

Assessment of Regional Economic Security Level in Innovative Development

Lidia S. Arkhipova^{1,*} and Elena I. Kulikova²

¹*Plekhanov Russian University of Economics, 117997, Moscow, Stremyanny pereulok, 36, Russia*

²*Financial University Under the Government of the Russian Federation, 125993, Moscow, Leningradsky prospekt, 49, Russia*

Abstract: Analysis of the innovative development of the regional economy is a relevant problem due to its role in ensuring the economic security of the country and achieving priority goals. The subject of the research are the regions of one of Russia's most dynamically developing macro-regions – the Volga Federal District. It features innovation clusters, a network of modern manufacturing companies, research organizations. At the same time, it developed a significant territorial heterogeneity of the regional space.

Therefore, in the course of the study, a typology of the regions was drafted according to a number of indicators, which made it possible to assess the level of their innovative development and identify zones of relative stability, medium and critical state. A forecast of the main indicators of the innovation component was made showing the ability of the regions to overcome the factors preventing the development of the innovation economy.

The research results showed that most of the regions have a medium level of economic security in the field of innovation. The Nizhny Novgorod Region and the Republic of Tatarstan are at a high level. The economy of these regions is characterized by a high level of diversification, resilience to instability in the domestic market and external challenges. The Saratov region, the Republic of Mari El and the Orenburg Region are in a low-level zone. A short-term forecast indicates that in general the situation will not change – the regions will increase or decrease the values of the indices within the achieved levels of economic security. A qualitative transition to a new level is possible provided that the problems that hinder the innovative economy in the regions are eliminated.

Keywords: Regions, innovative component, economic security, calculation methods.

I. INTRODUCTION

The Volga Federal District is one of the most successfully developing macro-regions in Russia. Regional specific features of evolution or regression in innovation depend on the effectiveness of state policy (Nikitskaya, *et al.* 2014; Nosova, *et al.* 2018). This macro-region is characterized by the stable pace of industrial production, the development of innovative and industrial clusters, and a powerful network of modern research organizations. The regions of the district are provided with the most important factors of economic growth and the development of an innovative economy. However, considerably uneven socio-economic development of the regions, instability of the overall macroeconomic situation in the country promote the development of significant problems and challenges to the economic security of this territory.

One of the most important priorities of the state policy in the Russian Federation is the transition of the economy to an innovative model and, as a consequence, to the growth of innovative production, which is the basis for improving the living standards of

the population and ensuring sustainable economic growth. An innovative factor in the economic development influences the economic structure of the country and its regions, increases the efficiency of the main types of economic activity that have developed in a certain territory, and to a large extent ensures regional economic security (Glazyev S.Yu. 1997; Zhukovskaya, *et al.* 2018; Kormishkina, *et al.* 2017).

II. ANALYSIS AND RESULTS

The research results are based on modern statistical, comparative and analytical methods. Methods developed by Russian scientists were used for the calculation of indices evaluating the innovative component of the economic security of the regions. They made it possible to determine the role of innovation in the regions, showed their ability and readiness to introduce innovation in the economy. Calculations were made allowing to group the regions according to the level of economic security in the innovation sphere.

Economic security is the state of protection of the national economy from external and internal threats, which ensures the country's economic sovereignty, the unity of its economic space, and the conditions for the implementation of strategic national priorities of the

*Address correspondence to this author at the Plekhanov Russian University of Economics, 117997, Moscow, Stremyanny pereulok, 36, Russia; Tel: +7(926)354-21-41; E-mail: lidia.arkhipova@mail.ru

Russian Federation (Decree of the President of the Russian Federation, 2017). The innovative component of the region’s economic security, in its turn, is a state of innovative development of the region that characterizes the stability and sustainability of the territory’s economy and is determined by the ability of the state to protect the interests of its entities based on the development and implementation of a long-term innovation policy.

The analysis of the innovative development level of the regions in the Volga Federal District was carried out using methods developed by Russian scientists and tested by the authors of the study.

According to the proposals of scientists from the Institute of Economics at the Russian Academy of Sciences (Senchagov and Mityakov, 2015) a composite index of the innovative component of economic security was calculated, which allows us to determine whether a region belongs to a specific threat zone according to the main indicators.

The calculated index of the innovative component of economic security in the regions of the Volga Federal District (Figure 1) indicates that only one region is in the “stability” zone and has a very high level of economic security in innovation – the Nizhny Novgorod Region.

According to the forecast drafted until 2020, a slight decrease in the index is expected, which indicates a

possible enhancement of challenges in economic security in the innovation sphere. Nevertheless, it can be expected that the Nizhny Novgorod Region will stay within the “stability” zone which is a positive trend for the entire district.

Diagnostic results for other entities of the district regarding “threat zones” and a short-term forecast are presented in Table 1.

The zone of high-level economic security in innovation (between 0.75 and 1) features three regions – the Republic of Tatarstan, the Perm Krai and the Ulyanovsk Region. Over 2010-2017, the index in these regions is relatively stable: in some years it transferred to the zone of “significant threat” (for example, the Republic of Tatarstan in 2015-2016, the Perm Krai in 2014), but in general there are no sharp shifts to the zone of “critical threat”, which is a positive trend.

According to the forecast, only in the Perm Krai starting from 2019-2020, the value of the index will be steadily increasing, which indicates a weakening of threats to economic security. In general, the Perm Krai, the Republic of Tatarstan, and the Ulyanovsk Region in the forecast period will remain in the zone of “moderate threat”, which indicates a significant potential of the regions.

The zone of medium-level economic security in innovation (between 0.5 and 0.75) features six regions: the Republic of Bashkortostan, Mordovia and

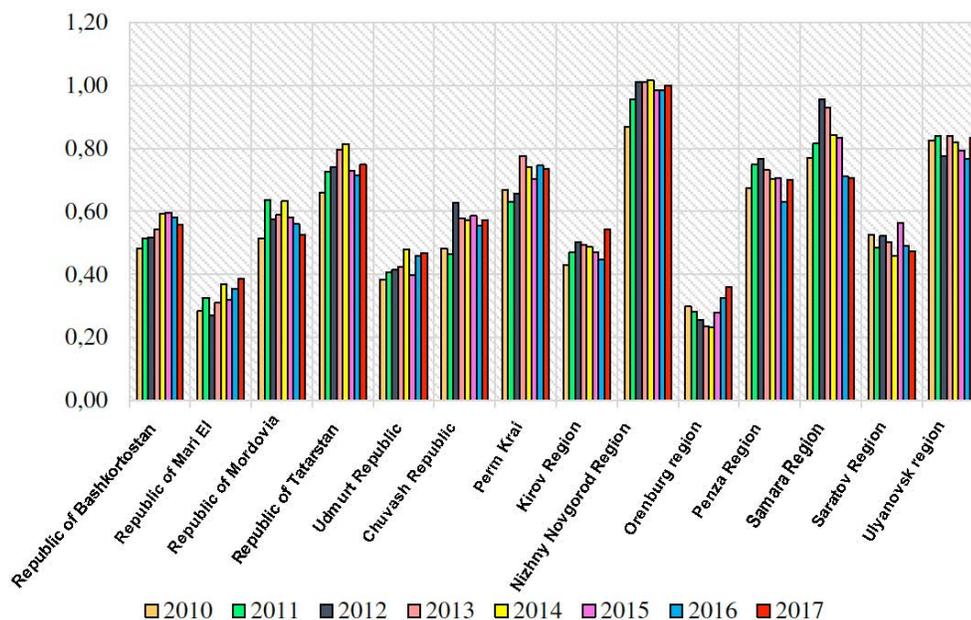


Figure 1: Composite index of the innovative component of economic security in the Volga Federal District (compiled by the authors based on the calculation results).

Table 1: Typology of the Volga Federal District regions by “Threat Zones” and Forecast Until 2020

“stability” zone (values from 1 to 1.6).	“moderate threat” zone (values from 0.75 to 1).	“significant threat” zone (values from 0.5 to 0.75).	“critical threat” zone (values from 0.25 to 0.5).	“catastrophic threat” zone (values from 0 to 0.25).
1) Nizhny Novgorod Region (↑↓=)	1) Republic of Tatarstan (↑↓↓) 2) Perm Krai (↑↑↑) 3) Ulyanovsk Region (↓↓↑)	1) Republic of Bashkortostan (↑↑↑) 2) Republic of Mordovia (↑↓↓) 3) Chuvash Republic (↑ = ↓) 4) Kirov Region (↓ = ↑) 5) Penza Region (↓↓↓) 6) Samara Region (↑↓↓)	1) Saratov region (↑ = ↓) 2) Mari El Republic (=) ↑↑) 3) Udmurt Republic (=) ↑↑) 4) Orenburg Region (↓↓↑)	-

(↑) – forecasted index growth.

(↓) – forecasted index drop.

(=) – forecasted index remained at the same level compared to last year.

Authors' calculations based on data from information portals.

Chuvashia, as well as the Kirov, Penza and Samara Regions.

Over 2010-2017, the Chuvash Republic improved its position regarding the “threat zone”, until 2012 the region remained in the zone of “critical threat”. The Kirov Region also saw a significant improvement: over 2010-2016, the region remained firmly in the zone of “critical threat” and only in recent years the situation has changed for the better. The Samara region, on the contrary, was in the zone of “moderate threat” until 2016 and 2017, and only in the last two years the indicators worsened. The Republic of Bashkortostan, the Republic of Mordovia, and the Penza Region were firmly in the zone of “significant threat”.

According to the forecast until 2020, the index will decrease in the Republic of Mordovia, the Chuvash Republic, the Penza Region and the Samara Region, which, of course, will affect their economic security. It is worth noting that, in general, the regions will remain within the “significant threat” zone, as well as the Republic of Bashkortostan and the Kirov region, in which a slight increase in the index is expected. Thus, if the current economic policy remains the same, the level of economic security in these entities will remain at a medium level.

The zone of low-level innovative component of economic security (between the values of 0.25 and 0.5) includes the Saratov Region, the Republic of Mari El, the Udmurt Republic, the Orenburg Region. The minimum value of the index over 2010-2017 is demonstrated by the Orenburg Region: the index ranges from 0.2 to 0.3. This indicates that the region has a low level of economic security in innovation, and urgent measures are required to improve the situation.

In general, these regions demonstrate positive dynamics, which is a positive trend and there is a probability of improvement in the future.

In all the regions of the district, except for the Saratov Region, the index of the economic security innovative component is expected to grow by 2020, it means that threats to economic security in the short term can be mitigated provided that the country's macroeconomic situation is positive.

None of the regions of the Volga Federal District entered the zone of “catastrophic threat” (values from 0 to 0.25).

Thus, the analysis and assessment of the composite index of the innovative component of economic security in the regions of the Volga Federal District revealed an unfavorable situation in terms of remoteness of the economic security indicators in innovation from threshold values: only one region, the Nizhny Novgorod Region, is in the “stability” zone and has a very high level of economic security in innovation, while most of the regions are located in the zone of “significant” and “critical threat”.

The forecast until 2020 confirms that the territorial entities face significant challenges and threats – all regions will remain within the achieved level of economic security, which means that there are significant threats in the innovation sphere in the regions of the Volga Federal District. To increase the level of economic security in this area, state support measures are required, as well as efforts on the part of regional authorities to increase the cost-effectiveness of innovation.

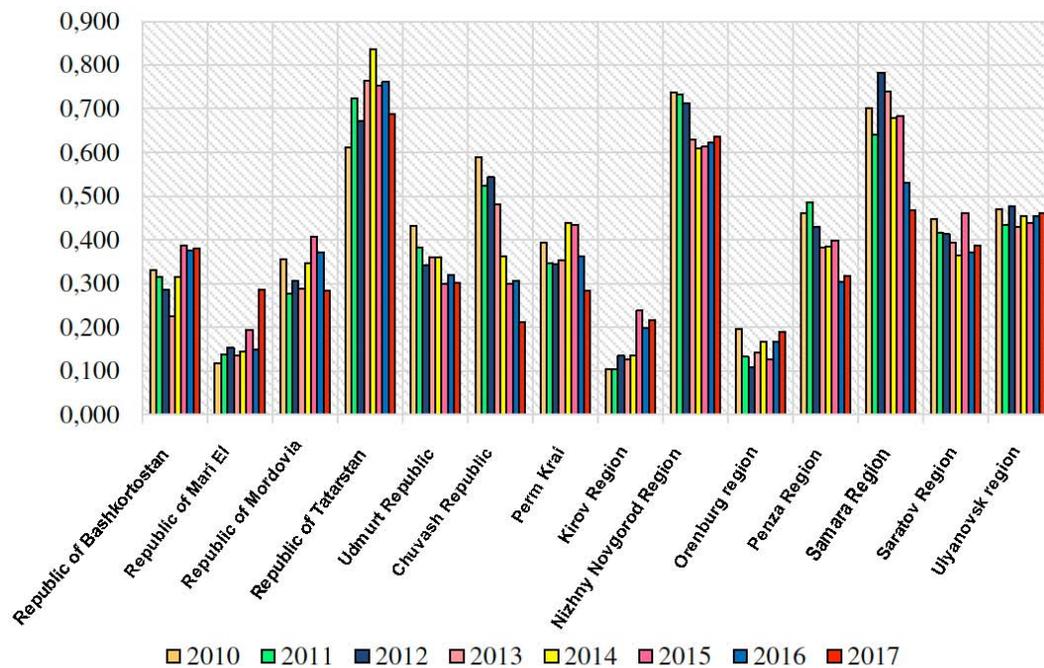


Figure 2: General Innovation Index in the Volga Federal District regions (compiled by the authors based on the calculation results).

The next approach was developed by the Independent Institute for Social Policy of the Russian Federation, based on the calculation of the regional innovation index (Independent Institute of Social Policy of the Russian Federation, 2006). In this regard, the regions of the Volga Federal District were analyzed with respect to their ability to create innovations and their readiness to introduce them into the economy.

Calculations of the general innovation index, as the arithmetic average of the five calculated sub-indices (normalized indicators) made it possible to arrange the regions according to the level of their ability and readiness to introduce innovations in the economy, which indicates the state of the regional innovation economy (Figure 2).

The results of the calculated general index of economic security innovativeness of the regions in the district (Figure 2) show that only three regions are capable and ready to introduce innovations in the economy, that is, they have a high level of economic security in the innovation sphere – the Republic of Tatarstan, the Nizhny Novgorod Region, and the Samara Region. According to the forecast until 2020, the Republic of Tatarstan and the Nizhny Novgorod Region (despite a decrease in the index in the next three years) will remain at a high level of economic security, while the Samara Region will transfer to a medium level of economic security starting from 2019,

which reflects the presence of significant problems and threats in the region.

Successful implementation of innovations is associated with factors such as leadership in the quality of human potential, high innovation activity of enterprises, and investments in science and new technologies.

Now, we will analyze the remaining regions of the Volga Federal District regarding their ability and readiness to introduce innovations in the economy and the forecast until 2020 (Table 2).

The calculation results show that most of the regions are able to introduce innovations in the economy, but are not ready to implement them. Therefore, the regions can be divided into two groups.

The first group includes those entities that throughout the study period had a medium level of economic security in the innovation sphere: the Republic of Bashkortostan, the Republic of Mordovia, the Udmurt Republic, the Chuvash Republic, the Perm Krai, the Penza Region, the Saratov Region, the Ulyanovsk Region. The situation in them is stable. The forecast shows a high probability that all of these regions, with the exception of the Chuvash Republic, will remain at a medium level of economic security. In the Chuvash Republic up to 2020, problems in the

Table 2: Typology of the Volga Federal District Regions by their Ability and Readiness to Introduce Innovations in the Economy and Forecast Until 2020

The region is able and ready to introduce innovations in the economy (values above 0.5).	The region is able, but not ready to introduce innovations in the economy (values from 0.2 to 0.5)	The region is poorly able and not ready to introduce innovations in the economy (values from 0.1 to 0.2)	The region is not able and not ready to introduce innovations in the economy (values below 0.1)
1) Republic of Tatarstan (↑↑↑) 2) Nizhny Novgorod Region (↓↑↑) 3) Samara Region (↑ ↓↓)	1) Republic of Bashkortostan (↑↑↑) 2) Mari El Republic (↓↑↑) 3) Republic of Mordovia (↑↑↑) 4) Udmurt Republic (↓↓↓) 5) Chuvash Republic (↓↓↓) 6) Perm Krai (↑↓↓) 7) Kirov Region (↑↑↑) 8) Penza Region (↓↓↓) 9) Saratov Region (↓↓↓) 10) Ulyanovsk Region (↓ = ↓)	1) Orenburg Region (↓↑↑)	-

(↑) – forecasted index growth.

(↓) – forecasted index drop.

(=) – forecasted index remained at the same level compared to last year.

Authors' calculations based on data from information portals.

innovation sphere are expected to intensify, which will lead to a transfer to a low level of economic security.

The second group includes regions that increased their level of economic security only in 2017 and moved from a low to a medium level: the Republic of Mari El and the Kirov Region. The situation in these regions is rather unstable, thus, additional measures are needed so that the level of economic security does not drop again. The forecast for the coming years suggests that both in the Mari El Republic and in the Kirov Region the index will grow, therefore, it is likely that both entities will steadily occupy the medium level of economic security.

The dynamics of the general innovation index indicates that in some regions in the period of 2010-2013 it declined steadily, then growth continued until 2017 (the Republic of Bashkortostan, the Saratov Region, the Udmurt Republic, the Perm Krai). In a number of regions, the annual dynamics is variable, which indicates the instability of these regions in the achieved level of economic security of the innovation sphere. These are the Republic of Mari El, the Republic of Mordovia, the Kirov Region, the Ulyanovsk Region.

Only one region is not capable enough and is not ready to introduce innovations in the economy – the Orenburg Region. This region is an outsider in the district according to the general innovation index. It has developed a critically low level of economic security in the field of innovation. If we analyze the dynamics of the general index, we can observe its cyclical nature

and growth by 2017. On the whole, the situation requires urgent measures to improve innovative activity in the region, otherwise it will inevitably lag behind other entities even more.

The forecast drafted until 2020 showed an expected slight increase. However, the situation in the Orenburg Region will not change significantly and the region will continue to be at a critically low level of economic security.

The main measures that can change the situation in the region include the effective use of potential, improving the skills of the workforce, improving the investment climate, and increasing investment in modern production.

Thus, the analysis of the general innovation index suggests that most of the regions of the Volga Federal District have a medium level of economic security in the innovation sphere, that is, the regions are able, but not ready, to introduce innovations into the economy. The calculated forecast showed that all regions except for the Chuvash Republic (transition from medium to low level from 2018) and Samara region (transition from high to medium level from 2019) will remain within the achieved levels of economic security. This means that there are factors holding back the transition of regions to a new level of economic security (Kormishkina, *et al.* 2017).

The third method for assessing the innovative component of the economic security in the Volga

Federal District regions is rating the regions according to their level of innovative development (Gusev, 2018). It allows calculating the rating of regions according to two groups of factors: innovation susceptibility and innovative activity.

The index of innovative development of regions' economic security is calculated for this purpose as the arithmetic average of the sub-index of innovation susceptibility and innovative activity (Table 3, Figure 3).

A high level of economic security (values from 70 to 100) according to the index of innovative development in 2017 is demonstrated by two regions of the district – the Republic of Tatarstan and the Nizhny Novgorod Region. Both regions consistently occupy leading positions. In the short term, they will have a consistently high level of economic security due to the fact that they are regional zones of Russia's innovative economy (Zhukovskaya, et al. 2018).

Most regions of the Volga Federal District have a medium level of economic security (values from 40 to 70) by the index of innovative development: the Republic of Bashkortostan, the Republic of Mordovia, the Udmurt Republic, the Perm Krai, the Penza Region, the Samara Region, and the Ulyanovsk Region. The Republic of Mordovia and the Udmurt Republic are the only regions that were not always at a medium level of economic security: the first entity transferred to a low

level in 2011-2013, and the second one – in 2011-2015.

The short-term forecast shows the absence of fundamental changes – all the regions with a medium level of economic security will remain within this range, which indicates the presence of threats that limit the development of the region in the field of innovation.

A low level of economic security (values from 10 to 40) by the index of innovative development is typical for the Republic of Mari El, the Chuvash Republic, the Kirov, Orenburg and Saratov Regions. All these regions are within a low level of economic security, which indicates that there are significant problems preventing further development.

By 2020, two regions will be able to transfer to the medium level of development – the Republic of Mari El and the Chuvash Republic. The other regions will remain at a low level, although a positive development trend is observed.

No regions in the district have a critically low level of economic security (values below 10).

Thus, the calculation and analysis of the innovation development index, where the main role is played by innovation susceptibility and innovative activity of the regions, showed that most of the entities in the district have a medium level of economic security. Only the

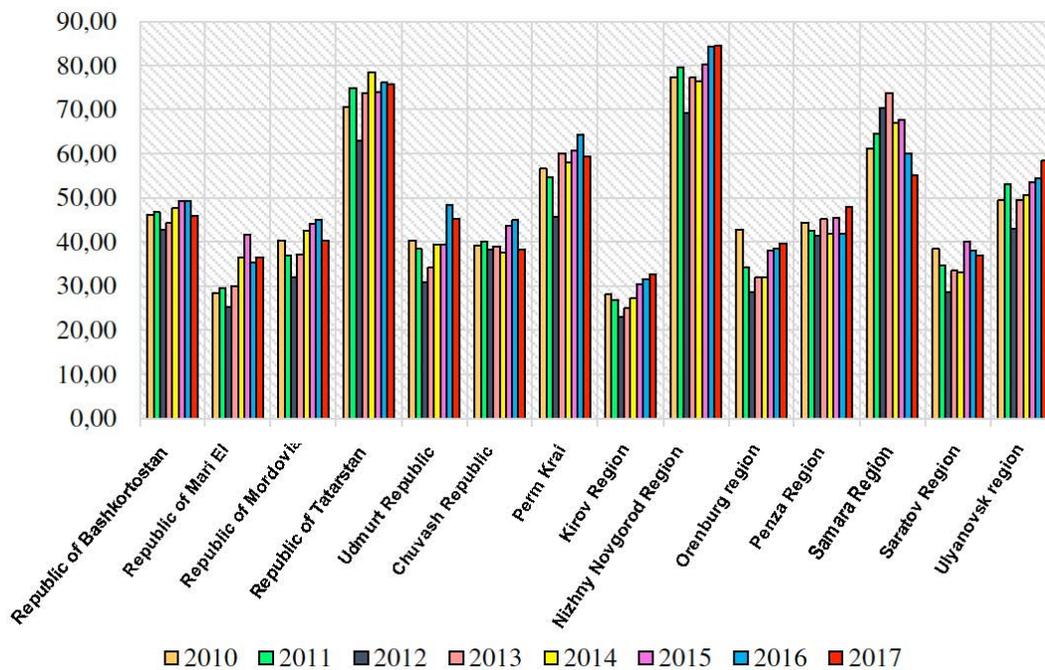


Figure 3: Innovation Development Index in the Volga Federal District regions (compiled by the authors according to the calculation results).

Table 3: Typology of Regions in the Volga Federal District by Innovative Development and a Three-Year Forecast Until 2020

The region has a high level of innovative development. (values from 70 to 100)	The region has a medium level of innovative development. (values from 40 to 70)	The region has a low level of innovative development. (values from 10 to 40)	The region has a critically low innovative development (values below 10)
1) Republic of Tatarstan (↑↑↑) 2) Nizhny Novgorod Region (↑↑↑)	1) Republic of Bashkortostan (↑↑↑) 2) Republic of Mordovia (↑↑↑) 4) Udmurt Republic (↑↑↑) 5) Perm Krai (↑↑↑) 6) Penza Region (↓↑) 7) Samara Region (↑↓) 8) Ulyanovsk Region (↓↑)	1) Mari El Republic (↑↑↑) 2) Chuvash Republic (↑↑↑) 3) Kirov Region (↓↑) 4) Orenburg Region (↓↑) 5) Saratov Region (↑↑)	-

(↑) – forecasted index growth.

(↓) – forecasted index drop.

(=) – forecasted index remained at the same level compared to last year.

Authors' calculations based on data from information portals.

Republic of Tatarstan and the Nizhny Novgorod Region reached a high level.

The forecast until 2020 reflects the fact that only two entities will be able to transfer to a higher level of economic security (from low to average), namely, the Republic of Mari El and the Chuvash Republic. The other regions will stay within the achieved values. Thus, we can conclude that a larger number of regions face problems that limit their innovative development.

III. CONCLUSION

The results of all three methods were summarized to present general assessment of the situation in the regions of the Volga Federal District. They demonstrated that most of the regions have a medium level of economic security in the field of innovation – the Samara Region, the Perm Krai, the Ulyanovsk Region, the Republic of Bashkortostan, the Republic of Mordovia, the Penza Region, the Chuvash Republic, the Kirov Region, the Udmurt Republic.

Following the results of the three methods, the Nizhny Novgorod Region and the Republic of Tatarstan have a high level of economic security in the field of innovation. It is worth noting that the economy of these regions is characterized by a high degree of resilience, including resilience to instability in the domestic market and external challenges. The Volga Federal District is characterized by a stable production potential, leads in the production of innovative products per capita, has an average level of labor productivity, which contributes to a high level of innovative development in general (Arkhipova, *et al.* 2018).

A low level of economic security in the field of innovation is characteristic for the three regions – the

Saratov Region, the Republic of Mari El and the Orenburg Region. While during the research period, the Saratov region and the Mari El Republic were able to occupy the medium level of economic security in terms of their capability and ability to introduce innovations in the economy, the Orenburg region is in the worst situation. Following the calculations of all the three methods, this region is characterized by a low level of economic security, which reflects the fact that the region in recent years has accumulated many threats that hinder the improvement of economic security.

Thus, the assessment of the innovative component of the economic security in the regions showed that the entities of the Volga Federal District face problems and threats limiting the development of this sphere. Most of the regions have a medium level of economic security in the field of innovation. The Nizhny Novgorod Region and the Republic of Tatarstan are at a high level, while the Saratov Region, the Republic of Mari El and the Orenburg Region are at a low level.

The forecast indicates that in general the situation will not change – the values of the indices will be increased or decreased within the achieved levels of economic security. However, a qualitative transition to a new level is not expected, which suggests the need to mitigate threats to the innovative component of economic security in the regions.

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Received on 02-12-2019

Accepted on 02-02-2020

Published on 11-02-2020

[DOI: https://doi.org/10.6000/1929-7092.2020.09.11](https://doi.org/10.6000/1929-7092.2020.09.11)

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