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Use of statistical tools when monitoring threats to national security

Abstract. The article is devoted to assessment of the impact of corruption on economic growth in the context of globalization. The goal of the research is to substantiate the use of statistical methods when assessing the impact of corruption on economic growth. In conditions of Russia's transition to an innovative path of economic development an urgent task is to increase economic growth. Corruption has a negative impact on economic growth, reducing the efficiency of public investments; as well as on investment attractiveness, scaring off foreign investors. Because of corruption, revenues from taxation reduce; the budget does not receive the necessary funds to finance government expenditures. Ultimately, these negative effects lead to the diminution of economic security. The problem of corruption is high on the list of threats to national security of any state. It is pointed out that the use of matrix method allows assessing the positions of the countries in terms of two factors: the Corruption Perceptions Index and the value of GDP per capita. A statistical estimation of the impact of corruption on economic growth using regression model is presented. The conclusion concerning the necessity of methodology developing for quantification of threats to national security is made.

Keywords: Corruption; Corruption Perceptions Index; National Security; Threats to National Security; Economic Growth

JEL Classification: F01; H56; O57

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Использование статистических инструментов в мониторинге угроз экономической безопасности

Аннотация. Статья посвящена оценке влияния коррупции на экономический рост в условиях глобализации. Целью научного исследования является обоснование использования статистических методов при оценке влияния коррупции на экономический рост. В условиях перехода России на инновационный путь экономического развития актуальной задачей является повышение темпов экономического роста. Коррупция оказывает отрицательное влияние на экономический рост, поскольку снижает эффективность государственных инвестиций, негативно отражается на инвестиционной привлекательности, отпугивая иностранных инвесторов; по причине коррупции уменьшаются поступления налоговых доходов, бюджет не получает необходимый объем средств для финансирования государственных расходов. В конечном итоге указанные негативные воздействия приводят к снижению экономической безопасности государства. Проблема коррупции занимает одно из первых мест в перечне угроз национальной безопасности любого государства. Отмечается, что использование матричного метода позволило оценить позиции стран в зависимости от двух факторов: индекса восприятия коррупции и значения ВВП на душу населения. Представлена статистическая оценка влияния коррупции на экономический рост с использованием регрессионной модели. Сделан вывод о необходимости разработки методического аппарата с целью количественной оценки угроз национальной безопасности.

Ключевые слова: коррупция; индекс восприятия коррупции; национальная безопасность; угрозы национальной безопасности; экономический рост.

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Використання статистичних інструментів для моніторингу загроз економічній безпеці

Анотація. Стаття присвячена оцінці впливу корупції на економічне зростання в контексті глобалізації. Метою наукового дослідження є обґрунтування використання статистичних методів при оцінці впливу корупції на економічне зростання. Корупція має негативний вплив на економічне зростання, оскільки знижується ефективність державних інвестицій, що негативно позначається на інвестиційній привабливості та відлякує іноземних інвесторів; з причини корупції зменшуються надходження доходів від податків, бюджет не отримує необхідний обсяг коштів для фінансування державних витрат. Зазначені негативні впливи призводять до зниження економічної безпеки держави. Проблема корупції посідає одне з перших місць у переліку загроз національній безпеці будь-якої держави. Відзначається, що використання матричного методу дозволило оцінити позиції країн залежно від двох факторів: індексу сприйняття корупції та показника ВВП на душу населення. Представлено статистичну оцінку впливу корупції на економічне зростання з використанням регресійної моделі. Зроблено висновок про необхідність розробки методичного апарату з метою кількісної оцінки загроз національній безпеці.

Ключові слова: корупція; індекс сприйняття корупції; національна безпека; загрози національній безпеці; економічне зростання.

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1. Introduction

Economic security is considered by most authors as the most important qualitative characteristic of economic system, which determines its ability to maintain normal living conditions for the population and sustainable resourcing of the national economy, as well as assert national interests.

The concepts of «threat» and «security» are closely related to each other: it is impossible to conduct a full study of economic security without examining threats. The economic damage inflicted on a subject as a result of materialisation of threats may be related to its inability to withstand competition, corruption and other internal and external factors.

Corruption is understood as an abuse of entrusted power for personal gain. According to macroeconomic researches, corruption is an obstruction to economic growth, which often provides financial support to organized crime and terrorism and constitutes a serious threat to the national security of states. Corrupt behaviour of authorities as a social phenomenon restricts economic freedom in business environment and freedom of competition, increases differentiation of the population by the level of income and the quality of life, leads to social and economic instability and political tension in a country.

2. Brief Literature Review

The study of scientific literature has shown that modern scholars consider corruption as the most serious obstacle to the effective implementation of the socio-economic and political strategy of states.

Recent empirical studies have revealed that corruption is responsible for low economic growth, less foreign and domestic investment, high inflation, currency depreciation, low expenditures on education and health, high military expenditures, high income inequality and poverty, less tax revenue, and high child and infant mortality rates [1]. When corruption has become systemic, it resembles organized crime [2].

According to the team of authors, Kenny, Klein & Sztajrowska (2011), «the first line of defense for policymakers against the major ill effects of corruption in infrastructure is the restriction of government transfers to firms and reliance on consumer prices that effectively cover full cost. Corrupt elites may have an interest in going along with such policy change, because it might make them better off too» [3].

The paper shows that different types of corruption differently affect economic development. Bad corruption, or corruption which is associated with poor institutions, has a negative impact on economic growth and capital accumulation. However, residual (idiosyncratic) corruption, or corruption which is uncorrelated with other governance characteristics, has a strong positive effect on development in countries with poor institutions [4].

Corruption benefits the few at the expense of the many; it delays and distorts economic development, preempts basic rights and due process, and diverts resources from basic services, international aid, and whole economies [5].

It might be well to point out that scholars study the influence of the corruption upon different parameters of socio-economic development of society. In such a way, the research of causal effect between the corruption and the availability of large volume of natural resources is of special interest [6].

The research conducted by Papaconstantinou, Tsagkanos & Siriopoulos (2013) corroborated the negative influence of the bureaucracy on the growth of the Gross Domestic Product per capita of the European Union [7].

It was proved by Ehsan, Rosser and Rosser (2004) that the growth of the tax burden contribute to the increase of the illegal (black-market) component of the economy, which is closely connected with the corruption [8].

Thus, a successful anti-corruption policy is impossible without fundamental studies of this phenomenon, as well as the factors which cause it.

3. Purpose

To substantiate the use of statistical methods when assessing the impact of corruption on economic growth.

The authors propose to use statistical tools that allow characterising the relationship of corruption phenomena and living standards, as well as giving evaluation of the level of the impact of its factors in the overall system of threats to the national interests of a state.

The statistics of OECD National Accounts Statistics Database for the countries and the data published by Transparency International are the information base (materials) of this study.

The methods of comparative, dynamic, coefficient and regression analyses of the key indicators using STATISTICA 7.0 program as well as graphical analysis of the obtained results (the construction of matrices) are applied in the study.

4. Results

World economic practice offers a variety of techniques for shadow economy assessment including corruption assessment. Thus, for example, an annual composite index which measures the level of corruption perception in the public sector in different countries called the Corruption Perceptions Index (CPI) is widely used. This index is calculated on the basis of surveys conducted among experts and business communities by the international organization Transparency International.

As it was noted above the CPI, in fact, is civil corruption control tool. It should be noted that national statistical services of different states are constantly improving methods of shadow economy quantitative evaluation, but there is no generally accepted global evaluation system, however. It is clear that statistical accounting and assessment of this phenomenon in the SNA (System of National Accounts adopted in all developed countries) will allow considering a detailed and comprehensive picture of the relationship of corruption and economic growth.

To evaluate the relationship and the impact of corruption and economic growth, we have conducted a study of sampled population of countries according to Transparency International (Table 1). The sampled population of the countries is ranked on a scale from 0 (the highest level of corruption) to 100 points (the lowest level of corruption).

Tab. 1: The CPI dynamics for the period of 2009-2013

| Country | 2009 | | 2010 | | 2011 | | 2012 | | 2013 | |
|---------------|--------|------|--------|------|--------|------|--------|------|--------|------|
| | Points | Rank | Points | Rank | Points | Rank | Points | Rank | Points | Rank |
| Russia | 22 | 146 | 21 | 154 | 24 | 143 | 28 | 133 | 28 | 127 |
| USA | 75 | 19 | 71 | 22 | 71 | 24 | 74 | 17 | 76 | 15 |
| Great Britain | 77 | 17 | 76 | 20 | 78 | 16 | 73 | 19 | 74 | 18 |
| Canada | 87 | 8 | 89 | 6 | 87 | 10 | 84 | 9 | 81 | 9 |
| Japan | 77 | 17 | 78 | 17 | 8 | 14 | 74 | 17 | 74 | 18 |
| Italy | 43 | 63 | 39 | 67 | 39 | 69 | 42 | 72 | 43 | 69 |
| Germany | 80 | 14 | 79 | 15 | 81 | 14 | 79 | 13 | 78 | 12 |
| France | 69 | 24 | 68 | 25 | 72 | 25 | 71 | 22 | 71 | 22 |
| China | 36 | 79 | 35 | 78 | 36 | 75 | 39 | 80 | 40 | 80 |
| India | 34 | 84 | 33 | 87 | 31 | 95 | 36 | 94 | 36 | 94 |
| Brazil | 37 | 75 | 37 | 69 | 38 | 73 | 43 | 69 | 42 | 72 |

Source: Based on the data from:

<http://www.transparency.org.ru/indeks-vospriiatiia-korruptcii>

In order to characterize the economic growth and eliminate territorial and demographic differences, we have calculated GDP per capita for the countries under study (Table 2).

Tab. 2: The GDP per capita dynamics for the period of 2009-2013

| Country | GDP per capita (US\$) | | | | |
|---------------|-----------------------|------------|------------|------------|------------|
| | 2009 | 2010 | 2011 | 2012 | 2013 |
| Russia | 8,776.223 | 15,921.429 | 15,546.763 | 18,014.493 | 18,340.278 |
| USA | 46,032.258 | 47,483.871 | 47,412.141 | 51,722.93 | 51,223.975 |
| Great Britain | 35,451.613 | 35,306.452 | 34,285.714 | 36,714.286 | 37,359.375 |
| Canada | 38,794.118 | 39,264.706 | 38,852.941 | 43,352.941 | 45,147.059 |
| Japan | 39,755.906 | 35,851.24 | 33,555.556 | 36,023.622 | 37,629.921 |
| Italy | 34,833.333 | 30,724.138 | 28,213.115 | 29,721.311 | 30,098.361 |
| Germany | 39,451.22 | 35,987.805 | 34,654.321 | 39,098.765 | 40,370.37 |
| France | 39,924.242 | 33,230.769 | 33,215.385 | 33,909.091 | 35,781.25 |
| China | 3,553.398 | 7,409.0226 | 7,363.5004 | 9,129.5607 | 12,178.022 |
| India | 1,046.296 | 3,449.275 | 3,259.882 | 3,913.692 | 4,012.759 |
| Brazil | 7,678.756 | 10,915.423 | 10,408.867 | 11,310.68 | 12,273.632 |

Source: Calculated by the authors using the World Bank Open Data

Using the matrix method, the relationship of CPI (in points) and economic growth (GDP per capita) is shown in dynamics for 2009 and 2013 in Fig. 1 and Fig. 2, respectively.

The obtained data analysis indicates a kind of stability in the dynamics when evaluating the relationship of CPI and economic growth for the last four years. Thus, the following countries are in the quadrant characterized by a high level of corruption and a low level of GDP per capita: India, China, Brazil, and Russia. Such countries as Great Britain, Canada, Germany, Japan and France are in the quadrant characterized by a low level of corruption and a high GDP per capita. Italy is in the quadrant characterized by a high level of corruption and a high GDP per capita.

Graphical analysis (Fig. 1 and Fig. 2) indicates a link between the Corruption Perceptions Index and GDP per capita.

The diversity of factors influencing the studied process can be divided into two groups: the main (it determines the level of the studied process) and the secondary. The secondary often has an accidental character, determining specific and individual features of every object of study, which is why the univariate regression was chosen.

Using the data shown in Table 3, we have conducted a statistical estimation of the impact of corruption on economic growth by means of regression analysis.

It is assumed that the rectilinear link is the basis for this dependence, which can be expressed as a simple linear regression equation (1):

$$\hat{Y} = a_0 + a_1 \times X \tag{1}$$

It is advisable to choose the CPI as an independent variable x and GDP per capita as a dependent variable y . To determine the parameters a_0, a_1 from the equation (1) STATISTICA 7.0 program package was used; the results of the regression analysis are presented in the form of equation (2)

$$Y_{GDP} = 23,914 + 0,00117 \times X_{CPI} \tag{2}$$

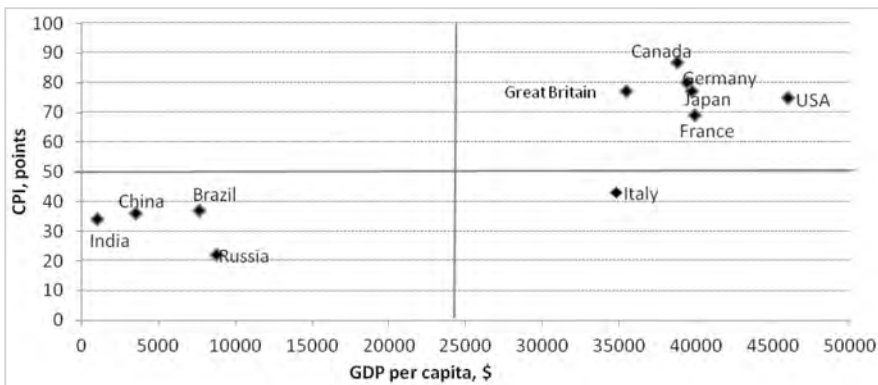


Fig. 1: Matrix of the relationship of CPI (points) and GDP per capita (US\$) for 2009
Source: Calculated by the authors

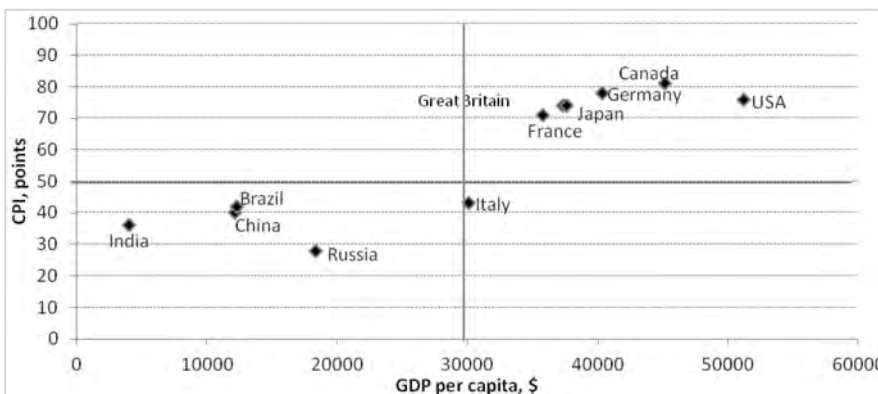


Fig. 2: Matrix of the relationship of CPI (points) and GDP per capita (US\$) for 2013
Source: Calculated by the authors

Tab. 3: Technology table for construction of regression for 2013

| Name | CPI, points | GDP per capita, \$ |
|---------------|-------------|--------------------|
| Russia | 28 | 18,340.278 |
| USA | 76 | 51,223.975 |
| Great Britain | 74 | 37,359.375 |
| Canada | 81 | 45,147.059 |
| Japan | 74 | 37,629.921 |
| Italy | 43 | 30,098.361 |
| Germany | 78 | 40,370.37 |
| France | 71 | 35,781.25 |
| China | 40 | 12,178.022 |
| India | 36 | 4,012.759 |
| Brazil | 42 | 12,273.632 |

Source: Compiled by the authors according to Tables 1 and 2

This equation shows that an increase of CPI index by one unit (i.e. corruption reduction) causes an increase of GDP per capita by US\$ 0.00117.

Figure 3 shows the qualitative characteristics of the resulting model: the correlation coefficient is 0.88, i.e., the link between the resultant characteristic (Y), and the factor characteristic (X) is close. The determination coefficient is 0.79; it suggests that 79% of the variance of GDP per capita is due to variation in the characteristic X . The significance of the regression coefficient is checked by Table F-Fisher criterion. In this case, it indicates the significance of the coefficients.

5. Conclusions

According to the results of the conducted study, it can be concluded that corruption is a kind of public reaction to an unstable and ineffective economic and social policy of the state, an attempt to correct its most obvious defects. As a result of social adaptation of a large part of the population to crises and social problems, values of the consumer society and pragmatic attitudes to life-support begin to play a dominant role, which, in turn, influences the degree of readiness for corrupt relationships.

Russian scientists Tkacheva, Sevrukova and Afanasyeva (2013) indicate that implementing a responsible fiscal policy reduces many kinds of economic risks, increases Russian economy investment attractiveness, which is an important factor for the acceleration of the economic development of the country [9].

A developed system of complex budget analysis comprising budget indicators of quantitative and qualitative analysis, an assessment of the structure of fiscal revenues and expenditures both in terms of types of income and expenses, and in terms of inter-level exchange for carrying out an inter-sector analysis will allow tightening the control over budget disbursement in the Russian Federation reducing the level of corruption in this sphere [10].

Thus, the modernization of political and social life in Russia, extreme complexity and diversity of modern processes and phenomena in the corrupt spheres require not only a qualitative study of their main driving forces, mechanisms and characteristics, but also a quantitative monitoring and evaluation in order to create scientifically based strategy of national anti-corruption policy.

Threats to national security from the corrupt processes generate a need for this negative social and economic phenomenon monitoring. Currently, there is almost no formalisation of the issue of corruption processes monitoring in Russia, i.e. information collected by various bodies has no specific common form of representation, and is often fragmented, sometimes even contradictory. To resolve these contradic-

| Regression Summary for Dependent Variable: CPI (Regression) | | | | | | |
|---|----------|-------------------|----------|----------------|----------|----------|
| R= ,88884890 R ² = ,79005237 Adjusted R ² = ,76672486 | | | | | | |
| F(1,9)=33,868 p< ,00025 Std. Error of estimate: 9,8044 | | | | | | |
| N=11 | Beta | Std. Err. of Beta | B | Std. Err. of B | t(9) | p-level |
| Intercept | | | 23,91435 | 6,630585 | 3,606673 | 0,005689 |
| GDP/capita | 0,888849 | 0,152733 | 0,00117 | 0,000201 | 5,819608 | 0,000253 |

Fig. 3: **Regression analysis results**
Source: Calculated by the authors from STATISTICA 7.0

tions it is necessary to create scientifically grounded conception and analytical framework to monitor corruption processes.

Being a systemic problem, corruption requires systemic anticorruption efforts, which include coordinated actions of the three sectors of a society: government, business and civil society. Nowadays, state power has the most resources to counter corruption in comparison with the other anti-corruption entities; maximum involvement of civil society in the fight against corruption should become a central objective of government

policy. This covers both the involvement of civil society in the development of anti-corruption strategy and the use of social resources for the implementation of an anti-corruption policy.

The authors have proved that the CPI increase, i.e. corruption reducing, leads to the GDP per capita growth. The statistical tools proposed by the authors allow characterising the relationship of corruption phenomena and living standards, as well as assessing the level of factors impact in the overall system of threats to the national interests of the state.

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