MANAGEMENT OF THE TERRITORY TAX POTENTIAL TO ENSURE ITS TAX SECURITY

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Abstract
The authors investigated theoretical approaches to the tax potential category, substantiated the position that tax potential should be managed to ensure tax security of public law education and the basis of its assessment. Forecast models of tax potential developed in relation to the Republic of Mari El. The purpose of the study is to examine The purpose of the study is to examine structure of the consolidated budget tax revenue. One of the objectives of the study is to validate the uniformity of the tax revenue structure. The authors determined that the share of the three main taxes (personal income tax, corporate income tax and corporate property tax) in the total tax revenues of the consolidated budget does not practically change. Models are built using correlation-regression analysis, describing the dependence of macroeconomic indicators and the main sources of tax revenues. The results of the study is constructed model, which is used to determine the region tax potential.
Keywords: tax potential, tax security, tax revenues, assessment of tax potential
JEL classification: F43, H2, H21

1. Introduction

Tax revenues are the basis for the formation of a budgets profitable part. In this regard, the issues of estimating these revenues, their limits and possibility of increasing cause particular interest. The amount of tax revenues inextricably connected with tax potential. Entity determination problem and tax capacity management is an important government task. The issues of formation, assessment, and forecasting of tax potential have received modern reasoning and substantiation in numerous scientific works domestic and foreign scientists. However, many problematic issues still require reflection and the search for new scientific approaches.

Consider the approaches to the definition of the concept under study. It should be noted that in the scientific literature the categories of tax potential and tax burden (the ratio of taxes to GDP) are sometimes used as synonyms (for example, Stefan Brem, 2013), which, in our opinion, is not quite true in some publications by the same authors delimited concepts as: "taxable capacity" and "tax capacity".

Thus, in the studies of Tuan Minh Le, Blanca Moreno-Dodson and Jeep Rojchaichaninthorn (2012), the term “taxable capacity” refers to the predicted value of the tax burden indicator (ratio of taxes to GDP), assessed using regression analysis taking into account country characteristics, and the category of tax Capacity refers to an integral part of the financial (income) potential.

Professor Hemlata Rao (1993), arguing about the quantitative assessment of tax potential and measures for its mobilization, defines these categories as a measure of income (1) and the amount of tax revenues received (2). In the first case, income is taken as a measure of tax

potential, formed from state and local taxes received by the budget and other non-tax revenues. In the second, tax potential means resources, that is, the projected amount of tax revenues of any state obtained at different levels of taxation and comparing results with other states, which gives a "measure of relative tax potential". The continuity of these categories is due to the fact that when comparing tax revenues with tax potential, it is necessary to take into account the efforts of tax authorities to mobilize them.

The study of Luky Alfirman (2003) on the stochastic boundaries of tax potential seems to be the most interesting. According to the author, the tax potential is defined as the tax capacity that can be obtained if the economy uses all its resources and capabilities to mobilize all possible tax revenues, taking into account the main characteristics. In other words, tax-intensiveness is the actual value of tax revenues, and the tax potential is the predicted value of tax revenues obtained as a result of a regression analysis of stochastic boundaries. Moreover, the tax limit is understood as a system of various tax potentials. The spectrum of implemented instruments of research, technology and innovation policy is widely differentiated nowadays including the institutions and mechanisms of technology transfer (Kokkinou A., Ladias C., Papanis E., Dionysopoulou P. 2018).

Enlinson Mattos, Fabiana Rocha and Paulo Arvate (2011) adhere to the point of view of Alfirman (2003) and note that the unused tax potential is a measure of inefficiency, however, they believe that it cannot be determined.

The calculation of the tax potential index is typical for countries that use a representative tax system (RNS) to the tax potential estimated. Horacio Sobarzo (2004) defines this index as the Tax Potential Index Use (TPIU) and offers to count as the ratio of actual tax revenues to the possible.

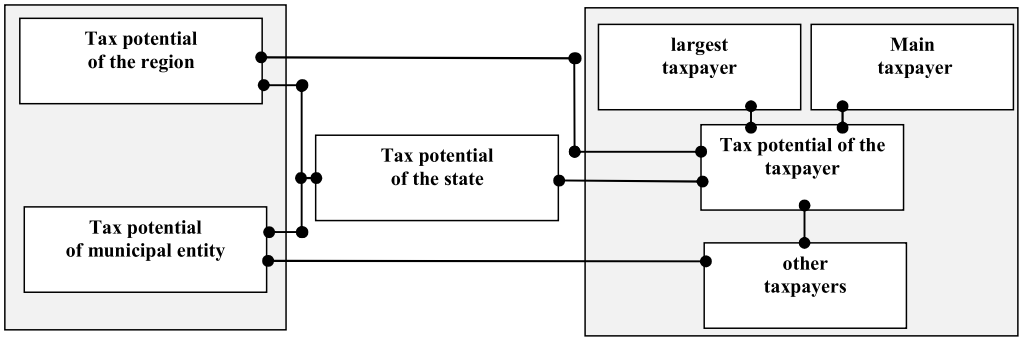
Russian scientists use different terms (taxable capacity, tax capacity, tax potential) for disclosing the contents term of tax potential. Most of the approaches are very similar, the difference in concepts, as a rule, is explained by the objectives of the research, or the tasks of managing a specific national taxation system.

2. Materials and methods

The author's approach to the term “tax potential of the state” is presented in Figure 1. On the one hand, the tax potential consists of a set of tax potentials of all the subjects of the federation (regions), which in turn is a consolidation of the tax potentials of the territories (municipalities) included in them, on the other hand, it is made up of the tax potentials of tax and tax payers: depending on the status, of individuals and legal entities; in relation to the provision of tax revenues, the administrative and territorial division is the largest and main.

The dualistic property of tax potential influences the choice of its assessment method, which should take into account not only macroeconomic indicators, but also the behavioral model of the taxpayer, which serves as an indicator of the effectiveness of the applicable tax policy and the quality of tax administration.

Figure 1 - Dualism of the "tax potential" category



Source: compiled by the authors

The above allows us to reveal the category of tax potential from two positions:

1– as a predicted value and control object;

2– as the volume of actual receipts of tax revenues in the budget system.

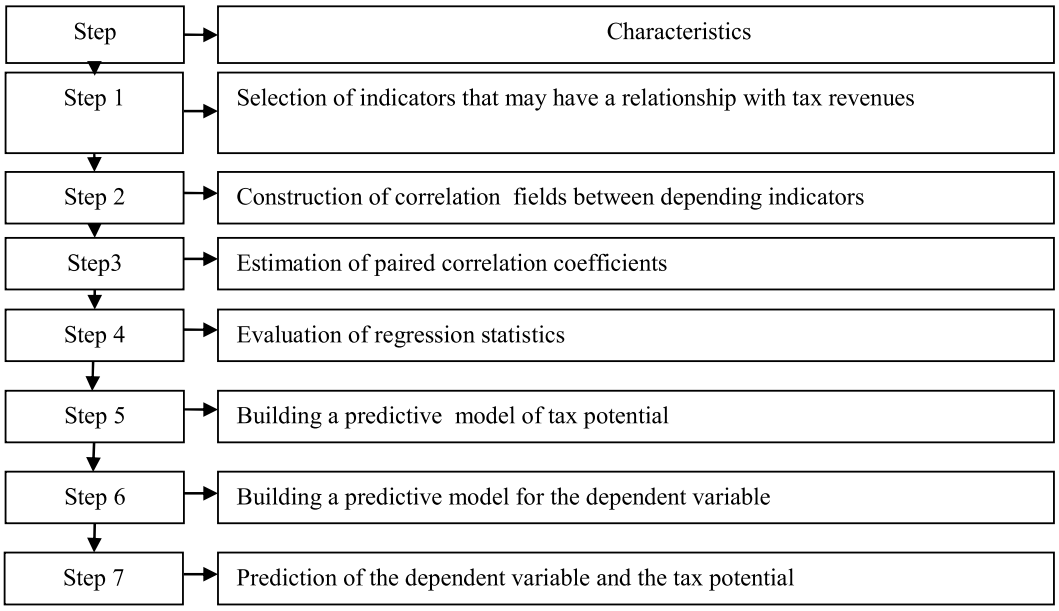
In turn, the receipt of tax revenues in time periods allows us to consider the tax potential in the aggregate of its two components:

- actual tax potential;
- strategic tax potential.

Strategic tax potential can be considered in different time periods, including for 1 year (short-term) and for longer periods (medium-term, long-term), which is due to the planning and forecasting methodology, which proves its viability.

The actual tax potential is the receipt of taxes and fees on a specific reporting date. The actual tax potential is the object of planned management, information for monitoring and regulating the development of the regional economy. Considering this component of the studied category, we can say that each territory (region, urban district, municipality, etc.) at a certain point in time receives revenues in the form of taxes and fees, which are the maximum achievable under these conditions. Those the short-term tax potential was not fulfilled or exceeded the forecast value due to the influence of various factors, the resulting amount of tax revenues is the actual tax potential, which is subject to monitoring, analysis and adjustment of further forecast values. Strategic tax potential is the ability of the tax base in the future to generate income in the form of tax revenues. This indicator is a flexible tool for assessing tax revenues for the long term. In this case, it becomes necessary to create an information-analytical system for forecasting the tax potential, revealing the influence of all internal and external factors, taking into account possible development scenarios, as well as a reflective basis of the mechanism for their implementation. The management of the tax potential of a territory should be based on its assessment. The assessment is carried out on the basis of the forecast of tax revenues, which have the largest share in the total amount of tax revenues and at the same time this share remains almost unchanged during the period preceding the assessment. The algorithm is shown in the figure 2.

Figure 2 - Algorithm for estimating the tax potential based on regression analysis.

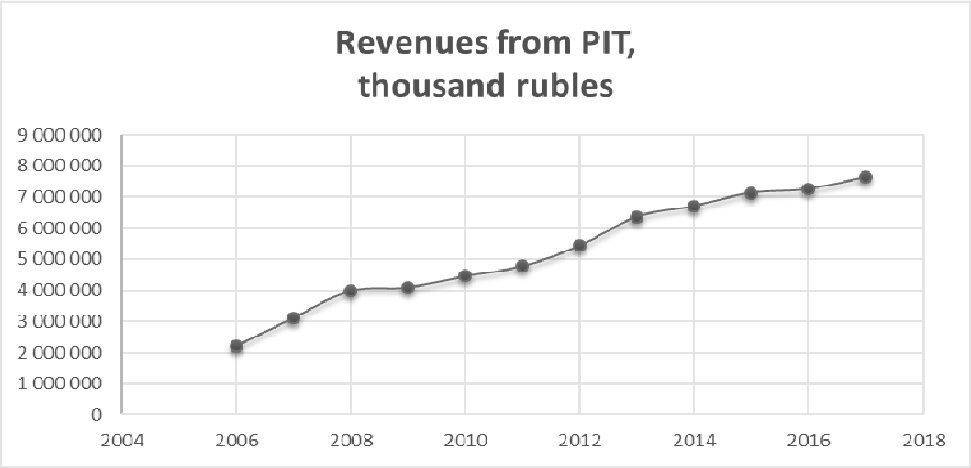


Source: compiled by the authors

3. Results

Graphic analysis of tax revenues from personal income tax to the consolidated budget of the Mari El Republic presented in Figure 3.

Figure 3 Revenues from PIT to the consolidated budget of the Mari El Republic, thousand rubles



Source: compiled by the authors based on data from the Federal State Statistics Service

Tax revenues from personal income tax is increasing annually. At the same time, the growth rate of revenues corresponds to the recorded dynamics of growth in nominal wages according to the data of the Federal State Statistics Service Mari El Republic. In this regard, the average nominal wage per month was chosen for building the model.

The initial data for the calculation are presented in the table 1.

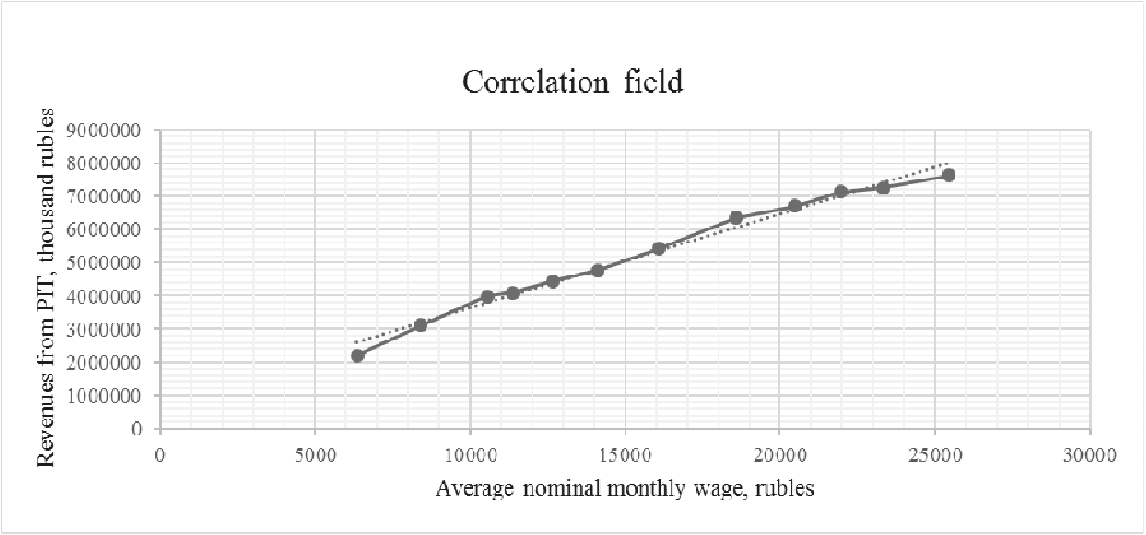
Table 1– Input data for model building

Year	Revenues from PIT, thousand rubles	Average nominal monthly wage, rubles
2006	2 215 090	6344,00
2007	3 123 792	8404
2008	3 987 615	10535
2009	4 098 128	11357,10
2010	4 454 793	12669,40
2011	4 774 698	14128,40
2012	5 432 880	16075,40
2013	6 357 278	18558,33
2014	6 704 799	20473
2015	7 134 082	21947
2016	7 256 173	23305,3
2017	7 626 691	25439,5

Source: compiled by the authors based on data from the Federal State Statistics Service

In the second step of the analysis, we, according to the proposed method, we will build a correlation field between PIT revenue and the dependent indicator that have selected - average nominal accrued wage. The results are presented in the figure 4.

Figure 4 Correlation field dependence of PIT revenues from average nominal monthly wage



At the third stage, we need to build a matrix of paired correlation coefficients. The results are presented in the table 2.

Table 2 - Matrix of paired correlation coefficients

-	Y	X
Y	1	-
X	0,9944	1

Source: compiled by the authors

The correlation coefficient (multiple R) tends to 1, which means a strong relationship between the dependent and independent variable.

At the 4th stage, we will conduct a regression analysis of the initial data. The results are presented in table 3.

Table 3– Regression Statistics

Regression Statistics	
multiple R	0,995422605
R-squared	0,990866163
Normalized R-squared	0,98956133
Standard error	147,8455189
Observations	9

Source: compiled by the authors

The coefficient of determination (R-square) shows that in 99% of cases, the variability y (income tax on individuals) can be explained using the predicted value of the average nominal accrued wages.

Normalized R-squared is almost no different from the coefficient of determination, which indicates the quality of the proposed model. The values of the coefficients are presented in table 4.

Table 2– Coefficients

-	Coefficients
Y-intersection	457,4246056
Variable x 1	0,312718053

Source: compiled by the authors

An analysis of Student's t-statistics (t estimated = 27.5> t tabular = 2.36), evaluating the ratio of the magnitude of the linear correlation coefficient to the standard deviation, concluded that there is a relationship between the variables and the correlation coefficient found is significant.

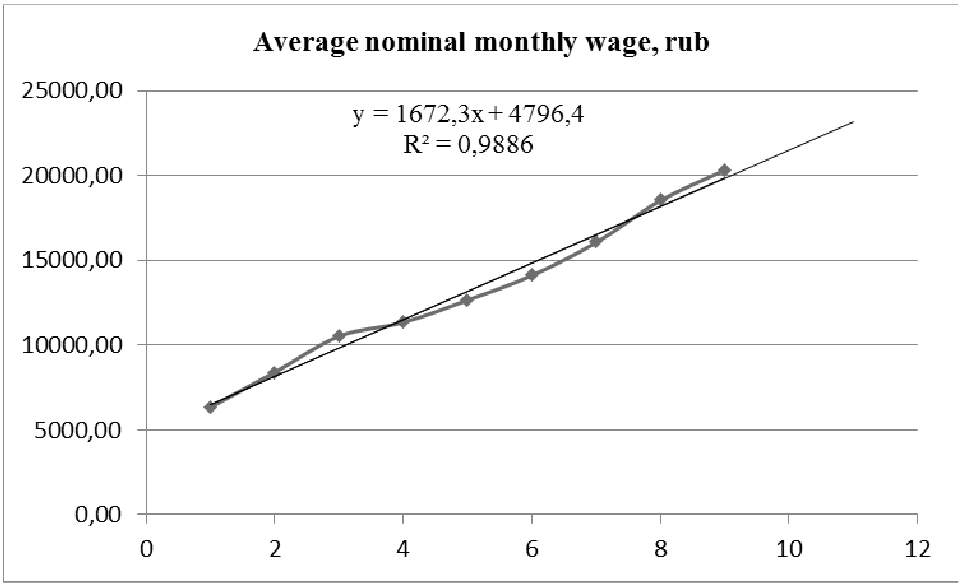
The p-value was less than 0.05, which also indicates the significance of the resulting equation. The statistical significance of the equation was estimated using the Fisher F-test. The tabular value of the F-test (for the significance level $\alpha = 0.05$) is 5.32, which is less than F = 759.3. The conclusion of the statistical significance of the regression equation. Therefore, the connection of the tax on personal income with the factor included in the model is significant.

At 5 stage is building a predictive model. An equation (1) describing the forecast of revenues from PIT:

$$y=457,42+0,31x \quad (1)$$

At the 6th stage, a predictive model is building for the dependent variable, i.e. an equation is made describing the relationship between the values of x. To do this, the time factor t is introduced into the model, we construct a graph, determine the dependence, select the trend and estimate the R-squared value. The results are shown in Figure 5.

Figure 5- Forecast average nominal monthly wage



Source: compiled by the authors based on data from the Federal State Statistics Service

Thus, the following equation (2) is obtained, describing the forecast of the average nominal accrued wages:

$$x = 1672,3t + 4796,4 \quad (2)$$

At the 7th stage, we will make a forecast of the income tax receipts on the basis of the given dependencies. The results are presented in table 5.

Table 5– Calculation results

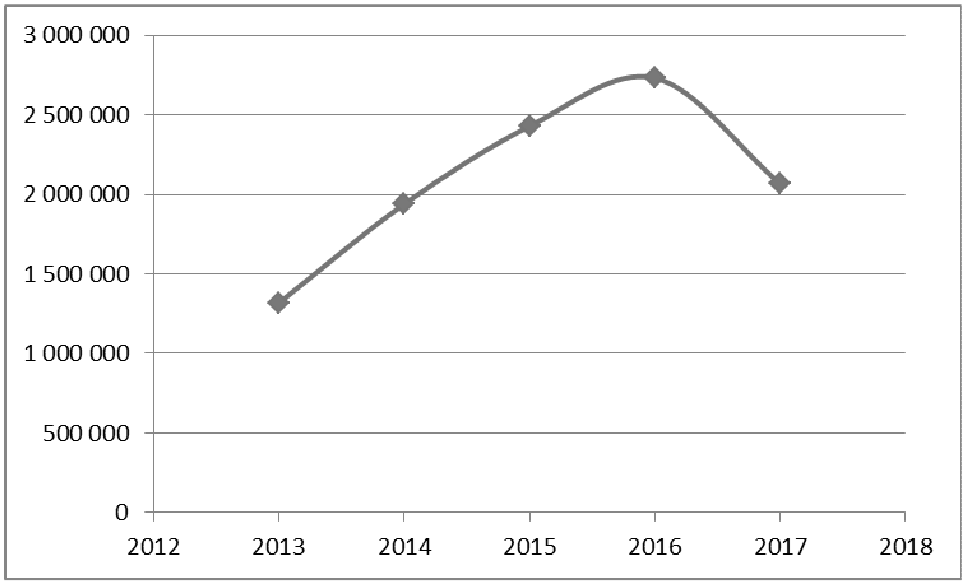
Case	Indicator	2016	2017	2018
inertial	Revenues from PIT, thousand rubles	21519,4	23191,7	24864
	Average nominal monthly wage, rubles	7128,434	7646,847	8165,26
optimistic	Revenues from PIT, thousand rubles	22595,37	24351,285	26107,2
	Average nominal monthly wage, rubles	*7461,985*	*8006,31835*	*8550,652*
pessimistic	Revenues from PIT, thousand rubles	20443,43	22032,115	23620,8
	Average nominal monthly wage, rubles	6794,883	7287,37565	7779,868

Source: compiled by the authors

A similar study was conducted for income tax. The results are presented in Figure 6.

Stage 1

Figure 6– Corporate Income Tax Revenues in the consolidated budget of the Republic of Mari El in 2013-2017.



Source: compiled by the authors based on data from the Federal State Statistics Service

The working hypothesis of the study was the following: building a predictive model for income tax should be made taking into account such indicators as: investment in fixed capital, current asset turnover, balanced financial result. Testing the hypothesis was carried out on the basis of identifying the correlation dependence between factors. Original data for the construction of the model are shown in Table 6.

Table 6 – Input data for model building. in millions rubles

Year	Corporate Income Tax Revenues	Fixed investment	current asset turnover	Balanced financial result by manufacturing activity
	Y	x_1	x_2	x_3
2013	1 318	16576,2	133260,6	1582
2014	1 940	22304,2	166770	2655
2015	2 429	26860,8	199084,3	3892
2016	2 731	31656,5	226110,8	5299
2017	2 065	45126	228974,5	4268,7

Source: compiled by the authors based on data from the Federal State Statistics Service

The values obtained are presented in table 7 - paired matrix of correlation coefficients:

Table 7– Paired matrix of correlation coefficients

-	Y	x_1	x_2	x_3
y	1	-	-	-
x_1	0,482928258	1	-	-
x_2	0,830720584	0,886272427	1	-
x_3	0,984509811	0,406244112	0,780318	1

Source: compiled by the authors

The value of the pair correlation coefficient of less than 0.5 indicates a weak connection with the performance indicator, and therefore the factor x1 should be excluded from the model. The application of the Farrar-Glober algorithm has led to the conclusion that there is a multicollinearity between the factors. In this connection, we concluded that it is more expedient to build a model with the factor x3. At the same time, it should be borne in mind that the main income tax revenues are in the Republic of Mari El for processing industries, it is more expedient to use the indicator of the net financial result for this type of activity. Input data for the model construction are shown in Table 8.

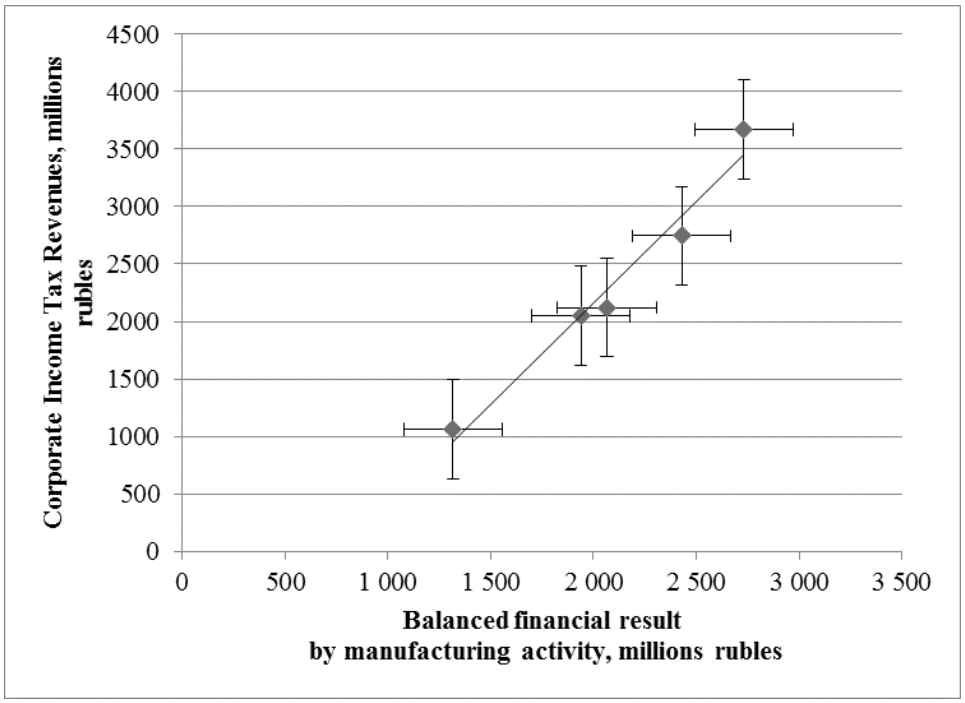
Table 8– Input data for the model construction , in millions rubles

Year	Corporate Income Tax Revenues	Balanced financial result by manufacturing activity
	y	x_1
2013	1 318	1062,5
2014	1 940	2049,8
2015	2 429	2745,9
2016	2 731	3673,4
2017	2 065	2121,9

Source: compiled by the authors based on data from the Federal State Statistics Service

The correlation field of the relationship between Corporate Income Tax Revenues and Balanced financial result by manufacturing activity is presented in Figure 7.

Figure 7- correlation field of the relationship between Corporate Income Tax Revenues and Balanced financial result by manufacturing activity



We conducted a regression analysis of the source data. The regression statistics are shown in table 9.

Table 9– Regression Statistics

Regression Statistics	
multiple R	0,984509811
R-squared	0,969259568
Normalized R-squared	0,959012757
Standard error	108,3153492
Observations	5

Source: compiled by the authors

The correlation coefficient (multiple R) tends to 1, which means a strong relationship between the dependent and independent variable.

The coefficient of determination (R-square) shows that in 97% of cases, the variability of y (income tax revenues) can be explained using the predicted value of the balanced financial result of organizations related to the type of activity in manufacturing.

The normalized R-square practically does not differ from the coefficient of determination, which indicates the quality of the proposed model.

On average, the calculated values deviate from the actual by 6.02%. Since the error is less than 7%, this equation can be used as a regression. The results are presented in table 10.

Table 10-The data obtained

-	Coefficients	standard error	t-statistic
Y-intersection	821,1277977	139,796	5,873758
Variable x 1	0,547216288	0,056264	9,725808

Source: compiled by the authors

An analysis of Student's t-statistics (t calculated = 9.72> t tabular = 3.182) allowed us to conclude that there is a relationship between the variables, and the calculated correlation coefficient is significant.

The p-value was less than 0.05, which also indicates the significance of the resulting equation.

The statistical significance of the equation was estimated using the Fisher F-test. The tabular value of the F-test (for the significance level $\alpha = 0.05$) is 10.1, which is less than F = 94.5. Therefore, the regression equation is statistically significant. Therefore, the relationship of income tax with the factor included in the model is significant.

Thus, we obtain the following equation (3) describing the revenue forecast of corporate income tax:

$$y= 821,12+0,54x \quad (3)$$

Stage 6

The forecast indicator of Balanced financial result by manufacturing activity was carried out on the basis of the Holt-Winters method.

Stage 7

The forecast of Corporate Income Tax Revenues is presented in table 11.

Table 11 - Corporate Income Tax Revenues, in millions rubles

Year	Corporate Income Tax Revenues
2018	3737,66
2019 (Plan)	2630,12

Source: compiled by the authors

A similar study was conducted for corporate property tax.

Stage 1

Input data for the model construction are shown in Table 12.

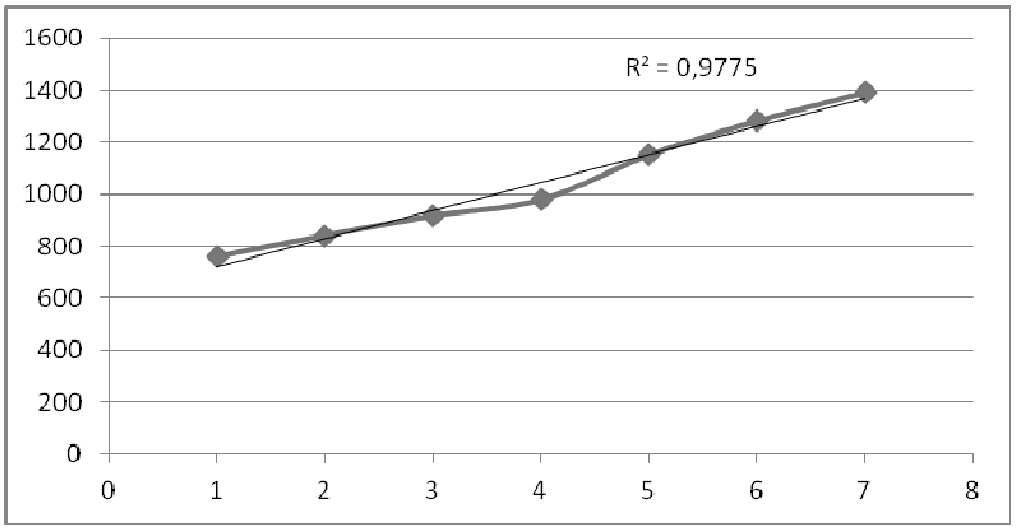
Table 12– Input data for the model construction, in millions rubles

revenues	Year						
	2011	2012	2013	2014	2015	2016	2017
Corporate property tax	757,9	840,3	915	977,2	1150,2	1 281	1 391

Source: compiled by the authors

Imagine the data graphically, select the trend using the method of analytical alignment. The results are presented in the figure 8.

Figure 8– Schedule of corporate property tax

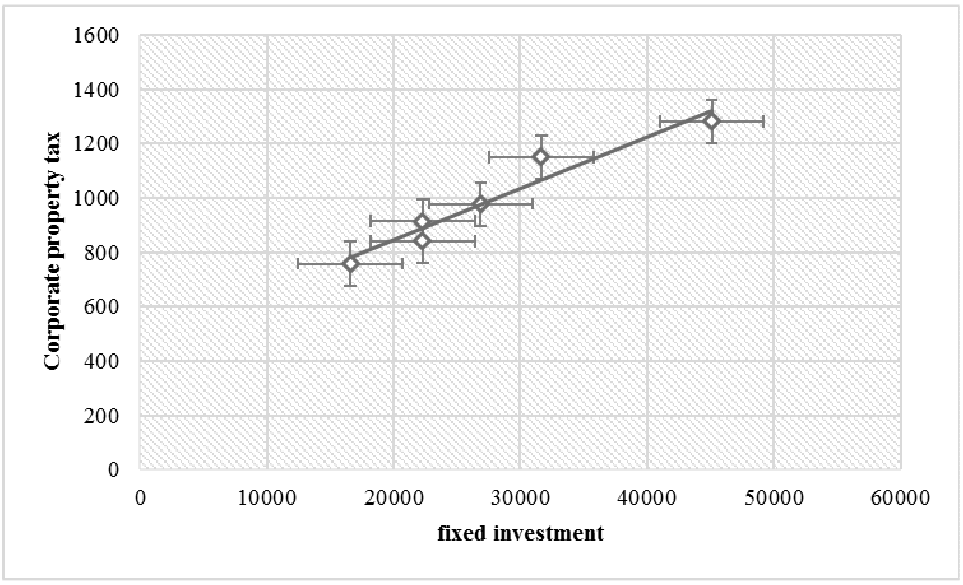


Source: compiled by the authors based on data from the Federal State Statistics Service

Stage 2

We construct a correlation field of the relationship between the corporate property tax and fixed investments. The results are presented in figure 9.

Figure 9- The correlation field depending between the corporate property tax and fixed investments.



Source: compiled by the authors

Stage 3-4

We conducted a regression analysis of the source data. The regression statistics are shown in table 13.

Table 13– regression statistics

multiple R	0,976670782
R-squared	0,953885816
Normalized R-squared	0,938514421
Standard error	44,62419326
Observations	5

Source: compiled by the authors

The correlation coefficient (multiple R) tends to 1, which means a strong relationship between the dependent and independent variable.

The coefficient of determination (R-square) shows that in 95% of cases, the variability of y (revenues from the property tax of organizations) can be explained using the predicted value of investments in fixed assets.

The normalized R-square practically does not differ from the coefficient of determination, which indicates the quality of the proposed model. The results obtained are shown in table 14.

Table 14– Results Obtained

-	**Coefficients**	**standard error**	**t-statistic**	**P-Value**
Y-intersection	570,4173216	61,99542983	9,200957605	0,002715221
Variable x 1	0,01622108	0,002059151	7,877557053	0,004262442

Source: compiled by the authors

The analysis Student's t-statistic is concluded that there is a dependence between the variables and the correlation coefficient found significant.

The p-value was less than 0.05, which also indicates the significance of the resulting equation.

The statistical significance of the equation was estimated using the Fisher F-test. The tabular value of the F-criterion is less than F = 94.5. Therefore, the regression equation is statistically significant. Thus, the connection of the property tax of organizations with the factor included in the model is essential.

Stage 5

Thus, the following equation (4) is obtained, which describes the forecast corporate property tax:

$$y=570,4+0,016x \quad (4)$$

Stage 6

Input data for the forecast of **fixed investment** are given in table 15.

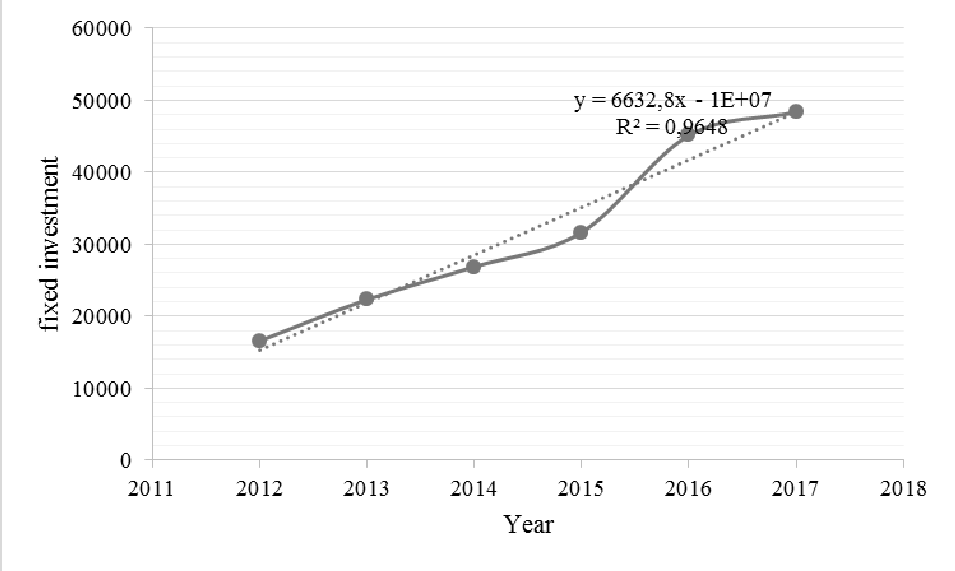
Table 15 - Input data for the forecast fixed investment , in millions rubles

Year	**fixed investment**
2012	16576,2
2013	22304,2
2014	26860,8
2015	31656,5
2016	45126
2017	48353,6

Source: compiled by the authors based on data from the Federal State Statistics Service

Prediction dependent factor is performed by an analytical alignment. As a result of the graphical representation, a linear trend is revealed, as reflected in Figure 10.

Figure 10- fixed investment



Source: compiled by the authors based on data from the Federal State Statistics Service

Based on the resulting prediction equation implemented dependent factor. The results are presented in table 16.

Table 16 – Forecast , in millions rubles

Year	fixed investment
2018	55027,7
2019	61660,5

Source: compiled by the authors

Stage 7

Using the obtained values, the property tax of organizations is predicted. The results are presented in table 17.

Table 17 – Forecast , in millions rubles

Year	Corporate property tax
2018	1450,8432
2019	1556,968

Source: compiled by the authors

On the basis of the proposed models, formula (5) is designed for prediction of region tax potential:

$$НП_p = \frac{y_1+y_2+y_3}{n} \times 100 = \frac{1848,94+0,31x_1+0.54x_2+0.016x_3}{n} \times 100 \quad (5)$$

where

n– average value of the share of three major taxes over the past three years;;

$НП_p$– region tax potential.

A summary of the calculation results is given in table 18.

Table 18 - Summary table of calculation results, in millions rubles

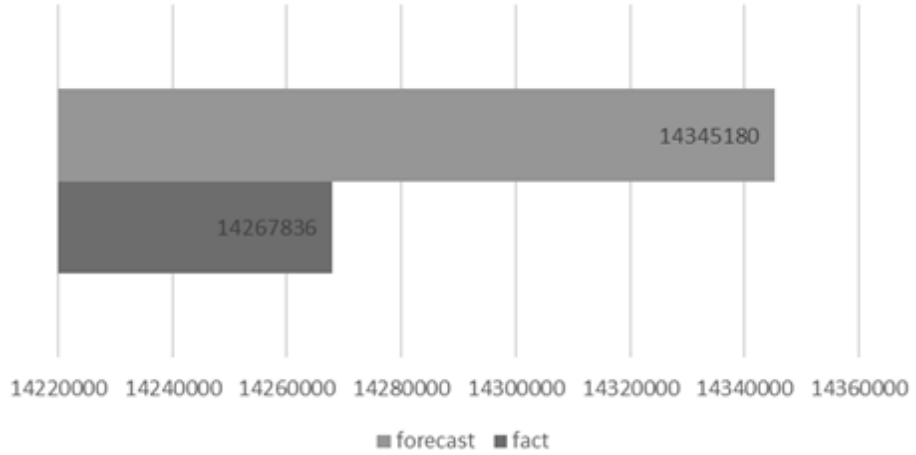
Indicator	conventional name	Model	Forecast	
			2018	2019
Modeling region tax potential considering uniformity coefficient by using the method of correlation-regression analysis				
Revenues from PIT, thousand rubles	y_1	$y_1=457,42+0,31x$	7461,98	8006,31
Average nominal monthly wage, rubles	x_1	$x_1= 1672,3t + 4796,4$	22595,37	24351,28
Corporate Income Tax Revenues	y_2	$y_2= 821,12+0,54\ x_2$	3737,66	2630,12

Balanced financial result by manufacturing activity	x_2	$x_2 = Lt + p * Tt$	5401	3350
Corporate property tax, mln. Rub.	y_3	$y_3 = 570,4 + 0,016\, x_3$	1450,84	1556,96
fixed investment, mln.rub	x_3	$x_3 = 6632,8t + 8598,1$	55027,7	61660,5
Tax potential of the region, mln. Rub.	$НП_p$	$НП_p = \frac{y_1 + y_2 + y_3}{n} * 100$	**14882,93**	**14345,18**

Source: compiled by the authors

Comparison of the forecast model and the actual tax revenues is shown in the figure 11.

Figure 11- Region tax potential in 2018



Source: compiled by the authors based on data from the Federal State Statistics Service

4. Conclusion

The results of the study led to the following conclusions:

1. Tax potential should be managed to ensure tax security of public law education and the basis of its assessment. The forecast of region tax potential should be made on the basis of those taxes whose share in the structure of the region's tax revenues does not change or changes only slightly.

2. The assessment of tax revenue uniformity is carried out by analyzing the structure of tax revenues of the region consolidated budget.

3. The relationship between macroeconomic indicators and tax revenues is revealed with the help of the correlation-regression analysis, models are constructed that describe these dependencies. As the analysis shows, such an approach allows one to estimate the tax potential fairly accurately.

4. The results of the study consolidated budget of the Mari El Republic showed that determined that the share of the three main taxes (personal income tax, corporate income tax and corporate property tax) in the total tax revenues of the consolidated budget does not practically change. This allowed us to build models using correlation-regression analysis, describing the dependence of macroeconomic indicators and the main sources of tax revenues.

5. Acknowledgments

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