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# Pros and Cons of the Digital Economy in Russia

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## ABSTRACT

The study object is the digital economy. The aim of the article is to define the risks and chances that accompany the rapidly developing digital technologies and penetrate into almost all spheres of human life and society. The following risks were identified: dependence of economic agents on the Internet; replacement of human labor with machinery; backlog of education system from the needs of the digital economy; digital inequality; oligopolization in the information market; reduction of state control over the digital economy; companies gaining significant advantages over consumers due to the use of modern technology for big data analysis; supranational nature of the digital economy and formation of network global market for goods and services; reduced scope of protectionist measures for national producers and import substitution; rise in cybercrime. The chances are: emerging new jobs affected by digitalization; development of security and risk management technologies; automation of industry and provision of services; development of 3D printing and other additive manufacturing technologies; development of end-to-end virtual environment technologies; nearly endless segmentation and restructuring of the digital economy due to permanent appearing and disappearing of its elements (niches); transaction cost reduction; improving the quality of state electronic services for both business and public.*

***Keywords:*** digital economy; digitalization; blockchain; fintech; financial technology; national economy; payment systems; cryptocurrencies; electronic money; cybercrime; labor market; taxes

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## INTRODUCTION

The term digital economy as a phenomenon is frequently used in common speech and media. It is relatively new and yet to be studied, although it is of considerable importance for further development of both national and global economies. The term digital economy was first coined in the scientific literature in 1996 [1]; however, for more than 20 years there has not been a single idea of its essence. Scientists made many attempts to formulate its generally accepted and accurate interpretation, although without much success. This might be due to the dynamic nature of the development and the versatility of the digital economy.

Scientists of different periods focused on the development features of the digital economy within a certain period. At the turn of the century, the authors focused on e-commerce [2, 3].

The attention to the institutional component has notably increased since 2010, primarily to the role of state regulation. The phenomenon of the digital economy was already studied at the level of national and su-

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pranational scientific and managerial structures (European Commission, OECD, G20 DETF).

The issues of cybersecurity, privacy, the impact of big data technology, the Internet of things and artificial intelligence on the economy and society have been brought up since 2013–2014. Some scientific papers overview the definitions of the digital economy and their interpretations. The articles by Bukh and Heeks, as well as Rouse [4, 5] are among them. A large amount of research for financial technologies and automation of financial processes was conducted at the Financial University [6–10].

The development of the digital economy undoubtedly has a positive effect on economic growth and the ability of economic agents to fulfill their functions and satisfy needs. Like any complex phenomenon, the digital economy contains both opportunities and threats for various subjects of economic relations. This article provides their detailed analysis and the best ways of managing them.

## THE DIGITAL ECONOMY AND FINANCIAL TECHNOLOGIES

Officially the digital economy is viewed upon in the Decree of the President of the Russian Federation "On the Strategy for the Development of the Information Society in the Russian Federation for 2017–2030"[1]. It is an economic activity where digital data is the key to production. Processing big data and using the analysis results may significantly increase the efficiency of various types of production, technologies, equipment, storage, sales, delivery of goods and services compared to traditional forms of management. The digital economy is not a separate industry; in fact it is a way of life, a new basis for developing public administration, economy, business, social sphere, and society as a whole. It is the achievement of a post-industrial society based on the so-called "knowledge economy". In this case, the information becomes an important economic resource. To receive, preserve and disseminate, as well as protect information is important for the development of society and individuals. With other countries competing for leadership in the formation of a new technological order, Russia's successes in the knowledge economy are critically needed for the future of the country.

Modern technologies have influenced social and economic relations and formed a new reality. This reality provides strong interdependence and mutual influence of both elements of individual socio-economic systems and the systems themselves at various levels. The digitalization has led to a psychological "contraction" of the world where distances have partly ceased to be an obstacle to the formation of ties between economic agents. The effect of digitalization can be compared with the development of rail and sea transport in the 19th century, as well as air transport in the 20th century. In the case of transport, distances shortened: traveling and transporting goods became easier, faster and cheaper, transport played the role of the circulatory system of the industrial economy and significantly contributed to its development. Telecommunication technologies had a similar effect on a post-industrial society where information began to play an important role.

Digital technologies are specific about the quality of the infrastructure of the development area, as well as the quality of human capital. Working in the digital economy requires significant knowledge and skills. In the new conditions the consumption function also demands certain specific skills from citizens.

In the context of information transparency and decentralized network structures, reducing information asymmetries, the state is losing its monopoly on managing the information field, and as a result, it partially loses the resource for managing the economy and society. In the future, the states, groups and indi-

[1] On the Strategy for the Development of the Information Society in the Russian Federation for 2017–2030: Decree No. 203 of the President of the Russian Federation of May 9, 2017.

viduals will undoubtedly be able to use material resources, relationships and information faster, more comprehensively and flexibly than their predecessors will gain the power[2].

The past few decades are described by significant political, social and economic instability. The development of information technology supported this turbulence, creating both new risks and opportunities for subjects of economic relations. Due to the traditional inertia of legislative and executive authorities, objective changes are often misunderstood and rejected at the state level. Though in 2018 President of the Russian Federation Vladimir Putin called to intensify digital transformation, little has been done within more than a year.

On May 28, 2019, Chairman of the State Duma Viacheslav Volodin estimated the delivery of the national project "Digital Economy" as too slow: "Of the 20 bills ... only one law has been passed so far, and 19 have not been adopted ... unless we reconsider our attitude to robotics, artificial intellect, we will not reach the indicator, and the task set in the President's message."[3]

In the context of the digital economy and the knowledge economy, changes are highly intense and often radical; they are destroying long-standing socio-economic relations and have a significant impact on the social and political life of countries. The inability of state authorities to keep pace with these changes and respond effectively to them, not to speak of anticipating them, to perform their functions requires a transformation of the management approach. In this regard, the scientific approach aimed at detailing and assessing the risks and chances of the digital economy is of particular relevance.

The major changes resulting from digitalization are observed in the financial sector of the economy. The term "fintech" is often referred to with the term "digital economy". A feature of financial relations is a large amount of information to be processed and transmitted to remote correspondents. Today, none of the areas of financial activity can be "pre-digital". Digital technologies are not only a tool in financial relations. They also determine area for development of financial organizations, change the nature and way of interaction with customers and create the technological basis of new financial instruments and services. The representatives of the financial sector have repeated that it was too late for banks to start digitalization: those who did not do this a few years ago fall far behind and will eventually have to leave the market. Indeed, modern innovations greatly affect the competitiveness of financial companies. Currently, the influence of trends and development of digital technologies determine the development of financial activity. The financial sector plays a key role in the national economy. This is evident in the formation of an innovative economy which requires significant investment and borrowing. Besides, the digitalization of financial relations is necessary for the development of the digital economy, since the intensification of economic relations, in particular, the Internet economy, has required electronic money and electronic payment systems. Therefore, special attention is to be drawn to fintech when analyzing the risks and opportunities for the development of the digital economy.

## THE CONS OF THE DIGITAL ECONOMY

Despite having been developed for more than 30 years, the digital economy as a new qualitative phenomenon is still not fully understood. In terms of theoretical research, this slowness is not new or surprising. In terms of legal regulation of the economy and financial activity, lagging behind is not only extremely unacceptable, but also dangerous. Unfortunately, it is precisely the lag in the develop-

[2] Global trends: paradox of progress. A publication of the National Intelligence Council. January 2017. URL: https://www.dni.gov/files/images/globalTrends/documents/GT-Core-Russian.pdf (accessed on 02.10.2019).

[3] Volodin criticized the course of the national project "Digital Economy". RBC. 28.05.2019. URL: https://www.rbc.ru/economics/28/05/2019/5ced15079a7947bc82e3dbeb (accessed on 02.10.2019).

ment of modern economic theory, the insufficient assessment of the risks and chances accompanying the digital economy, which create the prerequisites for making erroneous decisions in its legal regulation.

In this regard, the risks and chances of the digital economy are to be analyzed, including in the financial sector.

The risks are as follows:

• *Economic agents depend utterly on the Internet*. Violating the normal functioning of the telecommunications infrastructure can completely paralyze various systems at all levels of the economy. The WEF Global Risk Report notes a critical failure of the information infrastructure as one of the most dangerous risks for mankind[4].

As already mentioned, digitalization in the financial sector has gone very far. Therefore, it is one of the most vulnerable elements of the economic system for the risk implementation.

It is worth mentioning the psychological dependence of the population on the network, the phenomenon of "clip thinking", and difficulties with perception of reality in a large amount of information whose significant part is false and / or manipulative.

• *Digitalization for the sake of digitalization*. There is a myth that digitalization can solve all multiple problems of the Russian economy. No doubt, the competent use of modern technologies can be beneficial. The Russian economy focuses on the export of natural raw materials at the cost of the manufacturing industry and infrastructure, where digital technologies can be expected to fit most efficiently.

The digital economy should not be limited to IT and telecommunications, as well as to the online economy. The elements of the digital economy are active on all segments of the national economy. Moreover, Industry 4.0 involves the brisk growth of high-tech industries and the introduction of cyberphysical systems in all areas of economic activity.

In Russia, the implementation of Industry 4.0 concepts is very limited due to a degraded non-resource real sector of the national economy. In the midst of economic sanctions, the weak domestic industry (especially machine tool and instrument making industries) significantly reduces the potential for innovation. This is risky as if the national economy continues to lag in technologies, the dependence on foreign technologies, software and high-tech equipment will increase.

In Russia, there is obviously too much enthusiasm for fashionable digitalization by means of budget subsidies; their effectiveness is as a rule questioned. This situation may remain the same until the state planning system of the economy is restored. The system combines strategic (long-term) and program-targeted planning in priority development areas (growth points).

• *Digitalization implies the development of robotics and artificial intelligence technologies* and poses risks for workers, especially for low or medium-qualified people. It is expected that a number of professions will cease to exist, the unemployment will rise and workers' social guarantees will be reduced.

The 2017 PwC report shows the shares of jobs threatened to be replaced by automation in different countries by 2030: 38% in the U.S., 35% in Germany, 30% in the U.K., and 21% in Japan. World Bank experts give even more menacing numbers for developing countries: up to 2/3 of all jobs in the coming years can be automated [11][5]. Domestic scientists predict that in our country 57 "traditional" professions will disappear by 2030, but 186 new ones will appear[6].

[4] The Global Risks Report 2019. The World Economic Forum. URL: https://www3.weforum.org/docs/WEF_Global_Risks_Report_2019.pdf (accessed on 02.10.2019).

[5] Workforce of the future. Pw C. 2018. P. 8. URL: https://www.pwc.com/gx/en/services/people-organisation/workforce-of-the-future/workforce-of-the-future-the-competing-forces-shaping-2030-pwc.pdf (accessed on 02.10.2019); World Development Report "Digital Dividends" by World Bank. 2016. URL: https://openknowledge.worldbank.org/ (accessed on 02.10.2019).

[6] Atlas of emerging jobs. Agency for strategic initiatives and Skolkovo Moscow School of Management. 2019. URL: https://www.atlas100.ru/index/ (accessed on 02.10.2019).

These problems are not yet relevant in Russia, since the use of industrial robots is still exotic. Nevertheless, the rise of artificial intelligence systems, including in the banking sector, has already led to massive reductions.

In the long term, in case of mass robotization in Russia due to the development of own technologies and production or due to the cheapening of foreign robotics, we can distinguish two serious problems for our society developed over the past decade. First, the age of retirement increase led to a significant number of workers to remain on the labor market. Like many older people, most of them do not have enough aptitude to learning new skills, as well as to retraining and generally possess outdated skills that will not enable them to be highly employable in the face of a reduction in available jobs, as well as jobs requiring low or medium qualifications. Second, a significant number of migrants usually engaged in menial work arrive in the Russian Federation annually. Due to declining demand for their labor, the situation of families of such migrants can worsen significantly. Therefore, it is now necessary to implement programs to integrate at least the children of migrants into the society and to ensure that they can receive a quality education. Otherwise, there may appear a lot of dropouts united by ethnicity, living on state allowance and often engaged in criminal activity. Unfortunately, in the USA ethnic gangs create significant problems for society.

• *The education system lags behind from the digital economy requirements.* On the one hand, standardization of educational process unifies educational programs and training of specialists with a predictable set of knowledge and skills. On the other hand, the education system remains extremely inertial and does not respond to ongoing significant changes caused by digitalization and other results of scientific and technical progress. The rapidly transforming labor market requires a more flexible system of personnel training and updated educational programs.

Labor activity and additional professional education partially reduce the gap between the requirements of employers and the capabilities of the domestic education system. This is positive, since in the knowledge economy, education should be a part of a person's life throughout his entire career. Nevertheless, eliminating the gap between knowledge and skills obtained at a university or college and the real work requirements costs employees and employers extra.

It is important that training of young specialists included developing their habits and needs for continuous self-education, for obtaining not only skills, but also knowledge, as well as readiness to change professions over a long working life. The adaptability of the employee to rapidly changing working conditions is one of the most valuable qualities.

• *Digital inequality*. As a result of previous industrial revolutions, the countries of the world will develop unevenly in Industry 4.0. Due to the development of digital technologies, the division of the world into the center and the periphery will increase even more. The level of the digital economy development varies in the countries of the global North and the global South. According to McKinsey, in 2010, the contribution of the Internet economy to the GDP of developed countries amounted to 3.4%, while in Russia, Eastern Europe, West Asia and other long-term countries this figure was 1.9%.

Inequality in development will be increasing at the regional level due to different quality of regional human capital, financial capabilities, infrastructure development, etc. Similar phenomena are observed in China, where the development of the digital economy in the eastern and southwestern regions is twofold different [12]. A good example is the state of California that surpasses the other states in terms of GRP and is a center for the development of information technology[7].

[7] California is a territory of an endangered middle class. News. Economy. 26.10.2018. URL: https://www.vestifinance.ru/articles/109254 (accessed on 02.10.2019).

At the micro level, digital inequality appears between citizens, considering their age, gender and education.

• *Oligopolization in the information market.* There are key economic resources and dominant social groups at each stage of economic and social development. In a post-industrial society, such roles were respectively acquired by information, as well as owners and top managers associated with data processing. They start fighting with the "old" industrial and especially the financial elite. In the post-industrial society, the main advantage of modern high-tech companies is the ability to accumulate and process large amounts of information about the most diverse aspects of the activities of individuals and legal entities using the Internet. This opportunity is the result of the widespread use of telecommunication technologies and personal electronic devices with permanent net access [13]. Therefore, IT-companies have instruments of active influence on decision-making by economic entities. These companies can offer goods and services even if potential customers do not yet understand they'd like to have them. The companies can shape public opinion and influence political processes (eg. the case of Cambridge Analytica). Thus, a class with intellectual dominance gains power over other citizens, who can lose subjectivity in decision-making.

Based on historical experience, it can be assumed that oligopolization processes will take place in the information market (as an economic resource). Oligopolization will manifest itself in the concentration of production factors belonging to a relatively small number of owners of huge and powerful IT companies, as well as in data concentration (and the processed information) in the data centers of these companies.

In such conditions, the situation of ordinary citizens is expected to become even worse. In the post-industrial society, such phenomena will be more humane than in the previous cases (for example, enslavement of low-land peasants, fast and socially difficult urbanization, cruel exploitation of the working class, etc.). Most likely, they will concern information rights and freedoms related to the protection of personal data, privacy, freedom of thought and conscience. In our opinion, a negative scenario for the development of the digital economy may also be the excessive use of technology by the state to control and suppress citizens.

• *Reducing the state control over the digital economy*, considering the trend for horizontal ties between economic entities and bypassing the traditional channels of exchange and consumption of goods and services. Typical of many relations in the information society, decentralization and anonymity tempt economic agents to avoid commitments to the state, to create an illusion of its uselessness, and to behave as free-riders. The state should suppress such behavior. At the same time, prohibitive regulation will be ineffective since it will create difficulties for law-abiding citizens and entrepreneurs, but will not solve the problem of circumvention of law by violators. It is necessary to find new ways to determine the tax base for entrepreneurs building their business through direct horizontal connections. Also, the state should ensure maximum transparency in the process of spending budget funds, which will lead to public awareness of the need and public utility of paying taxes.

• *Using modern technologies to analyze big data*, as well as collecting diverse user information by various companies lead to significant advantages over consumers. This results in personified advertising, artificial formation of public opinion, cramming. In our opinion, it is also dangerous to diversify citizens according to their well-being and solvency based on an analysis of their digital identity that leads to a selective approach to the provision of services and even rights to them. An example is the experience of the PRC in using a social rating system to divide people into groups with different rights and opportunities. Such experiments are completely anti-demo-

cratic and demonstrate a prospect of returning to the archaic society by means of modern technology.

• *Attempts to establish bans on the use of financial technologies* instead of legal regulation of their application as a consistent development of previously formed legal approaches. The complexity of the problem tempts to solve it by simple and crude methods, primarily prohibitive, which ultimately creates new problems, worsens the general business conditions in the country, and leads to an increase in the shadow sector of the economy.

An example is the prohibitive regulation of the cryptocurrency market. Despite the fact that the authors treat them negatively for non-environmental friendliness, the regulation should still be carried out in a civilized form and reflect a clear pragmatic position. The indecision and inconsistency of the financial authorities led to chaos regarding cryptocurrencies in the field of law enforcement. As a result, "curious" court decisions were made: for example, to prohibit information about cryptocurrencies from the Internet on the territory of the Russian Federation[8].

• *Supranational nature of the digital economy and the formation of network global market for goods and services*, including financial ones. The development of online trading has favorably affected the ability of citizens to purchase various goods in foreign online stores and marketplaces and to receive orders by mail. It is often cheaper than to buy them in local stores. Thus, Russian businessmen are losing customers and profits, and the state does not receive taxes. Restrictive measures reducing the maximum allowable cost of goods that does not require customs duties, to some extent, can limit the penetration of goods from foreign stores into the domestic market. However, a significant part of online purchases is associated with transferring rights to use digital objects (software, video and audio files, books, etc.), as well as a number of services provided electronically in the "gray zone" (for example, the services of numerous freelancers, streamers, creators of network content).

Financial transactions on the world's leading exchanges require only a computer and an Internet connection and are almost not controlled by the state whose resident makes such transactions. Traditional approaches to the legal regulation of these activities will not produce the desired result.

• *In the digital economy, the ability to implement measures to protect national producers and import substitution is reduced.* Protectionism involves the use of economic and administrative methods that artificially increase the competitiveness of domestic goods and services in the domestic market. Protectionism can also stimulate the development of domestic enterprises that ideally should catch up with foreign competitors in terms of production efficiency, product quality and other criteria. In case of the digital economy, a problem arises when its key products / services (microprocessors, storage media, operating systems, software) produced in the country are significantly behind their foreign analogues. Another problem is that copying production technologies for these products may be impossible for technical reasons, and creating own production that can catch up with the leaders is also impossible: regardless of the need for large investments (including in human capital), large-scale R&D and the need to fight for the sales market (preferably not only internal), there is a decisive time factor. Technology is developing faster: while the country is creating its own production of high-tech products, leaders will move further. Thus, in the context of Industry 4.0, the implementation of protectionist policies becomes more complicated and the implementation of the import sub-

[8] Bitcoin got to the Supreme Court. RBC website. URL: https://www.rbc.ru/newspaper/2018/03/05/5a97e79e9a79470de78a6eda (accessed on 02.10.2019); The Supreme Court agreed to determine the status of cryptocurrency sites. RBC website.URL: https://www.rbc.ru/technology_and_media/02/03/2018/5a97e79e9a79470de78a6eda (accessed on 02.10.2019).

stitution policy in high-tech industry is an extremely difficult task.

• *The backlog of legislation and law enforcement from the rapidly changing realities of the digital economy.* The norms of Section VIII of the Criminal Code of the Russian Federation "Crimes in the Sphere of Economics" and their application have a significant discrepancy between the legal interpretation and actual crimes in the sphere of economics committed using information and telecommunication networks, including the Internet [14]. A significant part of crimes is currently committed using information and telecommunication technologies, but they are quite traditional in nature (fraud with bank payment cards, distribution of drugs by the network, etc.). Digitalization has led to emerging crimes whose impact is directed to automated computer systems and the classification of acts (for example, fraud) is very difficult. Supposedly, the development of digital technologies and their application in the economic sphere will accelerate and this gap will grow. It will increase opportunities for actually criminal activity in temporary lags arising between the beginning of the criminal use of new technologies and the emergence of legislative tools to suppress such activities.

• *Increasing risks of cybercrime in the context of the development of the digital economy.* Of particular note is the importance to develop information security technologies. Widespread use of information technology and digitalization of various activities create "cumulation" of risks in the context of many interconnected complex systems. Already mentioned "The Global Risks Report 2019" report notes that there are quite likely and serious risks: "critical destruction of the information infrastructure", "IT fraud and data theft", as well as "cyber attacks". The activities of cybercriminals are dangerous for several reasons. First, it is transnational, which significantly complicates the fight against it even without considering multi-level identity anonymization of the criminal achieved by means of modern technologies. Second, the object of cybercriminal attacks is information, an important "resource" of the post-industrial society. Destruction, theft and compromise of information can lead to extremely negative consequences for both citizens and companies, and for states. Third, the objects of infrastructure and production often become the target of cybercriminals and cyberterrorists. Proliferation of cyberphysical systems and the high level of interaction and interconnectedness of various objects through information and telecommunication technologies make them extremely vulnerable to cyber attacks. Fourth, the cost of resources for committing cybercrimes is not comparable with the possible damage from them. Fifth, the activities of cybercriminals are often not of a pronounced institutional nature, they may not be regarded as "traditional" crime which complicates the activities of law enforcement agencies.

## THE GOOD EFFECTS OF DEVELOPING THE DIGITAL ECONOMY

Let us take a look at the chances of the digital economy:

• *Beneficial processes in the labor market.* As already mentioned, digitalization not only clears jobs and professions away, but also promotes new ones. Opportunities for remote work are growing creating great employment opportunities for residents of remote and depressed territories, as well as for people with limited mobility. Statistics on online platforms related to career and remote work show the significant popularity of remote employment and freelance. Linkedin has over 350 million users, Careerbuilder is visited by more than 24 million users a month. Platforms related to freelance are actively developing: 12.5 million users are registered at Upwork, 14.3 million — at Freelancer.com, Uber service alone has about 1 million drivers [15]. According to individual evaluations, by 2020 every second worker in the USA is expected to become freelancer [16].

Distributed and unneedful of offices, new network structures will save companies on rent and employees' commute time. Such transformations in the labor market require reforms of labor legislation, for example, in terms of accounting for working time, monitoring its duration, working hours, part-time work, etc.

Researchers also note returning the production of a significant part of consumer goods and services to households based on improving household appliances [17]. This observation is also evidence of some decentralization of the modern economy in the framework of co-consumption.

• *Using the concepts of the Internet of things and big data to improve business performance and reduce uncertainty.* Smart systems, process automation in various fields of activity consisting in collecting and processing large amounts of data by machines, as well as excluding people from routine activities, will increase economic resources efficiency and reduce the impact of uncertainty in decision-making. The use of industrial Internet technology will positively affect most sectors of the economy. The development of the concept of "smart cities" and "smart homes" will allow for a more efficient use of resource-saving technologies, a beneficial effect on the quality of the urban environment and the lives of citizens, and will increase public safety.

• *Development of security and risk management technologies.* The development of digital identity and blockchain technologies will ensure the security of the activities of economic entities, cut down transaction costs, reduce the influence of asymmetric distribution of information, and diminish the uncertainty factor.

The use of drones, robots and artificial intelligence systems will reduce the need for human participation in hazardous activities, minimize the risk of the "human factor", and automate public safety systems.

• *Automation of industry and the provision of services, as well as the development of 3D printing and other additive manufacturing technologies.* Robotics and artificial intelligence cut the need for labor resources in the context of mass production and standardization of service delivery. At the same time, the development of additive manufacturing technologies opens up opportunities for individualization of products. This may lead to a creative approach to production, an increase in demand for highly skilled workers able to create unique products in accordance with the specific needs of the customer.

• *The development of end-to-end virtual environment technologies to reduce the negative impact on the economy of factors of large distances and imbalances in the economic development of territories.* The use of modern information and telecommunication technologies (augmented and virtual reality, digital identity, blockchain, cloud technology, remote workstations), as well as measures to reduce "digital inequality" will weaken the centripetal processes in the Russian economy and minimize spatially determined gaps in the economic development territories caused (among other factors) by the concentration of economic resources in a small number of regions. This concentration is as a result of socio-economic processes associated with accumulating resources in a limited area in order to achieve a synergistic effect for more intensive economic growth. The use of these technologies and creation of an appropriate infrastructure will reduce the level of this concentration without slowing down economic development. Virtual environment and big data technologies will create mechanisms for identifying the most effective solutions in various fields of activity with their subsequent relay to all subjects of a particular system. A key area is the creation of a large-scale virtual educational environment, integrated into the modern education system at all levels. This measure is focused on the development of human capital, one of the most important factors of scientific and technological progress. Virtual environment technologies can be used in healthcare, state

and municipal administration, as well as in the field of national defense.

• *Virtually endless segmentation and restructuring of the digital economy due to permanent appearing and disappearing of its elements (niches).* Such flexibility opens up opportunities for self-realization and self-sufficiency of citizens that contributes to economic growth and reduces the social burden on the state. Besides, emerging new niches create additional opportunities for small and medium-sized businesses, as well as startups. In this regard, an important postulate of legal creativity should be the creation of favorable conditions for new niches of the digital economy.

• *Reducing transaction costs.* A feature of the digital economy is the diminishing role of intermediaries by creating digital services (for example, electronic trading platforms) that provide direct contact between the supplier and buyer of goods or services. The territory where counterparties are located, language barriers, and currency differences do not anymore have a significant impact on the economic relations of various entities. The legal regulation of such services and the protection of the rights of the parties (given the possible location of sites and one of the parties outside the Russian jurisdiction) are still an urgent problem. At the same time, attempts to regulate such Russian sites will only lead to their loss of competitiveness compared to the foreign ones and will stimulate the departure of both the sites and their customers outside the Russian jurisdiction.

• *Improving the quality of state electronic services for both business and public.* Governments of all countries are increasingly switching to digital technologies. In developing countries the number of jobs with intensive use of IT technologies is higher in the public sector than in the private one. By 2014, all 193 member states of the United Nations (UN) had national websites: 101 of them allowed creating personal accounts, 73 of them could file income tax returns, and 60 of them could register a company. As for the most common basic government administrative systems, 190 UN member states have implemented automated financial management, 179 have used such systems for customs clearance, and 159 — for tax administration. 148 of them have introduced some form of digital identification, and 20 of them have created multi-purpose digital identification platforms[9].

Many efficient and convenient electronic services were already created in Russia. They facilitate relations between authorities and citizens on various issues. In general, it should be noted that in developing this element of the digital economy, the Russian Government has achieved significant success.

## CONCLUSIONS

Undoubtedly, the list of risks and opportunities that accompany the development of the digital economy is not complete. Nevertheless, ignoring the mentioned risks and chances of the development of the digital economy in Russia may cause errors in planning and in making decisions in economic regulation at both the legislative and executive government levels.

Due to digital technologies and the ongoing transition to a new technological structure, the Russian Federation has a unique chance to become competitive at the international level, to solve many internal problems, and to improve the quality of life of citizens. Our country has repeatedly experienced modernization in a very short time which often led to severe social and other risks. To manage such risks, one should study them in the framework of scientific activity, conduct predictive analysis, plan measures to minimize and eliminate them. Scientists from various fields of science should focus on the changes in society that accompany the development of digital technology.

[9] World Development Report "Digital Dividends" by World Bank. 2016. URL: https://openknowledge.worldbank.org/ (accessed on 04.10.2019).

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REVIEW



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# Effect of Growth Opportunity, Corporate Tax, and Profitability toward Value of Firm through Capital Structure (Listed Manufacturing Companies of Indonesia)

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## ABSTRACT

The study aims to determine the Effect of growth opportunity, corporate tax, and profitability on the value of firm through the capital structure as an intervening variable at manufacturing companies in Indonesia Stock Exchange. The sample consists of 32 manufacturing sector companies listed in Indonesia Stock Exchange within 2013–2017. The study results show that growth opportunity and corporate tax have a positive effect on the structure of capital, in contrast to profitability, which affects negatively. Meanwhile, capital structure and profitability have a positive Effect on firm value. On the other hand, growth opportunity and corporate tax have no bearing on company value. Yet, capital structure does not mediate between growth opportunity and corporate tax to the value of firm. Nevertheless capital structure mediates the Effect of profitability on the value of firm.

***Keywords:*** growth opportunity; corporate tax; profitability; value of firm and capital structure

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## BACKGROUND

One of the main objectives of the company is to increase the value of firm through increasing the prosperity of the owners or shareholders of the company (Brigham, Gapenski, & Daves, 2006) [1]. The value of firm describes the prosperity of shareholders in the long run so that the company's goal in the long term is to maximize the value of firm. Shareholder prosperity often reflects on increasing stock market prices (Hanafi & Halim, 2012) [2]. The higher the stock price is, the higher the prosperity of shareholders is. The management of the company has a responsibility to manage the company in order to increase The Value of Firm. Stock market prices are a reflection of every financial decision taken by management, so that the company's value is a result of the management's actions. These financial decisions include investment decisions, funding decisions and dividend policies. The management will carefully consider the decisions taken so as to lead to an increase in The Value of Firm.

The value of a company formed through indicators of stock market value is strongly influenced by investment opportunities. Investment opportunities can provide a positive signal about the company's growth in the future so that it will increase stock prices. With the increase in stock prices, The Value of Firm will increase and can provide high prosperity to investors through the return which will be obtained. The main objective of the company according to the theory of the firm is to maximize the value of the firm (Salvatore, 2005) [3]. Maximizing The Value of Firm is very essential for the company itself, because maximizing The Value of Firm also means maximizing the prosperity of shareholders which is the company's main goal.

According to (Brigham & Houston, 2011) [4] signaling theory is an action taken by a company to provide guidance for investors about how management views the company's prospects. The Value of Firm in this study is measured using the ratio of stock market prices to the value of the book or often referred to as the price to book value (PBV). Companies that have relatively high returns on equity usually have a stock market price many times greater than the value of their books, than companies whose returns on equity are low. Companies that have higher PBVs indicate

that the company's performance in the future is assessed to be more prospective by its investors.

Based on previous research there are several factors that can affect The Value of Firm, including: growth opportunity, corporate tax, tangibility, profitability and capital structure. Some of these factors have a relationship and influence on the company's value that is not consistent. Growth opportunity / company growth can be defined as an increase that occurs in the company. The higher the growth of the company is, which also means that the company's opportunity to grow is higher, the greater the funding needs are. Companies that have high growth rates are generally small companies.

Given that tax is the main source of state revenue, then in an effort to maximize tax revenues, the government applies tax rules in such a way through other tax laws and regulations. For taxpayers, tax is a burden that must be paid to the state, and can reduce the company's net income. Therefore, in order to reduce the tax burden that must be paid, many companies carry out tax management (tax management), namely a comprehensive effort by the tax manager (Tax Manager) in a company or organization so that matters relating to taxation of the company or the organization can be managed properly, efficiently, and economically, so as to give maximum contribution to the company (Pohan, 2013) [5].

Profitability ratio is the ability of the company to obtain profits in relation to sales, total assets and own capital (Sartono, 2014) [6]. In this study profitability ratios are measured by return on assets (ROA). ROA is a ratio that shows the company's ability to generate net income to return equity to shareholders. ROA is a comparison ratio between net income after tax to total assets. The reason for using the ROA variable in this study is because it has many advantages. One of them is to be able to measure the efficiency of overall capital use, which is sensitive to every thing that affects the state of the company.

According to (Fahmi, 2012) [7], the capital structure aims to integrate the sources of permanent funds which are then used by companies in ways that are expected to be able to maximize The Value of Firm. Declining capital structure can cause changes in The Value of Firm. In accordance with the pecking order theory, companies with large profit levels will use internal funds first before using debt (Anjarwati, Chabachib, & P, 2015) [8]. In this study capital structure is calculated by the ratio of debt to equity ratio (DER), which is a ratio that compares the total debt held by the company with the total capital invested by the company for the survival of the company.

In this study, the shares of manufacturing companies were selected that are listed on the Stock Exchange Indoneia (BEI), these agencies provide the infrastructure to support the implementation of trade Effect an orderly, fair, and efficient and easily accessible to all stakeholders (stakeholders). The reason why the author chose the object of the research in manufacturing companies is because the manufacturing sector consists of various industrial sub-sectors. This reflects the reaction of the capital market as a whole, besides, manufacturing companies also have the highest number of companies on the Indonesia Stock Exchange. Manufacturing companies also dominate the market when compared to other companies listed on the IDX.

## THEORETICAL FRAMEWORK

### Agency Theory

Agency theory (agency theory) is the basis of the theory underlying the company's business practices. Agency theory was put forward by (Jensen & Meckling, 1976) [9]. This theory was developed in order to understand and solve problems that arise when there is incomplete information while making a contract (engagement). The relationship between the principal and the agent can lead to information asymmetry. Information asymmetry is a condition where there is an imbalance in information acquisition between management as an information provider (preparer) with the shareholders and stakeholders in general as users of information (users).

### Pecking Order Theory

Pecking Order Theory is a theory that prioritizes funding sources from within. According to (Kartika A., 2016) [10], in brief this theory states that companies like Internal Financing (funding from the results of the company's operations in the form of retained earnings). If External Financing is needed, the company will issue the safest securities first, that is, starting with the issuance of bonds, then followed by securities characterized by options (such as convertible bonds), and finally, if this is still insufficient, new shares are issued.

### Growth Opportunity

Growth opportunity is also called the opportunity of a company to grow in the future. Growth opportunity is

an indicator of the extent to which a company's earnings per share increases as debt increases (Brigham E.F., Houston J.F., 2011) [4]. Companies with high growth rates will try to increase their fixed assets so that they need more funds in the future, but still have to be able to maintain the level of profit. As a result, retained earnings will increase and the company tends to owe more to maintain its debt ratio.

### Corporate Tax

For taxpayers, tax is a burden that must be paid to the state, and can reduce the company's net income. Therefore, in order to reduce the tax burden that must be paid, many companies carry out tax management (tax management), which is a comprehensive effort by tax managers in a company or organization so that matters related to taxation from the company or the organization can be managed properly, efficiently, and economically, so that it gives maximum contribution to the company (Bringham E.F., Houston J.F., 2011) [4].

### Profitability

Company's Profitability is one of the bases for assessing the condition of a company, for this reason an analytical tool is needed to assess it. The analytical tool in question is financial ratios. Profitability ratios measure management Effectiveness based on returns obtained from sales and investments. Profitability also has an important meaning in an effort to maintain its survival in the long term, because profitability shows whether the business entity will always try to increase its profitability, because the higher the level of profitability of a business entity is, the survival of the business entity will be more secure (Hermuningrum Sri., 2012) [11].

### Capital Structure

Capital consists of equity (retained earnings and funds obtained from the sale of shares) and debt (loan funds). Corporate profit costs reflect opportunity costs (Opportunity cost); returns that can be obtained by shareholders if they maximize the value of dividends and invest the funds themselves. The company's new equity costs (issuing new shares) also reflect opportunity costs: returns obtained by new capital holders if they invest their funds in other forms, not in the company's shares. This cost is higher than the cost of retained earnings because it also covers the expenses associated with selling new shares (floating costs) (Madura J., 2011) [12].

### Value of Firm

Value is a certain condition that has been achieved by a company as a picture of public trust in the company. Increasing The Value of Firm is an achievement in accordance with the wishes of its owners, because with the increase in The Value of Firm, the welfare of the owners will also increase, and this is the duty of the manager as an agent who has been entrusted by the company to run his company (Bringham E.F., Houston J.F., 2011) [4].

According to (Jansen, 2001) [13], to maximize the value of a company not only the value of equity is considered, but financial resources such as debt and preferred stock. Company value is the fair value of the company that describes the perception of investors towards certain issuers, so that company value is the perception of investors that is always associated with stock prices. Company value can be seen from the value of the shares of the company concerned. The Value of Firm is also in terms of management where The Value of Firm now depends on the value of the manager. Value-based management is also a process of maximizing company value based on continuous calculations (Harjito, 2012) [14].

## ANALYSIS AND DISCUSSION RESULTS

### Path Analysis

In this study, the Effect of growth opportunity, corporate tax, and profitability on firm value with capital structure as variables intervening will be analyzed using path analysis. Based on the objectives and hypotheses built in this study, the form of path diagrams to be estimated is as follows (*Fig. 1*).

Stages in path analysis include test path assumption path analysis, goodness of fit model test path diagram and path significance test.

### Prerequisite Test Path Analysis Prerequisite

Tests in path analysis include normality and multicollinearity tests.

### Normality Test

The value of cr Univariate all indicators and the value of cr multivariate in this study has been smaller ±2.58 so that it can be assumed that the data after elimination of outliers have not met the assumption of normality.

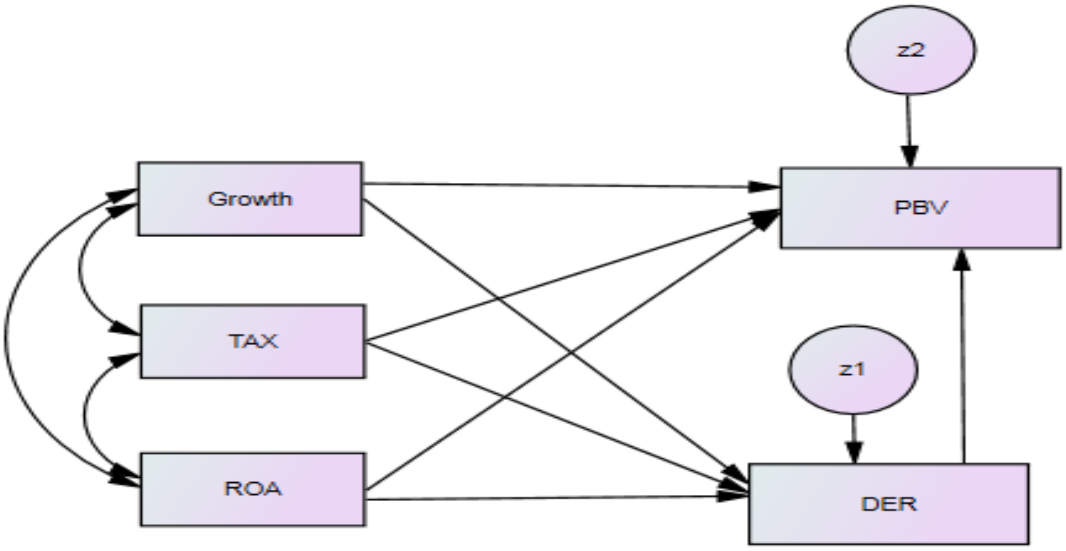


*Fig. 1.* **Path chart diagram model**

*Source:* Compiled by the authors.

### Multicollinearity Test

Obtained value covariance matrix determinant of sample of 0.002 because this value exceeds 0.002, it can be stated that there is no multicollinearity in the model. The results of this test are also supported by the absence of a correlation coefficient between latent variables that exceed 0.9.

### Goodness of Fit Model Test

The structural model is stated to have fulfilled the Goodness of fit model if the model has fulfilled one of the assumptions contained in the table above. According to Haryono (2017) [15], if there are one or two criteria goodness-of-fit that have met, then it can be said that the model is built well.

Based on *Fig. 2*, a summary of the results of the obtained goodness of fit model is as follows (*Tabl. 1)*.

Based on *Table 1*, the results show that the SEM model has met all the criteria of the Goodness of fit model. The probability value of the analysis results has also exceeded 0.05 which indicates that the covariance matrix sample has similarities with the estimated population covariance matrix so that the results of the analysis are able to describe the actual population conditions. Thus the research model is feasible to be used to test the research hypothesis.

### Path Coefficient Significance Test

The significance test of the path coefficient is used to test the Effect of growth opportunity, corporate tax and profitability on firm value with capital structure as a variable intervening. The results of this significance test will then be used to test the research hypothesis.

Besides being able to determine the significance of the influence of each exogenous variable on endogenous variables, the results of path analysis can also predict the contribution of all exogenous variables to endogenous variables. The contribution can be seen from the value Squared Multiplier size of each endogenous variable.

Based on *Table 3,* the value of the squared multiple correlation DER variable is 0.318, this indicates that the contribution of the GROWTH, TAX and ROA variables given to the DER is 31.8%, and the value of the squared multiple correlation variable PBV is 0.372, indicating that the contribution given by the GROWTH, TAX and ROA variables to the DER variable is 37.2%.

### Direct, Indirect and Total Influence Test

The results of direct, indirect and total influence by AMOS 22 are as follows:

Contributions to direct influence and indirect Effects of growth against PBV is as follows (*Tabl 4)*.

From *Table 4* it can be seen that, the value of the direct Effect of growth on the PBV is equal to 0.068, while the indirect Effect of growth on the PBV through DER is 0,044, the total overall Effect is 112. Since the direct Effect of growth on the PBV is greater than the Effect of Indirect growth of PBV through DER, it can be concluded that DER in this study is not a variable intervening.

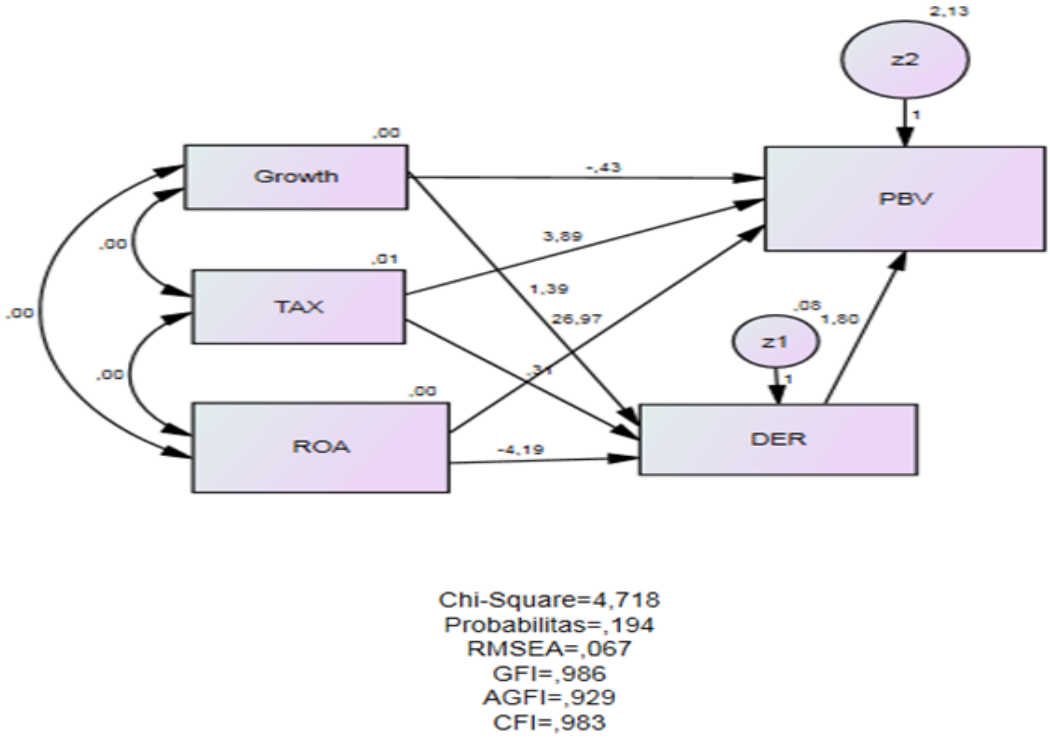


*Fig. 2.* **Goodness of fit model test results**

*Source:* Compiled by the authors.

*Table 1*

**Goodness of fit model test results**

| No | Goodness of fit index | Cut off value (reference) | Value on model | Description |
|---|---|---|---|---|
| 1 | Chi – Square | <7815 | 4718 | Fit |
| 2 | Probability | >0.05 | 0194 | Fit |
| 3 | GFI | >0.9 | 0.986 | Fit |
| 4 | AGFI | >0.9 | 0.929 | Fit |
| 5 | CFI | >0.95 | 0.986 | Fit |
| 6 | RMSEA | <0.08 | 0.067 | Fit |

*Source:* Data processed by the researchers.

The direct influence and indirect influence of TAX on PBV are as follows (*Tabl. 5*).

From *Table 5* it can be seen that the direct Effect of TAX on PBV is 0.105, while the indirect Effect of size on PBV through DER is 0.105, the total overall Effect is 0.149. Because of the direct influence of TAX against PBV greater than the indirect Effect of TAX on PBV through DER, it can be concluded that DER in this study is not a variable intervening.

Direct influence and indirect influence of ROA against PBV is as follows (*Tabl. 6*).

From *Table 6* it can be seen that the direct Effect of ROA on PBV is — 0.117, while the indirect Effect of ROA on PBV through DER is 0.665, the total overall Effect is 0.548. Although the direct Effect of ROA on PBV is smaller than the indirect Effect of ROA on PBV through DER, it can be concluded that DER in this study is a variable intervening. DER is full mediation because through DER, ROA can affect PBV.

## DISCUSSION

Growth opportunity in this study has a positive Effect on capital structure. The results of this study are in accordance with the Signaling Theory which states that companies that have large assets have greater access to funding sources or loan funds from creditors, because creditors believe in the amount of assets owned can be used as collateral to lend funds to the company, and high

*Table 2*

**Significance test results**

| | | | Effect Value | Coefficient Line | Description |
|---|---|---|---|---|---|
| DER | <– | TAX | 013 | . 185 | Influential (+) significantly |
| DER | <– | ROA | *** | –. 498 | Influential (–) significantly |
| DER | <– | Growth | 011 | . 188 | Influential (+) significantly |
| PBV | <– | Growth | 349 | . 068 | No Effect |
| PBV | <– | TAX | 153 | . 105 | No Effect |
| PBV | <– | ROA | ***. | 665 | Influential (+) significantly |
| PBV | <– | DER | . 006 | . 235 | Significant (+) Effect |

*Source:* Researcher's data.

*Table 3*

**Squared multiple correlation**

| | Estimate |
|---|---|
| DER value | . 318 |
| PBV | . 372 |

*Source:* Researcher's data.

*Table 4*

**Effect of direct and indirect Growth of the PBV**

| Description | Value |
|---|---|
| Direct Effect (direct Effect), | 068 |
| Indirect Effect Growth to PBV through DER (indirect Effect) | 044 |
| Total Effect (total Effect) | 112 |

*Source:* Data processed by the researchers.

sales indicate that the company is developing, so it has good prospects for the long term. The study results support the research conducted by (Febriyani and Srimindarti, 2010) [16] and (Seftianne and Handayani, 2011) [17] which state that growth opportunity influences capital structure. The study results do not correspond to the results of the study by Mai (2006) [18] which states that growth opportunity does not affect the capital structure.

Growth opportunity in this study does not affect The Value of Firm, the results of this study do not correspond to the proposed hypothesis, which states that growth opportunity has a positive Effect on firm value, meaning that the high and low growth of the company is not influenced by the high value of the company in the same direction. The results of this study are not in line with the results of the research conducted by Dewi (2014) [19], who found that the company's growth had a positive and significant Effect on firm value.

The results showed that the direct Effect of growth on PBV was greater than the indirect Effect of growth on PBV through DER, so it can be concluded that DER in this study was not a variable intervening. These findings do not correspond to the proposed hypothesis, which states that growth opportunity has a positive Effect on firm value with a capital structure as a variable intervening. The results of this study are not in line with the trade of theory which states that an increase in the debt ratio in the capital structure will increase The Value of Firm. The policy of using debt in the company's capital structure gives a signal to the investor that the funding policy by the company affects The Value of Firm. Positive responses from investors will cause the increase in growth opportunity. A high growth opportunity will cause an increase in investment. This increase in investment means that there is also an increase in the asset structure. Growth opportunity and high asset structure will cause the increase in the use of debt in the capital structure and subsequently will affect The Value of Firm.

Corporate tax in this study has a positive Effect on capital structure. The results of this study indicate that the higher corporate tax is, the higher the capital structure of a company is, and the lower the corporate tax is, the

*Table 5*

**Direct and indirect Effects of TAX on PBV**

| Description of | Value of |
|---|---|
| (direct Effect) | .106 |
| Indirect Effects of TAX to PBV through DER(indirect Effect) | .105 |
| Total Effect (total Effect) | 149 |

*Source:* Researcher's data.

*Table 6*

**Effect of direct and indirect ROA on PBV**

| Description | Value |
|---|---|
| direct Effect (direct Effect) | –.117 |
| indirect Effect ROA to PBV through DER (indirect Effect) | .665 |
| Total Effect (total Effect) | .548 |

*Source:* Researcher's data.

lower the capital structure of a company is; that is, between corporate tax and structure capital it has the same direction. These findings correspond to the hypothesis proposed, which states that corporate tax has a positive Effect on capital structure. The theory by Modigliani-Miller (MM) explains that the use of debt will be more profitable compared to self-capital. This is because the creditors in setting the interest rate of their loans adjusted to the economic conditions of a country that has a tendency to affect the ability of companies to repay loans, for example, the inflation rate. It can be concluded that it is very unlikely that creditors apply loan interest rates that are too burdensome to debtors, because it will cause problems for creditors themselves, namely the possibility of a bad debt.

The study results support the research conducted by Setiawati (2011) [20], Owolabi and Inyang (2012) [21], Rostami and Akparpour (2012) [22], and Dewi (2013) [19], in their research stating that tax has a positive and significant Effect on capital structure. Research by Anisa and Djumahir (2014) [23], Dewi and Bajra (2013) [24] states that tax has a positive significant Effect on capital structure, but the results of this study do not support the research conducted by Chaerunisa and Farah (2014) [25] which states that tax does not affect the capital structure.

The results of the study show that corporate tax does not affect The Value of Firm, meaning that The Value of Firm is not influenced by corporate tax. The results of this study do not correspond to the proposed hypothesis, which states that corporate tax has a positive Effect on firm value. Corporate tax does not affect The Value of Firm due to the amount of cash issued by the company for the payment of the tax burden in the long run according to the applicable corporate income tax rate. This is responded to by the market (investor) as a reason that does not affect The Value of Firm.

This study found that the direct Effect of corporate tax on firm value is greater than the indirect Effect of corporate tax on firm value through capital structure. Thus, in this study capital structure is not a variable intervening. The results of this study do not correspond to the proposed hypothesis, which states that corporate tax affects The Value of Firm with the capital structure as a variable intervening.

Capital structure shows the comparison between the amount of long-term debt and own capital. Companies that use debt in their operations will get tax savings, because taxes are calculated from operating profits after deducting interest on debt. Therefore, net income that is the right of shareholders will be greater than companies that do not use debt. Thus, The Value of Firm also becomes greater. This means that if the capital structure is larger, The Value of Firm will also increase. However, companies will not be able to use 100% debt in their capital structure. This is because the greater the debt is, the greater the financial risk of the company is. The risk in question is financial risk, namely the risk that arises because of the company's inability to pay interest and principal installments in poor economic conditions. In such conditions if the debt is greater, The Value of Firm will decrease.

Based on the results of the hypothesis, it can be explained that profitability has a negative Effect on capital structure variables. Companies that have a high ability to

make profits use retained earnings (equity) as capital to finance the company's operations without external funds. According to Kartika (2016) [10], this is in line with the Pecking Order Theory. The Pecking Order Theory states that companies like internal financing (funding from the company's operating results in the form of retained earnings) and, if external financing is required, the company will first issue the safest option, namely by issuing bonds. Thus, companies with high profitability will set aside profits in retained earnings. In the case of retained earnings, the company does not require external financing, since retained earnings are used to finance the activities of the company. With retained earnings or due to equity capital, a small impact on capital structure will be of small size.

The results of this study are in line with the results of the studies by Anjarwati et al. (2015) [8], Kartika (2016) [10], Kontesa (2015) [26], Paminto, Setyadi, & Sinaga (2016) [27], Thomas, Chenuos & Biwott (2014) [28], Arini (2012) [29], Damayanti (2013) [30],, Natalia (2015) [31], Rita Puji Astuti (2013) [32], Safitri (2014) [33], Setiawati (2010) [34] showing that profitability has a significant negative Effect on capital structure. The study results also correspond to the statement by Hamidy (2014) [35] and Lusangaji (2011) [36] that companies with high profitability will have more internal funds (retained earnings) than companies with low profitability. With large retained earnings, companies will prefer to use retained earnings before using debt.

The results of the study show that profitability has an Effect on company value. The findings are in line with the proposed hypothesis which states that profitability has a positive Effect on firm value. The high and low profitability of the company affects the high and low value of the company, the influence is in the same direction. The higher the profitability of the company is, the higher The Value of Firm is, and vice versa. Profitability is the company's ability to generate profits. If the company generates high profits, it indicates that the company's performance is good and has good prospects for the long term, so it can attract investors to buy the company's shares. With the number of investors who will buy these shares, the demand for shares will be high, it will increase stock prices.

High stock prices reflect high corporate value and high profitability reflects the company's ability to generate high returns for shareholders. With a high profitability ratio owned by a company will attract investors to invest their capital. In addition, with a good profitability ratio, investors will respond positively. Positive responses from investors will increase stock prices to further increase company value. This is consistent with the concept of the signaling theory. The theory claims that profitability will be a signal from the management that describes the company's prospects on the basis of the formed level of profitability and directly affects the value of the company, as can be seen from the share of the price in the market.

The study results are consistent with the results of the studies by Anjarwati et al. (2015) [8], Dewi & Wirajaya (2013) [19], Kontesa (2015) [26], Paminto et al., (2016) [27], Hamidy (2014) [36], Kodongo et al. (2014) [37], Sucuahi & Cambarihan (2016) [38], Agustia (2010) [39], Alfredo Mahendra DJ (2011) [40], Bukit (2012) [41], Kusumajaya (2011) [42], Languju et al. (2016) [43], Nurhayati (2013) [44], Prisilia (2012) [45], Suffah & Riduwan (2016) [46], Wulandari (2013) [47]. These studies show that profitability has a significant positive Effect on firm value.

Based on the DER analysis in this study, it is an intermediate variable, this result due to the direct influence of ROA on PBV is less than the indirect effect of ROA on PBV, it can be concluded that the DER variable can mediate the effect of ROA on PBV. Based on these results, which argue that the capital structure can be an intermediary between profitability and the value of the company, contrary to the Pecking Order theory, which states that the higher the profitability, the more profit will be saved, so that the capital structure will be low. This means that if the company has a large level of profit, it will have a greater internal source of financing. This will influence the decision on the capital structure or financing of the company, namely in financing its business activities, such as developing products or needs through investment costs that allow companies to use their own capital, namely from domestic companies, for example, in the form of retained earnings as profits generated by the company rather than using external funds.

In this study, capital structure can mediate the Effect of profitability on firm value. This can happen if internal funding sources are no longer sufficient. For example, if a company expands, which requires a large amount of funds to stimulate a future increase in profits, the company can use as an alternative a source of external funds, namely in the form of debt received from external parties. That is, both internal and external funding sources are used to increase company profits. If not considered properly, their use will have a negative Effect on The Value of Firm. These results are consistent with the research conducted by Chen and Chen (2011) [48] stating that profitability has

a significant Effect on The Value of Firm with the capital structure as an intervening variable.

This study shows that the capital structure has a positive Effect on firm value. These findings are consistent with the proposed hypothesis stating that the capital structure has a positive Effect on firm value. Companies must be able to determine the amount of debt, because the existence of debt to a certain extent will be able to increase The Value of Firm. However, if the amount of debt goes beyond a certain limit it will reduce The Value of Firm. The study results are consistent with the Trade-off theory which explains that if the position of the capital structure is below the optimal point, each addition of debt will increase The Value of Firm. The trade-off theory predicts a positive relationship with The Value of Firm. The results of this study correspond to the study results by Hermuningsih (2012) [11], Kontesa (2015) [26], Hamidy (2014) [35], Bukit (2012) [41], Kusumajaya (2011) [42] showing that the capital structure has a positive Effect on firm value.

## CONCLUSION

Some conclusions obtained from the results of this study are as follows:

1. Growth opportunity has a positive Effect on the company's capital structure, this means that the size of the company growth is able to influence the high and low capital structure of the company, the Effect is in the same direction. The higher the size of the company is, the greater the company's capital structure is, and vice versa.

2. Growth opportunity does not affect The Value of Firm. High and low growth opportunity does not affect the high and low values of the firm's capital structure. It cannot mediate the Effect of growth opportunity to company value.

3. Corporate tax has a positive Effect on the capital structure of the company. This means that the high and low corporate tax affects the high and low capital structure of the company, the Effect is unidirectional. The higher the corporate tax is, the higher the capital structure of the company is, and vice versa.

4. Corporate tax does not affect The Value of Firm. The high and low corporate tax of a company does not affect The Value of Firm.

5. Capital structure cannot mediate the Effect of corporate tax on firm value.

6. Profitability has a negative Effect on the variable capital structure of the company. High and low profitability is against the high and low capital structure of the company.

7. Profitability has a positive Effect on firm value. The high and low profitability of a company has an Effect on the high and low value of the company, the influence is in the same direction. The higher the profitability of the company is, the higher The Value of Firm is.

8. Capital structure can mediate the Effect of profitability on firm value.

9. Capital structure has a positive Effect on corporate value variables, this means that the high and low capital structure of the company has an influence on the high and low value of the company, the influence is the same. The higher the company's capital structure is, the higher The Value of Firm is.

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Agustina Hanafi — Discussion of research results.

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ORIGINAL PAPER



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# Factors of Success of Initial Coin Offering. Empirical Evidence from 2016–2019

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## ABSTRACT

Since 2013, Initial Coin Offerings (ICO) have allowed companies to attract financing with the help of cryptocurrencies. Statistics of ICO shows that the ICO market is increasing and demand for funds continues to grow with claims of over $ 15 billion raised in the first half of 2018. The increasing volumes of investment in ICO projects as an alternative method to venture capital or IPO are caused by, for example, the possibility of reselling the received tokens at a higher price after the launch of the project or obtaining the company's services at lower prices. While the importance of the topic is growing, there is the absence of fundamental works emphasizing the determinants of an ICO's success. The scientific novelty of the forthcoming research consists in the formation of the model evaluation of ICO success. Using econometric analysis based on data for 1392 projects, we show that the volatility of the main cryptocurrencies has a significant impact on the success of ICO. The constraints of the platform for Smart Contacts (ERC-20) and dependence on the Ethereum volatility overcome all other factors. Our data contributes to existing literature and shows the insignificance of the sector of the project, almost all location region and fluctuation of influence of quality of the team. This result may be explained by the uncertainty of the investor about the project (weak signals), absence of the regulation and legal framework. This result is beneficial for owners of companies since it is an argument for decreasing costs for marketing.

***Keywords:*** ICO; investment; success of initial coin offering; digital economics; smart contracts; blockchain; crowdfunding

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## INTRODUCTION

According to the PWC [1], initial coin offering ('ICO', also token launch or token generation) is a term describing a limited period in which a company sells a predefined number of digital tokens (crypto coins) to the public, typically in exchange for major cryptocurrencies or increasingly against FIAT currencies.

ICO is conducted on one specific blockchain, which serves as an ICO platform (the most common is the Ethereum blockchain — 90.2%[1]). The project-specific coins (tokens) are issued by a smart contract on the platform blockchain. Smart contracts[2] [2] are computer protocols, which permit trusted transactions and agreements to be carried out among disparate, anonymous parties with no central authority, legal system, or external enforcement mechanism required after the execution criteria have been met. Before the ICO launch, the project seeking funds creates two smart contracts which define the key parameters of the ICO and the tokens to be distributed (the amount of money going to be accepted maximally (the hard cap), the time frame when the ICO happens, the prize of the project-specific coins and how many of these coins will exist). After these smart contracts are deployed on the blockchain, investors can participate in the ICO by investing to the ICO smart contract; however, funds are not paid directly to the project itself. After the payment by the investors, the following part of the process is completely automated, according to the pre-defined rules in the smart contracts. The project receives access to the funds paid into the ICO smart contract and the investors receive their share of tokens from the token smart contract. Thus, the core machinery of the ICO process — the exchange of funds for tokens — is a fully automated system running on a blockchain [3]. The main advantages of smart contracts are independence (no need to find intermediary to make a

[1] Representative self-selected database used in the empirical part. Source: www. ICObench.com.

[2] Smart contracts are self-executing contracts with the terms of agreement between the buyer and the seller being directly written into the lines of the code. The code and the agreements contained therein exist across a distributed, decentralized blockchain network.

deal), security (contract is stored encrypted in the distributed registry), credibility (all information has many copies in blockchain), cheapness (low costs) and accuracy (low operational risk).

## INITIAL COIN OFFERING: CHARACTERISTICS AND PROCESS

There are several reasons explaining the popularity of Ethereum platform for ICO projects. First, this is a public database with the ability to store digital transactions for unlimited time. Maintenance and protection of such a database do not require any key management systems. Second, the platform reduces the complexity of the operations and simplifies the process itself leading to reduced cost. Third, Ethereum token has a real demand from the participants of the market because in order to make actions in the Ethereum blockchain, the users pay a certain amount of GAS (its cost is related to the ether coin and is used exclusively as payment for actions). The next advantage is the ability to create your own contracts with your currency leading to a big community and many nodes in the network allowing faster confirmation of contracts [speed of building blocks (10 minutes (BTC) vs 12 seconds (ETH)]. Finally, the advantage of using this particular type of platform is clear regulation and proven reliability. *Table 1* represents the comparison of five biggest platform and lists the maim advantages and disadvantages of each.

ICOs are inconsistently regulated across the world, and, depending on the jurisdiction, they can take different forms including a security, utility token or digital currency. The United States Securities and Exchange Commission (SEC US) and The Swiss Financial Market Supervisory Authority (FINMA) divide tokens only into 2 main types: security tokens (this type is to some extent similar to securities) and utility tokens (this type gives its holders the access to services provided by the project). Also there exists the third specific type — payment tokens. SEC focuses on comparing tokens with securities, FINMA is focused on the economic functions of tokens[3]. Each type of token has key features:

1. Security token (SEC) / Asset token (FINMA). This category of tokens represents assets such as participation in real physical underlyings, companies, or earnings streams, or an entitlement to dividends or interest payments. In terms of their economic function, the tokens are analogous to equities, bonds or derivatives. Sharing profits of a project is implemented by Modum[4] or NEX[5].

2. Utility token (SEC) / Utility token (FINMA). This category provides access to the goods and services that the project will launch in the future. Also, they can be used as a type of discount or premium access to the goods and services of the project. For instance, Ethereum provides infrastructure for a computer, the Ethereum Virtual Machine (EVM), which is accessible worldwide for anyone. In order to use this computer (e.g., deploy smart contracts), a fee uniquely payable in Ether is due. Hence, only the possession of Ether allows access to the service provided by the Ethereum computer. Other examples are Filecoin[6] [6], Gnosis[7].

3. Cryptocurrencies (SEC) / Payment token (FINMA). Usually, the tokens of this category have no further functions or links to other development projects. Cryptocurrencies purpose is to be items of inherent value (similar, for instance, to cash or gold) that are designed to enable purchases, sales, and other financial transactions. They are intended to provide many of the same functions as long-established currencies such as the U.S. dollar, euro or Japanese yen but do not have the backing of a government or other body. For example, Bitcoin, in its original sense of a currency allows to easily transfer value worldwide over the Bitcoin blockchain. Other examples are Dash[8], Monero[9].

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[7] Company offers prediction market platforms, decentralized trading protocols and secure wallet app. URL: https://gnosis.io (accessed on 07.03.2019).

[8] Decentralized platform and cryptocurrency. URL: https://www.dash.org/ru/

[9] The 9th cryptocurrency based on market capitalization. URL: https://monero.org (accessed on 07.03.2019).

*Table 1*

**Comparison of top 5 popular platforms for execution of smart contracts [4, 5]**

| Platform | Advantages | Disadvantages |
|---|---|---|
| ETHEREUM (ETH) | Free to setup. Contract transactions are charged in gas.<br>Ethereum token standard or ERC-20<br>Own smart contract programming language Solidity<br>Clear guidelines for developers<br>Cutting edge development community<br>Lots of literature/help available<br>Smart contract developers nearly always have experience using Ethereum | Network frequently overloaded (leads to decreasing the speed)<br>Scalability (during a new large ICO the system falls)<br>More expensive than other platforms<br>Developers have found a number of security issues with the Ethereum code. Added to this, poor quality smart contract code has left many contracts exposed to hackers |
| WAVES | Requires very little background knowledge to create own tokens | Not versatile platform<br>Small userbase |
| HYPERLEDGER FABRIC (HLF, 'chaincode') | Open Source and free to use<br>Permissioned membership<br>Supported by IBM<br>Flexibility as allows contracts to be coded in a variety of languages (e.g. go language or 'golang')<br>Reliable Performance<br>Supports plug-in components | No token system |
| NEM | Created in Java so easy to use (lighter code) and has no platform specific programming language<br>Scalability<br>Excellent performance/faster execution (e.g. while ETH does a maximum of 15 transactions per second, NEM reportedly manages hundreds of transactions per second)<br>High level of security<br>Easy to update | Smaller development community than other platforms<br>Fewer tools available<br>NEM uses code off the blockchain which makes it less decentralized |
| STELLAR (SSC) | Simple platform<br>Good performance (median confirmation time is 5 sec.)<br>Well regarded within the industry<br>Almost costless (no gas fee for computation only negligible transaction fee equals $\$ 2\times10^{-6}$ vs medium price for a transfer $ 0.094 in ETH) | Not suitable for more complex smart contract development<br>Not Turing complete |

*Source:* Compiled by the authors.

*Table 2*

**Rights and responsibilities of different types of token***

| | Pre-sale / The token doesn't yet exist, but the claims are tradeable [Simple Agreement for Future Tokens (SAFT)] | The token exists |
|---|---|---|
| Security token | The same as securities (not subject to Anti-Money Laundering Act (AMLA) | The same as securities |
| Utility token | | 1. No more securities, if exclusively a functioning utility token<br>2. Still the same as securities, if also or only investment function |
| Payment token | | No more securities.<br>Means of payment under AMLA |

*Source:* ICOscoring.

* ICOscoring (2018). URL: https://medium.com/swlh/types-of-tokens-the-four-mistakes-beginner-crypto-investors-make-a76b53be5406 (accessed on 07.03.2019).

*Table 2* shows the rights and responsibilities of different types of token based on ICOscoring analysis.

It is important to notice that utility tokens are used in more than 95% of all the existence projects and sometimes they are given completely absurd functions[10]. This is an implication of the legal restrictions. Moreover, the safest type of token for investors is security token. However, this type of token makes ICO more complicated and requires KYC (know your customer) / AML (anti-money laundering) procedures. However, the type of token might be amended throughout the project development, or because of SAFT-agreements. For example, Ziliqa[11], Seele[12], and Credits[13] all issued ERC-20 tokens (utility) in the early stages of development and later aim to substitute them for own cryptocurrencies (payment tokens).

## LITERATURE REVIEW

Due to the limited of published papers and academic proven works about ICO, literature review is divided into 2 parts: the reviews about crowdfunding and about ICO. The choice of study crowdfunding may be explained by similar mechanism and idea[14]. Note that under the crowdfunding we take into account only equity crowdfunding or crowdinvesting which delivers investors a share in the company. In the contrast to classical crowdfunding (it is almost non-repayable), crowdinvesting has more similarities with ICO, e.g. the motivation of agents (receive dividends). However, Belleflamme (2012) [7] states that participants of both formats of crowdfunding receive some usefulness from involvement in a closed community. Ferrerira and Pereira (2018) [8] show that the motivations for investors in equity and reward crowdfunding are similar. With similar motivations it is possible to apply the data available for reward crowdfunding to equity crowdfunding, since both campaigns can be designed to answer the same needs and motivations. Moreover, according to Belleflamme (2012) [7] crowdfunding projects share major characteristics: pre-purchase a product, willingness to pay and community benefits. These make crowdfunding more comparable to ICO.

Ahlers (2015) [9] identifies three main signals that influence the success of a crowdfunding campaign: a well-designed roadmap (including exit strategies for investors, such as an IPO or sale of a company), a Board of Directors (in particular, their number and level of education) and the share of the company with which its founders are willing to part (it is assumed that the founders will want to keep a large share of the company only when they believe in its success). At the same time, third-party project quality certifications, such as patents or grants, have no significant impact on success of campaigns. It has been found that the depth of the project description (Xiao, 2014 [10]) ("the elements on the homepage of a project that can well describe the project are positively associated with its crowdfunding performance") or the requested amount of money (Mollick, 2014 [11]) ("crowdfunding success appears to be linked to project quality, in that projects that signal a higher quality level are more likely to be funded, while a large numbers of friends on online social networks are similarly associated with success") influence funding success. Communication with the platform members and visitors is important for successful project funding as well (Xiao, 2014). Xu (2014) [12] focused on the updates of project descriptions and found that these updates also influence crowdfunding success. Koch and Siering (2015) [13] found that the project description, related images and videos as well as the question of whether the founder has previously backed other projects, influence funding success. Li (2018) [14] showed that financing objectives, assignment of shares, and the number of inquiries have a significant impact on investors' willingness to invest; the minimum initial investment amount and the number of inquiries have a significant impact on financing efficiency, and early investment affects the decision-making behavior of investors later in the process via the herding effect. Ahlers (2013) [9] found that ventures with more board members,

[10] ICOscoring (2018). URL: https://medium.com/swlh/types-of-tokens-the-four-mistakes-beginner-crypto-investors-make-a76b53be5406) (accessed on 07.03.2019).

[11] The cryptocurrency. URL: https://zilliqa.com (accessed on 07.03.2019).

[12] Protocol. URL: https://miningbitcoinguide.com/ico/seele (accessed on 07.03.2019).

[13] Decentralized blockchain platform built on peer-to-peer principles for developing smart contracts and decentralized applications. URL: https://credits.com (accessed on 07.03.2019).

[14] Detailed comparison of IPO, crowdfunding and ICO in appendix 2.

higher levels of education and better networks send out positive signals and are more likely to be funded. Moreover, the exit strategy, the existence of a financial plan and the age of the capital-seeking venture also play significant roles. Zvilichovsky (2015) [15] underlines that crowdfunding acts on both sides of the market which is a peer-economy phenomenon. Author finds causal channel from playing both sides of the market to increased crowdfunding success and provides evidence as to the existence of reciprocity.

All current research on ICO may be divided into two main categories (theoretical and empirical) with the three biggest research questions in the ICO literature: factors affecting the success of ICO, factors affecting the liquidity and volatility of tokes and underpricing of ICO.

Adhami (2017) [16] investigates the impact of various factors on the success of ICO process and proves that this is the correlation with the existence of at least a part of the code and the crypto tokens pre-sale, while the correlation with the existence of the white book, the type of tokens and sales bonuses was not confirmed. Yadav (2017) [17], on the basis of interviews of several experts in the crypto field, identifies the following signals, important for investing in ICO process: the local environment (government) relationship to invest in blockchain technology projects, company history, liquidity of issued crypto tokens and their distribution, response of crypto communities on the project, promotional bonuses and paid ads, and the quality of information in the White Paper.

The correlation of an ICO price to its success was explored by Benedetti and Kostovetsky (2018) [18] who found a negative correlation on the nominal ICO price and ICO success, as there is a higher demand for tokens with low nominal prices. An additional aspect that can influence ICO success is the **platform** used, as ICOs teams must decide which platform to release their tokens on during the ICO. Fisch (2018) [19] finds that **Ethereum-based tokens** positively affected the ICO valuation, as there are fewer risks in choosing an established platform compared to using new technology. Howell, Niessner and Yermack (2018) [6] find the adoption of the Ethereum blockchain to be positively correlated to ICO returns over five months. Moreover, authors state that success is associated with disclosure, credible commitment to the project, and quality signals. Amsden and Schweizer (2018) [20] found a positive significant impact of launching a token on the Ethereum platform and tradability success; however, they also found a negative correlation with the amount raised and the use of the Ethereum platform.

As in any project, a key signal for investors in an ICO is that of the **quality of the management team** as it provides a signal of the potential success of the venture. Momtaz (2018) [21] finds that the quality of the management team as measured by analyst ratings from the ICOBench platform is positively related to the first-day returns. Howell (2018) [6] discovers a positive correlation between entrepreneurial experience to volume and liquidity; however, they find no correlation to abnormal returns in five months. Within literature pertaining to the factors contributing to equity crowdfunding success which operates similarly to security tokens, Ahlers et al. (2015) [9] uncover that a higher quality of human capital had a positive impact on crowdfunding success. Fisch (2018) [19] researches whether the **number of founders in the management team** influences the likelihood of success and suggests no correlation between the number of founders and the profitability of the ICO. Conversely, Amsden & Schweizer (2018) [20] measure human capital by the number of team members and ICO advisors and find that a larger number of team members and advisors is positively related to the chance of the token being traded as well as the amount raised. ICOs imply a high level of uncertainty and a high information asymmetry (Amsden & Schweizer, 2018 [20]), the presence of female members in the management team should increase the success of the ICO.

Furthermore, ICO success is linked to the **market sentiment.** Previous literature shows that investor and market sentiment, as measured by social media statistics (Benedetti, 2018 [18]; Fisch, 2018 [19]) and Google trends (Polasik, 2015 [22]; Sovbetov, 2018 [23]), affects the returns of cryptocurrencies. Regarding Twitter statistics, Benedetti (2018) [18] compares the relationship between the amount of Twitter followers and market capitalization and uncovers that more users lead to a larger market capitalization. Howell (2018) [6] found a positive correlation between

the number of Twitter followers and five-month abnormal returns, as well as volume and liquidity; while Fisch (2018) [19] suggests that the presence of a Twitter page post-ICO affects the profitability of the ICO. Pertaining to the effect of the frequency of Google searches of cryptocurrencies on their returns, Sovbetov (2018) [23] looks at the factors that influence the price of the top cryptocurrencies and suggests that in the short-run, a greater number of Google searches only leads to an increase in the price of bitcoin. However, in the long- run it leads to an increase in the price of each cryptocurrency in their sample. Polasik (2015) [22] shares the view that an increase in the amount of Google searches leads to higher returns for bitcoin. Conversely, within the stock market, Bijl (2016) [24] analyses whether Google trends data can predict stock returns and finds that high levels of Google search volume predict low future stock returns.

There is a need to define what a **success of ICO** is. Adhami (2017) [16] defines success as a binary variable, where value of "1" corresponds to the live ICO (it exists and performs) and "0" corresponds to ICO failure. Lyandres (2019) [25] uses five success measures of ICO: 1) a binary variable with value"1" if at least a minimal amount ($ 10000) was raised; 2) the log amount raised; 3) the ratio of the amount raised to hard cap; 4) a binary variable with value "1" if a token was eventually listed on an exchange; 5) a "disaster indicator" which is a binary variable with value "1" if a token is delisted within a year of listing or experiences cumulative return lower than 95% a year after listing — for subsamples of ICOs with high and low values of various ICO characteristics. Amsden and Schweizer (2018) [20] define ICO success in the way whether the token is subsequently listed on an exchange (token tradability) and traded actively or not. The authors explain the definition due to exchanges are protective of their reputations and as this definition is "the only consistent and unbiased method when the dataset consists of both security and utility tokens". Boreiko (2018) [26] tests if proxies for success of ICO are correlated as should be the case if they all correctly identify the successful ICOs. The authors found that some consistent significant correlation coefficient of some proxies among each other, none of them are correlated with tokens' long-run performance as measured by the return in five months following the first month of trading. As for proxies, the authors take Token LR return; Token Listed on Exchange; Token Coinmarketcap ranking; Total funds raised; Raised more $US 100k; Raised more than min cap; Reached hard cap; N. investors; N. Twitter followers; Listing coverage; Icobaazar rating; Icobench rating; Icoholder rating; Bitcoin LR return and Ether LR return. Burns (2018) [27] uses three proxies for success of ICO: the four-month return on investment (ROI) of the ICO, the first-day returns and the total amount raised for the entire duration of the ICO. We define the success as the total amount raised; success ratio and BENCHY rating[15]. The literature overview of the papers about crowdfunding and ICO served as a basis for the hypothesis.

The technical characteristics and constraints of smart contract platform lead to constraints in the future choices of the team. Moreover, the majority of them are connected to the exact cryptocurrency. Therefore:

**H1:** The choice of a platform for creating smart contracts matters to potential contributors and affects the probability of a project's success.

**H1a.** Volatility of Ethereum positively affects the probability of success.

**H1b.** Volatility of Bitcoin negatively affects the probability of success.

Different signs of cryptocurrencies are defined by different directions of volatility between Ethereum and bitcoin. The graphs 1 and 2 show relationship between Ethereum and Bitcoin.

**H1.**

1. $$lnraised_i = c + \sum_i \beta_i Market\ Characterisctics_i + \\ + \sum_i \gamma_i control\ varibles\left(ico\ characterisctics\right)_i + \\ + \theta_i team\_size + \varepsilon_i$$

2. $$dummy\_ss\_ratio_i = c + \sum_i \beta_i Market\ Characterisctics_i + \\ + \sum_i \gamma_i control\ varibles\left(ico\ characterisctics\right)_i + \\ + \theta_i team\_size + \varepsilon_i$$

[15] ICObench (2019). URL: https://icobench.com/ratings (accessed on 08.06.2019).

3. $r\_benchy_i = c + \sum_i \beta_i Market\ Characterisctics_i +$

$+ \sum_i \gamma_i control\ varibles\left(ico\ characterisctics\right)_i + \varepsilon_i$

More information is better for a potential investor due to the absence of the regulation and legal framework (because of the high level of risk). For example, the existence of a white paper, open code or review from experts increases the availability of information leading to the increase of the investors' level of confidence. Therefore:

**H2:** The availability and quality of the information regarding prospective ICO projects matters to potential contributors and positively affects the probability of a project's success.

**H2.**

1. $lnraised_i = c + \sum_i \gamma_i\ ico\ characterisctics_i +$

$+ \sum_i \beta_i\ rating\ characteristics_i +$

$+ \theta_i team\_size + \varepsilon_i$

2. $dummy\_ss\_ratio_i = c + \sum_i \gamma_i ico\ characterisctics_i +$

$+ \sum_i \beta_i\ rating\ characteristics_i +$

$+ \theta_i team\_size + \varepsilon_i$

3. $r\_benchy_i = c + \sum_i \gamma_i ico\ characterisctics_i +$

$+ \beta_i num\_expert_i + \varepsilon_i$

*Table 3* demonstrates list of all variables in the sample.

Since ICO market is unregulated, there is no single source of ICO data, the study was conducted on a sample of companies that carried out ICO in the period from 2013 to 2018 and the data are presented on the ICOscoring platform, in the list of Coinschedule and Coindesk. All data have been collected manually from ICODrops, ICOBench, Coinmarketcap and the companies' white papers. To collect the data, we wrote a special code at Python to automate the process. It allows to get the real time pricing data.

The process of the data collection was the following: we collected the data from open sources, then we added the information from social networks (Twitter, Facebook and Telegram), and finally verified the information by means of white papers. The open sources we used are the most comprehensive and reliable databases.

## EMPIRICAL RESULTS

In our data sample were 1824 projects, but after the data was cleared only 1392 projects left. In the sample, the majority of projects started in 2017 (334) and 2018 (935). 56 countries are presented (USA (147 projects, 9.7%); Singapore (179 projects, 11.82%); UK and Ireland (131 projects, 8.65%); Europe (32 countries included, 436 projects, 28.78%); Russia (86 projects, 5.68%). These top five countries are 64.64% of all the projects in the dataset. Among the regulation in our sample are 503 projects where ICO is allowed, 339 — allowed, but there will be future regulation, 509 — regulations (98% of the projects in the dataset are presented in the countries with no ban). The majority of the projects are utility type tokens (1321) and 1261 projects are based on Ethereum platform. 166 projects represent finance industry, 167 — business services, 239 — cryptocurrency and 282 are presented by the sector platform. The team size varies from 0 to 50 participants, with skewness to the right, the majority of the projects have from 3 to 12 participants in the team. The same skewness is true for the number of experts.

All variables of the rating have been taken from ICObench. The methodology of the rating is the following: the algorithm divides the evaluation on 4 different groups (team, ICO information, product presentation, marketing and social media). An ICO can be evaluated many times a day and the rating cannot be manually changed. All ICOs are rated under the same condition, by the same assessment algorithm. The overall rating of the ICObench algorithm is a mark out of 5. ICObench allows to get expert review. Experts are rating independently. ICObench does not allow experts to give bad rates to their competitors just because they are higher on the leader board. Each expert's rate is weighted in regard to his or her expertise, years of experience in the field, and possible available publications. We consider this part of the rating the subjective

*Table 3*

**List of all variables and their description**

| Name | Description |
|---|---|
| **Dependent variables** | |
| lnraised | The logarithm of the amount of the funds raised during ICO |
| dummy_ss_ratio | The dummy variable: 1 — success ratio equal to or more than 100%, 0 — not. Success ratio,%, = raised (the amount that the ICO project raised during ICO, $)/hard cap (the amount that the ICO project put as a target, $) |
| r_benchy | The category variable from 1 to 5. Special assessment algorithm that uses more than 20 different criteria for each project, including the quality of the team members (photos, full names, social media links), ICO information, whitepaper, milestones, video presentation and marketing and social media |
| **Independent variables** | |
| | *Financial details and exchange* |
| durarion_ico | ICO duration, days |
| ln(vol24h_1d) | The logarithm of volume of funds, in $ for the first 24 hours |
| distributed | Distributed number of tokens, $ |
| num_cur | Number of currencies accepted, including fiat and cryptocurrencies |
| fiat | The dummy variable: 1 — accepts fiat money, 0 — does not |
| ETH | The dummy variable: 1 — accepts ethereum, 0 — does not |
| BTC | The dummy variable: 1 — accepts bitcoin, 0 — does not |
| bonus | The dummy variable: 1 — additional bonus, 0 — not |
| traded | The dummy variable: 1 — listing, 0 — not |
| duration_listing | Listing duration, in days up to 6.08.2019 |
| open_pr_usd | ICO price at the beginning of the 1st trading day, $ |
| close_pr_usd | ICO price at the end of the 1st trading day, $ |
| close_pr_usd_5d | ICO price at the end of the 5th trading day, $ |
| close_pr_usd_10d | ICO price at the end of the 10th trading day, $ |
| close_pr_usd_30d | ICO price at the end of the 30th trading day, $ |
| close_pr_usd_60d | ICO price at the end of the 60th trading day, $ |
| close_pr_usd_90d | ICO price at the end of the 90th trading day, $ |
| close_pr_usd_180d | ICO price at the end of the 180th trading day, $ |
| close_pr_usd_365d | ICO price at the end of the 365th trading day, $ |
| | *ICO Characteristics* |
| wp_KYC | White paper and Know Your Customer requirement, the dummy variable: 1 — exists, 0 — does not |
| sector_finance | The dummy variable: 1 — industry finance, 0 — not |
| sector_platform | The dummy variable: 1 — industry platform, 0 — not |
| sector_cryptocurrency | The dummy variable: 1 — industry cryptocurrency, 0 — not |
| sector_business | The dummy variable: 1 — industry business, 0 — not |
| location_us | The dummy variable: 1 — location in the USA, 0 — not |
| location_singapore | The dummy variable: 1 — location in Singapore, 0 — not |
| location_uk | The dummy variable: 1 — location in the UK (plus Ireland), 0 — not |
| location_ | The dummy variable: 1 — location in Russia, 0 — not |

*End of Table 3*

| Name | Description |
|---|---|
| location_europe | The dummy variable: 1 — location in Europe (32 countries included), 0 — not |
| utility_token | The dummy variable: 1 — type of token — utility, 0 — not |
| platform_eth | The dummy variable: 1 — platform type — Ethereum, 0 — not |
| | *Team characteristics* |
| team_size | The number of participants in the team at the beginning |
| Num_adv | Number of advisors |
| | *Market characteristics* |
| eth_return | Ethereum Bitcoin return on the ICO starting date |
| eth_vol_week | Weekly volatility of Ethereum (7 days before the ICO started) |
| eth_vol_month | Monthly volatility of Ethereum (30 days before the ICO started) |
| bit_return | Bitcoin return on the ICO starting date |
| bit_vol_week | Weekly volatility of Bitcoin (7 days before the ICO started) |
| bit_vol_month | Monthly volatility of Bitcoin (30 days before the ICO started) |
| ind_return | CRIX return on the ICO starting date. CRIX is the cryptocurrency index which represents a weighted market capital index of the top cryptocurrencies and is balanced monthly based on the market value and trading volume of the cryptocurrencies. |
| ind_vol_week | Weekly volatility of CRIX (7 days before the ICO started) |
| ind_vol_month | Monthly volatility of CRIX (30 days before the ICO started) |
| | *Rating characteristics* |
| r_team | Rating of a team at ICObench |
| r_vision | Rating of a vision of the project at ICObench |
| r_product | Rating of a product at ICObench |
| r_experts | Rating of experts at ICObench |
| num_expert | Number of experts for rating at ICObench |
| var_r_team | Variance of rating from experts for a team |
| var_r_vision | Variance of rating from experts for a vision |
| var_r_product | variance of rating from experts for a product |

*Source:* compiled by the author.

part. The expert's rating from 1 to 5 is assigned to the ICO for team, vision, and product.

*Table 1 In the Appendix 4* gives descriptive statistics for 52 explanatory variables and 3 dependent variables. From the Pearson correlation matrix, we found that the correlation between dependent and independent variables is high (e.g., the correlation between r_benchy and r_experts is 81.79%). This corrects the specification of models and variables used. For each regression, we calculate the max and average VIFs, which are all below 4, meaning no evidence of multicollinearity. The results of the multivariate analysis are presented in *tables 2*.

*Tables 2 in the Appendix 4* represent the evidence for H1 and H2. We found that volatility of Ethereum positively correlated with the total amount raised lead to the conclusion that the bigger the fluctuation of the market is, the bigger the interest from the investors to the market is. That may be a signal for the speculation as the investor's interest is willing to earn more and the possibility to earn at the cryptocurrency market on Ethereum is higher due to technical issues. The significance is stronger for weekly volatility as there is more ambiguity for cryptocurrency market over the long run. Significant control variables are the same for all model specifications:

• ICO duration has a slightly negative impact. The longer the ICO is, the harder is to raise funds, e.g. the project located in inappropriate countries leads to an increase in the ICO period and is a signal of less willingness to invest.

• Bonus, existence of WP and KYC have surprisingly negative signs. We believe that these parameters show the ICO transparency, but the logic of the investors is the same as for the ICO duration: if the project is complicated, the founders try to make it as attractive as possible.

• The opportunity to invest ICO using fiat money has a positive impact, as investors interpret it as a safer way to invest (there is no need to convert fiat to cryptocurrency before investing).

• The location of ICO significance negative in Russia and Europe due to big uncertainty of regulation in these regions. In Europe some regulations are only in France, Cyprus and Luxembourg, and there are no legal procedures in the other 29 countries. Nevertheless, in Russia we also have regulation of cryptocurrency market the current status of ICO and cryptocurrency market are still not fully defined (according to the federal portal of regulatory legal acts of the Ministry of Economic Development of Russia[16], the legal procedure has not been completed yet). Despite the fact that there is a regulation of the cryptocurrency market in the USA, the variable is not significant. The explanation is the following: companies registered both within and outside the United States limit the participation of the U.S. citizens and residents in token sale due to the legislation in the sphere of securities and stock market, as well as with the activities of the regulator in the face of the Commission on securities and exchanges (Securities and Exchange Commission; SEC)[17]. Since there is a number of problems (the regulation varies from state to state; court practice suggests that bitcoin is money, while the CFTC stated that it is rather a commodity; a special license is required to conduct cryptocurrency activities in some states), the main office locates in the USA and the token is issued in a different place.

• An indirect factor of the team quality is the size, which has positive influence. Since there are no financial reports at the ICO sale stage, the team size is one of the methods to define the firm size [28], which is a classical factor of influence in the corporate finance.

• The number of experts at the ICObench has slightly positive impact as there is no transparent information how these experts are approved to rate the projects. However, due to the absence of an underwriting process, rating is the only good proxy for it leading to taking into consideration rating and the experts' opinion.

• Variance of rating of the team, vision and product (in different specifications) also has a positive impact on the total funds raised. This influence has an unexpected sign. However, taking into account the significance of the proxy for underwriting (number of experts) and insignificance of internal decisions (the existence of a bonus, white paper and KYC), the bigger variance is, the better the quality of the rating is since different experts show the variety of arguments for and against the project.

Surprisingly, the sign of the Bitcoin influence is positive and only for weekly data, which leads us to the conclusion that the cryptocurrency type does not matter in the short term period; but due to the technical decision to use Ethereum platform to issue tokens, monthly volatility of Bitcoin is insignificant. This supports the sign of CRIX. We find statistical significance and present it in *tables 2 Appendix 4*.

The second definition of the ICO success (success ratio) supports our hypothesis as well with additional significant control variables. The list of the main differences between the two models (lnraised is the first model, ss_ratio is the second one) is the following:

• In contrast to model 1, the availability of bonus is insignificant. However, the existence of white paper and KYC has the same signs and impact as in model 1. The exception is model 2.1 (with Bitcoin volatility). The founders of the pro-

[16] Federal portal of normative legal acts of Ministry of Economic Development of Russia (2019). URL: https://regulation.gov.ru/projects#search=цифровые&npa=79293). (accessed on 17.08.2019).

[17] KYC Center (2018). URL: https://forklog.com/ssha-kak-yurisdiktsiya-dlya-kriptovalyut-ico-i-blokchejn-startapov (accessed on 17.08.2019).

jects establishing the hard cap understand what they may offer to the potential investor, leading to understatement the hard cap and increasing the probability of reaching it.

• The projects in the sector of the platform have more chances to be successful due to the demand and prospects of the sector from the business side. Platforms allow to make ecosystems and provide technological improvement for companies. A survey of 500 CEOs conducted by McKinsey & Company in 2018 showed that technology can increase company profits and capitalization by 30–50% [29].

• The influence of the location changes: in model 2, the probability of success of a project from the UK is higher by 10%[18], since in March 2019 the Financial Conduct Authority (FCA) issued a new guidance on cryptoassets, where the big focus is on the protection of investors and token-holders.

• The availability of Bitcoin as a means of investing in an ICO reduces the likelihood of success, and this contradicts the sign of the influence of Bitcoin volatility (the correlation between them is negative), since the Bitcoin mining procedure becomes more complicated with each mined token and leads to increased costs for investors. So, if investors choose Bitcoin, for the same amount of money they invest less spending funds for transaction costs. At the same time, these transaction costs during the mining process ensure internal value of cryptocurrency and decrease its volatility.

• The number of experts has negative impact as it shows the inability to manage the project by the team.

The last measure of the ICO project success is ICObench rating; however, the factors of influence are very similar to model 1 and model 2. The new significance variable is the number of currencies accepted by the project. More currencies increase the chances of getting a higher rating from ICObench due to diversity and openness to investors. The location and industry of the cryptocurrency in the industry does not matter, since they understand the procedure for launching projects of this type and the results.

## LIMITATIONS AND CONCLUSION

In the recent report the OECD[19] states that 'under specific caveats, regulated forms of ICOs have the potential to become an alternative financing mechanism for young SMEs with Distributed Ledger Technologies(DLT)-related projects and could facilitate faster financing at a lower cost compared to most traditional financing mechanisms, benefiting from cost efficiencies derived from automation and disintermediation through the use of DLTs and the blockchain'. This study is the first step in a large research, whose aim is to help investors decide on investing in ICOs. The current study focuses only on one side of the procedure and limited number of variables. Moreover, the dataset may suffer from self-selection or other problems with mainly collected data, but this is the first dataset which will be available for other researches and will be updated automatically by a special code. Further research will focus on team quality (which characteristics of the board of directors are a signal for investors), media coverage (the importance of social networks for ICO success) and case studies of STO, DAOICO and IEO as a new form of ICO.

Empirical results show that the volatility of the main cryptocurrencies has significant impact on the success of ICO. The constraints of the platform for Smart Contacts (ERC-20) and dependence on the Ethereum volatility overcome all other factors. Our data supplement the existence literature and show fluctuations in the importance of the project sector, region of location and quality of the team depending on the definition of success. This result can be explained by investor uncertainty regarding the project (weak signals), lack of any one type of regulation and legal base. This result is beneficial for company owners because it is an argument in favor of lower marketing costs.

[18] Financial Conduct Authority (2019). URL: https://www.fca.org.uk/publication/consultation/cp19–03.pdf (accessed on 17.08.2019).

[19] OECD (2019), Initial Coin Offerings (ICOs) for SME Financing. URL: https:// www.oecd.org/finance/initial-coin-offerings-for-sme-financing.htm (accessed on 17.08.2019).

## Appendix

### Appendix 1. Detailed smart contract process

A smart contract consists of three obligatory and one non-obligatory parts:

1. Data. Receiving input from a user or another contract.
2. Condition. Analysis of the correctness of the data and verification of compliance with the terms of the contract.
3. Action. Operations with input data, obtaining data from the registers, data processing, recording/updating data in registers, etc.
4. Conditions for changing the contact and/or conditions for viewing the contract. Option rights.

Here is an example of a smart contract procedure:

Step 1. Agent 1 identifies himself/herself with his/her blockchain address (public key) and uses a smart contact to define the terms of the contract signing it with his/her private key.

For example, the agent wants to sell his/her car

Step 2. Agent 1 makes his/her part of the deal. In our example this means that the agent leaves the car and the car key in the garage with a smart contract controlled by the smart lock. The car has its own blockchain address (public key) stored in the blockchain.

Step 3. Agent 2 is a counterparty of the deal. He/she sings the contract with his/her private key transferring money or making his/her part of the deal.

Step 4. The smart contract is verified by each node on the blockchain network checking agent 1 and agent 2 and their actions.

Step 5. If the network agrees that all conditions are true, agent 2 automatically gets the access code (in our example the code to the smart garage lock). The blockchain registers agent 2 as a new owner.

In case of ICO, the process is the following. Two agents are project (creates smart contracts before ICO) and investors (send capital to the smart contract and receive corresponding tokens automatically). There is an intermediary between the agents (Blockchain as an automated ICO Platform) where two types of smart contracts are made. ICO Smart Contract defines key parameters of ICO such as soft and hard cap, token prize and duration. Token Smart Contact facilitates the use of token, including the initial distribution and the subsequent transfer of tokens. Both contract types are created by the project side. The first smart ICO contracts work by transferring capital from investors on the project side, checking the transaction and launching the Smart Contract token, which delivers tokens to investors.

### Appendix 2. Detailed comparison of various types of fundraising for companies

When describing ICOs, we must emphasize the difference between ICOs and IPOs. To make it simple, a comparison table with 7 categories is presented in table 7. The main difference between IPO and ICO is the aim why companies decided to raise funds. On the one hand, IPO is used for companies as additional investments. IPOs are not held in the first round, which may be a signal of trust for investors. ICO is very quick and there are no barriers to enter for either investors or companies. We aggregate the comparison of ICO and IPO at the *table 1* of *Appendix 2*.

*Table 1*

**Comparison of ICO and IPO**

| | ICO | IPO |
|---|---|---|
| Goal | The company sells tokens to gain stakeholders in the product ecosystem (stakeholders use the tokens to interact with the product) | Company wants to raise additional capital from investors in order to continue the company operations and growth |
| When | At the begging of the project | Not the first round of investment |

*End of Table 1*

| | ICO | IPO |
|---|---|---|
| Funding stage | All stages | Later stage |
| Regulatory | They are not restricted by any legal requests to issue any sort of legal documentation. There is no standard for an ICO whitepaper. Low regulation | There is a legal document called prospectus; it is a part of the obligatory requirement to chronicle with the regulatory authority. It signifies a legal statement with an objective to issue its share to the public. High regulation |
| Duration of offerings | The whole ICO procedure is much shorter in duration. The length of the period depends on the timeline and the nature of the project itself. Popular ICOs can frequently be much quicker | Customary IPO issuance can be a time-consuming process, because of mandatory legal and compliance procedures. It approximately takes 4 to 6 months |
| Access to offerings | Anyone can take a part in ICO. One is only required a base currency of either Ether or Bitcoin that can be transformed into the ICO token | Allowed only to institutional investors such as funds, mutual funds and investment banks. Often, only a small number is assigned to retail investors. Shares can simply be bought as soon as they are traded on exchanges |
| Characteristics of deal | Investment amounts >$ 100k, low transaction cost | Investment amounts >$ 10m, high transaction cost |

*Source:* compiled by the author.

In the Cambridge English Dictionary, crowdfunding is defined as 'the practice of getting a large number of people to each give small amounts of money in order to provide the finance for a business project, typically using the internet'[1]. According to Ordanini (2011), the concept of crowdfunding is a collective effort of various individuals, who come together to pool the funds, to support new potential projects, organizations and businesses. The main purpose of crowdfunds is to either gather enough investors to make a product launch successful or to gather working capital to produce these things after a product has been launched.

Either the main purpose of crowdfunds is to gather enough investors to make a product launch successful or to gather working capital to produce these things after a product has been launched. We aggregate the comparison of ICO and crowdfunding at the *table 2 of Appendix 2*.

*Table 2*

**Comparison of ICO and crowdfunding[2]**

| | ICO | Crowdfunding |
|---|---|---|
| Accessibility | Anyone could take part, as accessibility for them falls on a wider range | Most crowdfunding projects are restricted to a certain region or a certain country, native to the people behind the project (there exist the biggest ones which are global, e.g. KickStarter) |

[1] URL: https://dictionary.cambridge.org/dictionary/english/crowdfunding (accessed on 01.06.2019).
[2] URL: https://tokenguru.net/articles/ico-vs-crowdfunding-what-is-the-difference (accessed on 01.06.2019).

*End of Table 2*

| | ICO | Crowdfunding |
|---|---|---|
| Product | Tends to revolve around the blockchain technology, e.g. eSports gaming (Unikorn Gold), banking (Bancor, BABB and Centra), platforms (Stratis), social media (Social), etc. | Products may vary from textile, technology, software, hardware or even food. Sometimes they even span niche markets such as intellectual property and other services that offer similar trades |
| Return on Investment | ICO is an investment | Offer an already working platform or product and participants are merely paying for early access to be able to use these products or get discounts for next purchases |
| Legitimacy and Regulations | They are not restricted by any legal requests to issue any sort of legal documentation. There is no standard for an ICO whitepaper.<br>Low regulation | Crowdfunds are most likely legitimate especially if the company trying to raise money would tie their products up to whatever business they are. These may involve patents, intellectual rights and would require forms to be filled out and submitted to the government. Also, these products may undergo testing first to make sure that it is safe for use or consumption by the public. Even then, not everyone would be able to participate in the projects, since with the problem of accessibility, they are limited by the region |
| Risks | Both of these have risks involved. However, ICO risks are considerably higher as most people who invest in them have profit in mind. The losses that might be suffered by an investor for an ICO would be different from someone who participated in a crowdfunding project and are not expecting for a return of investment, but just an early access to a technology or a product | |

According to Boreiko (2018) [26], we can contribute our tables 1 and 2 by the following characteristics:

| Characteristics | IPO | VC | Crowdinvesting | ICO |
|---|---|---|---|---|
| Marketing channel | Underwriters | Private negotiations | Online platforms | Social media |
| Intermediation | Syndicates | VC | Online platforms | – |
| Asymmetric information | Average | low | Above average | Highest |
| Monitoring ex-post | Governance mechanisms | VC | – | – |
| Liquidity | low | | – | High |

## Appendix 3. Market overview of crowdfunding

The classical or commodity (premium) crowdfunding allows the investor to get the result (product) of the project. The transaction volume in 2018 was $ 9.4 billion, while the average value of the project in 2018 equaled $ 1 065. China is the leader in the market ($ 7 477 million), the USA is on the 2nd place ($ 1 041 million) and three other big countries are the UK, Japan and France $ 156 million, $ 94 million, $ 93 million, respectively).

The business segment of crowdfunding (crowdlending) reaches $ 383.6 billion as the transaction volume in 2018 with the average value of the project in 2018 equaled $ 14 629. In this segment China is still the leader with 91% market share ($ 347.9 billion) [30].

## Appendix 4. Empirical results. Tables

*Table 1*

### Summary statistics and correlation matrix

This table gives descriptive statistics (mean, standard deviation, min and max) for the dependent variables and the Pearson correlation coefficient.

| Variable | Obs | Mean | Std. dev | Min | Max |
|---|---|---|---|---|---|
| **Dependent variables** | | | | | |
| lnraised | 1 392 | 15.096 | 1.950 | 5.631 | 26.938 |
| dummy_ss_r~o | 1 392 | 0.552 | 0.497 | 0 | 1 |
| r_benchy | 1 392 | 3.304 | 0.658 | 1.3 | 5.0 |
| **Financial details and exchange** | | | | | |
| duration_ico | 1392 | 54.66 | 52.27 | −72.00 | 389.00 |
| duration_listing | 200 | 419.98 | 203.00 | 3.00 | 1 394.00 |
| lnvol24h | 200 | 12.04 | 2.92 | 2.40 | 20.31 |
| distributed | 1147 | 0.54 | 0.21 | 0.01 | 1 |
| num_cur | 1392 | 2.19 | 3.21 | 0 | 100 |
| Fiat | 1392 | 0.17 | 0.38 | 0 | 1 |
| ETH | 1392 | 0.91 | 0.29 | 0 | 1 |
| BTC | 1392 | 0.48 | 0.50 | 0 | 1 |
| OTHER | 162 | 0.07 | 0.25 | 0 | 1 |
| bonus | 1392 | 0.52 | 0.50 | 0 | 1 |
| traded | 1392 | 0.28 | 0.45 | 0 | 1 |
| open_pr_usd | 200 | 0.39 | 1.01 | 0.00 | 11.47 |
| close_pr_usd | 200 | 0.45 | 1.09 | 0.00 | 11.50 |
| close_pr_usd_5d | 198 | 0.45 | 1.47 | 0.00 | 18.68 |
| close_pr_usd_10d | 197 | 0.49 | 2.03 | 0.00 | 26.88 |
| close_pr_usd_30d | 192 | 0.54 | 2.21 | 0.00 | 27.66 |
| close_pr_usd_60d | 186 | 0.50 | 1.83 | 0.00 | 19.73 |
| close_pr_usd_90d | 180 | 0.68 | 2.79 | 0.00 | 32.83 |
| close_pr_usd_180d | 171 | 0.72 | 4.65 | 0.00 | 55.64 |
| close_pr_usd_365d | 132 | 0.23 | 0.87 | 0.00 | 6.73 |
| leg_code | 1379 | 2.04 | 0.90 | 1.00 | 4.00 |
| wp_KYC | 1392 | 0.66 | 0.47 | 0 | 1 |
| sector_finance | 1392 | 0.12 | 0.32 | 0 | 1 |
| sector_platform | 1392 | 0.20 | 0.40 | 0 | 1 |
| sector_cryptocurrency | 1392 | 0.17 | 0.38 | 0 | 1 |
| sector_business | 1392 | 0.12 | 0.33 | 0 | 1 |
| location_us | 1392 | 0.10 | 0.31 | 0 | 1 |
| location_singapore | 1392 | 0.13 | 0.33 | 0 | 1 |
| location_uk | 1392 | 0.09 | 0.29 | 0 | 1 |
| location_rus | 1392 | 0.06 | 0.24 | 0 | 1 |
| location_europe | 1392 | 0.31 | 0.46 | 0 | 1 |
| utility_token | 1376 | 0.95 | 0.21 | 0 | 1 |
| platform_eth | 1391 | 0.90 | 0.30 | 0 | 1 |
| **Team characteristics** | | | | | |
| team_size | 1356 | 9.33 | 6.08 | 0 | 50 |
| num_adv | 1392 | 4.89 | 4.79 | 0 | 32 |
| **Market characteristics** | | | | | |
| eth_return | 1392 | −0.001 | 0.06 | −0.23 | 0.25 |
| eth_vol_week | 1392 | 0.05 | 0.02 | 0.00 | 0.16 |

*End of Table 1*

| Variable | Obs | Mean | Std. dev | Min | Max |
|---|---|---|---|---|---|
| eth_vol_month | 1392 | 0.05 | 0.02 | 0.02 | 0.10 |
| bit_return | 1392 | 0.00 | 0.05 | −0.19 | 0.25 |
| bit_vol_week | 1392 | 0.04 | 0.02 | 0.00 | 0.13 |
| bit_vol_month | 1392 | 0.04 | 0.02 | 0.01 | 0.09 |
| ind_return | 1392 | 0.00 | 0.06 | −0.23 | 0.19 |
| ind_vol_week | 1392 | 0.05 | 0.02 | 0.00 | 0.13 |
| ind_vol_month | 1392 | 0.05 | 0.02 | 0.00 | 0.09 |
| **Rating characteristics** | | | | | |
| r_team | 704 | 3.84 | 1.09 | 1.0 | 5.0 |
| r_vision | 704 | 3.78 | 1.15 | 1.0 | 5.0 |
| r_product | 704 | 3.56 | 1.12 | 1.0 | 5.0 |
| r_experts | 1010 | 3.39 | 0.66 | 1.1 | 4.8 |
| num_expert | 704 | 16.71 | 24.00 | 1 | 236 |
| var_r_team | 647 | 0.59 | 0.68 | 0.00 | 4.50 |
| var_r_vision | 647 | 0.68 | 0.69 | 0.00 | 4.50 |
| var_r_product | 647 | 0.72 | 0.71 | 0.00 | 5.33 |

| | Inraised | dummy_ss_ratio | r_benchy | duration_ico | duration_listing | Invol24h | distributed | num_cur | Fiat | ETH | BTC | OTHER | bonus | traded | leg_code | wp_KYC | sector_finance | sector_platform | sector_cryptocurrency | sector_business | location_us | location_singapore |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Inraised | 100,00% | | | | | | | | | | | | | | | | | | | | | |
| dummy_ss_ratio | 23,20% | 100,00% | | | | | | | | | | | | | | | | | | | | |
| r_benchy | 9,75% | -6,32% | 100,00% | | | | | | | | | | | | | | | | | | | |
| duration_ico | -10,59% | -9,67% | 11,44% | 100,00% | | | | | | | | | | | | | | | | | | |
| duration_listing | 16,67% | 2,34% | -5,51% | 1,36% | 100,00% | | | | | | | | | | | | | | | | | |
| Invol24h | 24,19% | 30,48% | 8,10% | -27,43% | 7,27% | 100,00% | | | | | | | | | | | | | | | | |
| distributed | -10,10% | -3,12% | -8,45% | 11,27% | -0,79% | -28,70% | 100,00% | | | | | | | | | | | | | | | |
| num_cur | 2,14% | -7,90% | 6,41% | 8,84% | -9,74% | -26,31% | 8,72% | 100,00% | | | | | | | | | | | | | | |
| Fiat | 1,74% | -6,24% | 11,50% | 13,31% | -6,29% | -19,21% | -3,82% | 30,42% | 100,00% | | | | | | | | | | | | | |
| ETH | 3,90% | -6,30% | 19,21% | 8,20% | -4,68% | -9,84% | 10,13% | 17,15% | 9,32% | 100,00% | | | | | | | | | | | | |
| BTC | 5,17% | -11,99% | 12,94% | 16,32% | -12,27% | -16,10% | 6,04% | 40,56% | 35,68% | 18,56% | 100,00% | | | | | | | | | | | |
| OTHER | 0,50% | 9,73% | -67,20% | -20,17% | 74,18% | -4,05% | -14,58% | -21,55% | -14,94% | 100,00% | -30,18% | 100,00% | | | | | | | | | | |
| bonus | -5,36% | -9,51% | 23,77% | 15,02% | -11,76% | -10,10% | 6,98% | 10,20% | 7,06% | 13,81% | 10,96% | -11,34% | 100,00% | | | | | | | | | |
| traded | 23,68% | 14,55% | -1,84% | -20,03% | 34,25% | 15,32% | -2,34% | -8,42% | -12,90% | -3,94% | -12,82% | 7,76% | -11,22% | 100,00% | | | | | | | | |
| leg_code | 1,00% | 9,00% | -8,82% | -8,13% | 5,47% | 13,59% | -12,33% | -8,33% | -7,82% | -7,20% | -12,50% | 15,11% | -8,13% | 6,68% | 100,00% | | | | | | | |
| wp_KYC | -14,34% | -9,07% | 35,76% | 19,90% | -49,19% | -8,11% | -5,27% | 10,18% | 12,02% | 11,33% | 11,52% | -7,70% | 19,80% | -31,77% | -10,67% | 100,00% | | | | | | |
| sector_finance | 5,21% | -4,93% | 1,93% | 1,14% | -3,35% | 5,74% | 1,99% | 1,36% | 7,72% | 3,45% | 6,25% | -9,24% | 3,69% | -2,64% | 0,90% | 4,56% | 100,00% | | | | | |
| sector_platform | 7,32% | 3,99% | -7,61% | -5,22% | 5,82% | 6,65% | -0,60% | 2,02% | -1,10% | -0,46% | 1,62% | 2,56% | -2,12% | 8,24% | 6,37% | -21,93% | -18,36% | 100,00% | | | | |
| sector_cryptocurrency | -0,82% | 5,47% | -4,68% | -0,71% | -4,31% | -3,06% | 5,95% | -1,37% | -0,09% | 4,78% | 1,76% | -10,13% | -5,39% | 1,03% | -5,26% | 3,24% | -16,61% | -22,68% | 100,00% | | | |
| sector_business | -5,11% | -4,51% | 4,77% | 6,41% | 6,85% | 4,76% | 5,07% | -1,84% | -0,77% | -4,00% | -3,05% | 8,85% | 5,43% | -0,45% | -3,33% | 6,26% | -13,54% | -18,49% | -16,73% | 100,00% | | |
| location_us | 4,11% | 4,45% | -9,28% | -0,32% | 8,72% | 9,71% | -7,44% | -5,89% | -4,22% | -9,04% | -8,85% | -5,29% | -8,84% | 11,47% | 36,45% | -16,71% | -3,12% | 2,77% | -3,03% | -0,37% | 100,00% | |
| location_singapore | 4,72% | 2,75% | 6,90% | -10,59% | -2,91% | 15,43% | -16,51% | -4,54% | -2,30% | 3,44% | -7,63% | 1,57% | -4,29% | 0,62% | 40,64% | 9,01% | 0,68% | -2,95% | 2,79% | -2,15% | -13,07% | 100,00% |
| location_uk | 0,85% | 2,34% | -0,99% | 12,10% | 11,20% | -8,85% | 1,99% | 2,85% | 2,49% | 1,96% | 6,56% | 1,74% | 2,44% | -5,91% | -2,44% | 2,20% | 5,69% | -2,62% | 2,42% | 0,21% | -11,03% | -12,30% |
| location_rus | -10,07% | 0,06% | -6,78% | 0,76% | 3,85% | -9,26% | 16,45% | 1,95% | -3,53% | -1,03% | 2,60% | -3,02% | -3,09% | 6,09% | 27,15% | -16,05% | -4,71% | 3,72% | -1,17% | -1,11% | -8,73% | -9,73% |
| location_europe | -4,11% | -8,39% | 8,44% | 3,88% | -8,03% | -11,71% | 11,87% | 7,63% | 12,65% | 5,71% | 4,92% | -16,20% | 8,73% | 0,47% | -47,39% | 3,68% | -3,04% | -3,41% | -2,36% | 3,85% | -23,00% | -25,65% |
| utility_token | 1,86% | 1,26% | -4,62% | -8,23% | -1,54% | -13,32% | -6,64% | 0,55% | -7,67% | 0,11% | -2,03% | 6,55% | -5,02% | -0,08% | 3,82% | -4,59% | -0,58% | 4,83% | -6,74% | -0,43% | -7,13% | 8,36% |
| platform_eth | 2,27% | 7,05% | -2,21% | 0,92% | 12,27% | -8,49% | 6,97% | -14,26% | -6,91% | 20,06% | -16,62% | -45,00% | -2,31% | 4,03% | 1,09% | -2,14% | 0,93% | 2,04% | -4,91% | 1,07% | -2,15% | 2,49% |
| team_size | 14,26% | -1,35% | 16,19% | 4,40% | 0,36% | 12,38% | -2,14% | -1,27% | 7,77% | 2,15% | 0,69% | -9,62% | 6,39% | 3,49% | -3,77% | 1,88% | -0,18% | 3,43% | -5,56% | 2,67% | -7,91% | 4,29% |
| num_adv | 15,20% | -5,88% | 31,33% | -6,09% | -13,41% | 8,78% | -5,10% | 7,42% | 6,68% | 8,39% | 8,55% | -0,11% | 9,72% | 1,21% | 1,55% | 11,57% | 3,83% | 1,74% | -6,59% | -0,20% | -0,22% | 5,53% |
| eth_vol_week | 11,59% | 8,54% | -9,74% | -7,97% | 12,67% | 10,60% | 7,64% | -5,55% | -5,67% | -3,89% | -5,82% | 5,11% | -0,83% | 10,59% | -4,13% | -16,32% | 2,05% | 3,31% | -1,67% | -2,00% | 0,08% | -6,35% |
| eth_vol_month | 11,90% | 11,23% | -14,59% | -9,32% | 26,25% | -1,14% | 6,60% | -4,60% | -5,56% | -8,15% | -5,19% | 5,37% | -5,50% | 15,12% | -0,18% | -17,54% | -0,40% | -0,57% | -1,59% | -4,89% | 6,34% | -3,87% |
| bit_vol_week | 11,10% | 11,26% | -16,88% | -11,09% | 5,01% | 9,76% | 9,40% | -5,02% | -6,59% | -3,98% | -7,78% | 10,88% | -8,21% | 14,64% | 2,58% | -28,26% | 0,71% | 6,38% | -4,18% | -8,50% | 8,17% | -6,19% |
| bit_vol_month | 14,18% | 15,08% | -24,91% | -13,42% | 16,19% | 13,61% | 10,17% | -4,20% | -8,21% | -4,10% | -5,32% | 12,63% | -9,19% | 21,19% | 3,62% | -31,77% | -0,97% | 5,84% | -4,52% | -7,94% | 12,13% | -7,76% |
| ind_vol_week | 8,76% | 9,23% | -10,73% | -2,32% | 2,57% | 4,71% | 10,70% | -2,98% | -2,48% | 0,49% | -4,75% | -5,84% | 0,77% | 5,48% | -1,51% | -5,93% | 2,29% | 1,04% | -1,93% | -4,14% | -1,24% | -3,88% |
| ind_vol_month | 10,33% | 10,32% | -14,96% | -3,18% | 11,24% | 1,67% | 10,66% | -1,66% | -4,01% | 1,19% | -2,83% | -1,87% | -1,29% | 11,66% | -0,08% | -4,98% | 0,67% | -2,11% | -0,94% | -4,64% | 4,42% | -3,08% |
| r_team | 10,74% | -3,30% | 22,85% | 2,66% | -9,60% | 19,12% | -3,02% | -3,92% | -5,80% | -2,56% | -1,65% | 5,27% | -4,07% | 0,15% | 2,00% | 7,93% | 6,93% | -6,00% | -3,26% | 6,71% | 2,34% | 9,11% |
| r_vision | 9,53% | 2,54% | 10,19% | 0,17% | 0,90% | 29,69% | -2,94% | 0,83% | -2,61% | -2,53% | -2,75% | 3,60% | -5,89% | 2,17% | 2,70% | 2,14% | 2,07% | 1,34% | -6,15% | 5,85% | 2,43% | 4,18% |
| r_product | 6,84% | -2,46% | 19,80% | 2,93% | -10,06% | 25,41% | -0,11% | -2,00% | -5,92% | -3,09% | -0,57% | -6,95% | -1,14% | -1,39% | 4,10% | 10,40% | 5,63% | -5,23% | -6,59% | 8,37% | 1,46% | 9,12% |
| r_experts | 15,84% | -0,69% | 81,79% | 4,26% | -0,65% | 21,96% | -11,81% | 6,74% | 10,32% | 13,45% | 10,20% | -18,50% | 18,97% | 0,54% | 6,35% | 28,10% | 0,74% | -4,48% | -5,56% | 5,54% | -3,01% | 6,00% |
| num_expert | 5,15% | 6,43% | 12,57% | -2,84% | -11,89% | 9,25% | 7,21% | 12,34% | -1,75% | 9,81% | 6,36% | -5,77% | 7,24% | 8,14% | -9,96% | 6,41% | -6,93% | 6,98% | -9,16% | -1,70% | -6,01% | -7,64% |
| var_r_team | 7,76% | 2,91% | -0,62% | 1,61% | -0,04% | -0,03% | 1,83% | 6,49% | 3,98% | 4,74% | 7,48% | 15,30% | 3,02% | 2,37% | -6,06% | 5,58% | 4,55% | 0,82% | -6,91% | -5,72% | -7,20% | 1,07% |
| var_r_vision | 5,15% | 0,42% | 5,82% | 11,18% | -0,16% | -11,07% | 1,00% | 4,72% | 0,71% | 2,47% | 5,84% | 9,92% | 4,43% | -1,33% | -4,33% | 5,29% | 2,84% | -0,35% | -3,93% | -0,78% | -6,96% | 5,88% |
| var_r_product | 5,26% | -1,00% | 2,75% | 6,80% | -1,83% | 10,52% | 2,47% | 5,03% | 6,62% | 4,41% | 7,61% | -5,45% | 3,30% | -0,29% | -7,18% | 4,63% | 4,27% | -2,08% | -1,94% | -3,61% | -4,50% | 1,22% |

| | location_uk | location_rus | location_europe | utility_token | platform_eth | team_size | num_adv | eth_vol_week | eth_vol_month | bit_vol_week | bit_vol_month | ind_vol_week | ind_vol_month | r_team | r_vision | r_product | r_experts | num_expert | var_r_team | var_r_vision | var_r_product |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Inraised | | | | | | | | | | | | | | | | | | | | | |
| dummy_ss_ratio | | | | | | | | | | | | | | | | | | | | | |
| r_benchy | | | | | | | | | | | | | | | | | | | | | |
| duration_ico | | | | | | | | | | | | | | | | | | | | | |
| duration_listing | | | | | | | | | | | | | | | | | | | | | |
| Invol24h | | | | | | | | | | | | | | | | | | | | | |
| distributed | | | | | | | | | | | | | | | | | | | | | |
| num_cur | | | | | | | | | | | | | | | | | | | | | |
| Fiat | | | | | | | | | | | | | | | | | | | | | |
| ETH | | | | | | | | | | | | | | | | | | | | | |
| BTC | | | | | | | | | | | | | | | | | | | | | |
| OTHER | | | | | | | | | | | | | | | | | | | | | |
| bonus | | | | | | | | | | | | | | | | | | | | | |
| traded | | | | | | | | | | | | | | | | | | | | | |
| leg_code | | | | | | | | | | | | | | | | | | | | | |
| wp_KYC | | | | | | | | | | | | | | | | | | | | | |
| sector_finance | | | | | | | | | | | | | | | | | | | | | |
| sector_platform | | | | | | | | | | | | | | | | | | | | | |
| sector_cryptocurrency | | | | | | | | | | | | | | | | | | | | | |
| sector_business | | | | | | | | | | | | | | | | | | | | | |
| location_us | | | | | | | | | | | | | | | | | | | | | |
| location_singapore | | | | | | | | | | | | | | | | | | | | | |
| location_uk | 100,00% | | | | | | | | | | | | | | | | | | | | |
| location_rus | -8,22% | 100,00% | | | | | | | | | | | | | | | | | | | |
| location_europe | -21,66% | -17,14% | 100,00% | | | | | | | | | | | | | | | | | | |
| utility_token | -0,11% | 4,09% | -1,05% | 100,00% | | | | | | | | | | | | | | | | | |
| platform_eth | 1,57% | -1,64% | 2,94% | 5,56% | 100,00% | | | | | | | | | | | | | | | | |
| team_size | -5,18% | -0,51% | 6,32% | 3,56% | -0,70% | 100,00% | | | | | | | | | | | | | | | |
| num_adv | -2,89% | -2,45% | 0,77% | -0,36% | 2,02% | 5,44% | 100,00% | | | | | | | | | | | | | | |
| eth_vol_week | 1,13% | 0,51% | 1,81% | 2,09% | 4,47% | -4,19% | -2,32% | 100,00% | | | | | | | | | | | | | |
| eth_vol_month | 2,48% | -3,85% | -2,18% | 4,15% | 4,57% | -6,67% | -4,09% | 58,91% | 100,00% | | | | | | | | | | | | |
| bit_vol_week | -1,45% | 3,50% | 0,49% | 0,33% | 2,40% | -7,23% | 2,18% | 63,13% | 48,01% | 100,00% | | | | | | | | | | | |
| bit_vol_month | 2,17% | 4,72% | -4,08% | 5,61% | 2,67% | -8,25% | -0,79% | 41,46% | 70,11% | 73,10% | 100,00% | | | | | | | | | | |
| ind_vol_week | 2,36% | 0,36% | 2,69% | 1,97% | 6,12% | -5,87% | 0,75% | 80,84% | 55,55% | 71,09% | 51,54% | 100,00% | | | | | | | | | |
| ind_vol_month | 3,08% | -3,40% | -0,65% | 4,00% | 6,80% | -6,59% | 1,68% | 45,94% | 81,85% | 49,16% | 75,11% | 67,08% | 100,00% | | | | | | | | |
| r_team | 6,01% | -7,19% | -2,14% | 5,10% | 0,33% | 15,34% | 22,64% | 3,18% | 1,43% | 2,53% | -0,83% | 1,69% | 0,07% | 100,00% | | | | | | | |
| r_vision | 7,06% | -0,40% | -2,82% | 0,11% | -1,09% | 5,18% | 13,36% | 6,23% | 6,64% | 6,13% | 7,09% | 2,81% | 4,03% | 66,44% | 100,00% | | | | | | |
| r_product | 8,21% | -5,07% | -6,96% | 3,95% | 1,80% | 7,02% | 13,44% | 0,82% | -0,56% | -1,76% | -2,13% | -1,47% | -0,93% | 72,58% | 73,45% | 100,00% | | | | | |
| r_experts | 1,35% | -6,24% | 4,23% | -2,84% | -0,63% | 17,87% | 36,15% | -4,80% | -8,44% | -9,23% | -12,46% | -5,43% | -7,89% | 57,90% | 48,77% | 56,02% | 100,00% | | | | |
| num_expert | 1,56% | 2,40% | 1,01% | 6,72% | 5,34% | 0,50% | 17,10% | 2,18% | 4,91% | 2,97% | 8,69% | 3,96% | 11,61% | 13,82% | 10,91% | 10,94% | 21,79% | 100,00% | | | |
| var_r_team | 0,85% | -3,16% | -0,34% | -9,49% | -2,04% | -4,51% | -2,64% | -2,30% | 0,42% | -2,45% | -1,45% | -0,15% | 2,48% | -14,14% | -8,03% | -9,34% | -10,44% | 6,86% | 100,00% | | |
| var_r_vision | 1,01% | -3,92% | 1,28% | -7,15% | 1,00% | -1,36% | 2,77% | 4,03% | 2,14% | 3,35% | 2,21% | 5,24% | 4,73% | -9,80% | -18,67% | -11,71% | -9,52% | 4,77% | 61,18% | 100,00% | |
| var_r_product | 1,73% | -4,62% | 4,30% | -11,78% | -2,55% | 1,69% | 2,87% | -0,71% | 1,97% | 1,53% | 0,68% | 4,02% | 4,33% | -11,01% | -13,04% | -18,17% | -9,10% | 5,65% | 66,21% | 64,80% | 100,00% |

*Table 2*

## Results of multivariance analysis. All specifications and models
## Model for logarithm of total raised funds

| | lnraised | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Variable | 1.1.1 | 1.1.2 | 1.1.3 | 1.2.1 | 1.2.2 | 1.2.3 | 2.1.1 | 2.1.2 | 2.1.3 | 2.2.1 | 2.2.2 | 2.2.3 | 3.1.1 | 3.1.2 | 3.1.3 | 3.2.1 | 3.2.2 | 3.2.3 |
| eth_vol_week | 10.676*** | 10.109*** | 10.410*** | | | | | | | | | | | | | | | |
| eth_vol_month | | | | 8.389** | 8.005* | 8.102* | | | | | | | | | | | | |
| bit_vol_week | | | | | | | 5.661* | 5.083 | 5.298* | | | | | | | | | |
| bit_vol_month | | | | | | | | | | 5.898 | 5.297 | 5.592 | | | | | | |
| ind_vol_week | | | | | | | | | | | | | 7.625*** | 7.205** | 7.354*** | | | |
| ind_vol_month | | | | | | | | | | | | | | | | 6.719* | 6.459* | 6.600* |
| duration_ico | -0.003*** | -0.003*** | -0.003*** | -0.004*** | -0.003*** | -0.003*** | -0.003*** | -0.003*** | -0.003*** | -0.003*** | -0.003*** | -0.003*** | -0.003*** | -0.003*** | -0.003*** | -0.003*** | -0.003*** | -0.003*** |
| Fiat | 0.264* | 0.284** | 0.263* | 0.241* | 0.263* | 0.242* | 0.239* | 0.259* | 0.239* | 0.242* | 0.262* | 0.242* | 0.248* | 0.268* | 0.248* | 0.249* | 0.270* | 0.249* |
| bonus | -0.382*** | -0.381*** | -0.381*** | -0.349*** | -0.350*** | -0.349*** | -0.364*** | -0.365*** | -0.364*** | -0.357*** | -0.359*** | -0.357*** | -0.376*** | -0.376*** | -0.375*** | -0.358*** | -0.358*** | -0.357*** |
| wp_KYC | -0.733*** | -0.723*** | -0.719*** | -0.773*** | -0.762*** | -0.759*** | -0.738*** | -0.732*** | -0.728*** | -0.737*** | -0.731*** | -0.726*** | -0.781*** | -0.769*** | -0.768*** | -0.792*** | -0.779*** | -0.778*** |
| sector_finance | 0.105 | 0.129 | 0.127 | 0.128 | 0.149 | 0.149 | 0.123 | 0.146 | 0.144 | 0.133 | 0.155 | 0.154 | 0.128 | 0.150 | 0.149 | 0.137 | 0.158 | 0.157 |
| sector_platform | 0.212 | 0.229 | 0.233 | 0.235 | 0.251 | 0.255 | 0.223 | 0.239 | 0.243 | 0.225 | 0.241 | 0.245 | 0.231 | 0.246 | 0.249 | 0.233 | 0.248 | 0.252 |
| location_us | 0.293 | 0.271 | 0.256 | 0.273 | 0.256 | 0.238 | 0.259 | 0.244 | 0.226 | 0.267 | 0.251 | 0.233 | 0.281 | 0.262 | 0.245 | 0.261 | 0.245 | 0.227 |
| location_rus | -1.301*** | -1.311*** | -1.313*** | -10.304*** | -10.311*** | -10.316*** | -10.345*** | -10.351*** | -10.356*** | -10.337*** | -10.344*** | -10.348*** | -10.339*** | -10.347*** | -10.351*** | -10.325*** | -10.332*** | -10.336*** |
| location_europe | -.412*** | -0.424*** | -0.430*** | -0.416*** | -0.429*** | -0.435*** | -0.408*** | -0.420*** | -0.426*** | -0.408*** | -0.419*** | -0.426*** | -0.424*** | -0.435*** | -0.441*** | -0.422*** | -0.433*** | -0.439*** |
| utility_token | -0.087 | -0.136 | -0.106 | -0.079 | -0.120 | -0.098 | -0.045 | -0.089 | -0.066 | -0.075 | -0.115 | -0.093 | -0.086 | -0.129 | -0.107 | -0.086 | -0.127 | -0.105 |
| team_size | 0.049*** | 0.048*** | 0.048*** | 0.049*** | 0.048*** | 0.047*** | 0.049*** | 0.048*** | 0.047*** | 0.049*** | 0.048*** | 0.047*** | 0.049*** | 0.049*** | 0.048*** | 0.049*** | 0.048*** | 0.048*** |
| num_adv | 0.017 | 0.015 | 0.015 | 0.017 | 0.015 | 0.015 | 0.014 | 0.013 | 0.013 | 0.016 | 0.014 | 0.014 | 0.015 | 0.014 | 0.014 | 0.016 | 0.014 | 0.014 |
| num_expert | 0.005** | 0.005** | 0.005** | 0.005** | 0.005** | 0.005** | 0.005** | 0.005** | 0.005** | 0.005** | 0.005** | 0.005** | 0.005** | 0.005** | 0.005** | 0.004** | 0.005** | 0.005** |
| var_r_team | 0.294*** | | | 0.282*** | | | 0.284*** | | | 0.281*** | | | 0.283*** | | | 0.277*** | | |
| var_r_vision | | 0.191** | | | 0.201** | | | 0.197** | | | 0.198** | | | 0.191** | | | 0.196** | |
| var_r_product | | | 0.177** | | | 0.170** | | | 0.170** | | | 0.170** | | | 0.164* | | | 0.165** |
| _cons | 15.060*** | 15.200*** | 15.164*** | 15.178*** | 15.290*** | 15.280*** | 15.377*** | 15.500*** | 15.489*** | 15.359*** | 15.482*** | 15.461*** | 15.317*** | 15.433*** | 15.421*** | 15.341*** | 15.442*** | 15.431*** |
| N | 630 | 630 | 630 | 630 | 630 | 630 | 630 | 630 | 630 | 630 | 630 | 630 | 630 | 630 | 630 | 630 | 630 | 630 |
| r2 | 20,79% | 20,06% | 19,99% | 19,19% | 18,64% | 18,46% | 19,06% | 18,47% | 18,31% | 18,89% | 18,33% | 18,17% | 19,70% | 19,08% | 18,93% | 19,10% | 18,57% | 18,39% |
| r2_a | 18,85% | 18,11% | 18,04% | 17,22% | 16,65% | 16,47% | 17,08% | 16,47% | 16,31% | 16,91% | 16,34% | 16,17% | 17,74% | 17,10% | 16,95% | 17,13% | 16,58% | 16,40% |
| legend: | *p<0.1 | **p<0.05 | ***p<0.01 | | | | | | | | | | | | | | | |

## Model for success ratio, marginal effects

| | dummy_ss_ratio (margin effects) | | | | | |
|---|---|---|---|---|---|---|
| Variable | 1.1 | 1.2 | 2.1 | 2.2 | 3.1 | 3.2 |
| eth_vol_week | 1.915** | | | | | |
| eth_vol_month | | 4.335*** | | | | |
| bit_vol_week | | | 2.348*** | | | |
| bit_vol_month | | | | 4.425*** | | |
| ind_vol_week | | | | | 1.683** | |
| ind_vol_month | | | | | | 2.928*** |
| duration_ico | -0.002*** | -0.002*** | -0.002*** | -0.002*** | -0.002*** | -0.002*** |
| bonus | -0.052 | -0.039 | -0.048 | -0.039 | -0.051 | -0.044 |
| wp_KYC | -0.074* | -0.071* | -0.058 | -0.034 | -0.082** | -0.080** |
| sector_finance | 0.011 | 0.014 | 0.009 | 0.015 | 0.015 | 0.018 |
| sector_platform | 0.109** | 0.117** | 0.108** | 0.109** | 0.112** | 0.115** |
| sector_cryptocurrency | 0.070 | 0.076 | 0.067 | 0.074 | 0.069 | 0.073 |
| location_singapore | -0.007 | 0.002 | -0.007 | 0.007 | -0.008 | 0.002 |
| location_uk | 0.098* | 0.096* | 0.103* | 0.097* | 0.099* | 0.099* |
| BTC | -0.089** | -0.088** | -0.097*** | -0.098*** | -0.094*** | -0.094*** |
| num_adv | -0.007** | -0.007** | -0.008** | -0.008** | -0.008** | -0.008** |
| num_expert | 0.002* | 0.002* | 0.002* | 0.001* | 0.002* | 0.001* |
| var_r_team | 0.035 | 0.033 | 0.034 | 0.033 | 0.034 | 0.032 |
| N | 646 | 646 | 646 | 646 | 646 | 646 |
| lroc | 71,90% | 72,65% | 72,04% | 72,75% | 71,65% | 72,11% |
| legend: | *p<0.1 | **p<0.05 | ***p<0.01 | | | |

## Model for rating from ICObench, odds ratio

| | r_benchy | | | | | |
|---|---|---|---|---|---|---|
| Variable | 1.1 | 1.2 | 2.1 | 2.2 | 3.1 | 3.2 |
| eth_vol_week | 0.0013549** | | | | | |
| eth_vol_month | | 1.113e-07*** | | | | |
| bit_vol_week | | | 5.574e-08*** | | | |
| bit_vol_month | | | | 4.405e-16*** | | |
| ind_vol_week | | | | | 1.137e-06*** | |
| ind_vol_month | | | | | | 9.468e-12*** |
| duration_ico | 1.001 | 1.001 | 1.001 | 1.000 | 1.001 | 1.001 |
| num_cur | 0.953*** | 0.952*** | 0.950*** | 0.949*** | 0.951*** | 0.950*** |
| Fiat | 1.322 | 1.339 | 1.341 | 1.305 | 1.344 | 1.323 |
| ETH | 2.537*** | 2.303*** | 2.747*** | 2.597*** | 2.671*** | 2.394*** |
| bonus | 1.565*** | 1.507*** | 1.527*** | 1.452** | 1.559*** | 1.499*** |
| wp_KYC | 3.893*** | 3.888*** | 3.401*** | 2.938*** | 4.004*** | 4.112*** |
| sector_finance | 0.789 | 0.764 | 0.779 | 0.737 | 0.766 | 0.732 |
| sector_platform | 0.819 | 0.806 | 0.835 | 0.839 | 0.829 | 0.815 |
| sector_cryptocurrency | 0.534*** | 0.524*** | 0.517*** | 0.483*** | 0.521*** | 0.507*** |
| location_singapore | 1.449 | 1.430 | 1.456 | 1.343 | 1.483 | 1.391 |
| location_rus | 0.849 | 0.824 | 0.871 | 0.832 | 0.858 | 0.798 |
| platform_eth | 0.669 | 0.697 | 0.612** | 0.696 | 0.682 | 0.743 |
| team_size | 1.038*** | 1.034*** | 1.032** | 1.025** | 1.034*** | 1.029** |
| num_adv | 1.044*** | 1.042** | 1.050*** | 1.047*** | 1.046*** | 1.044*** |
| num_expert | 1.007** | 1.007** | 1.007** | 1.009** | 1.007** | 1.008** |
| var_r_team | 0.936 | 0.939 | 0.897 | 0.854 | 0.909 | 0.915 |
| var_r_vision | 1.216 | 1.203 | 1.285 | 1.327* | 1.269 | 1.266 |
| N | 638 | 638 | 638 | 638 | 638 | 638 |
| cut1_cons | 0,005*** | 0,003*** | 0,003*** | 0,001*** | 0,004*** | 0,002*** |
| cut2_cons | 0,010*** | 0,005*** | 0,006*** | 0,002*** | 0,008*** | 0,004*** |
| cut3_cons | 0,020*** | 0,010*** | 0,013*** | 0,004*** | 0,016*** | 0,008*** |
| cut4_cons | 0,036*** | 0,018*** | 0,022*** | 0,007*** | 0,028*** | 0,013*** |
| cut5_cons | 0,079*** | 0,039*** | 0,049*** | 0,015*** | 0,061*** | 0,028*** |
| cut6_cons | 0,106*** | 0,053*** | 0,066*** | 0,019*** | 0,082*** | 0,038*** |
| cut7_cons | 0,175*** | 0,088*** | 0,109*** | 0,033*** | 0,136*** | 0,063*** |
| cut8_cons | 0,275*** | 0,138*** | 0,171*** | 0,052*** | 0,213*** | 0,099*** |
| cut9_cons | 0,378** | 0,191*** | 0,235*** | 0,072*** | 0,294*** | 0,137*** |
| cut10_cons | 0,581 | 0,294** | 0,359** | 0,112*** | 0,45* | 0,211*** |
| cut11_cons | 0,961 | 0,486 | 0,593 | 0,186*** | 0,743 | 0,35** |
| cut12_cons | 1,430 | 0,722 | 0,887 | 0,279*** | 1,106 | 0,523 |
| cut13_cons | 2,336* | 1,178 | 1,457 | 0,462 | 1,819 | 0,859 |
| cut14_cons | 3,003** | 1,516 | 1,883 | 0,599 | 2,351* | 1,112 |
| cut15_cons | 4,229*** | 2,143 | 2,673** | 0,864 | 3,328*** | 1,586 |
| cut16_cons | 5,681*** | 2,889* | 3,615*** | 1,185 | 4,487*** | 2,155 |
| cut17_cons | 8,619*** | 4,402*** | 5,555*** | 1,862 | 6,864*** | 3,334** |
| cut18_cons | 11,637*** | 5,965*** | 7,584*** | 2,591** | 9,334*** | 4,579*** |
| cut19_cons | 21,270*** | 10,977*** | 14,175*** | 5,016*** | 17,301*** | 8,654*** |
| cut20_cons | 37,689*** | 19,511*** | 25,474*** | 9,244*** | 30,977*** | 15,704*** |
| cut21_cons | 48,328*** | 25,040*** | 32,790*** | 11,993*** | 39,865*** | 20,302*** |
| cut22_cons | 75,850*** | 39,382*** | 51,742*** | 19,139*** | 62,894*** | 32,305*** |
| cut23_cons | 108,968*** | 56,676*** | 74,569*** | 27,778*** | 90,673*** | 46,883*** |
| cut24_cons | 187,854*** | 97,799*** | 129,083*** | 48,288*** | 157,088*** | 81,793*** |
| cut25_cons | 362,221*** | 188,574*** | 249,811*** | 93,510*** | 303,872*** | 158,82*** |
| cut26_cons | 2801,928*** | 1460,476*** | 1939,949*** | 729,534*** | 2352,921*** | 1232,154*** |

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# Disintegration of the World Trade System: Reasons and Consequences

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## ABSTRACT

The article presents the study results of the world trade stagnation issues associated with the WTO systemic crisis. The aim of the article is to summarize the main reasons for the world trade system disintegration and to identify feasible directions for the world economic order transformation. The G20 trade-restricting measures were analyzed based on the statistical databases of the WTO and the non-governmental organization Global Trade Alert (GTA). The views of leading domestic and foreign experts on the consequences of liberalization of the world trade in goods and services were summarized. The author systematized the reasons for the world trade system disintegration, including: the US anti-globalization policy aimed at containing the PRC; counteracting unipolar globalization by the Southeast Asian nations; developed countries' rejecting the growing participation of developing countries in redistributing global resources; inefficiency of international organizations in solving problems of global imbalances, inequality and instability of the global financial system. Structuring disintegration processes revealed its main trends: protectionism, regionalism, trans-regionalism. There were shown mechanisms to keep the US in the European Union due to companies providing professional services to European business. The author evaluated Russia and China's competitive advantages in the production chains of the new technological structure. The areas of cooperation between Russia and the BRICS countries for realizing export potential in agriculture, aviation and nuclear industries were determined. The prospects for trade and economic relations in Eurasia are discussed in terms of changing the economic paradigm and shifting the regulation of the global economy problems to the regional level.

***Keywords:*** world trading system; WTO crisis; trade wars; protectionism; regionalism; transregionalism; global imbalances; anti-Russian sanctions; change of economic order; BRICS supranational institutions

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## INTRODUCTION

After the 2008–2009 global financial and economic crisis the world's largest economies rejected the liberal doctrine and switched to protecting domestic markets from external competition by pursuing an unconventional monetary policy and active government support for private businesses. The response from emerging markets led to increased distrust, destabilization of established trade relations, increased speculative activity and reduced effectiveness of the multilateral trading system. In 2009–2019, the number of notified regional trade agreements (ignoring the WTO principle of non-discrimination) increased from 287 to 473[1], and the number of new protectionist measures introduced by the US government in relation to other countries increased *twelve* times — from 140 to 1765[2].

The current state of the world economy is characterized by its participants refusing to comply with the established "rules of the game", increased populism and nationalism, rejection of globalization, open markets, immigration, and development of international cooperation and execution of previously undertaken international commitments. Despite the absence of direct armed conflicts between the major powers, the extension of life expectancy and an increase in per capita income, a "benign" world order was not established. According to Richard Haass, President of the Council on Foreign Relations, the unsettled situation in the Middle East and Ukraine, as well as the growing number of potential hot spots indicate that "what exists [today] in many parts of the world as well as in various venues of international relations resembles more a new world disorder" [1, p. 13].

## CHARACTERISTICS OF DISINTEGRATION PROCESSES

Transnationalization, automation and robotization of production, and shifting the center of economic activity from West to East led to a significant increase in competition. Given these transformations, and to maintain its leading position in the world economy, the United States has slowly been moving its trade policy towards protectionism and isolationism — right to sanctions for political reasons.

Today, the US openly sabotages its participation in the WTO (for example, by blocking the appointment of new arbitrators to the appeals body of this organization). This demarche is argued by threats to national security and the ineffectiveness of the WTO's actions to protect the United States from unfair competition from China [2, p. 8].

According to Joseph Stiglitz, Nobel Prize winner in Economics, D. Trump's administration underestimates its opponents. He says that the White House declared a full-scale trade war to China. But the US and its business interests are especially likely to suffer from such a war for China has far more control over its economy than the US does over the American economy. The US can only take actions in limited circumstances, and the length of time that it has taken to bring the actions in China's steel and intellectual property is testimony to the difficulty of taking actions.

US corporations have made large investments in China, especially so since China can take a variety of actions which make life for these businesses and their expatriate employees more difficult. Moreover, American consumers and producers will suffer if they are denied access to China's inexpensive products, or if the costs of those products increase. In addition, in a trade war, a non-market economy of the PRC has distinct advantages, because there are many more levers which it can exercise [3, p. 521].

Increasing trade tension and trade restrictive measures at continued economic uncertainty between the USA and China have resulted in decreasing international trade dynamics. In the 1990s, the ratio of the world merchandise trade volume growth to the world real GDP growth was generally higher than 2,

[1] WTO Regional Trade Agreement Database. URL: http://rtais.wto.org/UI/charts.aspx (accessed on 18.07.2019).

[2] The 24th Global Trade Alert Report. CEPR Press, 2019. URL: file:///C:/Users/Alexey/Downloads/GTA24-JawJawnotWarWar.pdf (accessed on 18.07.2019).

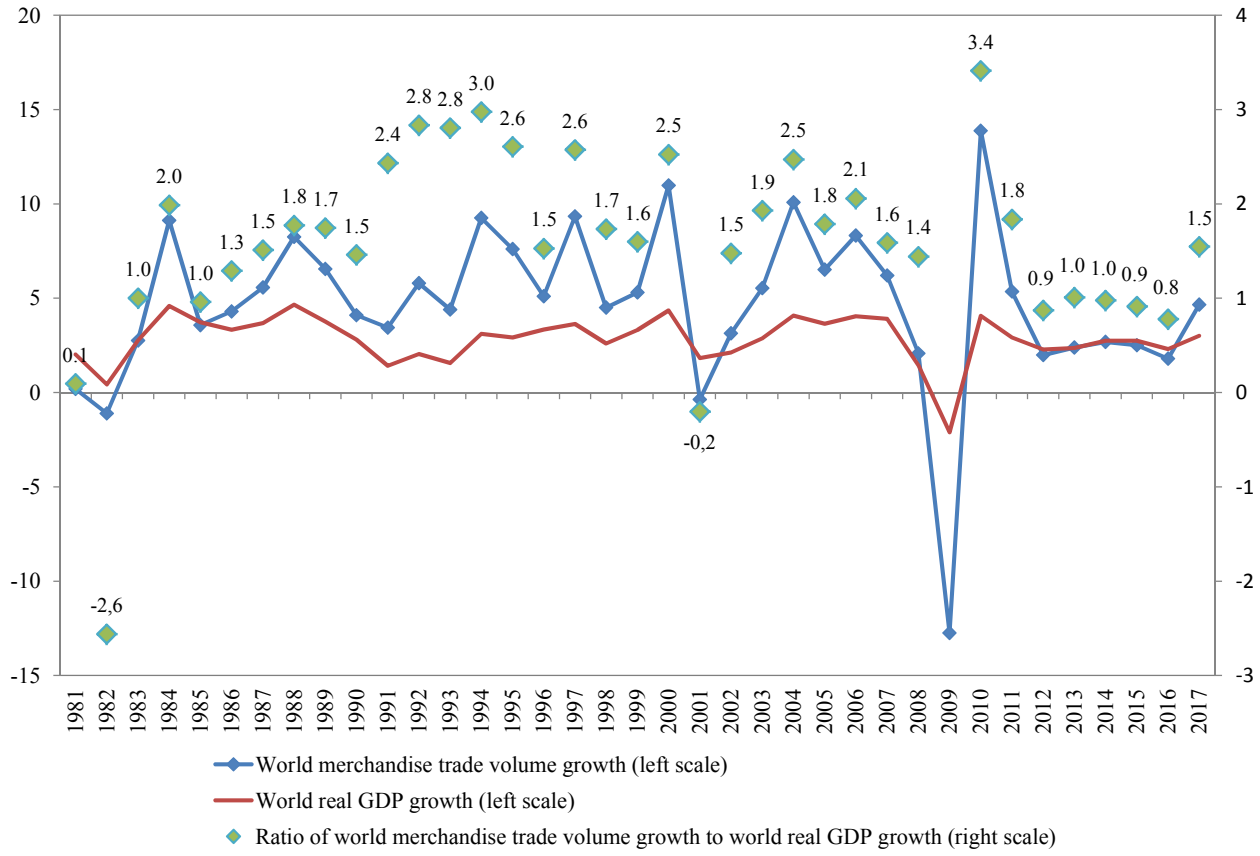


*Fig. 1.* **Ratio of world merchandise trade volume growth to world real GDP growth, 1981–2017 (annual percentage change and ratio)**

*Source:* WTO. World Trade Statistical Review 2018. URL: https://www.wto.org/english/res_e/statis_e/wts2018_e/wts18_toc_e.htm (accessed on 18.07.2019).

and in 2011–2017, it was already reduced to 1 (*Fig. 1*). These factors and decreased overall economic activity were the reasons for the slowdown in world merchandise trade to 3% in 2018 compared to 4.6% in 2017. According to the WTO estimates, in 2019, trade growth will slow down to 2.6%[3].

The commencement of global disintegration processes can be considered the collapse of the USSR that caused the destruction of the bipolar system of international relations. The disintegration of the socialist system of planned economy paved the way to a market fundamentalism model, whose main vehicle was the United States. With the United States becoming the only global superpower, the formation of a unipolar world has led to the formation of intractable asymmetries and imbalances in the world economic development, caused mainly by universal financialization and virtualization of the world economy.

Dissatisfaction with unipolar globalization became apparent in the late 1990s, when the countries of Southeast Asia started competing with American companies. The Asian financial crisis provoked a currency speculation by American vulture funds. This resulted in some 50 million people in Asia alone fell under the poverty line [4, p. 31]. The ensuing attack on the World Trade Center was an undisguised demonstration of the waning of the US global influence, the inability of the key reserve currency issuer to prevent destabilizing capital

[3] World Trade Organization. Annual Report 2019. URL: https://www.wto.org/english/res_e/booksp_e/anrep_e/anrep19_chap1_e.pdf (accessed on 18.07.2019).

flows and to bring the world economy back to balance.

At the same time, as more developing countries entered the world stage, developed Western countries were also complaining about globalization. They ran into problems of declining living standards and quality of life, access to resources and growing disguised and overt unemployment. The culmination of the West's departure from the liberal democratic order was the results of the UK vote on withdrawal from the EU in June 2016.

Thus, the other side of market globalization was the formation of global imbalances [5] and growing inequality [6] — the problems that multilateral institutions, including the G20 [7], are not able to solve. Global imbalances are related to the fact that the main recipients of capital are the issuers of reserve currencies, which have exhausted the possibilities for productive placement of the savings of the rest of the world. Therefore, capital is not used for investment, but for consumption and speculation, exacerbating the growth in global external debt [8, p. 24–25].

Disintegration processes are also manifested in an organized large-scale withdrawal of financial resources from the control by national fiscal systems. This causes the development of shadow banking, overstatement of asset prices, slowing the growth of the real economy, and deepening of income inequality in both developed and developing countries. Despite its ambitious agenda, the G20 failed to resolve these problems, resulting in the formation of a parallel financial and economic reality — global offshoring [9]. Due to the instability of the international financial architecture, deglobalization has become a factor in the internal politics of too many countries. Thus, the world economy is on the verge of new financial shocks [10, p. 7, 8].

Together with the destruction of the American-centric order, new political alliances are forming in Eurasia, seen both in appearing pan-Asian financial institutions and potential implementation of political initiatives such as "One Belt One Road" [11] and the Big Eurasian Partnership [12].

## DISINTEGRATION PROCESS STRUCTURE

Given the specifics of the current foreign economic policy of sovereign states, we can distinguish three main disintegration trends aimed at protecting national interests in the crisis of the multilateral trading system: protectionism, regionalism and transregionalism.

*Protectionism.* Attributed to the successful intergovernmental GATT/ WTO negotiations, a sharp decrease in import tariffs worldwide is considered to be one of the most important achievements in the development of the world economy over the past decades. On the other side, the WTO members widely used trade policy measures restricting exports and imports, including domestic content requirements, preferential loans and other non-tariff barriers [13, p. 130].

A particularly clear manifestation of the trade policy intensification is a jump in protectionist measures by the G20 countries after the 2008–2009 financial and economic crisis. Published on June 24, 2019, a WTO report on G20 trade measures indicates that the trade coverage of new import-restrictive measures introduced between October 2018 and May 2019 was more than three-and-a-half times the average since May 2012. The trade coverage of import-restrictive measures during the period is estimated at $ 335.9 billion. This is the second highest figure on record, after the $ 480.9 billion reported in the previous period. The period between May 2018 and May 2019 represents a dramatic spike in the trade coverage of import-restrictive measures by the G20 countries. They include anti-dumping and countervailing measures, sanitary and phytosanitary measures, and other trade barriers[4].

It should be noted that the G20 governments actively started protectionist measures

[4] WTO Report on G-20 Trade Measures (mid-October 2018 to mid-May 2019). URL: https://www.wto.org/english/news_e/news19_e/g20_wto_report_june19_e.pdf (accessed on 18.07.2019).

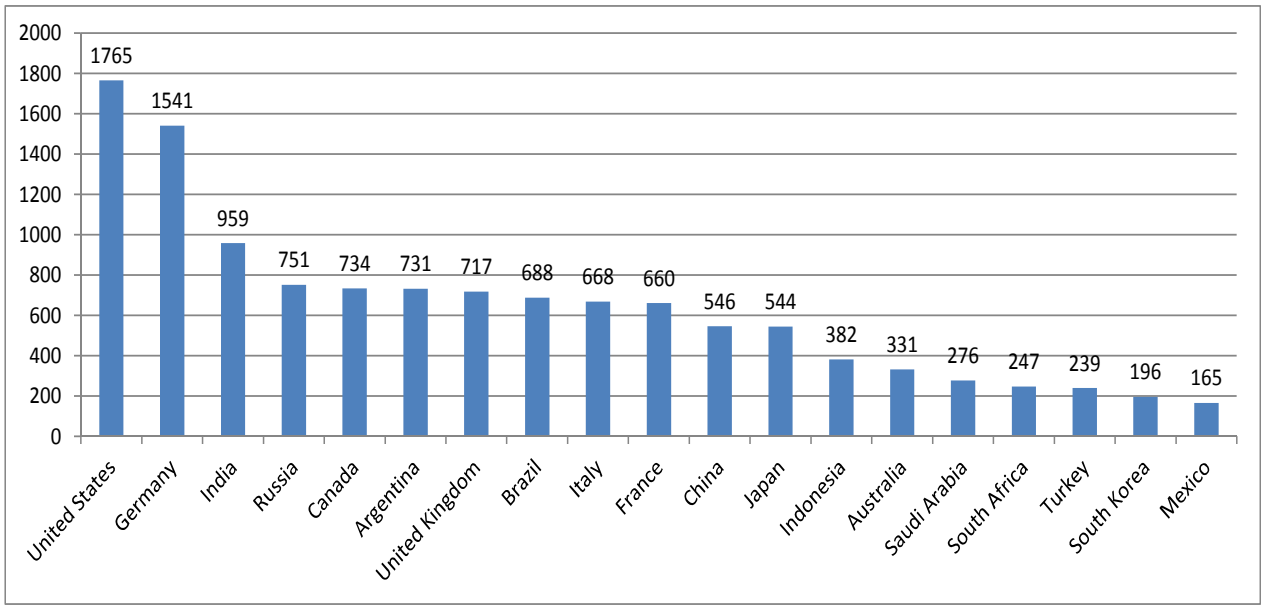


*Fig. 2.* **Number of protectionist measures taken by the G-20 countries from November 2008 to June 2019**

*Source:* compiled from data: The 24th Global Trade Alert Report. URL: file:///C:/Users/Alexey/Downloads/GTA24-JawJawnotWarWar.pdf (accessed on 18.07.2019).

even before the US-Chinese trade wars. 348 cases have been recorded since November 2008 when trade policy measures taken by the governments of 36 countries had a negative impact on trade flows of more than $ 10 billion. By 2013, 70% of the world's goods exports were under protectionist measures that did not exist before the global financial crisis. This share increased to 74% by 2019.

According to the non-governmental organization Global Trade Alert that analyzes protectionist actions under the auspices of the London Center for Economic Policy Research (CEPR), over *12 thousand* protectionist measures were initiated by the G20 governments from November 2008 to June 2019, including quotas, licensing, and increased import quotas and duties, lending, subsidies, dumping, government procurement and other trade policy measures (*Fig. 2*).

Thus, despite the G20 summits keep calling on adhering to the free trade principles, the actual leaders of these countries do exactly the opposite.

*Regionalism*. Modern regionalism is another disintegration trend, which is also a consequence of the world's political disintegration following two world wars. In 1900, besides 13 empires, there were 55 sovereign states, whereas in 2009 the UN consisted of 192 sovereign states; 113 of them had previously belonged to colonies and empires and the other 33 had formed part of other countries [14, p. 46].

Today, each of these states (including 164 WTO members) is a party to at least one regional trade agreement (RTA), including agreements on partial liberalization of trade, on free trade in goods, services and on the customs union. Many RTAs are bilateral. Providing more favorable terms of trade to each other rather than to the other WTO members RTA participants recede from the guiding principle of the multilateral trading system — nondiscrimination.

The WTO has registered a fourfold increase of RTAs since 2000. In mid-2019, there were 294 RTAs, of which 256 are various free trade agreements and 18 are customs unions (*Table 1*). The number of actual RTAs is different from the total number of the RTAs notified in the WTO. This is due to the specifics of the methodology that separates agreements on economic integration (including trade in services, investments,

*Table 1*

**Figures on Regional Trade Agreements notified to the WTO and in force (as of June 2019)**

| Types of Agreement | Total | As a percentage of the total |
|---|---|---|
| Customs Unions | 18 | 3.8 |
| Economic Integration Agreements | 152 | 32.1 |
| Free Trade Agreements | 256 | 54.1 |
| Regional Trade Agreements – Accession | 25 | 5.3 |
| Partial Scope Agreements | 22 | 4.7 |
| Grand Total | 473 | 100.0 |

*Source:* compiled from data: WTO Regional Trade Agreements Database. URL: http://rtais.wto.org/UI/publicsummarytable.aspx (accessed on 18.07.2019).

etc.) from agreements on free trade in goods. Moreover, about 100 RTAs are plurilateral, i.e. more than two countries or trading blocks act as a RTA party. There are 30 plurilateral agreements except the agreements involving the EU or EFTA, [15, p. 209–211].

*Transregionalism.* In the structure of disintegration processes, transregionalism, a relatively new phenomenon in the world economy, should be noted. It occurs in the creation of mega-regional trade partnerships. They involve countries representing different regions and continents. These agreements go beyond the WTO regulatory framework. As a rule, they envision an across-the-board free trade zone, which, in addition to liberalizing trade in goods and services, may include gradual abolition of non-tariff, administrative and other bureaucratic barriers, harmonization of trade standards in the fields of intellectual property rights, industrial and investment policies, as well as state enterprises activities, dispute resolution mechanisms in arbitration proceedings and so on.

A number of such agreements have already entered into force, in particular:

- A Comprehensive and Progressive Trans-Pacific Partnership Agreement incorporating 11 countries (CPTPP or TPP-11), a simplified version of the Trans-Pacific Partnership (TPP) after the withdrawal of the United States.
- EU-Canada Comprehensive Economic and Trade Agreement. Negotiations are ongoing to sign The Regional Comprehensive Economic Partnership (RCEP) between the ASEAN countries, China, Japan, India, South Korea, New Zealand and Australia.

The interaction within the mega-regional partnerships is mostly due to the common economic interests of the parties, the interstate agreements, the development of new transport and communication systems, rather than the common borders and location [15, p. 417]. However, it is difficult to predict their future development considering the increasing geopolitical tensions in the world. In 2016, the negotiations between the EU and the USA on the Transatlantic Trade and Investment Partnership (TTIP)

lost their relevance and were terminated. The Donald Trump administration has been highly negative regarding the US participation in the TPP and TTIP. Therefore, the prospects for the United States joining mega-regional partnerships remain in doubt.

## US FIGHTING FOR EUROPE

Brexit and D. Trump joining the White House negated US activity to create mega-regional free trade zones and thereby suspended the US entering Europe (within the TTIP). However, the deglobalization rhetoric emanating from the White House should not be misleading. The United States still retains great competitive advantages and potential for further promotion of Anglo-Saxon values in the European Union, the largest trading partner of the United States and the main recipient of American investments.

It should be noted that Europe seriously depends on Anglo-Saxon companies providing professional services to business. For example, the Big Four audit 95% of Europe's largest companies[5]. Anglo-American law governs the absolute number of financial transactions in European financial markets. Moreover, there are no European firms among the largest top 100 law firms in the world; almost all of them are represented by Anglo-American capital[6]. Three leading US credit rating agencies account for 96%[7] of all credit ratings in the world (and therefore, in Europe). And finally, the stable (in some cases increasing) relative size of the American currency in servicing various segments of the international financial market suggests that the dollar is not going to give up its position to the euro as a global reserve currency.

In the field of digital technology the United States has an almost absolute supremacy in the European market. For example, American companies Microsoft, Apple, eBay, Amazon, Google, Twitter, Facebook do not have analogues in Europe [16, p. 84]. American companies specializing in creating and managing social networks offer their solutions in the monetary sphere. On the one hand, they can be regarded as disintegration elements of the global monetary system, and on the other hand, the global cyber financial system as a transition to a qualitatively new level.

For example, Facebook is preparing to launch the digital currency Libra which can be accessed by 2.7 billion of FB users. If each follower makes a $ 1,000 payment on Facebook using the blockchain technology, the annual turnover of this network may be $ 2.7 trillion, or 11% of US federal debt[8]. At the same time, the cost of Libra and the entire turnover will be tied to the dollar, and therefore to the American economy. It should be emphasized that other cryptocurrencies, as well as many key technologies of the digital economy, are tied to the US dollar.

As long as the United States dominates the digital space, with English in global communication, and Anglo-American law in international transactions, the US position will be strengthened even in chaos. Thus, the current disintegration may represent a transition from the US dominance in the traditional real economy to dominance in digital virtual reality. What seems to be chaos and disorder may become a new economic order, on a fundamentally new institutional basis. The leading role will be played not by formal institutions represented by intergovernmental organizations, but by supranational informal network structures. They will enable American transnational corporations to interact directly with consum-

[5] EU auditor market share: 2017 audit reports. Audit analytics. 2018. URL: https://www.auditanalytics.com/blog/eu-auditor-market-share-2017-audit-reports/ (accessed on 18.07.2019).

[6] Legal excellence internationally renowned. UK legal services 2018. TheCityUK, 2018. URL: https://www.thecityuk.com/assets/2018/Reports-PDF/86e1b87840/Legal-excellence-internationally-renowned-UK-legal-services-2018.pdf (accessed on 18.07.2019).

[7] The financial crisis: unresolved. The Economist. 8th September 2018. URL: https://www.economist.com/printedition/2018–09–08 (accessed on 18.07.2019).

[8] Shchukin O. Libration of the dollar. Tomorrow. 26.06.2019. URL: http://zavtra.ru/blogs/libratciya_dollara (accessed on 18.07.2019).

ers, ignoring the complex interstate rules and regulation.

This assumption has a reason; the United States has the greatest number of largest digital transnational corporations among G7 countries and China. In 2018, the US share in the global GDP, calculated at market prices, amounted to 24.2%, which is higher than in several previous years. The United States continues to be a world leader in higher education, science, R&D and innovation economy. The volume of dollar-denominated international financial assets is almost three times the volume of international assets denominated in euro, the closest competitor to the dollar. The United States is still the most attractive country for international immigration and is gaining as the world's energy power.

Among other things, the United States protects its national interests by increasing the trade costs of countries enjoying their political, economic, financial, and military patronage in the global market.

For example, the EU states suffered significant losses after joining the US anti-Russian sanctions. In 2014–2017, Dutch and Russian trade fell 8.2 times more than that of the United States and Russia's, Italian — 6.6 times, German — 5.6 times, Polish — 2.6 times. In general, during the sanctions period, the United States accounted for only a 2% decrease in trade with Russia, and the remaining 98% belonged to other sanctioning countries [17, p. 53; 18, p. 14]. At the same time, Russia's BRICS partners — India, China and Brazil — also supported anti-Russian sanctions. On the one hand, it can be regarded as the BRICS countries' fee to access the US-controlled global market, and on the other hand — as opposition to Russian transnational corporations in this market.

The EU is keen on restoring WTO functionality. European companies have benefited greatly from the globalization of production. Over the past two decades, Europe has been among the regions most integrated into global value chains (GVCs), in particular, the content of import components in exports or the share of re-exported intermediate goods in imports. The importance of the Euro zone participating in GVCs is higher than for the United States and Japan, and is comparable with China. So, despite the high level of intra-regional trade, the EU will not be able to isolate itself from trade conflicts in other regions of the world. The EU's goal is to reform the WTO so to create a more flexible framework for negotiations, to introduce new rules able to eliminate grey zones (industrial subsidies, forced transfer of technology and intellectual property rights), to develop a new approach to involve developing countries and low-income countries in key decision-making, to create a more efficient and transparent dispute resolution mechanism, to strengthen the transparency and monitoring functions of the WTO [19, p. 515–519].

## CHANGE OF ECONOMIC ORDER

Analyzing the problems and prospects for the world trade system, one should first consider the restructuring of the world economy to a new technological structure. Now, only the USA, Russia and China seem to have a complete scientific cycle — from basic research to disruptive developments in production. That is why the US is fighting sanctions wars against Russia and trade wars against China to deplete the resources of these countries and to prevent them from taking leading positions in new production chains.

A candidate for world (regional) leadership, Russia has a number of advantages: a unique design school, excellent programmers, the ability to make unexpected jerks (for example, in developing advanced models of military equipment), weapons, including a nuclear umbrella, which can provide other countries with geopolitical protection against the USA, as well as a huge supply of energy, fresh water and land suitable for agricultural activities. At the same time, Russia, unlike China, is experiencing a shortage of financial resources and a modern production base. These compara-

tive advantages of Russia and China combined would create a powerful platform to take the lead in a new technological structure[9].

To enable its competitive advantages, Russia could focus on the priority development of some export sectors, such as agriculture, aviation and nuclear industries. Given the disintegration trends and transformations discussed above within the framework of the emerging new technological order, Russia's successful participation in the formation of the regional trade system in Eurasia depends on the following institutional factors:

1) activating (weakening) the USA and the EU protectionist policies that will impede (facilitate) the positioning of Russian TNCs in the global market in general and the Eurasian market in particular;

2) creating a geopolitical counterweight to the United States by strengthening the military, political and economic importance of the BRICS countries on the world stage that will allow Russia to conclude new and to develop existing agreements on economic cooperation and strategic ties with other countries;

3) developing a supranational BRICS policy in the agricultural sector (following the example of a single agricultural policy of the EU) in order to ensure food security of Eurasia and coordinate joint activities of the state, capital and industry in the Eurasian economic space in the context of the disintegration of the multilateral trade system and fragmentation of the global market;

4) developing legal mechanisms of non-price competition within the WTO through creation of effective forms of cooperation based on public-private partnerships and targeted state support to specific producers of agricultural products that demonstrate high labor productivity; including financial indicators of investment attractiveness and innovative production into the current performance indicator system of the state agro-industrial complex support program;

5) establishing joint ventures with major buyers of Russian household products, primarily China and India, to organize deep local processing of Russian agricultural raw materials in order to redistribute value added more equitably in favor of Russian agricultural producers;

6) creating within the BRICS an alternative organization to the WTO to regulate the intra-group market space, including export deliveries of the three sectors in order to reduce internal customs and other barriers to the intra-group trade;

7) integrating all participants of the Russian agro-industrial complex — the state, research centers, databases of manufacturers and consumers — into a single information system by means of digital technologies (for example, using the experience of the Chinese company Alibaba in creating retail and wholesale online stores) in order to ensure quick and centralized access of consumers and manufacturers to this system. The mechanisms of the digital economy are designed to significantly increase the efficiency and investment attractiveness of the Russian agricultural sector;

8) together with China and India, creating a large aircraft manufacturing and air transport company (following the example of European Airbus or American Boeing) to provide the Eurasian space with its own air transport fleet, which can radically cut domestic transportation costs and compete with the leaders of the global aerospace industry. To finance this project, it is necessary to use the experience of the US federal contract system [20];

9) creating a supranational umbrella body in the field of nuclear energy development (using the experience of the European Euroatom). Such an organization will make it possible to overcome the restrictions on the BRICS countries participation in the value added chains in the field of nuclear energy, due to national security issues. This umbrella organization could help unite the efforts of the BRICS countries to provide Eurasian projects, including agricul-

[9] Khubiev R. Principle formula of the XXI century: Russia is either a superpower or it is not. Regnum. 08.06.2019. URL: https://regnum.ru/news/economy/2661957.html (accessed on 18.07.2019).

ture and aviation industries, with a relatively cheap, powerful and uninterrupted supply of clean energy. Represented by Rosatom State Corporation, Russia has comparative advantages in the global nuclear energy industry, being ahead of other countries in the number of nuclear power units built abroad. Russia also has first-class and competitive technologies in the field of peaceful nuclear energy and, with intensified innovative research and development, can ensure the safe operation of nuclear power plants in any climatic and natural conditions. The synergistic effect of cooperation in the nuclear industry can be achieved through its close relationship with the aerospace, military and oil and gas industries. Thus, cooperation in the nuclear industry can solve a lot of problems and serve as an incentive to intensify cooperation of the BRICS countries at the political level, which had a mild and more formal character until now;

10) creating own settlement and payment system based on the currencies of the BRICS countries (as well as other key currencies of Eurasia — the Japanese yen, the South Korean won, the Singapore dollar) allowing to control currency flows and to break the dependence on the US dollar and euro SWIFT systems.

When planning long-term cooperation of the BRICS countries, it is necessary to recognize the importance of creating supranational institutions, and not limit the integration of free trade zones. The latter put a more developed economy (in this case, China) in a privileged position, and this will mean the reproduction of trade imbalances at the regional level.

To deliver its resources in the growing crisis potential of the world economic processes, Russia together with the other BRICS participants should work out a hybrid model of socio-economic development, a qualitative alternative to market fundamentalism.

Current change in the world economy is a prerequisite for this alternative. It is due to the fact that based on financial expansion American secular accumulation cycle has exhausted the possibilities of economic development. This is evidenced by the long stagnation of the US living standards, bankruptcy of large industrial cities and the possibilities to form foreign exchange reserves independent of the US Federal Reserve and to introduce own currency discussed by some states [21, p. 66].

Dominant in the world, the neoliberal model can give way to a new integral system practiced in Asian countries for a long time (China, India, Japan, Singapore, South Korea). The hybrid system differs from the current neoliberal doctrine in a number of characteristics: a combination of state and private property, centralized planning and market self-organization, control of public interests and private initiative. The attitude to money is fundamentally different in this model: unlimited lending based on fiat money is replaced by money issue under investment plans of economic agents in accordance with centrally established priorities [21, p. 22–24].

## CONCLUSIONS

After the production of American TNCs was transferred to regions with lower social, environmental and tax standards, the United States lost its advantage in foreign trade. At the same time, free trade agreements actively signed by the leading Asian economies are narrowing the market space for the US capital. With D. Trump joining the White House, the United States failed to bind numerous RTAs under mega-regional partnerships — TTP and TTIP. Nevertheless, China and Japan continue working towards the consolidation of RTAs, promoting their own versions of mega-regional partnerships — RCEP and CPTPP. The USA is the main speaker of protectionism and isolationism creating barriers for the Eurasian countries to access the global market.

Created upon an initiative and with the support of the USA (IMF, World Bank, WTO), multilateral intergovernmental institutions with their strict rules, inflexible and limited regulatory sys-

tems are an obstacle to the full globalization of markets. In conditions of transnationalization and automation of production, these institutions are no longer able to protect the United States from "unfair" competition from developing countries, primarily China. Therefore, the United States by all means impedes the activities of these institutions (for example, by delaying the ratification of the IMF quota and vote reform or by blocking the appointment of new arbitrators to the WTO appeals body).

China has been leading in a number of world indicators — GDP (calculated at purchasing power parity), export, money supply (expressed in dollars). Generally, China is still a "copy shop" of Western industries and lags behind the West and several other Asian countries in developing advanced technologies. To make a breakthrough in a new technological structure, China should establish closer cooperation with Russia. The formation of bilateral trust can be facilitated by Russia and China's more active involvement in the development and global promotion of a conceptual alternative to neoliberalism in order to solve the problems of asymmetric development in the world as a whole and in Eurasia in particular.

Despite China's obvious economic successes, a change in global leadership is not expected in the foreseeable future. The United States possesses a significant number of effective institutional levers and mechanisms of influence on the world economy; Eurasia will have to create own alternative to them. The experience shows that this is a long-term process. Therefore, at this stage of integration into the world economy Russia and the BRICS countries should concentrate on developing an effective strategy for regional cooperation focused on creating and developing Pan-Asian supranational institutions in Eurasia.

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# Bankruptcy Prediction Models for Construction Companies in the Russian Federation

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## ABSTRACT

The article is concerned with determining the main predictors of bankruptcy in construction organizations in the Russian Federation. Probabilistic prediction of bankruptcy is relevant for both individual companies and sectors of the national economy. Developed a long time ago, the existing bankruptcy prediction methods do not consider the industry specifics of organizations. The article investigates the mechanism for probabilistic prediction of bankruptcy based on logit models. Criteria affecting the bankruptcy probability were substantiated; a mathematical model was proposed to calculate the probability. The provided model was tested in a real company. Based on the sample of small and medium-sized construction companies, the author proposed a logit model reflecting the main factors affecting the financial state of construction companies in Russia and, therefore, the likelihood of their bankruptcy. Testing the model on the actual data from the construction enterprises showed its high predictive power. The study results allow predicting the bankruptcy in construction organizations by means of logit models.

***Keywords*:** bankruptcy; construction companies; bankruptcy prediction; regression; logit model

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## INTRODUCTION

In accordance with the Federal Law of December 25, 2018 No. 478-FZ "On amendments to Federal Law "On Joint Participation in Construction of Apartment Buildings or Other Real Estate and on Amendments to Several Legislative Acts of the Russian Federation" and Separate Legislative Acts of the Russian Federation", from 1 July, 2019, real estate developers are required to use escrow accounts to attract and store cash from property buyers. At the same time, the construction is supposed to be financed by credit funds provided by banks. The funds of the buyers remain on the escrow accounts until the construction ends or are returned to the buyers in case of termination of the shared construction participation agreement.

The construction companies have to service a loan obtained from an authorized bank which increases their volume of expenses and cash outflows.

The question now arises: how difficult this innovation will be for construction companies and if this will lead to bankruptcies among developers?

Forecasting defaults of enterprises, including companies in the construction sector as one of the most important sectors determining the development of the country's econo-

my, is Russia's urgent problem, since the construction industry is among the most at risk of bankruptcy [1]. In the IV quarter of 2018, one of the main indicators of the business climate in the construction sector, the business confidence index (BCI) was equal to –19%. This means that the forecast for the industry as a whole is negative, despite the presence of such successful large companies as PIK or Donstroy.

It is important to understand the special features of the construction sector distinguishing it from other sectors in the economy. These differences are caused by the specificity of the final product and the complexity of the applied production and labor technologies. The characteristics inherent in the field of construction include the following aspects:

- nonhomogenity of the construction process and final products;
- relationship between all technological operations in the construction process. The sequence of production processes is important. The time shift of one of the construction stages directly affects the entire construction plan;
- uneven ratio of construction and installation works by their labor costs and varieties. This makes it difficult to plan the required number of workers, as well as their qualification;
- a large number of companies involved in the construction process: several organizations can be involved at the same time (general contractor and subcontractor);
- high material consumption of the construction industry. Material expenses account for 50–70% of the total estimated cost of construction projects;
- impact of climatic and regional conditions on the construction process. Different labor and production costs may be required depending on the region and its climatic conditions. The construction process is influenced by such factors as weather conditions, terrain, wetlands and the ability to deliver the necessary materials to the construction site [2].

Thus, the construction industry is rather difficult to do business due to the number of specific features.

According to Rosstat statistics, from 2013, there has been a steady increase in the number of construction companies in Russia.

In *Fig. 1* we see that the number of operating construction companies has grown over 5 years from 217 961 in 2013 to 279 496 in 2017. The number of companies operating in this industry increased from 2% to 17% every year. There is also a noticeable increase in the scope of work performed in the construction industry.

Over 5 years, the scope of work performed by the type of economic activity "construction" increased from 6019.5 billion rubles in 2013 to 7573 billion rubles and 8385.7 billion rubles in 2017 and 2018 correspondingly.

The following statistics can be seen along with these indicators. The number of loan arrears to the construction industry has grown significantly over the past few years. The number of construction companies that overdue their loan obligations as of January 1, 2013 was equal to 68,241, which amounted to 8% of the total number of debtor companies in Russia. This indicator was rapidly growing, and as of January 1, 2019, the number of companies that overdue their loan obligations amounted to 287,294, or 15% of the total number of companies.

The business confidence index helps assess the climate in the construction industry. According to Rosstat, in the IV quarter of 2016, the BCI was — 21%, and at the end of 2017 and 2018 it was –20% and –19%, respectively. In the IV quarter of 2018, contraction companies distinguish the following factors limiting their activities: high taxes (38%), high cost of materials (30%), lack of work orders (27%), insolvency of customers (25%), unfair competition from other construction firms (26%), lack of financing (21%), a large percentage of loans (17%), and incompetence of workers (12%).

Thus, the construction industry is currently in unstable. Its recovery after the crisis slows

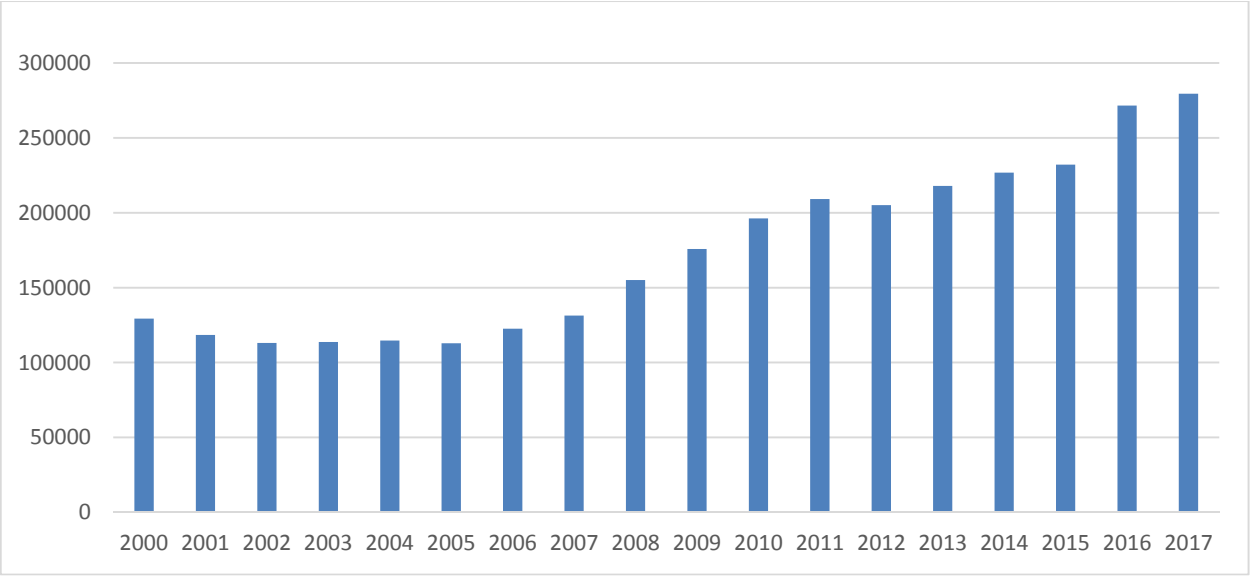


*Fig. 1.* **Number of operating construction companies in the Russian Federation**

*Source:* URL: http//www.gks.ru/free_doc/doc_2018/stroit-2018.pdf (accessed on 15.07.2019).

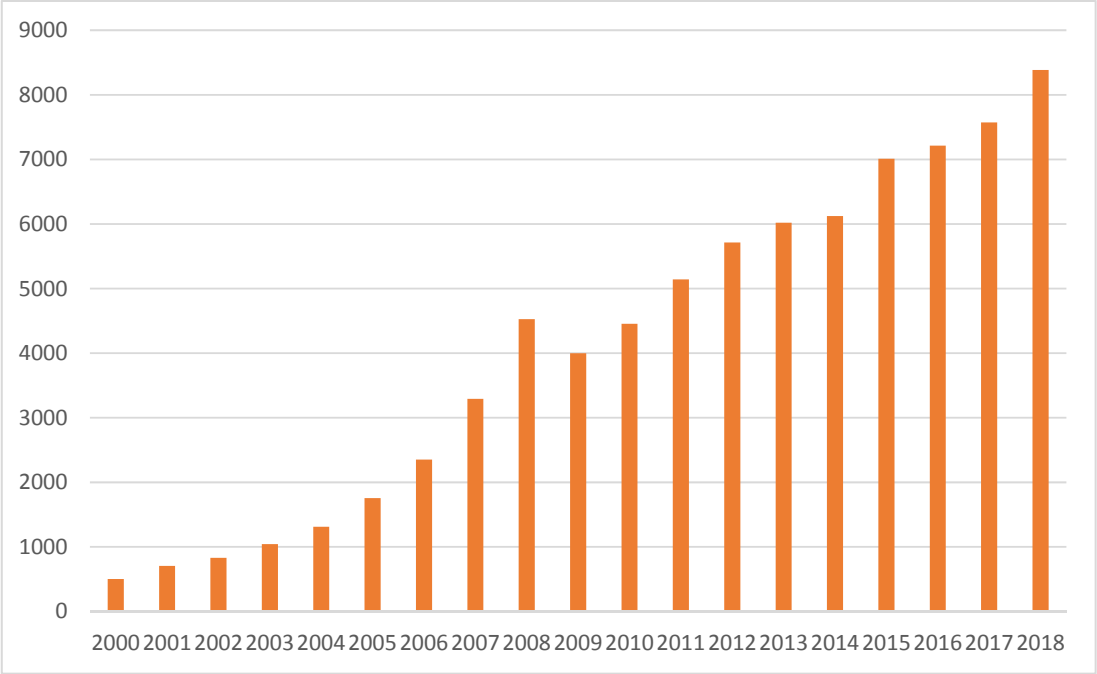


*Fig. 2.* **Scope of work performed by the type of economic activity "construction"**

*Source:* URL: http//www.gks.ru/free_doc/doc_2018/stroit-2018.pdf (accessed on 15.07.2019).

down due to lower incomes and persistent inflation risks. In the IV quarter of 2018, the balance of the number of concluded agreements amounted to –5%. This means that the majority of respondents noted a decrease in this indicator compared to the previous period. Due to the deterioration of the business climate in the construction industry, the problem of company bankruptcies is becoming significant. According to a survey of entrepreneurs in 2017, 16–17% of contraction companies assess their condition as pre-bankrupt, i.e. their financial condition worsens over 3–4 quarters.

Therefore, with increasing sales volumes (see *Fig. 2*) and an increasing number of market participants (*Fig. 1*), the number of con-

struction companies with signs of bankruptcy is also growing. It is necessary to determine the factors influencing the probability of bankruptcy of construction companies, as well as to select a model that will help find and study these indicators and, most importantly, predict the financial insolvency of construction companies. This issue may attract the attention of not only top-level managers of developers, but also lenders to construction companies, as well as their shareholders.

There is no single model for predicting bankruptcy of a company. It is also necessary to consider the market characteristics of each individual country, since applying foreign models to Russian companies will not always provide an accurate forecast [3, 4].

## RESEARCH RESULTS

Today, there are enough works on predicting bankruptcy of companies. They differ in the factors in the considered models, their number, as well as in the methods used to build models. This is noted in the work by Yu. N. Zakharova and N. N. Yaromenko [5].

Modern approaches to the financial condition of an enterprise and the probability of its bankruptcy involve not only discriminant analysis models, but also models based on neural networks allowing analysis with lack of information and complex non-linear relationships between variables. This conclusion was obtained by T. V. Varkulevich and O. Yu. Shchukina, in the study devoted to modern approaches to forecasting bankruptcy of enterprises [6].

Besides, one should consider not only internal, but also external factors potentially affecting the probability of bankruptcy of enterprises [7].

Nevertheless, the Altman model (1968) remains one of the most famous and popular models for predicting bankruptcy, being one of the first examples of the multiple discriminant analysis (MDA) method [8]. The author compiled a sample of 66 American companies from 1946 to 1965 (33 operating companies and 33 bankrupt companies). This model showed fairly accurate prediction abilities: the probability of correct predicting for the year ahead is 95%, for two years — is 83%. However, the Altman model (1968) cannot be called universal, since it can be applied only to the companies whose shares are traded on the stock market. E. Yu. Fedorova, M. A. Chukhlantseva and D. V. Chekrizov noted the indicated feature of the Altman model in [9].

Besides, the differences in business conditions in the USA and Russia are too significant making the Altman model (as well as the Taffler model) difficult to apply due to inaccurate predictions. This thesis is also confirmed in the work by G. V. Davydova and A. Yu. Belikov [10].

Logit models for predicting bankruptcy of enterprises gained little recognition in scientific publications. A fundamental contribution to the study of logit models for predicting bankruptcies was made by J. A. Ohlson (1980) [11]. This method uses regression analysis of binary selection models. The predicted variable "bankruptcy" in these models can take "0" values if the company has not gone bankrupt, and "1" values if the company has done. Another advantage of logit models is that they can be used to construct nonlinear factor dependencies in models. As a result, Ohlson developed the following regression formula:

$$Y = -1.3 - 0.4X_1 + 0.6X_2 - 1.4X_3 + 0.1X_4 - 2.4X_5 - 1.8X_6 + 0.3X_7 - 1.7X_8 - 0.5X_9, \quad (1)$$

where $X_1$ — is the natural logarithm of the ratio of assets to the GDP deflator index;

$X_2$ — is the ratio of short-term and long-term debt to assets;

$X_3$ — is the operating capital to assets ratio;

$X_4$ — is the ratio of current liabilities to current assets;

$X_5$ — is the net profit to assets ratio;

$X_6$ — is the ratio of net profit and depreciation to the amount of short-term and long-term debt;

$X_7$ — equals to 1 if total liabilities exceed total assets, or equals to 0 in the opposite situation;

$X_8$ — equals to 1 if net profit was negative in the last two years, or to 0 if it was positive;

$X_9$ — is the ratio of the difference in net profit for the last reporting period and net profit for the previous reporting period to the modulus of the amount of these financial indicators [11].

Having calculated the Y value, it is possible to find the probability of bankruptcy by the logistic regression formula [5]:

$$P = \frac{1}{1+e^{-Y}}, \quad (2)$$

where $e$ — is the exponent (Euler's number); and $P$ — is the probability of bankruptcy of the enterprise.

It is more difficult to apply logit models as they often use high-quality variables. Nevertheless, they are characterized by a sufficiently high forecast accuracy, which makes it possible to use them when the probability of bankruptcy cannot be described only by financial variables.

For example, Russian author G.A. Khaidarshina (2009) built a logit model to assess the risk of bankruptcy of Russian enterprises [12]. The sample included 350 enterprises from different industries that vary in scale of activity. As a result, the author identified 11 significant variables, including the age of the enterprise, its credit history, current liquidity ratio and the Central Bank of Russia refinancing rate. The study results show the accuracy of the model built by G.A. Khaidarshina, accounted for 85.6%, which is a fairly high result proving the applicability of logit analysis to predicting bankruptcy of Russian companies. Also, the high predictive ability of logit models was noted in the article by O.E. Bol'shakova A.G. Maksimov and N.V. Maksimova who tested small and medium-sized enterprises [13].

In this article we will try to build a logit model for predicting bankruptcy of Russian construction companies. The specifics of the industry requires considering not only financial, but also non-financial indicators of enterprises, which is what logit models are for. Besides, logistic models, in contrast to discriminant analysis models, not only help determine whether companies are bankrupt or not, but also show the probability of a company to become bankrupt [14].

The following advantages distinguishing the model from other methods of predicting bankruptcy can be specified:

- the ability of the model to determine the probability of bankruptcy of companies;
- data should not necessary to have a normal distribution, in contrast to the discriminant analysis model;
- the results are easy to interpret;
- the model can consider specific variables for different industries;
- high accuracy of the results [15].

Since the considered examples of logit analysis for predicting bankruptcies of companies (for example, the model of G.A. Khaidarshina) showed rather high predictive accuracy, there is a reason to believe that by applying this type of model to the construction sector, one can also obtain a highly effective estimate of the probability of bankruptcies of construction companies.

The generated database includes 526 Russian construction companies specializing in the construction of residential and non-residential buildings. In this paper, microenterprises, small and medium enterprises were considered. The information about the organizations and their financial statements were taken from the Spark information source.

The sample consists of open financial statements of construction companies for 2014–2017. The sample includes the data for the crisis period from 2014 to 2015. It was decided not to exclude these data, since such fluctuations in the market can be quite expected in the future and including this information can improve the predictive qualities of the model. On the contrary, the choice of a specific time period (recession period or

recovery period) would lead to the fact that the built model could assess the probability of bankruptcy only considering the current situation in the construction industry, which would worsen its predictive accuracy and narrow the applicability.

The sample contains information on 370 operating companies and 156 companies that were liquidated or are in the process of bankruptcy as of December 31, 2017. Most of these organizations have an open legal form. The companies were selected based on the fact that public companies are more demanding of their reporting, as it is open to a wide range of people.

The dependent variable in the model is binary and takes "1" values if the company is bankrupt, and "0" values if it is operating. For bankrupt companies, the latest accounting reports made before the bankruptcy were only included in the sample, since it is very difficult to say exactly when the organization became financially insolvent. Besides, the period between the moment when the company first experiences financial problems and the time when the arbitral tribunal decides to declare the company bankrupt can vary from few to a few years [16].

## SELECTING EXPLANATORY VARIABLES FOR A LOGIT MODEL

One of the main objectives of this work is to select indicators affecting the probability of bankruptcy of construction companies. The author analyzed many works on logit analysis to predict the default of companies, and selected the most suitable factors for the model under review. In this work, the most significant indicators from the other empirical studies are taken as explanatory variables. These include both classical studies on predicting bankruptcy (E.I. Altman (1968) [8], J.A. Ohlson (1980) [11]) and modern studies (V. Yu. Zhdanov, O.A. Afanas'eva (2011) [15], S.A. Gorbatkov, S.A. Farkhieva (2018) [17]).

The financial indicators have been chosen based on the definition of bankruptcy. As noted earlier, bankruptcy means the company has no funds to pay off debt [18]. This is expressed in the fact that the organization cannot create new cash flows or attract external financing. As a result, the company does not have enough funds to meet its obligations.

An indicator demonstrating a company's ability to pay current liabilities is the current liquidity ratio (curLiq), calculated as the ratio of current assets to short-term liabilities. Also, important is the solvency ratio (SvsO), equal to the ratio of equity to all liabilities. The solvency ratio shows how much the company is dependent on its creditors and is stable in a crisis situation when attracting foreign investment is difficult.

To verify the profitability and effectiveness of company management, the following indicators were selected:

- ROE — is the ratio of net profit to equity. This index allows to evaluate the effectiveness of invested equity in the company. If the company functions well, this indicator should be more than 1;
- ROA (Return on assets) — is the net profit ratio to all company assets. The ROA allows to evaluate what net profit each unit of assets can make. This ratio makes it possible to evaluate the effectiveness of the company's management.
- ROS (Return on sales) — is the ratio of net profit to company revenue. ROS is another important indicator for evaluating the performance of a company. It allows to compare the profitability of firms within one industry.

The indicators reflecting liquidity (curLiq), solvency (SvsO) and the company's profitability (ROE, ROA, ROS) became even more significant for construction companies after the new amendment to Federal Law dated 01.07.2018 No. 214-FZ. The above ratios reflect the company's ability to pay for its obligations on time and effectively manage the invested funds.

Let us check some hypotheses about the influence of non-financial indicators on the probability of bankruptcy of a company. For example, B.B. Demeshev and A.S. Tikhonova

(2014) tested the following hypothesis: the older the company is, the lower the probability of bankruptcy is [19]. The age of the company can really play an important role in its functioning. Having completed another project, construction organizations will potentially have a more own funds to be spent on business development. This can reduce the company's dependence on external financing and reduce the probability of bankruptcy.

Another hypothesis is the negative relationship between the size of the company (comp_size) and the probability of bankruptcy. For small companies or the ones that just start their development is extremely difficult to attract credit funds for the projects. Many of them may bankrupt due to lack of own funds to meet their current obligations.

To check the relationship between the probability of bankruptcy and the size of the company, a revenue logarithm indicator (lnRevenue) was introduced. As the revenue generated by companies from the sample varies greatly between the firms, the logarithm of this indicator was taken to simplify the interpretation.

The econometric model for assessing the bankruptcy factors of construction companies is as follows:

$$Y = F\ (curLiq,\ SvsO,\ ROA,\ ROE,\ ROS,\ lnRevenue,\ comp\_size,\ age). \quad (3)$$

The probability of bankruptcy of an enterprise can be calculated by the following formula:

$$P_i = \frac{1}{1+e^{-\left(\begin{array}{c}a_0+a_1 curliq_1+a_2 SvsO_i+a_3 Roe_i+a_4 ROS_i+a_5 InRevenue_i+\\ +a_6 ROA_i+a_7 compsize_i+a_8 age_i+\varepsilon_i\end{array}\right)}}, \quad i = 1...526, \quad (4)$$

where $P_i$ –is the probability of bankruptcy of the $i$-th company, α0 is a constant value;

α1 ... α10 — are parameter estimates obtained as average values for the sample;

$\varepsilon_i$ —is an error of the log model, reflecting deviations of the actual value of the dependent variable from the predicted value. It is generally taken to be zero.

## BUILDING A LOGIT MODEL TO ASSESS BANKRUPTCY FACTORS OF CONSTRUCTION COMPANIES

To assess the impact of the selected ratios on the bankruptcy of construction companies, we use the Stata14 package to solve statistical problems. It helped build a logit model including all explanatory variables. *Table 1* shows the model obtained after constructing the regression.

The statistics above shows that almost all regression coefficients are significant at any reasonable level of significance. Significant variables include the ROA and age.

The ROA may be insignificant since potential bankrupt companies already experience financial problems a year before the default. They start selling off their assets as they hope to get over the crisis. By doing so, businesses can overestimate the ROA.

The *age* index also relates to insignificant variables and shows how long the company exists. This result can be obtained due to the ambiguous influence of the age of the company on its financial stability and management efficiency. On the one hand, the older the company is, the more counterparties it has acquired within its lifetime and the more orders it may have. On the other hand, a large number of acquired relationships can also have a negative effect on the company's activities. Due to the loyalty between the company and its constant counterparties, the effectiveness of payment and debt management decreases. This may lead the company to increase late payments and to bankruptcy proceedings if the relations with the counterparties worsen. Therefore, the age of the company can have both positive and negative effects on the probability of bankruptcy of the company and is not significant.

The insignificant age and ROA variables were removed from the second stage of building the logit model. *Table 2* reflects the updated regression statistics.

*Table 1*

**Logit model 1**

```
. logit bankrupt sLiq SvsO ROE ROA ROS lnRevenue i.comp_size age

Iteration 0:   log likelihood = -287.25978
Iteration 1:   log likelihood = -203.61352
Iteration 2:   log likelihood = -183.00905
Iteration 3:   log likelihood =  -179.7727
Iteration 4:   log likelihood = -179.57507
Iteration 5:   log likelihood =  -179.5747
Iteration 6:   log likelihood =  -179.5747

Logistic regression                             Number of obs     =        526
                                                LR chi2(9)        =     215.37
                                                Prob > chi2       =     0.0000
Log likelihood =  -179.5747                     Pseudo R2         =     0.3749
```

| bankrupt | Coef. | Std. Err. | z | P>\|z\| | [95% Conf. | Interval] |
|---|---|---|---|---|---|---|
| sLiq | -1.213096 | .2926656 | -4.14 | 0.000 | -1.78671 | -.6394814 |
| SvsO | -.1557101 | .0302781 | -5.14 | 0.000 | -.2150541 | -.096366 |
| ROE | -.3968591 | .141142 | -2.81 | 0.005 | -.6734923 | -.1202259 |
| ROA | -.0806657 | .1795676 | -0.45 | 0.653 | -.4326118 | .2712804 |
| ROS | -2.244519 | .6220966 | -3.61 | 0.000 | -3.463806 | -1.025232 |
| lnRevenue | .2428741 | .0616831 | 3.94 | 0.000 | .1219775 | .3637708 |
| comp_size | | | | | | |
| 2 | -1.052509 | .2899157 | -3.63 | 0.000 | -1.620733 | -.4842847 |
| 3 | -1.954751 | .4936351 | -3.96 | 0.000 | -2.922258 | -.9872436 |
| age | -.0180554 | .027371 | -0.66 | 0.509 | -.0717016 | .0355907 |
| _cons | -2.999704 | 1.050806 | -2.85 | 0.004 | -5.059246 | -.9401619 |

*Source:* calculated by the author.

*Table 2*

**Logit model 2**

```
. logit bankrupt sLiq SvsO ROE ROS lnRevenue i.comp_size

Iteration 0:   log likelihood = -287.25978
Iteration 1:   log likelihood = -204.96912
Iteration 2:   log likelihood = -181.46575
Iteration 3:   log likelihood = -179.90752
Iteration 4:   log likelihood = -179.90087
Iteration 5:   log likelihood = -179.90086

Logistic regression                             Number of obs     =        526
                                                LR chi2(7)        =     214.72
                                                Prob > chi2       =     0.0000
Log likelihood = -179.90086                     Pseudo R2         =     0.3737
```

| bankrupt | Coef. | Std. Err. | z | P>\|z\| | [95% Conf. | Interval] |
|---|---|---|---|---|---|---|
| sLiq | -1.242342 | .2902214 | -4.28 | 0.000 | -1.811165 | -.6735183 |
| SvsO | -.155542 | .0303183 | -5.13 | 0.000 | -.2149649 | -.0961191 |
| ROE | -.4197041 | .1341943 | -3.13 | 0.002 | -.6827201 | -.1566882 |
| ROS | -2.283701 | .6205705 | -3.68 | 0.000 | -3.499997 | -1.067405 |
| lnRevenue | .2403916 | .0617658 | 3.89 | 0.000 | .1193328 | .3614503 |
| comp_size | | | | | | |
| 2 | -1.049589 | .2886773 | -3.64 | 0.000 | -1.615386 | -.4837917 |
| 3 | -1.921264 | .4889267 | -3.93 | 0.000 | -2.879543 | -.9629856 |
| _cons | -3.072688 | 1.028905 | -2.99 | 0.003 | -5.089304 | -1.056072 |

*Source:* calculated by the author.

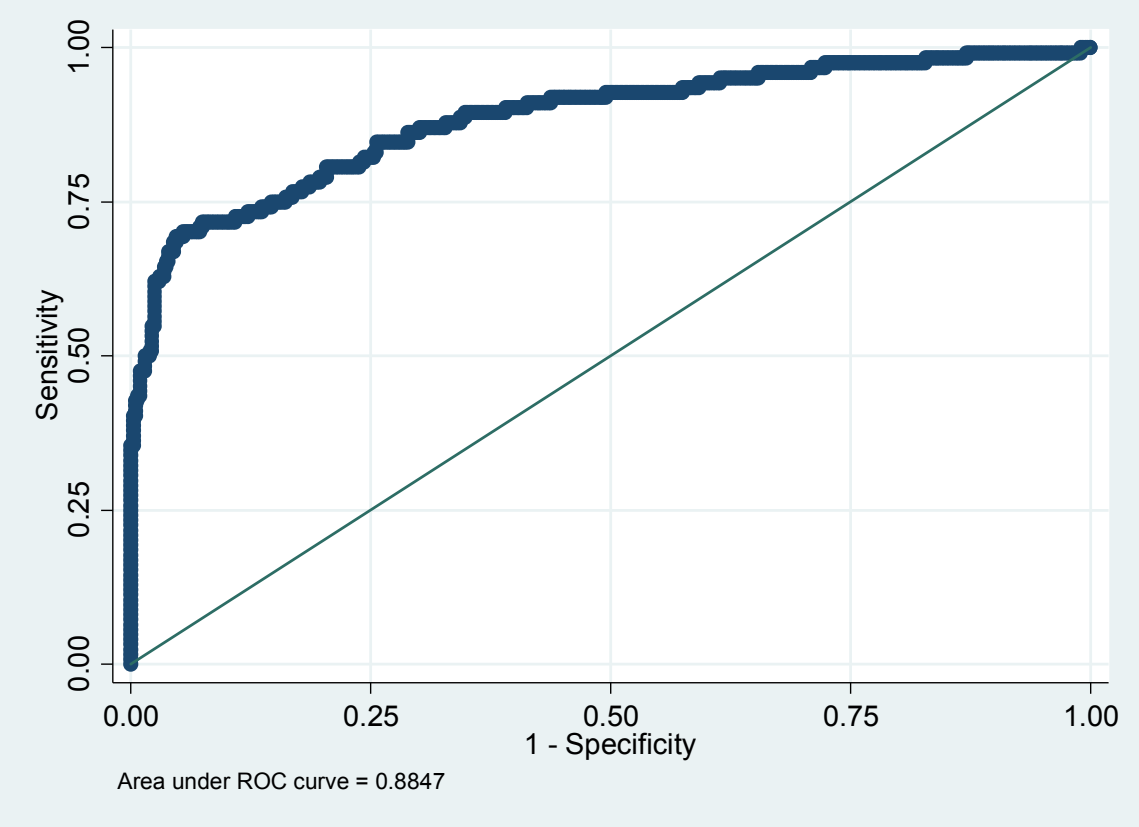


*Fig. 3.* **ROC-analysis**

*Source:* compiled by the author.

After the ROA and age variables were excluded, all remaining coefficients turned out to be significant at any reasonable level of significance.

The quality control procedure of the binary specification was also verified. ROC analysis suits here. When conducting this test, the main attention is paid to the AUC indicator considered as the area of the figure located under the ROC curve and can be calculated by the formula:

$$AUC = \int f(x)dx = \Sigma_i \left[\frac{X_{i+1} + X_i}{2}\right] \times (Y_{i+1} - Y_{i+2}). \quad (5)$$

*Fig. 3* shows the ROC curve and the value of the AUC.

The AUC was 0.8847, which is close to 1. The classifier turned out to be qualitative. The AUC indicator can be interpreted as follows: a randomly selected bankrupt company with a probability of 88.47% will be evaluated by the classifier of the model higher than a randomly selected existing company.

To check our assumptions and the influence of each coefficient on the probability of bankruptcy of companies, the marginal effects were calculated. The results are presented in *Table 3*.

According to the results, the ROS (return on sales) coefficient in the logit model has the greatest impact on the probability of bankruptcy of construction companies. An increase in the ROS variable by one base unit reduces the probability of bankruptcy by 22.3%. The specifics of the construction industry include a high share of cost in sales. Here, the relationship between the control of the structure and volume of expenses and the financial sustainability of the construction organization is quite obvious. Continuing increase in new orders in most efficient operating companies allows to increase the revenue growth rate com-

*Table 3*

**Marginal effects calculation**

| | Delta-method dy/dx | Std. Err. | z | P>\|z\| | [95% Conf. | Interval] |
|---|---|---|---|---|---|---|
| sLiq | -.1215719 | .0226323 | -5.37 | 0.000 | -.1659303 | -.0772135 |
| SvsO | -.0152209 | .0032094 | -4.74 | 0.000 | -.0215111 | -.0089306 |
| ROE | -.041071 | .0125199 | -3.28 | 0.001 | -.0656096 | -.0165324 |
| ROS | -.2234761 | .0782119 | -2.86 | 0.004 | -.3767687 | -.0701836 |
| lnRevenue | .023524 | .0059113 | 3.98 | 0.000 | .011938 | .03511 |
| comp_size | | | | | | |
| 2 | -.1264242 | .0386485 | -3.27 | 0.001 | -.2021738 | -.0506746 |
| 3 | -.1748416 | .0410354 | -4.26 | 0.000 | -.2552694 | -.0944137 |

*Source:* calculated by the author.

pared to the cost growth rate due to the effect of production leverage.

The size of the company may influence the probability of bankruptcy. One can see that the comp_size variable is categorical. The sample includes three types of companies: micro, small and medium. The limiting effect for this type of variable is interpreted as follows: how much the dependent variable changes when moving from one category to another. *Table 3* shows that micro-companies were considered for the base category. If the company is small, then the probability of its bankruptcy is 12.6% lower than that of a micro-enterprise. Based on these results, medium-sized enterprises are least affected by bankruptcy. The probability of their default is 17.5% lower than that of microenterprises. In most cases, medium-sized companies have more equity than small organizations. As a result, medium-sized companies have a greater resource for paying off their obligations and investing in new projects than small and micro-enterprises.

Also, the current liquidity has a fairly strong effect on the probability of bankruptcy of construction companies. If this ratio increases by one, the probability of bankruptcy decreases by 12.2%. Current liquidity reflects the company's ability to pay its current liabilities as soon as possible. Many contractors working with construction companies, including credit organizations, are guided by this indicator. Therefore, the greater the current liquidity indicator of a company is, the fewer signs of bankruptcy it has.

The ratio of equity to all liabilities also turned out to be significant. If this indicator increases by one, the probability of default decreases by 1.5%. Indeed, if a company takes on too many obligations (the SvsO coefficient decreases), then it risks not to pay it on time and become financially insolvent.

ROE (return on equity) is the second significant coefficient of profitability. If return on equity increases by one base unit the company's chance to become bankrupt decreases by 4.1%. ROE is an extremely important indicator for attracting investments and evaluating policies pursued by the company management.

The last significant indicator in the considered logit model is the natural logarithm of revenue (lnRevenue). If this indicator increases by a unit, it increases the probability of bankruptcy by 2.4%. Despite the fact that the size of the company is in negative correlation with the probability of its bankruptcy, this dependence can be explained. An increase in construction revenue means more likely an increase in receivables than an increase in cash flow during the observation period. However, it always means the growth of short-term obligations that must be paid. This fact provokes

*Table 4*

**Values of variables for JSC "BALTSTROY"**

| Significant coefficient | Value |
|---|---|
| sLiq | 0.999451 |
| SvsO | 0.016284 |
| ROE | –5.52443 |
| ROS | –0.56243 |
| lnRevenue | 20.89492 |
| comp_size | 3 |

*Source:* compiled by the author.

further research on the impact of the dynamics of revenue volumes and financial stability of construction organizations.

Let us test the predictive ability of the logit model on a real company that faced the problem of bankruptcy. For example, JSC "BALTSTROY" company, whose financial statements are presented by the electronic resource Spark. In August 2018, the Arbitration Court of St. Petersburg and the Leningrad Region introduced a monitoring procedure for this company as part of the bankruptcy proceedings of this company.

Due to the real financial statements of JSC "BALTSTROY" for 2017, we can check whether the logit model built in this work is applicable for predicting bankruptcies of construction companies in practice. Therefore, for the selected company, the coefficients significant in the model should be calculated. Table 4 shows the values of these indicators for JSC "BALTSTROY".

We substitute these values into formula (4) to calculate the probability of default of JSC "BALTSTROY" one year before its actual bankruptcy. The results of the calculations are following:

$$P = \frac{1}{1+e^{-\left(\begin{array}{l}-3.073+1.243\times 0.999+0.156\times 0.016-0.42\times \\ \times(-5.524)-2.284\times(-0.562)+0.24\times 20.89-1.92\end{array}\right)}} = 0.92.$$

As a result, the probability of bankruptcy of JSC "BALTSTROY" one year before the monitoring procedure by the Arbitration Court of St. Petersburg and the Leningrad Region is 92%.

It can be concluded that the constructed logit model really has rather high predictive qualities and can be used to assess the probability of bankruptcies of construction companies in practice.

## CONCLUSIONS

The proposed bankruptcy prediction model for construction companies is highly reliable in predicting their potential financial insolvency. The logit model is characterized by simple calculations; the explanatory variables have a strong logical relationship with the financial

activities of construction organizations, considering the industry specifics. Moreover, the model allows including new significant variables, non-financial ones, based on the individual working conditions of specific organizations. This circumstance adds an applied character to the presented logit model for predicting bankruptcy.

It should definitely be noted that the sample used in this article is limited. Today, according to Spark, there are more than 200 thousand companies in Russia involved in the construction of residential and non-residential buildings. This study included only 526 construction companies into the sample. The database spread-out can potentially change the significance and marginal effects of some coefficients and be more accurate in reflecting the situation on the Russian construction market.

Nevertheless, the logit model presented in the article has good predictive characteristics both at the level of medium and small enterprises. It helps assess the chance of bankruptcy of construction enterprises considering the scale of their activities. There are plenty opportunities for further research that can improve this model.

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# Assessment of Budget Impact on the Financial Sustainability of the Altai Territory Economy

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## ABSTRACT

Based on the methods of quantitative and coefficient analysis of financial indicators, the author assessed the state of the Altai Territory budget and its impact on the financial sustainability of the region's economy. The problems in the structure of income and expenditure revenues were noted: high growth rates of the budget expenditures, mainly due to social expenses; decreasing budget receipts of own revenues, such as property tax and other tax and non-tax revenues; growing dependence of the regional budget on uncompensated receipts, mainly due to increasing grants allocated by the federal center to equalize budgetary provision. Of note was the imbalance of the regional budget leading to its financial imbalance. The author suggested measures to make the regional budget balanced: ensuring the efficiency and control of the budgetary resources, reducing the growth rate of budget expenditures and increasing tax and non-tax revenue receipts. The scientific novelty of the study consists in using a set of financial indicators to determine the state of the Altai Territory budget for 2016–2018 in order to assess its impact on the financial sustainability of the region's economy. The results can be used by federal and regional authorities as a fiscal stimulus tool for the financial sustainability of the Altai Territory and other regions of the Russian Federation.

***Keywords:*** regional economy, structure of regional budget, financial sustainability, budget revenues and expenditures, growth rate, tax and non-tax revenues, uncompensated receipts; budget evaluation criteria; budget coefficients

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## INTRODUCTION

The relevance of the study of the regional budget in the Russian Federation is steadily growing, since it is part of the financial system participating in the distribution of financial income by the main priority sectors of economic activity and subsequently affects its financial sustainability [1, 2]. The increasing interest in this issue is confirmed by the studies of the authors who consider the impact of the budget on the sustainability of the regional economy [3]. The budget is an integral component of the policy of regional authorities in financial and economic development and plays an important role in ensuring the financial sustainability of the regional economy.

The chief goals of the executive branch of the regional authority are to ensure budgetary resources, consolidate and reduce budgetary expenditures, improve budget formation and execution processes, and control municipal and state debts [4]. At the expense of the budget funds, the regional authorities distribute income from profits from the profitability sector of economy and among other administrative-territorial entities. Here, problems may arise affecting the budget system sustainability [5]. There can be: inflation, a crisis in the country and an inefficient financial system. As a result, a budget deficit may appear when expenses exceed revenues.

The state is interested in providing gratuitous assistance to the regional budget for the regional authorities to carry out their own budget policies and maintain financial sustainability [6]. State support involves the investment of the budgetary resources in the priority sectors of the economy [7, 8].

However, one of the main problems in the budget system is to choose the expenditure pattern. It is responsible for the budget balance and the effective allocation of the budgetary resources, as well as for developing favorable conditions for the national economy, providing high-quality public services and maintaining sustainability in the social sphere [9, 10].

The aim of the paper is to study the budget indicators of the Altai Territory that will let us assess its impact on the financial sustainability of the region.

Accordingly, the following should be done:

- to determine the criteria and methods for assessing the regional budget;
- to analyze the structure of the regional budget of the Altai Territory;
- to assess the impact of the regional budget on the financial sustainability of the Altai Territory.

## BUDGET ASSESSMENT METHODS AND EVALUATION CRITERIA

The regional budget was assessed by means of the quantitative evaluation criteria and the coefficient analysis method [11–13].

To determine the financial sustainability of the regional budget the following states can be highlighted:

1) absolutely stable;
2) normal;
3) unstable;
4) crisis (*Table 1*).

To assess the impact of the regional budget on the financial sustainability of the Altai Territory, budget coefficients should be used [14, 15]. Thus, we consider the following set of financial indicators that allow us to assess the independence, sustainability and directions of the regional budget:

1) coefficient of budget autonomy (independence):

$$C_{aut} = \frac{TNTR}{R} \times 100\%;$$

2) coefficient of budget dependence:

$$C_{dep} = \frac{UR}{R} \times 100\%;$$

3) coefficient of sustainability:

$$C_{sust} = \frac{UR}{TNTR} \times 100\%;$$

4) coefficient of deficit:

*Table 1*

**Methods to determine sustainable state by the following quantitative criteria**

| Type of financial sustainability | Calculation formula | Calculation formula, % |
|---|---|---|
| Absolutely stable | *E* < *Ro* + *Cr* | *Ro* / *R* = 60–70%<br>*Cr* / *R* = 30–40%<br>*D* / *E* = 10–15% |
| Normal | *E* = *Ro* + *Cr* | *Ro* / *R* = 40–50%<br>*Cr* / *R* = 50–60%<br>*D* / *E* = 20–25% |
| Unstable | *E* = *Ro* + *Cr* + *AF* | *Ro* / *R* = 20–30%<br>*Cr* / *R* = 70–80%<br>*D* / *E* = 30–35% |
| Crisis | *E* = *Ro* + *Cr* + *AF* | *Ro* / *R* = 5–10%<br>*Cr* / *R* = 90–95%<br>*D* / *E* = 40–45% |
| Definitions | Sum of expenses (*E*) = Own revenues (*Ro*) + Control revenues (*Cr*) + Additionally attracted finance (*AF*) | 1. Own revenues (*Ro*) includes ongoing tax and non-tax revenues.<br>2. Control revenues (*Cr*) includes tax revenues distributed on a temporary basis and at differentiated rates.<br>3. Additional financial sources (*AF*) are extra-budgetary funds, borrowed funds.<br>4. Debt (*D*) is the size of the budget deficit |

*Source:* calculated according to [14].

$$C_d = \frac{Def}{TNTR} \times 100\%;$$

5) coefficient of business activity:

$$C_{ba} = \frac{NTR}{TNTR} \times 100\%;$$

6) coefficient of tax revenues:

$$C_{tr} = \frac{TR}{TNTR} \times 100\%;$$

7) coefficient of budget coverage:

$$C_{bc} = \frac{R}{E} \times 100\%;$$

8) coefficient of budgetary provision of the population:

$$C_{bpp} = \frac{E}{P} \times 100\%;$$

where $R$ — is total budget revenues;

*E* — is total budget expenditures;

*TNTR* — is received tax and non-tax revenues, revenues of trust budgetary funds, i.e. total revenues minus non-repayable and non-recoverable transfers;

*UR* — is non-repayable and non-recoverable transfers from budgets of higher levels;

*TR* — is tax revenues;

*Def* — is deficit;

*NTR* — is non-tax revenues;

*P* — is population.

## REGIONAL BUDGET STRUCTURE ANALYSIS OF THE ALTAI TERRITORY

Today, the implementation of all social programs and obligations is the key priority for the regional budget, structural transformation and modernization of economic development. The system of social policy, education and health care is being improved to increase the level of well-being and the quality of life of the population [16, 17]. In 2018, about 70% of all budget expenses were used to achieve the goals.

The state programs for the economic development of the Altai Territory are no less important for the regional authorities. They are aimed at supporting agriculture, industry, small and medium enterprises, improving labor market conditions and promoting employment. This will increase the competitiveness of the region's economy[1]. Implementing state programs for the socio-economic development of the Altai Territory requires an effective budget policy that will achieve financial sustainability [18].

The budget state and possible implementation of the state development programs are shown by revenue receipts. The income structure consists of own revenues and uncompensated receipts (*Table 2*).

The calculations show a significant increase in total budget revenues by 17 billion rubles in 2018 compared to 2017, while the growth rate was already 120%. The growth rate of own revenues exceeds the average rate in Russia by 1.5 times. Uncompensated receipts in 2018 showed the highest growth rate for the last three years and amounted to 134%, or 47.8 billion rubles. In 2016, own revenues also reflected the stable budget revenues, with the highest growth rate of 122%, or 50 billion rubles. This suggests that the regional budget was the least dependent on federal centers, in contrast to 2018[2].

The structure of the budget's own revenues should be analyzed to see why they increased (*Table 3*).

*Table 3* shows that over the past three years the largest share is represented by individual income taxes, income taxes and excise taxes, which is about 70% of total tax revenues.

In 2018, there was a high growth rate of individual income tax (113%, or 17.6 billion rubles) and corporate income tax (114%, or 14 billion rubles) with the highest share in the revenue structure (33% and 26%). The lowest share of revenues is still retained by property tax and non-tax revenues, 9% and 11%, respectively. Therefore, there are problems in the revenue structure requiring increase in their tax base [19].

Uncompensated receipts from the federal budgets to the regional budget are necessary to implement regional development programs and cover the budget deficit, thereby ensuring sustainable development. However, constantly increasing gratuitous aid means that the budget system is unstable and belongs to the subsidized one (*Table 4*).

The data of the uncompensated receipts structure show that the fewest grants for the last three years were provided in 2016–58% of all receipts. The regional budget was less dependent on the federal budgets [20, 21]. However, 2018 notes a rather high share of grants (71%) and growth rate (142%) compared to

[1] Law of the Altai Territory dated December 05, 2017 No. 92-3C "On the regional budget for 2018 and for the planning period of 2019 and 2020". URL: http://docs.cntd.ru/document/450377816 (accessed on 22.07.2018).

[2] Information on the regional budget execution as of 01.01.2019. URL: http://fin22.ru/isp/ispbud/o2018/o2018_2923.html (accessed on 19.02.2019).

*Table 2*

**Revenue receipts of the Altai Territory budget**

| Indicator | 2016 | | 2017 | | 2018 | |
|---|---|---|---|---|---|---|
| | Growth rate (chain), % | Value, billion rubles | Growth rate (chain), % | Value, billion rubles | Growth rate (chain), % | Value, billion rubles |
| Revenues, total | 104 | 83045 | 102 | 84965 | 120 | 102029 |
| Uncompensated receipts | 85 | 32979 | 108 | 35570 | 134 | 47780 |
| Own revenues | 122 | 50065 | 100 | 49395 | 110 | 54248 |

*Source:* the author's calculations according to the Ministry of Finance of the Altai Territory. 2019. URL: http://fin22.ru/isp/ispbud/o2018/o2018_2923.html (accessed on 02.19.2019).

*Table 3*

**Structure of own revenues of the Altai Territory**

| Indicator | 2016 | | | 2017 | | | 2018 | | |
|---|---|---|---|---|---|---|---|---|---|
| | Value, billion rubles | Share, % | Growth rate, % | Value, in billion rubles | Share, % | Growth rate, % | Value, billion rubles | Share, % | Growth rate, % |
| Individual income tax | 14750873 | 30 | 105 | 15657818 | 32 | 106 | 17649269 | 33 | 113 |
| Corporate income tax | 12898267 | 26 | 160 | 12256768 | 25 | 95 | 13970129 | 26 | 114 |
| Excise taxes | 13263457 | 26 | 128 | 11371420 | 23 | 85,7 | 11644095 | 21 | 102 |
| Corporate property tax | 4423136 | 9 | 104 | 4695127 | 9 | 106 | 5109288 | 9 | 109 |
| Other tax and non-tax revenues | 4729636 | 9 | 103 | 5413387 | 11 | 114 | 5875453 | 11 | 108 |
| Total revenues, billion rubles | 50065369 | | | 49394520 | | | 54248234 | | |

*Source:* the author's calculations according to the Ministry of Finance of the Altai Territory. 2019. URL: http://fin22.ru/isp/ispbud/o2018/o2018_2923.html (accessed on 02.19.2019).

*Table 4*

**Structure of the main uncompensated receipts to the Altai Territory budget**

| Receipts from the federal budget | 2016 | | | 2017 | | | 2018 | | |
|---|---|---|---|---|---|---|---|---|---|
| | Value, billion rubles | Share, % | Growth rate, % | Value, billion rubles | Share, % | Growth rate, % | Value, billion rubles | Share, % | Growth rate, % |
| Grants | 18533909 | 58% | 105% | 23605828 | 66% | 127% | 33486904 | 71% | 142% |
| Subsidies | 6559561 | 20% | 83% | 5469531 | 16% | 83% | 6005152 | 13% | 110% |
| Subventions | 5498641 | 17% | 105% | 5098899 | 15% | 93% | 5230649 | 11% | 102% |
| Inter-budgetary transfers | 1671841 | 5% | 22% | 883184 | 3% | 53% | 2673476 | 5% | 302% |
| Total revenues, billion rubles | 32263952 | | | 35057443 | | | 47396182 | | |

*Source:* the author's calculations according to the Ministry of Finance of the Altai Territory. 2019. URL: http://fin22.ru/isp/ispbud/o2018/o2018_2923.html (accessed on 02.19.2019).

*Table 5*

**Structure of budget expenditures of the Altai Territory**

| Indicator | 2016 | | | 2017 | | | 2018 | | |
|---|---|---|---|---|---|---|---|---|---|
| | Value, billion rubles | Share, % | Growth rate, % | Value, billion rubles | Share, % | Growth rate, % | Value, billion rubles | Share, % | Growth rate, % |
| Social expenses | 53664036 | 69 | 98 | 58166314 | 70 | 108 | 66055101 | 71 | 113 |
| National economy | 16497375 | 21 | 86 | 14885748 | 18 | 90 | 16028062 | 17 | 107 |
| General inter-budgetary transfers to local budgets | 2000592 | 2 | 107 | 4733284 | 5 | 236 | 4101218 | 4 | 87 |
| National security and law enforcement | 524697 | 1 | 117 | 714837 | 1 | 136 | 1002051 | 1 | 140 |
| Other expenses | 5178482 | 7 | 82 | 5024161 | 6 | 97 | 6058869 | 7 | 120 |
| Total expenses, billion rubles | 77865182 | | | 83524344 | | | 93245301 | | |

*Source:* the author's calculations according to the Ministry of Finance of the Altai Territory. 2019. URL: http://fin22.ru/isp/ispbud/o2018/o2018_2923.html (accessed on 02.19.2019).

the previous periods. Low income of own taxes caused the increase in grants for socio-economic development programs (*Table 5*).

According to *Table 5*, expenses increased by 10% in 2018 compared to 2017. It reached the highest level of 93 billion rubles. This growth was due to the high share of social expenses within the state and regional development programs, which occupies 71%, or 66 billion rubles, of the budget spending. Extreme funds of 19.2 billion rubles were allocated from the regional budget for social support of the population. There was an increase in wage expenses for public sector employees by an average of 10%.

There is an increase in the growth rate of expenses on the national security in the amount of 1 billion rubles (140% growth rate). In 2017, budget funds in the amount of 4.8 billion rubles were allocated for general interbudgetary transfers (236% growth rate).

The data of the national economy are approximately the same expenditure indicators for the considered time period. The main expenses are allocated to the important sectors of the economy, such as agriculture, industry, small and medium-sized businesses, etc. Expenses in these areas amounted to 60% of total expenses of the national economy in order to develop the real sector of the region's economy, to introduce the latest technologies and to increase labor productivity.

## BUDGET ASSESSMENT AND RESEARCH RESULTS

To analyze budget indicators as a tool, the following coefficients maybe applied: budget autonomy (independence), budget dependence, sustainability, deficit and budget coverage, etc. (*Table* 6).

In *Table 7*, according to 2016–2018 quantitative criteria for estimating the Altai Territory budget, the calculations of the indicators for 2016 demonstrate the absolute financial sustainability of the budget. In 2017–2018, the indicators have normal financial sustainability, which confirms the downward trend in the financial sustainability of the regional budget (*Table 8*).

Carried out by means of the coefficient analysis, the calculations in *Table 8* show a tendency over the past year of decreasing autonomy of own revenues of the regional budget system against increasing dependence of the regional budget system on uncompensated receipts from the federal budget. Due to these receipts, the budget revenues cover expenses, thereby forming a high level of surplus.

Despite this, in 2018, the coefficient of financial sustainability revealed a negative trend in the sustainable development of the budget due to increased uncompensated receipts and lower revenues of its own budget.

As a rule, increased share of uncompensated receipts indicates the inability of the regional budget to cover expenses from its own budget revenues to implement targeted programs of socio-economic development, thereby showing its financial unsustainability. Thus, in 2018, the Altai Territory showed a sufficient increase in dependence on the federal budget; as a result, this region can be considered subsidized. Its own tax and non-tax revenues to the regional budget should be increased in order to reduce dependence on the federal budget. The following measures are required:

1) to balance the regional budget — to spend the budget funds efficiently, to allocate resources to priority areas of economic development;

2) to increase the tax base of revenues with low growth rates;

3) to increase tax potential;

4) to conduct effective planning, monitoring and application of the budget funds.

The region's development requires developing strategic programs to solve the problems above, where budget policy is the most important. It should be focused on increasing the financial sustainability of the regional budget, increasing the efficiency of expenditures in the social and investment sphere, changing the structure of the budget and the level of expenditure based on reliable forecasts of revenues to the budget.

*Table 6*

**Data for assessing the regional budget impact on the financial sustainability of the Altai Territory, billion rubles**

| Indicator | 2016, billion rubles | 2017, billion rubles | 2018, billion rubles |
|---|---|---|---|
| Budget revenues (*R*) | 83045 | 84965 | 102029 |
| Budget expenditures (*E*) | 77865 | 83524 | 93245 |
| Tax revenues (TR) | 45336 | 43981 | 48373 |
| Non-tax revenues (*NTR*) | 4729 | 5413 | 5875 |
| Tax and non-tax revenues (*TNTR*) | 50065 | 49394 | 54248 |
| Uncompensated receipts (*UR*) | 32979 | 35570 | 47780 |
| Deficit (surplus) (*Def*) | +5179 | +1441 | +8784 |
| Population (*P*) million people | 2376 | 2365 | 2350 |

*Source:* the author's calculations according to the Ministry of Finance of the Altai Territory. 2019. URL: http://fin22.ru/isp/ispbud/o2018/o2018_2923.html (accessed on 02.19.2019).

*Table 7*

**Quantitative criteria for estimating the Altai Territory budget**

| Indicator | 2016 | 2017 | 2018 |
|---|---|---|---|
| Formula | *E* < *Ro* + *Cr* | *E* = *Ro* + *Cr* | *E* < *Ro* + *Cr* |
| Type of financial sustainability | Stable | Normal | Stable |
| **Relative indicators of financial sustainability** | | | |
| State | *Ro/R* | *Cr/R* | *D/E* |
| Absolutely stable | *Ro/R* = 60–70% | *Cr/R* = 30–40% | *D/E* = 10–15% |
| Normal | *Ro/R* = 40–50% | *Cr/R* = 50–60% | *D/E* = 20–25% |
| Unstable | *Ro/R* = 20–30% | *Cr/R* =70–80% | *D/E* = 30–35% |
| Crisis | *Ro/R* = 5–10% | *Cr/R* = 90–95% | *D/E* = 40–45% |
| **Calculation** | | | |
| 2016 | 60.3% | 39.8% | 2.8% |
| 2017 | 58.1% | 41.9% | 2.4% |
| 2018 | 53.2% | 46.9% | 2.1% |

*Source:* calculated by the author.

*Table 8*

**Coefficient analysis rating of the Altai Territory budget**

| Indicator | Calculation formula | Standard | | 2016 | | 2017 | | 2018 | |
|---|---|---|---|---|---|---|---|---|---|
| Coefficient of autonomy | $C_{aut} = TNTR / R \times 100\%$ | ⩾ 80 | 1 | –1 | 60.3 | –1 | 58.1 | –1 | 53.2 |
| | | ⩾ 70 | 0 | | | | | | |
| | | ⩽ 70 | –1 | | | | | | |
| | | ⩽ 40 | –2 | | | | | | |
| Coefficient of dependence | $C_{dep} = UR / R \times 100\%$ | ⩽ 20 | 1 | 0 | 39.7 | –1 | 41.9 | –1 | 47.8 |
| | | ⩽ 30 | 0 | | | | | | |
| | | ⩾ 40 | –1 | | | | | | |
| | | ⩾ 60 | –2 | | | | | | |
| Coefficient of sustainability | $C_{sust} = UR / TNTR \times 100\%$ | ⩽ 30 | 1 | –1 | 65.9 | –1 | 72 | –1 | 88 |
| | | = 30–60 | 0 | | | | | | |
| | | = 60–100 | –1 | | | | | | |
| | | ⩾ 100 | –2 | | | | | | |
| Coefficient of deficit (surplus) | $C_d = D_{ef} / TNTR \times 100\%$ | – | +2 | +2 | +10.3 | +2 | +2.92 | +2 | +16.2 |
| | | ⩽ 10 | +1 | | | | | | |
| | | ⩽ 15 | –1 | | | | | | |
| | | ⩾ 15 | –2 | | | | | | |
| Coefficient of business activity | $C_{ba} = NTR / TNTR \times 100\%$ | ⩾ 20 | +2 | –1 | 9.4 | +1 | 10.96 | +1 | 10.83 |
| | | = 10–20 | +1 | | | | | | |
| | | ⩽ 10 | –1 | | | | | | |
| Coefficient of tax revenues | $C_{tr} = TR / TNTR \times 100\%$ | = 60–80 | +1 | –1 | 90.5 | –1 | 89 | –1 | 89.2 |
| | | ⩾ 80 | –1 | | | | | | |
| Coefficient of budget coverage | $C_{bc} = R / E \times 100\%$ | ⩾ 100 | +2 | +2 | 106.7 | +2 | 101.7 | +2 | 109.4 |
| | | = 100–95 | +1 | | | | | | |
| | | ⩽ 95 | –1 | | | | | | |
| Coefficient of budgetary provision of the population | $C_{bpp} = E / P \times 100\%$ | Growth rate of the coefficient should be ahead of inflation rate | | +1 | 32.7 | +1 | 35.3 | +1 | 39.7 |
| Total value | | | | 1 | | 2 | | 2 | |
| | | | | Unstable state | | Unstable state | | Unstable state | |

*Source:* calculated by the author.

In recent years, expenses on social development programs have grown significantly. It is necessary to optimize social expenses and to maintain a balanced redistribution of available budgetary resources among current expenses (mainly in the social part) and expenses on the development of other important areas (intensive development of the real sector of the economy, support for innovation, infrastructure, education and healthcare, implementation of approved state development programs).

## CONCLUSIONS

The paper provides the analysis of the budget structure of the Altai Territory where revenues and expenses were studied. The state of the regional budget was assessed by means of the quantitative and coefficient analysis and the main problems were identified. The comprehensive assessment proved that the regional budget of the Altai Territory is financially unstable.

The results demonstrated the current state and problems of the regional budget. Monitoring the dynamics of key financial indicators is necessary to solve the problems. A comprehensive increase in the effectiveness, diligence and control over the use of budgetary resources is required, as well as reducing the growth rate of budget expenditures and increasing tax and non-tax revenues. This will increase the volume of own tax revenues, improve the efficiency of budget expenditures, reduce the financial dependence of the regional budget on the federal budget and reduce the debt burden. These measures will help to balance the budget of the Altai Territory and to increase financial sustainability.

The use value of the study lies in developing and applying theoretical and methodological foundations to assess the impact of the budget on financial sustainability. The quantitative and coefficient analysis, based on a rating assessment of the regional budget state, made it possible to conduct a comprehensive assessment of the impact of the regional budget on financial sustainability and to obtain reliable values of the indicators.

The main contribution of this study is in the measures proposed to improve the budget system of the Altai Territory as a single tool to ensure financial sustainability. Subsequent adjustment of the budget policy and state development programs is possible based on the presented findings. The study can be used by the federal and regional authorities for budget stimulation of the financial sustainability of the Altai Territory and other regions of the Russian Federation. The results can be applied for an integrated assessment of the financial sustainability of the Altai Territory economy.

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# Biggest Public Oil Companies: Impact of External and Internal Factors on Capitalization

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## ABSTRACT

Estimate and search for factors that influence the capitalization of public oil companies are of great interest to researchers. The impact of various external and internal factors on the value of oil companies' stocks was considered. This includes changes in oil prices, stock market index movements, inflation fluctuations, financial and production indicators. The study includes building models with calculated standard errors by the Driscoll-Kraay method based on quarterly data for the eight biggest public oil companies operating in the upstream and downstream segments, from the first quarter of 2006 to the third quarter of 2017. Such indicators as total oil production by OPEC countries, greenhouse gas emissions by companies, and the sum of shareholder's funds owned by large institutional investors were used for the first time when building the model to identify factors affecting the market capitalization of oil companies. One of the key results is the conclusion that quarterly production volumes turned out to be the most significant factor having a positive impact on the cost of oil firms. That is, investors are laying the idea of compensating for losses from lowering the cost of oil by increasing its production and selling a larger volume in the value of shares in companies. At the same time, such indicators of production efficiency as profitability in the upstream and downstream segments lose their significance depending on the period under consideration.

***Keywords:*** capitalization; oil industry; mining and processing; stock market; external and internal factors

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## INTRODUCTION

### Oil companies as investment objects

Investment objects are of value to potential beneficiaries in case there are prospects for further increase in their value. To evaluate an asset and its earning power, it is necessary to conduct an integrated analysis of external and internal factors, their impact on the selected object, as well as to forecast future changes and events entailing these changes. Oil companies are not an exception, although there are specifics of the enterprises in this industry to be considered in the analysis. Among other things, an expert's choice of an assessment approach depends on this.

Before we move to the technical details of the study, determining the factors affecting the performance of oil companies, it is worth evaluating the investment attractiveness of this industry in the long term. Macroeconomic analysis of the oil industry and its prospects will answer how practical it is to buy shares of oil companies.

From 1965 to 2015, i.e. over a 50-year period, the rapid growth of the global economy led to an increase in oil demand by 2.8 times: from 1,524 to 4,332 million tons[1]. Important is the growth in

[1] Statistical review of world energy — all data. BP — 2017. URL: https://www.bp.com/en/global/corporate/energy-economics/statistical-review-of-world-energy.html (accessed on 15.08.2018).

aggregate demand of the countries of the Asian region that increased by more than 9 times over the same time period (from 163 to 1506 million tons), while it increased by 2 times for North America (from 620 to 1042 million tons). This fact is due to the rapid development of the economies of the Asian region. This also confirms a significant increase in the share of oil consumption in the region, which increased from 10% of the global level in 1965 to 34.7% by 2015, and in 2017 amounted to 35.7%.

According to the predicted values of global oil demand presented in the reports of world analytical centers, the demand volume indicator will amount to 4916 million tons by 2040 (*Fig. 1*), 13% higher than in 2016.

It is important that, despite the differences in the predicted values of energy demand volumes presented in the analytical reports of various agencies and organizations, they agree that oil will continue to hold a leading position in terms of energy consumption for the coming decades. The analysis of the current and predicted indicators of oil consumption proves the demand for the oil industry development. This implies the further development of the oil business and the ability of oil companies to generate income for their shareholders.

To make the best investment decision, stock market participants are guided by methods for determining the fair value of public companies. Under such an analysis, one should consider as many factors as possible that can influence stock prices and play a role in the value formation and further development of the companies. Current issues of determining capitalization of oil companies are the most relevant due to the high price volatility in the oil market started in 2014.

Stock prices of some large oil companies and the value of futures contracts for the Brent crude oil from 2006 to 2017 (*Fig. 2*) demonstrate that the capitalization of firms follows the dynamics of energy prices, but the observed decline is not as significant as the oil price. From 2013 to 2015, the oil price fell by 60%, however, over the same time, the value of ExxonMobil, Chevron and Royal Dutch Shell shares fell by 23, 28 and 36%, respectively.

Considering the analysis, it can be assumed that large oil companies have a protective mechanism due to which the negative impact of declining oil prices is smoothed out. As a result, the capitalization losses reduce within unfavorable market conditions. By the end of 2017, the stock price of the Chevron oil company equaled the values of 2013 and compensated for the decline that started in 2013, while the oil price failed to recover to its previous maximum.

Diversification of production activities into upstream and downstream segments is a mechanism protecting oil companies' capitalization from decline. *Figures 3* and *4* illustrate a slump in operating profit for the upstream segment of the biggest oil companies Exxon Mobil, Chevron, BP and Total in 2014–2015, when oil prices fell significantly and the downstream segment grew over the same period. The presented graphs show that operating profit in the refining segment is not influenced by changes in the oil market, which supposedly was the reason for stock prices not to decrease proportionate to the oil price downturn.

The development of oil companies depends on the factors requiring a more detailed analysis. This will become the key to more effective forecast models of capitalization of oil companies. The following questions should be answered in this work: what factors determine the dynamics of stock prices? how do large oil companies manage to mitigate the effects of declining oil prices?

## OVERVIEW OF EXISTING STUDIES

Evaluation and search for factors influencing the capitalization of oil companies is of great interest to researchers. Many studies are devoted to the impact of external factors on the capitalization of oil companies, including the impact of changes in oil stock prices [2–6], stock index movement [4], inflation fluctuations and industrial production index [7].

In some works, the behavior of stock prices of oil companies is considered not only based on external factors, but also internal factors, such as financial and production ones, that are included in econometric models [8–10].

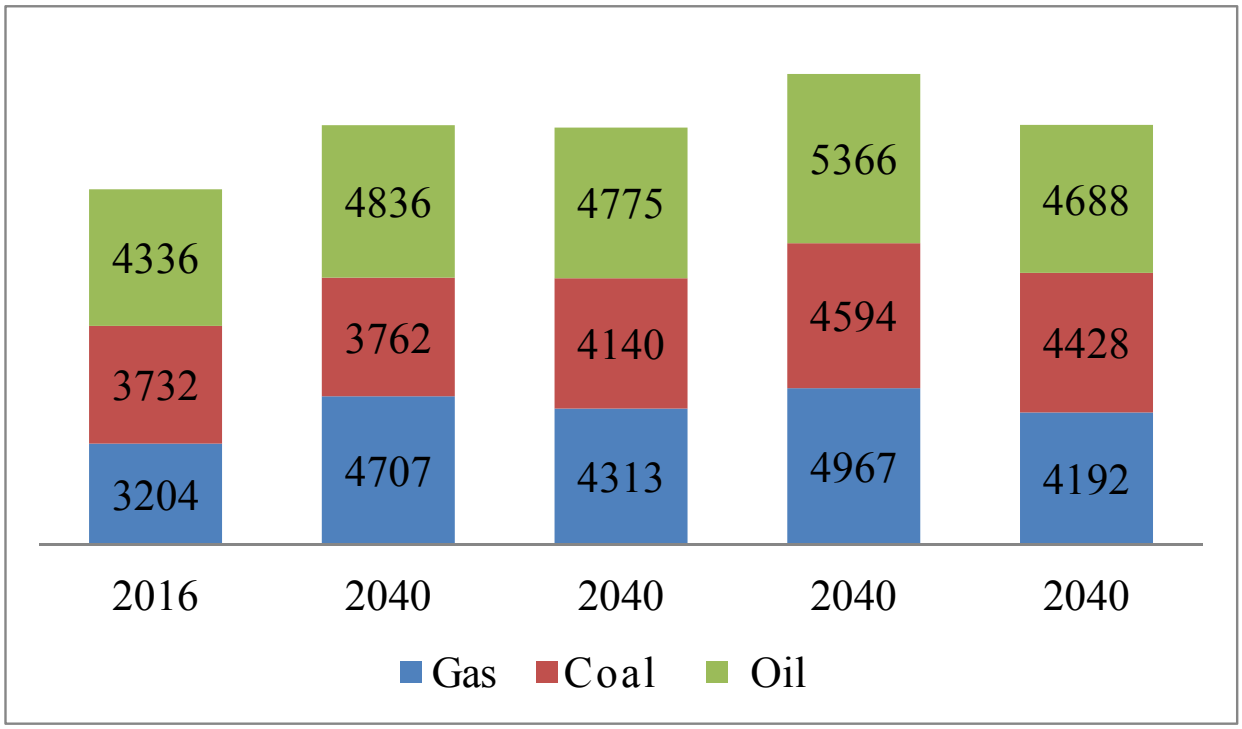


*Fig. 1.* **Predicted values of global demand for fossil fuels by 2040 according to baseline scenarios (million tons of oil equivalent)**

*Source:* compiled by the authors based on data from reports by BP, IEA, OPEC, INEI RAS [1].

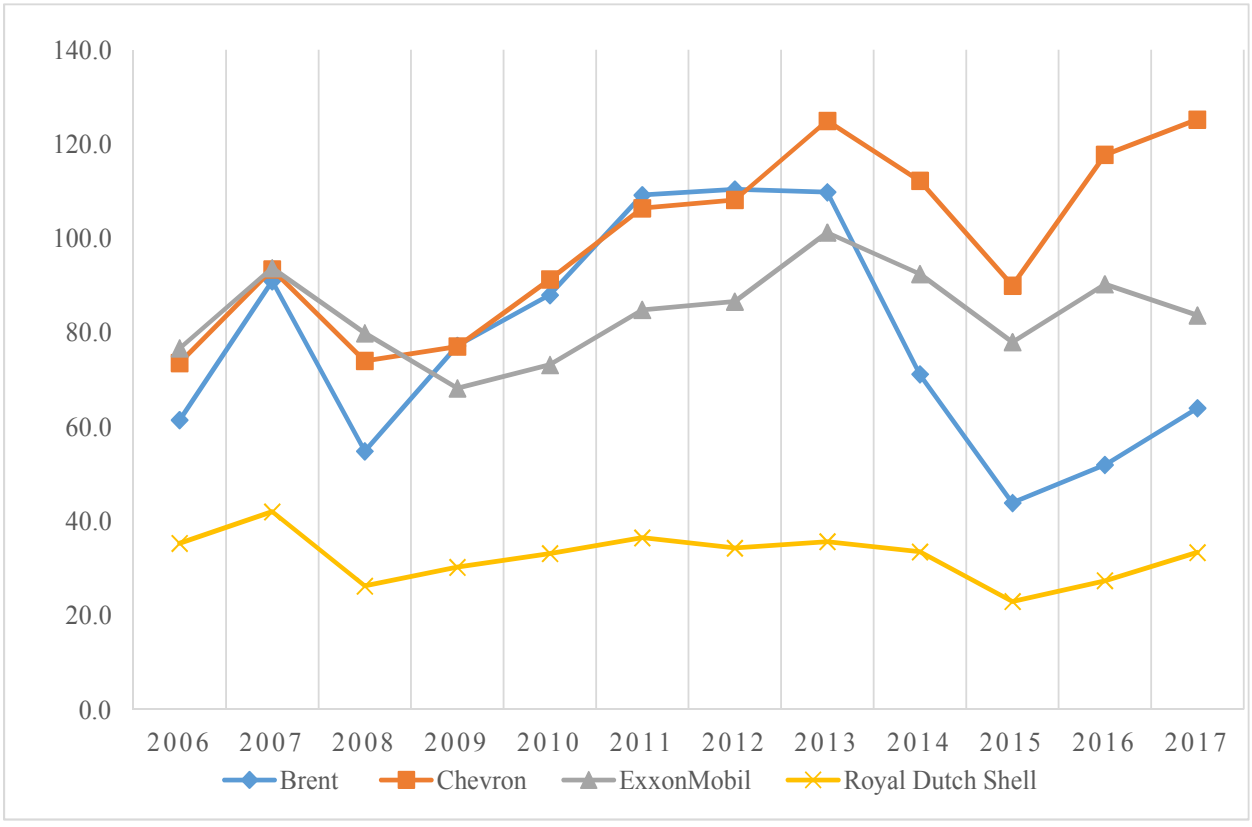


*Fig. 2.* **Share prices of some public oil companies and Brent crude oil from 2006 to 2017 (in US dollars)**

*Source:* compiled by the authors based on on data from the Thomson Reuters Eikon database.

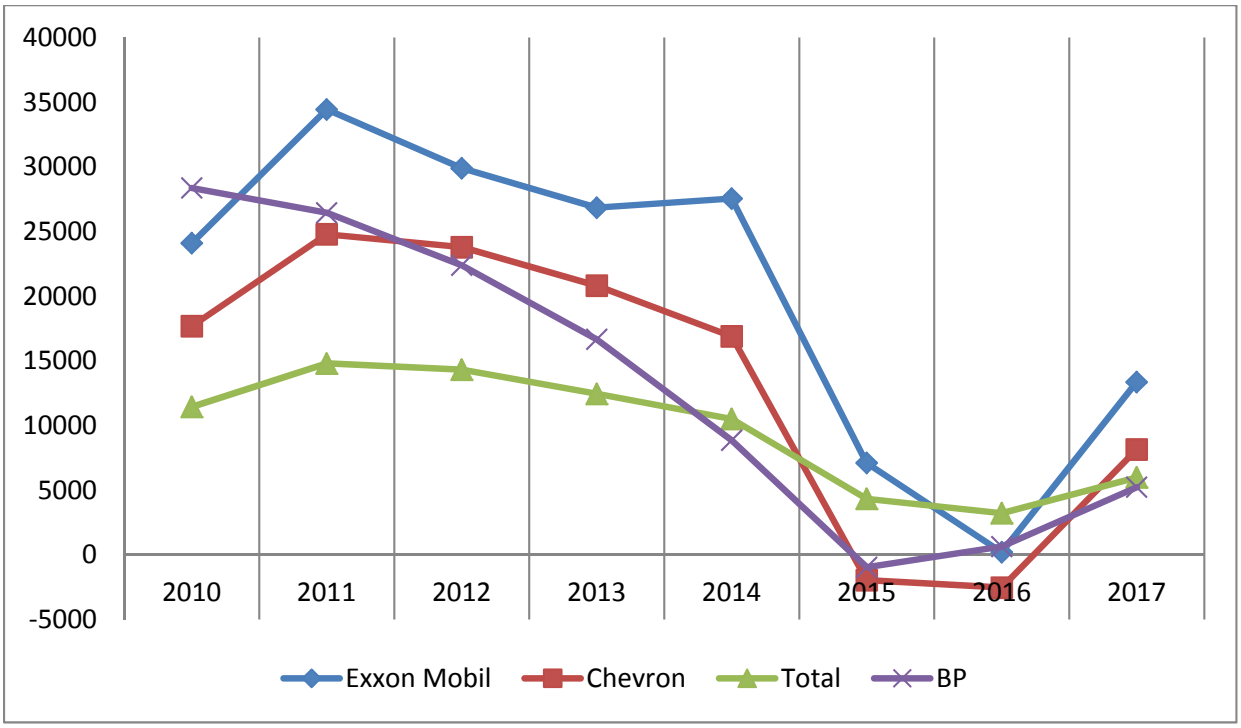


*Fig. 3.* **Operating profit of oil companies in the production segment from 2010 to 2017 (million US dollars)**

*Source:* compiled by the authors according to data from annual reports of companies.

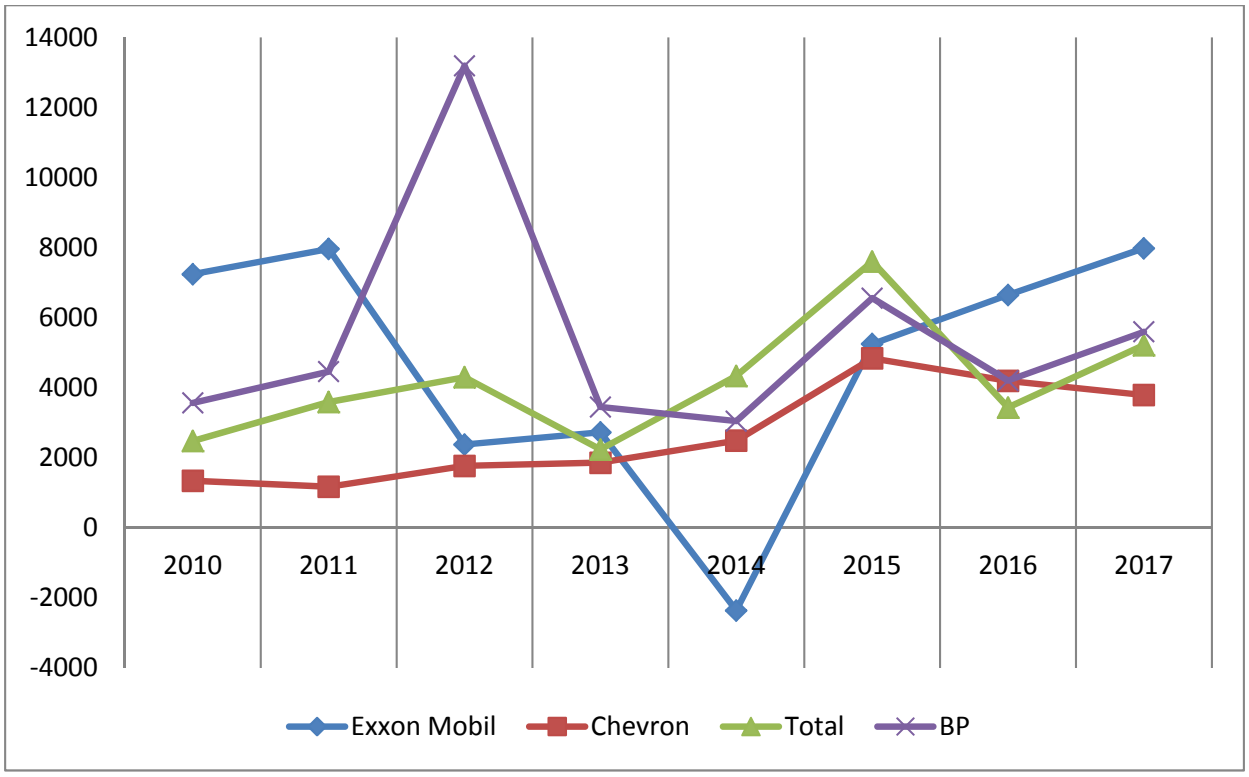


*Fig. 4.* **Operating profit of oil companies in the refining segment from 2010 to 2017 (million US dollars)**

*Source:* compiled by the authors according to data from annual reports of companies.

In [9], the authors use more than ten independent variables characterizing the general financial condition of oil companies; they include the ratio of capital costs to revenue, dividend payout ratio, fixed asset turnover ratio, reserve growth rate, etc. The empirical study provides a sample of annual data for the period 2009–2013 of 82 oil companies. The authors came to the following conclusions [9]:

- the higher the dividends, the higher is the stock prices of oil companies;
- the growth of profitability of companies stimulates the growth of the value of securities;
- the variable capital expenditures turned out to be insignificant.

The study presents a rather short time period using annual rather than quarterly data. From 2009 to 2013, oil prices were in a bull trend, as were the global stock markets, which had a significant impact on the growth in the price of oil companies.

In this study a broader period is considered: from 2006 to 2017. We will use quarterly data allowing to analyze the influence of factors included in the model on the stock prices of oil companies depending on the upward / downward trend of oil prices.

In [2], the authors suggest that in the future, oil companies will have to conduct their production activities according to global requirements to reduce environmental impact within the framework of the climate agenda against global warming. However, this hypothesis is not proved in the work in any way. In [2], the influence of factors on the company value is assessed individually distinguishing this work from many others. This approach showed extremely low values of the $R^2$ indicator (ENI was the highest indicator in the regression, with the value of 0.12) [2] which is not beneficial to the consistency of the results.

As part of study [10], the authors found that regardless of the industry where the resource company belongs to, revenue, fossil price and EBITDA are fundamental value drivers. Like in previous studies, macroeconomic factors are not presented in the work.

In [2], an individual approach to companies is used — 4 companies from different industries, including the energy sector. Such an approach does not give the whole picture of the industry, as the results can be explained by the leadership position and the range of activity of the companies under review (each company's capitalization exceeds 25 billion US dollars).

In [11], the authors also analyze the impact of financial and production indicators on the stock prices of oil companies. To conduct an empirical analysis, the authors collected annual panel data on 14 international companies in the oil and gas sector from 1990 to 2003. According to the results of the study, oil prices and oil production volumes had a significant impact on the value of oil companies.

As part of this study, the influence of both external and internal factors on the capitalization of oil companies will be analyzed. These will include the factors that were not previously explored in the works, such as profitability in production and processing, volumes of energy production by OPEC countries, and the total share of equity owned by the largest institutional investors (top-100 on the list of owners). The studies on the decisions of OPEC countries on production volumes are mainly devoted to identifying the relationship between the production volumes and the oil price; this factor was not used in any of the above works on changing the capitalization of oil companies.

***In this study, we verify the following hypotheses:***

**H1**: diversification of production activity by oil companies reduces the negative impact of declining prices in the oil market; in other words, rising profitability in the production and refining segment has a positive effect on the capitalization of oil companies;

**H2**: increasing debt ratio of companies leads to a decrease in the market value of oil companies;

**H3**: increasing equity profit leads to increasing capitalization of oil companies;

**H4**: increasing the Brent crude oil price has a positive effect on the market value of oil companies;

**H5**: increase in dividend payments per share has a positive effect on capitalization;

**H6**: geopolitical uncertainty and tension, greenhouse gas emissions, oil production by OPEC countries affect the market value of oil companies;

**H7**: increasing share of institutional investors and a company's oil production in the companies' equity have a positive effect on capitalization.

## DATA

To conduct a regression analysis, we collected quarterly data of the eight biggest public oil companies operating in the upstream and downstream sectors based on market capitalization (BP, Chevron, Exxon Mobil, Royal Dutch Shell, Total, Equinor, OMV, Imperial Oil) for the period from the 1st quarter of 2006 to the 3rd quarter of 2017. The selected period is explained by the fact that the data for some factors included in the study had not yet appeared by the time the study was conducted.

To collect the data, the following electronic resources were used: the Thomson Reuters Eikon database, Yahoo! Finance, quarterly reports of the companies (they are presented on the websites of the companies, as well as in the SEC database called the EDGAR System) — to aggregate financial and production indicators for oil companies, and the information on the share of institutional investors; Investing.com — the data on the Brent crude oil price, Jodi Oil — the data on OPEC oil production. Other open Internet sources were also used to collect the data.

*Table 1* shows the endogenous and exogenous variables that will be used to build models for regression analysis.

## RESEARCH METHODOLOGY

As part of the analysis of the existing studies, the following model was developed for econometric analysis:

$$m_{it} = ß_0 + ß_1 external'_{it} + ß_2 KPI'_{it} + v_{it},$$

where $i = 1, 2,\ldots; n$; $t = 1, 2,\ldots T$; $v_{it} = u_i + e_{it}$;

$m_{it}$ — is a dependent variable, which is market capitalization;

$external'_{it}$ — is a vector of variables having an external influence on oil companies which are not able to influence them (includes *OPECoilprod, GRI, WUI, BOWNERS, OILPrice*);

$KPI'_{it}$ — is a vector of variable production and financial indicators of the company (includes *COP, GGEmissions, Debt_ratio, DivYield, ROE, Prof_up, Prof_down*);

$u_{it}$ — is unobserved individual effects, and $e_{it}$ — is residual perturbation [12, p. 5].

To reduce the emission performance in the sample, as well as to adjust all variables for their comparability, we used the logistic data standardization, carried out according to the following algorithm [13]:

$$Factor_{tr} = \frac{1}{1+\exp\left[-Slope\times\left(Factor-Median\right)\right]},$$

where $Factor_{tr}$ — is the transformed value of the factor affecting the capitalization of oil companies and the endogenous variable;

*Slope* — is a transformation coefficient for dependent and independent variables;

*Median* — is a median value.

The transformation coefficient Slope was calculated by the following formula [13]:

$$0.95 = \frac{1}{1+\exp\left[-Slope\times\left(Factor_{95\%}-Median\right)\right]},$$

where $Factor_{95\%}$ — is the value of the 95% percentile of the dependent and independent variables;

*Slope* — is a transformation coefficient for dependent and independent variables;

*Median* — is a median value.

To consider autocorrelation and heteroskedasticity, we will build a model with standard errors calculated by the Driscoll-Kraay method. The model with fixed effects with standard errors by the Driscoll-Kraay method is as follows [14]:

$$\tilde{z}_{it} = z_{it} - \bar{z}_{it} + \bar{\bar{z}},$$

*Table 1*

**Dependent and independent variables for regression analysis**

| Name in the model | Units of measure | Brief description |
|---|---|---|
| **Endogenous variable** | | |
| MarketCap | Million dollars | Capitalization of an oil company. For the companies with the capitalization in national currency, the currency was exchanged to dollars at the average rate for the corresponding quarter* |
| **Exogenous variables** | | |
| OPECoilprod | Thousand tons | The indicator of total oil production by OPEC countries |
| GRI | Point | Geopolitical Risk Index. Developed by Dario Caldara and Matteo Iacoviello. Based on the occurrence of words related to geopolitical tensions in 11 leading international newspapers** |
| WUI | Point | World Uncertainty Index. Developed by H. Ahir, N. Bloom and D. Furceri. Based on the frequency counts of "uncertainty" and its variants in the quarterly Economist Intelligence Unit (EIU) country reports*** |
| GGEmissions | Tons / Million dollars | The company's greenhouse gas emissions accounting for $ 1 million in revenue. The data provided by the companies for this indicator are annual. Therefore, as part of this work, we adhered to the principle that emissions are evenly distributed by quarters within each year |
| Bowners | Shares | The total share of equity owned by the biggest institutional investors (top-100 on the list). This indicator will help conclude how much the biggest stock market the investors are interested in acquiring stocks of a particular company, and identify trends |
| COP | Barrels | Quarterly oil production by the company |
| Debt_ratio | % | Company debt ratio. It is calculated as the ratio of borrowed funds to total assets |
| Prof_up | % | Profitability of sales in the upstream segment, which is calculated as the ratio of profit in the production segment to the revenue in the corresponding segment |
| Prof_down | % | Profitability on sales in the downstream segment, which is calculated as the ratio of profit in the processing segment to the revenue in the corresponding segment |
| DivYield | % | Dividend payout ratio. It is calculated by the following formula: dividends per share / market share price |
| ROE | % | Return on equity. It is equal to net profit to equity ratio |
| OilPrice | Dollars | Brent crude oil price |

*Source:* compiled by the authors.

* We used data on exchange rates.URL: https://ru.investing.com/currencies (accessed on 28.08.2019).

** More details on the calculation are here: http://www.policyuncertainty.com/gpr.html (accessed on 28.08.2019).

*** More details on the calculation are here: http://www.policyuncertainty.com/wui_quarterly.html (accessed on 28.08.2019).

where $z_{it} \in \{y_{it}, x_{it}\}$,

$$\bar{z}_i = T_i^{-1} \sum_{t=t_{i1}}^{T_i} z_{it},$$

$$\bar{\bar{z}} = \left(\sum T_i\right)^{-1} \sum_i \sum_t z_{it}.$$

In this case, the function of the dependent variable is calculated by the pooled OLS (pooled ordinary least squares) model:

$$\tilde{y}_{it} = \tilde{x}_{it}^{'} + \tilde{\varepsilon}_{it},$$

where $i = 1,\ldots, N$; $t = 1,\ldots, T$, while $y_{it}$ — is a scalar, $\boldsymbol{x}_{it}$ — is $(K + 1) \times 1$ vector of independent variables, $\theta$ — is $(K + 1) \times 1$ coefficient vector.

In other words, the data can be noted in the following general form:

$$\mathbf{y} = \left[ y_{1t_{11}} \ldots y_{1T_1}\, y_{2t_{21}} \ldots y_{NT_N} \right]',$$

$$\mathbf{X} = \left[ \mathbf{x}_{1t_{11}} \ldots \mathbf{x}_{1T_1}\, \mathbf{x}_{2t_{21}} \ldots \mathbf{x}_{NT_N} \right]'.$$

Estimated coefficients $\theta$ can be calculated as follows:

$$\hat{\theta} = \left(\mathbf{X}'\mathbf{X}\right)^{-1} \mathbf{X}'\mathbf{y}.$$

The Driscoll-Kraay errors for a linear model can be noted as follows:

$$\mathbf{h}_{it}\left(\hat{\theta}\right) = \mathbf{x}_{it}\hat{\varepsilon}_{it} = \mathbf{x}_{it}\left(y_{it} - \mathbf{x}_{it}^{'}\hat{\theta}\right).$$

A detailed description of standard errors calculated by the Driscoll-Kraay method for the pooled OLS model is given in work [14].

Driscoll and Kraay showed that a modified standard nonparametric estimation of the covariance matrix of time series can remain effective, despite spatial and temporal dependence of the data [14, 15].

## DATA ANALYSIS AND MODEL BUILDING

A balanced sample was made according to the collected data. We compile descriptive statistics for the data under review (*Table 2*).

Based on the data presented in *Table 2*, we can conclude the following:

1) the sample contains big and medium-sized companies; the maximum value for MarketCap presented in the data is $ 505 billion, while the minimum is $ 7.3 billion;

2) Debt_ratio (debt ratio) is 0.56 on average over the sample. This means that on average slightly more than half of the companies' assets (56% of assets) are formed by borrowing. This amount of borrowed funds is explained by long-term investment projects typical for the oil industry;

3) the average value for the Prof_down factor is almost two times less than for the Prof_up indicator, the standard deviation for Prof_up is 0.23, while for Prof_down it is 0.034. This suggests that the profitability in the production sector has more volatility and a wider range of values than for the processing sector, which includes greater risks in conducting business exclusively in this segment. As expected, the average profitability in upstream is higher, therefore, the risk is justified by higher profits in the sector.

The transformations carried out within the data normalization reduced the asymmetry and kurtosis coefficients (*Table 3*), although they could not completely level them.

As part of an econometric study, the data obtained during the logistic normalization will be used. In order to identify the relationships between the variables, a correlation matrix was built (*Table 4*). Since the data distributions differ from the normal one, the Spearman's rank correlation criterion was used. Based on the data obtained, the conclusions are following:

1) there is a correlation with variables WUI, BOWNERS, COP, Debt_ratio, Prof_down, ROE *и* OILPrice significant at a 10% significance level between the dependent variables;

2) according to the Chaddock scale, there is a high positive relationship between the market capitalization of oil companies and the volume of quarterly oil production (correlation coefficient = 0.82 <0.9);

3) there is a high negative relationship between the market capitalization of oil com-

*Table 2*

**Descriptive statistics of dependent and independent variables by companies involved in mining and processing**

| Variable | Obs | Mean | Std. Dev. | Min | Max |
|---|---|---|---|---|---|
| MarketCap | 384 | 154 235.4 | 109 742 | 7333.205 | 505 713.2 |
| OPECoilprod | 384 | 359 103.3 | 19 157.56 | 330 504.5 | 401 850 |
| GRI | 384 | 86.09145 | 31.53744 | 42.58954 | 189.9569 |
| WUI | 384 | 140.9283 | 40.05575 | 86.76926 | 250.476 |
| GGEmissions | 384 | 103.58 | 77.14108 | 37.585 | 633.5 |
| BOWNERS | 384 | .3120043 | .1182262 | .067782 | .645275 |
| COP | 384 | 1.35e + 08 | 7.05e + 07 | 1.22e + 07 | 6.52e + 08 |
| Debt_ratio | 384 | .5659287 | .0682635 | .4074319 | .6647185 |
| Prof_up | 384 | .3269277 | .2394137 | –.7810881 | .6838232 |
| Prof_down | 384 | .0180773 | .0343744 | –.3161234 | .1550507 |
| DivYield | 384 | .0115384 | .010989 | 0 | .0646358 |
| ROE | 384 | .0334323 | .0354467 | –.181 | .142 |
| OILPrice | 384 | 80.81451 | 25.38886 | 36.77 | 126.3233 |

*Source:* compiled by the authors.

panies and the debt ratio (correlation coefficient = – 0.73);

4) high relationships between independent variables are not observed, since the correlation coefficients for independent variables do not exceed 0.6. Therefore, it can be assumed that multicollinearity is absent.

The signs at the correlation coefficients presented in *Table 4* correspond to the economic logic and hypotheses stated earlier. It is interesting that the growth of oil production by OPEC countries, geopolitical tensions and global uncertainty, greenhouse gas emissions and the debt ratio of companies negatively affect the capitalization of oil companies; other factors have positive signs at the coefficients. Another thing is that the relationship between the dependent variable and the oil price is weak (correlation coefficient = 0.09). Moreover, the correlation coefficient is significant at a 10% level, which again doubts the opinion that the oil price plays one of the most important roles in shaping the value of oil companies.

To verify the presence of autocorrelation and heteroskedasticity, we will carry out the corresponding tests. The results are presented in *Table 5*.

The Pesaran test showed the intergroup correlation; the null hypothesis of its absence was not confirmed [16, 17]. Presented in *Table 5,* the Wooldridge test results indicate serial correlation [18]. The modified Wald test showed the intergroup heteroskedasticity in the model under review [19].

In this work, we use a panel data model with fixed effects with errors calculated by the Driscoll-Kraay method. *Table 6* presents the simulation results. Within the study, we built (1) a general model, (2) a model that includes only external factors, (3) a model that includes only internal factors, as well as models using data before 2014 and after 2014 (4) and (5).

## RESULTS

As can be seen from *Table 6*, the coefficient of the variable OPECoilprod has a positive sign in mod-

*Table 3*

**Indicators of asymmetry and excess kurtosis of dependent and independent variables before and after logistic transformation**

| № | Variable | Before normalization | | After normalization | |
|---|---|---|---|---|---|
| | | Skew | Kurt | Skew | Kurt |
| 1 | MarketCap | .96 | 3.51 | .36 | 2.12 |
| 2 | OPECoilprod | .22 | 2.01 | –.059 | 1.36 |
| 3 | GRI | 1.30 | 4.42 | .55 | 2.22 |
| 4 | WUI | .79 | 3.13 | .22 | 1.63 |
| 5 | GGEmissions | 3.91 | 24.76 | .8 | 2.67 |
| 6 | BOWNERS | –.078 | 2.27 | .002 | 1.42 |
| 7 | COP | .87 | 9.8 | –.008 | 1.51 |
| 8 | Debt_ratio | –.67 | 2.51 | –.053 | 1.42 |
| 9 | Prof_up | –1.44 | 5.84 | –.009 | 1.3 |
| 10 | Prof_down | –2.74 | 29.27 | –.079 | 2.35 |
| 11 | DivYield | 1.78 | 7.3 | .43 | 2.50 |
| 12 | ROE | –.81 | 7.1 | .024 | 1.78 |
| 13 | OILPrice | .12 | 1.6 | .057 | 1.37 |

*Source:* compiled by the authors.

els (1), (2) and (4). In other words, an increase in oil production by OPEC countries leads to an increase in the capitalization of oil companies in the production and refining segments. It is important that the sign at the coefficient differs in models (4) and (5). It can be assumed that until 2014, the supply of energy resources grew according to the global economy development as a whole, which had a positive effect on the value of oil companies. However, after 2014, the supply of oil exceeded the current level of consumption, the sign at the variable OPECoilprod changed to the opposite.

The GRI and WUI variables turned out to be significant in the general model, while the coefficient at the geopolitical tension index has a positive sign in models (1), (2), (4) and (5). At the same time, the world uncertainty index is negative, although in model (5) the sign has reversed. The results can be interpreted as follows: geopolitical tensions in the world, including terrorist attacks, wars, sanctions, have a positive effect on the capitalization growth of oil companies, also because oil exporting countries were at the centre of operations. The world uncertainty index is more concerned with the economic component; therefore, the lack of an accurate global economic policy negatively affects the value of companies.

The GGEmissions variable has a positive sign at the coefficient in all models. In model (5), the factor turned out to be insignificant at any reasonable level of significance. These results indicate that while companies have not faced serious restrictions on emissions from the states, therefore, the increase in greenhouse gas emissions associated with an increase in production positively affects the capitalization of companies.

The sign at BOWNERS is positive in models (1), (2) and (4), i.e. an increase in the total share of equity owned by the 100 biggest institutional

*Table 4*

**Correlation matrix (Spearman's correlation coefficients)**

| | MarketCap | OPECoilprod | GRI | WUI | GGEmissions | BOWNERS | COP | Debt_ratio | Prof_up | Prof_down | DivYield | ROE |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| MarketCap | 1.0000 | | | | | | | | | | | |
| OPECoilprod | −0.0015 | 1.0000 | | | | | | | | | | |
| GRI | −0.0063 | 0.3980* | 1.0000 | | | | | | | | | |
| WUI | −0.0920* | 0.5270* | 0.3413* | 1.0000 | | | | | | | | |
| GGEmissions | −0.3499* | 0.0014 | 0.2201* | 0.0406 | 1.0000 | | | | | | | |
| BOWNERS | 0.3940* | 0.1222* | 0.1302* | 0.1388* | −0.2584* | 1.0000 | | | | | | |
| COP | 0.8196* | −0.0197 | 0.0035 | −0.0527 | −0.3207* | 0.4507* | 1.0000 | | | | | |
| Debt_ratio | −0.7389* | −0.0492 | −0.0301 | −0.0783 | 0.1631* | −0.4347* | −0.5230* | 1.0000 | | | | |
| Prof_up | 0.0329 | −0.3145* | −0.4474* | −0.4543* | 0.0495 | −0.2465* | −0.0531 | 0.0532 | 1.0000 | | | |
| Prof_down | 0.0846* | 0.1462* | 0.2964* | 0.2386* | 0.2096* | 0.1708* | 0.1722* | −0.0801 | −0.2675* | 1.0000 | | |
| DivYield | 0.0048 | 0.1095* | 0.0840 | 0.1925* | −0.2357* | −0.0209 | 0.1018* | −0.0242 | −0.3410* | −0.0405 | 1.0000 | |
| ROE | 0.3508* | −0.2681* | −0.3258* | −0.5209* | −0.2211* | −0.0241 | 0.2619* | −0.1215* | 0.5535* | −0.0116 | −0.3209* | 1.0000 |
| OILPrice | 0.0986* | −0.0825 | −0.4869* | −0.1566* | −0.4095* | −0.1380* | −0.0551 | −0.0442 | 0.5329* | −0.3644* | −0.1673* | 0.4545* |

* — dependence ⩽ 0,1

*Source:* compiled by the authors.

*Table 5*

**Test results on the presence of serial correlation and heteroskedasticity**

| Pesaran test | | Pesaran test | | Wald test (modified) | |
|---|---|---|---|---|---|
| CD | Pr | F | Prob>F | chi2 | Prob>chi2 |
| 4.7 | 0.0000 | 18.87 | 0.0034 | 463.34 | 0.0000 |

*Source:* compiled by the authors.

*Table 6*

**Results of building regression models considering the Discroll-Kraay standard errors**

| | 1 | 2 | 3 | 4**** | 5**** |
|---|---|---|---|---|---|
| OPECoilprod | .031* | .032 | | .51** | −.036* |
| GRI | .084*** | .073*** | | .86*** | .056 |
| WUI | −.05* | −.11** | | −.001 | .059* |
| GGEmissions | .08*** | | .042* | .025*** | .022 |
| BOWNERS | .056* | .05* | | .11** | −.062* |
| COP | .066* | | .059* | .089** | .16*** |
| Debt_ratio | .023 | | −.003 | .038 | −.022 |
| Prof_up | .038* | | .039* | .046* | −.023* |
| Prof_down | −.022* | | −.023* | −.002 | −.061*** |
| DivYield | −.019* | | −.024* | .001 | −.104*** |
| ROE | .051** | | .059* | .069** | .017 |
| OILPrice | .06*** | .07*** | | .051** | .147** |
| _cons | .317*** | .457*** | .453*** | .130* | .460*** |
| N | 384 | 384 | 384 | 288 | 96 |
| R 2 | 0.28 | 0.19 | 0.18 | 0.33 | 0.44 |
| Prob>F | 0.0002 | 0.0019 | 0.0013 | 0.0000 | 0.0000 |

*Source:* compiled by the authors.

* — significant at 15% level; ** — significant at 5% level;

*** — significant at 1% level; **** — models 4 and 5 are constructed according to the data until 2014 and after 2014, respectively.

investors had a positive effect on the company's capitalization. In model (5), the sign at the factor turned out to be negative.

The Debt_ratio factor turned out to be insignificant in each of the constructed models. The coefficient on sales profitability in the upstream segment has a positive sign in all models, except model (5), while the profitability of sales in the downstream segment is negative. Both factors were significant. Within the framework of the general model, the results can be interpreted as follows: at a high oil price, it is more profitable to sell crude oil, rather than refine it. As for the negative signs at the coefficients in model (5), it can be assumed that the investors were skeptical about the shares of oil companies after 2014 and paid attention to the absolute indicators of revenue and profit, which were decreasing.

It is important that the coefficient for the DivYield variable turned out to be negative in all considered models, except model (4), where the factor turned out to be insignificant, i.e. the investors did not pay attention to the dividend payout ratio until 2014. According to the results obtained, after 2014, the investors became negative to the attempts of the companies to keep them at the expense of dividend income growth. The same conclusion is true for the general model.

The coefficients for the variables ROE and OilPrice turned out to be positive in each model. In other words, an increase in the coefficient of return on equity and the oil price lead to an increase in the capitalization of oil companies.

## CONCLUSIONS

The econometric study revealed the influence of all factors included in the model on the capitalization of oil companies, except the debt ratio. The following results were received as a result of the hypotheses testing.

Diversification of production activity by oil companies reduces the negative impact of declining oil prices. The upstream segment profitability has a positive impact on the change in the capitalization of energy companies. However, in the case of the long-term decline in oil prices observed after 2014, this factor was not ultimate in the investors' decisions. The sign at the coefficient turned out to be negative, which does not have an economic and logical interpretation, except that the investors are not much oriented towards the internal financial performance of oil companies in the event of external shocks in the oil market that to some extent may be due to irrational behavior.

The debt ratio of oil companies was insignificant in none of the models, which can be explained by the significant debt burden on each of the companies included in the sample due to the specifics of their production activity; this reduces the attractiveness of this indicator for an investment decision. In other words, the investors do not pay attention to the debt ratio, as they are sure that the biggest oil companies will cope with their obligations.

Return on equity ratio has been significant. It has a positive effect on the value of shares of oil companies. In the model with data after 2014, it stopped being significant that proves the assumption about the irrationality of the investors outlined earlier.

The increase in the Brent crude oil price has a positive effect on the market value of oil companies. In the case of building a model according to data after 2014, the price of oil remained one of the few factors leading to an increase in the capitalization of oil companies.

An unexpected result was the sign at the dividend payout ratio, which turned out to be negative. In other words, investors have a negative attitude towards increasing dividend payments, which may be explained by the desire of investors to acquire shares in companies that have growth prospects. An increase in the dividend payout ratio indicates that the best option for free cash is to distribute it among shareholders, rather than investing in promising projects. Besides, the growth of this indicator against the significant debt burden can also be perceived negatively.

The indices of geopolitical tension and uncertainty, greenhouse gas emissions, the level of oil production by OPEC countries were significant in the built models. The coefficient for the greenhouse gas emission factor turned out to be

positive, i.e. investors have not yet set negative expectations regarding changes in the capitalization of oil companies in the context of their environmental impact.

According to the study results, it was found that an increase in the share of institutional investors and the volume of oil production by the company in its equity have a positive effect on the shares of oil companies in the framework of the general model. Supposedly, institutional investors influence the market by their decisions; their increasing share in oil companies leads to an increase in capitalization. Such a mechanism is successfully implemented with a bull trend in the market, including the energy market, whereas with a bear trend it stopped working (the sign changed to negative with the BOWNERS factor). Despite the increase in the share of oil companies by the 100 biggest players, the institutional investors who buy shares, their market influence is not so great as to deploy shares during general decline.

The results obtained help conclude that quarterly production volumes are the most significant factor that has a positive impact on the value of oil companies. Investors may lay the idea of compensating for losses by lowering the oil price by increasing its production and selling a larger amount of oil in the price of shares of companies.

It is important to note the following: the oil price has a greater impact on the value of oil companies during the decline than during the growth period [the coefficient for the OILPrice variable is almost the highest in model (5), and it is about 3 times higher than the value for the same variable in model (4)]. This conclusion is opposite to the results of study [4] showing the opposite asymmetric effect of changes in oil prices and the value of stocks of companies: price increase had a greater impact than decrease. The result obtained in [4] can be explained by the prevailing bull trend both in the stock market and in the energy market in the period under review. The authors used the data on stock prices of 30 oil companies and oil prices from January 2, 2004 to December 31, 2015.

The same is true for the opposite result obtained for dividend payout ratios. In [9], the authors conclude that it has a positive effect on the value of stock prices of oil companies. They considered the annual data for 82 oil companies from 2009 to 2013, when the market had a pronounced uptrend after the 2008 crisis.

To continue the study on the valuation of companies, including those of the oil industry, it is useful to analyze the influence of the considered factors not only on the capitalization of oil companies operating both in upstream and downstream segments, but also the ones engaged in production in only one of them. This will allow specialize and clarify the findings from the segmentation of companies.

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# Theoretical and Methodological Foundations of Designing a Balance Model for Reproducing Investment Potential of Institutional Sectors in the Regional System

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## ABSTRACT

Reproducing investment potential of institutional sectors of the economy of any territorial system becomes a challenging issue in the light of recent trends: lack of financial resources for modernization and development of the real sector of economy, failure to successful implementing the planned strategic programs for economic development of territorial systems at macroeconomic, regional and municipal levels. A systematic approach to the formation and reproduction of these resources is required. In this regard, the main purpose of the work was to develop methodological foundations of designing a balance model for reproducing the investment potential of institutional sectors in the regional system. The analysis of the advantages and disadvantages of the existing approaches showed that a systematic representation of the reproduction processes of the investment potential of institutional sectors in the territorial systems requires a detailed mapping of the movement processes of financial resources between the sectors, as well as spatial features of the movement of their investment resources between the regional systems. Proposed in the work, the theoretical and methodological approach uses the basic principles of the system of national accounts: "double entry", according to which one sector initiates the movement of financial flows, and the other accepts them; financial account structure of institutional sectors. Moran's spatial autocorrelation and autoregression method was also applied. Thus, it provides to assess the investment resource endowment of the sectors and their sufficiency to solve the most important development problems, to determine the main uses of these resources by institutional sectors, and the riskiness of their investment activities. Such an approach provides an opportunity for state authorities and a financial regulator to assess the system of investment interconnections between institutional sectors that has developed in the regions, the problems and threats of financial development of these sectors, and to find reserves to solve them.

***Keywords:*** investment potential; balance model of reproduction; institutional sectors; interregional interconnections; spatial autocorrelation

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## INTRODUCTION

### Relevance of the study

Investment resources play a key role in the development of the economy in any territorial system. They establish the baseline not only for the real productive sector of the economy, but also for the general government sector and provide it with the necessary resources for the most important strategic programs for the socio-economic development of territories. They play a key role in developing the household sector and provide its representatives with the required material benefits and opportunities for self-realization in society. Reproducing the investment potential of the institutional sectors of the economy of any territorial system becomes an urgent problem in view of recent trends. Among them are: lack of financial resources for upgrading and developing the real sector of economy, active capital outflow from domestic economy and ongoing speculative financial policies, increasing budget deficits in public administration and failure to successful implementation of the planned strategic programs for economic development of territorial systems at macroeconomic, regional and municipal levels.

Investment resources develop financial foundations for the institutional sectors of economy in the territorial system and, therefore, form the potential for its progressive socio-economic development. Given the economic and financial coherence of the institutional sectors, the relevance of the system theoretical and methodological approaches to reproduction processes of their investment potentials is growing. First, this will help identify negative trends in financial flows circulating between the sectors of financial, non-financial corporations, government, households and foreign institutions that lead to the degradation of their investment potential. Second, this will allow establishing the interregional flow features of investment resources in these institutional sectors. Third, a systematic approach will reveal the influence of internal and external factors on the reproduction processes of the investment potential of the sectors.

Thus, it is possible to determine the best way to regulate emerging negative trends in circulating and reproducing investment resources of institutional sectors for progressive socio-economic development of the territories. This paper is devoted to developing a theoretical and methodological approach to the reproduction processes of the investment potential of institutional sectors.

## TOPIC RESEARCH REVIEW

**The design method of equilibrium, balance models for developing socio-economic systems** is the closest to the systematic approach of the study. The method uses the methodology to construct an intersectoral balance model, a system of national accounts or matrices of financial flows. This updated approach can most accurately reflect the financial flows between the sectors: financial corporations including banks, credit institutions, insurance organizations, pension funds and investment companies; non-financial corporations based on manufacturing enterprises of various industries, including trade and services. It also helps analyze the financial relationships between the public administration sector and households and identify key factors threatening the development of investment potential and the financial stability of the territorial system as a whole.

In 1923, a team of authors led by P. I. Popov were trying to balance the national economy of the USSR for 1923–1924 [1]. It was for the first time when they tried to build balance models reproducing the investment potential of interconnected institutional sectors, reflecting the features of financial flows between the sectors and revealing the threat of losing the existing investment potential of the socio-economic development of the sectors in the territorial system. The authors analyzed production and distribution of national products between agricultural, industrial, transport and construction enterprises for industrial and non-productive purposes (to meet the needs of the population), collective consumption (maintenance of state

and municipal institutions), export of goods to other countries and stocks. They built a balance model for the development of the economic regions of the USSR that reflected the links between private and state enterprises of various sectors of the national economy. The sectors can be attributed to non-financial corporations, state and municipal institutions (the state administration sector), population (the household sector) and world economy (the rest of the world sector).

The generated balance models did not directly relate the studied business entities to one or another institutional sector before the methodology of the system of national accounts.

Developed under the direction of P.I. Popov, the model made it possible to assess the supply of institutional sectors with goods of various industries in physical and monetary terms, but did not reveal the reproduction features of the investment potential of the financial corporations that included banks and other credit institutions, insurance organizations and other financial institutions. Credit resources of the banking sector were considered while compiling production tables for goods for each industry; however, the resources of financial corporations were not considered as a separate sector. Besides, the model does not reflect the relationship between economic regions in the field of production and consumption of goods or financial flows between the territorial systems. The first balance model of the national economy is also known by double calculation of gross product since individual industries penetrated into each other while exchanging goods [2].

The methodology of reproduction processes in the development of the investment potential of institutional sectors was further developing towards consolidated financial balances of production, distribution, redistribution and end use of the social product and national income, as well as **intersectoral balances**.

The intersectoral balance ("input-output") model developed by V.V. Leontief characterized the processes of formation and use of the aggregate social product by industry. Besides, it revealed the cost structure of its production and the distribution structure by industry; by linear economic and mathematical equations it reflected the intersectoral production relationships between institutional sectors in the country's economy and, moreover, made it possible to predict their change. Using this model, one can assess the investment potential of various sectors of the economy in territorial systems of various levels; unfortunately, it is impossible to analyze financial flows between institutional sectors — this is important when studying the problems of reproduction of their investment potential. Unlike other balance approaches to economic structure, the input-output method by V.V. Leontief helps reflect the relationship between individual territorial systems by means of regression analysis, especially the flows of goods and financial resources between them.

Until the 1960-s, balance models of the national economy did not disclose the features of financial flows between different sectors; they only reflected the processes of production and consumption of products and goods by various sectors of the economy, circulation of labor resources, balance of cash income and expenditure of the population. At the same time, territorial relationships were reflected in the balance sheets only between urban and rural settlements. Built in 1959 by M.R. Eidel'man [3], the intersectoral balance reflected the reproduction processes of the aggregate social product in 83 sectors of the national economy in physical and monetary terms. This made it possible to assess the flow features of the social product in monetary terms between non-financial corporations (material production sectors, forestry enterprises, housing and communal services, transport, communications, healthcare, culture, education, science), households (population), the government sector (state enterprises), and the sector of the rest of the world (especially import and export of goods). The balance sheet revealed the specifics of the

material and technical supply of industries, accumulation of production and non-production fixed and circulating assets, and increase in stocks and reserves of the aggregate social product, which made it possible to simplify the reproduction processes of the national economy and investment flows between the sectors. Unlike the previous ones, this balance revealed the development features of a larger number of sectors of the national economy and reflected a wide range of manufactured goods. For the first time selective statistical research methods were used for each product type while creating the balance of certain costs, raw materials, fuel and electricity (primary reporting of 20% of enterprises was processed). This had a negative affect on the accuracy of the balance of the national economy. Besides, the balance did not characterize the features of territorial interconnections in the reproduction processes of the social product and investment flows. Like previous balances of the national economy, Eidel'man's approach did not affect the features of social product developed by financial corporations.

The financial corporations sector, as well as other institutional sectors, was proposed by **the methodology of the system of national accounts (SNA)**, adopted in 1991 by statistical authorities to characterize ongoing economic processes and their results at the macroeconomic level. This methodology made it possible to present not only a balanced system of interconnections between sectors of financial, non-financial corporations, government, households, foreign institutions, but also detailed information about the resources of these sectors and their use, to reflect the processes of reproduction of their investment potential. The methodology eliminated double calculation that was characteristic of earlier balance models due to the use of the "double entry" principle. According to this principle, each operation is reflected in the accounts, on the one hand, as a resource, and on the other hand, as the use of this resource. The advantage of the SNA methodology was separating the financial institutions sector in the system of institutional sectors. This sector includes sub-sectors such as the Central Bank, deposit money corporations (commercial, clearing, mortgage, savings banks), financial intermediaries (investment funds), financial auxiliary corporations (stock exchanges, broker organizations operating in the stock market, as well as lottery organizations), insurance institutions and non-state pension funds [4]. Studying the methodological features of the SNA financial account showed that this methodology does not reflect the features of the resources circulating between sectors in derivative financial instruments (futures, options, factoring, forfaiting transactions), or considers payments of financial institutions to suppliers, contractors and buyers on business transactions, financial leasing issues, investments in tangible and intangible assets, or discloses interregional interconnections of institutional sectors. Because many manufacturing and financial institutions are legally registered in the central regions, the SNA regional tables developed by scientists do not fairly represent the interconnections between institutional sectors. Publishing SNA statistics with a large time lag also complicates the study, modeling and forecasting of the reproduction processes of the investment potential of institutional sectors.

Social Accounting Matrix (SAM) is a modern theoretical concept using the principles of the intersectoral balance methodology in the study of financial flows between institutional sectors and the reproduction of their investment potential. The foundations for using matrices of social accounts in the study of the reproductive process features of financial resources in institutional sectors were laid in the works by R. Stone [5], G. Pyatt and J. Round [6], E. Thorbecke, J. Defourny [7] and H. Khan [8], A.R. Belousov and E.A. Abramova [9], N.N. Mikheeva [10], Z.B.-D. Dondokov [11], S. Yu. Ermakova [12], N.G. Zakharchenko [13, 14].

The matrix developed as a result of using this methodology is a unique economic model. It is used to study economic activity on a national and regional scale based on in-

terconnected balances reflecting the flows of products and their financial equivalents between economic agents (institutional sectors) during various economic transactions. Unlike the standard intersectoral balance model, this methodology considers transfer payments between institutional sectors, as well as the distribution of factor payments within each sector. The main advantage of this methodology is the ability to study regional features in financial flows circulating between sectors and reproducing their investment resources, to assess the financial stability of the studied territories, and to optimize the management of financial flows in the region.

The main disadvantage of this methodology is that it does not allow to study interregional relations and the direction of financial flows, the investment potential diversion of sectors. This makes it difficult to use the methodology for building matrices of social accounts in the study of the reproduction processes of the investment potential of institutional sectors in the territorial system. The study of interregional relations in financial flows between institutional sectors is of primary importance when analyzing the reproduction processes of their investment potential. Transferring investment resources of a particular sector to another territorial system leads not only to a reduction in the investment potential of the sector of this territory, but also in the opportunities for the progressive economic development of this territorial system. On the other hand, such investment flows provides additional sources for developing the institutional sectors of the territory where they are moved to.

The study of interregional interconnections in financial flows will reveal the additional investment opportunities for the progressive economic development of financial and non-financial corporations, households, and government institutions that are created in territorial systems as a result of such flows. Therefore, when creating the theoretical and methodological approach to the balance model design for the reproduction of investment potential, special attention will be paid to the study and modeling of interregional relationships.

## METHODOLOGY OF DESIGNING A BALANCE REPRODUCTION MODEL OF INVESTMENT POTENTIAL OF INSTITUTIONAL SECTORS

Designing a reproduction model of the investment potential of institutional sectors in the regional system involves a detailed study of financial flows between the sectors of financial and non-financial corporations, public administration institutions, household sector and foreign institutions, trends in the formation and use of these investment resources by the sectors, and studying internal and external factors environments that influence these processes. For the most accurate and comprehensive study of financial flows between institutional sectors reflecting the features of the formation and use of their investment potential, we propose a matrix approach whose methodological principles were briefly presented in our earlier works [15–17].

This approach based on the systematization of the primary data in the turnover balance sheet of credit institutions registered in the region, together with the accounts (on form No. 101) and the distribution of their financial transaction results by the assets and liabilities of institutional sectors using the basic principles of the SNA methodology (the principle of double entry, the structure of the institutional sectors of the national economy, the structure of their financial account) build a matrix of financial flows reflecting the features of the reproduction model of the investment potential of institutional sectors in the region. Let's take a closer look at these features.

The initial stage in designing a reproduction model of the investment potential of institutional sectors is the collection and systematization of accounting data of banks and other credit institutions registered in the region. Using this information as a basis for studying the reproduction processes of the investment potential is due to the fact that almost all op-

erations of non-financial corporations, enterprises of the public sector of the economy, households, insurance organizations, pension funds and investment companies are conducted through banks and credit institutions and are displayed in their turnover balance sheet on form No. 101. At this stage, data on the financial transactions of credit institutions are being systematized during the year, so that it is possible to analyze the dynamics of the reproduction processes of the investment potential of institutional sectors. The data on financial flows presented in this statement are already divided by assets and liabilities of the balance-sheet. Therefore, the main task at the next stage is to group them by financial instruments according to the structure of the SNA financial account. Namely on: investments in monetary gold; foreign currency; debt securities; stocks; derivative financial instruments; fixed assets and other tangible assets; transactions related to the placement of funds on deposits, loans and borrowings; payment of taxes and fees; payroll payments; payment of receivables and payables and settlements with suppliers and contractors.

The third stage suggests designing a matrix of financial flows by distributing credit institution transactions grouped by financial instruments between the institutional sectors according to the characteristics of balance accounts reflected in the regulation of the Central Bank of the Russian Federation dated 16.07.2012 No. 385P on accounting rules in credit organizations on the territory of the Russian Federation. When distributing the financial transactions of credit institutions between the sectors of financial and non-financial corporations, government, households and the rest of the world, we propose using the SNA basic principle, the principle of "double entry", according to which one institutional sector initiates financial flows and the other sector accepts them (*Fig. 1*). For example, in the emerging matrix of financial flows, transactions on banking institutions lending to institutional sectors should be displayed in the assets with a minus sign for the sector of credit institutions and a plus sign for the sector that receives borrowed funds. When the loans are returned, it is displayed in this matrix with the opposite signs. The corresponding liabilities reflect the formation of the investment potential of the financial corporations sector and its use by other institutional sectors.

The assets of a matrix of financial flows, on the contrary, reveals the features of the formation of the investment potential by the sectors of non-financial corporations, government, households, the rest of the world and its use by the financial corporations sector. As a result of this mapping of financial flows for all financial instruments, financial flows between these sectors are balanced in the matrix, and not the non-institutional sectors on their own, i.e. assets and liabilities. This is the main distinguishing feature of the proposed approach to designing balance reproduction models of the investment potential of institutional sectors. As a result of this approach, a closed system of financial flows between sectors for various financial instruments is built. Some institutional sectors generate financial flows, while others accept them.

The balance between the assets and liabilities of the matrix of financial flows (balanced matrix) characterizes the reproduction results of investment potential for each institutional sector. The negative final value of the institutional sector in the balanced matrix indicates no free investment resources in this sector and the directions of using its current investment potential, i.e. reflects those sectors where its financial resources were directed. The positive final value of the balanced matrix, on the contrary, helps identify additional investment opportunities for the sector development, provided as a result of attracting financial resources from other sectors.

Designed in this way, the model reveals the reproduction features of the investment potential of interconnected institutional sectors and helps assess the investment opportunities of the financial and non-financial corporations,

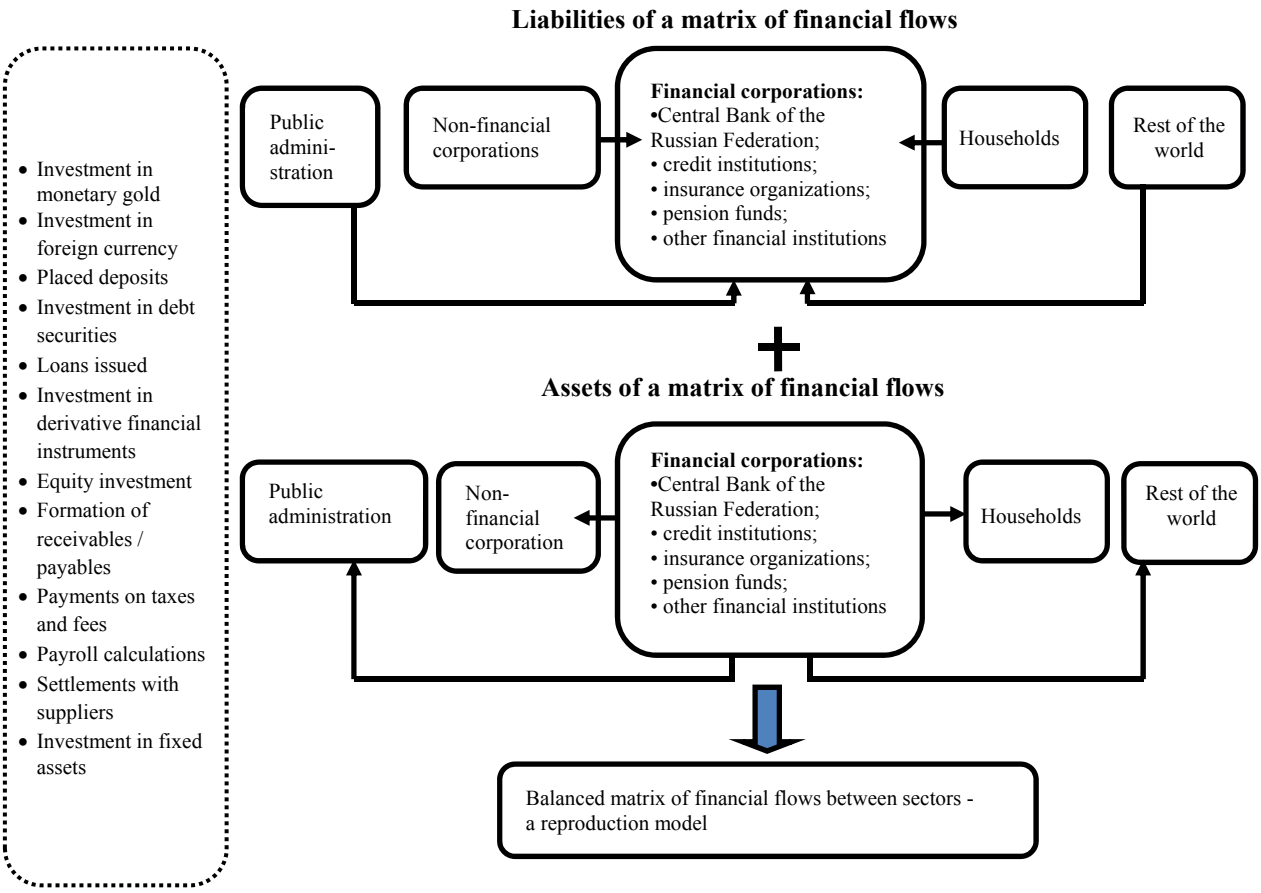


*Fig.* **Model of reproduction of the investment potential of institutional sectors in the regional system**

*Source:* compiled by the author.

households, government and foreign organizations, as well as the threats to the economic development of these sectors as a result of financial flows between them.

For example, a high balanced positive value in the reproduction model of investment potential in the financial corporations sector indicates a high concentration of unused investment resources of the sector in this region. They could be aimed at the recovering the economic sector of real production or financing important strategic programs for socio-economic development implemented by the government sector. A high negative value in the reproduction model in this sector is indicative of the emerging threats to the development of credit institutions, insurance organizations and pension funds in the region, as well as to find out the reasons (outflow of capital abroad, high debt load of institutional sectors, growing debt arrears to financial corporations, etc.). Negative values of reproduction of the investment potential of the household sector, nonfinancial corporations and government indicate the extensive use of the existing investment potential of these sectors and no free investment resources; in the case of high payables to other institutional sectors — the opportunity to lose financial stability.

As noted earlier, one of the drawbacks of existing methodological approaches to studying the reproduction processes of the investment potential of sectors using balance models is the lack of a spatial aspect. To solve this problem and to display **interregional relationships in the reproduction processes of the investment potential of institutional sectors** by a projected model, it is proposed to use the methods of spatial autocorrelation and autoregression by L. Anselin [18], R. Geary [19], A. Ge-

tis and J. Ord [20], P. Moran [21]. Modeling interregional relationships involves:

• designing a matrix of local autocorrelation indices of the studied regions $I_{Li}$ [22] to search for closely interrelated territories by various financial instruments to reproduce investment potential for each institutional sector:

$$I_{Li} = N \times \frac{(x_i - \mu) \times \sum_i w_{ij} (x_j - \mu)}{\sum_i (x_i - \mu)^2}, \quad (1)$$

where $N$ — is the number of regions;

$W_{ij}$ — is a spatial weight matrix element for regions $i$ and $j$;

μ — is an average value of an indicator;

$x_i$ — is an analyzed indicator of one region;

$x_j$ — is an analyzed indicator of the other region.

• analyzing spatial autocorrelation between regional systems by P. Moran's dispersion diagram allowing to divide the studied territories into four categories (HH, HL, LL, LH) depending on the level of reproduction of the investment potential of institutional sectors. According to this dispersion diagram, territories with a high concentration of investment resources in institutional sectors are located in the HL quadrant. However, we suggest relating to them only those territories whose local autocorrelation index value is above the upper limit of the spread of deviation of its values estimated for all regions:

$$I_{Li} > \left( \overline{I_{Li}} + \sqrt{\frac{\sum \left( I_{Li} - \overline{I_{Li}} \right)^2}{n}} \right). \quad (2)$$

To the territories closely related to the identified concentration centers of the investment potential of institutional sectors we suggest assigning regional systems in the HH and LH quadrants and with the values of local autocorrelation indices between the average and the upper scatter border. The matrix of local autocorrelation indices of the studied regions helps identify the interconnected areas, i.e. spatial units closely connected in the reproduction processes of investment potential, between which investment resources are mainly transferred. We suggest confirming the revealed interconnections between the territorial systems (spatial units) in the reproduction processes of the investment potential for each institutional sector by a correlation analysis using time series for the period from 1998 to 2017. This will help adjust the results obtained in the course of the spatial autocorrelation analysis and identify the regions truly connected in the reproduction processes and the investment potential flows of institutional sectors.

To understand the directions of the relationship between the territories in the flows of investment resources of institutional sectors, it is proposed to introduce a network approach: to design a map of spatial autocorrelation of regions with network lines representing interconnected territories by means of the local Moran's index (above the average level). Using this methodological approach will solve the problem of studying interregional relationships, typical of the methodological approaches considered before.

## TEST RESULTS OF THE METHODOLOGICAL APPROACH TO DESIGNING A BALANCE REPRODUCTION MODEL OF INVESTMENT POTENTIAL OF INSTITUTIONAL SECTORS

We tested this approach when designing the balance reproduction model of investment potential of institutional sectors in the regions of the Ural Federal District for the period from 1999 to 2017. Built as a result of systematization of the turnover balance sheet on form No. 101 of regional banks and credit institutions of Sverdlovskaya, Chelyabinsk, Kurgan and Tyumen regions, the balance reproduction model of their investment potential helped confirm the previously identified trends in the reproduction of the investment potential of the sectors of the Sverdlovsk region during both crisis periods in the economy and its recovery periods.

Thus, the 1998–1999 economic crisis in Russia, the deterioration in the economic situation

in 2003–2004, the 2008–2009 financial crisis and stagnation of economic development in 2012–2017 were accompanied by a significant outflow of investment resources of institutional sectors abroad (the rest of the world sector).

Let's consider the reproduction features of the investment potential of the institutional sectors in the Ural Federal District in 2016 (*Table 1*) typical of the indicated periods of economic development. The outflow of financial resources of institutional sectors abroad was carried out in the form of investments in foreign currency (18.8 billion rubles), short-term loans up to 1 year (6.3 billion rubles), long-term loans for more than 3 years (4.2 billion rubles) and investments in shares (7.1 billion rubles). As a result, the investment potential of foreign institutions in 2016 increased by 17.7 billion rubles. A positive surplus in the reproduction of investment potential was also observed in the general government sectors (24.1 billion rubles) and financial corporations (84.1 billion rubles). The investment potential of the government sector of the Ural Federal District increased due to the sale of sovereign debt securities (federal loan bonds) in the amount of 29.2 billion rubles, shares (5.2 billion rubles) and state property (2.4 billion rubles), the attracted credit resources in the amount of 2.9 billion rubles, as well as mandatory payments of taxes and fees (1.5 billion rubles).

The investment potential of the financial corporations sector in the Urals Federal District was replenished in 2016 by attracting institutional funds to bank deposits in the amount of 46.2 billion rubles and the Central Bank of the Russian Federation (58.3 billion rubles), the repayment of loans (33.5 billion rubles) and as a result of settlements with suppliers (66.5 billion rubles).

In 2016, as in other recession periods, the financial corporations sector actively attracted funds from other institutional sectors in the form of deposits from operations with foreign currency. On the other hand, it slashed lending to households and non-financial corporations, investment in stocks of the real sector of the economy. As a result, during economic downturns, the investment potential of households and nonfinancial corporations drastically decreased (*Table 2*).

The biggest reduction in the investment potential of the household sector was noted in 2009 (by 48 billion rubles), 2015 (82.5 billion rubles) and 2016 (76.6 billion rubles). Over the past four years, there has been a tendency to shrink investment opportunities for the development of this sector. The developing crisis in the economy does not always directly affect the reproduction processes of the investment potential of institutional sectors; these trends show up with some delay, and non-financial corporations are the vivid example. The 1998 economic crisis affected the investment potential of this sector only in 2000 and contributed to its decrease by 30.9 billion rubles. The signs of a long economic recession that began in 2012 appeared in the development of the investment potential of non-financial corporations a little earlier, in 2011 (investment potential decreased by 27.1 billion rubles) and sharply increased in 2016 (by 49.3 billion rubles), and 2017 (by 137.1 billion rubles). The non-financial corporations sector, with the manufacturing sector of the economy being a part of it, has been actively losing its investment potential over the past two years; financial corporations have played a significant role in this process as they have drastically reduced lending, investment in stocks and debt securities of the real economy. Financial corporations have powerful investment potential that could be used to restore the real sector of the economy and implement the most important state strategic programs for socio-economic development. However, unfortunately, these resources are invested in foreign currency, stocks and debt securities of foreign issuers, as well as they are used for lending to foreign institutions, thereby contributing to the active outflow of capital abroad.

## CONCLUSIONS

The presented theoretical and methodological approach to designing a reproduction model of the investment potential of institutional sectors helps use the basic principles of the system of national accounts ("double entry",

*Table 1*

**Balance model of reproduction of the investment potential of the institutional sectors of the Ural Federal District in 2016, million rubles**

| Financial investment instruments | Financial corporations | | | Government Sector | (Non-financial corporations) | (Household) | (The rest of the world) |
|---|---|---|---|---|---|---|---|
| | (Central Bank of the Russian Federation) | (Banks and credit institutions) | Other financial organizations) | | | | |
| 1. Investment in gold | –186 | –106 | –24 | –9 | –9 | 179 | 155 |
| 2. Foreign currency | 26 | –11490 | –682 | –73 | –84 | –6488 | 18791 |
| 3. Placed deposits | 58298 | 46226 | –24571 | –16884 | –13875 | –36868 | –12326 |
| 4. Investments in debt securities | 14858 | –78720 | 19990 | 29181 | 22143 | –4631 | –2822 |
| 5. Loans issued | 3023 | 33523 | –2483 | 2989 | 594 | –44416 | 6770 |
| – urgent loans (up to 30 days) | 0 | 24555 | –25415 | 0 | 70 | 0 | 790 |
| – short-term loans (up to 1 year) | 2093 | –30063 | 19815 | –878 | 2937 | –215 | 6312 |
| – medium-term loans (for a period of 1 year to 3 years) | 930 | 15202 | 2129 | 1842 | –8237 | –7696 | –4171 |

*End of Table 1*

| Financial investment instruments | Financial corporations | | | Government Sector | (Non-financial corporations) | (Household) | (The rest of the world) |
|---|---|---|---|---|---|---|---|
| | (Central Bank of the Russian Federation) | (Banks and credit institutions) | Other financial organizations) | | | | |
| – long-term loans (over 3 years) | 0 | 22 324 | 1 001 | 1 345 | 6198 | –35 045 | 4 178 |
| – on demand | 0 | 1505 | –13 | 681 | –374 | –1460 | –340 |
| 6. Investment in derivative financial instruments | 0 | –8760 | 8 760 | 0 | 0 | 0 | 0 |
| 7. Equity investment | 2 | –32 000 | 1 652 | 5 215 | 2 522 | 15 470 | 7 139 |
| 8. Debts | 9 | –8779 | 5 132 | –12 | 1180 | 2 406 | 65 |
| 9. Tax payments | 0 | –1530 | 0 | 1 530 | 0 | 0 | 0 |
| 10. Payroll payments | 0 | 1680 | 0 | –247 | 0 | –1433 | 0 |
| 11. Settlements with suppliers | 0 | 66 533 | –1 | 0 | –66 494 | 0 | –38 |
| 12. Investment in fixed assets | 0 | –6576 | 314 | 2 443 | 4684 | –865 | 0 |
| **BALANCE** | **76031** | **0** | **8 086** | **24134** | **–49 339** | **–76 646** | **17 734** |

*Source:* compiled by the author.

*Table 2*

**Dynamics of reproduction of the investment potential of the institutional sectors of the Ural Federal District for the period of 1999–2017, million rubles**

| Year | Financial corporations | | Government Sector | Non-financial corporations | Household | The rest of the world | Σ |
|---|---|---|---|---|---|---|---|
| | Central Bank of the Russian Federation | Other financial organizations | | | | | |
| 1999 | 998 | 253 | –740 | –684 | –32 | 206 | 0 |
| 2000 | 3270 | –633 | 288 | **–30872** | –1576 | **29524** | 0 |
| 2001 | 831 | 2156 | 2134 | –4256 | –3682 | 2817 | 0 |
| **2002** | –2555 | –3663 | 2201 | 45442 | **–13588** | –27837 | 0 |
| **2003** | 7756 | –3480 | –727 | 22253 | **–10636** | –15166 | 0 |
| 2004 | –6306 | 1201 | 638 | **–480** | –3070 | **8018** | 0 |
| 2005 | 5751 | –4089 | 420 | 12445 | –11035 | –3492 | 0 |
| 2006 | 4860 | 2583 | –5711 | 15685 | –14933 | –2483 | 0 |
| 2007 | 6648 | –3543 | –8815 | 14405 | –6951 | –1743 | 0 |
| **2008** | **–17803** | –13053 | **–26997** | 73622 | –851 | –14919 | 0 |
| **2009** | 29088 | –7093 | 13585 | **–7790** | **–48073** | **20282** | 0 |
| 2010 | 6798 | 8672 | 987 | 18671 | **–25711** | –9417 | 0 |
| 2011 | **–20287** | 16489 | 9865 | **–27125** | 25169 | –4111 | 0 |
| **2012** | **–13515** | 9720 | **–9813** | **–1441** | 6390 | **8659** | 0 |
| 2013 | –6383 | –40018 | **–4489** | 60252 | 692 | –10054 | 0 |
| 2014 | 2784 | –6257 | **–13227** | 52249 | –33372 | –2177 | 0 |
| **2015** | 1945 | 13922 | **–9637** | 48326 | **–82491** | **27934** | 0 |
| **2016** | 76031 | 8086 | 24134 | **–49339** | **–76646** | **17734** | 0 |
| 2017 | 174814 | 18446 | 20320 | **–137091** | **–37954** | –38535 | 0 |

*Source:* compiled by the author.

according to which one sector initiates financial flows, and the other accepts them, the structure of the financial account of institutional sectors) in the matrix form and reflect the financial flows between the sectors of financial and non-financial corporations, general government, households and foreign institutions, as well as study the features of the development and use of the investment potential of these sectors. As a result of the methodology of spatial autocorrelation and autoregression applied by P. Moran's method, it is possible to determine the features of the investment potential spatial flow between regional systems, to establish the influence of the internal and external factors on its reproduction processes. This approach provides to assess the investment resource endowment of the sectors and their sufficiency to solve the most important development problems, to determine the main uses of these resources by institutional sectors, and the riskiness of their investment activities. In our opinion, this approach should be used for developing the concepts of industrial, social, investment policy at the federal and regional levels, for preparing budget projects of the appropriate levels and when implementing the Strategy for Spatial Development of the Russian Federation adopted in February 2019 for the period until 2025.

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# Credit and Banking Component of the Market Economy Phenomenon: Methdological Approach Transformation to the Development of Digitalization and Capital Fictivization

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**ABSTRACT**

The article is based on the results of the 7th International Scientific and Practical Conference on Economics "The Market Economy Phenomenon: From the Origins into Our Days" held from March 27 to March 31, 2019 in the cities of Sochi and Sukhumi. The theoretical approaches of domestic and foreign researchers to understanding the market economy phenomenon, the specifics of its financial and credit sphere functioning in the context of the digital economy were generalized. The problems of the monetary economy in terms of the sanction confrontation were outlined. The authors analyzed and evaluated the processes and the phenomena observed in the post-Soviet economic space related to the transplantation of market economy mechanisms into the system of social reproductive relations, including its financial component based on their digitalization. The dialectic approach, system analysis, methods of economic and statistical and interdisciplinary analytical tools were used. The article revealed the key components of the market economy phenomenon appearing in the post-Soviet economic space and having a direct impact on the social reproduction results. The relationship was shown between the transformation of the evolutionary and methodological content of the money economy, its institutional and behavioral paradigm, the digitalization of the financial segment of the economic space with the scale of innovation, the penetration of cognitive psychology and neurophysiology into financial and credit relations, and their technological re-equipment. The results of the influence of instability factors on the budget and monetary sphere were presented. The authors described complex interdependencies of the processes and phenomena within the framework of the market economy phenomenon appearing in the post-Soviet economic space. The triune structure of the modern market doctrine was disclosed including psychological and behavioral, institutional and functional and reproduction and product aspects. The authors showed the transformational dynamics of the financial and credit sphere of modern society. Its specific features are: the increasingly important role of innovation, outsourcing, revising pricing methods, digitalization of business processes, penetration into managing neuromarketing technologies, and virtualization of the financial sector of the economy.

***Keywords:*** market economy; digital economy; cryptocurrency; neuromarketing; monetary economy; neuroeconomics; fake economics

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## INTRODUCTION

The economic doctrine of modern society is a socially oriented market mode of production whose phenomenon is universal. Its actualization for the post-Soviet economic space requires appropriate institutions developed by trial and error that leads to a distortion of the positive practical experience from other countries. This is due to the natural tendency of the scientific community of the former Soviet republics and regions to comprehend various models of the market economy (both socially oriented and mixed, and mainly corporate and state). This is where the understanding and the realistic idea of the place and role of the market economy enduring values in the post-Soviet economic space come from in the framework of the annual (since 2013) meeting of CIS economists at the Sochi Economic Conference "The Market Economy Phenomenon: From the Origins into Our Days" held this year for the seventh time. All these conferences are dedicated to the memory of Doctor of Economics, Professor A.F. Sidorov, a famous scientist, a major organizer of science in the South of Russia, an Honored Scientist in the Kuban. He founded his own unique scientific school incorporating the names of quite famous scientists and economists of the Soviet Union and present-day Russia, Ukraine, Uzbekistan, Kyrgyzstan, and Kazakhstan.

A lot of economists from the south of Russia, Moscow, Russian and foreign universities participated in the 7th International Scientific and Practical Conference on Economics "The Market Economy Phenomenon: From the Origins into Our Days" held from March 27 to March 31, 2019 in the cities of Sochi and Sukhumi. The main organizers were the Kuban State University and the Financial University under the Government of the Russian Federation; their representatives were leading the organizing committee. The conference coordinator is Honorary Figure of Russian Higher Education, Doctor of Economics, Professor, Scientific Director at the Department of Economic Theory, Financial University, Head of the Department of Philosophy and Methodology of Economic Science, Institute of Economics of the Russian Academy of Sciences, Full Professor of the National Research University "Higher School of Economics" R.M. Nureev. The chairman of the organizing committee is Doctor of Economics, Professor, Head of the Department of Theoretical Economics, Kuban State University V.A. Sidorov. The organizing committee co-chairs are: Corresponding Member of the Russian Academy of Sciences, Doctor of Economics, Professor, Head of the Department of Economic Theory and Scientific Director, Financial University D.E. Sorokin and Doctor of Economics, Professor, Dean of the Faculty of Economics, Kuban State University I.V. Shevchenko. The conference scientific director is Doctor of Economics, Professor, Head of the section "History of Economic Thought", Department of Economic Theory, Financial University Ya.S. Yadgarov.

The foreign members of the organizing committee were represented by the Belarusian State Agrarian Technical University (Doctor of Economics, Professor G.I. Ganush), Abkhazian State University (Doctor of Physical and Mathematical Sciences, Professor A.A. Gvaramiya), Karshi Engineering Economics Institute (Candidate of Technical Sciences, Associate Professor, N.N. Makhmudov, Doctor of Technical Sciences, Professor G.N. Uzakov, Republic of Uzbekistan), Lugansk National Agrarian University (Doctor of Economic Sciences, Professor V.G. Tkachenko). The scientists from Russia, Abkhazia, Armenia, Ukraine, Kazakhstan, and Uzbekistan participated in the conference.

Professor R.M. Nureev traditionally addressed the forum participants. He started the discussion by substantiating the theoretical and methodological base of the market economy phenomenon, revealing its value paradigm and touching upon the problems of state and market correlation to coordinate business entities. This problem has no solution beyond scientific understanding and analysis, since the development of market institutions (which aim to transit to sustainable socio-economic development) requires a scientifically based concept of economic growth. Within this concept, applied economic policy instruments would reflect the country's

political and economic realities and its place in world economic relations. Hence, science should develop economic principles and imperatives to implement the concept of socio-economic development which should be based on ideas of technical and technological re-equipment, assuming an investment policy of modernization and development of the financial sector and taking on the role of economic growth driver.

The conference determined its main direction within this idea — the methodological paradigm transformation of the credit and banking component of the market economy. The priority areas were: 1) the theoretical, methodological and historical-economic phenomenon of the market economy; 2) institutional and behavioral base of the market economy phenomenon; 3) monetary fetish of the market economy; 4) food issues of the market economy phenomenon; 5) business, innovation, information technology, trends and development prospects.

## EVOLUTIONARY AND METHODOLOGICAL CONTENT OF MONEY

The methodological features of the market economy phenomenon, including its monetary content, are historically associated with overcoming the experience of a non-systemic analysis by a systemic analysis. Professor **Ya. S. Yadgarov** spoke on the subject and drew attention to the main features of the non-systematic analysis of the market economy phenomenon during periods of widespread research paradigms of mercantilism, classical political economy, economic romanticism, and utopian socialism. Revealing the essential aspects of the first systematic analysis by the followers of the German historical school, neoclassicism and institutionalism, he connected this experience with a theoretical understanding of the essence and mechanism of value formation in the market economy.

The costly versions of the theory of value by adherents of the Smith-Ricardo's commodity-money views were followed by new marginal (A. Marshall and others) and behavioral (T. Veblen, E. Chamberlin, J. Commons, etc.) ones. They joined the scientific revolution due to problems related to the identification and understanding of influence of mainly non-cost, i.e. non-economic, factors on value formation: human addictions, habits and instincts; quality parameters of marketable products; service culture; advertising; legal grounds; action of collective institutions. The behavioral and marginal directions of the theory of value complement each other. In this regard, first, none of them has anything to do with the theories of "fair prices" of the pre-market period, nor with the Proudhon's "constituted value" or with the pricing practice of fascist and totalitarian countries. Second, they exclude any idea of suppressing competition by the state in order to avoid price mismatch even to marginal costs of producing goods.

Developing Professor Yadgarov's judgments, Professor **V. N. Ovchinnikov**, the Professor at the Department of Management, Higher School of Business, Southern Federal University, the Honored Scientist of the Russian Federation, the Doctor of Economics, dwelt on analyzing the emergence and development of the necessary and sufficient conditions for establishing the monetary economy. First, he identified the fundamental factors of institutional and organizational isolation of the business and operations entities by their specialization boundaries in nascent social division of labor, which objectively stipulated the demand for exchanging production results. Second, the prerequisites for their economic isolation by the appropriation boundaries giving the exchange a barter, and subsequently, a monetary economic form, providing for the equivalence of market transactions. In this regard, the monetary economy is a variety of business entities separated by the boundaries of the market economy sectors or objects of full or relatively partial appropriation. From the standpoint of methodology, looking for an effective owner as a potential subject of the market economy at the origins of the financial component of the product and income circulation seems to be untenable. In a constructive way, we can speak about the type (model) of a motivated agent of the mar-

ket economy that actually organizes the production process, carries out a circulation and capital turnover. Private appropriation of the means of production is redundant (non-core) here. To organize production, it is enough to rent them (from the state). This is the subject-object certainty of the relations of the market economy, its organizational and institutional foundations and economic nature.

Further, the problem of the economic (money) mechanism of the market economy was developed by Doctor of Economics, Associate Professor **E.E. Nikolaeva** and Doctor of Economics, Professor **B.D. Babaev**. They rejected the classical understanding the economic mechanism through its market nature as the unity of distributional and exchange relations and presented it as a dialectical interaction of the four reproduction stages. Considering reproduction from a systemic point of view, the speakers identified the functions of each element of the reproductive chain: producing, broadcasting, goal-setting. Particular attention was paid to economic laws, the core of the economic mechanism in the political and economic sense. The laws of circulation as a unity of distribution and exchange were presented by: a) the law of distribution according to work; b) the law of value; c) the laws of supply and demand in their interaction; d) the laws of money circulation. The authors believe that the combination (synthesis) of the methods of the political economy and institutionalism as a methodological basis for studying the economic mechanism is consistent for analyzing the interaction of the elements of its basis and superstructure.

The transformational aspect of the market economy phenomenon was touched upon in the speeches by the Honored Scientist of the Russian Federation, Doctor of Economics, Professor **G.P. Zhuravleva** and Doctor of Economics, Professor **V.A. Sidorov.** They focused on comprehending the new phenomenon in the conditions of the monetary market economy manifested in the growth of false ideas about its quality; they called it "fake economics". The general content of their speeches was an analysis of the essential characteristics of the emerging phenomenon: falsification of information, goods and services, human activities, news. No market entity can be sure of the reliability, completeness and objectivity of the proposed information. The fake nature of the modern market management system is based on falsification not of a subjective but of an objective, unintended nature, caused by the transition to a new technological structure, the digital economy.

"Fake economics" is a serious and dangerous phenomenon, not easy to be recognized. In the Russian Federation, it can be determined as follows: focus on short-term benefits which in the long term are accompanied by social, economic, environmental and other costs; unconstitutionality and subordination to Western partners, their needs and requirements; unstable, sporadically emerging and disappearing business.

"Fake economics" is a new, not yet explored phenomenon of the market economy. It requires a deep theoretical study. It implements the contradictions of the economic model of the free monetary economy and socially oriented economy, including differences between labor and unearned incomes, between rentiers who receive "free profits" and productive economies.

Falsification in the economy highlighted two main directions of its qualitative components: the ratio of power and economic theory, on the one hand, and the choice of the optimal vector of socio-economic development, on the other. The first direction was disclosed by Doctor of Economics, Professor **V.V. Dement'ev** who reported and analyzed the problems of equality and social justice between economic agents in the context of their proximity to power. According to the scientist, by means of a holistic analysis of the economic power phenomenon, one should carry out a search and get an exhaustive answer to the question: what the socially necessary economic order of power is: who, over whom (what), to what extent, how and in order to achieve what goals should power be implemented in the economic life of society? The

answer to this question can only be found on the paths of the political economy of power, the joint efforts of economists, sociologists and specialists in the field of law.

The second direction was the subject of research by Doctor of Economics, Professor **M.L. Al'pidovskaya**, who revealed the development features of socio-economic relations and the direction of transformation of the monetary economy in the evolution of the information economy. Among the features of the latter, she highlighted the negative features of modern private property, including: the prerequisites for the development of collective and social business forms in the modern world that impede developing scientific and technological progress; strategic prospects and risks of collective and social business forms and their mutual influence on the society and economy. Accordingly, a conclusion was made about two directions for expanding money management: territorial and internal (within oneself), based on increasing income level of the population and developing new technologies due to which the return exceeds investments. These two directions develop two strategic vectors: 1) transition from extensive to intensive development (followed by intensifying exploitation and confrontation and growing inequality); 2) development identification through gradual (phased) socialization of property.

Thus, the debate about the methodological basis of the monetary economy regarding the evolution phenomenon of the social nature of production and the so-called private capitalist appropriation has been interpreted through internationalization of world economic relations that sharply increased the role and importance of both transnational capital and systemic transformation of economic relations in the context of modern global challenges. The discussion participants concluded that the main task of contemporary economic science is to develop a theoretical and methodological base that will allow to resolve the above contradictions, considering the new realities in the market economy and its monetary content.

## INSTITUTIONAL AND BEHAVIORAL PARADIGM OF THE MARKET PHENOMENON

The polemic content of the methodological basis transformation of the monetary economy was further developed at the conference by analysis and systematic reflection of its institutional and behavioral platform, which allowed the forum participants to identify and delve into the issues of three related priority concepts: psychological and behavioral; institutional and functional; reproductive and productive.

*The psychological and behavioral concept* including its many inherent scientific and practical aspects were indicated in the speeches by **S.S. Varenik, G.A. Sorokina, I.A. Denisenko, Yu.K. Bgane** and others. In particular, S.S. Varenik believes that the increasing density of information flows affects human consciousness, decision-making process, cognitive processes, predicting and analyzing human behavior in the business environment, dynamics of equity and company capital, and the financial component of the economy as a whole. In her opinion, the intensity of the current socio-political processes commits a gross change in the language situation to multilingual and requires knowing a second language (interlanguage) to create comfortable conditions for a human being and society.

G.A. Sorokina and I.A. Denisenko focused the audience on the analytical aspects of optimizing the mechanism of public-private partnership (PPP) through the relations between the state and private agents. They believe that depending on the externalization of these relations, various resource combinations appear with an appropriate distribution of risks, responsibilities and rewards between them. They conclude that the cooperation model built within PPP is designed to create new facilities and to update the existing ones, to attract investments, to ensure effective budget regulation, to intensify entrepreneurial activity. On this base, it should develop a system of financial and credit interaction of business partners and bring experience and business approaches of private firms to public sector.

Yu. K. Bgane described the debatable aspects of the heterogeneity arising in the monetary economy and developing multilevel economic systems characterized by relative stability. The scientist believes that as a basic feature of financial systems, the category of heterogeneity not only provides new prospects for studying decentralized decision-making, but also offers an original interpretation of equilibrium, information, and uncertainty issues.

Studying the polemic content of the methodological basis transformation of the monetary economy is required due to the relevance of further understanding the current conceptual ideas about the financial support of business entities and their territorial localizations. The main conclusions are as follows:

- ambivalent nature of the development of institutional environment, contributing to a further heterogeneity;
- inconsistency with the processes of post-industrial transformation and directions of technological changes;
- inefficiency of measures to level heterogeneity; heterogeneity crisis in the latent period.

*The institutional and functional concept* was a key determinant in the speech by Professor **V. V. Il'inova**, who showed that companies developing business abroad, both face the financial component of competitive opposition and experience significant political risks. For modern Russia, political risk has rather negative consequences, since the imposed sanctions against many Russian companies and banks create transfer risk enhanced by possible disconnecting credit organizations from the international banking system (SWIFT). All these factors significantly affect the Russian economy. There arises the serious problem of import substitution concerning regional investment loans and targeted financing of enterprises from the federal budget; special forms of investment contracts; tax incentives; standardization of public procurement.

Due to unstable geopolitical situation with its risks and challenges, including Russia in world economic trends largely depends on timely and strategically sound state and regional policies aimed at developing the institutional environment of the investment process. This causes the problem of institutional support for financial and credit facilities, which is closely related to establishing development institutions. The implementation of this task was touched upon by Associate Professor **I. G. Tursunmukhamedov**, who formulated theoretical approaches to understanding the place and role of regional economic instruments and their systematization, showed the prerequisites for their effective use in the context of forming a regional industrial base.

The following discussion included the problems of development institutions, as well as those of distribution and use of cash funds, strategic territorial economic development, and the introduction of innovative forms of cooperation between government, education and business. In particular, it was noted (by Doctor of Economics, Professor **L. N. Rubtsova**) that the implementation of this content requires reviewing the regional crisis management strategy, permanent monitoring and control of the financial and socio-economic condition of the region as one of the priority areas of positive economic dynamics of the constituent entities of the Russian Federation.

Being supportive of such scientific and practical activities of the regional development institutes, the Director of the Center for Strategic Studies under the President of the Republic of Abkhazia, Candidate of Philosophy, Associate Professor **O. N. Damenia** briefly described the situation in post-Soviet Abkhazia. His statements are clear about the complex and contradictory, sometimes ambiguous processes in the Republic that destroyed the existing foundations of the Abkhaz society and put the country's population between two absent social systems — the old, already destroyed, and the new, not yet created. This shows the importance of the transition to a new social practice — program-targeted planning of social development.

According to the discussion results, the imperatives of functional changes were identified

in the monetary economy within establishing an innovative economy and development mechanisms of socially oriented market relations in the post-Soviet space.

*The reproduction and production concept* dominated in professors **L. G. Cherednichenko** and **A. Z. Selezneva's** report and allowed them to prove that an increase in oil and gas revenues amid rising oil prices continues to be the main factor in the growth of budget revenues. Their research findings show that the growth of non-oil and gas revenues is slow and is associated with improved managing mobilization of taxes, fees, customs payments to the budget, as well as an increase in the VAT rate. In this regard, the conditions and factors for making a budget surplus, the social factors of budget policy in the context of the pension reform, the need to prevent redistribution processes associated with a change in the recipient of budgetary allocations are important.

The report provoked a discussion about the possible directions of reproductive activity of market agents. It conveniently divided the positions into two directions and to those who are committed to business adapted to *formal or informal institutions*. Some followers of the first direction stated that the positive dynamics of the production sphere in line with modern scientific and technological achievements, improvements in the economic situation and increasing competitiveness of economic systems at various levels (especially within the ongoing economic sanctions) require urgent establishment of business sphere. The thesis on creating the conditions for self-production of entrepreneurial activity based on the content of the main signs of entrepreneurial behavior was suggested as a basis for this judgment. Professors **V. O. Moseiko** and **S. A. Korobov** noted that to be successful, a modern entrepreneur must obtain special entrepreneurial skills. On the one hand, they should be based on the individual's abilities to carry out economic activities by implementing the economic gene for the production; on the other hand, to entrepreneurial arbitration and building relations with the internal and external environment.

The followers of the informal direction identified themselves in research in the field of the shadow economy genesis realized in numerous forms; anti-money laundering policies; developing an integrated paradigm of shadow economic relations, instruments, forms and control principles as an economic alternative to a historically specific form of legal economy. The discussion participants (associate professors **V. V. Chaplya, T. G. Martseva, A. N. Stolyarova, M. A. Ponomareva**, and others) noted the following issues: low transparency of the shadow economy, which is defined as the ratio of the received positive effect from reducing the shadow economy to the costs to achieve it in comparable units; transferring economic crimes from the material production to the non-production sphere and becoming more social, since they mostly involve knowledge and information, rather than machines and mechanisms; emerging new types of practical activities (surveying, logistics, outsourcing, etc.) that require legal regulation and support in accordance with national or international legal norms, and, consequently, certain skills.

The forum also focused on the fact that the institutional and behavioral paradigm of the market economy phenomenon is relatively new to the post-Soviet economic space. It appears in attempts to highlight the specific features of socio-economic matter as a carrier (source) of instability of market agents, reflecting the goal-setting connected with economic activity and including its financial and credit support.

## DIGITALIZATION OF THE FINANCIAL SEGMENT OF ECONOMIC SPACE

The noumenon of the future society, evident in the form of total informatization of business processes, is now realized in the process of digitalization of the economic space with all the ensuing consequences. It is no coincidence that this phenomenon as an integral component of the modern market economy has received the greatest deployment in discussions and polem-

ics of the conference. As a result of an extensive discussion of trends in the processes of changing the form and substantial aspects of business due to the digitalization of the financial segment of the economic space, it became possible to distinguish conditionally virtual and real sectors of the economy. The virtual sector is represented by various types of digital activities, including financial organizations, where the main value is customer data; here the business is built around customer data and the boundaries between its types are intensively erased. The conditionally real sector covers companies whose activities are based on physical assets; for this segment, data collection is relevant for analysis and testing the hypothesis of the search for hidden reserves in order to increase productivity, optimization, and improve production sustainability.

According to Professor **G. M. Mishulin**, the unifying basis for both sectors is innovations; the disclosure of their features in the Russian Federation necessitates understanding the endogenous and exogenous drivers of the innovation process of the national innovation system. The scientist believes that the breaking point here is the lack of a clear idea of subordinated connections at all levels of the system development, including situational uncertainty regarding local development institutions; the effectiveness of this movement largely depends on the financial and non-financial conditions for the development and implementation of innovative projects.

To develop these ideas, associate professor **G. A. Terskaya** voiced research positions, according to which one of the major instruments of state support of Russia's innovative potential is the development of a monitoring system for its innovative infrastructure and implementing measures to improve the management of innovative processes. According to associate professors **I. E. Tursunov** and **G. F. Kuchkarov**, when new innovative structures are created, centers of innovation and technology transfer become the priority manifestations of the state economic policy; they are the vehicles of innovative entrepreneurship. Inhibition factors of these technical innovations are: underdevelopment of the financial and credit sector, the deficit of the state budget, an increase in interest rates when providing loans and, accordingly, the lack of demand for fundamentally new equipment.

An important topic of the discussion in the context of digitalization was identified by Professor **I. M. Sinyaeva**, who, in particular, emphasized that the main goal of the innovation policy is to create an internal high-tech market ensuring the entry of a domestic product into the world arena. She is convinced that this work is impossible outside the modeling of innovative marketing whose object at the macro level is the growth of the country's national economy and at the micro level is the growth of financial firms; its subject is the targeted process of developing innovative marketing using an information system based on marketing research. According to her reasoned conclusion, the main trends in the development of the financial sector are: integration (a quantitative decrease in the number of banks from 2013 to 2018 by more than 40%), digitalization (Internet banking — almost 90%, mobile banking — 76%) and unconditional customer orientation by means of CRM systems.

Associate professors **N. E. Brovkina** and **E. I. Meshkova** pointed out that traditionally studied as a combination of lenders, borrowers and credit products forming certain integrity and unity, the credit market is brought to the forefront in the digital economy. In their opinion, the credit market should be considered as a socio-economic integrated system that combines a relatively separate object and process and environmental regulatory and providing subsystems of the credit market.

With this interpretation, first, it becomes possible to track the interaction process of these environments, whose level of development determines the quantitative and qualitative components of the object system. Second, it provides for adequate regulating the interest policy of commercial banks, since the demand and supply of money, the volume of savings and investments, interest and income as elements of a single system are linked in the market economy.

As a guideline for pricing, a method based on assessing the economic capital cost is proposed — the cost of capital, intended to cover unforeseen losses of the bank, is also considered in the price of a loan.

According to Associate Professor **V. V. Sinyaev**, scientific and practical solution to the problems of digitalization should be linked to the development trends of the outsourcing market in financial markets, steadily growing in the volume of services sold. He described the situation when financial market players rely on outsourcing as a form of modern business and face severe competition from foreign firms, prompting active restructuring, selling assets unnecessary for core business, and outsourcing part of the corporate activities. In his opinion, further implementation of various types of outsourcing in financial companies requires competent strategic planning, professional operational management, clear financial management, and reliable quality control mechanisms. At the same time, outsourcing market services have to improve legislation (legal regulation of outsourcing relations) and modernize the culture of contractual relations in financial markets.

To continue the ongoing discussion about digitalization trends, Professor **T. E. Gvarliani** addressed the issue of modeling current business processes in financial institutions, which allows to identify the benefits and advantages obtained by merging and absorbing banks and replicating the bank's business into branches. This modeling should be used as a cleanup tool for the development bank in order to increase transparency and manageability, to provide a significant step towards certification of the quality management system, to improve the image and to increase the market value of the bank, as well as a link strategy with all elements and systems for managing business processes, personnel, projects, information technology (IT), etc. According to her calculations, the introduction of business process modeling will increase the efficiency and transparency of core operations and allocate resources and powers of responsible persons in the optimum way; as a result, it will reduce the cost of basic operations by 65%, increase liquidity management efficiency by 1.5 times, and reduce cash balances by 42%.

The following participants focused on the diverse organizational and technological aspects of digitalization in the Russian banking sector. For example, Doctor of Economics, Professor **N. V. Tskhadadze** noted that today Russia lags behind the developed countries in the range of banking products, in improving remote banking services and rising of acknowledged remote banking services technologies and innovative solutions. In her opinion, the fundamental trends in the development of remote banking services are: using strategies for multi-channel services to individuals; transferring remote customer service systems to outsourcing; creating joint remote service systems by various banks; improving the quality of services and their safety; integrated service by increasing the available services. She believes the country is capable of effective implementation of these measures: rapidly developing technologies for mobile banking; an expanding range of features, including a variety of mandatory payments; creating personal templates when performing the same operations; replacing call-centers with customer support online chats in a mobile application, more convenient and time-saving.

In her speech, Candidate of Economics **I. G. Gruzdeva** talked about essential use of neuromarketing in the banking sector among other technologies. She described neuromarketing as a tool helping to determine the consumer's attitude to a product or service before they realized it. I. G. Gruzdeva reminded that recently, most Russian banks have been focused on interest income. Currently, banks should move towards the fullest research of consumer activation issues through neuromarketology, an advanced technique for studying human brain reactions. To do this, neuromarketologists of the Russian banking system should shift the main focus to commission income, reconfigure the business model, change the strategy for promoting products and services on the market, use flavor and color schemes and targeted advertis-

ing, use remote channels, social networks and direct mail.

Finally, another participant, graduate student **M. M. Naguchev** sugested his own view on the aspects of digital transformation in the context of computerization of the banking sector and new business processes, organizational structures, regulations and rules, as well as new responsibility for data and new role models. He emphasized that computerization in the banking sector led to the replacement of digital entries in bank books with electronic symbols on appropriate media. It also led to the widespread use of debit credit cards that allow remote control of funds in bank accounts, provoking further development of monetary relations based on cryptocurrency. Meanwhile, each unit, whether it is Bitcoin, Ethereum, etc., represents a specific mathematical solution according to a specially developed algorithm, and no regulator is able to prohibit anyone from using cryptocurrency wallets to carry out transactions. It is no coincidence that in 2018, the Russian authorities got interested in creating their own state cryptocurrency (according to the instruction of the President of the Russian Federation to create a "crypto ruble") to perform settlements with counterparties around the world regardless of the sanctions. However, using cryptocurrency will become possible if the authorities agree with the partners on settlements in national currencies or somehow popularize crypto ruble. Theoretically, it will be possible to carry out transactions in many areas and to avoid the supervisory authorities of the countries that imposed sanctions against the Russian Federation.

The results of the discussion on the problems of the present and future digitalization in the financial segment of the Russian economic space can be summarized as follows: the versatility and diversity of the credit and banking phenomenon of the market economy was revealed; the possibility to apply modern information, including digital, technologies in marketing activities in the financial markets was determined; the place and role of digitalization in the direct connection between the demand and supply of money, the volume of savings and investments, interest and income as elements of a single system were shown. It was proved that in the context of digitalization and hyper-connectedness of the global economy, the financial system transformation determines the comprehensive development of innovative marketing and outsourcing in the financial markets.

## CONCLUSIONS

The results of the 7th Sochi International Scientific and Practical Conference (2019) can be resumed as follows.

One of the main results was the presentation of two new works dedicated to the beginning of the conference: "Phenomenon of market economy: theoretical and methodological content-business of innovations" (London: LSP Publ.) [1] and "The phenomenon of market economy: From the origins to the present day. Business, innovation, information technology, modeling" (Maykop: ElIT, electronic resource). The works were edited by the chairman of the organizing committee of the conference, Doctor of Economics, Professor V.A. Sidorov and scientific director of the conference, Doctor of Economics, Professor Ya.S. Yadgarov.

The conference resulted in a round table held in Sukhum on the basis of the Abkhaz State University. It was devoted to the problems of economic development and cooperation. The general conclusions were made by professors V.N. Ovchinnikov, G.N. Uzakov, R.M. Nureev, G.A. Sorokina, V.A. Sidorov, associate professors I.E. Tursunov, G.M. Mishulin and others. The subsequent discussion focused on the problems of institutional and reproduction content of the effectiveness of public reproduction and stabilization of socio-economic development, including issues of budget policy as a tool for influencing economic processes of monetary policy, as well as the agri-food complex in the context of transitive uncertainty, expectation and increased competitiveness.

At the end of the conference, the following unanimous decision was made:

1. The topic is relevant for the Russian theoretical economy and meets its goal-setting functions in the field of the credit and banking component of the market economy phenomenon.

2. The international status of this forum and the advance publication of two works help inform the largest number of interested parties about the ongoing transformations of the market economy.

3. The relevance of the conference topics allows the participation of representatives of the post-Soviet scientific economic community.

4. The feasibility to continue the conference in the future meets the requirements of economic science and university education.

In his closing speech, the scientific director of the conference, Doctor of Economics, Professor Ya.S. Yadgarov expressed gratitude to all participants. He noted that the forum materials were published as two final research folios before the conference. Professor Ya.S. Yadgarov expressed confidence that the tradition of the annual forum in memory of Professor A.F. Sidorov will continue.

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# Assessment of Forecast of Social and Economic Development of the Russian Federation for 2019–2024 (September, 2019)*

**Preliminary note**

It is very difficult to assess the validity of the quantitative parameters since the methodology and methods for the Forecast used by the authors are not known (indirect indicators point that it is based on the current trends in the Russian and world economies). First of all, the assessment of the Forecast was carried out from the point of view of its compliance with the goals of social and economic development as defined in Decree of the President of the Russian Federation dated 07.05.2018 No. 204.

## 1. EVALUATION OF THE FORECASTED RATES OF SOCIAL AND ECONOMIC DEVELOPMENT

It should be noted that the economic growth rates covered in the Forecast do not allow to realize the goal set in the Address of the President of the Russian Federation to the Federal Assembly dated 03.01.2018 to increase GDP per capita by 1.5 times by 2024. Considering the projected (according to the base and target options) population, this requires that the average annual GDP growth rates in 2019–2024 amounted to 7.2%, while in the target option they are 2.6 times lower (2.8%). Such rates do not allow increasing the income of the population which is the basis for social development. Thus, projected in the base case, the average annual growth of real disposable income of the population in 2019–2024 equal to 1.8% means that by 2024, the level of 2013 (101%) will be restored and followed by decline. In this case, it is not clear how a two-fold reduction in the share of the population will occur: their income will be below the subsistence level (6.6%) if the real disposable income remains at the level of 2013 when this share was 10.8%.

The evidence from overseas experience shows that the increase in the selective policy for disadvantaged population observed in recent years (emphasis on means testing while tightening requirements) conserves poverty, and the tightening of fiscal and monetary policies (adequately described in the initial sections of the Forecast) increases the number of disadvantaged citizens, classified as poor by the OECD standards.

It is noteworthy that the Forecast does not mention the dynamics of overcoming income inequality.

## 2. FACTORS OF SOCIAL AND ECONOMIC DEVELOPMENT

### 2.1. External factors

The Forecast seems to rightly note the instability of the world economy and high risks of its further slowdown (the Forecast suggests more pessimistic estimates: the growth of world GDP below 3% in 2019 compared to 3.2% according to the IMF forecast) and, as a result, "contraction" of world markets. In this regard, the orientation toward expanding exports as an economic growth driver does not seem entirely logical. Developing domestic demand seems to be more important in these circumstances. The Forecast mentions a drop in export prices for energy and raw materials as the most important consequences of such a slowdown for the Russian economy. This indicates the continued dependence of the raw materials of the Russian economy.

Current dynamics of the Russian ruble exchange rate does not confirm that "it is forecasted that the consistent implementation of macroeconomic policies within the framework of the budget rule will ensure that the exchange rate against the US dollar remains low depending on the dynamics of oil prices" (*p. 10 of the Forecast*). The evidence from practice shows that if the oil price in the world market rises, the ruble's rate to the dollar is relatively stable. If the oil price falls steadily, then the Russian ruble, as a rule, wastes quickly. There has been significant volatility of the Russian ruble exchange rate in 2018–2019, intensified after the US government introduced the next sanctions against Russian companies and individuals, as well as increased uncertainty in the energy markets. According to the Bloomberg terminal, on August

* Forecast of social and economic development of the Russian Federation until 2024. The official website of the Ministry of Economic Development of the Russian Federation. URL: http://economy.gov.ru/minec/activity/sections/macro/prognoz/2019093005 (accessed on 04.10.2019).

2, 2019, the Russian ruble climbed to the fourth place among the most volatile currencies with an indicator of 10%[1] after the South African rand (15%), Turkish lira (14.5%) and Brazilian real (12.42%). Over the previous two months, the ruble was on the 7–8th position of the ranking[2].

### 2.2. Internal factors

#### 2.2.1. Investment activity

The Forecast indicates a slowdown in investment activity. The growth in investment in fixed assets in January — June 2019 amounted to 0.6% compared to 4.3% for the same period in 2018. This led to a decrease in the expected results in 2019 in comparison with the September forecast for 2018 (2.0% compared to 3.1%, respectively). In 2020 they forecast a sharp increase in investments (5.0%) which is supposed to be retained as an average annual indicator until 2024.

We will not discuss if this rate of investment growth is sufficient to solve the problems of breakthrough technological and social and economic development indicated in Decree No. 204. The factors that provide the predicted growth are not convincing enough.

The credit cycle development based on the recovery of business sentiment is indicated as a growth driver of investment activity. However, the reliability of this factor is doubtful: business sentiment may change in the result of various shocks and the borrowed nature of investments itself makes the investment process expensive and unreliable.

The forecast of increasing growth rate of investments in fixed assets to 5% in 2020 and 6.5% in 2021 (*p. 25*) seems contradictory, while the Ministry of Finance and the Bank of Russia's rigid guidelines for priority ensuring financial and price stability are maintained.

The mining industry remains the main direction for investments — 25.9%, while the manufacturing industry accounts for only 17.5% (an increase of only 1.3% compared to 2018). As a result, the share of the manufacturing industry in 2024 will be 12.7% compared to 12.3% in 2018. The 0.4% change does not imply any future noticeable shifts in the structural adjustment of the economy. Therefore, it is unclear how manufacturing combined with the projected contraction of foreign markets will become drivers of economic growth due to export orientation.

The expectations of a decrease in the net capital outflow from the country in 2019 to the GDP level of 1.4% compared to 2.2% in the April forecast seem too optimistic.

According to the Bank of Russia, the capital outflow from Russia sharply increased in 2018–2019: in 2018, it grew 2.7 times compared to the previous year — up to $ 67.5 billion[3]. In January — August 2019, it also increased 1.3 times — up to $ 26.1 billion compared to $ 20.6 billion for the same period in 2018[4].

#### 2.2.2. Labor productivity

The projected growth rates of labor productivity (2.3% of the average annual growth in the base case to 2024) prove that this factor is the main factor for economic growth under the current conditions (the projected average annual GDP growth in the base case for the same period is 2.6%). Thus, low growth rates of labor productivity do not allow reaching the target indicators of economic growth.

At the same time, the Forecast does not analyze how to increase the annual labor productivity by at least 5% by 2024 at 10.000 medium and large enterprises of the basic non-primary sectors of the economy as suggested by Decree No. 204.

Given the objective necessity for fast recovery of income lost in the 2014–2015 crisis, such low growth rates of labor productivity result in violating the core principle of the excess of labor productivity growth rates over wage growth rates; sustainable development is impossible without it.

In 2020, the growth rate of labor productivity in the three scenarios — basic, conservative, and target — will be lower than the growth rate of real

[1] The ruble volatility per month is calculated based on the prices of monthly options for the dollar against the ruble.

[2] The ruble went higher in the ranking of the most volatile currencies after the new US sanctions. 07.08.2019. URL: https://www.rbc.ru/finances/07/08/2019/5d49a6b09a79473e323fbd4b (accessed on 04.10.2019).

[3] Capital outflow from Russia increased 2.7 times in 2018. Vedomosti.17.01.2019. URL: https://www.vedomosti.ru/economics/news/2019/01/17/791702-ottok-kapitala (accessed on 01.10.2019).

[4] Capital outflow from Russia increased 1.3 times in eight months. 10.09.2019. URL: https://www.interfax.ru/business/675921 (accessed on 02.10.2019).

wages (*appendix tables on pages 105–110 of the Forecast*). The indicated lag in productivity is significant: in the conservative scenario — by 63.6%, in the base scenario — by 29.4%, and in the target scenario — by 30.0%. Although the text of the document partially explains this economic incident, its scale seems to be too significant. In fact, this means that in 2020 wage growth will go to the detriment of economic profitability which contributes to developing recessive trends and a monetary overhang in the consumer market.

In subsequent years, the rule of outstripping growth in labor productivity is not formally violated. However, the basic scenario runs along the very edge of the criterion: in 2024, the rates of labor productivity and real wages coincide, and in 2022–2023, the difference between them is only 0.1 percentage points. The reason is not the excessively high growth rates in wages (they are just low), but the low growth rates in labor productivity.

#### 2.2.3. Technological re-equipment

Low productivity growth rates are largely due to the outdated technological base of the economy. That is why, Decree No. 204 set the task of breakthrough technological development as a primary goal.

Actually, the Forecast does not pay due attention to this primary task (the super task, as noted in the speech of the President of the Russian Federation at the meeting with the Council of Legislators on April 24, 2019).

As a result, the Forecast does not present the dynamics of innovative activity of enterprises in the technological field, and it remains unclear whether by 2024 at least 50% of enterprises will carry out technological innovations annually as formulated in Decree No. 204. It should be remembered that a similar task was set in the Concept 2020 approved in 2008. However, the innovative activity of industry has not actually changed by 2018. In this regard, it is unclear how this goal is supposed to be achieved[5].

[5] Note that assessing the innovation activity effects and innovation contribution to economic development (one of its components is presented on page 23 of the Forecast), as well as identifying innovations with the TFP component from the Cobb-Douglas production function require a special justification. For several decades they have been emphasizing and explaining the illegality of this approach in the specialized literature.

*Table 7* on *p. 20* of the Forecast indicates two measures as tools to facilitate accelerated technological development: to implement technological development programs focused on artificial intelligence, the Internet of things, robotics and the development of digital platforms; to create a system of innovation centers. Meanwhile, these two areas of regulatory efforts seem to be secondary. For example, creation of innovation centers and valleys like Skolkovo or Lomonosov Moscow State University has virtually no effect on the technological re-equipment of the Russian economy. Similarly, artificial intelligence systems, the Internet of things, robotic programs, and digital platforms alone do not upgrade the manufacturing base of manufacturing industries and companies. The document does not mention a fundamentally important idea of the large-scale borrowing of technologies that Russian enterprises lack sorely. The foresaid demonstrates that the discrepancy in the forecast figures and planned real economic measures. In fact, the forecast document does not indicate the real sources of technological re-equipment of the domestic economy.

Of particular concern is the fact that the Forecast does not mention such a basic condition of technological re-equipment as the development of machine-tool production; its lag is both critical in terms of production volumes and technological level, including from the point of view of technological import dependence.

Due to this, the relatively high increase of capital investment is well marked in contrast to the insignificant innovation investment in economic growth. Regarding industry, it is mainly explained by the increase in state order (*p. 38*), which is not accompanied by effects in terms of key characteristics of production development, i.e. growth in labor productivity and other performance indicators (*see Industry section of Appendix 1*).

#### 2.2.4. Domestic demand

The Forecast (*p. 3*) notes that a slowdown factor of economic growth is the slowdown in aggregate demand growth, whose weakness is indicated by the rapid decline in inflation in 2019. This statement seems strange for the following reasons:

- first, we believe that the decline in demand is caused by a fall in household incomes the fore-

cast for 2020 notes that real consumer incomes will be increased, but the mechanism to achieve this growth is not indicated);

- second, the decrease in inflation is largely due to the synchronously tight monetary policy of the Bank of Russia and the fiscal policy of the Ministry of Finance of the Russian Federation. The Ministry of Economic Development communicates with them quite closely when developing anti-inflation policy measures. At the same time, the Forecast states that inflation in Russia is largely non-monetary in nature.

The section on policies regarding the so-called natural monopolies does not intend to conduct an audit of gas, electricity, transportation, etc. prices — it only says about price indexation. It is here that cost inflation is mostly formed contributing to fading activity of manufacturing enterprises and taking considerable funds from the population (payments for utilities).

### 3. ECONOMIC POLICY COORDINATION

We can't ignore the fact that the Forecast allowed the diminution of the role of the financial sector in achieving the parameters of the country's economic development. The state and development of the financial market, including the banking sector (lending volumes, indicators of financial stability), as a factor influencing the social and economic development of the country, is not specifically considered. In this regard, the financial (banking) resource component of the forecasts is absent. Just certain parameters of monetary policy are presented — the ruble exchange rate, inflation, etc. Unlike the previous forecasts, this document does not contain a forecast for the monetary sphere. It is just mentioned that the risk of social and economic development of Russia is an unjustified growth in consumer lending. It is advisable that the Ministry of Economic Development of the Russian Federation, together with the Bank of Russia, developed directions of state banking policy in the context of achieving national goals and key priorities, and the formation of domestic investment demand. We consider this condition important in the context of a remaining bank-oriented model of the Russian financial market and the role in the economy and in the implementation of national projects that development banks could play.

It is also important that this Forecast be supplemented by a forecast for the banking sector and the financial market as a whole, agreed with the Bank of Russia. It is also necessary to assess elaboration and feasibility of a number of state development programs for the certain sectors of the economy, primarily in terms of the validity and security of their financial and credit resources based on the first implementation results, including the project financing program for housing construction, preferential mortgage lending, and educational loan as a tool for developing human capital.

The document must identify the opportunities for creating internal financial resources, promoting investments, including mechanisms for subsidizing interest rates, as well as effective implementing investment projects with the state participation; emphasize the need for more active and large-scale involvement of Russian banks to solve the tasks. The following suggestions would certainly help:

- to increase the volume of investments and improve the efficiency of their use, to enlarge a membership in state programs by including representatives of the private sector of the economy and effective credit institutions, not state owned and not systemically significant;
- to increase credit support for economic growth in the country by Russian commercial banks, given the limited external borrowing, significant easing of some regulatory requirements imposed by the Central Bank, and especially with regard to the commercial banks whose loan portfolios are dominated by high-tech and highly efficient real economy projects;
- to create conditions for non-governmental financial institutions in the country in order to expand financial support for the domestic economy.

In unstable global environments, in the sphere of monetary policy switching to flexibly regulated ruble exchange rate in a certain range to increase its role in maintaining financial and economic stability seems logical.

The responsibility for macroeconomic stability between exchange and monetary policies requires more even distribution that may lead to an increase of the inflation targeting benchmark above 4%.

On the one hand, justified by fundamental factors and regulated and projected for the future, the range of the exchange rate of the Russian currency would not lead to appreciation of imported equipment necessary for re-equipping the production base and producing competitive non-primary Russian products. On the other hand, it could provide sufficient profitability and growth of export earnings of Russian producers.

Non-monetary factors should be managed through comprehensive measures, as they affect various sectors of the Russian economy and imply interaction with federal and regional authorities. The Bank of Russia and the Ministry of Finance of the Russian Federation, the Ministry of Economic Development of the Russian Federation, and other ministries and departments should be in close cooperation, especially when forecasting their activities.

Experts from the Financial University have repeatedly emphasized this aspect and have proposed measures to coordinate various areas of state economic policy[6].

The lack of coordination is exemplified by the fact that the parameters of this forecast do not correspond to the forecast of the Bank of Russia included in the draft Guidelines for the Single State Monetary Policy in 2020 and for 2021 and 2022. According to the forecast of the Ministry of Economic Development, in 2020, inflation will be 3%, and according to the forecast of the Bank of Russia, it will be 4% in case of an optimistic and basic scenario and in the case of a risk scenario, it can reach 6.5–6.7%. Note that when making decisions the Bank of Russia will be guided by the approved Fundamentals of monetary policy. Therefore, a significant part of the measures in the Forecast may in fact be financially unsecured.

## 4. RISKS FOR SOCIAL AND ECONOMIC DEVELOPMENT

Section "Forecast risks for social and economic development" on *p. 36* of the document identifies the main risks — stagnation of the global economy, deterioration of the consumer loan portfolio and slow implementation of structural reforms.

It seems that more significant risks are in the shortage or neutralization of sources of investment in fixed assets, slow technological re-equipment of the economy and the spontaneous release of workers due to the mass digitalization of production processes.

There are also risks of a steep decline in inflation, which does not correspond to the current internal and external conditions, on the one hand, and risks of high volatility of the ruble exchange rate, on the other.

Let's bear in mind such risks as poverty of a significant share of the population, its social and economic stratification, as well as uneven development and situation of Russian regions.

The risks of emergence of social strain due to the actions of destructive socio-political groups and failures in implementing reforms in the pension sector, healthcare, and education were not assessed.

The following risks were not assessed either: labor emigration of talented youth capable of innovation, development of attitudes toward self-realization abroad among young people, and destructive factors lowering the profile of conscientious work.

[6] The importance of coordinating various directions of state economic policy to ensure sustainable economic growth has been written over several years by scientists of the Financial University while preparing expert opinions on the draft "Guidelines for the Single State Monetary Policy", as well as they substantiated the position in monographs and articles, speeches at scientific conferences, as part of participation in the work of the Stolypin Club; Monetary policy of Russia: new challenges and prospects. Monograph. Eskindarov M.A., ed. M .: Knorus; 2016; Fiscal and monetary instruments to achieve financial stability and ensure economic growth. Monograph. Abramova M.A., ed. M .: Knorus; 2017; Eskindarov M.A., Maslennikov V.V., Abramova M.A., Lavrushin O.I., Goncharenko L.I., Solyannikova S.P., Morkovkin D.E., Abdikeev N.M. Strategy of the CSR 2018–2024: slogans, myths and reality (position of experts at the Financial University). Vestnik Finansovogo universiteta — Bulletin of the Financial University, 2017; 21 (3): 6–24.

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