Methodology for assessing the tax security of the state using mathematical modeling methods

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Abstract. The issues of studying tax security are especially relevant and important from the point of view of the problem of ensuring the security of the country as a whole, as a tool for managing socio-economic systems and ensuring social protection of the population. The purpose of the study is to study the indicators of the tax security of the Russian Federation, taking into account threats. The article clarifies the essence of the concept of "tax security"; assessed the tax security of the Russian Federation on its main aspects; Threats to Russia's tax security have been identified and systematized. The analysis of modern economic literature revealed the following problems in the study of this topic: some authors consider it as an independent type of security, others - as an integral part of budgetary and tax security; there is also no well-developed comprehensive methodology for assessing tax security; At the same time, the study of threats to tax security takes place without studying the causes of their occurrence and the consequences to which they lead. Keywords: budget and tax security, financial security, threats, sustainability, public government, Russia, socio-economic system, social protection of the population

1 Introduction

The budget and tax field constitutes the main component of the financial security. The sustainability of the state finance depends on it, as well as the ability of a state to execute its vital functions, such as defense capability, social protection of population, education and healthcare. In its turn, the budget component of the economy directly depends on taxes, which are the main income channel of the budget revenues and form the financial relations of a state with legal entities and individuals. Thus, the issues of the tax security studies are incredibly relevant and significant in terms of ensuring the security of the country in general.

The aim of the research. Given the above-mentioned, the aim of the thesis is to study the indices of the tax security of the Russian Federation taking the threats into consideration. In order to achieve the given aim it is necessary to solve the tasks drawn below during the research:

to precise the essence of the notion "tax security";

to assess the tax security of the Russian Federation regarding its main aspects;

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to reveal and to systemize threats to the Russian tax security.

2 Literature review Methodology

The following scientific methods were applied in the work:

deduction method used for studying the essence of tax security and assessment of methodic of estimating its level;

analysis; it was used to assess the level of tax security, to reveal the factors and reasons for changes in its level;

synthesis; used to get overall results of the research, to formulate conclusions and general results regarding the problems of assessment of the Russian tax security level;

comparison; used to fulfill and to ground tendencies, peculiarities, directions, factors and conditions influencing on the level of tax security of a state.

Nowadays the term "tax security" in the economic literature is inextricably connected to budget and its protection. Moreover, some of the scientists do not even mark it as an independent subtype of financial security and define it as a component of budget and tax security. It is worth noting that in some of the approaches the researchers pay attention only to the aspects related to budget, leaving the tax component aside. Thus, G.S.Izotova interprets the notion in question in this way: "the budget and tax security comprises ensuring by the federal and regional public authorities of unity of intersystem relations in order to support economy and, correspondingly, security via a system of legal, organizational, political and other tools" [1]. T.V.Uskova and S.S.Kopasova expose another interpretation of the definition: "the budget and tax security is an ability of the public authority bodies to provide financing via budgets of all levels of their fixed full amount of competences in order to execute the right of the citizens set forth in the Constitution of the Russian Federation in a long-term perspective in the conditions of destabilizing affect of the different accidental and deliberate factors" [2]. In this case the scientists stress that the national security of a state regarding realization of the rights and national interests of the citizens are ensured via an effective formation and use of the budgets. Thus, the studied approach towards definition of the budget and tax security fully excludes the notion of taxes and, correspondingly, the tax security in its content.

It is clear that formation of the budgets at any level is mostly effected via tax revenues; hence the ensuring of security in the budget sphere is impossible without a secure taxation system. However, from out point of view, the notion of "budget and tax security" should comprise the taxation aspects. For example, T.Yu.Tkacheva in her interpretation considers budget and tax spheres as a whole complex: "the budget and tax security – is a state of being protected of the budget and tax relations from internal and externals threats, where the budget and tax resources of a region form, being necessary to provide self-development of territories at a corresponding budget and tax control over their formation and spendings" [3]. O.V.Smolanova and A.S.Gromova have the same view. However, if we stick to the approach providing for definition of the tax security in a complex with the budget one, to our minds, the fullest definition is represented by B.A.Reisenberg: "the budget and tax security – is the ensuring of a sustainable, balanced condition of the federal and consolidated budgets of the Russian Federation, of correspondence of its revenue and expenses parts, an ability of the budget to satisfy state needs in financial resources on the basis of sufficiency of tax and other revenues into the budgets of different levels given the ensured high level of tax collection together with non-tax payments" [6].

Several scientists think that tax security constitutes an independent type of security: L.I.Khoruzhiy, Yu.N.Katkov, V.I.Khoruzhiy [7]. S.M.Frolova [8], D.N.Tikhonov [9], A.A.Tsviliy-Buklanova [10].

In our opinion, defining the tax security as an independent type of security is a pertinent and viable step towards increasing the financial security of a state. The idea given is grounded by the fact that the scientists, who consider the budget and tax security as a holistic complex, when assessing its level, analyze the indices that characterize the efficiency of budget use, their sustainability, autonomy, self-sufficiency and other indices, without paying attention to the issues of security of the tax relations in general and efficiency of formation of tax revenues in particular. The assessment of the tax security and revelation of threats in this area is, according to the authors, the primary task, with its solution allowing to at least increase the level of budget security and also will positively mirror on the financial security of a state.

3 Results and discussion

The modern situation in the tax sphere of the Russian Federation demonstrates an unsatisfactory level of the tax security in the country. It is not a secret that in the state there are fixed several schemes of understating the taxation base, there is a wide practice of double-entry bookkeeping, of paying so-called grey salaries, and there is also a high extent of "shadowing" the economy. It is connected with a non-perfect taxation system, a low level of taxation culture of the population, with the aspiration of the entities to practice tax evasion by any means. In this connection we could talk about impeding the realization of the fiscal function of a tax – one of its most vital functions.

In order to assess the level of the tax security of the Russian Federation it is necessary to analyze a number of indicators characterizing the quality of tax planning and predicting, formation of the tax potential, and also the efficiency of tax audits. In Table 1 we represent the characteristics for the chosen indicators' system.

Table 1. Characteristics of the state tax security indicators. Source: elaborated by the authors.

Indicators of tax security	Formula	The essence of the indicator	Threshold	Optimization direction
Indicator of tax collectability	Actual tax revenues / The sum of tax counted out of tax returns	Shows the ration of the tax payments collected during a defined period to a potential possible volume of the tax payments collected	1	Increasing
Indicator of tax burden	Actual tax revenues / GDP	An overviewing indicator, characterizing the role of the taxes in the social life and defined as a ration of the tax sum to the gross domestic product [11, p.200-201]	Average number	Increasing
Coefficient of turnover of tax debt	Tax revenues / Total tax debt	Characterizes the amount of tax income received by the state in actually collected tax payments per each ruble of tax liability	Average number	Increasing

Coefficient of concealment (understatement) of taxes	Additionally calculated taxes upon on-site audits / The sum of tax counted out of tax returns	Shows the extent of understating the taxes by tax payers, which is being revealed during desk and on-site audits by tax authorities	Average meaning	Decreasing
Coefficient of effectiveness of on-site audits	The number of effected on-site audits revealing breaches / Overall number of on-site organization audits performed	Shows, on one hand, the extent of effectiveness of the on-site audits, on the other hand, it reveals the good faith of tax payers regarding declaring the taxable incomes and expenses, not considered for the purposes of taxation	Average meaning	Decreasing
Coefficient of revealed errors when submitting tax returns	Additionally calculated taxes upon desk audits / The sum of tax counted out of tax returns	"Characterizes the extent of revealing of errors when submitting tax returns for the whole taxation base" [12, p.4].	Average meaning	Decreasing

We represent the source data for the analysis in Table 2, and in Table 4 we shall set the results of the analysis of the Russian tax security indicators for the period 2015-2017. The further estimation of the tax security of a state demands defining comparable indicators. The definition of comparable indicators is effected on the basis of the direction of optimization of an indicator: if the direction of optimization is increasing, the comparable indicator is defined as a ration of an actual index of an indicator to a normative; in case of decreasing – the normative meaning should be divided on the actual one.

Table 2. Source data for analyzing the indicators of the tax security of the Russian Federation. Source: calculated by the authors on the grounds of [13].

Indicators	2015	2016	2017
The amount of taxes to be paid to the budget (million rubles)	13726683.14	14810780.58	17188445.00
Actual tax revenues (mln rubles)	13788299.88	14482884.26	17343436.14
GDP (mln rubles)	58900652.20	64997039.30	86148600.00
Additionally calculated payments resulting from audits (mln rubles)	351478.02	451805.27	309973.99
Additionally calculated payments resulting from desk audits (mln rubles)	81265.52	99748.33	61174.09
Number of on-site audits revealing violations (units)	25954	25796	17337

Total number of on-site audits performed (units)	26192	26043	17563
Total tax debt (mln rubles)	1124284.44	1379709.06	1582872.63

Table 3. Analysis of indicators of tax security of the Russian Federation in 2015-2017. Source: calculated by the authors on the grounds of [13].

Indicators of tax security	Actual indices			Comparable indices		
	2015	**2016**	**2017**	**2015**	**2016**	**2017**
Indicator of tax collectability	1.0045	0.9779	1.0090	1.0045	0.9779	1.0090
Indicator of tax burden	0.2341	0.2228	0.2013	1.0669	1.0155	0.9175
Coefficient of tax debt turnover	12.2641	10.4971	10.9569	0.9164	1.0707	1.0258
Coefficient of concealment (understatement) of taxes	0.0197	0.0238	0.0175	1.0326	0.8551	1.1600
Coefficient of effectiveness of on-site audits	0.9909	0.9905	0.9871	0.9986	0.9990	1.0024
Coefficient of revealed errors when submitting tax returns	0.0059	0.0067	0.0036	0.9129	0.8025	1.5186

From the results of analysis for the main indicators of the tax security it is seen that throughout the recent 3 years (2015-2017) tax revenues into the consolidated budget of the Russian Federations showed a sustainable growth and increased in 25,78%, while the main tax rates – the corporate tax, the value added tax, the individual income tax – did not change. It is interesting that the biggest growth of the tax revenues during these three years were reached as a result of 2017, with the beginning of the recovery of the economy after a decline in 2015-2016: in 2017 the revenues into the consolidated budget of the Russian Federation in comparison to 2016 increased in 20%, or at nearly 2,9 billion rubles, and exceeded 17 billion rubles. Nearly 40% of the growth came out of the correctives of the price of oil, the latter having increased in 29% in December 2016 – November 2017 (from 40,3 to 52,1 dollars per barrel), this having brought additional 1,2 billion rubles of oil and gas incomes. However, 60% of the revenue growth, or 1,7 billion rubles, were provided by the oil and gas incomes supported by a good key macroeconomic factors dynamics.

As far as tax security indicators are concerned, it can be concluded that in 2015 and 2017 there was a high extent of collectability of taxes: actual tax revenues exceeded the planned sum of taxes paid to the budget in 0,45% and 0,9% correspondingly, which is an undoubtedly positive thing. There was a contrary situation in 2016: tax collectability reached 97,79%, which was caused by 28,54% increase in concealment of taxed incomes and, hence, tax payments in comparison to 2015. Given that the norm for this indicator is 1, it could be noticed that the comparable numbers for this indicator in 2015 and in 2017 exceed 1 and equal to 1,0045 and 1,0090 correspondingly, and in 2016 it was below the norm and equaled to 0,9779.

The indicator of tax burden, which characterizes the role of tax payments in the life of society, has fluctuated between 20,13% (in 2017) and 23,41% (in 2015) during the period analyzed. As a norm for this indicator equals to an average index, it could be marked that in

2015-2016 comparable numbers were above 1, and in 2017 – below 1, at that the index equaled to 0,9175.

Actual indices of the coefficient of tax debt turnover witness a deceleration of tax debt turnover. In 2015 tax debt completed 12,3 orbits per year, in 2016 – 1,8 orbits less comparing to 2015, and in 2017 0,5 orbits more than in 2016. The given dynamics is explained by excess of growth rate of the tax debt over growth rates of tax revenues and demonstrates the growth of shortfall (debt) of penalties and tax sanctions, rescheduling of debt, and also suspended enforcement of payments in a volume bigger than the tax revenues grow. The existence of the substantial amounts of taxpayers' debts to different level budgets means imperfection of the state financial security in general and of the tax security in particular. On the base of the data drawn in Picture 1 it can be concluded how huge the amount of debt to the budget system of the Russian Federation are within the period analyzed. It should be highlighted that the total tax and payment debt to the consolidated budget of the Russian Federation in 2015-2017 has been constantly growing: whereas in 2016 in comparison to 2015 the amount of debt grew up 22,71%, in 2017, in comparison to 2016, the amount grew up 14,73%. This constitutes a threat to the Russian tax security as the total debt in 2017 in comparison to 2015 has grown up 40,79%, meanwhile tax payments had only 25,78% growth.

The shortfalls, representing the tax debt volume that cannot be got back into the budgets for different reasons, have the biggest share in the structure of the total debt to the budget system of the Russian Federation, at that there is a negative dynamics of growth both of the absolute index of the indicator given and its share in the total debt: whereas in 2015 the shortfall amount equaled to 461562 million rubles, and its share, correspondingly, to 41,05% of the total amount of debt, in 2016 this indicator grew up 346652,4 million rubles, at that the share grew up to 44,57%. In 2017 there was the same dynamic of shortfalls: the growth reached 156,37% in relation to the previous year, in the end of the period the sum of shortfalls reached 961 567,5 million rubles (which is more that two times more than the same indicator in the beginning of the period analyzed). The share of this indicator at the end of 2017 equaled to 60,75%.

The amount of payments with suspended enforcement grew up in 2016 in comparison with 2015 – to 59611,8 million rubles, where in 2017 this dynamics kept on: the meaning of the index increased in 66139,7 million rubles in comparison to 2016, and it equaled to 595306,9 in the end of the period in question. The given index is 1,2678 times bigger than in the beginning of the given period, which also constitutes negative dynamics providing for decreasing in effectiveness of collectability of tax debt.

Delayed payments and rescheduled debt, in other words, the settled debt, has the smallest share in the structure of tax debt and, despite the growth of this indicator in the period analyzed, the situation scarcely changes: the share of this indicator equals to 1,38%, 1,46% and 1,24% in 2015, 2016, 2017 correspondingly. This demonstrates that within all the volume of debt to different level budgets only 1,24% of the debt will be recovered in some time. The situation described in the analysis of the indicator of debt to the budget of the Russian Federation, shows worsening of the tax security state in the country.

As far as comparable indicators of the coefficient of tax debt turnover are concerned, here, given the average number, which is a norm and which equals to 11,2394 correspondently, it should be noted that only in 2015 it went below 1, namely 0,9164; the highest number was reached in 2016 and equaled to 1,0707.

Coefficient of concealment (understatement) of taxes has a twofold nature: on the one hand, it shows effectiveness of tax authorities in revealing undeclared (concealed, understated) tax payments, on the other hand – in case of growth of this indicator – it demonstrates the continuity of the tendency to conceal the taxes by taxpayers. It, in contrary, attests to ineffective work of tax authorities regarding revealing of concealed (understated) units of taxation and constitutes a threat to the tax security of the state. Thus, for the further

analysis it is necessary to define, which position is more rational in the current research, and on what grounds the optimization route of this indicator should take place. Therefore, from the state's point of view and proceeding from the necessity of providing for its tax security, it is necessary to deem that coefficient of concealment (understatement) of debts characterizes the extent of concealment of debts by taxpayers, hence, in order to provide a high level of tax security it is necessary that the index of this coefficient was constantly decreasing.

An actual coefficient value for concealment (understatement) of taxes is rather low: in 2015 in equaled to 2,56%, in 2016 it reached its maximum in the period analyzed and equaled to 3,05%, and in 2017 in went down to 1,8%, which is the minimum in the period analyzed. It constitutes dynamics and attests to the growth of efficiency and quality of tax administration, as well as it attests an effective work of the tax authorities in respect of revealing the shadow economy, which is connected with the introduction of remote control tools and monitoring of tax ambient. All these aspects help to fill the budget and to reduce the shadow sector, to balance the competition conditions, to decrease corruption and, in a long term, to increase the effectiveness of economy. Regarding the comparable indicators, it could be noted that due to the average number of the analyzed indicator equaled to 0,0203, in 2016 the comparable indicator was below 1 and equaled to 0,8551, and in 2015 and 2017 – 1,0326 and 1,1600 correspondently, which attests to strengthening the audits in the country.

Coefficient of effectiveness of on-site audits, as the coefficient value for concealment of taxes, has a twofold nature. For this reason for the purposes of analysis of the tax security we opt for the pattern where the less on-site audits revealing violations there are, the higher the tax security level is, as it will attest to that the taxpayers faithfully declare their taxation bases and do not attempt to "go into the shadow". Thus, resulting from the analysis of the given indicator, we can conclude that the tax authorities during on-site audits reveal violations in more than 98 cases out of 100. Hence, the effectiveness of such control events is rather high, however it also attests to that the taxpayers have been still trying to conceal their income by understating their tax payments. Together with that we should mark a sustainable decreasing dynamics of this indicator: from 99,09% in 2015 to 98,71% in 2017. Given that the norm of this indicator is its average number, comparable indicators of coefficient of effectiveness of on-site audits in 2015-2016 were below 1, whereas in 2017 they somewhat exceeded this number, having reached 1,0024. It attests to increasing in tax security regarding this indicator.

The last of the indicators analyzed – coefficient of revealed errors when submitting tax returns – is in its essence similar to the two previous indicators. Hence for the purposes of the analysis we should set the position that the less errors there will be revealed by desk audits, the higher the level of the state tax security will be. Regarding the actual indices of the indicator, we should highlight the dynamics of decreasing in the end of the analyzed period – in comparison to its beginning. Where in 2015 coefficient of revealed errors equaled to 0,59%, in 2017 it equaled 0,36% already, which is an undoubtedly positive dynamics. However it should be said that in 2016 there was a growth of the number of the errors revealed in tax returns both in the absolute quantity and in relative to the total sum of the payments declared. As far as the comparable indicators are concerned, the maximum index was reached in 2017 and equaled to 1,5186, and the minimum – in 2016, equaled to 0,8025.

Thus, studying the comparable indicators, it could be noted that in 2015 three indicators out of six satisfied the average numbers, in 2016 – two out of six, in 2017 – five out of six exceeded 1, which attests to the strengthening of the tax security of the state.

Below we execute an integral estimation of the tax security of the Russian Federation using the method of addition.

Integral index of tax security – II TS

II_TS (c) 2015 = 1,0045 + 1,0669 + 0,9164 + 1,0326 + 0,9986 + 0,9129 = 5,9319.

II_TS (c) 2016 = 0,9779 + 1,0155 + 1,0707 + 0,8551 + 0,9990 + 0,8025 = 5,7207.
II_TS (c) 2017 = 1,0090 + 0,9175 + 1,0258 + 1,1600 + 1,0024 + 1,5186 = 6,6333.

Integral index of tax security – II TS

Given that the analysis of the tax security took 6 indicators into consideration, the average number of the integral indicator on the basis of addition method shall be 6. Thus, during the whole analyzed period the tax security of the state was at a satisfactory level only in 2017 (the integral indicator of tax security equaled to 6,6333). The worst year from the tax security point of view was 2016, as the actual number of the integral indicator is the furthest from the norm (0,2793 below it).

Below we execute an integral estimation of the tax security of the Russian Federation using the method of multiplication.

II_TS (c) 2015 = 1,0045 × 1,0669 × 0,9164 × 1,0326 × 0,9986 × 0,9129 = 0,9245.
II_TS (c) 2016 = 0,9779 × 1,0155 × 1,0707 × 0,8551 × 0,9990 × 0,8025 = 0,7289.
II_TS (c) 2017 = 1,0090 × 0,9175 × 1,0258 × 1,1600 × 1,0024 × 1,5186 = 1,6769.

The norm of the integral indicator of the tax security of the Russian Federation using the method of multiplication is 1. The results of the analysis performed on the basis of this method confirm the data got out of defining the integral indicator by method of addition: the tax security of the state was at a satisfactory level only in 2017, whereas in 2016 its level was the lowest.

Here are the areas of the polygons.

S 2015 = ½ × sin (360 ÷ 6) × (1,0045 × 1,0669 + 1,0669 × 0,9164 + 0,9164 × 1,0326 + + 1,0326 × 0,9986 + 0,9986 × 0,9129 + 0,9129 × 1,0045) = 2,5390.

S 2016 = ½ × sin (360 ÷ 6) × (0,9779 × 1,0155 + 1,0155 × 1,0707 + 1,0707 × 0,8551 + + 0,8551 × 0,9990 + 0,9990 × 0,8025 + 0,8025 × 0,9779) = 2,3526.

S 2017 = = ½ × sin (360 ÷ 6) × (1,0090 × 0,9175 + 0,9175 × 1,0258 + 1,0258 × 1,1600 + + 1,1600 × 1,0024 + 1,0024 × 1,5186 + 1,5186 × 1,0090) = 3,1449.

Thus, the results of analyzing the tax security in the Russian Federation via the graphical method, confirm the data got out as a result of the integral analysis: the tax security of the state was at a satisfactory level only in 2017, whereas in 2016 its level was the lowest.

On the grounds of the scientific researches [14-16] and on the results got [17-26], we can define the following threats to the tax security (Figure 1).
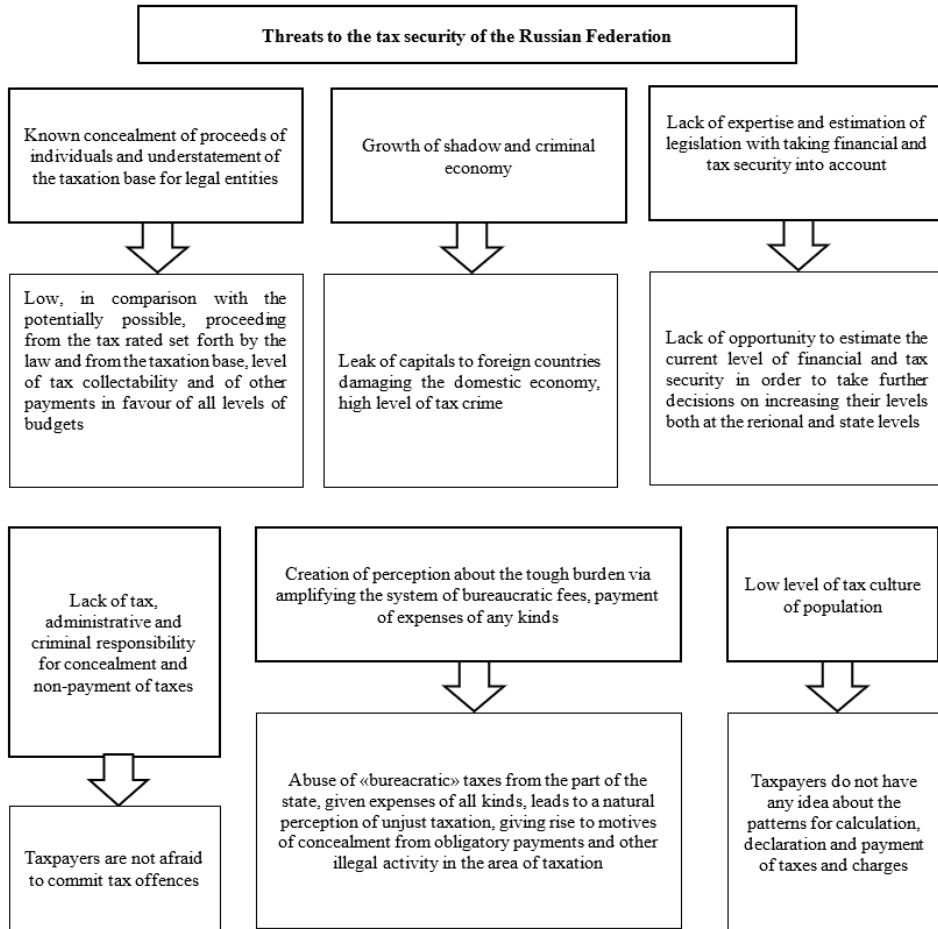
Fig. 1. Threats to the tax security of the Russian Federation and their consequences.

The main threats are: known concealment of proceeds of individuals and understatement of the taxation base for legal entities; growth of shadow and criminal economy; lack of expertise and estimation of legislation with taking financial and tax security into account; lack of tax, administrative and criminal responsibility for concealment and non-payment of taxes; creation of perception about the tough burden via amplifying the system of bureaucratic fees, payment of expenses of any kinds; low level of tax culture of population

4 Conclusions

In the Russian Federation at the moment there are a number of problems that impede the provision of a high level of tax security in the state as a tool for management in socio-economic systems. At that it is important to constantly monitor threats and to timely reveal new challenges and risks of decreasing in the effectiveness of the country's taxation system. It will allow to prepare in advance to combat the negative factors of the internal and external ambient, to decrease the negative influence of the current threats to the tax security, and also to elaborate measures to avoid some particular threats in the future.

As of today there has been adopted the Strategy for economic security, which constitutes the fundamental base for providing the state security in the field of economy and which

defines a number of the current threats and challenges to the financial system. However the given document hardly pays any attention to the problems of providing the financial security in general and tax security in particular; moreover there notions are still not mirrored in the legislative base. It results from the abovementioned that it is necessary to elaborate a State financial security strategy, which would include the definitions, content and structure of the categories analyzed, together with the courses of action of the state authorities in respect of providing the financial security in general and the tax security in particular. It is also important to thoroughly elaborate a mechanism for realization of the State strategy, as its elaboration and adoption will not provide for a high level of the tax security in the country.

5 Further research

The definition of tax security as an independent type of security is a necessary step towards improving the financial security of the state as a tool for management in socio-economic systems. The assessment of tax security and revelation of threats in this area is a primary task, with its solution allowing to at least increase the level of budget security and also will positively mirror on the financial security of a state. In the further research it is necessary to pay attention to elaboration of a complex methodic of assessment of the tax security of the state, which would provide a timely diagnostic of the tax sphere condition, and also revealing of the current threats and a direct estimation of the negative factors and risks affecting the state taxation system. It would allow to approach more systematically and knowingly to elaboration and realization of the tax policy, to timely reveal and eliminate consequences of tax offences, to increase tax collectability and to provide for a high level of the state tax security.

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