and credits — and examines its implications for national tax revenues and economic action. The authors of the article award three main conclusions. Primary, tax base procedures and credits explain more of the differences in government corporate tax profits than tax rates. Additional, while governments generally do not compensate for changes in tax rates with changes in base and credit, the impact of changes in tax rates on tax income and economic action depends on the range of the base. Third, as governments lessened their tax bases, the association among tax rates and tax incomes declined. General, the vicissitudes in state tax bases have made the government's corporate tax system more promising to organizations and reduced the scope to which higher tax rates increase corporate tax revenues, according to the authors of the article.

Heeick Choi, Rui Hu, Khondkar Karim [8] observes the connection amongst the reliability of income tax alterations and the excellence of exploration 'income forecasts. According to the authors of the article, the consistency of the income tax difference is more accurate and is related to information forecasts. In their view, the data placed on the consistency of this income tax difference show that it plays an essential character in improving the superiority of analysis 'forecasts. In addition, the authors of the article argue that the impression of the stability of the accounting tax difference on the quality of analysis 'forecasts is large for firms with a noisy material environment.

Glenn P. Jenkins, Chun-Yan Kuo [9] the article develops a policy and income modeling model for the value added tax (VAT) scheme in states where there is an curved taxation system, including sales taxes, excise taxes, and tariffs. The model is being applied to Nepal, which has introduced VAT to change the sales tax system and rationalize the excise and tariff systems. The authors 'research illustrations that tax policy in a developing country, which may seem very clear and politically consistent, can lead to a very narrow tax base. According to the authors of the article, if the government of a developing country wants to rely more on VAT over time, it should actively work to expand the base and improve compliance.

Li-Xia, Zhuang Yi-Qi, Liu Xue-Yong [10] suggests a new forecasting method based on a combination of support vector (SVM) and particle cluster optimization (PSO) for tax forecasting. In tax forecasting, the nonlinear relationship is effectively represented by the support vector machine, and optimization through particle swarming is applied to select the training parameters of the support vector machine. The tax forecasting model was constructed using a support vector machine optimized by the Particle Bundle Optimization Method (PSVM) based on research on the proposed forecasting model. Tax forecasting examples are used to confirm the forecasting effectiveness of the proposed model. The results of the experiment of the authors of the article show that the proposed SVM model has good prognosis.

Article Wielen, W. Van Der [11] examines the macroeconomic implications of tax changes in the European Union between 2000 and 2016. The novelty of the author's approach depends on the use of real-time estimates of discretionary budgetary adjustments. In particular, using a unique database covering expected and unforeseen tax changes, providing the first analytical panel estimates of production and employment multipliers for tax changes. The author's results show that income-based medium-term output multipliers range from -1.1 to -1.9 for unexpected tax changes. On the other hand, pre-announced changes temporarily reverse economic activity after the announcement, resulting in a less than one-to-one change in tax revenue after taxes, but reflecting one percentage point higher employment rates. Finally, the author finds evidence of an asymmetry between the effects of income increases and decreases in the European Union.

As noted by Andrejovská, A. and Puliková, V. [12], although it is generally accepted that taxes tend to be a strong policy tool for assessing the macroeconomic impact of alternative tax policies in a country, taxes are often relaxed by restrictions on the measurement of tax revenues. The purpose of the contribution is to quantify the impact of the selected macroeconomic indicators (gross domestic product, employment, government debt, foreign direct investment, effective tax rate, statutory tax rate) on the total amount of tax revenues, taking into account the tax competitiveness of the 28 EU member states. The authors used the methods of three regression analysis models: pooling models, fixed effects models, and random effects models. The hypothesis that gross domestic product has the greatest impact on tax revenue has been tested by the authors. Their analysis confirmed that the strongest correlation is observed between tax revenues and employment. This is followed by foreign direct investment and gross domestic product. An increase in these determinants by € 1 million (1% increase in employment) will increase tax revenues by 10,072 million in terms of employment, by 383.1 thousand euros in gross domestic product and by 434.2 thousand euros in foreign direct investment.

Hakim, T. A.'s research [13] examines the impact and consequences of both direct and indirect taxes on economic growth and overall tax revenues in a group of 51 countries over the period 1992–2016. Data were evaluated using the dynamic panel generalized method of moments (GMM). The author's results show that direct taxes are significant and negatively correlate with economic growth, while indirect taxes appear to have a positive but insignificant effect on the dependent variable. In addition, this study also found a significant and positive contribution of direct taxes to total tax revenues compared to indirect taxes. The conclusion is that a tax structure based on direct taxes, such as taxes on income, profits, and capital gains, is detrimental to economic growth, but is more efficient in collecting tax revenues in a country.

Gnangnon, S. K.'s analysis [14] consumed an instable set of panel data for 146 countries for the period 1981–2016, in addition to two-stage systemic generalized ways of the moment study. The author's empirical investigation has shown that the volatility of non-resource tax revenues damagingly affects the share of non-resource tax revenues in gross domestic product. The scale of this destructive influence is upper in less industrialized republics than

in relatively developed republics. This damaging influence manifests itself in the volatility of government spending: the volatility of non-resource tax revenues has a greater impact on the share of non-resource tax revenues as the amount of volatility in public spending increases. Lastly, the volatility of non-resource tax revenue has a stronger negative impact on the share of non-resource tax revenue as the volatility of economic growth rises, inflation instability growths, and the expressions of trade volatility increases. Limitations / Implications of the Study - The prime policy suggestion of this analysis is that policies that support safeguard the steadiness of non-resource tax revenues furthermore increase countries' share of non-resource tax revenues. For instance, government measures that help manage or prevent serious negative economic shocks (shocks that can lead to greater tax returns volatility) will ultimately help improve countries' tax revenue performance. The concrete allegations are the harshness of the present COVID-19 sickness shockwave (which is a source and request shockwave) and the resulting macroeconomic doubt - particularly in terms of volatile economic growth, volatile terms of trade, volatility in inflation and community opinion. volatility in spending - likely to result in serious losses in tax revenues. In the author's view, administrations in both industrialized and emerging states will undoubtedly study from the controlling of this crisis in order to formulate for probable upcoming trade and industry, business and health disasters in order to mitigate their opposing macroeconomic impacts, counting here their destructive tax impacts. receipts.

The article by Balginova, K., Alina, G., Shakharova, A. & Kurmanalina, A. [15] presents an analysis of the predictive model of the need of tax incomes of the government budget on macroeconomic indicators. The suggestion about the influence of entire retail trade on national taxes on properties, works and services is studied by means of correlation and regression analysis. In addition, the impact of nominal per capita income, volume of industrial products (merchandises and services) and investment in permanent assets on income tax was judged. In the way of the investigation, the authors selected an index of crude oil and natural gas production and analyzed its impact on tax incomes from global trade and overseas operations of the country. Therefore, the significance of methods for forecasting tax incomes in the situation of state tax audit and budget planning is validated.

An article by Rashid, H., Warsame, H. & Khan, S. [16] examines the degree to which democracy touches tax revenue in unindustrialized states versus industrialized states crossways different classifications of tax revenue. Constructed on a model of 30 advanced and 29 emerging countries from 2006-2013, the authors concluded that although democracy is positively associated with tax revenue in industrialized countries, this relationship is commonly destructive for emerging states when compared to their equivalents. ... This exploration shows that the tax revenue most damagingly affected by democracy in developing countries is corporate revenue. The positive results for developed countries support the predictions of a compatibility perspective: democracy leads to economic growth. For developing countries, this relationship is either undesirable or weaker, which is consistent with the predictions of a conflict viewpoint, according to which democracy leads to the fact that various groups increase the state's activity in seeking rent. These findings have implications for government tax policy.

Table 1: Revenues of income tax in the budget of the Republic of Uzbekistan for 2005-2016 (thousand soums)

No	Years	Revenues of income tax
1	2000	98,6
2	2001	143,1
3	2002	174
4	2003	210,5
5	2004	218,5
6	2005	281,3
7	2006	366,6
8	2007	313,9
9	2008	432,9
10	2009	544,8
11	2010	644,5
12	2011	1 223,70
13	2012	1 474,80
14	2013	1 628,30
15	2014	1 780,20
16	2015	1 833,00
17	2016	2 617,00

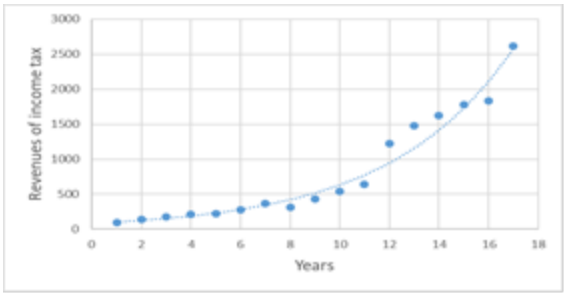

Figure 1: Revenues of income tax in the budget of the Republic of Uzbekistan for 2005-2016

3 RESEARCH METHODOLOGY

Based on the indicators of income tax revenues of the Republic of Uzbekistan, data graphs were created, their functions were selected and a model was developed. The reliability of the model was determined.

4 ANALYSIS AND RESULTS

The indicators of income tax revenues in the budget of the Republic of Uzbekistan for 2005-2016 are given in Table 1

Based on the data in this table, we will create a graph and mathematical model of income tax revenues to the budget of the Republic of Uzbekistan for 2005-2016.

The dynamics of income tax revenues in the Republic of Uzbekistan in 2005-2016 can be expressed by the following mathematical model (Figure 1)

$$y = 84,898e^{0,20t}; \qquad R^2 = 0,9767 \tag{1}$$

Table 2: Revenues of income tax in the budget of the Republic of Uzbekistan for 2017-2020 (thousand soums)

No	Years	Revenues of income tax
1	2017	2 890,70
2	2018	5 030,20
3	2019	9 975,80
4	2020	28 712,30

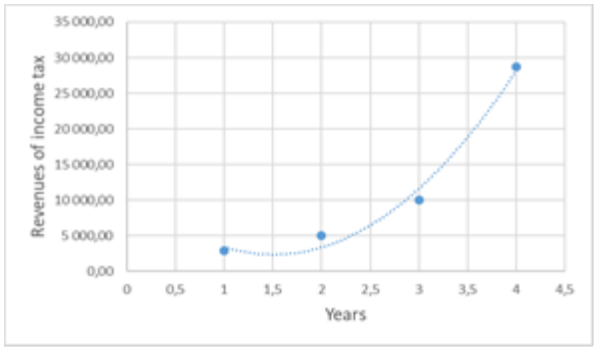

Figure 2: Revenues of income tax in the budget of the Republic of Uzbekistan for 2017-2020 (thousand soums)

The fact that the value of the approximation accuracy in this model (1) is $R^2 = 0.9767$ means that the model is able to express the dynamics of the indicators with a high degree of accuracy.

The indicators of income tax revenues in the budget of the Republic of Uzbekistan for 2017-2020 are given in Table 2

Based on the data in this table, we will create a schedule and econometric model of income tax revenues in the budget of the Republic of Uzbekistan for 2017-2020.

Revenues from income tax in the Republic of Uzbekistan for 2017-2020 can be expressed by the following mathematical model (Figure 2)

$$y = 4149,3t^2 - 12505t + 11796; R^2 = 0,9854 \quad (2)$$

The fact that the value of the approximation accuracy in this model (2) is $R^2 = 0.9854$ means that the model shows the dynamics of the indicators with a high degree of accuracy.

The results of the analysis show that after 2017, the budget began to achieve positive results in income tax revenues. The forecast indicators of income tax revenues in the Republic of Uzbekistan until 2030, calculated by model (2), are given in Table 3

If the budget is tasked to increase the income tax revenue by a certain amount in the current year compared to the previous year, the model (2) can be written as follows

$$y_t = 4149,3t^2 - 12505t + 11796 + by_{t-1} \quad (3)$$

where y_t - is the income tax revenue for the current year, y_{t-1} - is the income tax revenue for the previous year, and b is the coefficient for increasing the income tax revenue for the budget. If we assume that b = 0.1, then in 2021-2030 the budget will receive 8% of income tax revenue.

Table 3: Forecast of income tax revenue to the budget of the Republic of Uzbekistan in 2021-2030 according to the model (2) (thousand soums)

No	Years	Revenues of income tax
5	2021	53003,5
6	2022	86140,8
7	2023	127576,7
8	2024	177311,2
9	2025	235344,3
10	2026	301676
11	2027	376306,3
12	2028	550462,7
13	2029	550462,7
14	2030	649988,8
Total		3108273

5 CONCLUSIONS AND SUGGESTIONS

The analysis of the indicators of income tax revenues of the budget of the Republic of Uzbekistan for 2005-2016 shows that they did not meet the needs of the country, and on the basis of structural changes in 2017 began to achieve positive results. However, it was found through mathematical models and analysis that these changes were also insufficient. Using these models, new models were developed to achieve the planned results and based on them, forecast indicators were obtained.

The following mathematical models of income tax revenue were proposed to the budget:

- Model of income tax revenue to the current budget;
- Model of accounting for income tax revenue to the budget in the amount of an additional certain coefficient calculated in the current year in comparison with the previous year to achieve the planned goal:

The proposed models will help the country improve its income tax revenues.

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